DESIGN REPORT

DAMS CONSTRUCTION/RECONSTRUCTION PROJECT

CITY OF BOILING SPRING LAKES

North Lake Dam (BRUNS-001), Pine Lake Dam (BRUNS-002), Sanford Dam (BRUNS-003), Upper Lake Dam (BRUNS-012)

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EXECUTIVE SUMMARY

During Hurricane Florence (September 2018), Sanford Dam suffered major failure due to overtopping and substantial embankment erosion that caused sudden release and loss of the Boiling Spring Lake impoundment. Cascading failures occurred at smaller upstream dams serving the Boiling Spring Lake system: North Lake Dam, Pine Lake Dam, Middle Lake Dam, and Upper Lake Dam.

All the dams were earthen embankments with risers and/or conduits constructed circa 1962. Middle Lake Dam is privately owned. All other dams are owned and maintained by the City of Boiling Spring Lakes. The dams maintained varied water levels for aesthetics and recreational use throughout the City's lake system.

The goal of the project is to re-establish the impounded lakes upstream of the City-owned dams breached by Hurricane Florence. McGill was retained to design and submit the permit applications for the repairs of the City-owned dams to include restoration of the earthen embankment and installation of spillways and seepage control elements that meet current codes and standards. The design storm approved by NC Dam Safety program is the ½ PMP (Probable Maximum Precipitation) for the Sanford Dam and ⅓ PMP for the other dams in the system. The following are the major elements included in the design:

- At Sanford Dam, install a cutoff wall for the entire length of the dam, upgraded riser structure and cast-in-place (CIP) concrete box culvert to replace the existing undersized spillway and rebuild the embankment at the location of the breach and partially scoured area, and install mix-in-place (MIP) panels along the upstream and downstream toes of the embankment to mitigate the potential for cyclic liquefaction.
- At North Lake Dam and Pine Lake Dam, remove the existing bottom metal culverts because they are not compliant with current codes and standards and install riser structures and CIP box culverts with seepage controls.
- At Upper Lake Dam, replace the existing undersized spillway with a riser structure and CIP box culverts with seepage controls and rebuild the embankment at the breach.

Hydrologic and Hydraulic (H&H) models were developed to simulate the lake system aiming to assess hydraulic performance for various alternatives of all spillways. The H&H evaluation provided adequate spillway sizing to ensure overtopping protection up to the design storm for each lake. In addition, a combined breach of all dams upstream of Sanford Dam was simulated to ensure that the breach of the upstream dams does not cause overtopping and risk of failure at Sanford Dam.

A geotechnical exploration was conducted at all sites with added emphasis on the underlying limestone formation, which had been associated with sinkholes formation around Sanford Dam. A cutoff wall was recommended for the entire length of Sanford Dam to minimize the rate of groundwater flow in the limestone underneath the dam.

A preliminary environmental analysis and coordination with regulatory agencies, were completed to evaluate what impacts (if any) the proposed project may have on the site environmental features and to determine required permitting. It was agreed upon that permitting requirements for impacts to jurisdictional waters at the dam sites will be based on conditions prior to dam failures (i.e., the former Ordinary High Water Mark of the lakes) and be considered open water. This work will be authorized by the US Army Corps of Engineers under a Nationwide Permit 3 for Maintenance Activities and by the NC Division of Water Resources under Water Quality General Certification 4132. It is anticipated that no further consultation or studies will be required for threatened and endangered species. Due to proposed work in the floodplain and floodway, the base flood elevations will be changed from prior conditions. A Conditional Letter of Map Revision (CLOMR) has been prepared for the Local Floodplain Administrators of the City of Boiling Spring Lakes and Brunswick County as well as NCFMP. A Letter of Map Revision will also be required within 6 months of completion of construction which generally requires 4 to 6 months for review. A Floodplain Development Permit from the City of Boiling Spring Lakes is required following approval of the CLOMR.

Civil, geotechnical, and structural design and associated construction drawings and technical specifications were prepared for the proposed improvements. Based on the scope of the reconstruction work described in this report and on our experience on similar projects, we estimate that the duration of construction will be about 24 months for Sanford Dam and will be about 12 months each for North Lake Dam, Pine Lake Dam, and Upper Lake Dam. Based on our evaluation of the work required it is expected that the total contract duration will range between 36 to 48 months. This range is generally in line with the responses the City received from the initial Request for Qualifications for this project. It should also be noted for a project of this complexity that as the required contract duration is reduced in the bid documents the corresponding bid values will likely increase.

An opinion of construction cost was prepared for each dam using estimated quantities derived from the design:

- Sanford Dam $ 28,046,648
- Upper Lake Dam $ 1,994.921
- North Lake Dam $ 1,524,667
- Pine Lake Dam $ 1,246,648

Currently, all four dams haven been deemed eligible for disaster assistance by FEMA. However, FEMA has disallowed reimbursement for cost associated with enhancements required by the NC Dam Safety codes and standards (e.g., spillways enhancement and seepage control). Reimbursement for such enhancements will be sought under the 406 Mitigation assistance with FEMA. The determination of total reimbursement amount for each dam is still ongoing with FEMA. The City also seeking additional funding assistance opportunities with other Federal and State agencies,

1. INTRODUCTION

1.1 Project Location

The Boiling Spring Lakes system, which consists of Boiling Spring Lake, North Lake, Pine Lake, Middle Lake, and Upper Lake, is located on Allen Creek within the city limits of Boiling Spring Lakes, in Brunswick County, North Carolina (Figure 1). Spring Lake is connected to North Lake via a culvert without any known structures impounding the Lake. The dams in the system consist of Sanford Dam (impounding Boiling Spring Lake), North Lake Dam, Pine Lake Dam, Middle Lake Dam, and Upper Lake Dam. Middle Lake Dam is privately owned, and the other dams are owned and operated by the City of Boiling Spring Lakes (City) (Deeds in Appendix 1). Sanford Dam carries Alton Lennon Road, a City-owned road. East Boiling Spring Road, a City-owned/North Carolina Department of Transportation (NCDOT) maintained road, runs atop North Lake and Pine Lake dams. West Dam Road is a City-owned gravel road atop Upper Lake Dam. Middle Lake Dam is located about 850 feet (ft) upstream of SR 87 (George II Hwy).

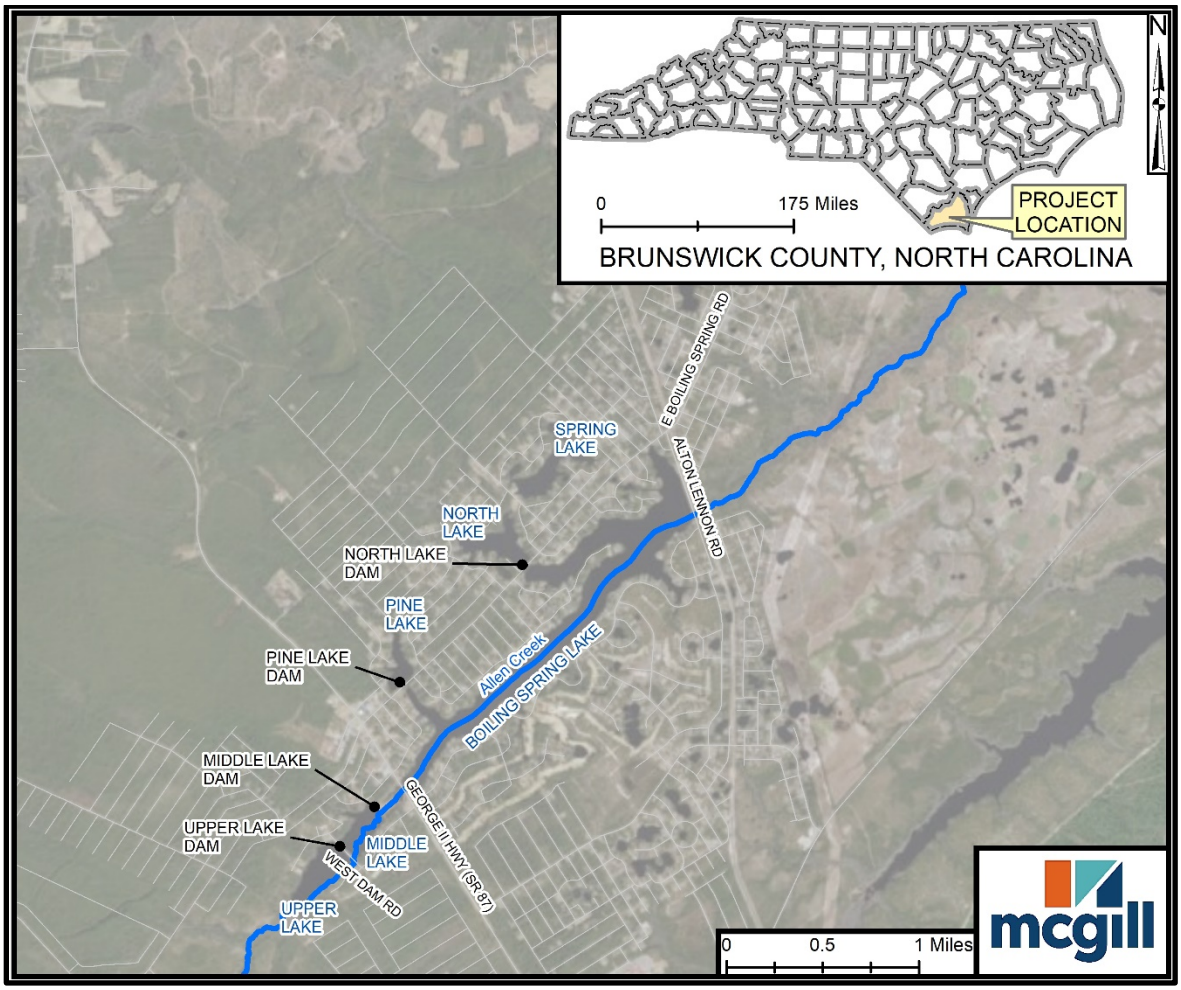


Figure 1. Location Map

1.2 Project History and Background

Sanford Dam, North Lake Dam, and Pine Lake Dam were designed by Henry von Oesen Consulting Engineers of Wilmington, North Carolina in 1960 for the Boiling Springs Development Corporation, a subsidiary of the Reeves Telecom Corporation. Original construction of the three dams was completed in 1961 and 1962 by the Lincoln Construction Company of Wilmington, North Carolina. The three dams were designed and constructed in support of the development of the Town of Boiling Spring Lakes. According to the Boiling Spring Lakes Sinkhole Hazard Reduction Plan (Planning & Design Associates, P.A. 1983), Boiling Spring Lakes was originally designed in the late 1950s as a “planned retirement community” and experienced the highest rate of population growth in Brunswick County between 1970 and 1980. The Town of Boiling Spring Lakes assumed ownership of the three dams in March of 1981.

Apart from the aforementioned information about original design and construction, little to no historical information is available for North Lake and Pine Lake Dams. No historical design or construction information is available for Middle Lake or Upper Lake Dams.

The City is practically based around this lakes system. Water levels are primarily maintained passively by the spillways for aesthetics and recreational use throughout the lake system. Sanford Dam is also operated to lower the Boiling Spring Lake level for flood control ahead of major storm events.

A Phase I Inspection Report prepared by Law Engineering (1980) as part of the federal interagency National Dam Safety Program stated that a high hazard classification was appropriate for Sanford Dam based on the location of the Military Ocean Terminal Sunny Point (MOTSU) railroad, which is located immediately downstream of the dam. Since at least from the time of the submittal of the Phase I Inspection Report, Sanford Dam has been classified as a high hazard structure. The other four smaller dams in the system were classified as low hazard structures or were previously not classified.

During Hurricane Florence in September 2018 Boiling Spring Lake suffered a sudden release and drawdown from the failure of the Sanford Dam, which also severed Alton Lennon Drive. Subsequently, the four other smaller dams failed (Figure 2). The City contacted the Federal Emergency Management Agency (FEMA) for reimbursement for the repairs under the disaster relief fund and retained McGill Associates (McGill) through their existing On-Call contract to assist with the initial damage assessment.

The City and McGill met with the North Carolina Department of Environmental Quality (NC DEQ), Division of Energy, Mineral and Land Resources (DEMLR), Dam Safety Program (NC Dam Safety) staff at the dam sites on January 10, 2019 to discuss the dam failures and approach to rehabilitation of the dams. During the meeting, NC Dam Safety expressed concerns about the hazard classification of the four smaller dams based on road traffic over the dams and/or the potential for the failure of Sanford Dam, due to failure of one or more of the four

smaller dams. McGill prepared a Dam Analysis Report, which included a simplified dam breach evaluation, and submitted it to NC Dam Safety for comments. The findings of the analysis were discussed in a meeting on June 3, 2019 with FEMA, NCDOT and NC Dam Safety (minutes included in Appendix 1). The outcome of the meeting was that a comprehensive evaluation of the lakes system was required to reconstruct the dam per current codes and standards.

The City subsequently retained a team of consultants through public solicitation. This team was led by McGill and included Schnabel Engineering South, P.C. (Schnabel) and East Coast Engineering & Survey, PC, (ECES). The McGill team was retained to evaluate the requirements of the NC DEQ codes and standards and prepare a Preliminary Analysis Report (PAR) (McGill 2020). Coordination with NC Dam Safety resulted in concurrence with the high hazard classification of the dams (See November 20, 2019 meeting minutes in Appendix 1). The North Carolina Administrative Code (NCAC) requires that the reconstruction of these dams shall meet current codes and standards as stated in the North Carolina Dam Safety Law of 1967 (NCGS 143-215.23 through 37) and North Carolina Administrative Code, Title 15A, Subchapter 2K: Dam Safety (15A NCAC 02K) (NCAC Effective) (See Hazard Potential Assessment Letter from NC Dam Safety in Appendix 1). Those include, but are not limited to:

- 15A NCAC 02K .0205 SPILLWAY DESIGN: Sanford Dam shall have a spillway with capacity to pass a flow resulting from the 1/2 PMP (Probable Maximum Precipitation) storm. The other three dams shall have spillways with capacity to pass a flow resulting from the 1/3 PMP.
- 15A NCAC 02K .0207 SEEPAGE CONTROL: All dams shall be designed and constructed to prevent the development of instability due to excessive seepage forces, uplift forces, or loss of materials in the embankment, abutments, spillway areas, or foundation.

Dam and spillway design alternatives were evaluated for hydraulic performance, construction considerations, environmental permitting, and capital, operation and maintenance cost in the PAR. Because the data and analyses used in the PAR are used and further expanded upon in this report, the PAR is included here by reference. The following spillways were recommended:

- Install a cutoff wall for the entire length of the dam, upgraded riser structure and cast-in-place (CIP) culvert to replace the existing undersized spillway and rebuild the embankment at the location of the breach at Sanford Dam.
- Remove the existing bottom metal culverts because they are not compliant with current codes and standards at North Lake Dam and Pine Lake Dam and install riser structures and CIP culverts with seepage controls adjacent to the embankment.
- Replace the existing substandard spillway with a riser structure and CIP culverts with seepage controls adjacent to the embankment and rebuild the embankment at the breach of Upper Lake Dam.

Subsequently, the City retained the McGill Team to design the recommended alternatives of the PAR, prepare the construction documents, and provide construction oversight for the project. This Design Report is prepared to document the criteria, parameters, assumptions, and computations made to design the spillways and restore the earthen embankments to accommodate the required storm design frequency for each dam.

Figure 2. Breach on Sanford Dam and Upper Lake (Upper Panel) and Pine and North Lakes (Lower Panel)

1.3 Terminology, Abbreviations and Nomenclature

A variety of dam names have been used in various reports and databases. The names adopted in this report are the most commonly used names by the City and public. For reference, Table 1 provides other names known to have been associated with each dam.

Table 1. Known Lake and Dam Names

Dam Name	Dam Sate ID	Water Body Name	Other Known Dam Names	Other Known Water Body Names
Sanford Dam	BRUNS-003	Boiling Spring Lake*	-Boiling Springs Lake Dam -Sanford Lake Dam	- Big Lake - Patricia Lake - Sanford Lake - Boiling Springs Lake
North Lake Dam	BRUNS-001	North Lake**	-North Dam	- Clear Pond
Pine Lake Dam	BRUNS-002	Pine Lake**	-Pine Dam	
Middle Lake Dam	BRUNS-011	Middle Lake*	-Middle Dam -Boiling Springs Lake Upper Dam	- Boiling Springs Lake
Upper Lake Dam	BRUNS-012	Upper Lake*	-Upper Dam -Upper (Allen Creek) Dam	- Boiling Springs Lake

*Boiling Spring Lake, Middle Lake, and Upper Lake are in line with Allen Creek (i.e., the three water bodies constitute a portion of Allen Creek).

**North Lake and Pine Lake are tributaries that discharge to Allen Creek.

Directional reference for the dams is based upon one looking downstream in the direction of flow (e.g., *Right* means the right side of an observer standing at a location looking downstream). The reservoir side of the dam is referred to as the upstream side or face and the other side as the downstream side/face.

Cross slopes are listed as a horizontal to vertical ratio unless explicitly stated otherwise (e.g., a 21 slope means a 1-foot vertical elevation change for each 2 feet (ft) horizontal distance).

Refer to Table 2 for a general list of abbreviations and acronyms used throughout this report. In case of conflict, abbreviations explicitly defined as part of a paragraph or computation take precedence over the list in Table 2.

Table 2. Abbreviations and Nomenclature

Item	Abbreviation / Acronym
Acceleration of Gravity	g
Acre-foot	ac-ft
Acres	ac
Cast-In-Place	CIP
Cubic feet per second	cfs
Cone Penetration Test	CPT
Downstream	D/S
Emergency Action Plan	EAP
Factor of Safety	FS
Feet	ft or ’
Finish Floor Elevation	FFE
Flow/Discharge	Q
Foot per second	fps
Gallons	gal
Gallons per minute	gpm
Geotechnical Data Report	GDR
Hours	hr
Hydrologic and Hydraulic	H&H
Inches	in or ”
Light Detection and Ranging	LiDAR
Maximum	Max
Miles	mi
Minimum	Min
Mix-In-Place	MIP
National Land Cover Database	NLCD
North American Vertical Datum of 1988	NAVD88
Operations and Maintenance	O&M
Probable Maximum Precipitation	PMP
seconds	s
Spillway Design Flood	SDF
Standard Penetration Test	SPT
Time of Concentration	TOC
Upstream	U/S
Volume	Vol, V
Natural Resources Conservation Service	NRCS
US Bureau of Reclamation	USBR
US Geological Survey	USGS
United States Army Corps of Engineers	USACE

1.4 Pre-Storm Features of the Dams

A summary of the dams' characteristics based on the NC Dam Safety inventory (NC Dam Safety 2020) and supplemented by topographic survey conducted following Hurricane Florence (Section 1.5) is presented below. The full inventory is provided in Appendix 1.

Sanford Dam and Alton Lennon Drive

- A 36-foot-high earthen embankment with a 1,584-foot crest length on the northeastern edge of the city
- Alton Lennon Drive, a City-owned road at elevation 38.2', is atop the dam
- A 53-foot x 12-foot main drop inlet spillway (control elevation 30.3') located in-line with Allen Creek at the northeastern corner of the lake and 4 lined CMP conduit outfalls (effective diameter 42 inches)
- A series of 4 gates on the face of the main drop inlet spillway serve as a bottom drain
- The normal water level (NWL) of the lake was maintained at 30.0' by the City by throttling the bottom drain gates

Upper Lake Dam and West Dam Road

- A 11-foot-high earthen embankment with an 850-foot crest length
- West Dam Road, a City-owned road at elevation 41.3', is atop the dam
- Two 6-foot X 6-foot concrete main drop inlet spillways (control elevation 38.0') each with a 4-foot CMP conduit located in-line with Allen Creek at the eastern corner of the lake
- A 42-inch gate on the face of each main drop inlet spillway serving as a bottom drain at invert elevation 33.5'

Pine Lake Dam

- An 18-foot-high earthen embankment with a 750-foot crest length
- East Boiling Spring Road, a City-owned / NCDOT-maintained road at elevation 44.0', is atop the dam
- A 7-foot diameter main drop inlet spillway (control elevation 35.0') located in-line with the Unnamed Tributary to Allen Creek and a 5-foot CMP conduit outfall
- One elevated 3-foot CMP culverts also serve as outfalls
- A 5-foot diameter gate on the upstream face of the main drop inlet spillway serves as a bottom drain at invert elevation 28.0'

North Lake Dam

- A 12-foot-high earthen embankment with a 600-foot crest length
- East Boiling Spring Road, a City-owned / NCDOT- maintained road at elevation 40.0', is atop the dam
- An elevated 5.5' x 4.5' CMP Box (control elevation 35.0') serves as the main outfall located in-line with Clear Pond and Spring Lake Tributaries to Allen Creek

- An elevated 36-inch CMP culvert also serves as an outfall

1.5 Professional Land Survey

East Coast Engineering & Survey (ECES), PC performed a series of hydrographic and topographic surveys between November 2018 and November 2019 to develop base files of each dam site. These surveys show the existing site conditions, including the breaches, post Hurricane Florence. In April and May 2020, ECES conducted hydrographic survey to collect the channel bathymetry upstream and downstream of Sanford Dam and McGill and GPI Mapping performed an aerial LiDAR (Light Detection and Ranging) survey to compile high-resolution terrain data (1-foot Digital Elevation Model) for the lakes floor (Figure 3). Conducted surveys were referenced to the NAD83 (2011), State Plane (Feet) North Carolina (FIPS 3200) datum with the elevation referenced to the North American Vertical Datum of 1988 (NAVD 88). All elevations and coordinates in this report are tied to the same datums unless explicitly stated otherwise.

Beyond the limits of the survey, LiDAR from the North Carolina Risk Management Office, known as QL2, was used. LiDAR is tied to NAD83 (2011) North Carolina State Plane Coordinate System, US survey feet; NAVD88 (Geoid 12A), US survey feet.

Figure 3. High Resolution digital elevation model (1-foot) derived from site-specific Light Detection and Ranging (LiDAR) data, topographic and bathymetric survey

2. HYDROLOGY AND HYDRAULICS

2.1 Spillway Design Flood

The proposed Spillway Design Flood (SDF) for the Sanford Dam spillway is the flow induced by the ½ Probable Maximum Precipitation (PMP) storm event. The SDF for North Lake, Pine Lake, and Upper Lake dams' spillways is based on the ⅓ PMP storm pursuant to the requirements of 15A NCAC 02K.0205 SPILLWAY DESIGN (NCAC Effective).

2.2 Rainfall Characterization

Rainfall data for the 100-year frequency storm were obtained from the National Oceanic and Atmospheric Administration (NOAA) Precipitation Frequency Data Server (PFDS). Runoff of the defined 100-year storm was computed for a 48-hour duration based on the size of the basin and based on the computed times of concentration. The 100-year, 48-hour storm was 14.7" (Figure 4 and Appendix 2). The 100-year event was evaluated for an initial check against existing records and for use in floodplain mapping.

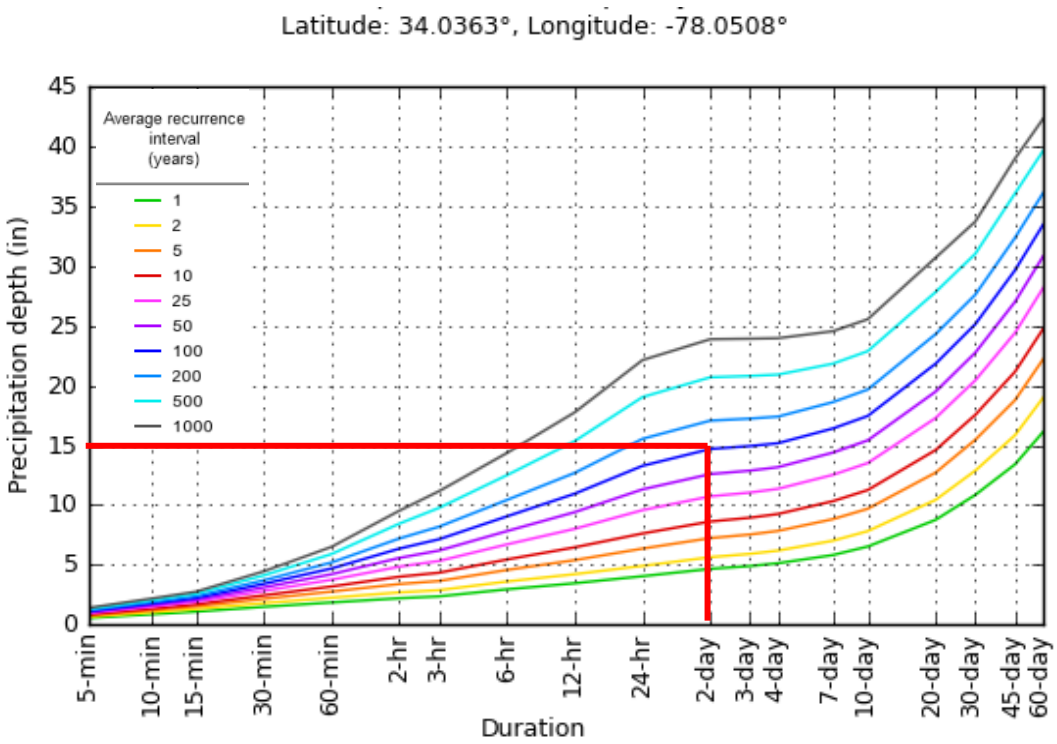


Figure 4. Rainfall Depth-Duration-Frequency Curves at Boiling Spring Lakes

The Probable Maximum Precipitation (PMP) rainfall amount and distribution for the watershed was calculated using methods from Hydrometeorological Reports No. 51 and 52 (HMR 51 and 52) (NOAA 1978, NOAA 1982) in combination with Hydrologic Engineering Center's Meteorological Visualization Utility Engine (HEC-MetVue). The PMP storm over the watershed yields about 50 inches of rain in 72 hours with a peak of 9.5 inches within a 30-minute time span

(Figure 5 and Appendix 2). A factor of 0.5 and 0.33 was applied to the PMP distribution to obtain the ½ PMP and the ⅓ PMP, respectively, for use in the hydrologic model.

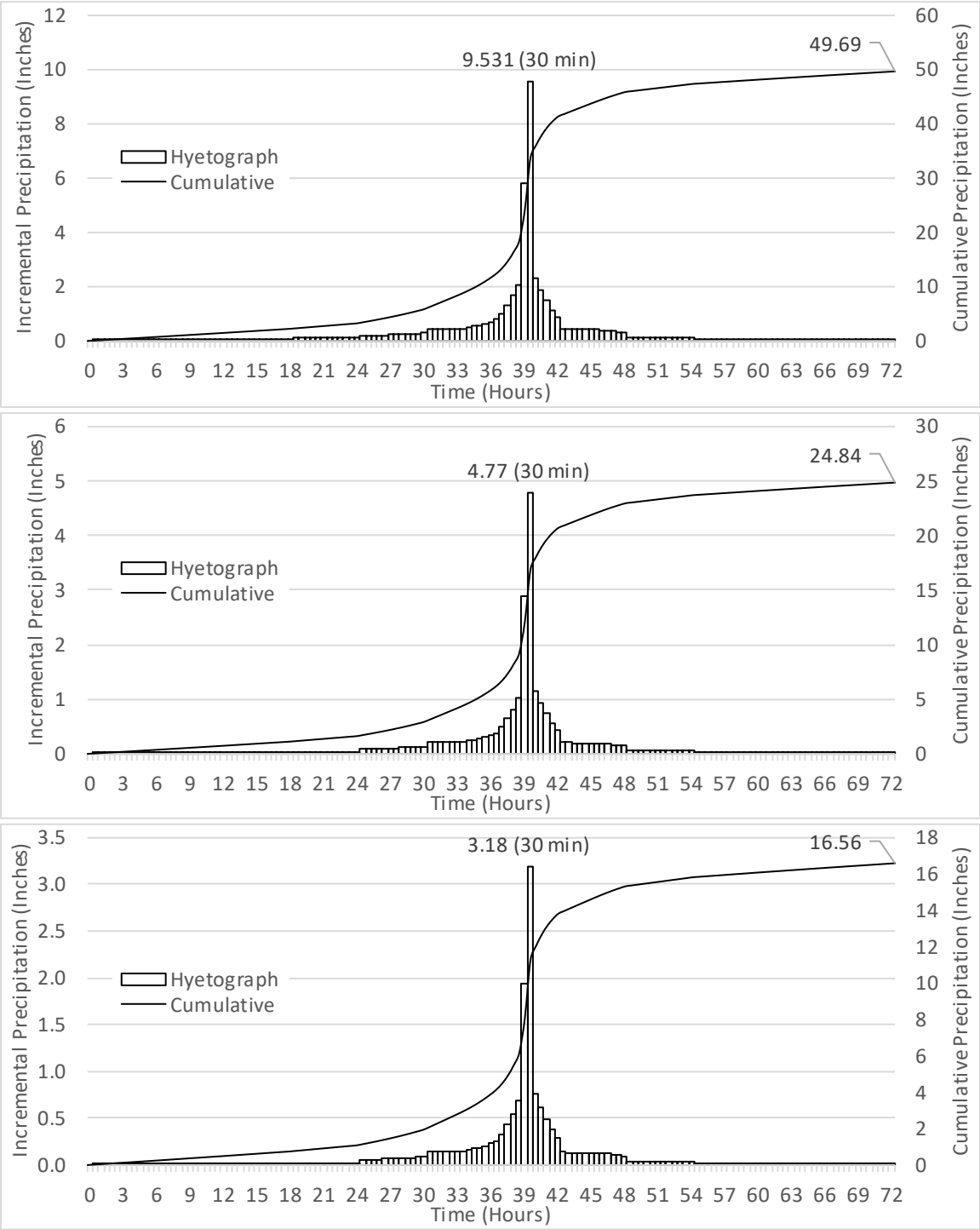


Figure 5. Rainfall amount and distribution for the Probable Maximum Precipitation (PMP) (upper panel), ½ PMP (middle panel), and ⅓ PMP (lower panel) at Boiling Spring Lakes

2.2.1 Hurricane Florence Rainfall Characteristics

Hurricane Florence was selected to validate the results of the hydrologic and hydraulic models developed for the Boiling Spring Lakes system (Sections 2.3 and 2.4). The simulated Hurricane Florence results were compared to available information on water surface elevation and other field observation for validation check of the developed models (Section 2.5).

Hurricane Florence made landfall as Category 1 hurricane mid-day of September 14, 2018, across eastern Brunswick County (Stewart and Berg 2019) delivering historic amounts of rainfall and caused record flooding across the state of North Carolina especially for the Southern Coastal Plain Region (Figure 6). Additional information on Hurricane Florence from the National Weather Service and rainfall gauges near the watershed are included in Appendix 2.

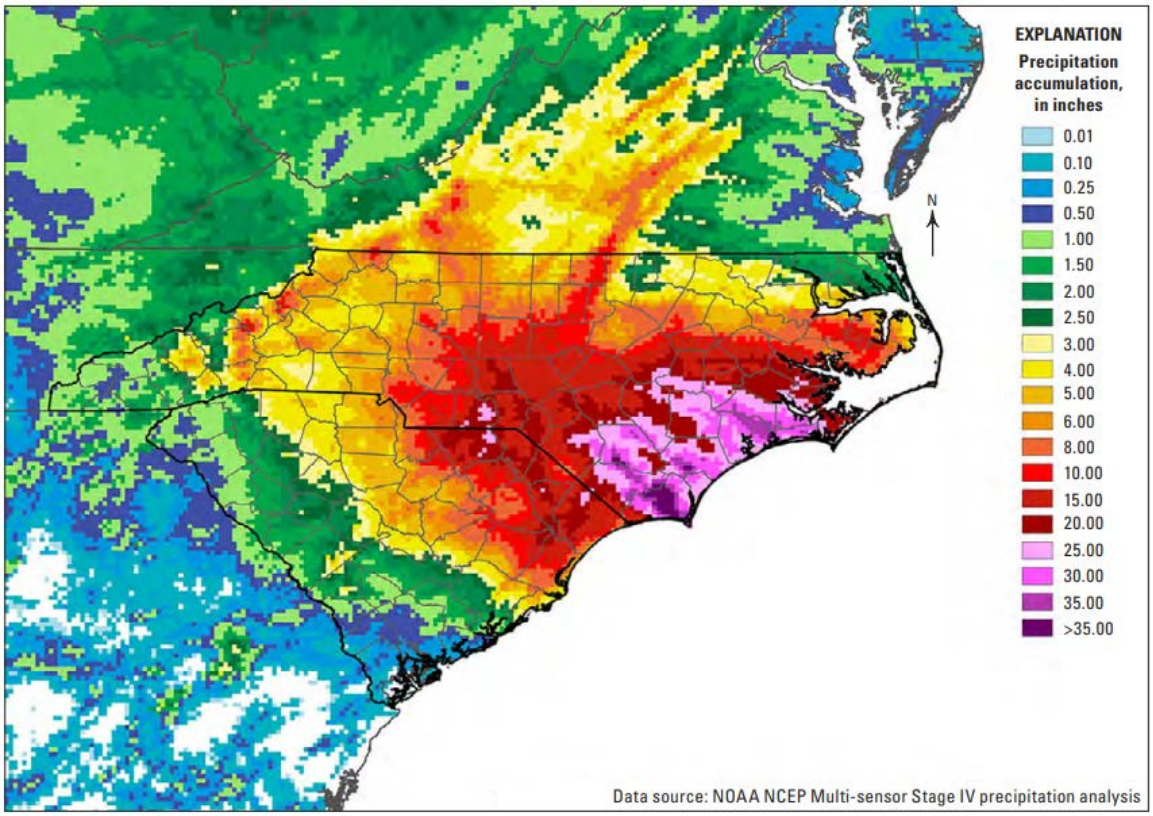


Figure 6. Accumulated Precipitation in North Carolina and surrounding States during Hurricane Florence during September 13-18 (Feaster et al. 2018).

Rainfall records associated with Hurricane Florence were obtained from two weather stations identified near the watershed and with good data quality: 1) The Nature Conservancy station at Varnamtown (ID: NNAC) located approximately 12 miles west to the watershed with hourly precipitation records , and 2) The USGS Station of Cape Fear River at Lock 1 (ID: 02105769) located 28 miles North West of the watershed with sub-hourly records (Figure 7). The total rainfall yielded by Florence at the NNAC station was higher than the ½ PMP event over the duration of the storm, but with peak rainfall substantially below the peak of the ½ PMP

distribution (Figures 5 and 8). For the USGS Cape Fear River station, precipitation total, as well as associated peak value, fell below the ½ PMP event.

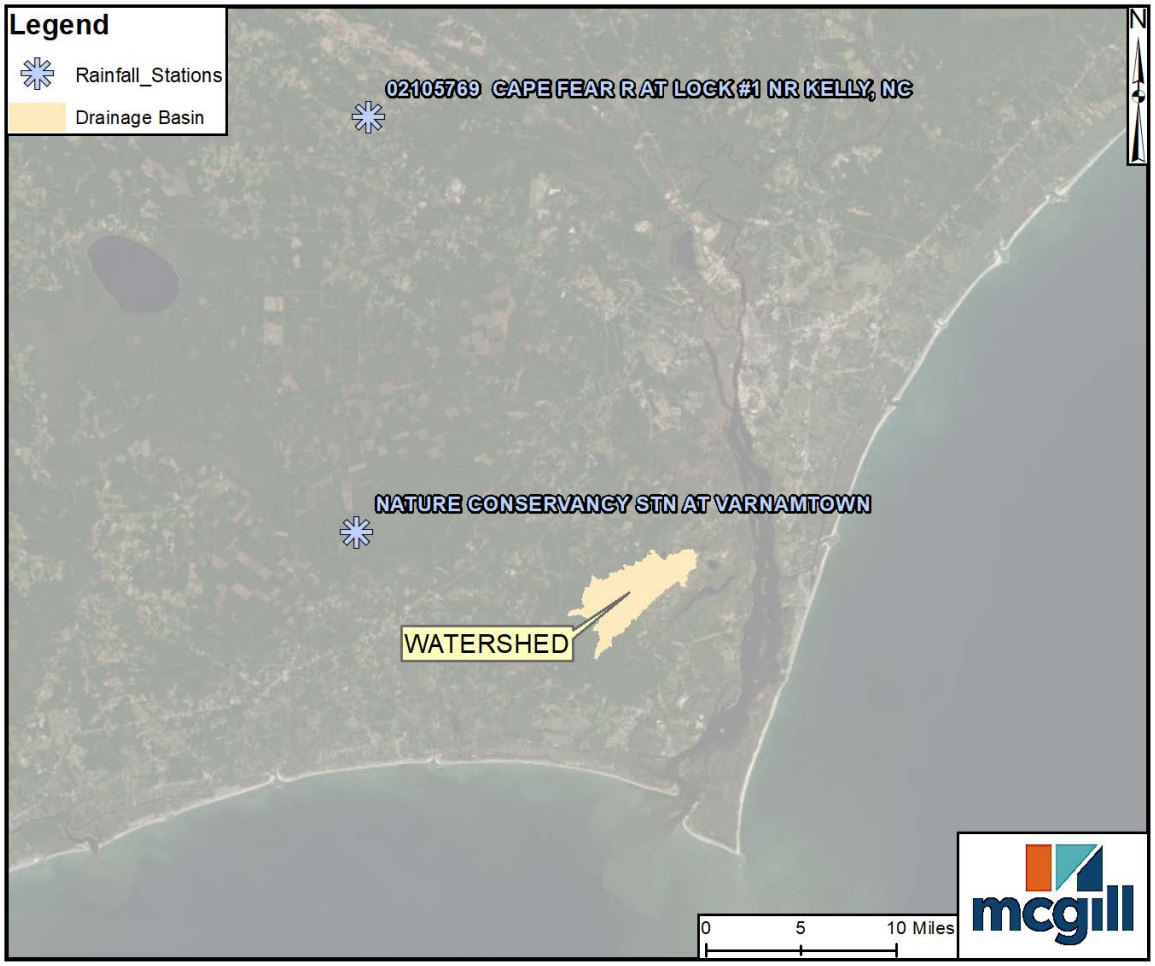


Figure 7. Rainfall stations near the watershed

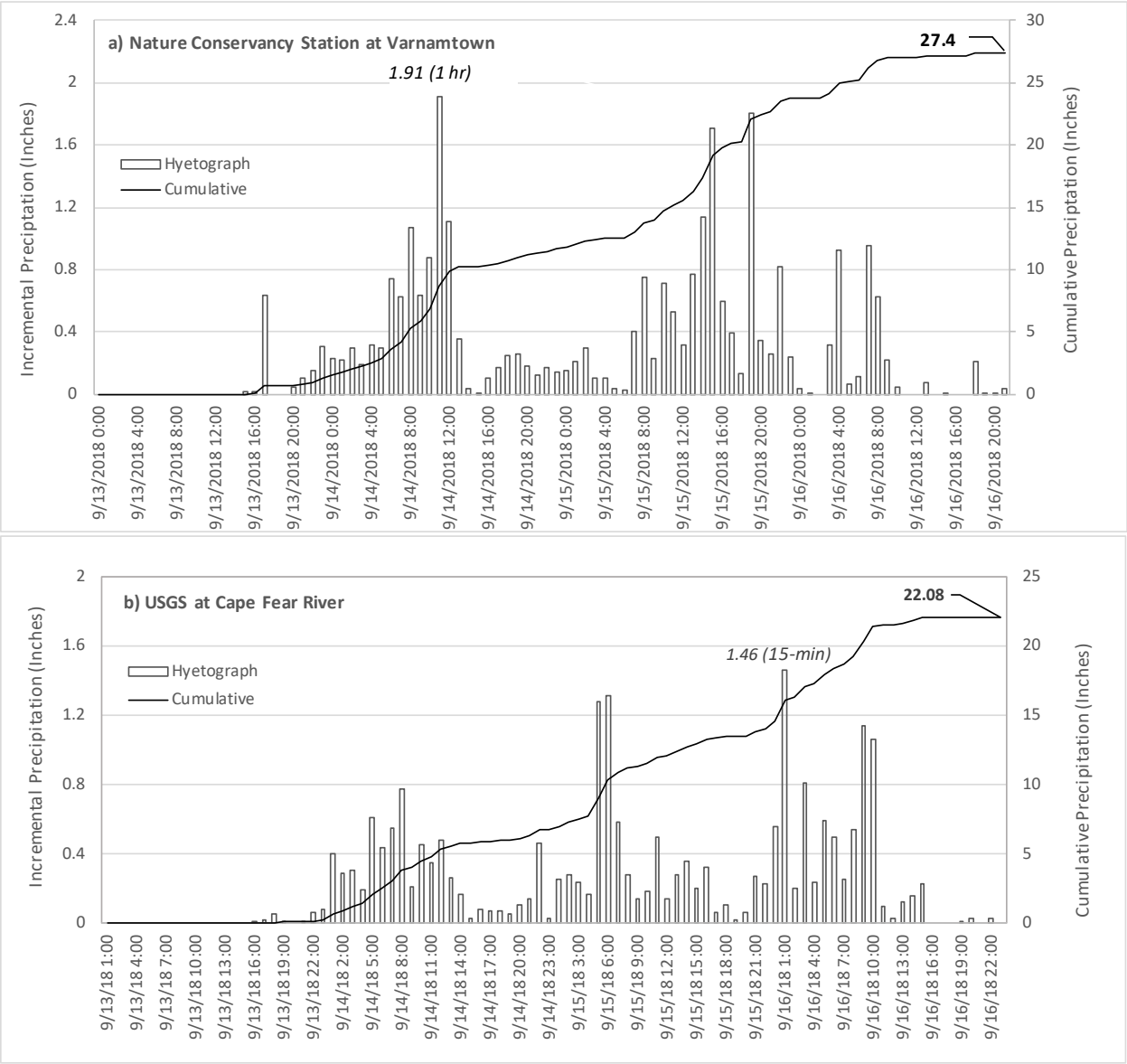


Figure 8. Hurricane Florence rainfall recorded at the Nature Conservancy weather station (top panel) and at Cape Fear R at Lock #1 Nr Kelly, NC (02105769) station (bottom panel).

An ongoing study by a research group at NC State University, conveyed to McGill via personal communication (Mitchell, Hunt and Johnson 2020), shows that, with a total rainfall of 27.4" over 78 hours recorded for Florence at the NNAC station with and average intensity of 0.35 in/hr, Hurricane Florence rainfall surpassed the 1000-year storm designated by NOAA Atlas 14 Intensity/Depth Duration Frequency Curves. Precipitation data retrieved from the NNAC weather

station (i.e., closest station to project location) were reviewed to corroborate the findings conveyed by the research team. Total precipitation recorded during the 5-day storm at the NNAC was 27.93” most of which occurred in a 3-day period. Maximum observed 3-day precipitation depth at the NNAC station was 27.12” with an average intensity of 0.35 in/hr. This classifies Hurricane Florence as a storm of > 1000-year recurrence interval (Figure 9).

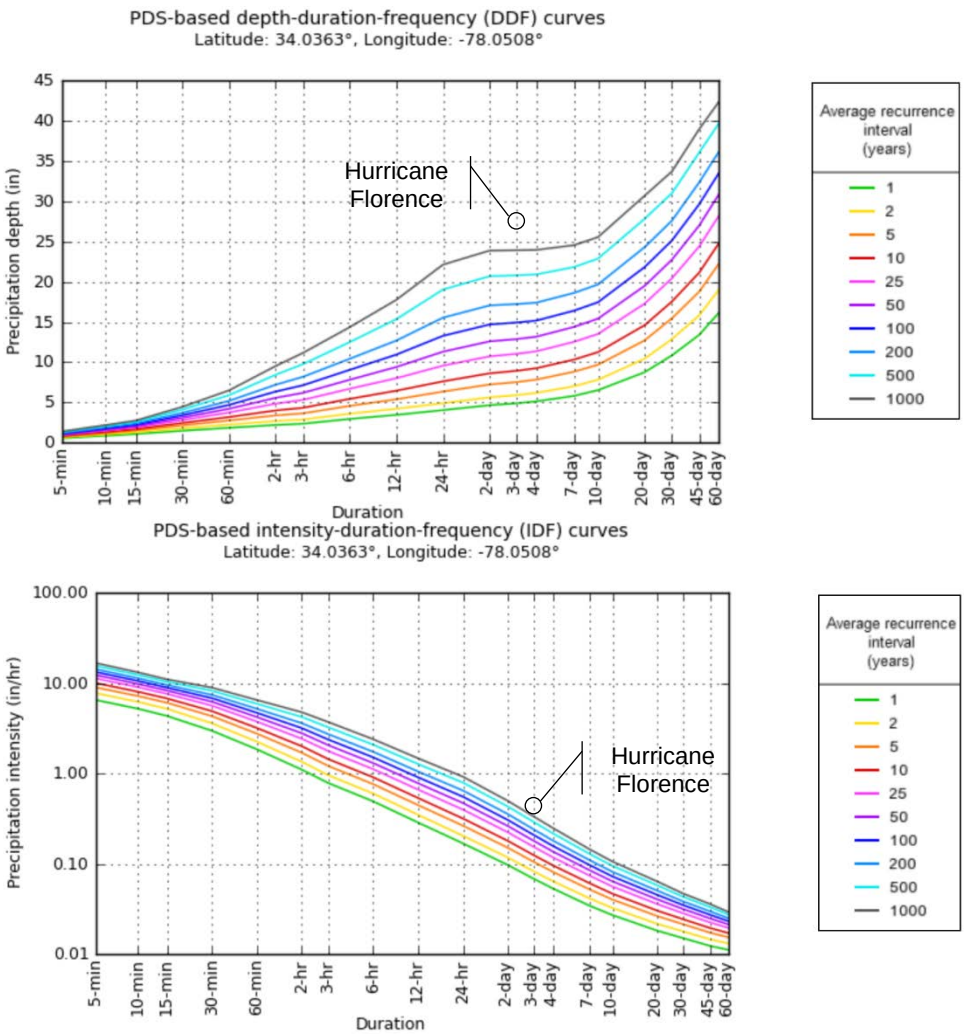


Figure 9. Hurricane Florence on Precipitation Depth- (upper panel) and intensity- (lower panel) Duration-Frequency Curves at Boiling Spring Lakes

An analysis of 72-hour precipitation totals conducted by the National Weather Service for Hurricane Florence provided similar conclusion: the annual exceedance probabilities (AEP)

surpassed the 1000-year threshold (i.e.; ≤ 0.1% chance) for the vast of NC Southern Coastal Plain region including the project site (Figure 10).

Figure 10. Return Intervals (years) for the worst case 72-Hour rainfall for Hurricane Florence (Source of the GIS data for Florence return interval analysis: NOAA-NWS).

2.3 Hydrologic Modeling

2.3.1 Modeling Approach

A hydrologic response assessment of the lakes system was performed to evaluate the runoff contributed from each sub-basin in the system for various storms. The analysis was conducted using the United States Army Corps of Engineers (USACE) Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) version 4.3. HEC-HMS is a rainfall-runoff model developed by the U.S. Army Corps of Engineers and is widely used for detailed rainfall-runoff modeling across the United States. HEC-HMS has two main components: *Basin Models* for the watershed physical parameters input and *Meteorologic Models* for the rainfall data input.

The rainfall distribution of Hurricane Florence, the ½ PMP and the ⅓ PMP were defined in HEC-HMS as *Specified Hydrographs* by inputting the storms' hyetographs (Figures 5 and 8) as Time Series.

2.3.2 Basin Characteristics

A 20-foot grid size Digital Elevation Model (DEM) obtained from the North Carolina Floodplain Mapping Program (NCFMP) website was used along with the USACE HEC-GeoHMS program and ArcGIS to delineate the contributing watershed to each of the Boiling Spring Lakes dams (Figure 11 and Table 3). In addition, the Allen Creek watershed area extending over 3 miles downstream of Sanford Dam, was included in the delineated system (i.e.; DA-7 & DA-8) (Figure 11) for use in the inundation mapping.

Figure 11. Delineated drainage basins of the Boiling Spring Lakes System

Table 3. Contributing drainage basins to each dam

Dam	Contributing drainage basins (from Figure 11)
Upper Lake Dam	DA-1 and DA-2
Middle Lake Dam	DA-1, DA-2, and DA-3
Pine Lake Dam	DA-4
North Lake Dam	DA-5A and DA-5B
Sanford Dam	DA-1, DA-2, DA-3, DA-4, DA-5A, DA-5B, and DA-6

Land use data was obtained from the 2011 National Land Cover Database (NLCD) created by the Multi-Resolution Land Characteristics (MRLC) Consortium (MRLC 2012) (Figure 12). Soil data was obtained from the Natural Resources Conservation Service (NRCS) Web Soil Survey in which each soil series has been assigned to a hydrologic soil group (HSG) (Figure 13). A composite curve number (CN) was determined for each drainage basin by intersecting the basin with the land use and soil hydrologic type in ArcGIS. This approach follows the Curve Number method described in Technical Release 55 (TR-55) by the NRCS (1986). Percent impervious was set to 0% for all sub-basins since it was included in computing the composite curve number.

The estimation of Time of Concentration (TOC) followed the TR-55 methodology through which longest flow paths are defined and subdivided into segments based on the type of flow. The longest flow paths were delineated by processing the DEM through HEC-GeoHMS and were further divided into sheet, shallow concentrated, and open channel flow. A travel time was calculated for each of the flow types and an overall TOC was determined for each sub-basin. Lag time was then calculated as 60% of the TOC (NRCS 2010).

A summary of basin characteristics is listed in Table 4. Detailed hydrologic computations are provided in Appendix 2.

Figure 12. Land Use/Land Cover Map

Figure 13. Hydrologic soil group map

Table 4. Basin Characteristics Summary

Drainage Basin	Area (ac)	Time of Concentration (hr)	Time of Concentration (min)	Lag Time (min)	Curve Number
1	1171.2	20.95	1257.0	754.2	88.3
2	1280	24.02	1441.2	864.7	89.0
3	518.4	7.25	435.0	261.0	86.0
4	729.6	18.32	1099.2	659.5	90.3
5A	870.4	9.04	542.4	325.4	79.1
5B	339.2	5.14	308.4	185.0	68.4
6	1875.2	5.2	312.0	187.2	67.6

Drainage Basin	Area (ac)	Time of Concentration (hr)	Time of Concentration (min)	Lag Time (min)	Curve Number
7	1644.8	5.99	359.4	215.6	58.4
8	1177.6	9.81	588.6	353.2	54.1

2.3.3 Runoff Simulation

The watershed parameters and rainfall data were used to develop a HEC-HMS hydrologic model (Figure 14) to simulate runoff hydrographs and peak flows under various storm scenarios.

Peak flow results of the 100-year event were compared with peak flows of other resources including FEMA flood studies[1] and the USGS StreamStats website[2] (USGS 2017)(Table 5). The comparison to the FEMA and StreamStats flows was conducted for broad reasonableness check only since the hydrologic analysis used to derive the FEMA flows was not available for review and the StreamStats values provide instantaneous peak flows for the recurrence interval.

The 100-year flood peak flows simulated in HEC-HMS are reasonably comparable to the flows used in the FEMA models. A major difference is noted for the Upper Lake watershed. The HEC-HMS simulated peak flow for Upper Lake Dam appears more reasonable at about 25% of the entire watershed peak (at Sanford) versus a 66% contribution in the FEMA model. StreamStats values, whenever available, were close to HEC-HMS values except at Sanford Dam: StreamStats peak flow was significantly lower than HEC-HMS value. For reference, StreamStats reports are included in Appendix 2. No gaging station was available for the lake system or any of its tributaries to be utilized for further modelling validation.

Runoff hydrographs were simulated for each sub-basin in HEC-HMS for Hurricane Florence (Figure 15), and for the ⅓ and ½ PMP storms (Figure 16). Hurricane Florence hydrographs were integrated in HEC-RAS model for a model validation check (Section 2.5), while hydrographs of the ⅓ and ½ PMP were used for the hydraulic assessment of the proposed dams designs (Section 2.6).

[1] Flows were available from FEMA hydraulic models developed for Allen Creek, North Lake (labeled as Clear Pond in the FEMA study), and Spring Lake. Details on the FEMA models are provided in Section 2.4.

[2] The StreamStats tool is based on regional regression analysis of peak floods for watersheds in similar geographic/hydrologic regions (Feaster, Gotvald and Weaver, Methods for estimating the magnitude and frequency of floods for urban and small, rural streams in Georgia, South Carolina, and North Carolina, 2011 (ver. 1.1, March 2014) 2014) but not specific to the current study area.

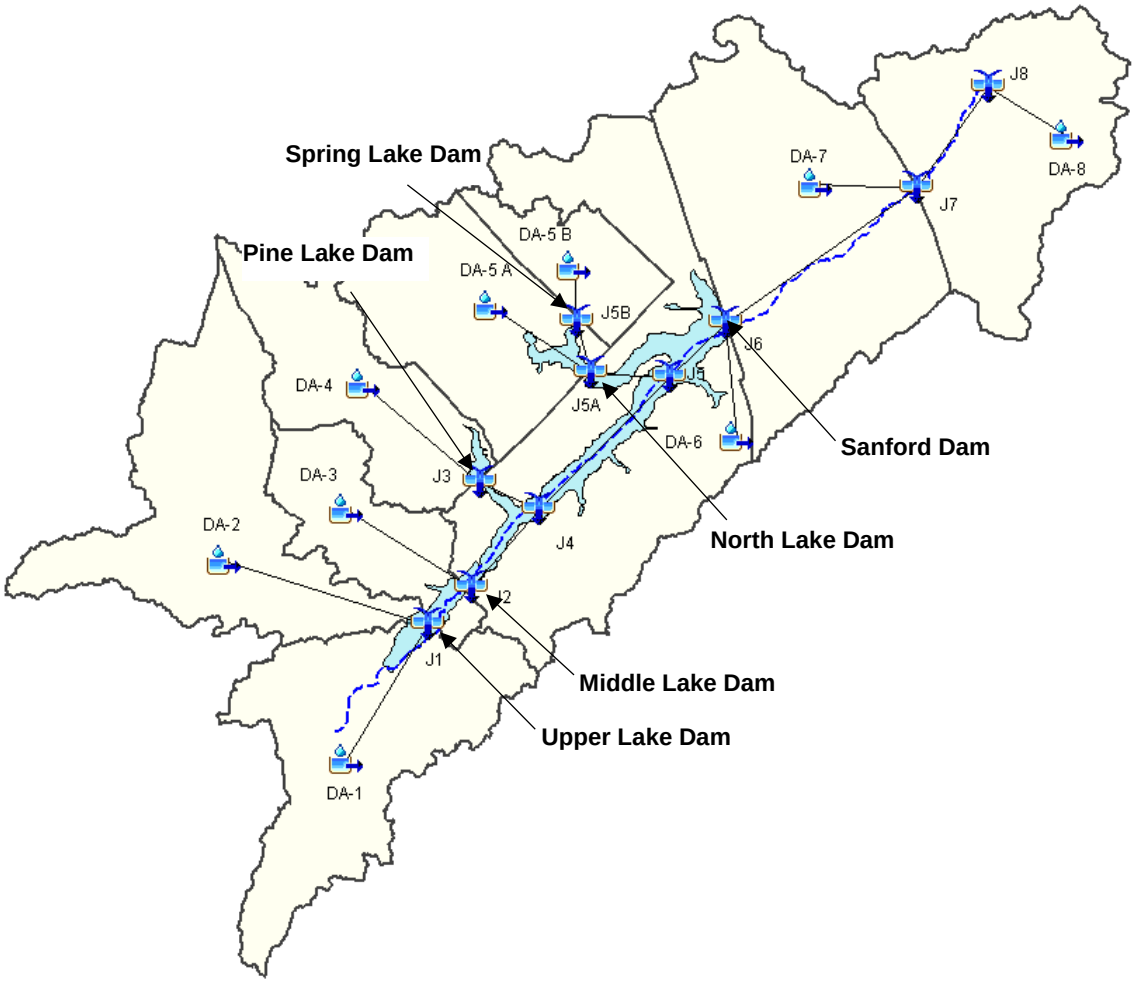


Figure 14. Schematic for the HEC-HMS Model for BSL System

Table 5. 100-Year Flood Peak Flows

		Peak Flow (CFS)		
	HEC-HMS Node	**FEMA**	**HEC-HMS**	**StreamStats**
Upper Lake Dam	J1	2360	847.1	785
Middle Lake Dam	J2	2360	1098.7	--
Pine Lake Dam	J3	--	301.7	506
Spring Lake	J5B	259	199.7	337
North Lake Dam	J5A	552	768.3	503
Sanford Dam	J6	3560	3476.0	2155

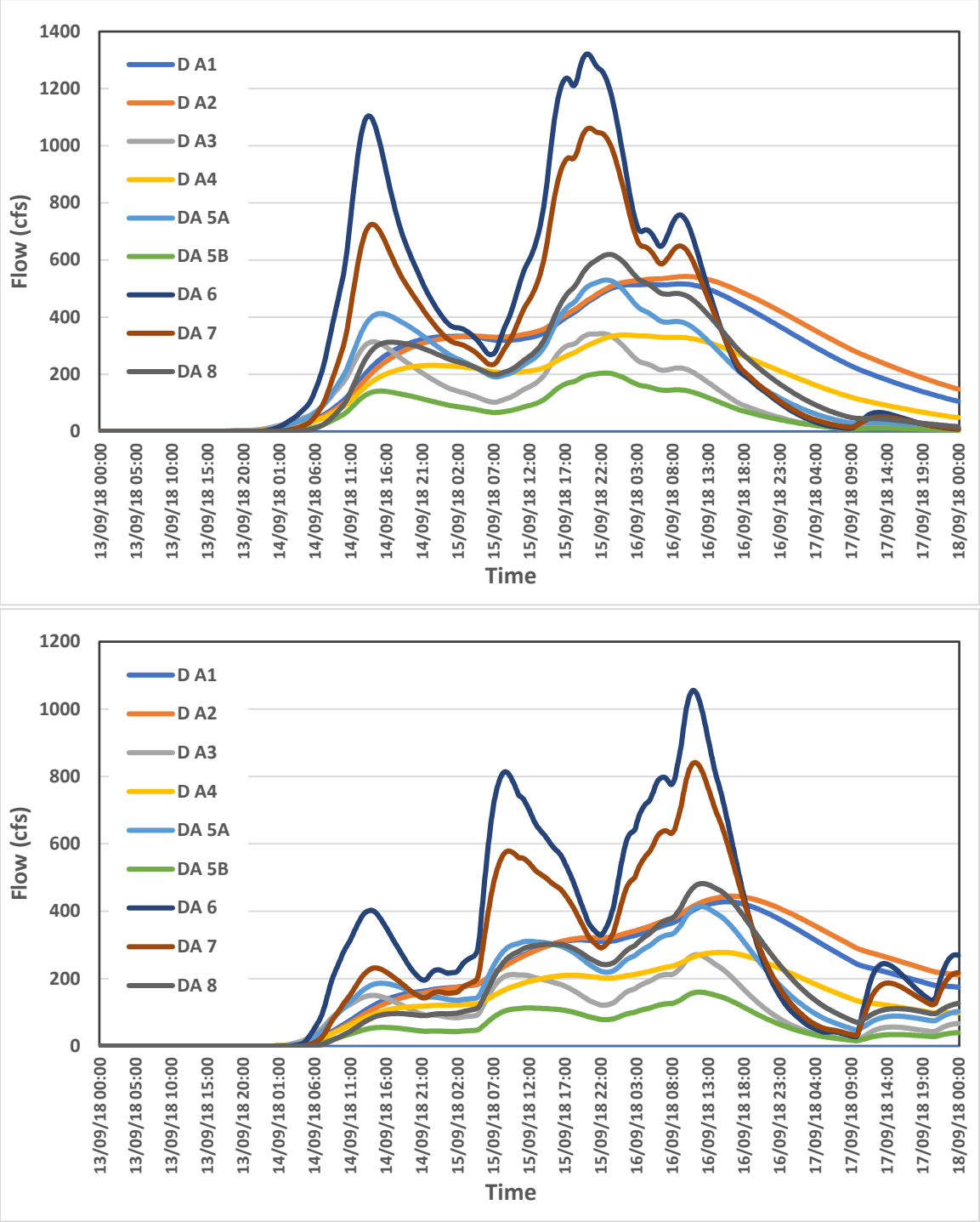
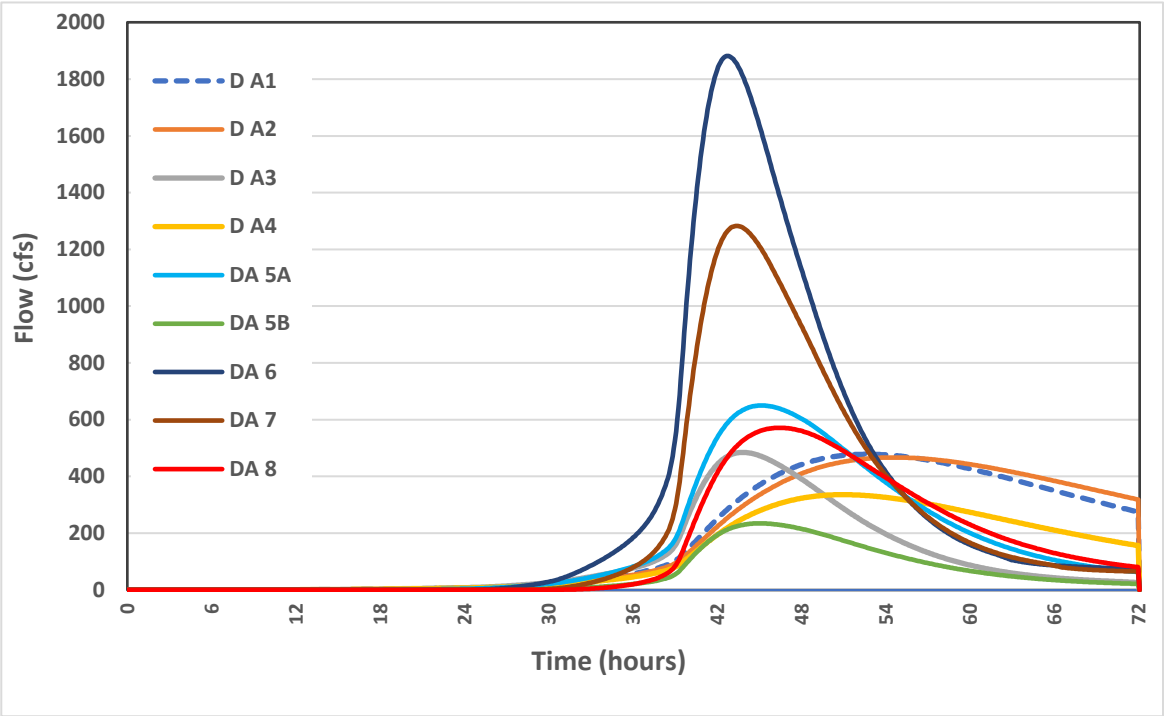


Figure 15. HEC-HMS simulated hydrographs for Hurricane Florence using precipitation records of the Nature Conservancy weather station (top panel), and at Cape Fear R at Lock #1 Nr Kelly, NC (02105769) station (bottom panel).



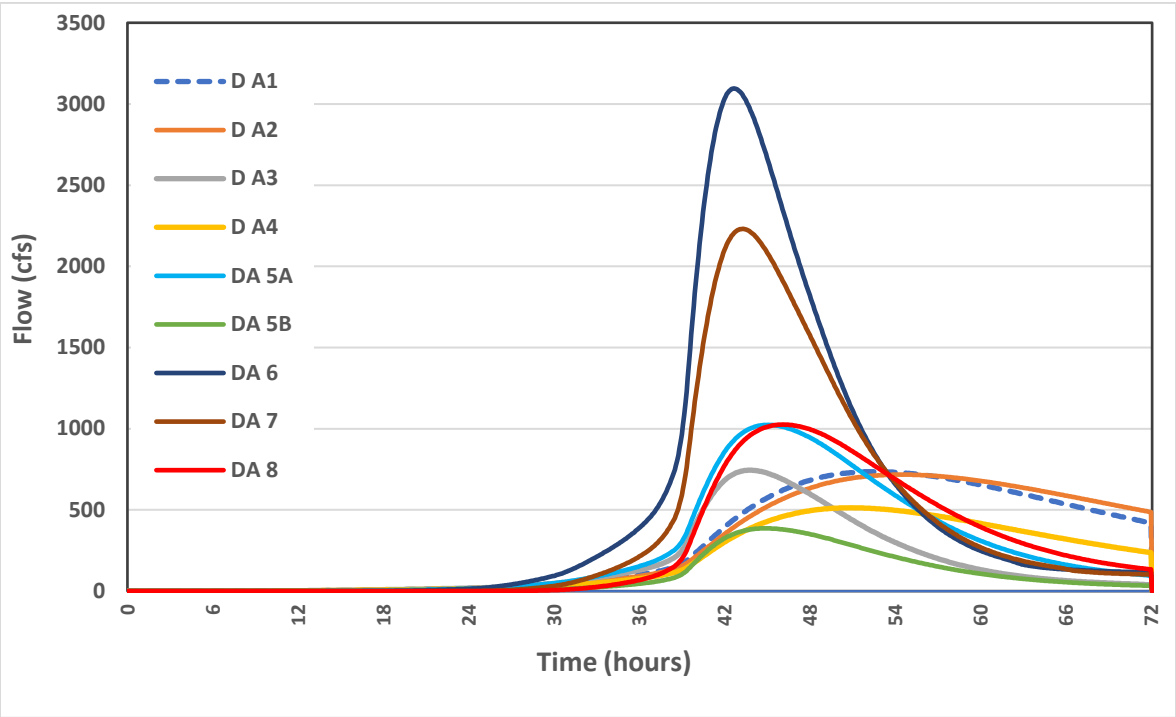


Figure 16. Runoff hydrographs for the ⅓ PMP event (upper panel) and ½ PMP event (lower panel

2.4 Hydraulic Modeling

2.4.1 HEC-RAS Model Approach

The Hydraulic Engineering Center Riverine Analysis System (HEC-RAS) version 5.0.7 was used to develop a hydraulic model of the system of lakes to include the dams and other existing hydraulic structures. The main objectives of the HEC-RAS model are (1) to design spillways with adequate capacity to pass the SDF and (2) to develop inundation maps for various breach and non-breach scenarios (Section 2.10).

Three FEMA HEC-RAS models were available within the study area: 1) Allen Creek upstream of Sanford Dam and extended through Upper Lake, 2) Allen Creek downstream of Sanford Dam, and 3) North Lake (labeled as Clear Pond in the FEMA model). The models were combined into one HEC-RAS model using junctions at the confluence of the reaches (Figure 17). The use of a single model allows for the dynamic (unsteady) simulation of the hydraulics of the lakes system. The FEMA Models were used as a starting point to verify initial runs and to verify reasonableness of the combined model. The model was then updated using the site-specific survey and LiDAR data and with the addition of cross sections as described in the following sections.

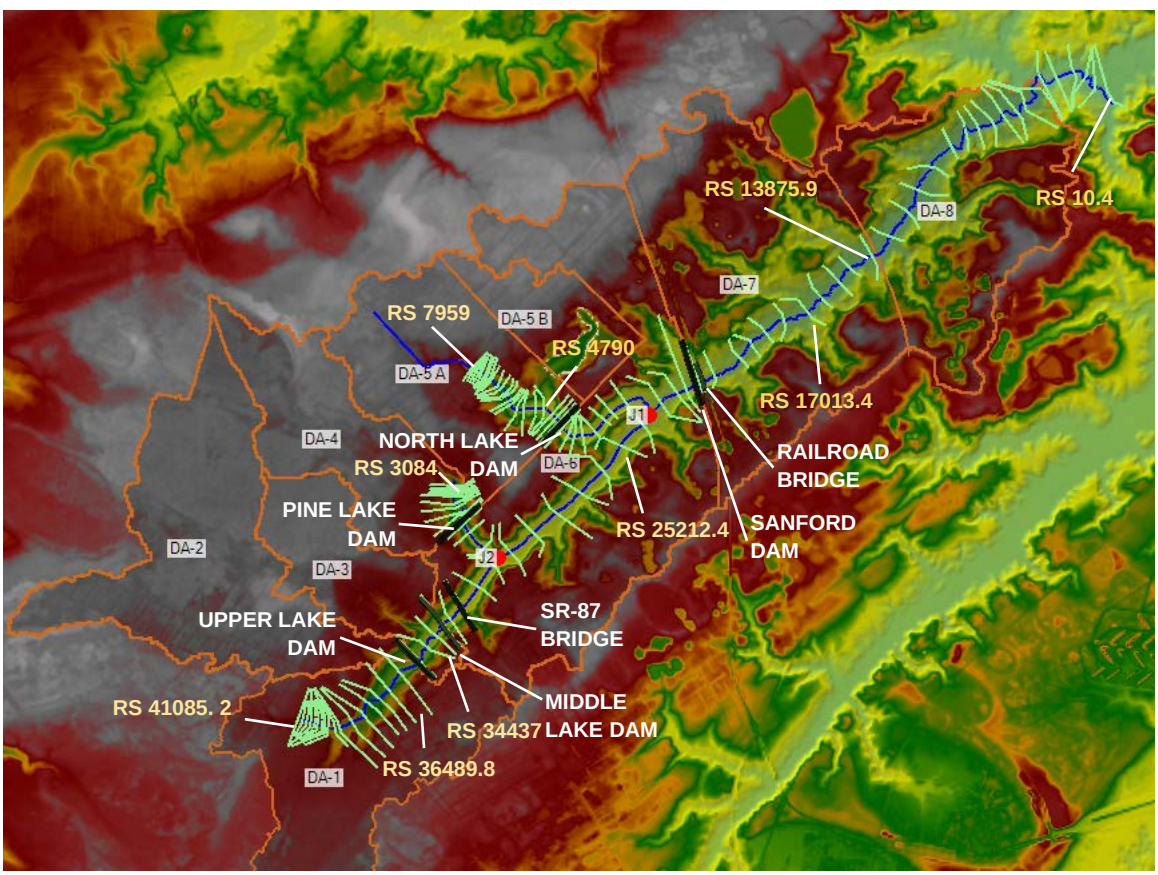


Figure 17. Schematic of the combined HEC-RAS model (for clarity, only river stations where a boundary condition is set are labeled – e.g., RS 41085.2)

2.4.2 Cross Section Geometry

Cross sectional geometric data were updated in RASMapper by using a composite terrain model built from (1) the topographic and hydrographic survey collected for this project, (2) the site-specific high resolution LiDAR of the drained lakes collected for the project (Section1.5), and (3) the NCFMP QL2 LiDAR. An example cross section is shown in Figure 18.

Figure 18. Cross Section views of a river station at Allen Creek upstream to Sanford Dam updated from the available FEMA cross sectional data (green contour) using a composite terrain built from site-specific LiDAR, topographic and hydrographic survey, and data QL2 LiDAR from NCFMP (navy contour).

New cross sections were added to the combined model to represent Pine Lake system originally not represented in the FEMA models and to provide additional details as needed based on the improved topographic data collected for the project.

2.4.3 Manning's Roughness Coefficients

Manning's roughness coefficients (n) in the models were reviewed against site conditions based on aerial imagery and site visits. The range of Manning's coefficients (Table 6) in the models are within industry standard published values (Chow 1959).

Table 6. Manning's roughness coefficients

Waterbody	Channel coefficient range	Floodplain coefficient range
Allen Creek	0.03 to 0.05	0.1 to 0.2
Pine Lake	0.03	0.1
North Lake	0.035 to 0.05	0.15

2.4.4 Structures Data

The five dams of the lakes system were included in the model based on available record data, existing models, and topographic survey (Figure 17). The dams were incorporated in the combined HEC-RAS model as *inline structures* to simulate the pre-hurricane and post-reconstruction (proposed) conditions.

Dual inline structures were used to simulate the spillways in HEC-RAS (i.e., riser drop structure and associated culverts): one inline structure to model the drop structure as a sharp crested weir with its crest equivalent to the riser control elevation and with its width equivalent to the length of riser permitting flow into conduits, and a second inline structure representing the outlet culverts and the embankment as a broad crested weir (Figure 19).

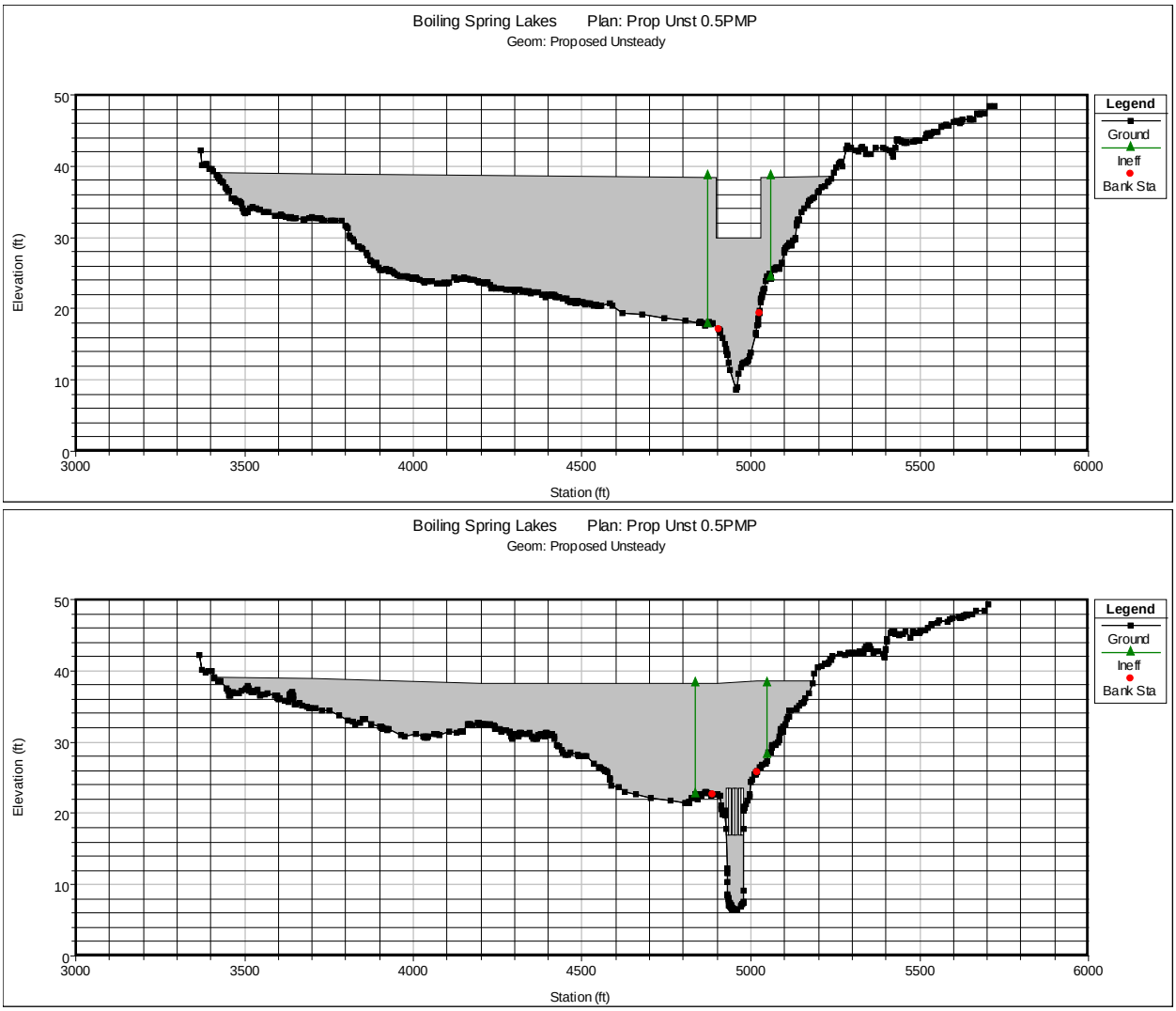


Figure 19. Dual inline structure used to model the drop box (upper panel) and outlet culverts (lower panel) of a riser structure (Sanford Dam shown as an example in the figure)

2.4.5 Boundary Conditions

The required boundary conditions for the developed HEC-RAS model are flow hydrographs at the beginning of each river and a water level condition at the downstream end of the model (Table 7). Ruoff hydrographs generated in HEC-HMS were used as flow hydrographs at the beginning of Allen Creek, Pine Lake, and North Lake. Lateral inflows were added to account for discharges along each waterbody (for example, the Spring Lake watershed runoff hydrograph was added as lateral inflow hydrograph into North Lake).

A normal depth with a slope of 0.0001 ft/ft was used as the downstream end boundary condition based on the flat topography at the downstream end of the combined model. For a normal depth boundary condition, Manning's equation is used to estimate a stage for each computed flow.

The downstream boundary condition is located about three miles downstream of the project area and as such the model results are not sensitive to this condition.

Table 7. HEC-RAS boundary conditions

Waterbody	River Station*	Boundary Condition	Source*
Allen Creek	41085. 2	Flow Hydrograph	DA-1 runoff hydrograph
Allen Creek	36489.8	Lateral Inflow Hydrograph	DA-2 runoff hydrograph
Allen Creek	34437.0	Lateral Inflow Hydrograph	DA-3 runoff hydrograph
Allen Creek	25212. 4	Lateral Inflow Hydrograph	DA-6 runoff hydrograph
Allen Creek	17013. 4	Lateral Inflow Hydrograph	DA-7 runoff hydrograph
Allen Creek	13875.9	Lateral Inflow Hydrograph	DA-8 runoff hydrograph
Allen Creek	10. 4	Normal Depth	Slope = 0.0001 ft/ft
North Lake	7959	Flow Hydrograph	DA-5A runoff hydrograph
North Lake	4790	Lateral Inflow Hydrograph	DA-5B runoff hydrograph
Pine Lake	3084	Flow Hydrograph	DA-4 runoff hydrograph

*Refer to Figure 17 for locations

2.5 Model Validation

Runoff hydrographs from Hurricane Florence simulated in HEC-HMS per each weather station (Figure 15) were used as input hydrographs to run an unsteady HEC-RAS simulation of the storm. Utilizing both sets of hydrographs helps interpret the significance of spatial variability in precipitation for modeled processes and aid the validity of hydrologic and hydraulic models' setup, especially with the lack of direct flow measurements for the watershed.

In HEC-RAS, a 5-second computation interval was used with a hydrograph output interval of 1-hour. Simulated hydraulic outputs using both flow hydrograph sets were well correlated (Table 8), with relatively small differences attributed to variation in precipitation-derived inflow hydrographs. The simulated water surface elevations indicated overtopping at all the dams; except for Pine Lake Dam that was barely overtopped or none at all (Table 8).

Available photograph and videos recorded at Sanford Dam at the time of the breach (Figure 20) and observations by City staff on-site during the hurricane corroborate the model. The NWS-NOAA reported that Sanford Dam, breached around 7:00 pm EDT on September 15 that caused the destruction of Alton Lennon Drive (https://www.weather.gov/ilm/HurricaneFlorence). HEC-RAS simulated the onset of the overtopping of Sanford Dam around 8:00 am on

September 15 per the NNAC-derived hydrographs, and around 1200 am on September 16 per the USGS-derived hydrographs. These results reasonably replicate field conditions. The temporal variation between the simulated overtopping for each of the stations and actual dam breach can be attributed to the location of Sanford Dam in between the two weather stations, as well as the time between the beginning of overtopping and development of the breach.

No videos/photographs are available for the other dams that breached late in the night. Since Pine Lake Dam is the only dam where the breach occurred at the riser, it is reasonable to accept that the breach at Pine Lake was due to seepage and/or piping around the conduits rather than overtopping.

Table 8. Simulated Flows and Water Surface Elevations during Hurricane Florence

	Top of Dam or road (ft)	Peak Flow (cfs)	Peak Water Surface Elevation (ft)	Overtopping Depth (ft)
a) Using rainfall data from the NNAC station				
Sanford Dam	38.2	3540.67	39.23	1.03
North Lake Dam	40	737.3	40.36	0.36
Pine Lake Dam	44	337.46	44.09	0.09
Middle Lake Dam	38	1341.6	39.3	1.3
Upper Lake Dam	41.3	1060.1	42.32	1.0
SR 87	33.67	1346.4	39.24	5.57
b) Using rainfall data from the USGS station				
Sanford Dam	38.2	2857.6	39.08	0.9
North Lake Dam	40	572.16	40.3	0.3
Pine Lake Dam	44	261.1	43.54	None
Middle Lake Dam	38	1108.5	39.1	1.1
Upper Lake Dam	41.3	871.96	42.22	0.9
SR 87	33.67	1112.6	39.08	5.4

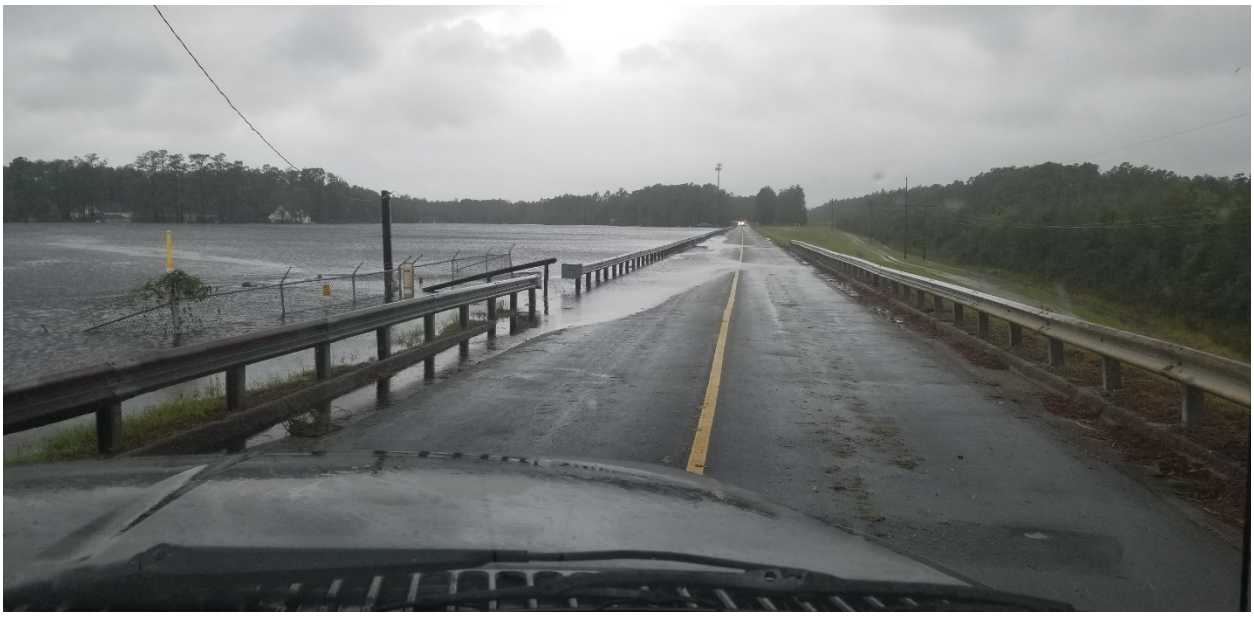


Figure 20. Alton Lennon Drive (Sanford Dam) Overtopping during Hurricane Florence (September 15, 2018)

2.6 Proposed Spillways

Runoff hydrographs were simulated for each sub-basin in HEC-HMS for the ⅓ and ½ PMP storms (Figure 16) and used as flow/inflow hydrographs for the hydraulic model of the lake system. Spillways were evaluated in the dynamic HEC-RAS simulation to maintain the existing normal water elevation in the lake system and provide overtopping protection (Table 9).

The Middle Lake Dam reconstruction design is ongoing under a separate project and NC Dam Safety stated that the Dam is now considered a high hazard and a spillway that accommodates the ⅓ PMP event will be required. The proposed Middle Lake Dam is modeled as a broad crested weir per the reconstruction plans provided to McGill and included in Appendix 2. Middle Lake plans will be submitted separately for permitting with NC Dam Safety.

2.6.1 Proposed Spillways Hydraulic Design Criteria

The proposed spillways convey the SDF for each dam without overtopping and accommodate the appropriate freeboard (Table 10) for the worst-case scenario where Middle Lake Dam is reconstructed.

The scenario that simulates the lake system without the reconstruction of Middle Lake Dam shows the following:

- The performance of Upper Lake Dam improves such that the dam is not overtopped during a ½ PMP event because of a lower tailwater condition at its outlet.
- Practically no impact on the performance of Sanford Dam with water surface elevation at Sanford Dam increasing by 0.03 ft only for the ½ PMP event.

Table 9. Hydraulic Design Criteria for the Spillways

	Design Storm	Normal Water Surface Elevation (ft)	Overtopping Elevation (ft)	Desired Freeboard (ft)
Sanford Dam	½ PMP	30	38.4	2
North Lake Dam	⅓ PMP	35	40	2
Pine Lake Dam	⅓ PMP	35	44	2
Upper Lake Dam	⅓ PMP	38	41.3	--(1)
SR 87(2)	100-year	N/A	33.67	N/A

1. Due to low head between normal pool and overtopping elevations, NC Dam Safety concurred that the maximum practicable freeboard will be accepted (November 20, 2019 meeting minutes in Appendix 1).
2. SR 87 is checked against overtopping for a 100-year storm event as desired by the City and NCDOT. This is not a requirement of NC Dam Safety.

Table 10. Hydraulic Performance of Proposed Spillways

Sanford Dam								
Description: Riser structure providing 140 ft long weir that discharges into six box culverts (7.5 ft span x 6.5 ft rise each) conveying water through the embankment.								
Top of Dam/Road (Overtopping)	38.4 ft		**Normal Pool**			**WSEL**	30.0 ft	
						Freeboard	8.4 ft	
100-year Event			**.33 PMP Event**			**.5 PMP Event**		
Flow (cfs)	**WSEL (ft)**	**Freeboard (ft)**	**Flow (cfs)**	**WSEL (ft)**	**Freeboard (ft)**	**Flow (cfs)**	**WSEL (ft)**	**Freeboard (ft)**
3029.7	33.48	4.92	3499.8	33.83	4.57	5425	35.2	3.2
North Lake Dam								
Description: Riser structure providing 55 ft long weir that discharges into two box culverts (6 ft span x 6 ft rise each) conveying water through the embankment.								
Top of Dam/Road (Overtopping)	40 ft		**Normal Pool**			**WSEL**	35.0 ft	
						Freeboard	5.0 ft	
100-year Event			**.33 PMP Event**			**.5 PMP Event**		
Flow (cfs)	**WSEL (ft)**	**Freeboard (ft)**	**Flow (cfs)**	**WSEL (ft)**	**Freeboard (ft)**	**Flow (cfs)**	**WSEL (ft)**	**Freeboard (ft)**
756.70	37.59	2.41	850.6	37.90	2.1	1372.4	40.35	Overtopping

Table 10. Hydraulic Performance of Proposed Spillways

Pine Lake Dam								
Description: Riser structure providing 14 ft long weir that discharges into a box culverts (5 ft span x 4 ft rise) conveying water through the embankment.								
Top of Dam/Road (Overtopping)	44 ft		**Normal Pool**			**WSEL**	35.0 ft	
						Freeboard	9.0 ft	
100-year Event			**.33 PMP Event**			**.5 PMP Event**		
Flow (cfs)	**WSEL (ft)**	**Freeboard (ft)**	**Flow (cfs)**	**WSEL (ft)**	**Freeboard (ft)**	**Flow (cfs)**	**WSEL (ft)**	**Freeboard (ft)**
294.57	39.55	4.45	316.84	40.69	3.31	509.3	44.17	Overtopping
Middle Lake Dam								
Description: A broad crested weir of 250 ft long and crest elevation at 35.0 ft								
Top of Dam/Road (Overtopping)	38 ft		**Normal Pool**			**WSEL**	35.0 ft	
						Freeboard	3.0 ft	
100-year Event			**.33 PMP Event**			**.5 PMP Event**		
Flow (cfs)	**WSEL (ft)**	**Freeboard (ft)**	**Flow (cfs)**	**WSEL (ft)**	**Freeboard (ft)**	**Flow (cfs)**	**WSEL (ft)**	**Freeboard (ft)**
1061.5	36.25	1.75	1197.3	36.35	1.65	1731.4	36.8	Overtopping
Upper Lake Dam								
Description: Riser structure providing 94 ft long weir that discharges into five box culverts (6 ft span x 5 ft rise each) conveying water through the embankment.								
Top of Dam/Road (Overtopping)	41.3 ft		**Normal Pool**			**WSEL**	38.0 ft	
						Freeboard	3.3 ft	
100-year Event			**.33 PMP Event**			**.5 PMP Event**		
Flow (cfs)	**WSEL (ft)**	**Freeboard (ft)**	**Flow (cfs)**	**WSEL (ft)**	**Freeboard (ft)**	**Flow (cfs)**	**WSEL (ft)**	**Freeboard (ft)**
845.6	39.94	1.36	941.25	40.08	1.22	1412.6	41.82	Overtopping
Note: Hatched cells correspond to the design storm for each dam.								

2.7 Energy Dissipators

Energy dissipation devices are provided at the outlet of each spillway to avoid scouring and undercutting of the structure. The energy dissipators provided at North Lake, Pine Lake, and Upper Lake dams consist of NCDOT Class 2 riprap aprons downstream of the outlet conduits for the full length of the headwalls. Riprap apron sizing was computing using the Federal Highway Administration's Hydraulic Engineering Circular No. 14, Hydraulic Design of Energy Dissipators for Culverts and Channels (FHWA 2006). At Sanford Dam, energy dissipation is provided through a combination of stepped chute using methods described in Hunt, et al. (2014) followed by NCDOT Class 2 riprap lined stilling basin to accommodate for the hydraulic jump

per the US Bureau of Reclamation (USBR) methodologies for Stilling Basins and Energy Dissipators (USBR 1984).

Final riprap armoring extent is shown in the engineering drawings and computations are included in Appendix 2.

2.8 Wave Protection

Wave protection evaluation for the upstream faces of all dams was performed based on the fetch distance per the procedures provided by the Soil Conservation Service's TR-69 (SCS 1983). Riprap is provided for the upstream faces of all dams (Table 11). Complete computations for wave protection are provided in Appendix 2.

Table 11. Wave protection summary

Sanford Dam– Upstream Slope		
Use Riprap Class	2	
Minimum Thickness	36	in
Lower Elevation	25.4	ft
Upper Elevation	34.3	ft
North Lake Dam– Upstream Slope		
Use Riprap Class	B	
Minimum Thickness	24	in
Lower Elevation	32.5	ft
Upper Elevation	37.3	ft
Pine Lake Dam– Upstream Slope		
Use Riprap Class	B	
Minimum Thickness	24	in
Lower Elevation	32.8	ft
Upper Elevation	36.9	ft
Upper Lake Dam – Upstream Slope		
Use Riprap Class	B	
Minimum Thickness	24	in
Lower Elevation	35.1	ft
Upper Elevation	40.7	ft
Upper Lake Dam – Downstream Slope		
Use Riprap Class	B	
Minimum Thickness	24	in
Lower Elevation	32.5	ft
Upper Elevation	37.4	ft

2.9 Low-Level Drains

Low-level drains are provided for each dam (Table 12) to achieve a target drawdown rate of about 1 foot per day, which reduces the risk of rapid drawdown and allow for practical management of the impoundment.

Because the amount of flow into the impoundment at the time to drawdown is variable, the operator is required to monitor the drawdown and throttle the gate as necessary to maintain the rate.

A base level flow was estimated for each lake using the Environmental Protection Agency's (EPA) WATERS (Watershed Assessment, Tracking & Environmental Results System) (WATERSKMZ v1.10, updated 01-19-2020) tool (EPA 2020).

The computed drawdown rates presume dry conditions (i.e., no rain within the contributing drainage area) to drawdown the each from the normal water elevation. Storage volume for each lake was computed from the site-specific LiDAR and bathymetric survey (Section 1.5) using the Storage Capacity Tool in ArcGIS (esri 2017).

The low-level drains were designed as free outfall discharge, i.e., the downstream water surface elevation needs to be lowered below the invert of the low-level drain. Computations for low-level drains are included in Appendix 2. Details about the structural design of the low-level drains are provided in Section 5.5.

Table 12. Low-Level Drains

Impoundment and low-level drain details	Elevation (ft NAVD88)	Impoundment		Drawdown	
		surface area (ac)	Storage (ac-ft)	rate[1] (cfs)	time[1] (day)
Location: Sanford Dam	30	277.7	2483.3	231.2	0.00
Normal Water Elevation: 30 ft	29	271.0	2208.7	219.1	0.60
Reservoir Bottom Elevation: ~11 ft NAVD88	28	261.5	1942.1	206.5	1.21
Inflow into the reservoir*: 22.08 cfs	27	247.7	1686.8	193.2	1.84
	26	230.3	1447.4	179.1	2.46
Low-level drain type: 4'x4' sluice gate	25	213.5	1224.9	164.1	3.09
Low-level drain invert: 17' NAVD88	24	192.5	1021.0	148.0	3.71
	23	168.7	839.8	130.6	4.33
	22	146.8	682.1	111.4	4.94
	21	130.7	543.0	79.7	5.57
	20	114.8	420.0	39.8	6.36
	19	101.6	311.5	7.5	7.82
	18	85.7	217.3	0.0	9.60
	17	66.7	140.5	No drawdown	

Impoundment and low-level drain details	Elevation (ft NAVD88)	Impoundment		Drawdown	
		surface area (ac)	Storage (ac-ft)	rate[1] (cfs)	time[1] (day)
Location: North Lake Dam	35	31.7	143.6	19.1	0
Normal Water Elevation: 35 ft	34	28.8	113.2	17.8	0.80
Reservoir Bottom Elevation: ~23.5 ft	33	25.4	86.0	16.4	1.57
Inflow into the reservoir*: 3.56 cfs	32	21.4	62.5	14.9	2.29
	31	17.9	42.8	13.2	2.96
Low-level drain type: 15"x15" sluice gate	30	14.4	26.6	11.4	3.58
Low-level drain invert: 25' NAVD88	29	9.9	14.4	9.4	4.12
	28	5.2	6.8	7.0	4.52
	27	2.7	2.9	3.5	4.80
	26	1.2	0.9	0.0	5.07
Location: Pine Lake Dam	35	5.9	13.2	4.1	0
Normal Water Elevation: 35 ft	34	4.0	8.2	3.7	0.61
Reservoir Bottom Elevation: ~25.25 ft	33	2.4	5.0	3.3	1.05
Inflow into the reservoir*: 2.12 cfs	32	1.3	3.1	2.8	1.33
	31	0.8	2.1	2.3	1.52
Low-level drain type: 8"x8" sluice gate	30	0.5	1.4	1.7	1.66
Low-level drain invert: 26' NAVD88	29	0.4	1.0	1.1	1.81
	28	0.4	0.6	0.2	2.00
	27	0.3	0.3	0.0	2.18
Location: Upper Lake Dam	38	37.9	146.8	27.0	0
Normal Water Elevation: 38 ft	37	34.5	110.6	21.6	0.68
Reservoir Bottom Elevation: ~23.75 ft	36	29.7	78.2	15.4	1.43
Inflow into the reservoir*: 9.79 cfs	35	24.4	50.9	5.0	2.32
	34	17.0	29.9	0.0	3.99
Low-level drain type: 2'x2' sluice gate Low-level drain invert: 33' NAVD88					

1. Drawdown time computed using the net flow, which is the average gate flow minus inflow into the reservoir

*Mean annual flow estimate from EPA's WATERS (Watershed Assessment, Tracking & Environmental Results System) (WATERSKMZ v1.10, updated 01-19-2020)

Abbreviations: ac = acre, cfs= cubic foot per second, ft or ' = foot, in or " = inch, NAVD88 = National American Vertical Datum of 1988

2.10 Minimum Flows

McGill contacted NCDEQ – Division of Water Resources (DWR) to determine minimum flow releases for the Dams. DWR reviewed the system and determined that a site-specific study is not warranted for operating the dams as “run-of-river” (i.e., operated such that the outflow from

each dam approximately equals inflow to each impoundment). No additional requirement for minimum flows is provided. The determination letter from DWR is included in Appendix 2.

2.11 Dam Breach Analysis

Dam breach analysis were conducted in HEC-RAS for two modes of failure: 1) failure during Spillway Design Flood (SDF) conditions, and 2) failure during “Sunny Day” conditions. While different scenarios of dam breach by structure and failure mode can be presumed, the “worst-case” scenarios for each mode of failure are presented herein.

The bottom of the breaches was set at the lowest possible of either the bottom of each lake or downstream normal tailwater. The bottom breach width was set equal to three times the height of the dam above the breach bottom, with a 2:1 side slope.

A detailed analysis for breach scenarios, including full size inundation mapping, as well as impacted properties are included in the Emergency Action Plan (EAP) for the Dams (separate standalone document).

a) Spillway Design Flood (SDF) Breach:

- Scenario a-1:
  Presumes a concurrent breach of all four dams (including Middle Lake Dam) upstream of Sanford Dam during the highest SDF (i.e., ½ PMP) at which all four dams are predicted to be overtopped (Table 10). Results indicated that the proposed spillway at Sanford Dam provides enough overtopping protection in the event of assumed failure of all upstream dams. The maximum water surface elevation is simulated at 36.04 ft (Figure 20) when the water surface elevation in Boiling Spring Lake is at its peak during a ½ PMP storm, maintaining a 2.36 ft freeboard. Inundation boundaries for the ½ PMP in this breach condition and in non-breach condition are essentially the same when shown at the map scale (Figure 21).

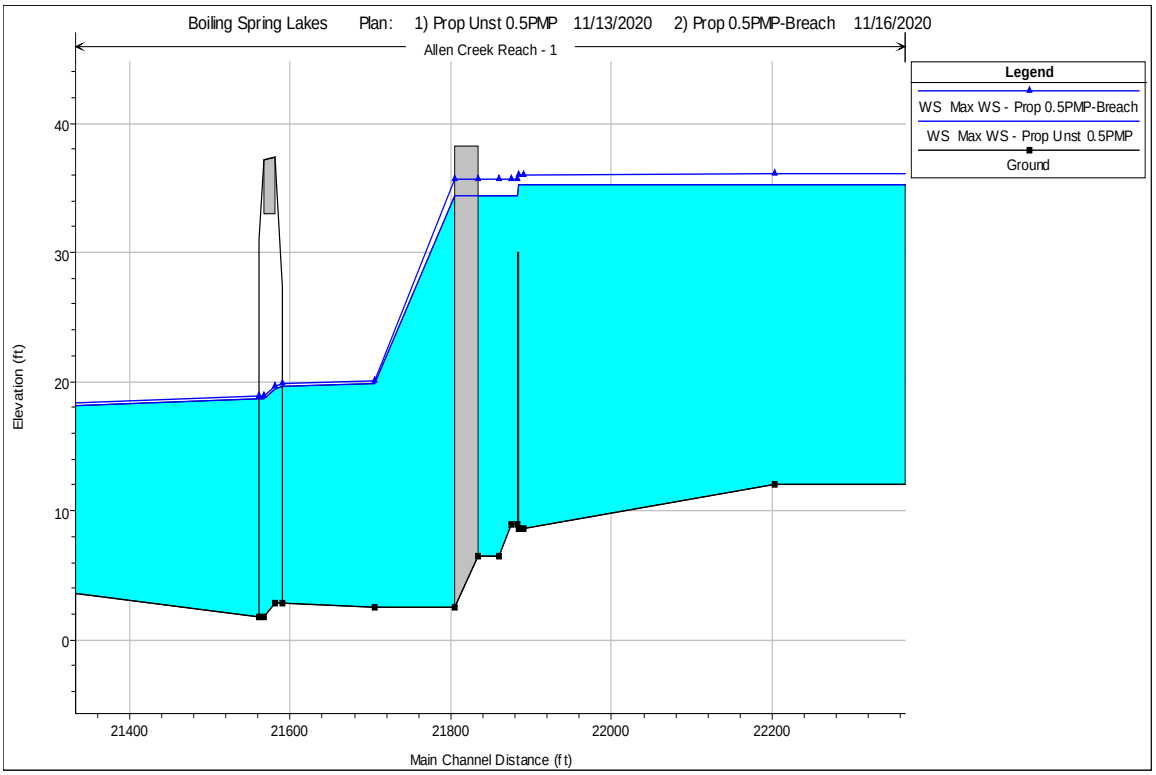


Figure 21. Maximum Water Surface Elevation at Sanford Dam during a ½ PMP event when all upstream dams upstream of Sanford Dam are Operational (filled) vs breached (line with triangle markers)

- Scenario a-2
  Presumes concurrent breach of all five dams in the system (including Middle Lake Dam) to estimate the risks associated with the concurrent failure of all dams during the ½ PMP event. Inundation mapping (Figure 21) indicates that the failure of Sanford Dam concurrently with other four dams does not pose additional risk to structures when compared to Scenario a-1 or to a non-breach condition during the ½ PMP flood.

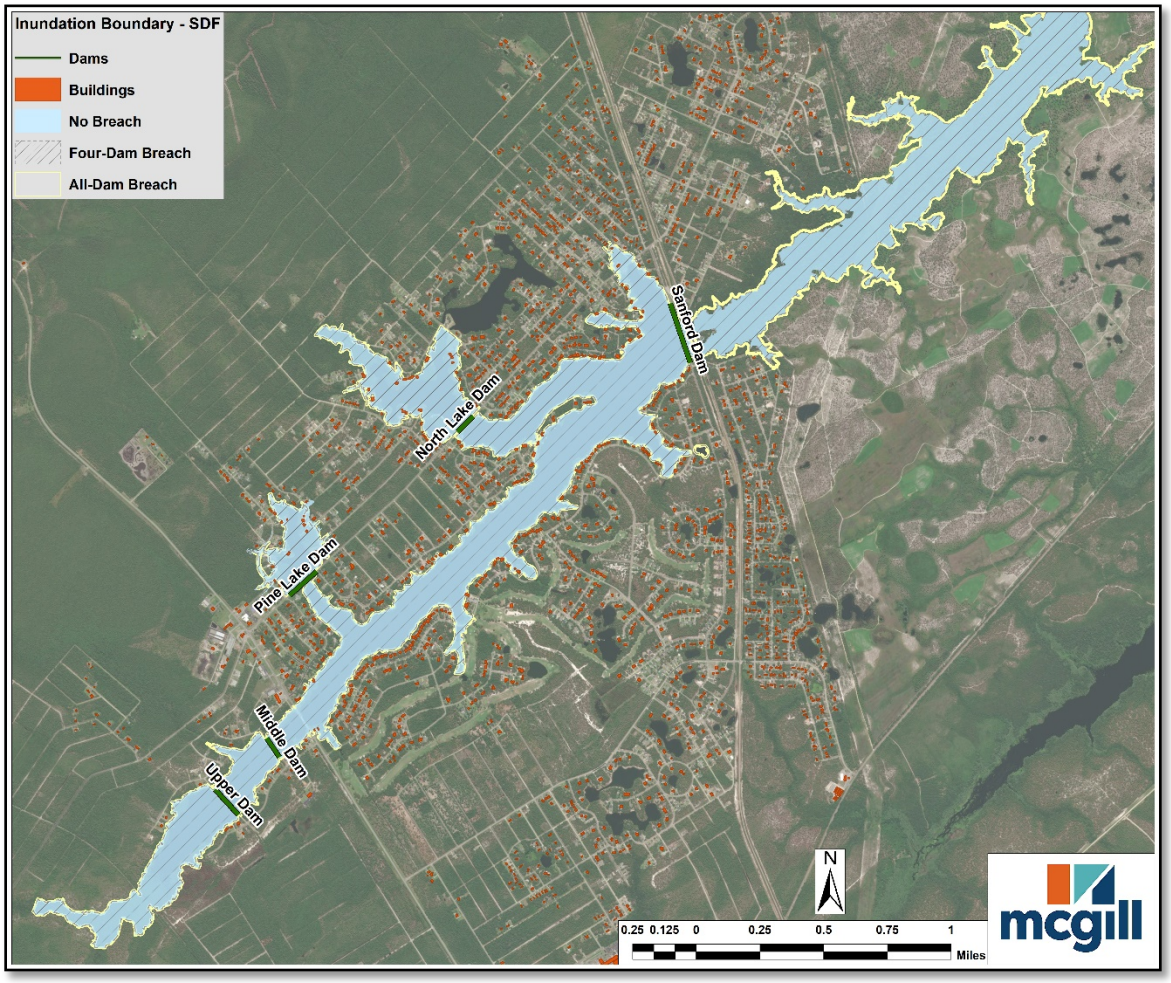


Figure 22. Inundation zones during a ½ PMP event when (a) all Upstream Dams are Operational (filled), (b) all dams upstream of Sanford Dam are breached (hatched) and (c) all dams are breached (yellow outline)

b) Sunny Day Breach:

- Scenario b-1:
  Presumes a concurrent "**piping"** breach of all four dams (including Middle Lake Dam) upstream of Sanford Dam with the lakes at a normal pool level and receiving base inflows. Simulation results demonstrated that breach flows will be contained in Boiling Spring Lake that is characterized by a relatively large impoundment capacity (Figure 22). This scenario poses no risk to surrounding structures or to SR 87 bridge that will not be overtopped due to the failure of upstream dams during a Sunny Day conditions.

- Scenario b-2
  Presumes concurrent **"piping"** breach of all five dams in the system (including Middle Lake Dam) with similar initial and boundary conditions as Scenario b-1. Inundation mapping in Figure 22 indicated a wider inundation downstream to the hypothetically

breached Sanford Dam when compared to Scenario b-1, however, both scenarios inundation boundaries at the lakes side upstream of Sanford Dam when compared at the map scale with no risk on surrounding structures.

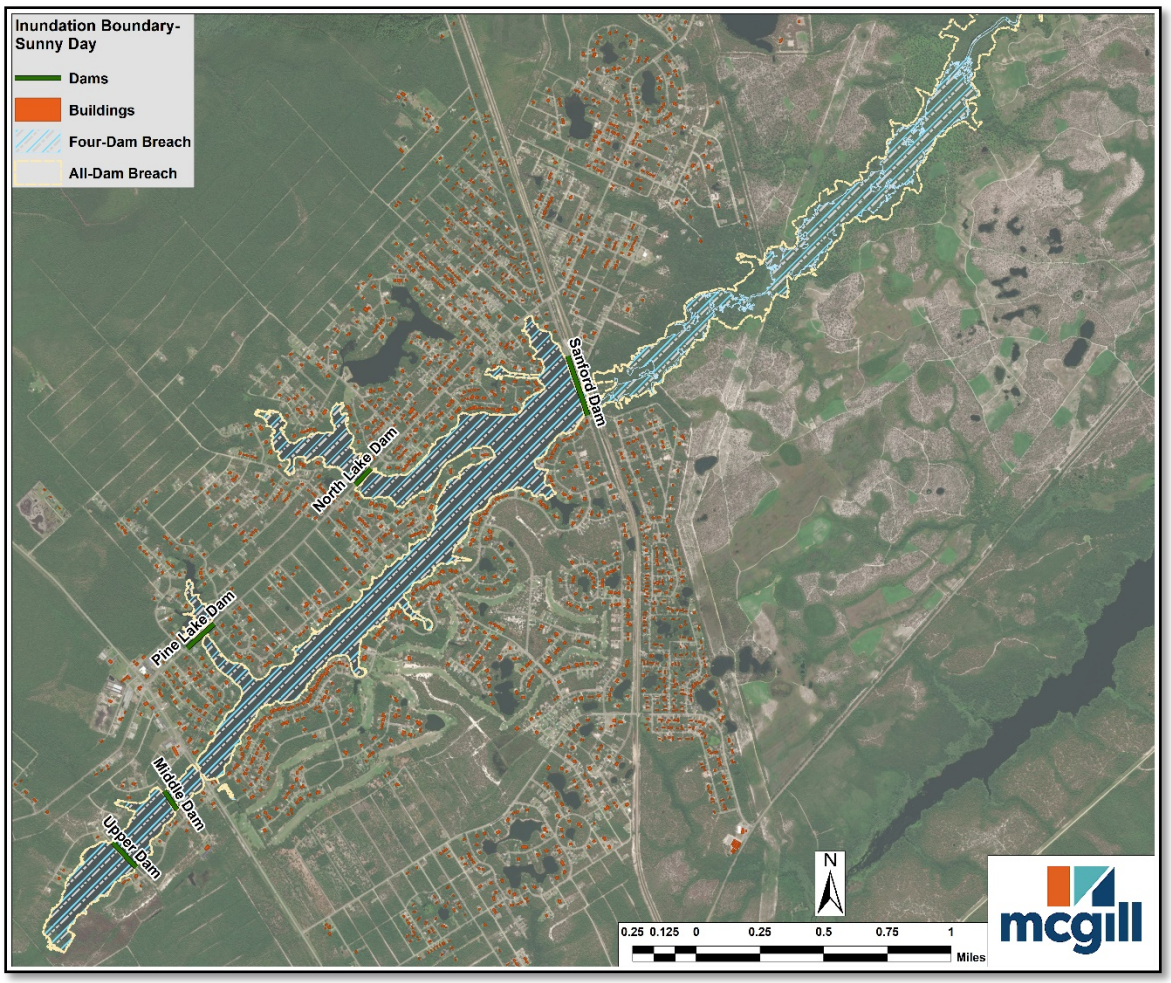


Figure 23. Inundation zones during a sunny-day breach when (a) all dams upstream of Sanford Dam are breached (hatched) and (b) all dams are breached (yellow outline)

3. SUBSURFACE EXPLORATION PROGRAMS

Schnabel performed geotechnical subsurface exploration and testing programs in August and September 2019 (Phase 1 Exploration), April 2020 (Phase 2 Exploration), and September 2020 (Supplemental Exploration). The purpose of these programs was to evaluate subsurface geologic and geotechnical conditions at each dam site in support of the remediation designs for Sanford, North Lake, Pine Lake, and Upper Lake Dams. The programs included Electrical Resistivity Imaging (ERI) geophysical surveys, subsurface geotechnical drilling and sampling, in-situ testing, Cone Penetration Tests (CPT), soil and rock laboratory testing, and ground water quality testing. The following quantities of test borings, ERI lines, CPT soundings, and test pits were performed at each dam site during these explorations:

- Sanford Dam
  - 10 test borings performed during the Phase 1 Exploration (SB-01 through SB-09)
  - 16 test borings performed during the Phase 2 Exploration (SB-10 through SB-21)
  - 17 CPT soundings performed during the Phase 2 Exploration (SC-01 through SC-18)
  - 3 ERI lines performed during the Phase 1 Exploration
  - 3 ERI lines performed during the Phase 2 Exploration
  - 2 test pits performed during the Supplemental Exploration (SD-TP-1 and SD-TP-2)
- North Lake Dam
  - 4 test borings performed during the Phase 1 Exploration (NB-01 through NB-04)
  - 3 CPT soundings performed during the Phase 2 Exploration (NC-01 through NC-03)
- Pine Lake Dam
  - 4 test borings performed during the Phase 1 Exploration (PB-01 through PB-04)
  - 3 CPT soundings performed during the Phase 2 Exploration (PC-01 through PC-03)
- Upper Lake Dam
  - 3 test borings performed during the Phase 1 Exploration (UB-01 through UB-03)
  - 4 CPT soundings performed during the Phase 2 Exploration (UC-01 through UC-03)
  - 1 test pit performed during the Supplemental Exploration (ULD-TP-1)

A summary of the test borings and CPT soundings is provided below in Table 13. The results of exploration are presented in the “Phase 1 and Phase 2 Geotechnical Data Report, Revision 1, Boiling Spring Lakes Dam Construction/Reconstruction” (GDR) (Schnabel 2021).

Table 13. Summary of Test Borings, CPT Soundings, and Test Pits

Test Boring/CPT Sounding/ Test Pit	Ground Surface Elevation (ft)	Depth to Top of Natural Soil (ft)	Elevation of Top of Natural Soil (ft)	Depth to Top of Rock/Refusal (ft)	Elevation of Top of Rock/Refusal (ft)	Total Depth (ft)	Elevation of Bottom of Boring/CPT/ Test Pit (ft)
SB-01	38.3	7.5	30.8	---	---	15.0	23.3
SB-02	37.9	12.0	25.9	40.5	-2.6	61.3	-23.4
SB-03	38.0	13.0	25.0	39.8	-1.8	62.0	-24.0
SB-04	38.0	18.0	20.0	39.9	-1.9	90.0	-52.0
SB-05	38.0	16.5	21.5	39.8	-1.8	60.0	-22.0
SB-06	37.7	28.0	9.7	37.7	0.0	60.0	-22.3
SB-07	38.1	29.2	8.9	37.8	0.3	60.0	-21.9
SB-08A	24.6	3.0	21.6	26.7	-2.1	46.7	-22.1
SB-08B	24.9	---	---	---	---	24.0	0.9
SB-09	21.5	1.8	19.7	23.1	-1.6	35.0	-13.5
SB-10	38.3	14.5	23.8	39.8	-1.5	39.8	-1.5
SB-11	39.0	13.0	26.0	38.5	0.5	38.5	0.5
SB-12	33.5	6.4	27.1	36.3	-2.8	36.3	-2.8
SB-13	28.9	7.0	21.9	36.3	-7.4	56.3	-27.4
SB-14	19.1	2.5	16.6	21.5	-2.4	21.5	-2.4
SB-15A	17.0	0.0	17.0	18.0	-1.0	38.8	-21.8
SB-15B	16.9	---	---	18.1	-1.2	26.0	-9.1
SB-16A	35.1	13.0	22.1	35.1	0.0	56.8	-21.7
SB-16B	34.7	---	---	34.3	0.4	45.0	-10.3
SB-17	27.0	3.5	23.5	29.0	-2.0	29.0	-2.0
SB-18	23.2	4.3	18.9	24.4	-1.2	24.4	-1.2
SB-19	23.5	3.3	20.2	25.0	-1.5	25.0	-1.5
SB-20	21.8	4.5	17.3	23.3	-1.5	23.3	-1.5
SB-21	20.2	4.0	16.2	21.8	-1.6	21.8	-1.6
SB-22	42.8	4.2	38.6	39.8	3.0	70.7	-27.9
SB-23	45.6	5.0	40.6	43.6	2.0	76.5	-30.9
SC-01	38.2	14.8	23.4	40.4	-2.2	40.4	-2.2
SC-02	38.4	19.0	19.4	40.8	-2.3	40.8	-2.3
SC-03	38.3	16.3	22.0	39.5	-1.2	39.5	-1.2
SC-04	38.3	16.5	21.8	39.9	-1.6	39.9	-1.6
SC-06	39.0	13.1	25.9	38.5	0.6	38.5	0.6
SC-07	33.7	6.6	27.1	36.3	-2.7	36.3	-2.7
SC-08	31.8	7.1	24.8	34.5	-2.7	34.5	-2.7

Table 13. Summary of Test Borings, CPT Soundings, and Test Pits

Test Boring/CPT Sounding/ Test Pit	Ground Surface Elevation (ft)	Depth to Top of Natural Soil (ft)	Elevation of Top of Natural Soil (ft)	Depth to Top of Rock/Refusal (ft)	Elevation of Top of Rock/Refusal (ft)	Total Depth (ft)	Elevation of Bottom of Boring/CPT/ Test Pit (ft)
SC-09	26.8	6.7	20.1	29.0	-2.2	29.0	-2.2
SC-10	21.8	1.8	20.0	23.6	-1.8	23.6	-1.8
SC-11	21.9	0.2	21.6	23.7	-1.8	23.7	-1.8
SC-12	24.9	3.7	21.2	27.0	-2.1	27.0	-2.1
SC-13	23.0	5.2	17.8	24.9	-1.8	24.9	-1.8
SC-14	22.0	5.4	16.6	24.0	-2.0	24.0	-2.0
SC-15	20.8	0.0	20.8	22.4	-1.6	22.4	-1.6
SC-16	40.9	4.7	36.2	39.8	1.1	39.8	1.1
SC-17	42.8	5.2	37.6	41.1	1.7	41.1	1.7
SC-18	44.2	4.3	39.9	42.3	1.9	42.3	1.9
SD-TP-1	22.2	3.0	19.2	---	---	13.5	8.7
SD-TP-2	17.5	0.5	17.0	---	---	9.5	8.0
NB-01	40.4	0.0	40.4	---	---	25.0	15.4
NB-02	40.3	12.0	28.3	---	---	27.5	12.8
NB-03	39.8	12.0	27.8	---	---	25.0	14.8
NB-04	39.5	3.0	36.5	---	---	25.0	14.5
NC-01	41.2	15.0	26.2	43.6	-2.4	43.6	-2.4
NC-02	40.6	13.9	26.6	---	---	25.3	15.3
NC-03	40.0	12.1	28.0	---	---	25.3	14.7
PB-01	44.5	0.0	44.5	---	---	25.0	19.5
PB-02	44.5	8.0	36.5	---	---	25.0	19.5
PB-03	44.5	7.4	37.1	---	---	25.0	19.5
PB-04	44.3	4.0	40.3	---	---	25.0	19.3
PC-01	44.5	2.9	41.6	58.9	-14.4	58.9	-14.4
PC-02	44.2	9.3	34.9	---	---	25.3	18.9
PC-03	44.4	5.7	38.7	---	---	25.1	19.3
UB-01	40.4	14.3	26.1	---	---	25.0	15.4
UB-02	41.3	8.0	33.3	---	---	25.0	16.3
UB-03	42.1	8.0	34.1	---	---	25.0	17.1
UC-01	41.3	9.5	31.8	---	---	25.3	16.0
UC-02	41.7	6.1	35.6	12.5	29.2	12.5	29.2
UC-02A	41.8	6.5	35.3	---	---	25.3	16.5
UC-03	42.2	5.2	36.9	---	---	59.1	-16.9

Table 13. Summary of Test Borings, CPT Soundings, and Test Pits

Test Boring/CPT Sounding/ Test Pit	Ground Surface Elevation (ft)	Depth to Top of Natural Soil (ft)	Elevation of Top of Natural Soil (ft)	Depth to Top of Rock/Refusal (ft)	Elevation of Top of Rock/Refusal (ft)	Total Depth (ft)	Elevation of Bottom of Boring/CPT/ Test Pit (ft)
ULD-TP-1	41.6	8.0	36.9	---	---	10.0	31.6

Note: "---" indicate that the interface was either not identified or not encountered

4. GEOTECHNICAL ANALYSES AND DESIGN

4.1 General

The BSL Dams will be modified to the extent required to repair damage due to the breach associated with Hurricane Florence in 2018 and to upgrade the dams and their foundations to be in compliance with the current hazard classification and NC Dam Safety codes and standards (See Section 1.2). The dam modifications were developed to restore the embankments to their pre-breach grade, accommodate the new spillway structures, reduce the potential for development of future sinkholes, improve seepage-collection and filtered conveyance, and improve seismic stability of the dam foundation (Sanford Dam only). The geotechnical engineering evaluations and analyses performed to support the design of the BSL dam rehabilitations are presented in the following sections of this report, and include the following:

- Evaluation of existing conditions,
- Selection of material properties,
- Selection of seismic design criteria,
- Design of seepage controls,
- Steady-state seepage and slope stability analyses for the proposed embankment sections,
- Foundation soils liquefaction potential analyses,
- Post-earthquake slope stability analyses
- Design of liquefaction mitigation measures,
- Selection of geotechnical parameters for structural design and analysis, and
- Additional geotechnical considerations for construction.

4.2 Selection of Material Properties

Material properties were selected and assigned to the soil and rock materials that comprise the embankment and dam foundation. The selected material properties were used in the geotechnical and structural analyses discussed in the following sections. Each assigned material property was selected based on in-situ test data presented in the GDR and our experience with similar materials. The selection of the material parameters for use in the design of the rehabilitation of each of the four BSL Dams is detailed in Appendix 3.

4.3 Selection of Seismic Parameters

Design seismic parameters were developed based on the seismic hazard data published by the USGS for the site. As stated in Section 1.2, NC Dam Safety has classified all four dams as high hazard dams. Based on this hazard classification, the size of the dams, the magnitude of the design storms for the dams, and current industry practices, we selected design ground motions and earthquake magnitude corresponding to a recurrence interval of 5,000 years for Sanford Dam and 2,500 years for North Lake Dam, Pine Lake Dam, and Upper Lake Dam. Additional

details regarding the selection of design ground motions and earthquake magnitude are provided in Appendix 3.

4.4 Sanford Dam

4.4.1 Evaluation of Existing Conditions

As discussed above, Sanford Dam overtopped and breached during Hurricane Florence in September 2018. The dam breach resulted in an approximate 300-foot-wide cut through the embankment immediately to the left of the spillway, and an approximate 100-foot-wide scoured area on the downstream slope about 100 feet to the left of the breach cut. The damaged areas have not been repaired and the road remains closed to the public.

Based on available historical information, defined here as information produced prior to September 2018, and the 2019 and 2020 subsurface exploration data presented in the GDR, the Sanford Dam embankment primarily consists of loose to medium dense sands with varying amounts of fines, the foundation soils are coastal deposits consisting mostly of sandy soils with varying amounts of non-plastic to medium plasticity fines, and fossiliferous limestone (referenced as rock) with a top of rock elevation of about EL 0. The drawing set entitled “Earth Fill Dams – Boiling Spring Lake Development” (1960 Drawings) (Henry von Oesen and Associates 1960) shows that a sloping core was installed in the embankment with the top of the core at the upstream side of the embankment crest and the bottom of the core terminating in the embankment foundation. The “Lake and Dam Repairs" record drawings (1979 Record Drawings) (Henry von Oesen and Associates 1979) indicate that the bottom of the core terminates at the top of rock immediately downstream of the existing spillway headwall. A bulk sample obtained from the left side slope of the breach cut at the approximate location of the core (as shown on the 1960 Drawings) was classified as sandy lean clay (CL). However, the condition and extent of the core are unclear due to lack of information about original construction and the limited ability to sample the core materials.

The foundation soils beneath Sanford Dam were generally classified as very loose to medium dense sands with varying amounts of fines. Relatively small pockets of lean clay (CL) and fat clay (CH) were also observed. The fine-grained plastic soils do not appear to be laterally continuous across the site. Relatively low standard penetration test (SPT) blow counts and CPT tip resistances were recorded when testing some of the cohesionless foundation soils encountered beneath the embankment during the 2019 and 2020 subsurface explorations. The cohesionless foundation soils have the potential to experience cyclic liquefaction and lose strength when subjected to seismic ground motions. The liquefaction potential of the foundation soils is addressed in Section 4.4.6 below. The foundation soils are underlain by fossiliferous limestones of the Castle Hayne Formation, which are discussed in Section 4.4.4.

Trees and woody vegetation were observed near the right abutment contact. Seepage paths can develop as roots expand and loosen soil and as voids develop from the decaying of dead roots.

4.4.2 Summary of Embankment Design Elements

The rehabilitation design for Sanford Dam includes the following embankment design elements:

- Repair of the breached area and the scoured area on the downstream slope, including removal of loose materials from the surface and placement and compaction of engineered fill soils;
- Removal of trees and woody vegetation from the right abutment contact;
- Grading new or damaged downstream embankment slope to 2.5H:1V;
- Grading the new upstream embankment slope to 3H:1V;
- Installation of a seepage collection system within the repaired breached section and spillway excavation;
- Installation of a cutoff wall within the embankment and dam foundation to reduce seepage through the foundation;
- Installation of MIP panels along the upstream and downstream embankment toes to increase seismic stability;
- Installation of uniform riprap wave protection along the upstream slope of the embankment near the normal pool elevation and along the downstream slope of the embankment near the normal tailwater elevation; and
- Reconstruction of the roadway atop the dam.

4.4.3 Embankment Zoning and Materials

The foundation soils beneath the existing spillway and within the breached area will be excavated to top of rock and replaced with engineered fill materials. The proposed embankment, which will be constructed within the excavation area, will be zoned earthfill consisting of a low-permeability core, upstream and downstream shells, and a seepage collection system. The seepage collection system will include a chimney drain and a blanket filter drain, which are discussed in Section 4.4.4. The embankment to the left of the breached area will generally not be modified except for the installation of the cutoff wall through the embankment crest, installation of soil-cement panels below the upstream and downstream slopes, and the repair of an area that was partially scoured by overtopping during Hurricane Florence.

The low-permeability core will have a top width of 8 feet located 2 feet below the crest of the dam and will have upstream and downstream slopes of 0.5H:1V. The centerline of the core will be offset upstream of the Dam Baseline Alignment and will coincide with the centerline of the cutoff wall (discussed below in Section 4.4.4). This proposed core position was selected so that the proposed core overlaps with the existing core. Leveling concrete will be placed along the top of rock beneath the core and the upstream shell to provide a generally uniform surface on which core fill can be compacted, to serve as a water barrier at the interface between the fill soils and foundation bedrock, and to mitigate the potential for internal erosion of fill soils into the underlying vuggy bedrock.

The embankment core and shell materials placed below EL 16 will be compacted using a higher compaction effort than embankment shell fill materials placed above EL 16. The fill materials compacted using the lower compaction effort are designated as “Common Fill” and “Core Fill,” and the fill materials compacted using the higher compaction effort are designated as “Select Fill” and “Select Core Fill.” The additional compaction effort applied to the Select Fill and Select Core Fill is intended to increase fill density, which will reduce settlement of the proposed spillway structures and increase shear strength, thus improving slope stability.

4.4.4 Seepage Controls

General

Sanford Dam has experienced several events related to uncontrolled seepage, and records of such events often describe the presence or formation of sinkholes on and/or adjacent to Sanford Dam. The subsections below present a brief summary of historical seepage-related events documented at Sanford Dam, a summary of conditions encountered during the 2019 and 2020 subsurface explorations, and proposed seepage controls.

Historical Seepage Events

Historical records made available to McGill and Schnabel indicate that sinkholes were reportedly present on the reservoir bottom during original construction of the dam and that the reservoir was partially drained by uncontrolled seepage through the dam foundation in 1962, 1964, 1969, 1976, 2001, and 2007. Previous evaluations of the observed sinkhole issues at the dam, such as those presented in the report entitled “Subsurface Investigation, Boiling Springs Dam” (S&ME 1977) and the “Technical Report on the Sinkhole Development Along the Sunny Point Access Railroad at Boiling Springs” (1978 MOTSU Sinkhole Report) (USACE 1978), indicate that the sinkholes were related to the rock layer in the top five to ten feet of the Castle Hayne Formation that underlies the foundation soils at a depth of about 36 to 40 feet below the Sanford Dam embankment crest.

As shown on the 1979 Record Drawings (Henry von Oesen and Associates 1979) and described in the “Report of Grouting Operations and Piezometer Installations” (S&ME 1979), an approximately 235-foot-long grout curtain was installed in the top 10 to 15 feet of the Castle Hayne Formation to address conditions which were expected to have caused the most expansive sinkhole event in the available records. The event included the formation of multiple sinkholes near the upstream toe, on the upstream slope, between the embankment and the MOTSU railroad, and downstream of the MOTSU railroad in late 1976 and early 1977. The lake was impounded in 1979 after completion of the grouting program.

During the 1979 grouting program, 12 pairs of screened piezometers were installed at the Sanford Dam site. Each pair reportedly included one piezometer installed in the overburden soils and one piezometer installed in limestone. Five pairs were installed along the downstream toe of the dam, and seven pairs were installed to the right (south) of the dam parallel to the MOTSU railroad. Based on our review of the historical piezometer readings recorded between 1979 and 1986, near-surface water levels were frequently measured in three out of the five

pairs installed along the downstream toe of the dam. These three pairs of piezometers were located between approximately 180 and 600 feet to the left of the existing spillway.

Conclusions from the Subsurface Explorations

During the preparation of the GDR, Schnabel reviewed historical project-specific data and reports, and published information about the geologic units in the vicinity of the site. *Stratigraphic Revision of the Middle Eocene, Oligocene, and Lower Miocene: Atlantic Coastal Plain of North Carolina* (Ward, Lawrence and Blackwelder 1978) describes the Comfort Member (upper unit in southeast North Carolina) of the Castle Hayne Formation a bryozoan-echinoid calcirudite which grades to a fine calcarenite and notes that the formation is generally soft and friable though locally may have a dense micritic matrix. The soils at the site are described on the *Geologic Map of North Carolina* (North Carolina Geological Survey 1985) as belonging to the Waccamaw Formation, which consists of loosely consolidated sand with silt and clay. The aforementioned historical project-specific reports generally confirm the presence of Waccamaw soils and Comfort Member limestones, indicate that the top of rock is at about EL 0, and suggest that about the top 10 feet of rock below the dam is the material that is most likely the cause of sinkholes at Sanford Dam.

The 2019 and 2020 subsurface explorations consisted of the drilling of eight widely spaced borings through the embankment crest and 13 borings near the embankment upstream and downstream toes. Thirteen of the 21 borings were advanced to depths at least 8 feet below the top of rock. Two piezometers were installed in rock in two of these borings located near the downstream toe, and two additional piezometers located in the right abutment were also installed in rock. In-situ permeability testing was performed using packers in every boring where rock was cored (packer testing), and in-situ variable-head permeability (slug) testing was performed in each of the four piezometers installed in rock. The top layer of rock encountered in each cored boring was described as vuggy, fossiliferous, weak (700 to 2,200 psi) calcirudite limestone, where the vugs often appear to be molds of shells that have been washed out in an apparent solutioning process. Underlying the calcirudite limestone, the encountered rock was described as fossiliferous, fine-to-medium-grained, very weak (600 psi) calcarenite limestone that contained a significant amount of sand-sized shell fragments. The performance of 22 packer tests resulted in Lugeon values as low as 106 (with the exception of two tests with values of 31 and 66) and as high as over 1,000, which approximately translates to permeability values between 1×10^{-3} cm/s and 1×10^{-2} cm/s. The performance of four slug tests resulted in permeability values between 7×10^{-3} cm/s and 9×10^{-2} cm/s. We did not recognize a relationship between either packer test or slug test results and rock type.

Beneath Sanford Dam, the top of rock was encountered between EL -2.8 and EL 0.5 (with the exception of boring SB-13 where top of rock was encountered at EL -7.4), and the observed thickness of the top calcirudite layer ranged between 5.0 feet and 10.9 feet. One boring (SB-04) was advanced to a depth of about 50 feet below the top of rock (90 feet below ground surface). In this boring, the calcarenite layer was observed to be about 20 feet thick, with a thin (15

inches) calcirudite layer near the middle of the layer, and was underlain by three feet of dolomitic limestone overlying a 13-foot-thick calcirudite layer. The bottom eight feet of boring SB-04 consisted of poorly-graded calcareous sand.

A piezometer was installed in the Waccamaw foundation soils in boring SB-08B, and the results of slug testing performed in the piezometer indicate that the foundation soils at the site have a permeability of approximately 1.4 x 10^{-3} cm/s.

Based on the condition of the encountered materials and the results of the permeability tests performed during the 2019 and subsurface explorations, the high-permeability top calcirudite limestone layer likely encourages the development of a hydraulic gradient that is high enough to promote a preferential seepage path between the reservoir and the rock layer. In addition, the gradient may be further reduced by the limited head loss through the relatively loose, high-permeability foundation soils. Such circumstances facilitate favorable conditions for initiation of concentrated seepage and internal erosion, which can eventually produce a sinkhole.

Cutoff Wall

The vuggy top calcirudite limestone layer is expected to have the potential to generate future sinkholes on or around the dam, as has been discussed herein. The 1976 sinkhole event serves as a confirmation of the potential for sinkholes to form on the embankment and initiate erosion which could lead to breach of the dam. The risk of seepage-induced failure of the dam must therefore be mitigated. Therefore, Schnabel recommends the installation of a cutoff wall constructed using a mix-in-place method which blends a cementitious binder and other additives with subsurface materials. The purpose of the cutoff wall is not to eliminate seepage, but rather to reduce the potential for development of concentrated seepage and to force seepage to travel below the wall, which reduces the hydraulic gradient through the foundation and, consequently, the overall seepage rate.

Construction of a cutoff by a ground modification method such as grouting is not recommended. Erosive rock material between grout-filled voids will remain in contact with groundwater such that it will be susceptible to erosion over time and may contribute to future sinkhole development. Furthermore, voids that result from eventual erosion or that remain untreated after the grouting process will act as “windows” in the modified formation which facilitate a path for concentrated seepage, an increase in hydraulic gradient, and an advancement in the rate of erosion of rock exposed to the concentrated seepage. Replacement of problematic rock with a soil-cement mitigates these concerns. As described in *Specialty Construction Techniques for Dam and Levee Remediation* (Bruce 2013), the performance and durability of a grout curtain will be challenged by the presence of erosion features. Furthermore and most importantly, a grout curtain can only be installed in the rock at the site, which would allow concentrated seepage paths to form between the dam and the top of rock downstream of the grout curtain (i.e., seepage would flow over the top of the curtain).

The proposed cutoff wall will be installed parallel to the dam baseline alignment near the upstream edge of embankment crest along the length of the dam from Station 10+00 to Station 24+00. The cutoff wall will be installed to a bottom elevation of EL -20, which is about a depth of 8 to 10 feet below the bottom of the calcirudite limestone layer. Within the footprint of the excavation, the cutoff wall will have a top elevation of EL 16 and will connect to the bottom of the proposed spillway culverts. The cutoff wall will have a top elevation of EL 25 to the right of the proposed spillway to reduce the need for a temporary work platform in this area during construction, which would subject the new CIP concrete spillway structures to additional loading. Elsewhere along the proposed cutoff wall alignment, the wall will be installed from the embankment crest.

The 1978 MOTSU Sinkhole Report describes a 14-foot-high, 70-foot-long cavity which was encountered in boreholes drilled adjacent to the MOTSU railroad about 600 feet to the right (south) of the existing spillway. The boreholes were drilled during a 1962 USACE subsurface exploration, which was performed to investigate subsurface conditions which contributed to the forming of multiple sinkholes adjacent to the MOTSU railroad. The 1978 MOTSU Sinkhole Report indicates that a bridge supported on caissons was constructed over the sinkhole area and does not indicate if the cavity was addressed otherwise. Additional details about the results of the 1962 USACE exploration are provided in the GDR. While drilling the Phase 2 (2020) exploration test boring SB-23, which is located about 200 feet directly upstream of the location of the cavity, the tooling used to drill the boring dropped under its own weight over a length of about 2.7 feet and the drilling water used to advance the boring was lost. These noted observations suggest that a void was encountered. If the void is connected to a network of voids or is part of a continuous cavity, such conditions could contribute to future development of sinkholes in the reservoir bottom. However, the distance of these conditions from the dam (approximately 600 feet southeast along Alton Lennon Drive) suggests that the safety of Sanford Dam is likely not threatened by these conditions. We therefore did not address these conditions in the dam construction/reconstruction design.

Dr. Donald A. Bruce, an industry leader in dam foundation grouting and expert in specialty geotechnical construction processes, reviewed the GDR, the MOTSU Sinkhole Report, and the Preliminary Analysis Report (McGill and Schnabel 2020), and prepared a letter dated June 5, 2020. The letter presents a narrative of his evaluation of the site conditions and opinion about an approach to modifying the dam foundation to mitigate sinkhole development potential, which is consistent with the design proposed in this report. The letter is included in Appendix 3.

Seepage Collection System

The historical records that were made available to McGill and Schnabel do not show evidence of a drain within or below a significant portion of the embankment. While the records also do not indicate a history of seepage issues unrelated to sinkholes, the previously-mentioned near-surface water levels that were measured in three of the five 1979 piezometers installed along

the downstream toe of the dam merit consideration for the installation of a seepage collection system within the embankment.

As described in Section 4.4.3, a seepage collection system will be installed as part of the new embankment section. The purposes of the seepage collection system are to maintain unsaturated conditions and shear strength in embankment fill, to provide a filtered exit to reduce risk of internal erosion in the embankment and foundation, and to develop a baseline phreatic surface elevation in the embankment and flow volume at the drain outlet as an aid in identification of changes in the embankment and foundation performance.

A chimney drain will be installed against the downstream face of the proposed embankment core and will consist of a 3-foot-wide zone (horizontal dimension) of filter sand (fine drainfill, ASTM C33 fine aggregate). The chimney drain will filter core soil particles and collect seepage exiting the downstream face of the low-permeability core. A blanket filter drain will be installed on top of the foundation rock (calcirudite) between the base of the chimney drain and the proposed downstream embankment toe. The blanket filter drain will consist of a 2-foot-thick layer of fine drainfill overlying a 1-foot-thick layer of fine gravel (coarse drainfill, NCDOT 78M aggregate) and non-woven geotextile, and will serve as a filtered exit for seepage flowing from embankment fill into the underlying calcirudite. A rectangular toe drain consisting of coarse drainfill surrounded by fine drainfill will be installed about 60 feet downstream from the proposed embankment core centerline and will extend from the left side of the excavation to the right side. An 8-inch slotted PVC pipe will be installed in the coarse drainfill layer to collect and convey seepage by gravity to drain outlets installed through the outlet sidewalls. The drain outlet inverts will be above normal tailwater elevation to allow for visual observation of normal and irregular discharge. The bottom of the toe drain will be connected to the blanket filter drain by a column of fine drainfill which will be installed along the length of the toe drain. The connection between the toe and blanket filter drains will facilitate an additional exit for seepage in the blanket filter drain in the event that pore pressures develop. Cleanouts will be installed near the outside ends of the drain to allow for future inspection and maintenance of the system.

Gradation requirements for fine and coarse drainfill aggregates were determined using the methodology presented in USDA-NRCS National Engineering Handbook Chapter 26 “Gradation Design of Sand and Gravel Filters” (USDA-NRCS 2017). These requirements were developed to specify aggregate materials suitable for use as drain and filter materials with respect to permeability and filtration of embankment and foundation soils. We selected the gradation of the fine drainfill aggregate based on the grain size distribution of the finest fine-grained foundation soil sample which was retained and tested (grain size distribution test) during the 2020 subsurface investigation (Schnabel 2021). We selected the gradation of the coarse drainfill based on the fine limit of the selected fine drainfill grain size distribution. Fine drainfill material should be durable, naturally occurring sand with a rounded or sub-rounded particle shape, not susceptible to cementation, dissolution, or degradation. The fine drainfill material used onsite should not be mechanically produced by crushing stone or coarse aggregate, as

such aggregate manufacturing produces angular-shaped particles which can form a dense soil matrix with a lower-than-desired permeability. Calcium carbonate aggregates will not be permitted for use because these materials are susceptible to cementation, dissolution, and degradation. Calculations for drainfill gradation requirements are included in Appendix 3.

4.4.5 Seepage and Slope Stability Analyses

Seepage and slope stability analyses were performed to evaluate seepage conditions and the stability of the proposed embankment geometry discussed herein. Seepage and stability were analyzed for the proposed embankment geometry to the left of the breached area (represented by the section at Station 17+50) and the proposed embankment geometry within the breached area and adjacent to the proposed spillway (represented by the section at Station 20+25). Factor of safety against slope failure was calculated for each section under proposed normal operating conditions, flood loading, and maintenance conditions. Additionally, the section at Station 20+25 was analyzed for pseudo-static earthquake loading for the 5,000-year seismic event. The results of the slope stability analyses indicate the proposed embankment sections meet the minimum FS against slope stability failures recommended in the USACE Engineering Manual (EM) 1110-2-1902 – Slope Stability (2003) for all loading conditions analyzed. Additional details and results of the seepage and slope stability analyses are presented in Appendix 3.

4.4.6 Foundation Liquefaction Potential

As noted above, relatively low SPT blow counts and CPT tip resistances were recorded when testing some of the cohesionless foundation soils encountered beneath Sanford Dam during the 2019 and 2020 subsurface explorations. According to the results of a liquefaction potential analysis that was performed in general accordance with methods presented in “Soil Liquefaction During Earthquakes” (Idriss and Boulanger 2008), the calculated factor of safety (FS) against liquefaction for the majority of the cohesionless foundation soils were less than 1.0. Therefore, the cohesionless foundation soils described above have the potential to experience cyclic liquefaction and lose strength when subjected to a peak ground acceleration caused by the 5,000-year seismic event. Additional details and results of the liquefaction potential analysis are presented in Appendix 3.

4.4.7 Post-Earthquake Slope Stability Analysis

We performed a post-earthquake slope stability evaluation of the upstream and downstream embankment slopes of Sanford Dam to the left of the breached area. This analysis incorporated the reduced foundation soils shear strengths resulting from the liquefaction potential analysis described above. The calculated FS against slope failure were less than the minimum recommended value of 1.2. Based on the results of our stability analysis, we expect that cyclic liquefaction of the foundation soils will result in excessive slope deformations and potential overtopping and uncontrolled release of the reservoir. Additional details and results of the post-earthquake slope stability analyses are included in Appendix 3.

We performed a cursory evaluation of post-earthquake slope stability with the addition of earthen berms at the embankment toes but determined that this approach was not feasible for achieving the minimum recommended FS. We therefore recommend modification of the foundation soils to remain below the embankment upstream and downstream slopes to the left of the breached area, which is described below. These modifications are not necessary within the footprint of the proposed spillway and breached area excavation because the foundation soils will be entirely removed and replaced with engineered fill materials.

4.4.8 Mix-In-Place Panel Design

The proposed foundation liquefaction mitigation measures at Sanford Dam include soil-cement panels constructed from the embankment toe elevation to top of rock elevation using a mix-in-place MIP construction method. The MIP panels are relatively high-strength, discrete elements embedded within the low-strength foundation soils, and the installation of the MIP panels will increase the overall shear strength of the foundation. The MIP panels were analyzed and designed in general accordance with the procedures outlined in the FHWA “Deep Mixing for Embankment and Foundation Support” design manual (Bruce, M.E.C. et al. 2013).

The MIP panels will be oriented perpendicular to the embankment baseline, will be 10 feet long continuous panels (as measured in plan view), and will be installed along the upstream and downstream toes. We assumed the MIP panels will have an effective width of 3 feet and an unconfined compressive strength (UCS) greater than 110 psi. We designed the MIP panels to have the same panel length across the upstream and downstream slopes of the dam to improve construction efficiency. Based on these assumptions, the following MIP panel spacings (center-to-center) are required to achieve a minimum post-earthquake FS against slope failure of 1.2 or greater:

- 15 feet along the upstream toe between Stations 10+10 and 18+35,
- 15 feet along the downstream toe between Stations 11+20 and 13+75, and
- 8 feet along the downstream toe between Stations 13+75 and 18+63.

We selected these design parameters based on current industry practices and conversations with contractors experienced in MIP panel installation. Additional details about the design of the MIP panels are included in Appendix 3.

4.5 North Lake, Pine Lake, and Upper Lake Dams

4.5.1 Evaluation of Existing Conditions

As discussed above, North Lake, Pine Lake, and Upper Lake Dams each breached during Hurricane Florence. NCDOT repaired the North Lake and Pine Lake embankments and roadways. The Upper Lake Dam breach resulted in an approximate 80-foot-wide cut through the embankment near the left abutment contact and has not been repaired.

Based on the 2019 and 2020 subsurface exploration data presented in the GDR, the North Lake, Pine Lake, and Upper Lake embankments and their foundations generally consist of loose to medium dense sands with varying amounts of fines. No evidence of a low-permeability

embankment core has been identified for any of the embankments. Rock was not observed at any of the dams during the performance of test borings. However, CPT refusal was observed at North Lake Dam and Pine Lake Dam at EL -2.4 and EL -14.4, respectively. At Upper Lake Dam, CPT refusal was observed at EL 29.2, but it appears that this is the result of encountering an obstruction (e.g. alluvial cobble, tree stump, etc.) instead of rock.

There are no indications or evidence of previous sinkhole activity at any of these dams, which may be due to the depth to rock beneath each dam and the relatively low hydraulic head imposed by each reservoir.

4.5.2 Summary of Embankment Design Elements

The rehabilitation designs for North Lake, Pine Lake, and Upper Lake Dams include the following work items:

- Repair of the breached area, including removal of loose materials from the surface and placement and compaction of engineered fill soils (Upper Lake Dam only);
- Removal of trees and/or woody vegetation from the embankments;
- Grading the new upstream and downstream embankment slopes to 3H:1V;
- Installation of filter diaphragms encapsulating the new spillway culverts;
- Installation of uniform riprap wave protection along the upstream slopes of the embankments;
- Reconstruction of the roadways atop the dams; and
- Removal of the 36-inch CMP installed in the left end of the Pine Lake Dam embankment.

4.5.3 Embankment Materials

New embankment sections of North Lake, Pine Lake, and Upper Lake Dams will be homogeneous. The backfill materials will consist of Common Fill soils described in Section 4.4.3. Each dam will be founded on naturally-occurring foundation soils. Filter diaphragms will be installed around the proposed spillway conduits. The embankments beyond the spillway excavations and the breached area (Upper Lake Dam only) will generally not be modified.

4.5.4 Seepage Controls

As discussed above, there are no indications or evidence of previous sinkhole activity at North Lake, Pine Lake, and Upper Lake Dams. There are also no indications or evidence of uncontrolled seepage through the embankment earthfill. Additionally, the embankment widths (40 or more feet) of these dams are more than sufficient for dissipating the low head differential between headwater and tailwater. Therefore, robust seepage control measures, such as a cutoff wall or a clay core, are not warranted at these sites.

The rehabilitation designs include the installation of filter diaphragms between the excavation slopes and around the proposed spillway culverts. The purposes of the filter diaphragm are to mitigate potential internal erosion issues by filtering any concentrated seepage that may develop along the spillway conduits or along the excavation surfaces, and to develop a baseline

phreatic surface elevations within the embankment and flow volume at the drain outlets as an aid in identification of changes in the embankment and foundation performance. The filter diaphragms will consist of fine drainfill, will be 3 feet thick, and will key 2 feet into the foundation soils and 1 foot into the excavation side slopes. A collection layer consisting of coarse drainfill and 6-inch-diameter slotted PVC collection pipes will be installed within the filter diaphragms to collect and convey seepage toward the drain outlets embedded in the outlet structure headwalls. This will allow for future visual inspection of the seepage outflows. The drain outlet invert elevations will be located 6 inches above the normal tailwater elevation, and the outlets will include check valves with backflow preventers. Cleanouts will be installed near the ends of the slotted collection pipe to allow for future maintenance and inspection of the system.

4.5.5 Seepage and Slope Stability Analyses

Seepage and slope stability analyses were performed for each of the three smaller dams to evaluate seepage conditions and the stability of the proposed embankment geometries discussed herein. Seepage and stability were analyzed for the proposed embankment geometries adjacent to the proposed spillways, which is the approximate maximum section of each dam. An additional section was analyzed for the proposed embankment geometry within the existing breached area at Upper Lake Dam. Factor of safety against slope failure was calculated for each section under proposed normal operating conditions, flood loading, and maintenance conditions. The results of the slope stability analyses indicate the proposed embankment sections meet the minimum FS against slope stability failures recommended in the USACE EM 1110-2-1902 (2003) for all loading conditions analyzed. Additional details and results of the seepage and slope stability analyses are presented in Appendix 3.

4.5.6 Foundation Liquefaction Potential

As with the foundation soils beneath Sanford Dam, relatively low SPT blow counts and CPT tip resistances were recorded in the cohesionless foundation soils beneath each of the three smaller dams. According to the results of the liquefaction potential analysis, calculated FS against liquefaction for the majority of the foundation soils at North Lake, Pine Lake, and Upper Lake Dams were less than 1.0. Therefore, the cohesionless foundation soils have the potential to experience cyclic liquefaction and lose strength when subjected to a peak ground acceleration caused by the 2,500-year seismic event. Additional details and results of the liquefaction potential analysis are presented in Appendix 3.

4.5.7 Post-Earthquake Slope Stability Analysis

Using the same approach described above for Sanford Dam, we analyzed post-earthquake stability of the upstream and downstream embankment slopes for each of the three smaller dams. The calculated FS against slope failure were less than the minimum recommended value of 1.2. Only the upstream slope of Upper Lake Dam had a calculated post-earthquake FS greater than 1.2. We therefore expect that excessive deformation of the three smaller dams will occur as a result of cyclic liquefaction of the foundation soils. However, modifications of the foundation soils below North Lake Dam, Pine Lake Dam, and Upper Lake Dam are not recommended based on the results of the semi-quantitative risk assessment (SQRA) described

in the following subsection. Additional details and results of the post-earthquake slope stability analyses are included in Appendix 3.

4.5.8 Seismic Semi-Quantitative Risk Assessment

We performed a seismic SQRA for North Lake Dam, Pine Lake Dam, and Upper Lake Dam. The intent of this SQRA was to estimate whether a sufficiently high risk of cyclic liquefaction exists at the three smaller dams, such that the installation of foundation modification measures is warranted. Based on the results of the SQRA, there is limited justification for additional risk reduction measures. It is therefore concluded that rehabilitation of the North Lake, Pine Lake, and Upper Lake Dams to address liquefaction is not warranted. Additional details and results of the seismic SQRA are included in Appendix 3.

4.5.9 Spillway Foundation Preparation

At North Lake Dam, Pine Lake Dam, and Upper Lake Dam, the foundation soils will be over-excavated below the proposed excavation grade to 5 feet horizontally beyond the spillway footprint, and, after dewatering and foundation preparation activities are completed, a 6-inch-thick layer of flowable fill (mudmat) will be placed on the subgrade to protect the subgrade and to provide a firm surface against which earthfill can be placed and compacted subsequent to construction of the spillway elements. The mudmat will remain in place, and the spillway elements will be constructed on top of it.

4.6 Geotechnical Parameters for Structures

At-rest, active, and seismically-induced lateral earth pressure coefficients were computed for the backfill behind the proposed inlet headwall, inlet weir walls, and outlet sidewalls at each of the BSL Dams. Earth pressures induced by compaction and allowable bearing pressures of the foundation soils were also considered. The recommended geotechnical parameters for structural analyses and design are provided in Appendix 3.

4.7 Geotechnical Instrumentation

To aid in the monitoring of the performance each dam, four types of instrumentation will be installed: reservoir staff gauges, structure monitoring points (SMPs), deformation monitoring points (DMPs), and vibrating wire piezometers (VWPs). The Drawings show the layout of the instrumentation program at each dam, as well as installation details. The following subsections include summaries of each type of instrumentation. Seepage collection weir vaults are not included in the instrumentation program because most of the seepage is anticipated to be conveyed through the dam foundation below the daylight elevation, which makes it difficult to accurately measure the amount of seepage through the dam.

4.7.1 Staff Gauges

Staff gauges will be installed on the upstream slopes of each dam to the right of the inlet structures to allow for visual measurement of pool elevations. The staff gauges will be 16-gauge enameling iron, with a porcelain enamel baked-on finish.

4.7.2 Structure Monitoring Points and Deformation Monitoring Points

SMPs and DMPs will consist of brass survey markers. SMPs will be installed at the top of the inlet and outlet structure headwalls at each dam. DMPs will be installed along the downstream edge of the embankment crest at Sanford Dam only. The SMPs and DMPs will allow for measurement of horizontal and vertical post-construction deformations of the structures and embankment, respectively, relative to a permanent benchmark (survey control point, SCP) located off the dam.

4.7.3 Vibrating Wire Piezometers

Thirteen VWPs will be installed in the Sanford Dam embankment and foundation to facilitate monitoring of the groundwater levels, confirmation of design assumptions, evaluation of structure performance, and identification of potential seepage issues. VWPs are electronic instruments which are used for long-term measurement of pore pressures in the embankment and foundation. The VWPs will be used to evaluate and monitor performance of the cutoff wall and drains. The locations and quantities of the VWPs include:

- 4 pairs of VWPs (VWPs 1 through 8) in the modified embankment section located to the left of the breached area to monitor seepage through the embankment and foundation and the effectiveness of the cutoff wall.
- 2 pairs of VWPs (VWPs 9 through 12) in the proposed embankment section to monitor seepage through the embankment and foundation and the effectiveness of the cutoff wall and drains.
- 1 VWP (VWP 13) in the gate well to record the reservoir water level.

Each VWP contains a thin steel diaphragm connected to a vibrating wire element that produces an electronic frequency. The frequency varies with the amount of pressure that is applied to the diaphragm. The recorded frequencies can be translated into pressure readings which can be used to evaluate the performance of the structure. The vibrating wire element sends the frequency through a cable. All VWP cables, except the VWP 13 cable, will be routed through buried electrical conduits to flush-mount enclosures. The cables will then be routed to GeoNet nodes located at the downstream edge of the embankment crest. The frequency data will be relayed wirelessly from the GeoNet nodes to the Data Transfer Point installed at the low-level well. The cable extending from VWP 13 will be wired directly to a multiplexer and then to the Data Transfer Point. The Data Transfer Point will read and automatically log the frequencies at specified time intervals and will transmit the data to a cloud-based platform. The data will be remotely accessible through a web browser.

4.8 Temporary Excavation Slope Stability

The temporary excavation slope grade of 2H:1V shown on the construction drawings was selected based on the design of similar projects. The stability of the excavation slopes is based on the assumption that the excavation will remain in a dewatered state throughout construction because excavation slope stability is dependent on the piezometric surface during construction. The Contractor will be responsible for temporary excavation stability and will be required to

provide an effective dewatering system capable of lowering the groundwater level to provide stable excavation slopes. Additional considerations regarding excavation dewatering are presented in Section 8.4.

5. STRUCTURAL ANALYSES AND DESIGN

5.1 General

As part of the rehabilitation of the BSL Dams, the existing culverts at North Lake Dam and Pine Lake Dam and existing spillways at Sanford Dam and Upper Lake Dam will be removed and replaced with new spillways. The new spillway design consists of multiple design elements which are required for the general safe performance of the dam and to meet the requirements of NC Dam Safety. This section includes an evaluation of existing conditions and provides an overview of the structural engineering evaluations and analyses performed to support the design of the BSL dam rehabilitations.

5.2 Sanford Dam

5.2.1 Evaluation of Existing Spillway

The existing structure was evaluated based on current codes and standards. The existing drop inlet riser structure concrete is deteriorated. Aggregates are exposed on the entirety of all visible surfaces, and the structure does not meet current design standards outlined in ACI 350-06, *Code Requirements for Environmental Engineering Concrete Structures* (ACI 2006).

According to the 1979 Record Drawings (Henry von Oesen and Associates 1979), the four original 54-inch-diameter corrugated metal pipe (CMP) spillway pipes experienced differential settlement at the upstream end, and the settlement caused separation of the first pipe joint downstream of the riser headwall. The 1979 Record Drawings indicate that an excavation was created downstream of the headwall, that the separated joints were repaired, that internal joint couplers were placed inside the pipes at every other joint, and that the insides of the pipes were coated.

According to a letter dated August 25, 1986, written by the City Commissioner to the Director of the North Carolina Land Quality Section, an 18-inch-wide, 4-foot-deep hole was discovered on the embankment crest shortly after a heavy rain event. The location of the hole was described as being over spillway pipe 1 (where the four spillway pipes are numbered such that pipe 1 is farthest to the right and pipe 4 is farthest to the left) and between the upstream edge of roadway and the spillway headwall. Water poured into the hole and reportedly disappeared “at a seepage rate”. The only reported visible consequence of pouring water into the hole was the observation of a “slight muddy drip” from one of the joints in pipe 4. Variable settlement was observed in the road pavement in the vicinity of the spillway pipes during a Dam Safety inspection in May 1987 and subsequent site visits. S&ME was retained by the City in June 1987 to investigate the apparent issue and to prepare a repair design. In the report entitled “Remedial Dam Repair Investigation and Design Report” (S&ME 1988), it was reported that each of the four CMP spillway barrels had experienced vertical movement and/or settlement, that pipe 1 exhibited “evidence of significant inflow of seepage”, and that SPT results indicated wet, lower-density soils adjacent to and below the spillway pipes. S&ME recommended in their 1988 report that 40-inch-inside-diameter (ID) polyethylene pipes be used to line the existing 54-inch CMP spillway pipes and that pressure injection grouting be performed to stabilize fill soils.

"Dam Repair" record drawings (Tri-State Consultants 1991) indicate that the 54-inch spillway pipes were lined (though details were not included). The injection grouting program to stabilize fill soils was reportedly not performed.

Data presented in the GDR indicate the presence of low-to-medium density fill soils above and adjacent to the spillway pipes and low-density foundation soils below the pipes. The data suggest that the low-density foundation soils below the spillway pipes, are natural soils in the original location of Allen Creek that were not removed or modified during spillway construction.

It is recommended that all elements of the existing spillway and the foundation soils below the existing spillway be removed as part of the rehabilitation. To bring the dam into compliance with current NC Dam Safety codes, a new spillway capable of safely passing the entire design storm will be constructed in the location of the existing spillway and in line with the downstream railroad bridge opening (as opposed to constructing the new spillway in the existing breached area), thus reducing the potential for scour downstream of the spillway.

5.2.1 Summary of Proposed Spillway Design

The new spillway will be constructed of cast-in-place concrete and will include an inlet structure, box culverts through the embankment, and an outlet structure. The inlet structure and outlet structure will be embedded in the embankment. The inlet structure will have a headwall which will extend above the inlet structure weir walls to retain the embankment. This configuration allows flow over the weir walls located on the upstream and left and right sides of the inlet, but not over the downstream headwall adjacent to the embankment.

The following is a summary of the new spillway design elements at Sanford Dam:

- Removal of existing spillway system and MSE wall;
- Removal of existing foundation soils to top of rock and replacement with structural fill for settlement control;
- Installation of a new single-stage CIP concrete inlet structure, box culverts, energy dissipator steps, and outlet sidewalls within the general footprint of the existing spillway;
- Installation of a chimney drain encapsulating the box culverts to mitigate potential internal erosion issues along the box culverts;
- Low-permeability core fill placed above the box culverts;
- Installation of a low-level drain conduit and sluice gate system to allow for the lowering of the reservoir pool; and
- Installation of a floating barrier in the reservoir upstream of the spillway, chain link fence at the top of the inlet and outlet headwalls and outlet sidewalls, and railing at the top of the gate well.

5.3 North Lake, Pine Lake, and Upper Lake Dams

5.3.1 Evaluation of Existing Spillways

The 1960 Drawings (Henry von Oesen and Associates 1960) contain limited design information for North Lake and Pine Lake Dams. The original spillway system was destroyed during the breach at Pine Lake and the structures at both dams were replaced by NCDOT with two 96-inch-ID CMP culverts to pass base flows and corrugated metal upstream and downstream headwalls. The recently installed CMP culverts and headwall structures at North Lake and Pine Lake Dams were not installed per the current requirements of NC Dam Safety. The CMP culverts are open, and there are no structures to regulate impoundment of the reservoirs. The corrugated metal will eventually deteriorate if left in place and is not an approved material for dam construction by NC Dam Safety. There is also uncertainty about the condition of gravel bedding placed beneath the CMP culverts. In addition, no seepage controls to protect against internal erosion are present in either embankment.

No original design or construction information is available for the Upper Lake Dam embankment and spillway elements. Base flow is passed through the dam through two concrete box inlets, each with 48-inch CMP conduits. Although no prior Notices of Deficiency were received from NC Dam Safety that pertain to the structure, the structure was evaluated based on current codes and standards. Like the Sanford Dam riser structure, the existing concrete is deteriorated. Aggregates are exposed on the entirety of all visible surfaces, and the structure does not meet current standards outlined in ACI 350. The CMP spillway pipe will continue to degrade if left in place. There is no indication that seepage controls are present in the embankment.

5.3.2 Summary of Proposed Spillway Design

The new spillways at North Lake, Pine Lake, and Upper Lake Dams will be similar to the new Sanford Dam spillway and include the following design elements:

- Removal of existing culverts or spillway systems;
- Installation of flowable fill “mudmats” placed on the foundation subgrade for constructability and protection of the subgrade;
- Installation of new single-stage CIP concrete inlet structures, box culverts, and outlet sidewalls within the general footprint of the existing spillways;
- Installation of filter diaphragms encapsulating the new spillway culverts to mitigate potential internal erosion issues along the box culverts;
- Installation of a low-level drain conduit and sluice gate systems to allow for the lowering of the reservoir pools; and
- Installation of a floating barrier in the reservoir upstream of the spillway, chain link fence at the top of the riser headwall, and railing at the top of the gate well.

5.4 Summary of Structural Analyses

Stability analyses were performed for the inlet structures and outlet structures for all four dams in general accordance with the USACE EM 1110-2-2100 – Stability Analysis of Concrete Structures (USACE 2005). As discussed above, Sanford Dam is considered to be a "Critical Structure," and North Lake Dam, Pine Lake Dam, and Upper Lake Dam are each considered to be "Normal Structures." The Site Information Category for design of the reinforced concrete structures for all four BSL Dams was determined to be "Ordinary" based on available geotechnical information. As applicable for each component of the spillways, global stability analyses for flotation, sliding, and rotational stability consider the following load cases: normal operating conditions, maintenance conditions, post-flood conditions, and seismic loading. A proprietary spreadsheet program entitled "Retwall" developed by Schnabel was used to design the retaining wall structures, including the inlet and outlet headwalls, weir walls, sidewalls, and base slabs. Structural geometries for these structures were developed such that the analyses performed for the considered load cases resulted in a calculated FS which is equal to or greater than the required value assigned for each load case. Additionally, a minimum thickness of 12 inches was used for all structural walls in accordance with the requirements for water-retaining structures presented in ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary (ACI, 2006). The Retwall spreadsheet was also used to design strength of reinforcement in accordance with ACI 350 provisions.

Commercial software licensed to Schnabel was used to analyze and design the single and multiple cell box culverts. The box culverts were analyzed as a cast-in-place system based on AASHTO LRFD Bridge Construction Specifications 6th Edition (AASHTO 2012). Design bending moments and shear forces were calculated for each member of the culvert system (i.e., interior walls, top and bottom slabs, and exterior walls). Based on computed design forces, member sizes and required steel reinforcement to resist the design loads are determined for each member.

Detailed design information, calculations, and analysis output results are presented in Appendix 4 as follows:

- Global stability calculations for the inlet structure of each dam.
- Design calculations for retaining walls and base slabs for each dam.
- Analysis reports generated using the culvert design software for each dam.

5.5 Low-Level Drains

Low-level drain systems which allow for the draining of the reservoirs were designed for all four BSL Dams based on the hydraulic analyses presented above. A sluice gate will be mounted to the downstream end of the right weir wall, and the gate operator will be accessible from the upstream embankment slope. A gate well composed of CIP concrete walls extending from the right weir wall to the top of inlet headwall will provide a vertical conduit to access the sluice gate and appurtenances. Manhole type steps will be embedded into one of the walls to facilitate

access into the gate well and for future maintenance of the system. Due to the inlet structures being embedded in the embankment, the low-level drain inlet will be located in the reservoir upstream of the embankment toe. Flows will be conveyed from the low-level drain inlet to the sluice gate via a CIP conduit. A trash rack will be installed at the inlet of the conduit to reduce the potential for debris to clog the drain system.

5.6 Public Safety Elements

A safety float buoy system will be installed upstream of the inlet structure at each dam. The safety float buoy system will consist of marker buoys to ensure public safety by warning boaters that they are approaching the spillway and to reduce the potential for debris to clog the spillway system. The buoy system will be anchored into the upstream slope of the embankment below the normal pool elevation.

Chain link fence will be installed along the inlet and outlet headwalls and outlet sidewalls for public safety and to prevent public access to the gate well platform. Guardrails will be installed along three sides at the top of the low-level gate well for maintenance staff safety.

6. ROADWAY DESIGN

All City-owned paved roads atop the dams (i.e., East Boiling Spring Lake Road and Alton Lennon Road) will be reconstructed using the NCDOT standard detail and design manuals. The roads consist of a rural section (Figure 24), two lanes, crowned, asphalt pavement. No curb and gutter, concentrated flow, or drainage pipes are proposed within the dams. Runoff from the roads will sheet flow into the shoulders. The roads pavement section consists of the same design implemented by NCDOT for the Reconstruction of East Boiling Spring Road. In addition, Guardrails are proposed on both sides of the roads for public safety.

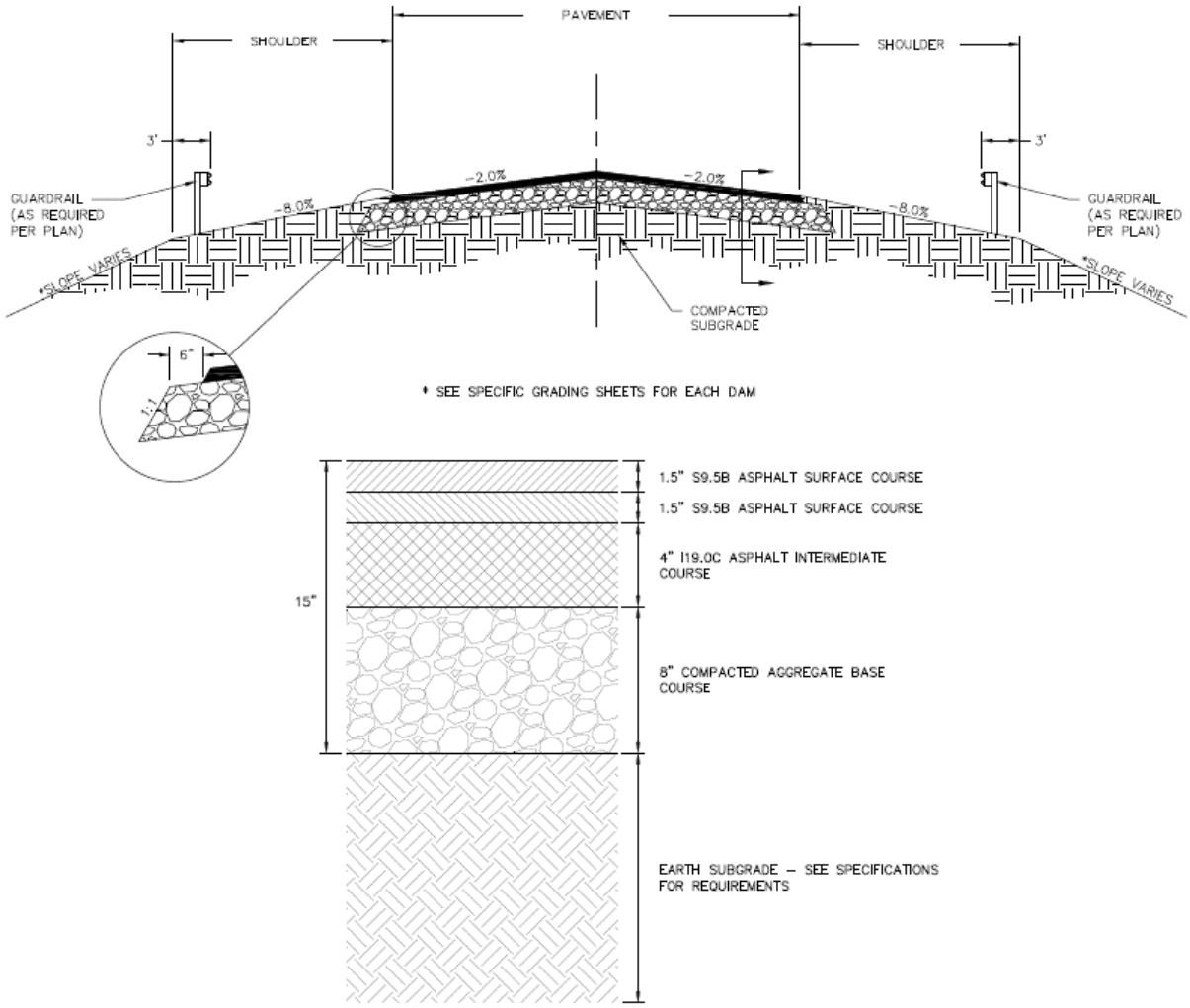


Figure 24. Typical roadway cross section for Alton Lennon Road and East Boling Spring Road

West Dam Road atop Upper Lake Dam will remain a gravel road since it is not open for public traffic (Figure 25).

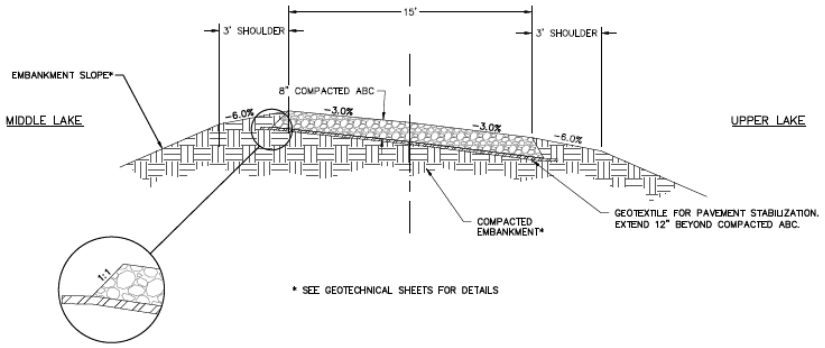


Figure 25. Typical gravel cross section for West Dam Road

7. ENVIRONMENTAL PERMITTING

7.1 Introduction

7.1.1 Purpose

McGill Associates, P.A. has completed a preliminary environmental analysis at four existing dam sites – Sanford Dam, Pine Lake Dam, Upper Lake Dam, and North Lake Dam – in the City of Boiling Spring Lakes, North Carolina. The purpose of this element of the report was to determine what environmental features exist at the proposed sites, how these features will likely be affected by the proposed work, and present the various environmental permitting applications prepared for the agencies having jurisdiction.

7.1.2 Proposed Project

The dams were breached and/or inlet/outlet structures were damaged during Hurricane Florence in September of 2018. The information provided in this report is based on project work that would involve repairing dams to “pre-Florence” conditions. While plans for dam repairs have not been completed at this time, it is the intent of the City to restore dams to their original purpose and function, which includes matching the original top embankment elevations and impounded volumes. The spillway capacity for each dam will be upgraded to meet the current NC Dam Safety requirements for high hazard facilities.

7.2 Methods

The methods discussed below were utilized for the preliminary environmental analysis in this report. Additional methods utilized for permitting activities are discussed in Section 7.4.

7.2.1 Aquatic Resources

The method for identifying aquatic resources was performed by examining the historic lake shoreline areas and drainages on the project boundary. Potential wetland sites were transected, with samples taken at points in areas with vegetative and topographic dissimilarities. Preliminary wetland determinations were made by observation of soils, hydrology, and vegetation at select points. The standard method for determining the boundary of open water areas is observations of the Ordinary High Water Mark (OHWM). The historic OHWM of the lakes was determined by reviewing the City of Boiling Spring Lakes lake management records, observations of aerial photography, organic debris lines, vegetation indicators (wet- versus dry-tolerant plant species), geomorphic indicators (slope changes, sloughing, etc.), and water marks on man-made structures such as piers and walls. Impacts to downstream areas along Allen Creek below Sanford Dam were observed and documented. Overall functionality related to flow, instream and riparian habitat, and riparian vegetative survival was observed and documented.

7.2.2 Threatened and Endangered Species

A desktop review was performed which includes a search of Federally listed threatened and endangered species within Brunswick County through the US Fish and Wildlife Service. The review includes a database search conducted through the North Carolina Natural Heritage Program and the US Fish & Wildlife Service (USFWS) Information for Planning and Consultation tool to identify past occurrences of species in the project area (see Appendix 5).

Information from the desktop review was used to determine which species required a presence/absence survey at the site. During a conversation with Emily Wells, Fish and Wildlife Biologist, USFWS, formal consultation was requested concerning the proposed project and its effect on federally listed species. The formal consultation was initiated via email on October 10, 2019. See Appendix 5.

Survey methods for identifying threatened and endangered species and habitat involved walking along transects within the project area and identifying appropriate habitat features. If habitat was identified, more detailed observations were made by noting any key indicators (i.e. signs of nesting, scat, tracks, etc.) of presence of the species. Please note this type of generalized presence/absence survey conducted during one site visit has limitations as some species are only present or readily identifiable during certain seasons.

7.2.3 Floodplains

The North Carolina Flood Risk Information System online mapping service was reviewed to determine if any floodway or floodplain areas exist within or near the project area.

7.2.4 Historic Resources

The North Carolina State Historic Preservation Office (NCSHPO) HPOWEB mapper was reviewed to determine if any historic resources exist within or near the project area. Sanford Dam (Boiling Spring Lake Dam) was mapped as HPO Site ID: BW0545. During a site visit photographs were taken of the Sanford Dam concrete riser and spillway outlets. Following the site visit, a formal review with NCSHPO was initiated via email on September 26, 2019 concerning Sanford Dam (Boiling Spring Lake Dam). See Appendix 5.

7.3 Site Description and Findings

7.3.1 Location

The project sites encompass four dams that make up the Boiling Spring Lakes system. The Sanford and Upper Dams traverse Allen Creek while the Pine Lake and North Lake Dams cross tributaries north of Allen Creek. The primary study areas were approximately 50 feet upstream and downstream from the center of the dams. The study area encompassing the Sanford Dam also includes downstream wetland and floodplain areas affected by the dam failure. Selected areas of the historic lake shoreline were also observed during site visits. The Pine Lake and North Lake sites can be accessed from East Boiling Springs Road, east of Highway 87. The Sanford Dam can be accessed from Alton Lennon Drive off of East Boiling Spring Road. However, only a portion of the road is open due to the breach. The Upper Lake Dam is also partially closed to traffic and can be accessed from Dam Road which is west of Highway 87. The project sites occupy the southern tip of the Cape Fear River Basin in Brunswick County, which is a coastal county subject to the rules of policies of the Coastal Resources Commission.

7.3.2 Existing Condition of Dams

The Pine Lake and North Lake Dams have been temporarily repaired and culverts installed by the NC Department of Transportation allowing for East Boiling Springs Road to be re-opened to traffic in both locations. The temporary culverts are placed at the bottom of the lakes such that

no water is currently impounded. The Upper and Sanford Dams have unrepaired breaches, and the roads crossing the dams are closed to traffic.

7.3.3 Jurisdictional Waters

Jurisdictional waters are streams, wetlands, lakes, and other open waters (i.e., “waters of the US”) that are subject to the regulations and rules of the Clean Water Act. The NC Division of Water resources classifies Allen Creek (Boiling Spring Lake) as B; Swamp Waters (Sw). The B classification is given to waters protected for both primary and secondary recreation uses. Primary recreational activities include swimming, skin diving, water skiing, and similar uses involving human body contact with water where such activities take place in an organized manner or on a frequent basis. Secondary recreation includes fishing, wildlife, fish consumption, aquatic life including propagation, survival and maintenance of biological integrity, and agriculture. The Swamp Waters classification is a supplemental classification intended to recognize those waters which have low velocities and other natural characteristics which are different from adjacent streams. The NC Division of Coastal Management (DCM) has confirmed that the lake is not located within a DCM Area of Environmental Concern.

Some areas along the shoreline and stream inlet areas of the lake appear to be either woody wetlands or freshwater marsh habitat. Since the dam breaches occurred, the original lake beds have reverted to a mix of small open water pools and sand flats with early successional herbaceous vegetation. Channels (possibly the natural stream beds prior to dam installation) currently conduct water through the lakebed and breach areas.

It is the opinion of McGill Associates that the proposed project areas near the dams where project activities would occur will be considered open water by regulatory agencies since these areas were previously flooded and are still sparsely vegetated. A pre-permitting site meeting on October 17, 2019 with the U.S. Army Corps of Engineers (USACE) and the NC Division of Water Resources (NCDWR) regarding the specific limits and classification of waters subject to federal and state jurisdiction confirmed the open water determination. See Appendix 5.

Extensive forested riparian wetlands were noted along Allen Creek downstream of the Sanford Dam. Fluctuating tributary levels, ground water discharge, and direct surface runoff typically influence the hydrology and ground water table. Upland habitat areas are sometimes embedded within riparian wetland boundaries, due to higher topography or abrupt topographic breaks. Over-bank flooding appears to have a significant impact on the establishment and maintenance of hydric conditions in these types of wetland systems. However, many of these areas are buried with sand and debris migrating from the upstream Boiling Spring Lake bed during the breach. As such, large portions of the wetland system appear to be highly degraded and exhibit characteristics of uplands.

7.3.4 Federally Listed Threatened and Endangered Species

According to USFWS and NCNHP online databases, five listed species are considered potentially occurring with the project sites – Bald Eagle, Red-cockaded woodpecker, Wood stork, Cooley’s meadowrue, and Rough-leaved loosestrife.

A survey of potential impacts to Federally listed threatened and endangered species that may occur within the project area was conducted by McGill Associates on July 30-31, 2019 and the results are as follows:

Bald Eagle (*Haliaeetus leucocephalus*) – Habitat exists in the project study area in the form of small open water features and nearby canopy trees. A review of NCNHP records on August 16, 2019 indicates no known Bald Eagle occurrences within 1.0 mile of the study area. A site visit on July 30-31, 2019 found no individuals within the study area, and there is no anticipated tree removal associated with the proposed project. Therefore, a biological conclusion of MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT was rendered.

Red-cockaded woodpecker (*Picoides borealis*) – Habitat exists in the project study area in the form of scattered mature pine trees greater than 19 inches in diameter at breast height, however, no tree removal is anticipated as a result of the proposed project. A review of NCNHP records on August 16, 2019 indicates there are known Red-cockaded woodpecker occurrences within 1.0 mile of the study area. A site visit on July 30-31, 2019 found no individuals or nesting cavities within the study area. Therefore, a biological conclusion of MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT was rendered.

Wood stork (*Mycteria americana*) – Habitat exists in the project study area in the form of freshwater marshes and ponds. A review of NCNHP records on August 16, 2019 indicates no known Wood stork occurrences within 1.0 mile of the study area. A site visit on July 30-31, 2019 found no individuals within the study area. Therefore, a biological conclusion of MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT was rendered.

Cooley's meadowrue (*Thalictrum cooleyi*) – Habitat exists in the project study area in the form of open right-of-way clearings along roadways and riparian areas along woodlands, however, proposed project work will take place within previously disturbed and maintained areas along the dams. A review of NCNHP records on August 16, 2019 indicates no known Cooley's meadowrue occurrences within 1.0 mile of the study area. A site visit during the survey window recommended by the USFWS on July 30-31, 2019 found no individuals within the study area. Therefore, a biological conclusion of MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT was rendered.

Rough-leaved loosestrife (*Lysimachia asperulifolia*) – Habitat exists in the project study area in the form of open right-of-way clearings along roadways and riparian areas along woodlands, however, proposed project work will take place within previously disturbed and maintained areas along the dams. A review of NCNHP records on August 16, 2019 indicates there are known Rough-leaved loosestrife occurrences within 1.0 mile of the study area. A site visit during the survey window recommended by the USFWS on July

30-31, 2019 found no individuals within the study area. Therefore, a biological conclusion of MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT was rendered.

During informal consultation with Emily Wells, Fish and Wildlife Biologist, USFWS, she indicated that the Red-cockaded woodpecker (*Picoides borealis*) was the lone federally listed species that may be affected by the proposed project. Since no tree removal is proposed for the project, impacts to the Red-cockaded woodpecker or its habitat are not expected. Formal consultation with Ms. Wells was initiated via email on October 10, 2019 to obtain her written concurrence. A concurrence letter was received from Ms. Wells on November 18, 2019 stating the following, 'Based on the information provided and other information available, it appears that the proposed action is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act at these sites.' See Appendix 5.

7.3.5 Floodplains

A review of floodplain mapping indicates there are flood hazard areas within all four dam sites (see Appendix 5). Allen Creek and its 2 tributaries Clear Pond (aka, North Pond) and Pine Lake are located on FIRM panels 2079, 2089, 2180, and 2190. The creek has been modeled by FEMA as a Detailed Study with base flood elevations and floodway. Proposed improvements to Sanford Dam and the Upper Dam will take place within the mapped floodway. Proposed improvements to North Lake Dam will take place within mapped 100-year floodplain. Pine Lake is not modeled in FEMA and is represented as Zone A floodplain.

7.3.6 Historic Resources

Sanford Dam is listed on the HPOWEB GIS Service mapper as:
Boiling Spring Lake Dam
HPO Site ID: BW0545
Status: SO
NRHD status: None
Description: 1961

The listing indicates an architectural survey has been performed at the site, but the site has not formally been placed on the National Register of Historic Places. An official review of the proposed project area was completed by the NC State Historic Preservation Office on October 28, 2019, with the conclusion that 'The Boiling Springs Lake Dam (BW0545), or Sanford Dam, was constructed in 1961 with the purpose of creating a centerpiece for development of the Boiling Spring Lakes community. The importance of this resource is related to its engineering and use in community planning. The proposed repair/replacement of key elements will return the resource to its historic form and function. We strongly recommend that the earthen dam be replaced in-kind and have no objection to the project as proposed.' See Appendix 5.

7.4 Environmental Permitting

7.4.1 Impacts to Jurisdictional Waters

Correspondence with the USACE and NCWRC has indicated that permitting requirements for impacts to jurisdictional waters at the dam sites will be based on conditions prior to dam failures (i.e., the former Ordinary High Water Mark of the lakes) and be considered open water.

The process of permitting impacts has started with an official determination forthcoming by the USACE of what jurisdictional areas are at the site. A jurisdictional determination of open waters within project areas was made according to guidelines set forth in the Corps of Engineers Wetland Delineation Manual (1987) and associated Guidance letters found in 33 CFR 328.2 of the Federal Register. As the regulating authority of Section 404 of the Clean Water Act, the USACE will make the final determination as to the jurisdictional status of the sites. The NCDWR 401 Certification Unit have authority over “waters of the State” and determine whether proposed activities violate State water quality standards under Section 401 of the Clean Water Act.

Since the dams will be repaired to essentially pre-hurricane specifications, this work will be authorized by the USACE under a Nationwide Permit 3 (NWP 3) for Maintenance Activities and by the NCDWR Water Quality General Certification 4132. The general conditions of both permits are located in Appendix 5. The NWP 3 authorizes the repair, rehabilitation, or replacement of structures destroyed or damaged by storms, provided that the work is commenced, or is under contract to commence, within two years of the date of the destruction or damage. Note that in accordance with Regional Condition 4.1.2 of the NWP 3 (pg 35), a Pre-Construction Notification has been submitted to the USACE. Additionally, (d) of the Water Quality GC 4132 notes that written approval from NCDWR is required due to dewatering and drawdowns to a sediment layer related to pond/dam maintenance or removal (pg 2).

During the pre-permitting meeting on October 17, 2019 with Gary H. Beecher, USACE and Chad Coburn, NCDWR regarding permit authorization, it was confirmed that based on the open water impacts discussed, the proposed project could be covered under a NWP 3 and a Water Quality GC 4132.

Additionally, during the pre-permitting meeting, consultation with Maria T. Dunn, Coastal Coordinator, NC Wildlife Resources Commission resulted in the request of additional permit application information regarding the overall purpose of the project and the preservation of downstream and lake system aquatic habitat. Ms. Dunn requested that an alternatives analysis, purpose and need analysis, and an analysis of overall lake system benefit to both the City community and fish and wildlife species. Low flow conditions will be established in order to maintain downstream aquatic habitat within Allen Creek, especially for the support of anadromous fish species. The lake watershed, hydroperiod, and open water and shoreline wetland habitat will be analyzed to stress the benefits of restoring the lake to historic water elevations. The requested information and data will be incorporated into USACE and NCDWR permit application documentation.

Based on preliminary discussions with the USACE and NCDWR, and field visits performed by McGill Associates, PA environmental specialists it has been determined that the proposed project will permanently impact approximately 0.82-acres of former lake bed (open water) and approximately 60 linear feet of Allen Creek downstream of Sanford Dam. Temporary impacts associated with equipment access and lay down areas will total approximately 1.8-acres of former lake bed (open water) and approximately 30 linear feet of Allen Creek downstream from Sanford Dam. All anticipated temporary impact areas will be returned to their original conditions and stabilized prior to lake refilling. See below for individual dam impact estimates.

Sanford Dam – Permanent Impacts = 0.49-Acres Open Water, 60LF Allen Creek

Temporary Impacts = 0.87-Acres Open Water, 30LF Allen Creek

North Lake Dam – Permanent Impacts = 0.13-Acres Open Water

Temporary Impacts = 0.34-Acres Open Water

Pine Lake Dam – Permanent Impacts = 0.11-Acres Open Water

Temporary Impacts = 0.25-Acres Open Water

Upper Lake Dam – Permanent Impacts = 0.09-Acres Open Water

Temporary Impacts = 0.29-Acres Open Water

7.4.2 Impacts to Federally Listed Threatened and Endangered Species

Based on the results of the surveys described in Section 2.2, it is anticipated that no permitting will be required for threatened and endangered species. Correspondence with the USFWS to obtain concurrence with the biological conclusions above was initiated to get concurrence on the biological opinions and verify there are no further permitting requirements.

7.4.3 Impacts to Floodplains

The proposed work will include new structures within floodway and floodplain areas to maintain historic lake water levels. The base flood elevations will be changed as a result of the proposed improvements from prior conditions, requiring a flood study to remap the surrounding flood hazard areas and a Floodplain Development Permit from the City of Boiling Spring Lakes. A Conditional Letter of Map Revision has been prepared for the Local Floodplain Administrators of the City of Boiling Spring Lakes and Brunswick County as well as NCFMP. A Letter of Map Revision will also be required within 6 months of completion of construction which generally requires 4 to 6 months for review.

8. CONSTRUCTION CONSIDERATIONS

8.1 General

This section includes construction considerations that generally apply to the Sanford, North Lake, Pine Lake, and Upper Lake Dams rehabilitations, unless otherwise indicated.

8.2 Construction Sequencing

Proper sequencing of dam construction is critical to the successful implementation of the project and reducing the risks associated with various components of the work (e.g., dam foundation preparation, stream diversion, etc.). The following subsections include the anticipated construction sequences and major construction activities for each of the BSL Dams. Although the sequences outlined below are included as notes on the Drawings, sequencing of construction and temporary works will generally be the responsibility of the Contractor, with submittal reviews by the Engineer.

8.2.1 Sanford Dam

Construction Stage 1

1. Flag limits of disturbance and install project signage and temporary site security and safety measures.
2. Survey and verify existing conditions.
3. Install E&SC measures.
4. Perform clearing and grubbing and perform utility modifications.
5. Prepare staging areas and temporary facilities, including but not limited to materials and equipment laydown area(s), stockpile areas, parking area(s), construction and engineering field offices, laboratory facilities, and temporary electrical and plumbing services.
6. Remove existing upstream embankment slope protection riprap. Remove riprap within the proposed excavation footprint. Stockpile for reuse.
7. Install partial Stage 1 upstream sheet pile cofferdam and downstream cofferdam. Leave an opening in both cofferdams to allow flow through existing spillway.
8. Install temporary diversion conduits, including inlet and outlet protection.
9. Install remainder of sheet piles for upstream and downstream cofferdams and route base flow through temporary diversion conduits.
10. Install dewatering system and begin dewatering operations.
11. Demolish existing spillway and create excavation.
12. Reconstruct damaged embankment section between approximate stations 15+00 and 17+00 as shown on SD-B drawings.
13. During the course of the work above, perform cutoff wall demonstration section between stations 10+00 and 11+00, perform MIP test elements at location proposed by contractor and approved by engineer, and install upstream and downstream MIP panels, including installation and removal of associated temporary work platforms.

Construction Stage 2

1. Prepare foundation rock surface, and install coarse drainfill and leveling concrete as shown on the SD B-series drawings.

2. Construct the embankment up to EL 16 between temporary stream diversion conduits and left side of excavation. During embankment construction, construct downstream riprap slope protection and elements of the proposed spillway which have proposed subgrade below EL 16.
3. Remove dewatering system.
4. Remove downstream cofferdam.
5. Install cutoff wall between Stations 18+50 and 22+50, including associated temporary work platform required for accessing and installing the cutoff wall. While installing this section of cutoff wall, construct temporary work platform required for installing cutoff wall between Stations 11+00 and 17+50.

Construction Stage 3

1. Install cutoff wall between Stations 11+00 and 17+50. Remove associated temporary works upon completion.
2. Construct spillway culverts and remainder of spillway inlet structure, with the exception of the upstream left weir wall section, as shown on drawings.
3. Construct embankment up to EL 25 between temporary stream diversion conduits and left side of excavation.
4. Remove Stage 1 upstream sheet pile cofferdam.
5. Install Stage 3 upstream cofferdam, and reroute flow through gap in spillway inlet weir wall and new low-level drain.
6. Remove temporary stream diversion conduits and extend embankment (with top at EL 25) to right abutment.
7. Remove Stage 3 upstream cofferdam.
8. Install cutoff wall between Stations 22+50 and 23+25, including construction and removal of temporary work platform.

Construction Stage 4

1. Construct embankment up to EL 36.
2. Install cutoff wall between Stations 17+50 and 18+50 and between Stations 23+25 and 24+00, including construction and removal of temporary work platforms.
3. Demolish existing roadway and grade to proposed roadway subgrade.
4. Construct embankment to the final proposed grade, including roadway, riprap groin protection, and upstream riprap slope protection, as shown on the drawings, with exception of guardrails.
5. Install geotechnical instrumentation, subsequently install guardrails.
6. Construct Stage 4 cofferdam around missing spillway inlet weir wall section, such that flow is routed through only the low-level drain.
7. Construct the missing spillway inlet weir wall section, and remove Stage 4 cofferdam.
8. Perform fine grading, place topsoil, and apply permanent seeding and mulching.
9. Remove E&SC measures.

8.2.2 North Lake Dam and Pine Lake Dam

The construction sequencing for North Lake and Pine lake Dams is practically identical as summarized below.

Construction Stage 1

1. Close east boiling spring road and establish traffic control measures in accordance with approved traffic control plan.
2. Flag limits of disturbance and install project signage and temporary site security and safety measures.
3. Survey and verify existing conditions.
4. Install E&SC measures.
5. Perform clearing and grubbing, perform utility modifications, and demolish roadway.
6. Prepare staging areas and temporary facilities, including but not limited to materials and equipment laydown area(s), stockpile areas, and parking area(s).
7. Remove and stockpile topsoil and riprap slope protection from areas to be disturbed as part of construction.
8. Install temporary stream diversion conduits, including inlet and outlet protection.
9. Install Stage 1 upstream and downstream cofferdams, and route flow through temporary stream diversion conduits.
10. Excavate for spillway replacement, demolish existing spillway, and install dewatering measures.

Construction Stage 2

1. Prepare spillway foundation surface, including installation of dewatering measures and placement of mudmat.
2. Construct spillway inlet structure, culverts, outlet structure, permanent riprap outlet protection, and low-level drain.
3. Construct embankment up to roadway subgrade between temporary stream diversion conduits and left side of excavation. During embankment construction, construct the riprap slope protection to left of spillway.
4. Remove Stage 1 upstream and downstream cofferdams.
5. Install Stage 2 upstream cofferdam, and reroute base flow through new low-level drain.

Construction Stage 3

1. Remove temporary stream diversion conduits and complete embankment construction up to roadway subgrade, including upstream riprap slope protection to right of spillway.
2. Remove Stage 2 upstream earthfill cofferdam.
3. Reclaim staging and stockpile areas.
4. Construct embankment to the final proposed grade, including roadway, as shown on the drawings.
5. Perform fine grading, place topsoil, and apply permanent seeding and mulching.
6. Remove E&SC measures.
7. Remove traffic control measures and reopen east boiling spring road in accordance with approved traffic control plan.

8.2.3 Upper Lake Dam

Construction Stage 1

1. Flag limits of disturbance and install project signage and temporary site security and safety measures.
2. Survey and verify existing conditions.
3. Install E&SC measures.
4. Prepare staging areas and temporary facilities, including but not limited to materials and equipment laydown area(s), stockpile areas, and parking area(s).
5. Remove and stockpile topsoil and riprap slope protection from areas to be disturbed as part of construction.
6. Install Stage 1 cofferdams maintain flow through breach.
7. Excavate for spillway replacement and demolish existing spillway conduits.
8. Prepare spillway foundation surface, including installation of dewatering measures and placement of mudmat.

Construction Stage 2

1. Construct culverts, outlet structure, permanent riprap outlet protection, low-level drain, and spillway inlet structure, with the exception of the upstream left weir wall section, as shown on drawings.
2. Construct embankment in area of new spillway up to roadway subgrade. During embankment construction, construct proposed permanent riprap slope protection.
3. Remove Stage 1 cofferdams.

Construction Stage 3

1. Install Stage 3 cofferdams, and reroute flow through gap in spillway inlet weir wall and new low-level drain.
2. Complete excavation within breach area, including installation of dewatering measures.

Construction Stage 4

1. Construct embankment in breach area up to roadway subgrade. During embankment construction, construct the riprap slope protection.
2. Remove Stage 3 cofferdams.
3. Reclaim staging and stockpile areas.
4. Block base flow from missing spillway inlet weir wall section, such that flow is routed through only the low-level drain.
5. Construct the missing spillway inlet weir wall section.
6. Construct new roadway sections, perform fine grading, place topsoil, and apply permanent seeding and mulching.
7. Remove E&SC measures.

8.3 Control of Water

Control of water during construction is an important consideration as it dictates the management of normal base flows through the construction site as well as the risk tolerance for less frequent rainfall events to inundate the construction site. Based on discussions with the City and noting

the minimum levels of control of water prescribed by State regulatory agencies, a 10-year level of protection was selected for all dams in this project. Although a control of water concept is shown on the Drawings, the Contractor will ultimately be responsible for developing and submitting for approval the control of water design that will be implemented during construction.

Table 14 summarizes the hydraulic constraints required to bypass the 10-year, 48-hour storm event peak flow around each construction site. For each construction stage, temporary cofferdams will be used to divert base and storm flows through temporary conduits, breach areas, newly constructed low-level drains, or temporarily unconstructed weir wall sections of the proposed spillway inlet structures (described below). The crests of the temporary cofferdams are designed at or above the calculated peak water surface elevation shown in the table below.

Table 14. Temporary Bypass for the 10-year storm

Event	Peak Flow (cfs)	Inlet Invert (ft NAVD 88)	Outlet Invert (ft NAVD 88)	Barrel Size (in)	Number of Barrels	Peak Water Surface Elevation (ft NAVD 88)
Sanford Dam						
10-yr, 48-hour	1458	15	12	60	5	25
North Lake Dam						
10-yr, 48-hour	362	28	27	60	2	35
Pine Lake Dam						
10-yr, 48-hour	165	28	27	60	1	34.5
Upper Lake Dam						
10-yr, 48-hour	461	Divert flow through existing breach (stage 1 peak water surface 30.0)				

The sequence notes outlined above state that a missing spillway weir wall section is to be constructed during Sanford Dam construction sequence Stage 4. The Contractor may elect to postpone construction of the missing spillway weir wall section until construction work at the other three dams is complete to limit encroachment of tailwater during storm events. The tailwater and downstream cofferdam crest elevations for Upper Lake Dam, North Lake Dam, and Pine Lake Dam are based on the Sanford Dam weir wall gap remaining open until completion of construction of the small dams.

The Contractor will be required to submit to the design engineer a Control of Water Plan, which will be approved prior to starting excavation or demolition work. Provisions will be required for daily observations and maintenance as needed to keep the bypasses clear from debris and able to function at intended capacity. There are also be requirements for controlled flooding of the work areas by the Contractor in advance of an oncoming major storm event to reduce the risk of failure of the cofferdams and significant loss of sediment from the sites.

8.4 Excavation Dewatering

Shallow groundwater conditions are anticipated in the spillway excavation at North Lake Dam, Pine Lake Dam, and Upper Lake Dam. Dewatering of the excavations at these three smaller dams is anticipated to be managed with sumps, collection ditches, and surficial pumps, although design of the dewatering measures is the responsibility of the Contractor. Excavation dewatering at Sanford Dam is expected to be challenging, as the base of the Sanford Dam spillway foundation excavation will be approximately 10 feet below the water elevation in Allen Creek and will be constructed in materials with relatively high permeabilities. Groundwater seepage from the right abutment will also likely be encountered during spillway foundation excavation. Therefore, the Contractor will need to install a dewatering system, such as a series of dewatering wells and collection ditches, to establish and maintain dry conditions during foundation preparation and fill placement. Dewatering wells are shown in the Drawings which present the Control of Water concept designs. However, the Contractor will be required to submit a Dewatering Plan, which will need to be approved before the Contractor can begin demolition or excavation work.

8.5 Foundation Surface Preparation

8.5.1 Soil Foundation Surface Preparation

The spillway foundation at each dam site will be prepared prior to fill placement or construction of spillway elements. Loose surficial materials in the breached areas at Sanford Dam and Upper Lake Dam, as well as the scoured area on the downstream slope of Sanford Dam, will be removed to establish a suitable foundation based on observed field conditions. All unsuitable material, debris, loose soils, alluvium, organics, and other objectionable material will be removed from foundation surfaces prior to fill placement. After removing any objectionable material, the foundation soils will be roughened. As discussed above, a 6-inch-thick mudmat will be placed on the subgrade at North Lake, Pine Lake, and Upper Lake Dams to protect the subgrade and to provide a firm surface against which earthfill can be placed and compacted subsequent to construction of the spillway elements. Additional requirements for foundation surface preparation will be provided in the contract documents.

8.5.2 Rock Foundation Surface Preparation

The existing Sanford Dam foundation soils within the spillway footprint will be excavated to top of rock and replaced with engineered fill materials. After the foundation soils have been removed, the rock surface may have voids. These voids create potential internal erosion issues in the dam. Prior to fill placement, voids in the rock surface will be filled with leveling concrete beneath both the low-permeability core and the upstream shell and with aggregate (backfill stone, NCDOT 58M aggregate) beneath the downstream shell. Additional requirements for foundation surface preparation will be provided in the contract documents.

8.6 Imported Earthfill

Existing fill and foundation soils which are excavated during performance of the project work may be reused for earthwork if they meet specified requirements. The remaining volume necessary for completing the work will consist of borrow material which will be imported from an

offsite source. The Contractor will be responsible for locating a borrow source and submitting test results which indicate that proposed borrow materials meet specified requirements. Common Fill materials will be required to have USCS soil classifications of SM, SP-SM, SP, or SC with a limited plasticity index value to mitigate potential for rapid drawdown slope failures. The low-permeability core at Sanford Dam will consist of natural cohesive fine-grained material. If cohesive materials meeting the requirements for core fill are not available from a local borrow material source, the Contractor may be allowed to blend less-cohesive soils with bentonite or other clay to produce a cohesive material that can be used as core fill. Requirements for soils for earthwork will be provided in the contract documents.

8.7 Earthfill Compaction Requirements

Select Common Fill and Select Core Fill will be required to be compacted to a density of at least 95% of the maximum density as determined by the Modified Proctor test (ASTM D1557). Common Fill and Core Fill will be required to be compacted to a density of at least 95% of the maximum density as determined by the Standard Proctor test (ASTM D698). Additional compaction requirements will be provided in the contract documents.

8.8 Installation Methods for Mix-In-Place Panels and Cutoff Wall

The MIP panels shown on the Drawings are elements constructed of four overlapping 36-inch-diameter columns. The cutoff wall requirements are presented assuming the Contractor will propose a mix-in-place installation method. The Contractor may utilize alternative methods for installing the elements provided the Contractor is able to demonstrate that the specified requirements are met. The Contractor will be required to construct demonstration sections to verify that the Contractor's proposed equipment, procedures, and mix designs can uniformly mix or replace the onsite soils and achieve the specified requirements. Additional requirements will be outlined in the contract documents.

8.9 Support Facilities for Mix-In-Place Panels and Cutoff Wall

MIP panel and cutoff wall construction will require support facilities for equipment operations, production of binder slurry, and collection and disposal of spoils. Temporary work platforms constructed on the upstream and downstream slopes of Sanford Dam will be necessary to provide a working surface for MIP panel installation. A temporary work platform will also be required to accommodate the large size of the cutoff wall equipment. The Contractor will be responsible for designing temporary work platforms. Excavation into the embankment to create a working surface or support other facilities will not be permitted.

8.10 Easements

8.10.1 Sanford Dam

Due to the location of Sanford Dam at the eastern limits of the City significant portions of the work area require either permanent or temporary construction easements. McGill coordinated with the City to secure easements from the USACE.

McGill contacted MS. Tana Waits M CIV USARMY CESAS (USA) to request a variable width Temporary Construction Easement along the western portion of the MOTSU Railroad right-of-way where it abuts the Reeves Telecom right-of-way along Alton Lennon Drive. Ms. Waits requested a full narrative describing what McGill will be doing and a narrative of exactly what work will be performed inside the requested temporary construction easement. McGill provided the following summary.

The City of Boiling Spring Lakes is undertaking the reconstruction of Sanford Dam which was damaged during Hurricane Florence in the fall of 2018. McGill Associates and Schnabel Engineering have been engaged to provide design, permitting, and construction administration for the project. The start of construction is anticipated in May 2021 with a duration of 18 months.

The Sanford Dam and associated spillway structure lie beneath Alton Lennon Road between South Shore Drive and East Boiling Spring Road at the eastern limit of the City. The spillway passes flows from Boiling Spring Lake to Allen Creek which flows east through the MOTSU railroad trestle. It is anticipated that the City will need a Temporary Construction Easement (TCE) along a portion of the MOTSU railroad right-of-way (ROW) to complete certain required elements of reconstruction of the dam and spillway.

No permanent concrete structures will be placed in the MOTSU ROW and no excavation is proposed inside the toe of the railroad embankment. Some minor earth fill will be placed near adjacent to the ROW to replace embankment fill lost during the event. Activities anticipated in the MOTSU TCE include construction access, staging, and temporary control of water by-pass piping. Construction activities will require temporary sheeting and shoring, earthwork, and dewatering adjacent to the ROW to allow for installation of the spillway and to tie back to existing grades. Other activities will include construction staging, access, temporary bracing and/or relocation of power pole guy lines and installation of temporary control of water by-pass pipes discharging back to Allen Creek upstream of the railroad trestle and embankment. Temporary riprap channel and bank lining, silt fence, and turbidity booms will be installed in accordance with erosion and sediment control permit requirements during construction. Disturbed areas will be restored and stabilized with riprap or seed and mulch. The riprap channel and bank lining will remain in place below normal water level.

McGill received a response from Ms. Waits acknowledging receipt. McGill and the City will pursue formal acceptance of easements for MOTSU ROW during the review and approval period for this Report.

The City also contacted the representative for Reeves Telecom and has completed a transfer of deed for the approximate 150 feet wide right-of-way abutting Alton Lennon Drive on the east. This provides the City ownership and control of all of the land beneath the Sanford Dam earthen embankment and spillway.

8.10.1 North Lake, Pine Lake and Upper Lake Dams

The City has already coordinated transfer of deeds with Reeves Telecom for ownership of all lands under North Lake, Pine Lake and Upper Lake Dams and the approximate 600-foot corridor east of Sanford Dam. The proposed reconstruction at each dam will require additional temporary construction easements and permanent easements from some of the adjacent property owners to accommodate control of water and grading activities. McGill and the City will pursue formal acceptance of these additional easements during the review and approval period for this Report.

9. ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

An Engineer's Opinion of Probable Construction Costs (EOPCC) was prepared for each of the BSL Dams using estimated quantities derived from the final design layouts. Unit or lump sum prices were selected for each line item to reflect economies of scale, access requirements, schedule, technical and site constraints, recent bid prices from similar projects, and/or published values.

Each cost item in the EOPCC has an impact on the total cost of the rehabilitation for each dam, and each has a risk associated with being able to construct or install that item at a specified unit rate or lump sum. Therefore, we have added a contingency factor in the EOPCC for each line item rather than applying one contingency factor to the subtotal cost. Adding a contingency factor for each line item allows us to more accurately weight the uncertainty and risk associated with each, such as:

- Margins of error in the conceptual-level cost and quantity estimates,
- Variations in subsurface conditions,
- Numerous smaller items not specified,
- A reasonable amount for field changes during construction, and
- Variability of bidding climate and material availability.

The applied contingency values are based on discussions with specialty contractors experienced with some of the more challenging work items. The contingency values for each cost item are shown in the EOPCC in Appendix 6.

The EOPCC only includes estimated costs to construct the proposed improvements. Additional costs that should be considered include, but may not be limited to, engineering costs during construction, environmental permitting costs, environmental mitigation costs, property acquisition or easement costs, long-term operation and maintenance costs, and other administrative costs.

Based on the information discussed above, the EOPCC for each dam are summarized in Table 15 below in 2020 dollars. Breakdowns of the EOPCC for each dam are included in Appendix 6.

Table 15. Engineer's Opinion of Probable Construction Costs

	EOPCC (2021 Dollars)
Sanford Dam	$28,046,648
Upper Lake Dam	$1,994,921
North Lake Dam	$1,524,667
Pine Lake Dam	$1,246,648
Total	**$32,812,884**

No escalation was applied to these amounts to account for anticipated construction schedule. The EOPCC summarized in Table 15 and detailed in Appendix 6 is to be considered a "Class 1 Estimate," according to the categories of cost estimates defined by the Association for the Advancement of Cost Engineering (AACE) International. According to the AACE, a Class 1 Estimate is a "Check Estimate or Bid/Tender" cost estimate which is made with a detailed unit cost with a detailed take-off. It is normally expected that this type of estimate is accurate to within +15 percent to -10 percent of the actual construction costs.

10. CONSTRUCTION SCHEDULE ESTIMATE

Construction schedule estimates were prepared based on the final designs described above, an assumed sequence of construction, and estimated durations for each construction activity. The construction schedule estimate is provided to establish an approximate duration for the construction period such that contract times can be established and permits can be obtained for items such as soil erosion and sediment control. The actual sequence of the work will vary due to Contractor means and methods, capabilities, preferences, risk tolerance, etc.

Based on the scope of the reconstruction work described in this report and on our experience on similar projects, we estimate that the duration of construction will be about 24 months for Sanford Dam and will be about 12 months each for North Lake Dam, Pine Lake Dam, and Upper Lake Dam. The project sequence presented on the Drawings indicates that the work at Sanford Dam, Pine Lake Dam, and Upper Lake Dam can be performed concurrently and that that the reconstruction of North Lake Dam cannot start until the proposed work is completed at Sanford Dam and Alton Lennon Road has been reopened. Alternatively, the Contractor will be allowed to work on all four dams concurrently if they elect to the perform roadway improvements to Drayton Road.

Even if the Contractor elects to actively work on all four projects at the same time, it is unlikely that the work would be completed in 24 months. There will be significant cost savings and efficiency for the contractor if the projects are staggered slightly to make efficient use of crews. For example, it would be most efficient to have one crew establish E&S features at one dam and then proceed to the next, rather than having four crews performing E&S activities simultaneously. Similarly, it would be most appropriate for a single crew focused on placing formwork, reinforcing steel and concrete placement to work on one of the upstream projects, then move to the next while the first project is being backfilled by an earthwork crew. Based on our evaluation of the work required it is expected that the total contract duration will range between 36 to 48 months.

It is possible that the duration may be reduced by up to 25 percent, but would also likely result in a cost increase to the project Irrespective of the scale of contractor equipment and manpower, many of the proposed work items must be performed in sequence with other work items. Work item interdependency, the specialized nature of select work items and corresponding number of subcontractors, and the general complexity of the reconstruction work will limit the rate of construction progression. It should be noted that the construction cost estimate presented in this report is based on the estimated durations discussed above and that an increase in construction cost will accompany a reduction in construction schedule. These estimates, sequencing narrative and corresponding cost trade-off are generally consistent with the contractor responses the City received related to projected scheduling in the initial Request for Qualifications for this project. We advise the City to consider these constraints when selecting a contract completion time for the bid documents.

11. OPERATION AND MAINTENANCE

An operation and maintenance (O&M) manual will be prepared for the City to provide guidance and instruction to project personnel for proper day-to-day operation, maintenance, and inspection of each of the BSL Dams. This manual will include O&M instructions for major facilities and equipment as they apply to dam safety. The O&M manual will be included under separate cover.

The O&M manual will not discuss procedures for operation under emergency situations. For these situations, an Emergency Action Plan (EAP) will be prepared and made available to project personnel. The EAP will be provided under separate cover.

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Appendix 1 – Background Information

DAMS CONSTRUCTION/RECONSTRUCTION PROJECT

CITY OF BOILING SPRING LAKES

North Lake Dam (BRUNS-001), Pine Lake Dam (BRUNS-002), Sanford Dam (BRUNS-003), Upper Lake Dam (BRUNS-012)

5400 Trinity Road, Suite 107

Raleigh, North Carolina 27607

Firm License No.: C-0459

DECEMBER 2020

20.07036

DEEDS

The data provided herein shows specific ownership by the City for Upper Lake Dam and Sanford Dam. The Quit Claim Deeds issued in 2019 by Reeves Telecom were prepared to clarify the intent to convey ownership of the Pine Lake and North Dams to the City. However, NCDOT is researching their records to determine if these properties were already conveyed with East Boiling Spring Road which NCDOT currently maintains. Therefore, ownership of the embankments for North Lake and Pine Lake Dams is currently unresolved.

Brunswick County—Register of Deeds
Robert J. Robinson
Inst #64482 Book 1426Page 1415
01/05/2001 02:04:36pm Rec#62029

Prepared by: Elva L. Jess
Attorney at Law
P. O. Box 11028
Southport, NC 28461

(NO TITLE EXAMINATION OR OPINION REQUESTED OR RENDERED)

FEE: Rudy Dixon
TOTAL 10 REV ____ TC# 1
REC# ____ CK AMT 133 CK# 3845
CASH ____ REF ____ BY BP

STATE OF NORTH CAROLINA

COUNTY OF BRUNSWICK

THIS DEED, made this 15th day of ~~October~~ NOVEMBER, 2000, by and between **REEVES TELECOM LIMITED PARTNERSHIP**, of Brunswick County, North Carolina, hereinafter (whether one or more) referred to as "GRANTOR"; and **CITY OF BOILING SPRING LAKES**, a North Carolina municipality, hereinafter (whether one or more) referred to as "GRANTEE," whose mailing address is 9 Boiling Spring Road, Boiling Spring Lakes, Southport, North Carolina 28461, hereinafter, whether one or more, referred to as "GRANTEE":

WITNESSETH

THAT the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain tract or parcel of land situated in Town Creek Township, Brunswick County, North Carolina, and more particularly described as follows:

For a tie line to the beginning, begin at a point where the northern right-of-way line of Boiling Spring Road intersects the western right-of-way line of North Lake Drive, said point being the southeastern corner of Lot 580 of the North Lake Section of Boiling Spring Lakes as shown on a map thereof recorded in Map Book 7, page 38 of the Brunswick County Registry; and thence runs south 52° 00' west with the southern line of Lot 580 to a point where such line intersects the high water mark of North Lake, the point and place of beginning.

From the beginning point thus established runs thence with the high water mark of North Lake in a north and westwardly direction to the northernmost point of said lake; thence in a southerly and westwardly direction with the high water mark of said lake to the westernmost point thereof; thence southwardly and eastwardly with the high water mark of said lake to the southernmost point thereof; thence with the high water mark of said lake northwardly and eastwardly to the point and place of BEGINNING, it being the intent of this deed to convey to the Grantee all lands lying below the high water mark of that lake known as North Lake located in Boiling Spring Lakes, North Carolina.

TO HAVE AND TO HOLD the aforesaid tract or parcel of land, and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

AND the Grantor covenants with the Grantee that Grantor has done nothing to impair such title as Grantor received, and Grantor will warrant and defend the title against the lawful claims of all persons claiming by, under or through Grantor, except for the exceptions hereinafter stated.

TS	AUX	CO			CPL	BY
2	5	1420	0	127	5	KO

- Deleted parcel #

wrong parcel

Correct Parcel # 142PA032

Title to the property hereinabove described is subject to the following exceptions: Easements, rights-of-way and restrictions of record; and *ad valorem* taxes for the current year and subsequent years.

IN WITNESS WHEREOF, the Grantor have hereunto set their hands and seals, the day and year first above written.

REEVES TELECOM LIMITED PARTNERSHIP (SEAL)
BY: GRACE PROPERTY MANAGEMENT, INC.,
General Partner

(CORPORATE SEAL)

BY: Davis P. Stowell
Davis P. Stowell, Vice President

ATTEST:

Peter Metz
Its Secretary

STATE OF NEW YORK

COUNTY OF NASSAU

I, the undersigned, a Notary Public in and for the State and County aforesaid, certify that PETER METZ personally appeared before me this day and acknowledged that he is ITS Secretary of GRACE PROPERTY MANAGEMENT, INC., General Partner of REEVES TELECOM LIMITED PARTNERSHIP, a South Carolina Limited Partnership authorized to transact business in North Carolina; and that, by authority duly given and as the act of the corporation, the foregoing instrument was signed in its corporate name by ~~DAVID P.~~ DAVIS P. STOWELL, its Vice President, ~~sealed with its corporate seal,~~ and attested by HIMself as its _____ Secretary.

Witness my hand and notarial seal, this the 16TH day of ~~October~~ NOVEMBER, 2000.

NOTARY PUBLIC

SHEILA S. PLATT
Notary Public, State of New York
No. 01PL-4801840
Qualified in Nassau County
Commission Expires October 31, ~~20~~ 2002

My commission expires:

10/31/02

STATE OF NORTH CAROLINA
COUNTY OF BRUNSWICK
The Foregoing (or annexed) Certificate(s) of Sheila S. Platt

Notary(ies) Public is (are) Certified to be Correct.
This Instrument was filed for Registration on this 5th Day of Janu 2001
in the Book and Page shown on the First Page hereof.

Robert J. Robinson /BF
ROBERT J. ROBINSON, Register of Deeds

BOOK ____ PAGE

1031 338

1031 338

Prepared by: Elva L. Jess
Attorney at Law
P. O. Box 11028
Southport, NC 28461

(NO TITLE EXAMINATION OR OPINION REQUESTED OR RENDERED)

STATE OF NORTH CAROLINA

COUNTY OF BRUNSWICK

THIS DEED, made this 30th day of April, 1995, by and between **REEVES TELECOM LIMITED PARTNERSHIP**, a South Carolina limited partnership registered in North Carolina having offices in Boiling Spring Lakes, North Carolina, hereinafter, whether one or more, referred to as "GRANTOR," and the **CITY OF BOILING SPRING LAKES**, a North Carolina municipal corporation, whose mailing address is Post Office Box 2610, Boiling Spring Lakes, North Carolina 28461, hereinafter, whether one or more, referred to as "GRANTEE":

W I T N E S S E T H

THAT the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the City of Boiling Spring Lakes, Town Creek Township, Brunswick County, North Carolina, and more particularly described as follows:

SECTION ONE (Spring Lake): Those four (4) tracts or parcels of land designated as "park areas" and adjacent to Spring Lake, as shown on a map recorded in Map Book 6 at Page 158 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 20 142JA049D100 0 mac 20 142PB002 0 20 142JA142JD010 0 mac 20 142ID022 0 20 142B142PB019 0 mac

SECTION TWO: Those three (3) tracts or parcels of land designated as "park areas" which are adjacent to Lake Keziah, as shown on map recorded in Map Book 6 at Page 162 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 20 142CB009D100 mac 20 142CB037 0 mac 20 142CB001 0 mac 20 142CB022 0 mac

That lot or parcel of land designated as "park area" which lies adjacent to Frink Lake, as shown on a map recorded in Map Book 6 at Page 162 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian

REC. Back Data
TOTAL 14.00
TC # 1 # 33420
CK
CASH 14.00

20 142CF006 0 mac

TR	AUX	CON	C			
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rights of property owners with property contiguous to the said lakeshore.

That lot or parcel of land designated "park area" which lies adjacent to Harper Lake, as shown on a map recorded in Map Book 6 at Page 162 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 20 127NA042 0 mac 20 127NA001 0 mac

SECTION FIVE: That lot or parcel of land designated "park area" which lies adjacent to Lake Reeves, as shown on a map recorded in Map Book 6 at Page 159 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 20 173BB032 0 mac 20 173BP001 0 mac

Those two (2) tracts or parcels of land designated "park areas" which lie adjacent to Lake Hastie, as shown on map recorded in Map Book 6 at Page 159 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 20 157ØF045 0 mac 2 157Ø 173BØ001 0 mac 20 157ØF028 0 mac

Those three (3) tracts or parcels of land designated "park areas" which lie adjacent to Lake Middleton, as shown on a map recorded in Map Book 6 at Page 159 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 2 1670 157NB006 0 mac 20 157NB045.010 mac 20 157NB036 0 mac 20 157NB023 0 mac

SECTION SEVEN (Pine Lake Sections): That tract or parcel of land designated as "park area" which lies adjacent to Pine Lake at the intersection of Boiling Spring Road and Pine Lake Road as shown on a map recorded in Map Cabinet H at Page 352 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 20 156EA058 0 mac 20 156EA057 0 mac lake park

SECTION TWELVE (Part 3, Rolling Hills): That tract or parcel of land designated "park area" adjacent to Seminole Lake as shown on a map recorded in Map Cabinet H at Page 348 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 2 157K 157CB019 0100 mac

That 30-foot lane adjacent to the Sunny Point access railroad running in a northerly direction from Fifty Lakes Drive to the aforesaid "park area" adjacent to Seminole Lake, as shown on a map recorded in Map Cabinet H at Page 348 of the Brunswick County Registry.

SECTION TWELVE (Part 2, Rolling Hills): That tract or parcel of land designated as "park area" which lies adjacent to Shadow Lake, as shown on a map recorded in Map Cabinet H at Page 328 of the Brunswick County Registry; TOGETHER WITH any

20 157FA012 0 mac
20 157FA010 0 mac

and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore.

1031 340

That tract or parcel of land designated "park area" which lies adjacent to Silver Lake, as shown on a map recorded in Map Cabinet H at Page 328 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 2 0 157FA 007 0130 mac
2 0 157FA 007 1300 mac

SECTION TWELVE (Part 4, Rolling Hills): Those two (2) tracts or parcels of land designated "park areas" which lie adjacent to Forest Lake, as shown on a map recorded in Map Cabinet H at Page 329 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 2 0 157CB 0010100 mac
2 0 157CB 0010600 mac
2 0 157CB 0010300 mac

SECTION TWENTY-ONE (Part 1, Mirror Lake Section): Those two (2) tracts or parcels of land designated "park areas" which lie adjacent to Mirror Lake, as shown on a map recorded in Map Cabinet H at Page 342 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 2 157K 157FC026 0 mac
2 157K 157FC022 0 mac
2 157K 157FC 0260100 mac

SECTION SEVENTY-TWO (Part 1): That tract or parcel of land designated "park area" located at the intersection of Fifty Lakes Drive and Alton Lennon Road, as shown on a map recorded in Map Cabinet L at Page 231 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 2 157K 157GF 059 0 mac

That tract or parcel of land designated "park area" bordered on the west by Lots #108, 109 and 110, on the north by Lots #115, 116, 117, and on the east by Lots #121, 122 and 123, as shown on a map recorded in Map Cabinet L at Page 231 of the Brunswick County Registry. 2 0 157GF 173 0 mac

SPRING LAKE SECTION 1 (Extension 1, Trailer Section): That tract or parcel of land designated "park area" which lies adjacent to Deer Pond, as shown on a map recorded in Map Cabinet H at Page 336 of the Brunswick County Registry; TOGETHER WITH any and all interest held by the Grantor in and to the adjacent lake, as shown on the map hereinabove referenced; and SUBJECT TO any and all riparian rights of property owners with property contiguous to the said lakeshore. 2 0 141JE 0040500 mac

The aforementioned tracts or parcels of land are conveyed SUBJECT to all covenants, conditions, restrictions and easements, either of record or implied, as they may affect said tracts or parcels of land.

TO HAVE AND TO HOLD the aforesaid lot or parcel of land, and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, the day and year first above written.

REEVES TELECOM LIMITED PARTNERSHIP (SEAL)

BY: [signature] (SEAL)
Attorney-in-Fact

STATE OF NORTH CAROLINA

COUNTY OF BRUNSWICK

I, Polly A. Johnson, a Notary Public in and for the state and county aforesaid, do hereby certify that RUDY DIXON, Attorney-in-Fact for REEVES TELECOM LIMITED PARTNERSHIP, personally appeared before me this day, and being by me duly sworn, says that he executed the foregoing and annexed instrument for and in behalf of REEVES TELECOM LIMITED PARTNERSHIP, and that his authority to execute and acknowledge said instrument is contained in an instrument duly executed, acknowledged and recorded in the Office of the Register of Deeds of Brunswick County, North Carolina on the 15th day of July, 1993, in Book 938 at Page 302, and that this instrument was executed under and by virtue of the authority given by said instrument granting him power of attorney; that the said RUDY DIXON acknowledged the due execution of the foregoing and annexed instrument for and in behalf of the said REEVES TELECOM LIMITED PARTNERSHIP.

WITNESS my hand and official seal, this the 30th day of April, 1995.

Polly A. Johnson
Notary Public

My commission expires:
March 29, 2000

POLLY A. JOHNSON NOTARY PUBLIC BRUNSWICK COUNTY, N.C.

STATE OF NORTH CAROLINA
COUNTY OF BRUNSWICK
The Foregoing (or annexed) Certificate(s) of Polly A. Johnson

Notary(ies) Public (is)(are) Certified to be Correct.
This Instrument was filed for Registration on the Day and Hour in the Book and Page shown on the First Page hereof
Recorded May 4, 1995 at 11:02 A.M.

[signature] /brf
ROBERT J. ROBERTSON, Register of Deeds

BK 1169 PG 1009

FILED FOR REGISTRATION
BK 1169 PG 1009

STATE OF NORTH CAROLINA
COUNTY OF BRUNSWICK

97 SEP 11 AM 11:37

ROBERT J. ROBINSON
REGISTER OF DEEDS
BRUNSWICK COUNTY, N.C.

Mail after recording to City of Boiling Spring Lakes

Prepared by Reeves Telecom Limited Partnership

WARRANTY DEED

THIS BEED, made this 21st day of August 1997, between REEVES TELECOM LIMITED PARTNERSHIP, a limited partnership of South Carolina, with an office located in the City of Boiling Spring Lakes, Brunswick County, North Carolina (hereinafter call "Grantor"), to City of Boiling Spring Lakes residing at P. O. Box 2410, Boiling Spring Lakes, N. C. 28461 (hereinafter call "Grantee"). The designation "Grantee" as used herein shall include said parties, their heirs, successors and assigns and shall include singular, plural, masculine, feminine or neuter as required by context.

000025

WITNESSETH

That the Grantor in consideration of a valuable consideration paid by the Grantee, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the City of Boiling Spring Lakes, Town Creek Township, Brunswick County, North Carolina, and more particularly described as follows: "SEE EXHIBIT A"

RET M. Eisenberg
TOTAL 14.00 REV ____ TC# 11891
REC# ____ CK AMT 18.00 CK# 267
CASH ____ REF ____ BY CG

TB	AUX	CON	GR	PCL	BPL	BY
2	142K	142J	G	003	0	SMR

TO HAVE AND TO HOLD the aforesaid lot (s) or parcel (s) of land and all the privileges and appurtenances thereto belonging to the Grantor in fee simple.

And the Grantor covenants with the Grantee that Grantor is seized of the premises in fee simple; has the right to convey the same in fee simple; that title is marketable and free and clear from all encumbrances; and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever, subject to the following exceptions:

1. Grantor reserves to itself, its successors and assigns, a drainage easement across said lot(s) or parcel (s) of land running along the property lines and extending five (5) feet on either side thereof, and the right to cross said property; to go to and from said easement by the nearest route; and should Grantor or its successors and assigns cause any damage to the property, then Grantor or its successors and assigns shall be liable to the property owner for same.

2. Grantor reserves to itself, its successors and assigns, an easement for installation and maintenance of utilities including but not limited to, electrical, telephone, water and sewer.

By the delivery of this Warranty Deed by the Grantor to the Grantee, the Grantor makes no representation or warranty that the lot (s) or parcel (s) conveyed will be suitable for building or other wise comply with building standards at such time a building permit may be sought by the Grantee.

BK 1169 PG 1011

The Grantor intends to no longer enforce those covenants, restrictions and conditions set forth in a public declaration date August 23, 1971 and recorded in Book 258 at Page 773. The Grantor hereby declares those covenants, restrictions and conditions to be of no further force or effect.

IN WITNESS WHEREOF, the undersigning Attorney in Fact for Grantor has hereunto set his hand and seal the day and year first above written.

Reeves Telecom Ltd. Partnership (SEAL)
by William R. Dixon, Jr. (SEAL)
its attorney in fact (SEAL)
REEVES TELECOM LIMITED PARTNERSHIP
BY WILLIAM R. DIXON, JR.
ITS ATTORNEY IN FACT.

STATE OF NORTH CAROLINA
COUNTY OF BRUNSWICK

I Polly A Johnson, do hereby certify that WILLIAM R. DIXON, JR., attorney-in-fact for REEVES TELECOM LIMITED PARTNERSHIP, personally appeared before me this day, and being by me duly sworn, says that he executed the foregoing and annexed instrument for and in behalf of REEVES TELECOM LIMITED PARTNERSHIP, and that his authority to execute and acknowledge said instrument is contained in an instrument duly executed, acknowledged, and recorded in the office of the Brunswick County Registry, North Carolina, on the 15th day of July, 1993 in Book 938 at Page 302, and that this instrument was executed under and by virtue of the authority given by said instrument granting him power of attorney; that the said WILLIAM R. DIXON, JR. acknowledged the due execution of the foregoing and annexed instrument for the purposed therein expressed for and in behalf of the said REEVES TELECOM LIMITED PARTNERSHIP.

WITNESS my hand and official seal, this 21st day of August, 1997

(NOTARY SEAL)

POLLY A. JOHNSON NOTARY PUBLIC BRUNSWICK COUNTY, N.C.

Polly A Johnson
NOTARY PUBLIC

My commission expires: 3/29/2000

STATE OF NORTH CAROLINA
COUNTY OF BRUNSWICK

The Foregoing (or annexed) Certificate(s) of Polly A Johnson

Notary(ies) Public is (are) Certified to be Correct.
This Instrument was filed for Registration on this 11th Day of September, 1997
in the Book and Page shown on the First Page hereof.

Robert J. Robinson /Cij
ROBERT J. ROBINSON, Register of Deeds

"EXHIBIT A"
BK 1169 PG 1012

2.63 Acres of Park Area to the Town of Boiling Spring Lake

At the Dam, on Alton Lennon Drive

Beginning at a PK nail in the centerline of Alton Lennon Drive, said road has a 60 foot R/W width, said PK nail located from a nail in the centerline intersection of Boiling Spring Road and Alton Lennon Road S 14*53'18" E 972.85 feet to the Beginning;

Running thence from said Beginning, so located, a line with the Town of Boiling Spring Lake N 75*00'00" E 95.85 feet to an iron stake on the western R/W of a 25 foot Utility Easement; thence with the western R/W of said 25 foot R/W easement S 14*59'59" E 1694.76 feet to a iron stake on said R/W and crossing Allen Creek; thence a new line with Reeves Telecom, Inc. and formerly the southern R/W of Tuscarora Road Extension, now abandoned, S 75*00'00" W 99.21 feet to a PK nail in the centerline of Alton Lennon Drive; thence with the centerline of Alton Lennon Drive as follows: N 14*52'25" W 232.09 feet, N 14*54'21" W 602.38 feet, and 14*52'34" W 860.29 feet to the Beginning containing 2.63 acres more or less as surveyed by Davey G. Williamson, R.L.S. during August 1997.

Brunswick County—Register of Deeds
Robert J. Robinson
Inst #91274 Book 1511Page 107
10/18/2001 11:34:31am Rec# 87687

Excise Tax $ | Recording Time, Book and Page

Tax Lot No. _____ Parcel Identifier No. _____
Verified by _____ County on the _____ day of _____, 20__
by _____

Mail after recording to

This instrument was prepared by **Frink, Foy & Yount, P.A.** **No Title Examination Requested or Rendered**

Brief Description for the index **West Dam Lake, Boiling Spring Lakes**

NORTH CAROLINA NON-WARRANTY DEED

THIS DEED made this day of September, 2001, by and between

GRANTOR	GRANTEE
Reeves Telecom Limited Partnership a South Carolina limited partnership authorized to transact business in North Carolina **3142 George II Highway** **Boiling Spring Lakes, N.C. 28461**	**City of Boiling Spring Lakes** **9 E Boiling Spring Road** **Boiling Spring Lakes, N.C. 28461**

Enter in appropriate block for each party: name, address, and, if appropriate, character of entity, e.g., corporation or partnership.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the City of **Boiling Spring Lakes**, **Town Creek** Township, **Brunswick** County, North Carolina and more particularly described as follows:

SEE EXHIBIT A attached hereto and incorporated herein by reference.

By acceptance of this conveyance, Grantor acknowledges that the City shall have the authority to impose restrictions on the use of said properties pursuant to its general police power and zoning authority.

The Grantor reserves, for itself, its successors and assigns, as well as the general public of the City of Boiling Spring Lakes and future property owners of property within the city limits of Boiling Spring Lakes and within the confines of the Boiling Spring Lakes Subdivision, more particularly those property owners whose property joins the lakes or ponds on said above described property, a right and easement for the use and benefit of the said lakes or ponds and their appurtenances for recreational purposes including, but not limited to, boating, swimming, fishing, water skiing, picnicking and other related activities.

TS	AUX	CON	GR	PCL	SPL
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MAP	MPSUF	BLK	PIN	SUF	INT
					KO

Rudy Dixon
TOTAL 12- TC# 1
REC# 12- CK# 4190
CASH REF BY

N.C. Bar Assoc. Form No. 7 © 1977
Printed by Agreement with the N.C. Bar Assoc. #003

Grantor further reserves for itself, its successors and assigns, a perpetual right and easement for the purpose of drainage from any sources necessary in connection with the development of the Boiling Spring Lakes Subdivision, as well as drainage from existing lakes and existing drainage.

Grantee, by the acceptance of this Deed, assumes the responsibility for the maintenance of the property herein described and any appurtenances located thereon.

The property hereinabove described was acquired by Grantor by instrument recorded in Book 147, Page 481 and 448-473, 483.

And the Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever except for the exceptions hereinafter stated.

Title to the property hereinabove described is subject to the following exceptions:
All easements and restrictive covenants and conditions of record which affect the foregoing described lots, parcels or tracts of land.

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

The Grantor makes no warranty, express or implied, as to title to the property hereinabove described.

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, or if corporate, has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first above written.

REEVES TELECOM LIMITED PARTNERSHIP

_____
(Corporate Name)

BY: _____
DAVIS P. STOWELL
VICE PRESIDENT OF GRACE PROPERTY MANAGEMENT, INC., GENERAL PARTNER

By: _____

President

ATTEST:

_____

Secretary (Corporate Seal)

SEAL-STAMP

NORTH CAROLINA, **Brunswick** County.
I, the undersigned, a Notary Public of the County and State aforesaid, certify that _ Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this __/__/____.

My commission expires: __/__/____ _____ Notary Public

SEAL-STAMP

NEW YORK, Naussau County.
I, the undersigned, a Notary Public of the County and State aforesaid, certify that DAVIS P. STOWELL personally came before me this day and acknowledged that he is Vice President of Grace Property Management, Inc., General Partner of Reeves Telecom Limited Partnership, a South Carolina limited partnership authorized to transact business in North Carolina, and that by authority duly given and as the act of the limited partnership the foregoing instrument was signed in its name by its General Partner. Witness my hand and official stamp or seal, this 8th day of ~~September~~ October, 2001.

My commission expires 04 OCT 03 _____ Notary Public

STATE OF NORTH CAROLINA
COUNTY OF BRUNSWICK

The Foregoing (or annexed) Certificate(s) of ANN MARGARET ZEMAN

Notary(ies) Public is (are) Certified to be Correct.
This Instrument was filed for Registration on this 18th Day of October, 2001
in the Book and Page shown on the First Page hereof.

_____
ROBERT J. ROBINSON, Register of Deeds

N.C. Bar Assoc. Form No. 7 © 1977
Printed by Agreement with the N.C. Bar Assoc. #003

EXHIBIT A

TIDE WATER LAND SURVEYING
P.O. BOX 11506
SOUTHPORT, N.C. 28465
910-457-9580

September 17, 2001

RE: DESCRIPTION OF WEST DAM LAKE AND DAM LOCATED IN BOILING SPRING LAKES.

BEGINNING AT THE CENTER LINE, CENTER LINE WHERE NC HWY 87 INTERSECTS WITH SOUTH WEST SHORE DRIVE. THENCE S 45-05-17 W, 2245.61' TO THE SOUTHEAST CORNER OF LOT 18, SECTION 31W,(SECTION 31W IS RECORDED IN BOOK G, PAGE 283 AT THE BRUNSWICK COUNTY REGISTER OF DEEDS OFFICE), SAID POINT ALSO LOCATED IN THE INTERSECTIONS NOTHERN RIGHT-OF-WAY OF SOUTH WEST SHORE DRIVE AND THE WESTERN RIGHT-OF-WAY OF WEST DAM RD. THENCE N 41-46-55 W, 196.28' TO THE NORTH-EAST CORNER OF LOT 18, SECTION 31W TO THE PLACE AND POINT OF BEGINNING. THENCE S 57-21-54 W, 37.55' TO A POINT. THENCE S 63-48-43 W, 80.58' TO A POINT. THENCE S 64-38-47 W, 80.45' TO A POINT. THENCE S 80-01-36 W, 95.46' TO A POINT. THENCE S 37-06-32 W, 101.57' TO A POINT. THENCE S 70-32-41 W, 97.95' TO A POINT. THENCE S 41-12-48 W, 109.09' TO A POINT. THENCE S 30-18-35 W, 80.19' TO A POINT. THENCE S 38-11-34 W, 65.81' TO A POINT. THENCE S 18-10-57 W, 65.83' TO A POINT. THENCE S 75-16-36 W, 81.74' TO A POINT. THENCE N 82-14-36 W, 96.88' TO A POINT. THENCE S 43-27-13 W, 85.12' TO A POINT. THENCE S 50-07-52 W, 82.20' TO A POINT. THENCE N 86-26-35 W, 319.15' TO A POINT. THENCE S 58-32-58 W, 313.05' TO A POINT. THENCE S 49-32-05 W, 326.94' TO A POINT. THENCE S 51-44-55 W, 239.09' TO A POINT. THENCE S 51-13-40 W, 190.04' TO A POINT. THENCE S 75-11-47 W, 49.85' TO A POINT. THENCE N 10-55-01 E, 164.16' TO A POINT. THENCE N 05-12-11 E, 222.21' TO A POINT. THENCE N 24-52-46 E, 308.47' TO A POINT. THENCE N 36-47-47 E, 295.99' TO A POINT. THENCE N 22-51-35 E, 236.22' TO A POINT. THENCE N 36-04-22 E, 80.04' TO A POINT. THENCE N 41-37-53 E, 80.68' TO A POINT. THENCE N 37-18-07 E, 80.12' TO A POINT. THENCE N 39-31-27 E, 80.35' TO A POINT. THENCE N 54-49-48 E, 85.50' TO A POINT. THENCE N 22-02-03 E, 81.83' TO A POINT. THENCE N 42-15-00 E, 80.80' TO A POINT. THENCE N 41-17-10 E, 80.62' TO A POINT. THENCE N 34-09-40 E, 20.00' TO A POINT. THENCE N 13-06-38 E, 85.72' TO A POINT. THENCE N 26-46-20 E, 64.60' TO A POINT. THENCE N 58-52-26- E, 61.82' TO A POINT. THENCE N 49-08-23 E, 80.00' TO A POINT. THENCE N 57-18-55 E, 30.24' TO A POINT. THENCE N 64-02-11 E, 54.56' TO A POINT. THENCE N 60-04-00 E, 84.90' TO A POINT. THENCE N 63-51-31 E, 93.52' TO A POINT. THENCE N 67-28-45 E, 178.12' TO POINT. THENCE N 49-34-15 E, 60' TO A POINT. THENCE S 40-25-45 E, 1055.67 TO A POINT. THENCE S 49-34-15 W, 60' TO THE POINT OF BEGINNING. CONTAINING 40.84 ACRES.

RECORD OF POOR QUALITY DUE TO CONDITION OF ORIGINAL

NON-WARRANTY DEED

STATE OF NORTH CAROLINA

COUNTY OF BRUNSWICK

THIS DEED, made this 27 day of ~~December~~ November 2019, by and between **Reeves Telecom Limited Partnership**, whose address is 63 Forest Avenue, Suite 5B, Locust Valley, NY 11560-1734, hereinafter, whether one or more, referred to as "GRANTOR," and the **City of Boiling Spring Lakes**, a North Carolina municipal corporation, whose address is 9 E. Boiling Spring Road, Boiling Spring Lakes, NC 28461, hereinafter, whether one or more, referred to as "GRANTEE":

WITNESSETH:

THAT the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple all of that certain lot or parcel of land situated in the Town Creek Township, Brunswick County, North Carolina, and more particularly described as follows:

SEE Exhibit A attached hereto and incorporated herein by reference.

TO HAVE AND TO HOLD the aforesaid lot or parcel of land, and all privileges and appurtenances thereto belonging, to the Grantee in fee simple.

Prepared by Michael R. Isenberg, Attorney at Law
109 E. Moore St., Southport, NC 28461 **WITHOUT OPINION ON TITLE**

IN WITNESS WHEREOF, the Grantor has hereunto executed this instrument the day and year first above written.

Reeves Telecom Limited Partnership

BY Grace Property Management, Inc., its' General Partner

BY: _____(SEAL)
Peter Metz, President

STATE OF NEW YORK

COUNTY OF Nassau

I, Woochul Kim, a Notary Public in and for the State and County aforesaid, do hereby certify that **Peter Metz, as President of Grace Property Management, Inc., general partner of Reeves Telecom Limited Partnership,** personally appeared before me this day and acknowledged the due and voluntary execution of the foregoing instrument for the purposes therein set forth.

Witness my hand and notarial seal, this the 27th day ~~of December~~ November, 2019.

_____

_____, Notary Public

My commission expires: 12-20-2022

WOOCHUL KIM
Notary Public, State of New York
No. 01KI6232939
Qualified in Nassau County
Commission Expires Dec 20, 2022

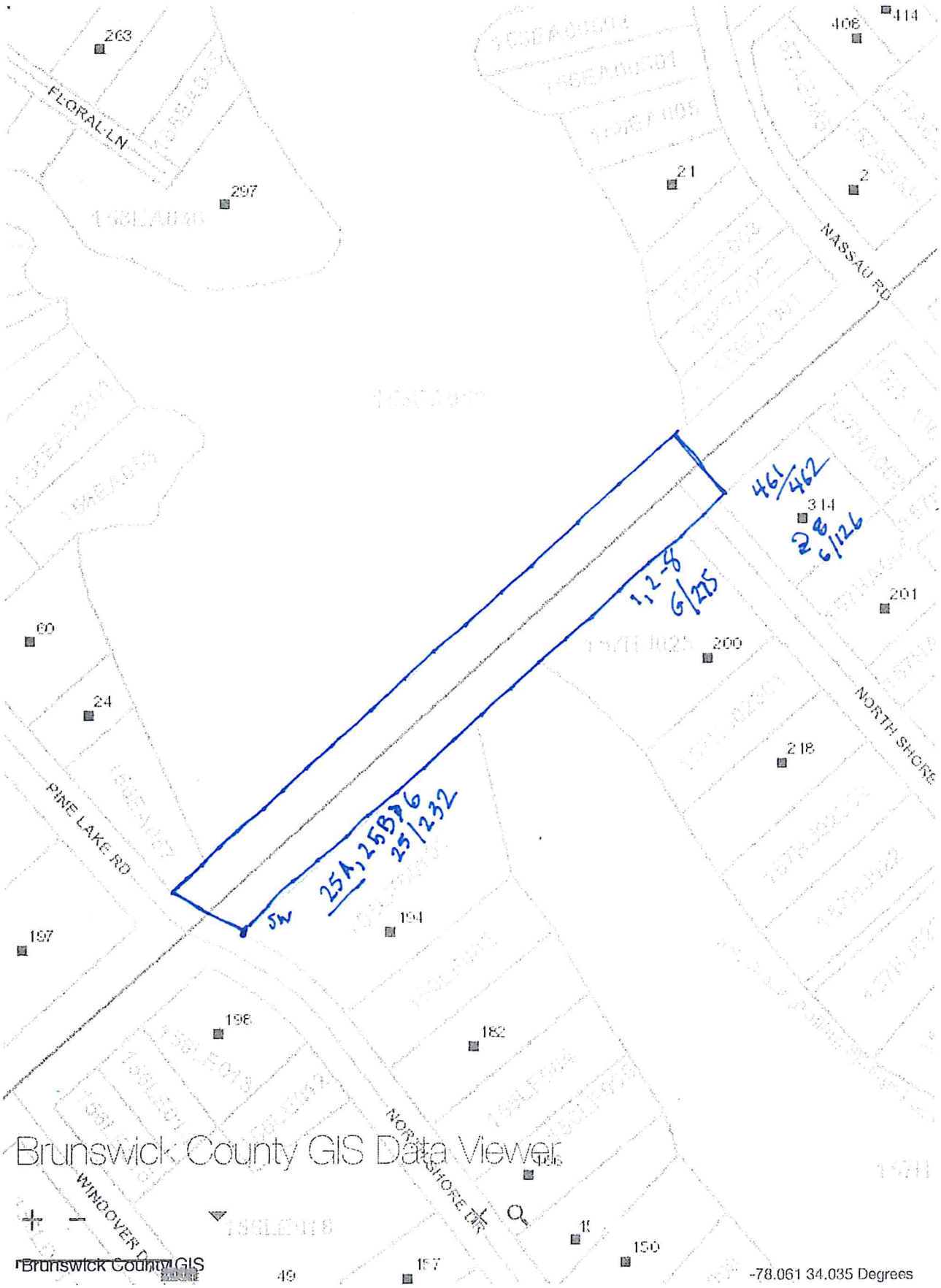
TRACT ONE:

BEGINNING at a point where the southeastern line of Boiling Spring Road intersects the eastern line of North Shore Drive, said point of intersection being at the westernmost corner of Lot 25A, Section 6, of Boiling Spring Lakes as shown on a map thereof recorded in Map Cabinet 35 at Page 232 of the Brunswick County Registry; run thence with said line of Boiling Spring Road in a northeastwardly direction to another eastern line of North Shore Drive which point is the westernmost corner of Lot 462, Section 8, of Boiling Spring Lakes according to a map recorded in Map Book 6 at Page 126 of the Brunswick County Registry; run thence in a line perpendicular to said right of way line of Boiling Spring Road to the northwestern line of said Boiling Spring Road; run thence with said northwestern right of way line in a southwestwardly direction to its' intersection with the eastern line of Pine Lake Road; run thence in a straight line to the point of beginning.

TRACT TWO:

BEGINNING at a point where the southeastern line of Boiling Spring Road intersects the eastern line of North Shore Drive, said point of intersection being at the westernmost corner of Lot 74, Section 8, of Boiling Spring Lakes as shown on a map thereof recorded in Map Cabinet G at Page 277 of the Brunswick County Registry; run thence with said line of Boiling Spring Road in a northeastwardly direction to another eastern line of North Shore Drive which is the northernmost corner of Lot 166, Section 19, of Boiling Spring Lakes according to a map recorded in Map Cabinet I at Page 207 of the Brunswick County Registry; run thence in a line perpendicular to said right of way line of Boiling Spring Road to the northwestern line of said Boiling Spring Road which is a corner of North Lake Drive where it intersects Boiling Spring Road; run thence with said northwestern right of way line of Boiling Spring Road in a southwestwardly direction to a point on Boiling Spring Road which is located North 43 degrees 30 minutes West from the point of beginning; run thence to the point of beginning.

NORTH LAKE DR
LONG LEAF RD
NORTH LAKE DR
LAKEVIEW DR E
E BOILING SPRING RD
NORTH SHORE
Brunswick County GIS Data Viewer
Brunswick County GIS
NORTH -78.053 34.045 Degrees


FLORAL LN
NASSAU RD
NORTH SHORE
PINE LAKE RD
NORTH SHORE DR
WINDOVER
461/462
28
6/126
1,2-8
6/225
25A, 25B, 26
25/232
5W
Brunswick County GIS Data Viewer
Brunswick County GIS
-78.061 34.035 Degrees

Meeting Minutes

Subject: Boiling Spring Lakes Dams Repair
Dams Classification and Design Criteria Required by Dam Safety

Date: June 3, 2019

Location: NC Dam Safety Program, Archdale Building, Floor 5, Main Conference Room

Attendees: See Sign in Sheet

Two meetings were scheduled on this day to cover the same topic. The first, from 11 AM to 12 PM was attended only by NC Dam Safety Program (Dam Safety), City of Boiling Spring Lakes (BSL) and McGill team personnel (all on the sign in sheet) to inform Dam Safety of the overall goals of the City's Dam Reconstruction project and allow time for questions and discussion. The second meeting, from 1 PM to 2 PM, included staff form FEMA and NCDOT to address the more specific issues revolving around the reconstruction of Pine Lake and North Lake dams and implications for East Boiling Spring Road which is owned and operated by NCDOT. The following minutes address discussions and outcomes from both meetings.

Purpose
The purpose of the meeting was to discuss Dam Safety's requirements as they relate to the restoration of the four city owned dams in BSL; in particular as it relates to:

- Hazard Classification of North Lake and Pine Lake Dams.
- Continuing to use East Boiling Spring Road (EBSR) embankment as the dam for North Lake and Pine Lake.
- Need to evaluate the entire Boiling Spring Lakes dams as a system, i.e., evaluate the existing and future spillway of Sanford Dam.
- Hazard rating on Upper and Middle Dams.

Discussion Outcome

- North Lake and Pine Lake cannot be classified as Low Hazard because of high Average Daily Traffic and shall be designed as High Hazard Dams.
- Dam Safety does not object to using the EBSR embankment as a dam if it meets or can be made to meet Dam Safety Standards.

  - Geotechnical evaluation of the embankment is required including slope stability, rapid drawdown, etc.
  - Conduct evaluation of soil types and compaction of the levee material.
  - The CMP culverts installed under ESBR need to be slip-lined or replaced if they are part of the dam. Slip-line must be structural and end treatment will be required to protect against fire hazard if plastic type of slip-line is used. Following up on the meeting, Art expressed that he prefers replacing the pipes and using a cradle.
  - Existing CMP cradle consisting of #57 stone is a concern. It may be able to be grouted to address seepage/piping source.
  - NCDOT requires hydraulic criteria in the DOT's manuals be met for use of embankment as dam.
  - The entire dam can be used as a spillway. If this option is used in design, the dam (roadway) slopes shall be armored (e.g., Articulated Concrete Block). NCDOT will require the City assume maintenance responsibility of the armoring. Interface between roadway, armoring and guardrail needs to be addressed in design. Following up on the meeting, Art expressed that the limits of the road segment used as a dam need to be clearly defined.
  - NCDOT prefers the use of a cofferdam structure rather than a riser connected to the pipes. This allows the current CMP's to not be part of dam and avoids the required slip-line and cradle upgrades discussed above.
  - Guardrails will be required per NCDOT policy adjacent to impounded water. Use of wire cable may be feasible. Either way the City needs to account for them in the design and modeling as source of seepage. The roadway may also need to be widened to meet setback requirements for guardrail; NCDOT will verify existing right-of-way limits.
  - Design will need to be reviewed/approved by Dam Safety and NCDOT.

- All dams, including Sanford Dam, shall be analyzed as one system.
  - Need to evaluate the existing and future spillway capacity of Sanford dam and its associated upstream and downstream impacts.
  - A structural evaluation of the existing spillway condition will be required as part of Dam Safety permitting.
  - By Law Sanford Dam spillway shall be designed for the ½ PMP and the other small, high hazard dam spillways will be designed for the 1/3 PMP flow. However, Dam Safety did note that, in light of the rainfall volume encountered during Florence (estimated at 35 inches), design for a storm of higher volume may be prudent.
  - Based on the current evaluation, Dam Safety does not concur with the Low Hazard designation for the Upper Dam. Based on further evaluation the City may submit a request that Upper Dam be classified as Low Hazard if system wide analysis supports this determination.
  - If warranted, an Incremental Hazard Evaluation will be included in the study.

- Dam Safety provided digital copies of all historical information on file for Sanford Dam.

- Evaluate sinkhole activities in the vicinity of the dams based on geotechnical investigation and historical records.
- Dam Safety requested a copy of the presentation provided in the 11 AM meeting.
- Dam Safety and McGill agreed that the outcome of these meetings was sufficient direction to proceed with the project. No written comments will be issued for the Breach Analysis previously submitted by McGill.

Name	Affiliation	Email
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Jonathan Moore	NCDOT	jlmoore6@ncdot.gov
Galen Cail	NCDOT	gcail@ncdot.gov
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Art Sengupt	DEMLR	art.sengupta@
Toby Vinson	DEMLR	toby.vinson@ncdenr.gov ncdenr.
Dan Sams		
Fred Jams		
Zaida Garci a		
Jaquelin	FEMA	
Maven	DHP FEMA	
Helen Mayor	FEMA ~~EHP~~ EHP	
Danny Smith	DEMLR	danny.smith@ncdenr.gov
John Lucey	DEQ	John.lucey@ncdenr.gov
Jeff Repp	City of BSL	jrepp@cityofbsl.org
Adam Paisley	Schnabel	apaisley@schnabel-eng.com

Meeting Minutes

Subject: Boiling Spring Lakes Dams Construction/Reconstruction Project
Preliminary Assessment – Interim Presentation

Date: November 20, 2019

Location: NC Department of Environmental Quality Dam Safety (NC Dam Safety),
Archdale Building, 512 N. Salisbury Street, Raleigh, NC 27604
Floor 5, Main Conference Room

Attendees: See Sign in Sheet

Purpose

The purpose of the meeting was to discuss findings of the Preliminary Assessment conducted for the project as agreed upon during the meeting conducted on June 3, 2019 with the City of Boiling Spring Lakes (City), FEMA, NCDOT, and NC Dam Safety. The slides presented at the meeting are attached to these notes for reference and additional details. The primary tasks of this Preliminary Assessment of the four City-owned dams (i.e., Sanford Dam, North Lake Dam, Pine Lake Dam, and Upper Lake Dam) include:

- Coordination with agencies to determine the most suitable permitting process
- Comprehensive hydrologic and hydraulic models
- Performance of subsurface exploration program to explore conditions potentially related to uncontrolled seepage
- Utilizing East Boiling Spring Lake Road as an impounding structure for North Lake and Pine Lake

Discussion Outcome

- McGill discussed coordination efforts with related regulatory agencies, including NC Wildlife Resources Commission (WRC), NC Department of Environmental Quality (NC DEQ), and US Army Corps of Engineers (USACE), as summarized by the following:
    - USACE 401/404 Permit expected to be issued as NWP 3 for Maintenance Activities and Water Quality General Certification 4132 based on conditions prior to Hurricane Florence (i.e., impacts to open water).
    - WRC requested inclusion of data on the need to restore the lakes.
    - Low flow conditions will be established in order to maintain downstream aquatic habitat within Allen Creek
    - NCHPO found no historic impacts.

- Middle Dam (private) may be reconstructed under NRCS EWP grant.

- McGill stated that although all dams predated NC Dam Safety regulations and were functional and impounding pre-Florence, they are now considered High Hazard Dams by NC Dam Safety. McGill requested confirmation by NC Dam Safety that the now breached dams must meet the current design codes and standard per 15A NCAC 02K.0204(e) when reconstructed. NC Dam Safety confirmed that the following design criteria, as stipulated in the referenced code, will apply:
    - Sanford spillway must provide overtopping protection up to ½ PMP storm (Probable Maximum Precipitation)
    - North Lake, Pine Lake, and Upper Lake spillways must provide overtopping protection up to ⅓ PMP storm*

  Note *: NC Dam Safety added that the breached Middle Lake Dam (private dam, not part of this assessment) is also now considered High Hazard and must also meet the same standards.

- McGill noted that the Middle Lake Dam was being considered for reconstruction under the City's NRCS EWP grant. McGill has coordinated with the City's selected engineer for this project regarding the status of the other dams and will share data as needed. The worst-case scenario between a reconstructed or removed dam will be considered in the design.

- McGill presented the hydrologic and hydraulic evaluation and initial design to meet the current requirements. Various alternatives were presented for each dam. The PMP storm was developed using the methodology described in HMR51 / HMR52.

- NC Dam Safety clarified that 2 feet of freeboard is preferred for each dam based on the design storm event. McGill clarified that the spillways will be sized to meet this requirement to the extent practicable on North Lake, Pine Lake, and Sanford Dams. McGill added that Upper Lake Dam might need to be an exception because only 3 feet are available between the normal water surface elevation in the lake and the overtopping elevation. NC Dam Safety agreed that a lesser freeboard depth may be used for Upper Lake Dam.

- Schnabel summarized relevant published regional geology information and available records.
    - The following information was presented in regional geology publications reviewed during this project phase:
        - The soils in the vicinity of the project site consists of interbedded sands, clays, and clay/sand mixtures of the Socastee Formation.
        - Limestones of the Comfort Member of the Castle Hayne Formation underlie soils in the vicinity of the project sites. Comfort Member limestones are generally described as highly fossiliferous and susceptible to dissolution of carbonate contents.

  - Drawings from around 1960 were found for Sanford, North Lake, and Pine Lake Dams. These are considered design drawings, not as-builts, because there were not sufficient information/dates on drawings to confirm otherwise.
  - No records available for Upper Lake Dam.

- Schnabel presented the approach to and results of the geotechnical exploration conducted at North Lake, Pine Lake, and Upper Lake Dams first.
  - The presence of the North Lake and Pine Lake Dams embankment cores shown in the 1960 Drawings could not be confirmed based on encountered conditions in borings.
  - Fill soils consisted of poorly-graded sands with varying amounts of fines, and appear to be compacted with compactive energy consistent with construction methods of the era in which the dams were constructed.
  - Foundation soils are generally consistent with published regional geology information, and generally consisted of loose poorly graded sands overlying loose clayey sands. Natural debris, such as organic soils and wood were encountered in some of the borings.
  - Dam Safety inquired if the geotechnical borings reached the Castle Hayne formation at these sites. Schnabel stated that rock was not encountered and clarified that determining depth to rock (if deeper than planned depth of borings) was not a goal of the exploration due to the relatively low hydraulic head of the dams, lack of surficial evidence of past sinkhole activity at the dam sites, and apparent lack of records of sinkhole activity at the dam sites. If by the completion of the preliminary assessment a need to conduct further investigation is identified, additional borings will be performed.
  - Dam Safety inquired if the encountered unsuitable material causes any concerns. Schnabel clarified that the findings do not raise significant concerns.
  - Schnabel stated that based on preliminary findings, additional geotechnical exploration at the sites does not seem warranted. McGill clarified that the goal is to proceed with the design with the data collected unless NC Dam Safety requires additional investigation.
  - NC DEQ Dam Safety noted that they would prefer to see at least one deep boring at each of the three upper dam sites to confirm depth to rock. Schnabel stated that conditions below the preliminary design phase borings will not likely affect the performance of the rehabilitated dams.

- Three conceptual remediation design alternatives were presented for each of the three upstream dams.
  - Summary of Alternatives:
    - Alternative 1 consists of complete removal of the existing culverts and appurtenances, construction of cast-in-place concrete (CIP) box culverts and downstream headwall, and construction of a CIP riser embedded in the embankment, and construction of a filter diaphragm around the CIP box culverts. A low-level drain and appropriate safety measures will be included in

the design. NC Dam Safety has previously stated corrugated pipes are unacceptable for water conveyance for dams.
    - Alternative 2 consists the same modifications as Alternative 1, except that the riser is constructed at the upstream embankment toe instead of embedded in the embankment.
    - Alternative 3 for North Lake and Pine Lake Dams consists of slip-lining the existing corrugated metal pipes (CMP), removal of the existing upstream and downstream corrugated metal headwalls and a portion of the CMPs, grouting of the remaining gravel bedding below the existing CMPs, construction of a CIP riser which is embedded in the embankment, and construction of a filter diaphragm around the sliplined pipes. The City emphasized that one of the goals of Alternative 3 is to avoid closing East Boiling Spring Road during construction.
    - Alternative 3 for Upper Lake Dam consists of complete removal of the existing spillway structures and construction of an open channel spillway with a bridge to maintain functionality of the road on the dam. McGill noted that this option may afford the most cost-effective potential to achieve more freeboard for Upper Lake.
  - Dam Safety stated that anti-flotation design is required for all risers.
  - Dam Safety stated that wave protection is required on the upstream side for all dams.
  - Dam Safety stated that Alternative 3 for North Lake and Pine Lake Dams is the least desirable and will require extensive documentation and demonstration that the gravel bedding grouting program under the CMPs will be sufficient to fill the voids to the full width and length of the bedding material to mitigate the seepage potential. A robust filtration system would also be required.
  - McGill clarified that the purpose of presenting these alternatives is to understand the requirements of NC Dam and then select the most cost-effective alternative. As such, the requirements of the grouting program might make Alternative 3 the least cost-effective one.

- Schnabel presented the approach to and results of the geotechnical exploration conducted at Sanford Dam.
  - An embankment core is visible on the sides of the breach at the general location (within the embankment) that is shown on the 1960s Drawings. Core soils were not identified in any of the borings, though the borings were drilled downstream of the core location shown in the 1960s Drawings.
  - Fill soils consisted of poorly-graded sands with varying amounts of fines, and appear to be compacted with compaction energy consistent with construction methods of the era in which the dams were constructed.
  - Foundation soils are generally consistent with published regional geology information, and generally consisted of loose clayey sands.
  - Rock was encountered at about elevation 0 ft, which is consistent with historical records.

        - The first 5-10 feet is “shell-mold limestone” (calcirudite). Historical sinkhole issues are reportedly attributed to this rock unit.
        - Below calcirudite is mostly “shell-hash limestone” (calcarenite).
        - In the borings advanced to about elevation -50, calcareous sand was encountered approximately between elevations -42 and -50.

- Two alternatives, with two layout options for each, were presented for Sanford Dam.
    - Alternative 1 consists of installing a labyrinth weir spillway.
    - Alternative 2 consists of installing a riser structure and box culvert spillway.
    - A positive cutoff wall that is embedded to about elevation -15 (about 15 feet below the top of rock) will be installed with either alternative.
    - For each Alternative, two options were considered:
        - Option A - constructing the structure at the location of the existing riser
        - Option B - constructing the structure at the location of the breach.
    - Option A is more efficient hydraulically than Option B because it reduces the risk of inducing scour at the embankment to the railroad bridge downstream of the dam. Option B was initially considered for potential cost savings. However, preliminary evaluation indicates comparable costs for both options.
    - Dam Safety is in favor of the positive cutoff wall and indicated that it is preferred over a grouting program, which might not completely fill the voids.
    - Additional borings will be needed to sufficiently understand the variability of the dam and its foundation.
    - Similar to the upstream lakes, the most cost-effective solution will be recommended to proceed with the design.

- NC Dam Safety noted that they preferred Alternate 1A – labyrinth at the current spillway location (on the Allen Creek alignment).

- NC Dam Safety noted that a toe drain and permanent geotechnical instrumentation would be required on Sanford Dam.

- FEMA stated that it is important to move to the next step (i.e., Project Scoping) since we are over a year after the storm and the project funding is not yet obligated. McGill indicated that the team will be moving with finalizing this assessment based on the input from NC Dam Safety at this meeting and submit a report in January. The City and design team will work with FEMA on the Project Scoping in parallel.

- FEMA stated that there is still uncertainty on the responsibility split between NCDOT and the City for the reconstruction of North Lake and Pine Lake Dams. NC Dam Safety indicated that although the current understanding is that the City owns the land and NCDOT owns the road, NC Dam Safety considers NCDOT as co-owner of the dam.
    - The City will work with NCDOT to get a Memorandum of Understanding (MOU) or some other legal agreement in place. Other potential options include the City taking ownership of the road over the dams.

- NC Dam Safety offered to be involved in the drafting of the MOU as needed.

Action Items

- City will work with NCDOT on resolving ownership/responsibility issues for Pine Lake and North Lake Dams. NC Dam Safety and FEMA will assist as needed.
- McGill/Schnabel will finalize the Preliminary Assessment Report.

Attachments

- Sign in Sheet
- Presentation Slides

mcgill

Shaping Communities Together

Sign In Sheet

Subject: Boiling Spring Lakes Preliminary Assessment Report

Date: 11/20/19

Location: Dam Safety Bldg

Name	Affiliation	Email	Phone
Dori Sabeh	McGill	DORI.SABEH@MCGILLASSOCIATES.COM	919.364.3989
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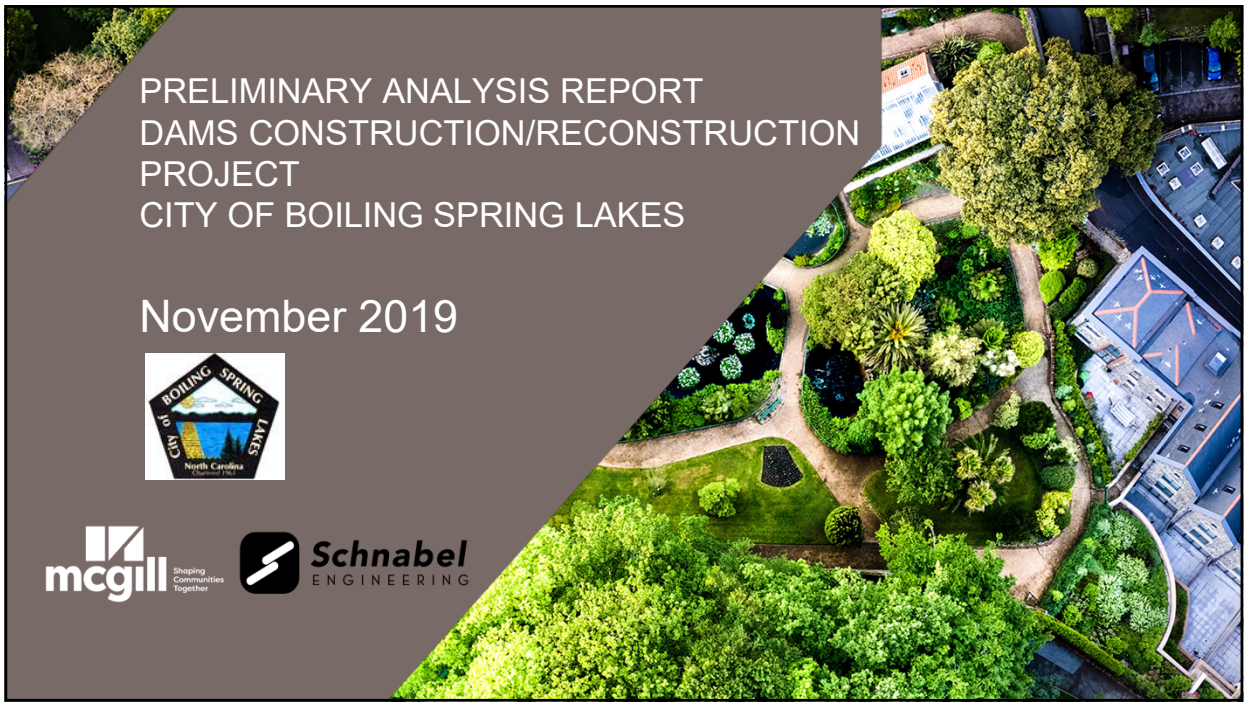
KENNETH TAYLOR	NCDENR	Kenneth.b.taylor@ncdenr.gov	919-707-9211
TOM FITZGERALD	SCHNABEL	TFITZGERALD@SCHNABEL-ENG.COM	336 274-9456
Jeff Repp	BSL	jreppe cityofbsl.org	910-363-0025
Mike Hanson	McGill	MICHAEL.HANSON@MCGILLASSOCIATES.COM	919-637-5594
Amy Coutts via phone	FEMA	amy.coutts@fema.dhs.gov	



PRELIMINARY ANALYSIS REPORT DAMS CONSTRUCTION/RECONSTRUCTION PROJECT CITY OF BOILING SPRING LAKES

November 2019

mcgill Shaping Communities Together

Schnabel ENGINEERING

Outline

- Preliminary Analysis Report (PAR) Overview
- Agency Coordination
- Codes and Standards
- Preliminary H&H
- Geologic Conditions
- Design Considerations
- Recommendations

Alton Lennon Road (Sanford Dam) during Hurricane Florence

PAR Overview

A meeting on June 3, 2019 with FEMA, NCDOT and NC Dam Safety Program revealed that additional tasks were necessary to fully define FEMA's Disaster Recovery Scope of Work related to the BSL dams. These tasks are the primary focus of this Preliminary Analysis Report. They include:

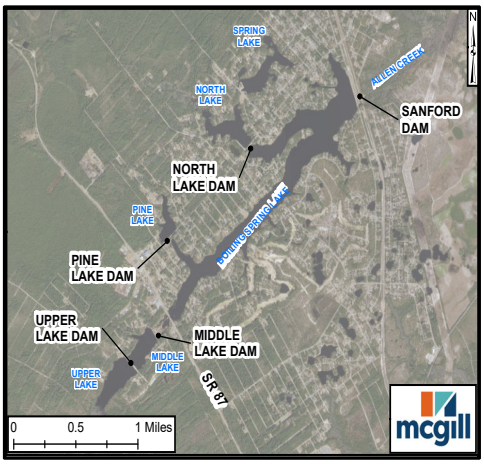
- Coordination with agencies to determine the most suitable permitting process
- Comprehensive hydrologic and hydraulic models
- Subsurface exploration program to fully address potential issues related to sinkhole formation
- Utilizing East Boiling Spring Lake Road as an impounding structure for North Lake and Pine Lake

Agency Coordination

McGill met onsite on 10.17.19 with:

- NC Wildlife Resources Commission,
- NC Department of Environmental Quality and
- US Army Corps of Engineers on site

1. *Permit based on pre Florence conditions - impacts to open water. (anticipate NWP 3 for Maintenance Activities and Water Quality General Certification 4132).*



Boling Spring Lakes Site Map

Agency Coordination (cont.)

2. *WRC requested inclusion of data on the need to restore the lakes.*
3. *Low flow conditions will be established in order to maintain downstream aquatic habitat within Allen Creek*
4. *NCHPO found no historic impacts.*
5. *Middle Dam (private) may be reconstructed under NRCS EWP grant.*

Middle Dam post Hurricane Florence

5

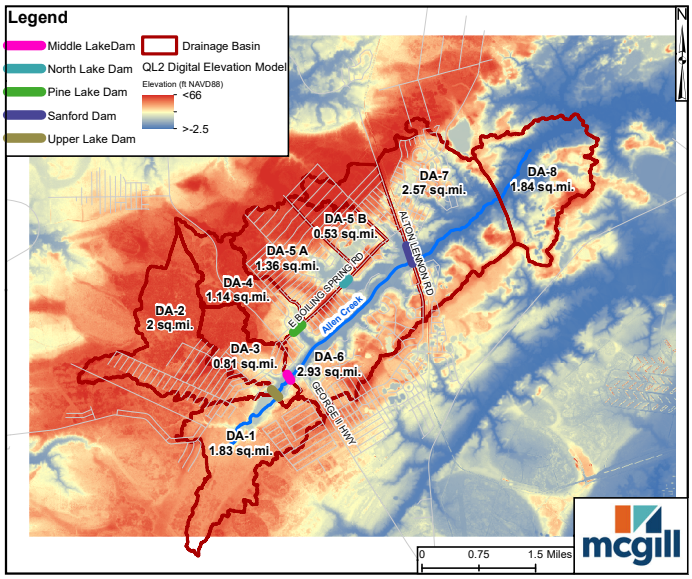
Codes and Standards

- All dams predated NC Dam Safety regulations
  - Pre Florence - all dams were functional and impounding
  - Post Florence - all dams are now considered High Hazard
- NC Regulations require reconstructed all dams meet current design standards per 15A NCAC 02K.0204(e)
- Hydrologic and Hydraulic Evaluation and Spillways Design
  - Sanford spillway must provide overtopping protection up to ½ PMP storm
  - North Lake, Pine Lake, and Upper Lake spillways must provide overtopping protection up to ⅓ PMP storm
- Geotechnical Evaluation and Embankments Design
  - Sanford - Sink holes, Seepage, Stability
  - North Lake, Pine Lake, and Upper Lake – Seepage and Stability

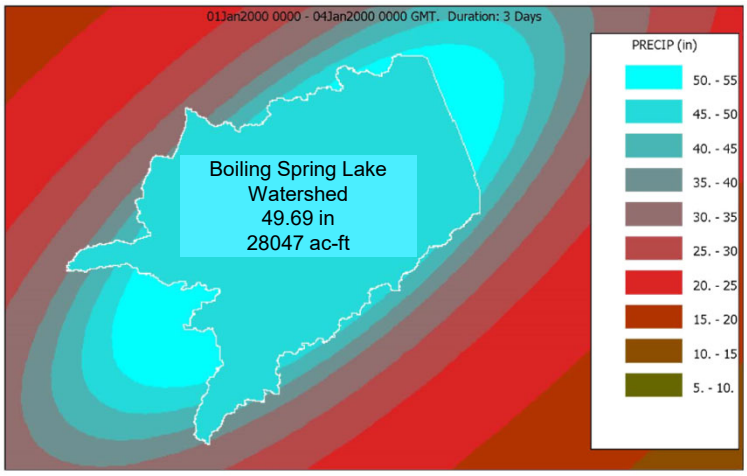
Preliminary Hydrologic/Hydraulic Evaluation

- Hydrology – PMP analysis
- Hydraulics – Combined modeling approach
- Comparison to effective model
- Initial spillway sizing
- Preliminary breach conditions

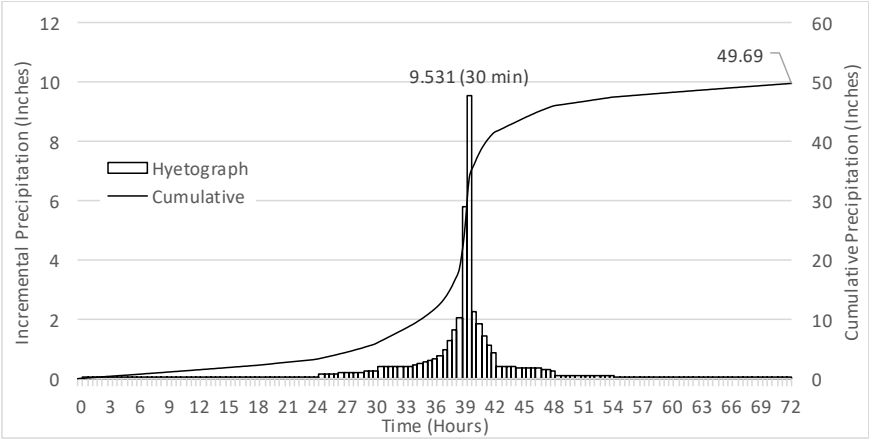
Hydrology



Rainfall - PMP



Rainfall - PMP



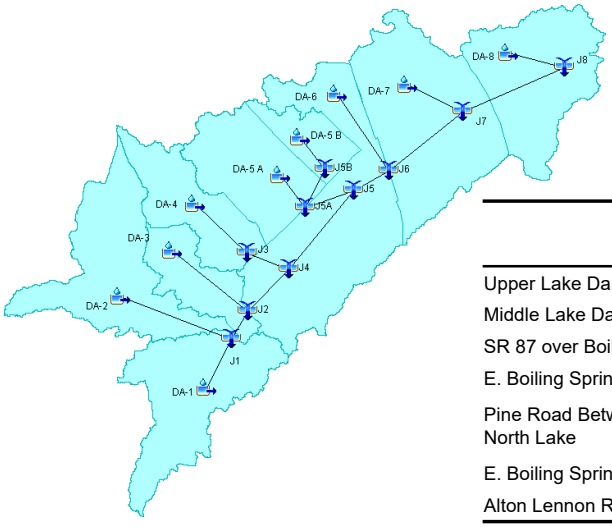
Hurricane Florence

Location	Rainfall Total	Location	Rainfall Total
6.2 miles NW Elizabethtown, NC	35.93"	Bennettsville, SC	18.05"
3.7 miles S Wilmington, NC	30.10"	Watha, NC	17.49"
4.1 miles WNW Hampstead, NC	29.52"	Lumberton, NC	17.49"
Sunny Point Military Terminal, NC	27.44"	Gallivants Ferry, SC	17.01"
Green Swamp/Nature Conservancy, NC	27.40"	3 miles N Lumberton, NC	16.11"
0.8 miles E Smith Creek, NC	27.20"	Marion, SC	15.79"
0.9 miles ENE Oak Island, NC	26.98"	2.6 miles N Pawleys Island, SC	15.75"
7.3 miles NE Wilmington, NC	26.58"	8.4 miles WNW Myrtle Beach, SC	15.41"
6.1 miles NW Whiteville, NC	25.91"	Whiteville, NC	15.38"
Turnbull Creek/Bladen Lakes State Park, NC	23.67"	7 miles SE Hemingway, SC	15.26"
2.9 miles WSW Loris, SC	23.63"	2 miles SW Pawleys Island, SC	14.41"
7.8 miles SW Bolivia, NC	23.33"	Blenheim, SC	14.38"
1.4 miles ENE Loris, SC	23.18"	Bald Head Island, NC	12.17"
Wilmington International Airport, NC	23.02"	Soules Swamp/Whiteville, NC	11.50"
2.3 miles NE Lumberton, NC	22.76"	Conway, SC	11.43"
Whiteville, NC	22.58"	3 miles NE Socastee, SC	11.11"
Caswell Beach, NC	22.57"	6.0 miles S Georgetown, SC	11.08"
Cape Fear Lock & Dam #1 near E. Arcadia, NC	22.21"	Hartsville, SC	11.02"
0.2 miles SSW Yaupon Beach, NC	22.07"	Darlington, SC	11.02"
4 miles E Burgaw, NC	22.06"	6.2 miles E Conway, SC	9.63"
Back Island/Holly Shelter Swamp, NC	20.87"	Myrtle Beach International Airport, SC	9.50"
3.0 miles SE Wilmington, NC	20.11"	Hemingway, SC	9.32"
Marion, SC	19.56"	Bennettsville, SC	9.08"
8.6 miles SSE Lumberton, NC	18.51"	Georgetown, SC	8.55"
3.8 miles NW Dillon, SC	18.38"	Florence, SC	7.62"

* A newspaper report claimed 36" fell in Southport, NC at a fire department. Although radar data suggests exceptional rain fell across this area, insufficient evidence has been collected so far to verify this report.

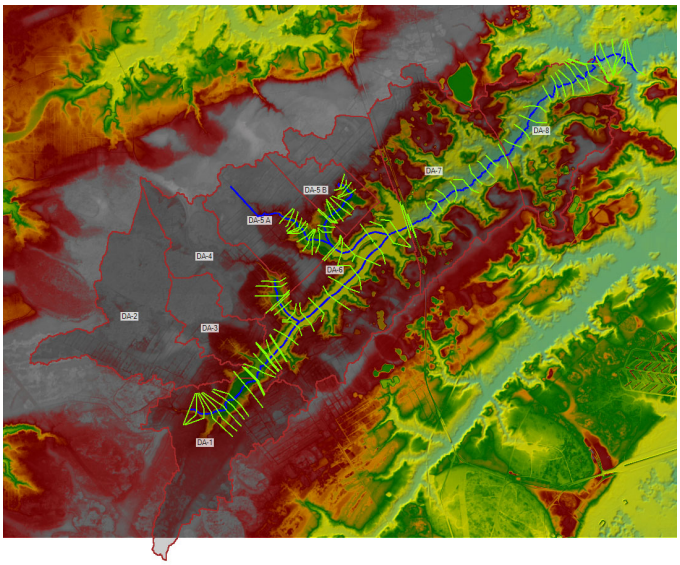
https://www.weather.gov/ilm/HurricaneFlorence

Runoff Hydrographs



	100-year FEMA	100-year Revised
Upper Lake Dam	2360	847.6
Middle Lake Dam	2360	1099.5
SR 87 over Boiling Spring Lake	2360	1099.5
E. Boiling Spring at Pine Lake Dam	--	302
Pine Road Between Spring Lake and North Lake	259	202
E. Boiling Spring at North Lake Dam	552	773
Alton Lennon Road at Sanford Dam	3560	3509

Hydraulics

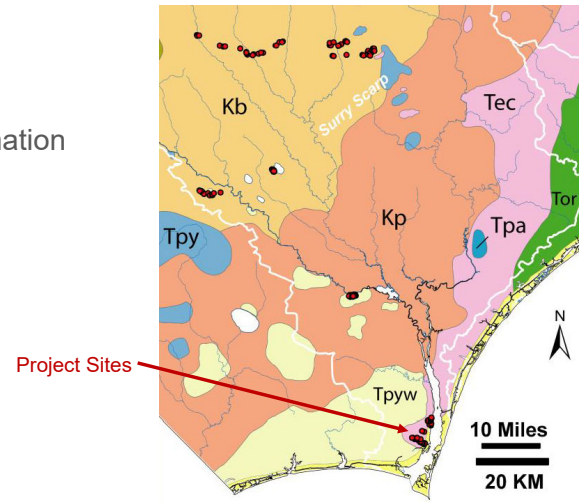


Initial Spillway Sizing

	Overtopping	Storm Design Flow (SDF)		Water Surface Elevation		
	Elevation	Event	Flow	Normal	SDF	Freeboard
Upper Lake Dam	41.3	⅓ PMP	943.1	38	40.4	0.9
E. Boiling Spring at Pine Lake Dam	44	⅓ PMP	335.9	35	38.6	5.4
E. Boiling Spring at North Lake Dam	40	⅓ PMP	888.2	35	38.3	1.7
Alton Lennon Road at Sanford Dam	39	½ PMP	6477	30	35.3	3.7
				Upper Dam Breach	35.5	
			Upper and Middle Dam Breach		35.7	

Overview of Geologic Conditions

- Soils
- Castle Hayne Formation



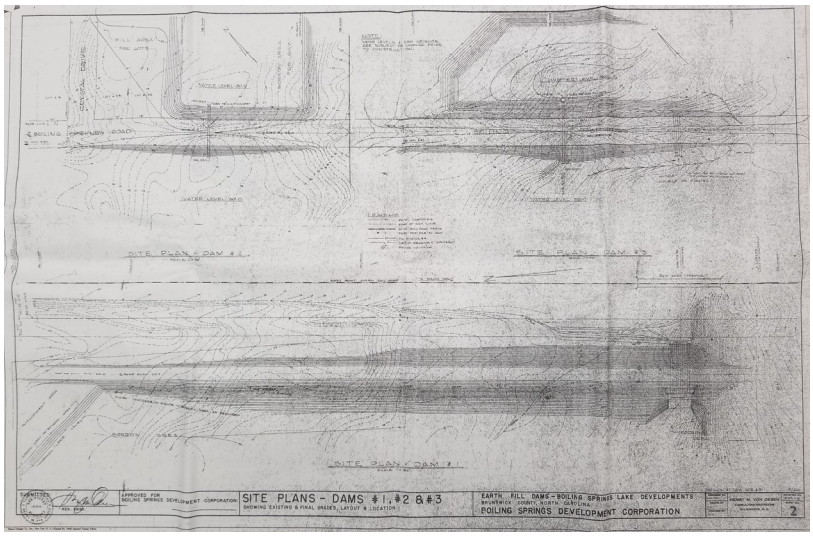
(NCAC, 2011)

Pertinent Available Records

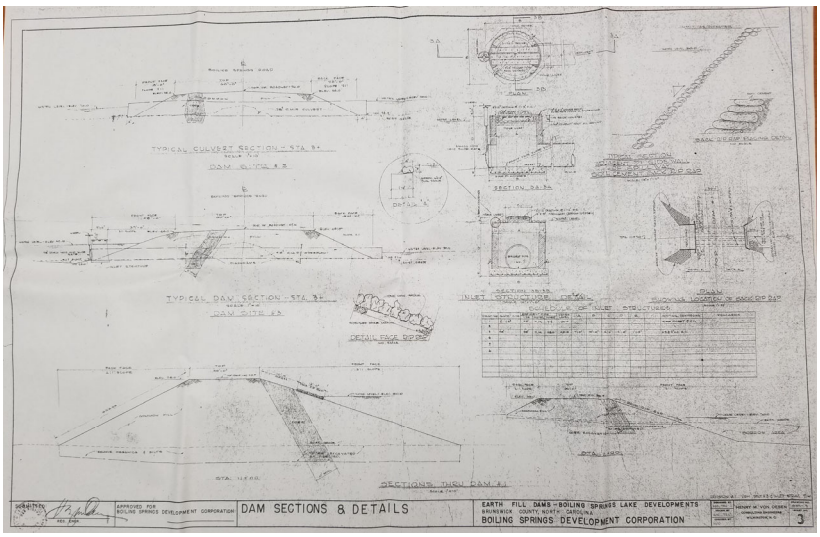
- Original Design Drawings (1960)
  Henry M. von Oesen Consulting Engineers (von Oesen)
  Sanford Dam / North Lake Dam (NLD) / Pine Lake Dam (PLD)
- Additional Sanford Dam Records

• 1977 Subsurface Investigation Report	S&ME
• 1979 Sinkhole Repair Record Drawings	von Oesen
• 1980 Phase 1 Inspection Report	USACE
• 1983 Sinkhole Hazard Reduction Plan	Planning & Design Associates, P.A.
• 1988 Remedial Repair Investigation and Design Report	S&ME
• 1991 Spillway Repair Record Drawings	Robert K. Russel, P.E.
• 2000 Remedial Repair Record Drawings	D. Miller & Associates, P.A.

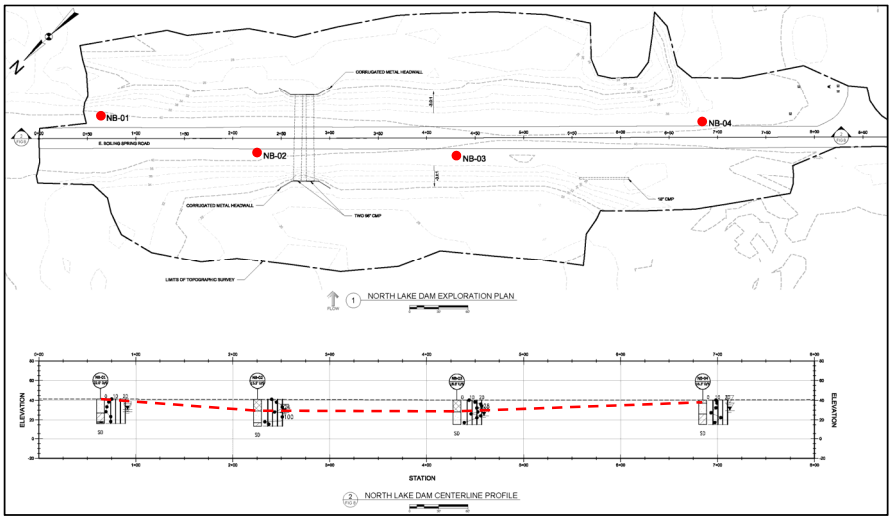
Original Design Drawings (1960)



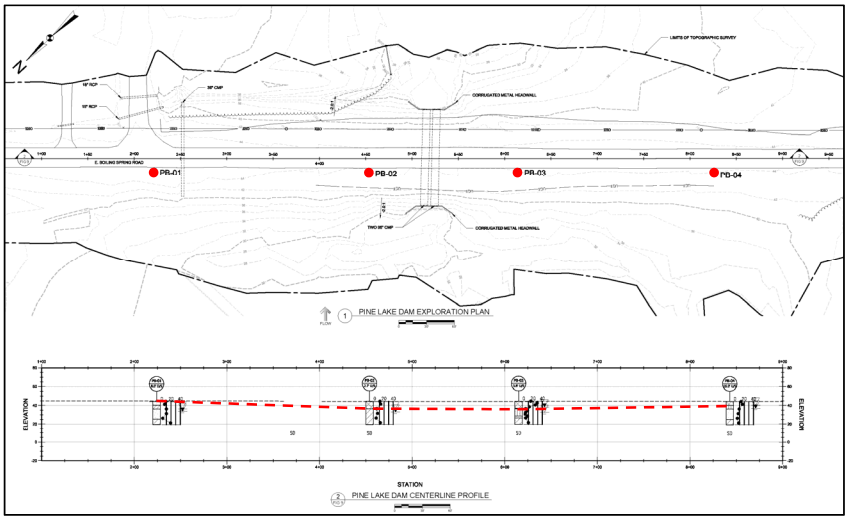
Original Design Drawings (1960)



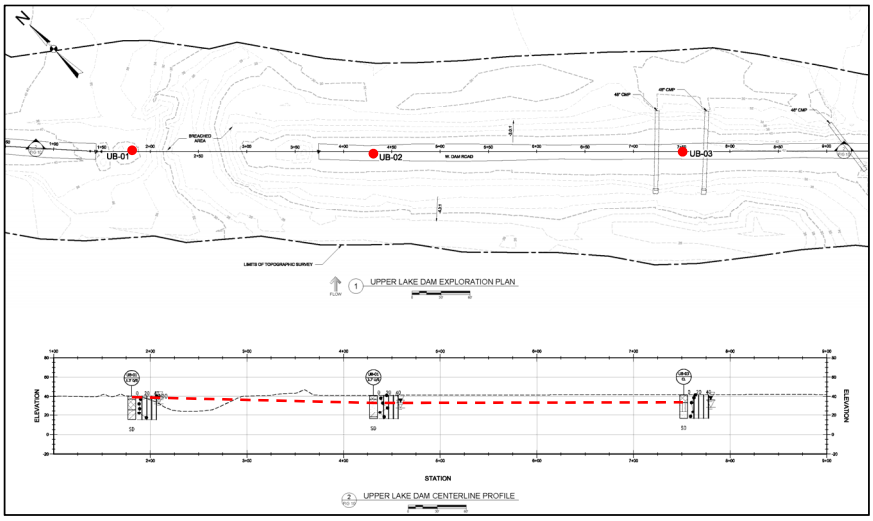
Overview of NLD Exploration



Overview of PLD Exploration



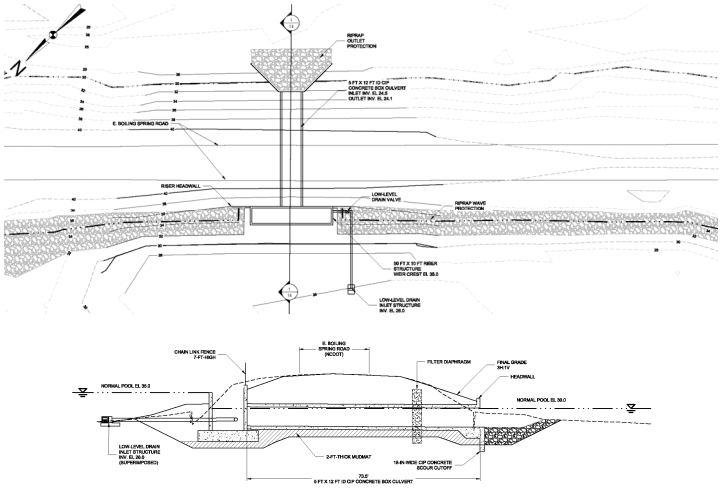
Overview of ULD Exploration



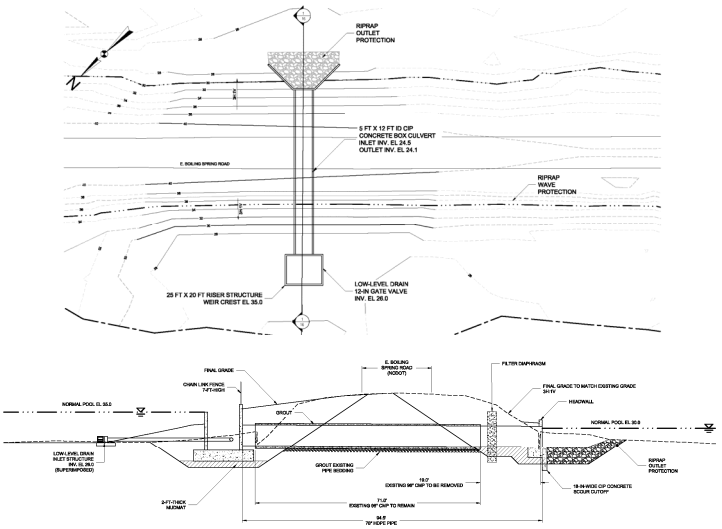
NLD/PLD/ULD Design Goals

- Restore the lakes to pre-breach condition
- Safely pass design floods
- Extend design life
- Facilitate ability to drain lakes
- Promote public safety
- Meet additional current codes and standards

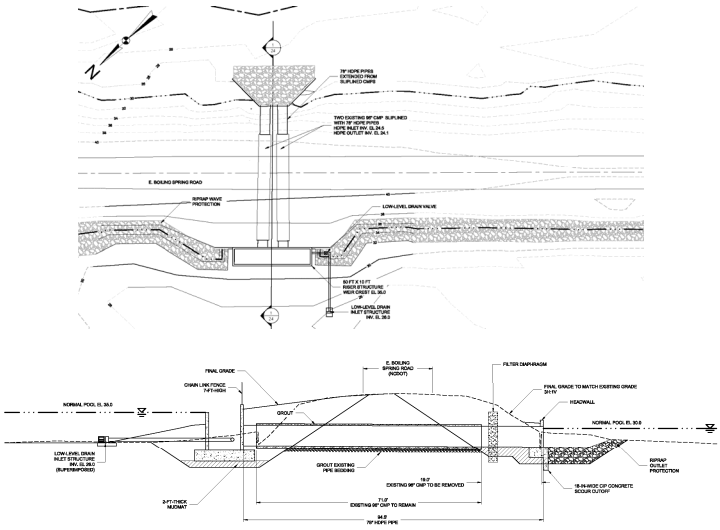
NLD/PLD/ULD Alternative 1 – Embedded Riser



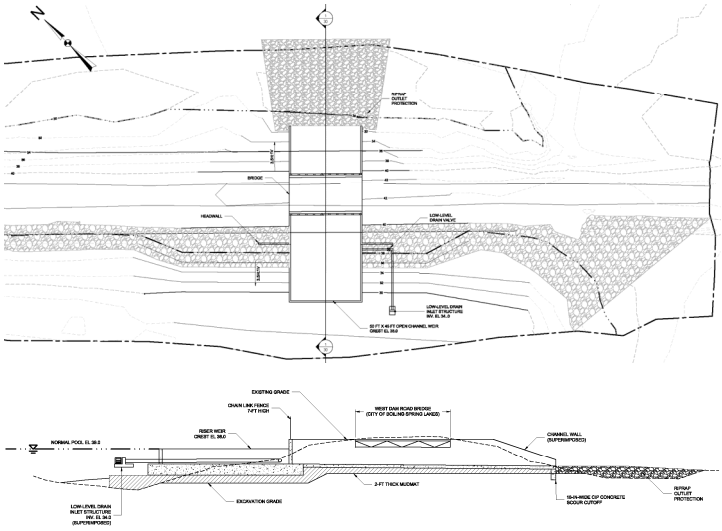
NLD/PLD/ULD Alternative 2 – Riser in Lake



NLD/PLD Alternative 3 – Upgrade Existing



ULD Alternative 3 – Open Channel Spillway



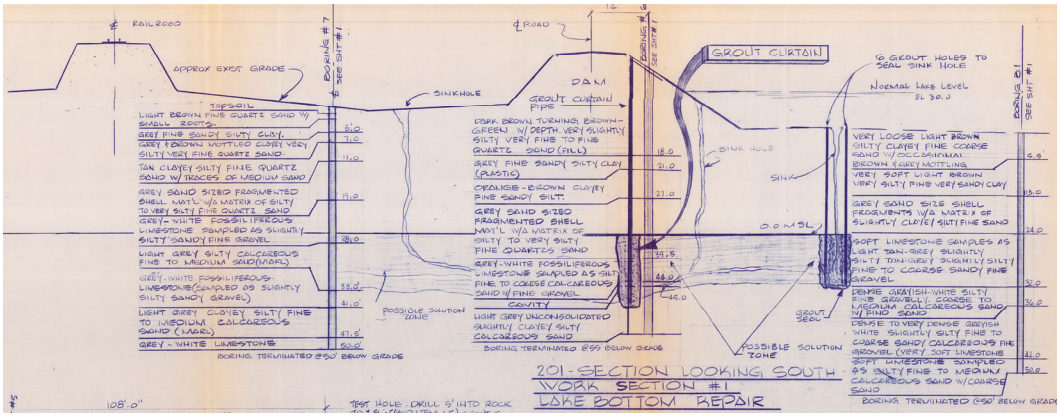
Seepage Events at Sanford Dam (SD)

- Records available for four seepage events
  - 1962
  - 1976-1978
  - 1986-1987
  - 2001-2002
- Average of one event per decade in first 40 years

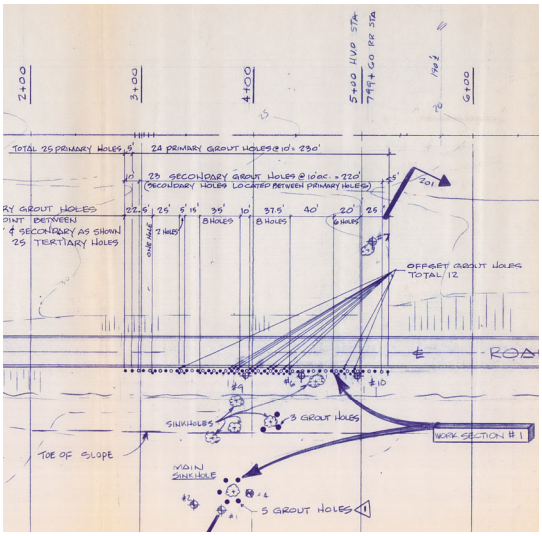
1962 SD Seepage Event

- Description in 1983 Hazard Reduction Plan
- Sinkholes formed adjacent to MOTSU railroad.
- Owner was required to perform grouting in 1964 and 1969.

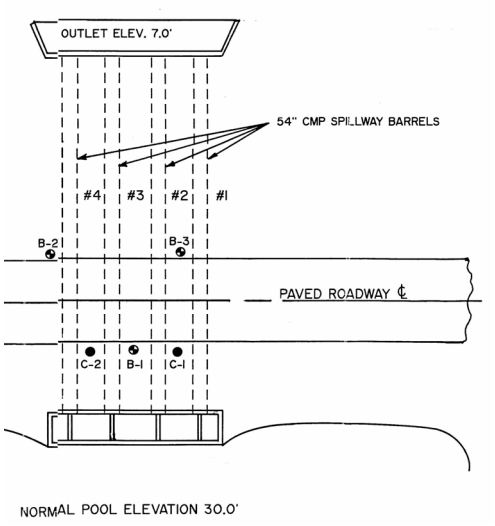
1976 SD Seepage Event



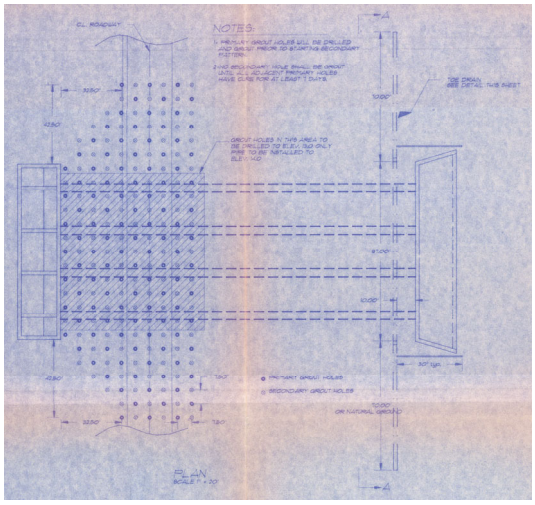
1976 SD Seepage Event

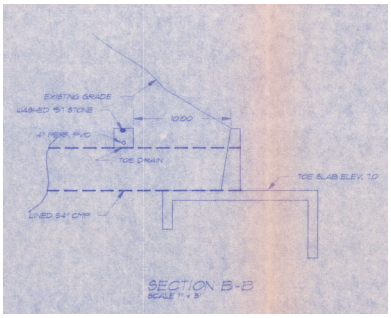


1986-1987 SD Seepage Event



1986-1987 SD Seepage Event





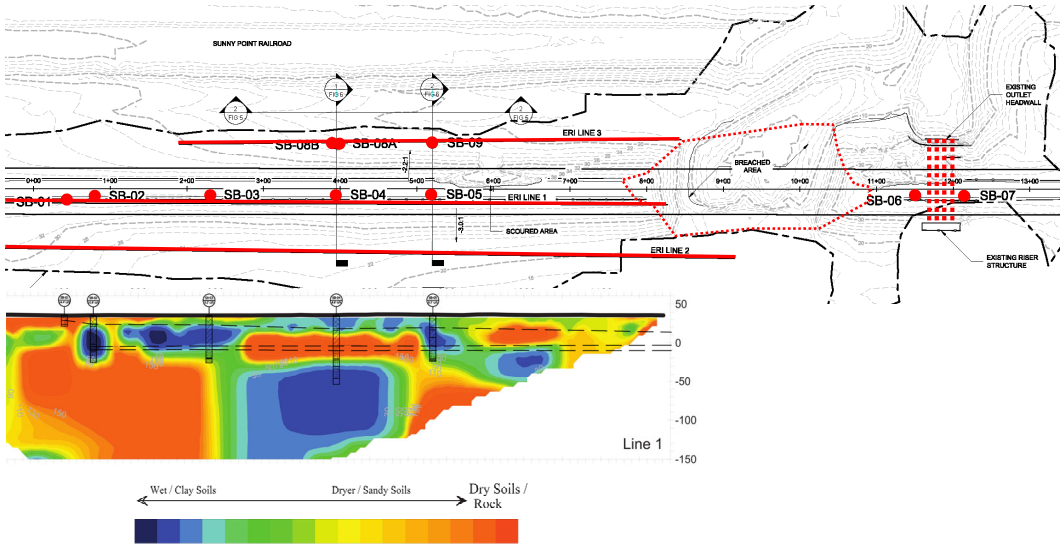
2001-2002 SD Seepage Event

Schnabel Photograph, February 2002

Overview of SD Exploration

- Intent of Exploration
  - Confirm approximate geometry of the dam
  - Characterize fill soils and foundation soils
  - Characterize foundation rock
  - Measure permeability in rock and foundation soils.
  - Evaluate variability in foundation rock
- Exploration Methods
  - Records review
  - Electrical Resistivity Imaging (ERI) geophysical survey
  - Auger borings with SPTs
  - Hydraulic conductivity (slug) testing
  - HQ-size rock coring
  - Hydraulic conductivity (Packer) testing in rock

Overview of SD Exploration



SD Foundation Rock

Calcirudite Limestone
(“shell-mold”)

Castle Hayne Formation

Calcarenite Limestone
(“shell-hash”)

Conclusions from SD Exploration

- Location of concentrated seepage
- Variability of foundation rock
- Existing spillway structure
- Soils at existing spillway

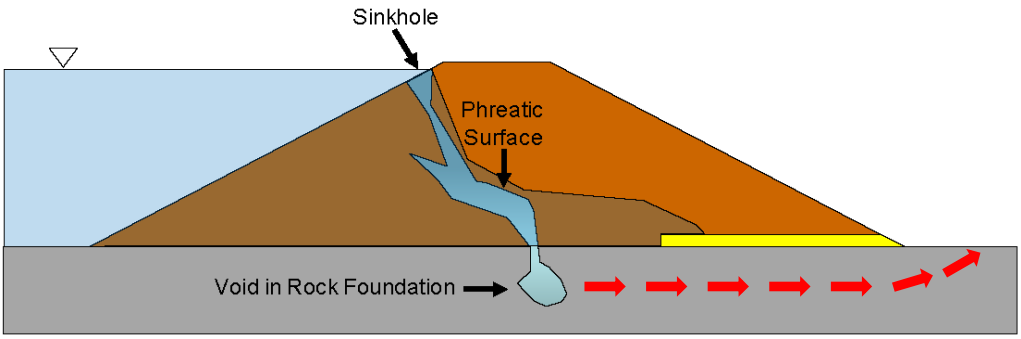
SD Design Goals

- Reduce risk to Dam Safety due to uncontrolled seepage
- Safely pass design flood
- Restore the lake to pre-breach condition
- Extend design life
- Facilitate ability to drain lake
- Promote public safety
- Meet additional current codes and standards

SD Common Design Modifications

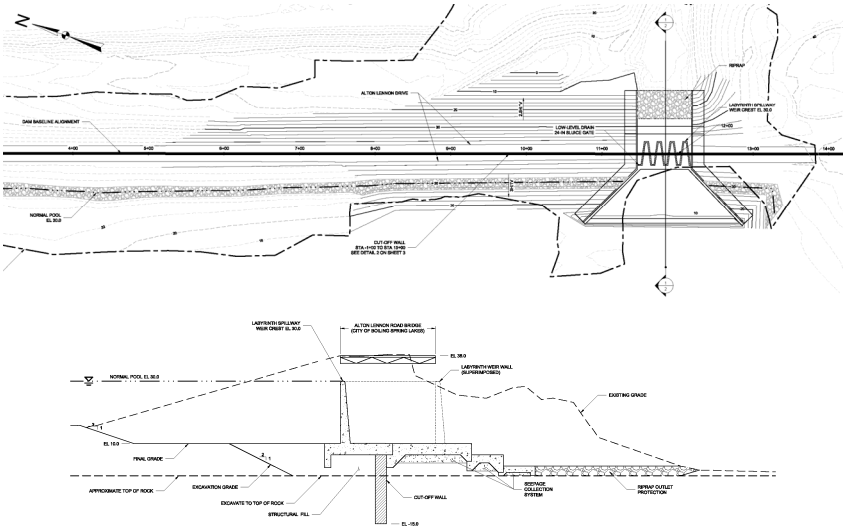
- New Spillway
- Repair / regrade embankment
- Install positive seepage cutoff
- Remove existing spillway

Seepage Failure Mode

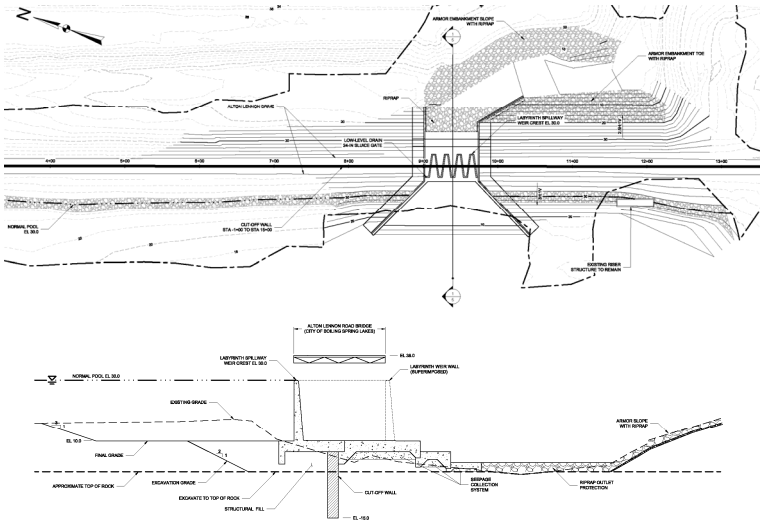


(taken from Best Practices in Dam and Levee Safety Risk Analysis, USBR / USACE, 2015)

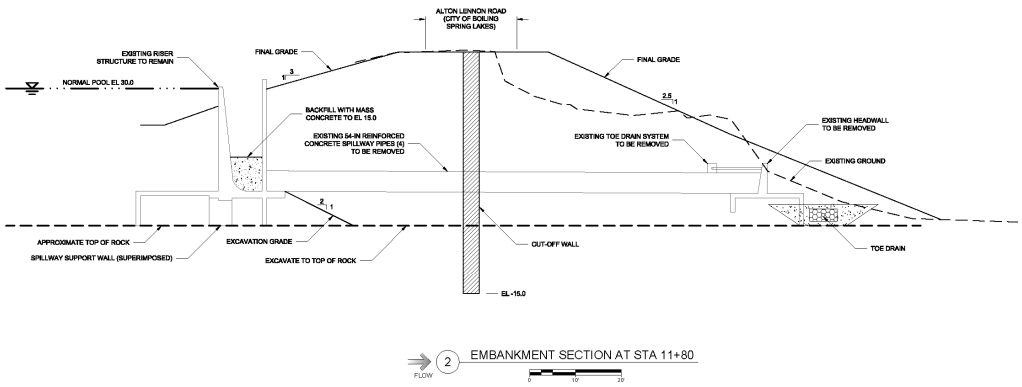
SD Alt. 1A – Labyrinth in Existing Footprint



SD Alt. 1B – Labyrinth in Breach

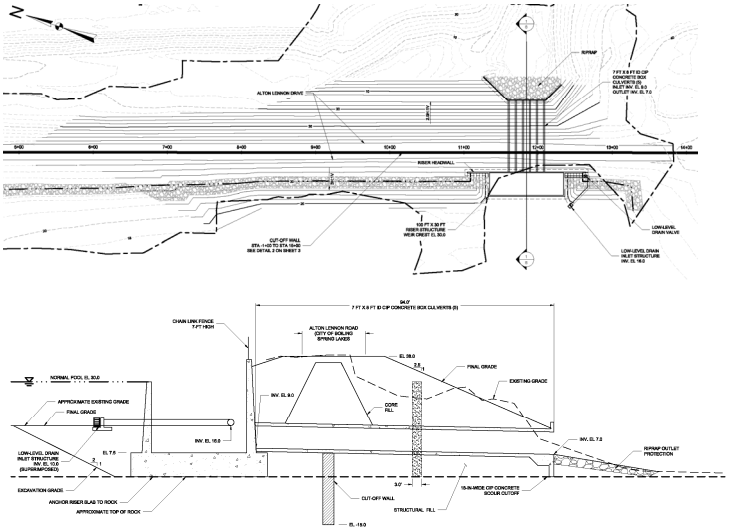


SD Existing Spillway Removal

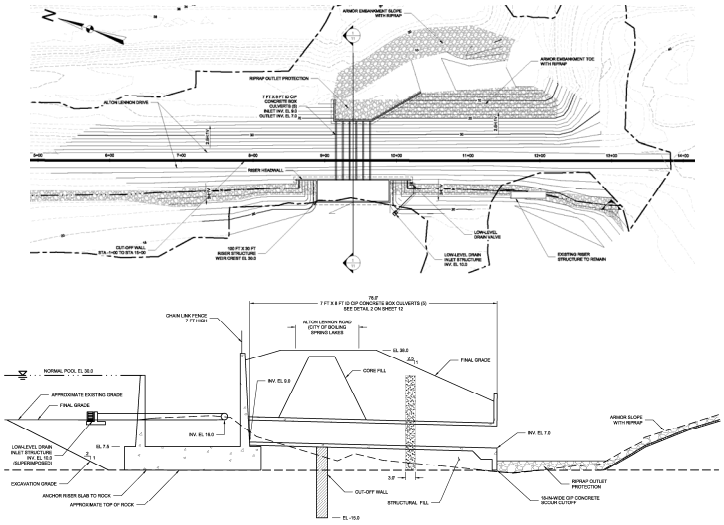


Example Labyrinth Spillway

SD Alt. 2A – Riser in Existing Spillway Footprint



SD Alt. 2B – Riser in Breach



Conclusion

- Any objections to the presented approach/alternatives?
- The most cost effective solution will be recommended for design.

Discussion

?

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
S. DANIEL SMITH
Director

NORTH CAROLINA
Environmental Quality

December 27, 2019

Michael Hanson, PE
McGill Associates
1915 Evans Road
Cary, NC 27513

RE: Hazard Potential Assessment
Boiling Springs Dams
Brunswick County
Dam ID: BRUNS-001/BRUNS-002/Upper and Middle Lake Dams
High Hazard

Dear Mr. Hanson:

This letter is in response to your letter Dated April 03, 2019 on a Hazard Potential Assessment of the Boiling Springs Dam which was submitted to our office for review. Your letter was subsequent to our meeting with your staff on January 10, 2019 where the NC Dam Safety expressed their concerns on the current classification of the subject dams.

A conclusion from the meeting was that all dams including the largest dam, Sanford Dam will be analyzed as one system. Sanford dam has been classified to be a High Hazard Dam since 2007. Both North Lake and Pine lake dams which were previously identified as Low Hazard dams are now considered to be High Hazard Dams because of high Average Daily Traffic (ADT) on East Boiling Springs Road. Upper and Middle dams flow into the Sanford Lake dam. It is our opinion that a breach of either Upper or Middle Dam would likely result in a cascade type failure of the Sanford Lake Dam. According to Section 15ANCAC02K.0105 of the NC Dam Safety Law, when dams are spaced such that the failure of the upper Dam would likely fail a lower dam, the consequence of the lower dam's failure shall be the determining factor for the Upper Dams hazard classification. Therefore, in our opinion all dams associated with the Sanford Lake Dam in the Boiling Springs area will be classified as High Hazard going forward.

Please use the following state IDs for the Boiling Springs Dams in future.

BRUNS-001	North Lake Dam
BRUNS-002	Pine Lake Dam
BRUNS-003	Sanford Lake Dam
BRUNS-011	Middle Dam
BRUNS-012	Upper Dam

The North Carolina Dam Safety Law of 1967 requires that the reconstruction of these dams shall meet current codes and standards as stated in the North Carolina Dam Safety Law and Rules, as amended (NCGS 143-215.23 through 37) and North Carolina Administrative Code, Title 15A, Subchapter 2K: Dam Safety (15A NCAC 02K).

For assistance, you may contact Mr. Dan Sams, PE, Regional Supervisor, at (910) 796-7215 or Art Sengupta, PE, Dam Safety Program in the Raleigh Central Office at telephone number (919) 707-9219.

Sincerely,

George L. Eller

George L. Eller, PE
State Dam Safety Engineer

gle/as

cc: Mr. Dan Sams, PE, Land Quality Regional Supervisor, Wilmington
Dori Sabeh, PE, McGill and Associates, Cary, NC

NC DAM SAFETY INVENTORY DATA

Based on spreadheet obtained from NC Dam Safety webpage on January 7, 2020. Received from Erica Langdon: erica.langdon@ncdenr.gov

STATE_ID	BRUNS-001	BRUNS-002	BRUNS-003	BRUNS-011	BRUNS-012
NID_ID	NC01108	NC01109	NC01110	NC05978	NC06405
Dam Name	North Lake Dam	Pine Lake Dam	Boiling Springs Lake Dam	Boiling Springs Lake Upper Dam	Upper (Allen Creek) Dam
OTHER_DAM_NAMES			Sanford Lake Dam		
EAP	N	N	Y	N	N
EAP_DATE			01/15/2016		
PHASE_1_REPORT	N	N	Y	N	N
DAM_STATUS	EXEMPT	EXEMPT	IMPOUNDING	IMPOUNDING	IMPOUNDING
DAM_HAZARD_POTENTIAL_DESCRIPTI	Low	Low	High	High	High
HAZARD_DATE	01/01/1900	01/01/1900	12/13/2007	04/14/2010	09/12/2019
COUNTY	Brunswick	Brunswick	Brunswick	Brunswick	Brunswick
REGION	WIRO	WIRO	WIRO	WIRO	WIRO
QUADRANGLE_NAME	Funston	Funston	Funston	Funston	Funston
LATITUDE	34.043	34.034	34.0462	34.0239	34.0216
LONGITUDE	-78.053	-78.064	-78.0373	-78.0658	-78.0693
RIVER_STREAM	Allen Creek	Allen Creek	Allen Creek	Allen Creek	Allen Creek
RIVER_BASIN	Cape Fear	Cape Fear	Cape Fear	Cape Fear	Cape Fear
NEAREST_TOWN	Orton	Orton	Orton	Boiling Springs Lake	Boiling Springs
DISTANCE_TO_NEAREST_TOWN	7	8	6		
DAM_TYPE	RE	RE	RE	RE	OT
DAM_PURPOSE	R	R	R	R	O
YEAR CONSTRUCTED	1964	1964	1964		
CONSTRUCTED_BY	Vonolson & Assoc	Vonolson & Assoc	Vonolson & Assoc		
TYPE_MODIFY_REPAIR					
MODIFY_REPAIR_YEAR					
STRUCTURAL_HEIGHT	10.0	10.0	30.0	9.0	
NORMAL_FREEBOARD			5.0	5.5	
HYDRAULIC_HEIGHT			25.0	3.5	
CREST_LENGTH	600	1040	1584	600	
CREST_WIDTH				25	
UPSTREAM_SLOPE				3.0	
DOWNSTREAM_SLOPE				3.0	
BOTTOM_DRAIN	U	U	U	Y	
BOTTOM_DRAIN_OPERABLE	U	U	U	Y	
NORMAL POOL ELEV.					
DRAINAGE_AREA(Ac)	1024	544	6381	240	
SURFACE_AREA(Ac)			200.0	80.0	
NORMAL_POOL_CAPACITY(Ac-Ft)			3000	0	
MAX_IMPOUNDMENT_CAPACITY(Ac-Ft)	250	400	3600	300	
MAX_DISCHARGE_CFS	198	198	132	0	
MINIMUM_RELEASE_CFS				0.00	
PRIMARY_SPILLWAY_TYPE					
EMRGENCY_SPILLWAY_TYPE					
INSPECTORS	James, Trent	James, Trent	James, Trent	James, Trent	
CONDITION ASSESSMENT	Not Rated	Not Rated	Not Rated	Not Rated	
LAST_INSPECTION_DATE	01/15/2019	01/15/2019	09/25/2018	01/22/2019	
NEXT_INSPECTION_DATE	01/15/2019	01/15/2020	04/01/2016	01/22/2020	
NOD_DATE					
NOD_DEADLINE_DATE					
NOD_RESOLVED					
NOV_RESOLVED					
DSO_DATE					
DSO_DEADLINE					
DSO_RESOLVED					
Owner	Boiling Springs Lake Development	Boiling Springs Lake Development	Boiling Springs Lake Development	Reeves Telecom, LLP	
Owner Type	Private	Local Gov	Local Gov	Utility	
ADDR_LINE1	CO: Town Manager	CO: Town Manager	CO: Town Manager	3142 Georges II Hwy	
ADDR_LINE2	Boiling Springs Town Council,	Boiling Springs Town Council,	Boiling Springs Town Council,		
CITY	Boiling Springs,	Boiling Springs,	Boiling Springs,	Boiling Springs Lake	
STATE	NC	NC	NC	NC	
ZIP	28461	28461	28461	28461	
Phone	9999999999	9999999999	9999999999	9100000000	

Appendix 2 – Hydrology and Hydraulics

DAMS CONSTRUCTION/RECONSTRUCTION PROJECT

CITY OF BOILING SPRING LAKES

North Lake Dam (BRUNS-001), Pine Lake Dam (BRUNS-002), Sanford Dam (BRUNS-003), Upper Lake Dam (BRUNS-012)

5400 Trinity Road, Suite 107

Raleigh, North Carolina 27607

Firm License No.: C-0459

DECEMBER 2020

20.07036

Weighted Curve Number Calculations

Drainage Area 1 Weighted Curve Number Summary

HSG	LandCover	area_ac	CN	CN * Area
B/D	Open Water	0.12	100	12.28
A/D	Open Water	0.32	100	31.99
N/A	Open Water	21.17	100	2116.52
A	Developed, Open Space	2.10	39	82.07
B/D	Developed, Open Space	4.93	61	300.49
A/D	Developed, Open Space	43.43	39	1693.70
N/A	Developed, Open Space	0.03	61	1.96
A	Developed, Low Intensity	1.84	51	93.92
B/D	Developed, Low Intensity	1.28	68	87.17
A/D	Developed, Low Intensity	2.47	51	126.06
N/A	Developed, Low Intensity	0.39	68	26.72
A/D	Developed, Low Intensity	1.53	51	77.96
A	Evergreen Forest	1.92	30	57.53
B/D	Evergreen Forest	36.69	79	2898.23
A/D	Evergreen Forest	277.26	79	21903.72
N/A	Evergreen Forest	3.06	58	177.47
A	Shrub/Scrub	0.27	30	8.15
B/D	Shrub/Scrub	7.19	73	524.65
A/D	Shrub/Scrub	64.13	73	4681.49
B/D	Grassland/Herbaceous	0.10	80	7.75
A/D	Grassland/Herbaceous	7.86	80	628.83
A	Cultivated Crops	0.81	72	58.12
A/D	Cultivated Crops	0.03	91	2.90
A	Woody Wetlands	1.44	98	140.94
B/D	Woody Wetlands	59.97	98	5876.78
A/D	Woody Wetlands	618.99	98	60660.59
N/A	Woody Wetlands	6.24	98	611.87
A/D	Emergent Herbaceous Wetlands	5.44	98	532.63
N/A	Emergent Herbaceous Wetlands	0.08	98	7.38
			Total Area (AC):	1171.07
			Sum of Area*Curve Number:	103429.91
			Weighted Curve Number:	88.3

Drainage Area 2 Weighted Curve Number Summary

HSG	LandCover	Area (ac)	CN	CN * Area
B/D	Woody Wetlands	440.32	98	43151.72
A/D	Woody Wetlands	430.22	98	42161.69
B/D	Grassland/Herbaceous	0.82	80	65.36
B/D	Developed, Low Intensity	0.78	68	53.28
A/D	Developed, Low Intensity	4.11	51	209.79
N/A	Developed, Low Intensity	0.27	68	18.47
A/D	Developed, Low Intensity	0.16	51	7.91
A	Shrub/Scrub	0.11	30	3.24
B/D	Shrub/Scrub	2.96	73	215.88
A/D	Shrub/Scrub	24.46	73	1785.36
A	Developed, Open Space	0.04	39	1.69
B/D	Developed, Open Space	5.60	61	341.34
A/D	Developed, Open Space	84.48	39	3294.87
N/A	Developed, Open Space	0.76	61	46.32
N/A	Emergent Herbaceous Wetlands	0.32	98	30.97
B/D	Evergreen Forest	2.95	79	233.07
A/D	Evergreen Forest	278.33	79	21988.12
N/A	Evergreen Forest	1.29	58	75.05
B/D	Open Water	0.00	100	0.15
N/A	Open Water	3.05	100	305.15
			Total Area (AC):	1281.03
			Sum of Area*Curve Number:	113989.44
			Weighted Curve Number:	89.0

Drainage Area 3 Weighted Curve Number Summary

HSG	LandCover	Area (ac)	CN	CN * Area
A	Woody Wetlands	8.33	98	816.61
B/D	Woody Wetlands	183.13	98	17946.31
A/D	Woody Wetlands	122.98	98	12052.23
N/A	Woody Wetlands	3.84	98	376.49
B/D	Grassland/Herbaceous	0.98	80	78.47
A/D	Grassland/Herbaceous	1.29	80	103.08
N/A	Grassland/Herbaceous	4.62	61	281.71
A	Developed, Low Intensity	1.91	51	97.27
B/D	Developed, Low Intensity	0.62	68	42.09
A/D	Developed, Low Intensity	9.15	51	466.78
N/A	Developed, Low Intensity	0.00	68	0.14
A/D	Developed, Low Intensity	2.62	51	133.77
A	Shrub/Scrub	6.21	30	186.18
B/D	Shrub/Scrub	1.03	73	74.94
A/D	Shrub/Scrub	1.85	73	135.15
N/A	Shrub/Scrub	0.28	58	16.39
A	Developed, Open Space	5.42	39	211.49
B/D	Developed, Open Space	1.50	61	91.40
A/D	Developed, Open Space	40.02	39	1560.62
N/A	Developed, Open Space	0.68	61	41.62
A	Emergent Herbaceous Wetlands	1.77	98	173.60
B/D	Emergent Herbaceous Wetlands	0.77	98	75.47
A/D	Emergent Herbaceous Wetlands	5.93	98	581.07
N/A	Emergent Herbaceous Wetlands	12.80	98	1254.56
A	Cultivated Crops	2.49	72	179.18
A/D	Cultivated Crops	0.17	91	15.55
A	Evergreen Forest	3.24	30	97.20
B/D	Evergreen Forest	0.85	79	67.52
A/D	Evergreen Forest	85.97	79	6791.97
A/D	Barren Land	4.61	90	415.29
A/D	Developed, Medium Intensity	1.69	57	96.11
A/D	Developed, High Intensity	0.81	61	49.24
			Total Area (AC):	517.57
			Sum of Area*Curve Number:	44509.50
			Weighted Curve Number:	86.0

Drainage Area 4 Weighted Curve Number Summary

HSG	LandCover	Area (ac)	CN	CN * Area
B/D	Woody Wetlands	222.05	98	21760.73
A/D	Woody Wetlands	306.26	98	30013.38
N/A	Woody Wetlands	0.67	98	65.92
A/D	Grassland/Herbaceous	1.22	80	97.71
B/D	Developed, Low Intensity	10.49	68	713.16
A/D	Developed, Low Intensity	10.31	51	525.66
N/A	Developed, Low Intensity	0.00	68	0.11
A/D	Developed, Low Intensity	3.47	51	176.78
B/D	Shrub/Scrub	2.62	73	191.34
A/D	Shrub/Scrub	6.03	73	440.45
N/A	Shrub/Scrub	0.11	58	6.17
B/D	Developed, Open Space	25.11	61	1531.79
A/D	Developed, Open Space	27.76	39	1082.56
N/A	Developed, Open Space	0.06	61	3.83
A/D	Emergent Herbaceous Wetlands	0.07	98	6.59
A/D	Cultivated Crops	7.39	91	672.12
B/D	Evergreen Forest	35.68	79	2818.88
A/D	Evergreen Forest	48.81	79	3855.89
N/A	Evergreen Forest	1.75	58	101.67
B/D	Open Water	1.97	100	196.93
N/A	Open Water	12.39	100	1239.08
B/D	Developed, Medium Intensity	0.72	72	51.63
A/D	Developed, Medium Intensity	2.68	57	152.69
A/D	Developed, High Intensity	0.44	61	27.13
			Total Area (AC):	728.05
			Sum of Area*Curve Number:	65732.20
			Weighted Curve Number:	90.3

Drainage Area 5.A Weighted Curve Number Summary

HSG	LandCover	Area (ac)	CN	CN * Area
A	Woody Wetlands	0.31	98	30.66
B/D	Woody Wetlands	32.93	98	3227.44
A/D	Woody Wetlands	305.44	98	29933.04
N/A	Woody Wetlands	0.54	98	52.69
B/D	Grassland/Herbaceous	0.79	80	62.92
A/D	Grassland/Herbaceous	0.31	80	24.49
A	Developed, Low Intensity	11.81	51	602.40
B/D	Developed, Low Intensity	19.42	68	1320.27
A/D	Developed, Low Intensity	4.35	51	221.72
N/A	Developed, Low Intensity	0.24	68	16.22
A/D	Developed, Low Intensity	0.27	51	14.00
A	Shrub/Scrub	11.93	30	357.97
B/D	Shrub/Scrub	14.14	73	1032.33
N/A	Shrub/Scrub	0.16	58	9.20
A	Developed, Open Space	18.94	39	738.63
B/D	Developed, Open Space	53.22	61	3246.26
A/D	Developed, Open Space	79.41	39	3097.16
N/A	Developed, Open Space	0.30	61	18.53
A/D	Cultivated Crops	4.48	91	407.47
A	Evergreen Forest	17.20	30	515.99
B/D	Evergreen Forest	123.61	79	9765.24
A/D	Evergreen Forest	129.44	79	10225.80
N/A	Evergreen Forest	3.98	58	230.65
A	Open Water	1.39	100	138.81
B/D	Open Water	6.04	100	603.66
N/A	Open Water	29.69	100	2969.09
N/A	Developed, Medium Intensity	0.04	72	2.55
			Total Area (AC):	870.37
			Sum of Area*Curve Number:	68865.20
			Weighted Curve Number:	79.1

Drainage Area 5.B Weighted Curve Number Summary

HSG	LandCover	Area (ac)	CN	CN * Area
A	Woody Wetlands	18.59	98	1821.78
B/D	Woody Wetlands	68.71	98	6733.83
A/D	Woody Wetlands	22.74	98	1159.87
N/A	Woody Wetlands	2.07	98	140.58
B/D	Grassland/Herbaceous	0.42	80	21.29
A/D	Grassland/Herbaceous	0.01	80	0.57
A	Developed, Low Intensity	0.03	51	1.70
B/D	Developed, Low Intensity	37.12	68	1113.60
A/D	Developed, Low Intensity	1.57	51	114.33
N/A	Developed, Low Intensity	1.27	68	93.00
A/D	Developed, Low Intensity	2.86	51	166.12
A	Shrub/Scrub	32.82	30	1279.85
B/D	Shrub/Scrub	8.76	73	534.18
A/D	Shrub/Scrub	17.11	73	667.17
N/A	Shrub/Scrub	0.57	58	34.91
A	Developed, Open Space	0.31	39	29.99
B/D	Developed, Open Space	0.47	61	45.98
A/D	Developed, Open Space	23.85	39	715.59
N/A	Developed, Open Space	18.29	61	1444.88
A	Emergent Herbaceous Wetlands	46.34	98	3660.83
N/A	Emergent Herbaceous Wetlands	1.99	98	115.70
A/D	Cultivated Crops	4.00	91	400.02
A	Evergreen Forest	0.37	30	36.88
B/D	Evergreen Forest	28.81	79	2880.84
A/D	Evergreen Forest	0.93	79	53.21
			Total Area (AC):	340.01
			Sum of Area*Curve Number:	23266.71
			Weighted Curve Number:	68.4

Drainage Area 6 Weighted Curve Number Summary

HSG	LandCover	Area (ac)	CN	CN * Area
A	Open Water	8.25	100	825.14
B/D	Open Water	16.90	100	1689.61
A/D	Open Water	0.49	100	48.66
N/A	Open Water	245.14	100	24513.66
A	Developed, Open Space	258.27	39	10072.67
B/D	Developed, Open Space	201.27	61	12277.40
A/D	Developed, Open Space	127.09	39	4956.39
N/A	Developed, Open Space	12.15	61	741.25
A	Developed, Low Intensity	136.85	51	6979.47
B/D	Developed, Low Intensity	68.82	68	4679.67
A/D	Developed, Low Intensity	29.07	51	1482.71
N/A	Developed, Low Intensity	7.26	68	493.82
A/D	Developed, Low Intensity	3.57	51	182.17
A	Developed, Medium Intensity	4.43	57	252.25
B/D	Developed, Medium Intensity	2.20	72	158.14
A/D	Developed, Medium Intensity	2.08	57	118.51
N/A	Developed, Medium Intensity	2.46	72	176.85
A/D	Developed, High Intensity	0.22	61	13.57
N/A	Developed, High Intensity	0.22	75	16.68
A/D	Barren Land	1.56	90	140.11
A	Evergreen Forest	86.62	30	2598.67
B/D	Evergreen Forest	98.15	79	7753.70
A/D	Evergreen Forest	155.48	79	12283.21
N/A	Evergreen Forest	12.04	58	698.54
A	Shrub/Scrub	33.61	30	1008.30
B/D	Shrub/Scrub	51.49	73	3758.70
A/D	Shrub/Scrub	25.06	73	1829.34
N/A	Shrub/Scrub	11.14	58	646.33
A	Grassland/Herbaceous	0.89	39	34.64
B/D	Grassland/Herbaceous	8.03	80	642.15
A/D	Grassland/Herbaceous	4.32	80	345.38
A	Woody Wetlands	6.30	98	616.99
B/D	Woody Wetlands	97.75	98	9579.28
A/D	Woody Wetlands	134.09	98	13140.52
N/A	Woody Wetlands	2.33	98	228.70
A	Emergent Herbaceous Wetlands	1.91	98	187.52
B/D	Emergent Herbaceous Wetlands	2.70	98	264.81
A/D	Emergent Herbaceous Wetlands	1.99	98	195.43
N/A	Emergent Herbaceous Wetlands	9.64	98	944.94
			Total Area (AC):	1871.84
			Sum of Area*Curve Number:	126575.87
			Weighted Curve Number:	67.6

Drainage Area 7 Weighted Curve Number Summary

HSG	LandCover	Area (ac)	CN	CN * Area
A	Barren Land	4.06	36	146.28
A/D	Barren Land	0.12	90	10.55
A	Cultivated Crops	6.53	72	470.50
NA	Cultivated Crops	0.21	72	15.13
A	Developed, Low Intensity	115.46	51	5888.60
A/D	Developed, Low Intensity	9.55	68	649.70
B/D	Developed, Low Intensity	0.35	68	23.77
NA	Developed, Low Intensity	0.56	68	38.15
A	Developed, Medium Intensity	2.71	57	154.44
NA	Developed, Medium Intensity	0.26	57	14.55
A	Developed, Open Space	220.52	39	8600.44
A/D	Developed, Open Space	29.83	61	1819.41
B/D	Developed, Open Space	0.19	61	11.50
NA	Developed, Open Space	1.40	61	85.17
A	Emergent Herbaceous Wetlands	8.22	98	805.59
A/D	Emergent Herbaceous Wetlands	21.19	98	2076.50
B/D	Emergent Herbaceous Wetlands	6.25	98	612.82
NA	Emergent Herbaceous Wetlands	2.47	98	241.75
A	Evergreen Forest	278.50	30	8354.86
A/D	Evergreen Forest	103.93	79	8210.29
B/D	Evergreen Forest	1.53	79	120.55
NA	Evergreen Forest	1.56	79	123.46
A	Grassland/ Herbaceous	114.83	39	4478.47
A/D	Grassland/ Herbaceous	31.71	80	2536.42
B/D	Grassland/ Herbaceous	0.02	80	1.45
NA	Grassland/ Herbaceous	0.48	80	38.25
A	Open Water	3.64	100	363.90
B/D	Open Water	12.04	100	1204.48
NA	Open Water	12.79	100	1279.18
A	Shrub/ Scrub	235.35	30	7060.37
A/D	Shrub/ Scrub	21.19	73	1547.07
B/D	Shrub/ Scrub	0.00	73	0.33
NA	Shrub/ Scrub	0.85	73	62.06
A	Woody Wetlands	167.24	98	16389.34
A/D	Woody Wetlands	139.22	98	13643.60
B/D	Woody Wetlands	92.01	98	9016.55
NA	Woody Wetlands	0.65	98	64.14
			Total Area (AC):	1647.42
			Sum of Area*Curve Number:	96159.61
			Weighted Curve Number:	58.4

Drainage Area 8 Weighted Curve Number Summary

HSG	LandCover	area_ac	CN	CN * Area
A	Barren Land	97.95	36	3526.04
A/D	Barren Land	0.06	90	5.54
B/D	Barren Land	0.09	90	8.24
A	Developed, Low Intensity	1.33	51	67.90
A/D	Developed, Low Intensity	0.16	68	10.86
B/D	Developed, Low Intensity	0.95	68	64.67
A	Developed, Medium Intensity	0.09	57	5.29
A	Developed, Open Space	7.59	39	296.00
A/D	Developed, Open Space	0.17	61	10.46
B/D	Developed, Open Space	0.43	61	26.18
A	Emergent Herbaceous Wetlands	4.46	98	437.14
A/D	Emergent Herbaceous Wetlands	1.41	98	137.89
B/D	Emergent Herbaceous Wetlands	0.39	98	38.06
NA	Emergent Herbaceous Wetlands	1.15	98	112.67
A	Evergreen Forest	291.07	30	8731.95
A/D	Evergreen Forest	10.07	79	795.77
B/D	Evergreen Forest	6.50	79	513.53
NA	Evergreen Forest	0.28	79	22.40
A	Grassland/ Herbaceous	168.33	39	6564.93
A/D	Grassland/ Herbaceous	24.00	80	1919.65
B/D	Grassland/ Herbaceous	5.77	80	461.91
NA	Grassland/ Herbaceous	0.30	80	23.88
B/D	Open Water	8.61	100	860.94
NA	Open Water	0.60	100	60.22
A	Shrub/ Scrub	206.81	30	6204.27
A/D	Shrub/ Scrub	16.23	73	1185.01
B/D	Shrub/ Scrub	3.58	73	261.32
NA	Shrub/ Scrub	0.41	73	30.18
A	Woody Wetlands	152.73	98	14967.26
A/D	Woody Wetlands	47.39	98	4644.18
B/D	Woody Wetlands	118.18	98	11581.59
NA	Woody Wetlands	2.54	98	248.89
			Total Area (AC):	1179.63
			Sum of Area*Curve Number:	63824.85
			Weighted Curve Number:	54.1

Time of Concentration
Drainage Area 1

Sheet Flow
Manning's kinematic solution

T_t = travel time (hr)
n = Manning's roughness coefficient
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

= 4.91

Reach 1

		Surface Description	n			
n	=	Dense Grasses	0.25			
L	=	150	ft		Elevation 1	Elevation 2
s	=	0.01			57	55
T_t	=	0.360	hr			

Shallow Concentrated Flow

T_t = travel time (hr)
L = flow length (ft)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{L}{3600V}$$

$$V_{Paved} = 20.3282(s)^{0.5}$$

$$V_{Unpaved} = 16.1345(s)^{0.5}$$

Reach 2

Surface description (paved or unpaved)	=	unpaved				
L	=	750	ft		Elevation 1	Elevation 2
s	=	0.0040			55	52
V	=	1.02	ft/s			
T_t	=	0.200	hr			

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$

$$T_t = \frac{L}{3600V}$$

Reach 3

		Surface Description	n			
n	=	Weedy Channel	0.22			
L	=	11828	ft		Elevation 1	Elevation 2
s	=	0.0010			52	39.68
Channel Type	=	Trapezoid				
V	=	0.16	ft/s			
T_t	=	20.39	hr			

Total Time of Concentration = 20.95 hr

Time of Concentration
Drainage Area 2

Sheet Flow
Manning's kinematic solution

T_t = travel time (hr)
n = Manning's roughness coefficient
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

= 4.91

Reach 1

		Surface Description	n			
n	=	Dense Grasses	0.25			
L	=	150	ft		Elevation 1	Elevation 2
s	=	0.01			57	56
T_t	=	0.360	hr			

Shallow Concentrated Flow

T_t = travel time (hr)
L = flow length (ft)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{L}{3600V}$$

$$V_{Paved} = 20.3282(s)^{0.5}$$

$$V_{Unpaved} = 16.1345(s)^{0.5}$$

Reach 2

Surface description (paved or unpaved)	=	unpaved				
L	=	750	ft		Elevation 1	Elevation 2
s	=	0.0027			56	54
V	=	0.83	ft/s			
T_t	=	0.250	hr			

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$

$$T_t = \frac{L}{3600V}$$

Reach 3

		Surface Description	n			
n	=	Weedy Channel	0.22			
L	=	18237	ft		Elevation 1	Elevation 2
s	=	0.0009			54	38
Channel Type	=	Triangle				
V	=	0.00	ft/s			
T_t	=	23.41	hr			

Total Time of Concentration = 24.02 hr

Time of Concentration
Drainage Area 3

Sheet Flow
Manning's kinematic solution

T_t = travel time (hr)
n = Manning's roughness coefficient
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

= 4.91

Reach 1

		Surface Description	n			
n	=	Dense Grasses	0.25			
L	=	150	ft		Elevation 1	Elevation 2
s	=	0.01			59	58
T_t	=	0.360	hr			

Shallow Concentrated Flow

T_t = travel time (hr)
L = flow length (ft)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{L}{3600V}$$

$$V_{Paved} = 20.3282(s)^{0.5}$$

$$V_{Unpaved} = 16.1345(s)^{0.5}$$

Reach 2

Surface description (paved or unpaved)	=	unpaved				
L	=	750	ft		Elevation 1	Elevation 2
s	=	0.0027			58	56
V	=	0.83	ft/s			
T_t	=	0.250	hr			

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$

$$T_t = \frac{L}{3600V}$$

Reach 3

		Surface Description	n			
n	=	Weedy Channel	0.22			
L	=	7198	ft		Elevation 1	Elevation 2
s	=	0.0029			56	35
Channel Type	=	Triangle				
V	=	0.00	ft/s			
T_t	=	6.64	hr			

Total Time of Concentration = 7.25 hr

Time of Concentration
Drainage Area 4

Sheet Flow
Manning's kinematic solution

T_t = travel time (hr)
n = Manning's roughness coefficient
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in) = 4.91
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

Reach 1

		Surface Description	n			
n	=	Dense Grasses	0.25			
L	=	150	ft		Elevation 1	Elevation 2
s	=	0.02			61	58
T_t	=	0.270	hr			

Shallow Concentrated Flow

T_t = travel time (hr)
L = flow length (ft)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{L}{3600V}$$
$$V_{Paved} = 20.3282(s)^{0.5}$$
$$V_{Unpaved} = 16.1345(s)^{0.5}$$

Reach 2

Surface description (paved or unpaved)	=	unpaved				
L	=	750	ft		Elevation 1	Elevation 2
s	=	0.0013			58	57
V	=	0.59	ft/s			
T_t	=	0.350	hr			

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$
$$T_t = \frac{L}{3600V}$$

Reach 3

		Surface Description	n			
n	=	Weedy Channel	0.22			
L	=	12644	ft		Elevation 1	Elevation 2
s	=	0.0017			57	35
Channel Type	=	Triangle				
V	=	0.00	ft/s			
T_t	=	17.70	hr			

Total Time of Concentration = 18.32 hr

Time of Concentration
Drainage Area 5A

Sheet Flow
Manning's kinematic solution

T_t = travel time (hr)
n = Manning's roughness coefficient
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

= 4.91

Reach 1

		Surface Description	n			
n	=	Dense Grasses	0.25			
L	=	150	ft		Elevation 1	Elevation 2
s	=	0.02			65	62
T_t	=	0.270	hr			

Shallow Concentrated Flow

T_t = travel time (hr)
L = flow length (ft)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{L}{3600V}$$

$$V_{Paved} = 20.3282(s)^{0.5}$$

$$V_{Unpaved} = 16.1345(s)^{0.5}$$

Reach 2

Surface description (paved or unpaved)	=	unpaved				
L	=	750	ft		Elevation 1	Elevation 2
s	=	0.0053			62	58
V	=	1.18	ft/s			
T_t	=	0.180	hr			

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$

$$T_t = \frac{L}{3600V}$$

Reach 3

		Surface Description	n			
n	=	Weedy Channel	0.22			
L	=	8985	ft		Elevation 1	Elevation 2
s	=	0.0024			58	36
Channel Type	=	Triangle				
V	=	0.00	ft/s			
T_t	=	8.59	hr			

Total Time of Concentration = 9.04 hr

Time of Concentration
Drainage Area 5B

Sheet Flow
Manning's kinematic solution

T_t = travel time (hr)
n = Manning's roughness coefficient
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

= 4.91

Reach 1

		Surface Description	n			
n	=	Dense Grasses	0.25			
L	=	150	ft		Elevation 1	Elevation 2
s	=	0.0030			58.91	58.48
T_t	=	0.590	hr			

Shallow Concentrated Flow

T_t = travel time (hr)
L = flow length (ft)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{L}{3600V}$$

$$V_{Paved} = 20.3282(s)^{0.5}$$

$$V_{Unpaved} = 16.1345(s)^{0.5}$$

Reach 2

Surface description (paved or unpaved)	=	unpaved				
L	=	750	ft		Elevation 1	Elevation 2
s	=	0.0034			58.48	55.9
V	=	0.95	ft/s			
T_t	=	0.220	hr			

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$

$$T_t = \frac{L}{3600V}$$

Reach 3

		Surface Description	n			
n	=	Weedy Channel	0.25			
L	=	4493	ft		Elevation 1	Elevation 2
s	=	0.0038			55.9	38.8
Channel Type	=	Triangle				
V	=	0.00	ft/s			
T_t	=	4.33	hr			

Total Time of Concentration = 5.14 hr

Time of Concentration
Drainage Area 6

Sheet Flow
Manning's kinematic solution

T_t = travel time (hr)
n = Manning's roughness coefficient
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in) = 4.91
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

Reach 1

		Surface Description	n			
n	=	Dense Grasses	0.25			
L	=	150	ft		Elevation 1	Elevation 2
s	=	0.03			58	54
T_t	=	0.230	hr			

Shallow Concentrated Flow

T_t = travel time (hr)
L = flow length (ft)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{L}{3600V}$$

$$V_{Paved} = 20.3282(s)^{0.5}$$

$$V_{Unpaved} = 16.1345(s)^{0.5}$$

Reach 2

Surface description (paved or unpaved)	=	unpaved				
L	=	750	ft		Elevation 1	Elevation 2
s	=	0.0040			54	51
V	=	1.02	ft/s			
T_t	=	0.200	hr			

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$

$$T_t = \frac{L}{3600V}$$

Reach 3

		Surface Description	n			
n	=	Weedy Channel	0.22			
L	=	4522	ft		Elevation 1	Elevation 2
s	=	0.0044			51	31.09
Channel Type	=	Triangle				
V	=	0.26	ft/s			
T_t	=	4.77	hr			

Total Time of Concentration = 5.20 hr

Time of Concentration
Drainage Area 7

Sheet Flow
Manning's kinematic solution

T_t = travel time (hr)
n = Manning's roughness coefficient
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

= 4.91

Reach 1

		Surface Description	n			
n	=	Dense Grasses	0.25			
L	=	150	ft		Elevation 1	Elevation 2
s	=	0.01			52	51
T_t	=	0.360	hr			

Shallow Concentrated Flow

T_t = travel time (hr)
L = flow length (ft)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{L}{3600V}$$

$$V_{Paved} = 20.3282(s)^{0.5}$$
$$V_{Unpaved} = 16.1345(s)^{0.5}$$

Reach 2

Surface description (paved or unpaved)	=	unpaved				
L	=	750	ft		Elevation 1	Elevation 2
s	=	0.0107			51	43
V	=	1.67	ft/s			
T_t	=	0.120	hr			

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$

$$T_t = \frac{L}{3600V}$$

Reach 3a

		Surface Description	n			
n	=	Weedy Channel	0.22			
L	=	2288	ft		Elevation 1	Elevation 2
s	=	0.0118			43	16
Channel Type	=	Triangle				
V	=	0.36	ft/s			
T_t	=	1.77	hr			

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$

$$T_t = \frac{L}{3600V}$$

Reach 3b

		Surface Description	n			
n	=	Weedy Channel	0.045			
L	=	7015	ft		Elevation 1	Elevation 2
s	=	0.0016			16	5
Channel Type	=	Triangle				
V	=	0.52	ft/s			
T_t	=	3.74	hr			

Total Time of Concentration = 5.99 hr

Time of Concentration
Drainage Area 8

Sheet Flow
Manning's kinematic solution

T_t = travel time (hr)
n = Manning's roughness coefficient
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

= 4.91

Reach 1

		Surface Description	n			
n	=	Dense Grasses	0.25			
L	=	150	ft		Elevation 1	Elevation 2
s	=	0.01			52	51
T_t	=	0.360	hr			

Shallow Concentrated Flow

T_t = travel time (hr)
L = flow length (ft)
s = slope of hydraulic grade line (land slope, ft/ ft)

$$T_t = \frac{L}{3600V}$$

$$V_{Paved} = 20.3282(s)^{0.5}$$

$$V_{Unpaved} = 16.1345(s)^{0.5}$$

Reach 2

Surface description (paved or unpaved)	=	unpaved			
L	=	750	ft	Elevation 1	Elevation 2
s	=	0.0187		51	37
V	=	2.20	ft/s		
T_t	=	0.090	hr		

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$

$$T_t = \frac{L}{3600V}$$

Reach 3a

		Surface Description	n			
n	=	Weedy Channel	0.22			
L	=	5943	ft		Elevation 1	Elevation 2
s	=	0.0056			37	3.8
Channel Type	=	Triangle				
V	=	0.32	ft/s			
T_t	=	5.17	hr			

Open Channels

r = hydraulic radius
s = slope of hydraulic grade line (land slope, ft/ ft)
n = Manning's roughness coefficient for open channel flow
T_t = travel time (hr)

$$V = \frac{1.49r^{\frac{2}{3}}s^{0.5}}{n}$$

$$T_t = \frac{L}{3600V}$$

Reach 3b

		Surface Description	n			
n	=	Weedy Channel	0.045			
L	=	8859	ft		Elevation 1	Elevation 2
s	=	0.0008			3.8	-3
Channel Type	=	Triangle				
V	=	0.59	ft/s			
T_t	=	4.18	hr			

Total Time of Concentration = 9.81 hr

NOAA Atlas 14, Volume 2, Version 3
Location name: Boiling Spring Lakes, North Carolina, USA*
Latitude: 34.0363°, Longitude: -78.0508°
Elevation: 29.98 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.543 (0.505-0.586)	0.646 (0.600-0.697)	0.748 (0.693-0.806)	0.836 (0.772-0.900)	0.941 (0.865-1.01)	1.02 (0.938-1.10)	1.11 (1.01-1.19)	1.19 (1.08-1.28)	1.30 (1.16-1.40)	1.39 (1.23-1.51)
10-min	0.867 (0.806-0.936)	1.03 (0.959-1.12)	1.20 (1.11-1.29)	1.34 (1.24-1.44)	1.50 (1.38-1.61)	1.63 (1.49-1.75)	1.76 (1.60-1.89)	1.89 (1.71-2.03)	2.05 (1.84-2.22)	2.19 (1.94-2.37)
15-min	1.08 (1.01-1.17)	1.30 (1.21-1.40)	1.52 (1.40-1.63)	1.69 (1.56-1.82)	1.90 (1.75-2.04)	2.06 (1.89-2.22)	2.22 (2.02-2.39)	2.38 (2.15-2.57)	2.58 (2.31-2.79)	2.75 (2.44-2.98)
30-min	1.49 (1.38-1.60)	1.79 (1.67-1.94)	2.15 (2.00-2.32)	2.45 (2.26-2.64)	2.82 (2.59-3.03)	3.11 (2.85-3.35)	3.41 (3.10-3.67)	3.70 (3.35-3.99)	4.11 (3.68-4.45)	4.45 (3.95-4.83)
60-min	1.85 (1.72-2.00)	2.25 (2.09-2.43)	2.76 (2.56-2.98)	3.19 (2.95-3.44)	3.75 (3.45-4.03)	4.21 (3.86-4.53)	4.69 (4.27-5.05)	5.20 (4.70-5.60)	5.90 (5.28-6.38)	6.50 (5.76-7.05)
2-hr	2.21 (2.04-2.41)	2.69 (2.48-2.94)	3.40 (3.13-3.70)	4.00 (3.67-4.36)	4.85 (4.42-5.28)	5.58 (5.06-6.07)	6.35 (5.73-6.92)	7.20 (6.45-7.83)	8.44 (7.48-9.20)	9.52 (8.37-10.4)
3-hr	2.36 (2.17-2.59)	2.88 (2.65-3.17)	3.65 (3.35-4.00)	4.34 (3.96-4.76)	5.32 (4.83-5.83)	6.19 (5.59-6.78)	7.14 (6.39-7.81)	8.19 (7.27-8.95)	9.76 (8.56-10.7)	11.2 (9.67-12.2)
6-hr	2.95 (2.71-3.25)	3.60 (3.30-3.98)	4.57 (4.18-5.04)	5.44 (4.96-6.00)	6.70 (6.06-7.37)	7.82 (7.02-8.59)	9.05 (8.05-9.93)	10.4 (9.18-11.4)	12.5 (10.8-13.7)	14.3 (12.3-15.8)
12-hr	3.46 (3.14-3.85)	4.22 (3.82-4.69)	5.39 (4.88-6.00)	6.46 (5.82-7.18)	8.01 (7.15-8.88)	9.40 (8.33-10.4)	10.9 (9.61-12.1)	12.7 (11.0-14.0)	15.3 (13.1-17.0)	17.7 (15.0-19.6)
24-hr	4.05 (3.72-4.45)	4.91 (4.52-5.41)	6.35 (5.83-6.99)	7.62 (6.96-8.38)	9.57 (8.66-10.5)	11.3 (10.1-12.4)	13.3 (11.7-14.6)	15.5 (13.5-17.2)	19.0 (16.2-21.1)	22.1 (18.5-24.8)
2-day	4.66 (4.31-5.11)	5.64 (5.21-6.18)	7.23 (6.67-7.95)	8.62 (7.90-9.48)	10.7 (9.72-11.8)	12.6 (11.3-13.9)	14.7 (13.0-16.3)	17.1 (14.9-19.0)	20.7 (17.7-23.1)	23.9 (20.1-26.9)
3-day	4.90 (4.54-5.34)	5.91 (5.48-6.46)	7.54 (6.96-8.24)	8.94 (8.21-9.78)	11.0 (10.0-12.1)	12.9 (11.6-14.1)	14.9 (13.3-16.4)	17.2 (15.2-19.0)	20.8 (17.9-23.1)	23.9 (20.3-27.0)
4-day	5.13 (4.76-5.58)	6.19 (5.74-6.74)	7.84 (7.25-8.54)	9.25 (8.52-10.1)	11.4 (10.4-12.4)	13.2 (11.9-14.4)	15.2 (13.6-16.6)	17.4 (15.4-19.1)	20.9 (18.1-23.2)	23.9 (20.4-27.2)
7-day	5.82 (5.44-6.25)	7.01 (6.56-7.55)	8.82 (8.22-9.49)	10.3 (9.58-11.1)	12.5 (11.5-13.5)	14.4 (13.2-15.5)	16.4 (14.9-17.8)	18.6 (16.7-20.2)	21.8 (19.2-23.9)	24.5 (21.3-27.4)
10-day	6.53 (6.12-7.00)	7.82 (7.33-8.40)	9.68 (9.04-10.4)	11.3 (10.5-12.1)	13.5 (12.5-14.5)	15.4 (14.1-16.6)	17.4 (15.9-18.9)	19.7 (17.7-21.3)	22.9 (20.3-25.0)	25.5 (22.3-28.2)
20-day	8.76 (8.22-9.37)	10.4 (9.80-11.2)	12.7 (11.9-13.6)	14.6 (13.6-15.6)	17.3 (16.0-18.5)	19.5 (18.0-20.9)	21.8 (20.0-23.5)	24.3 (22.0-26.3)	27.8 (24.9-30.4)	30.7 (27.1-33.8)
30-day	10.8 (10.2-11.5)	12.9 (12.1-13.7)	15.5 (14.6-16.5)	17.5 (16.5-18.7)	20.4 (19.1-21.8)	22.7 (21.2-24.3)	25.1 (23.2-26.9)	27.6 (25.3-29.7)	31.0 (28.1-33.6)	33.7 (30.3-36.7)
45-day	13.4 (12.7-14.2)	15.8 (15.0-16.8)	18.8 (17.7-19.9)	21.1 (19.9-22.4)	24.4 (22.9-25.9)	27.0 (25.2-28.7)	29.6 (27.5-31.6)	32.3 (29.8-34.6)	36.0 (32.9-38.9)	38.9 (35.2-42.3)
60-day	16.1 (15.3-17.0)	19.0 (18.0-20.1)	22.2 (21.0-23.5)	24.7 (23.4-26.1)	28.1 (26.5-29.8)	30.8 (28.9-32.6)	33.4 (31.3-35.5)	36.1 (33.5-38.4)	39.6 (36.5-42.4)	42.3 (38.7-45.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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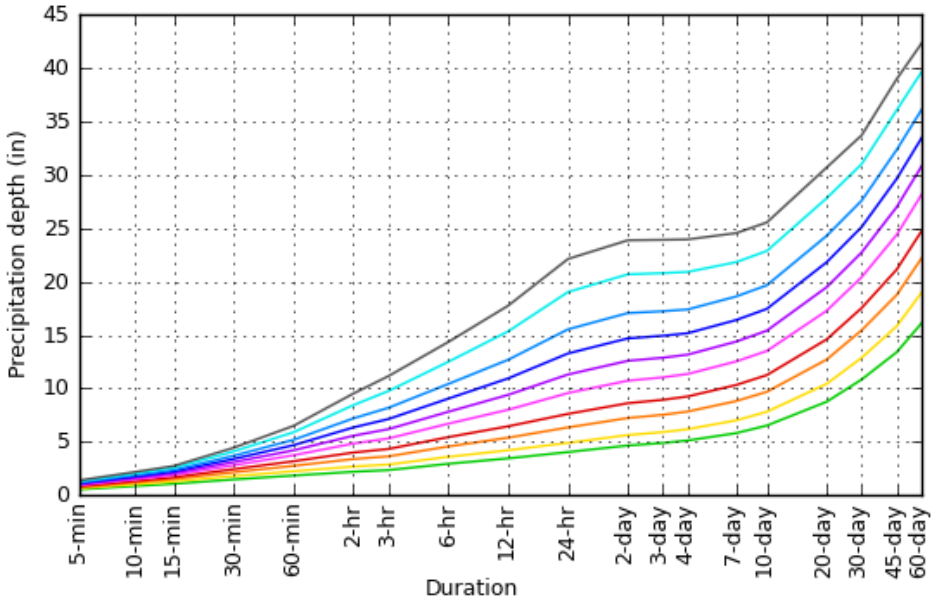
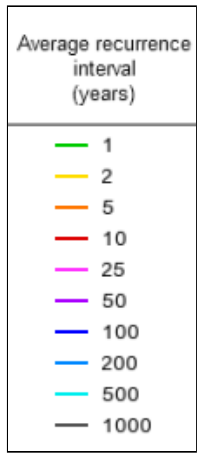
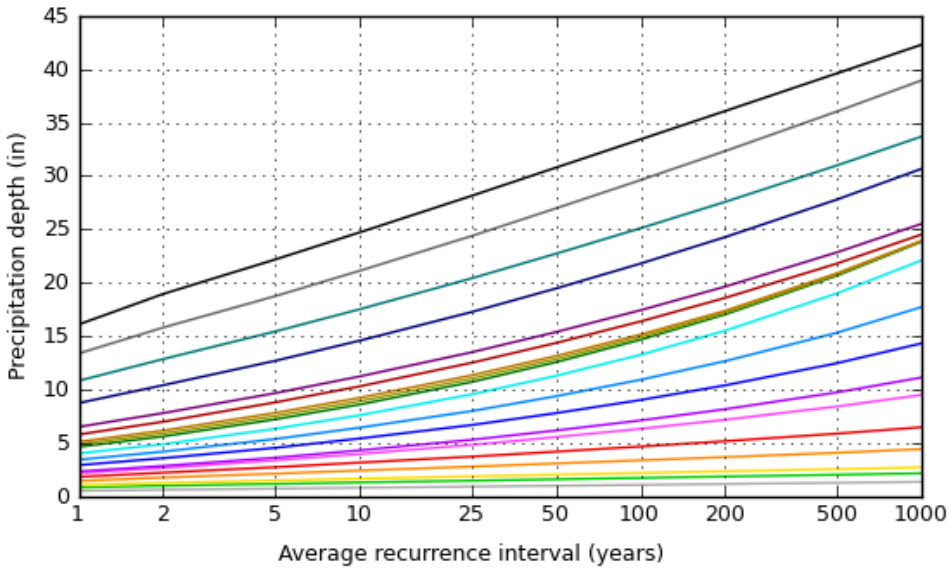
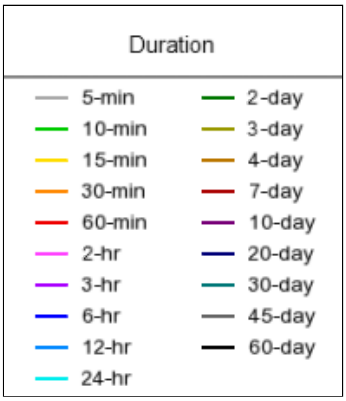
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 34.0363°, Longitude: -78.0508°









NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Thu Dec 5 15:06:24 2019

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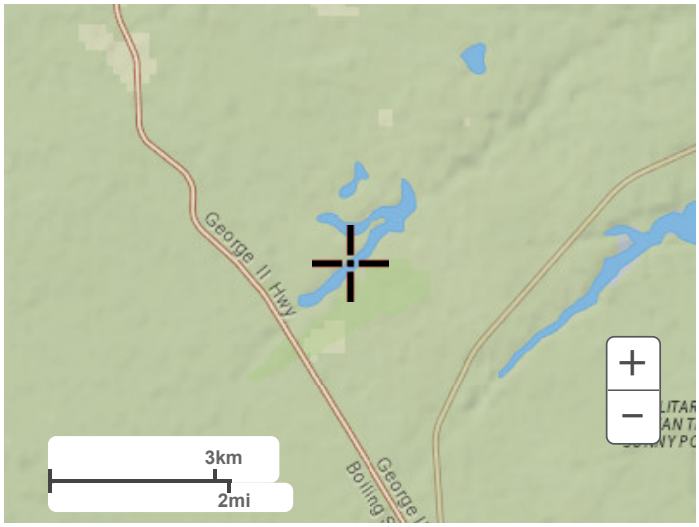
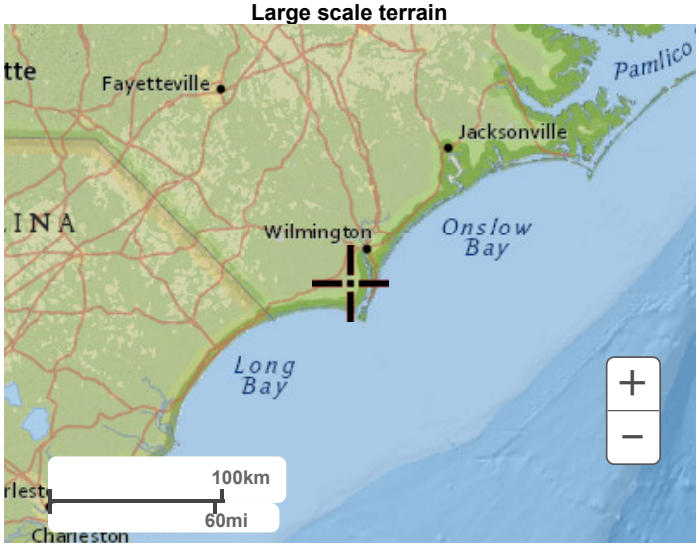
Maps & aerials

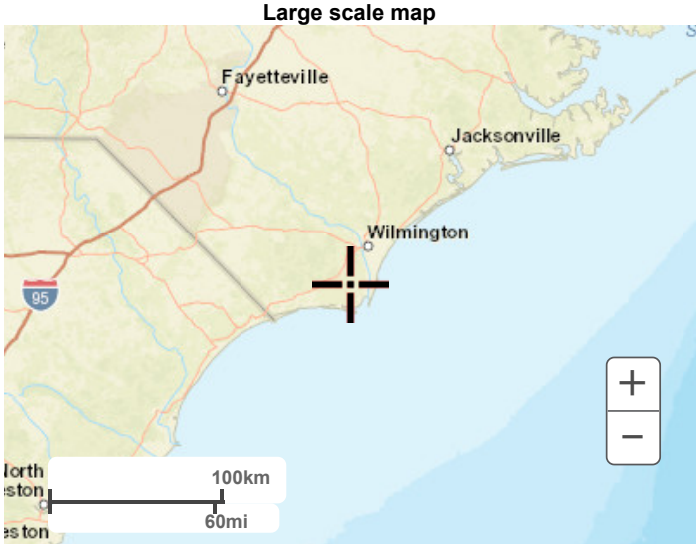
Small scale terrain



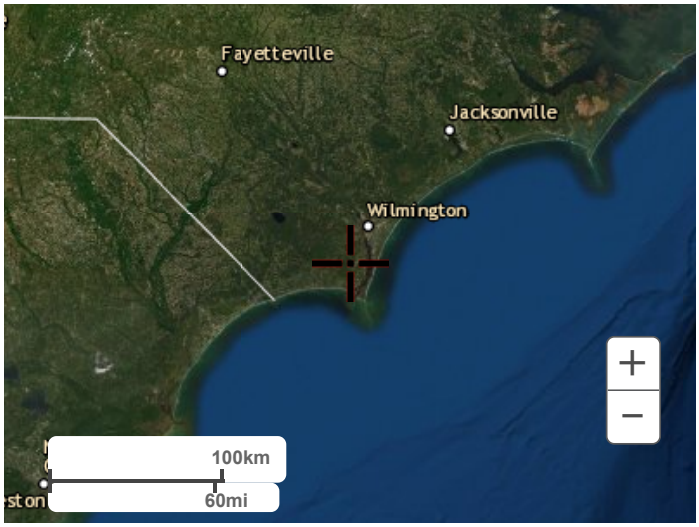
Large scale terrain



Large scale map



Large scale aerial



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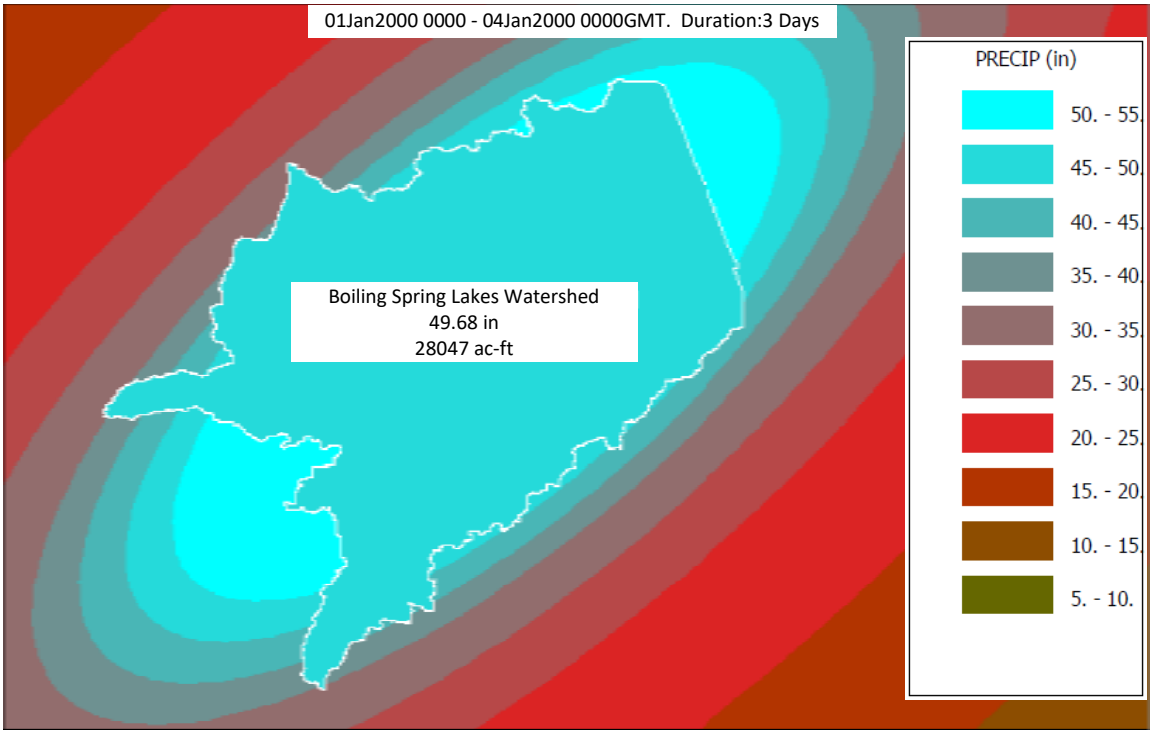
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

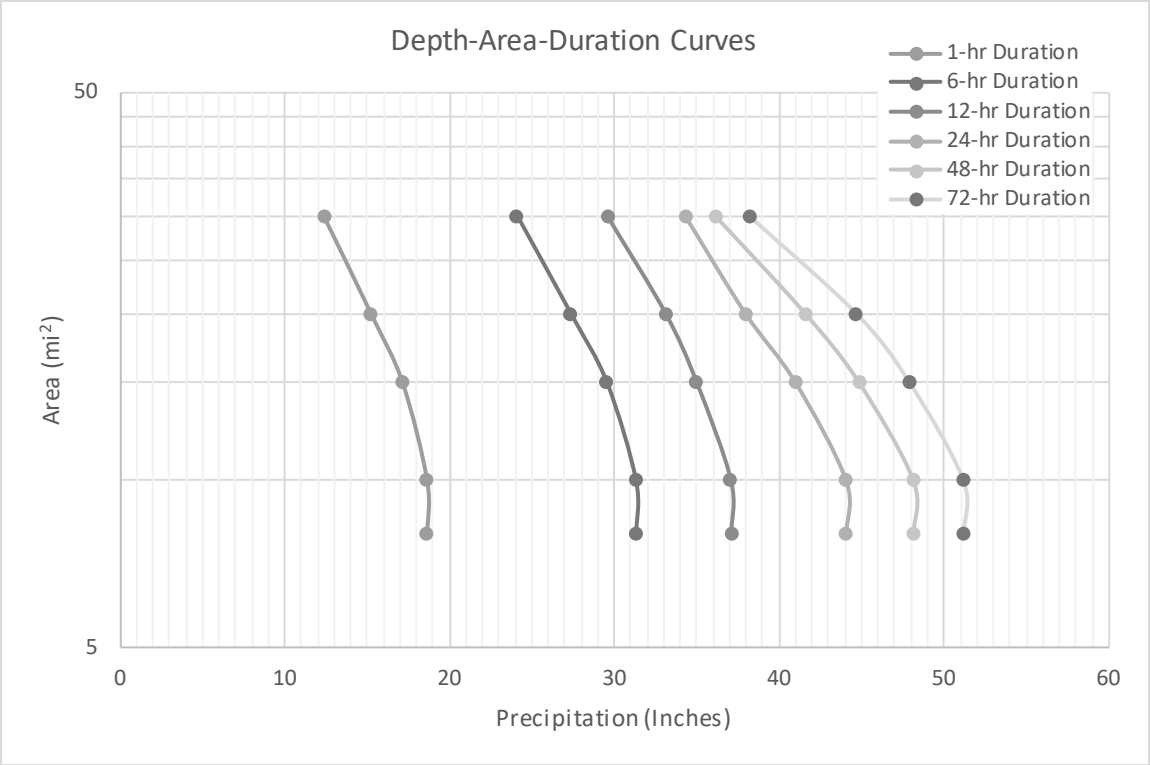
Probable Maximum Precipitation Temporal and Spatial Distribution for Boiling Spring Lakes Watershed

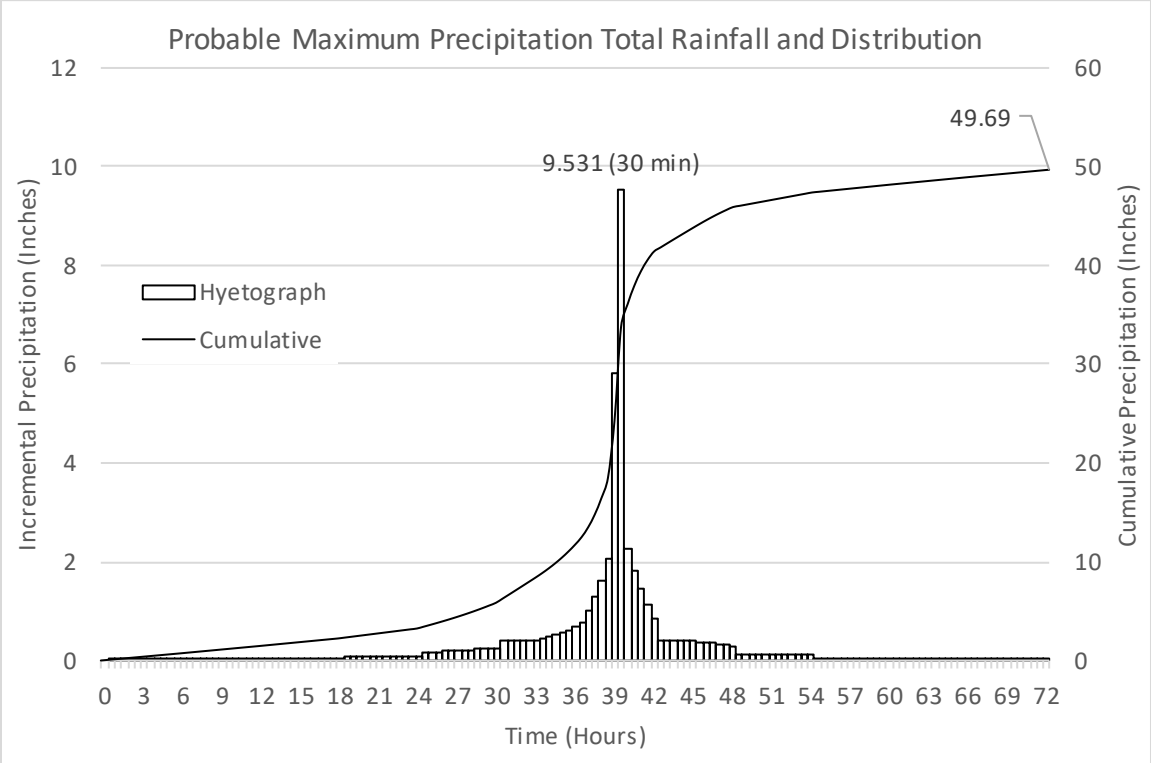
HEC-MetVue Results

Isohyetal pattern placed on the Boiling Spring Lakes Watershed



Basin	Intersected Avg Depth (in)	Intersected Area (sqmi)	Polygon Avg Depth (in)	Polygon Area (sq mi)	Area Delta (sq mi)	Add'l Volume (ac-ft)
Boiling Spring	49.68	10.59	49.68	10.59	0	28047


Depth-Area-Duration Curves
1-hr Duration
6-hr Duration
12-hr Duration
24-hr Duration
48-hr Duration
72-hr Duration
Area (mi²)
50
5
0
10
20
30
40
50
60
Precipitation (Inches)


Probable Maximum Precipitation Total Rainfall and Distribution
9.531 (30 min)
49.69
Hyetograph
Cumulative
Incremental Precipitation (Inches)
Cumulative Precipitation (Inches)
0 2 4 6 8 10 12
0 10 20 30 40 50 60
0 3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60 63 66 69 72
Time (Hours)

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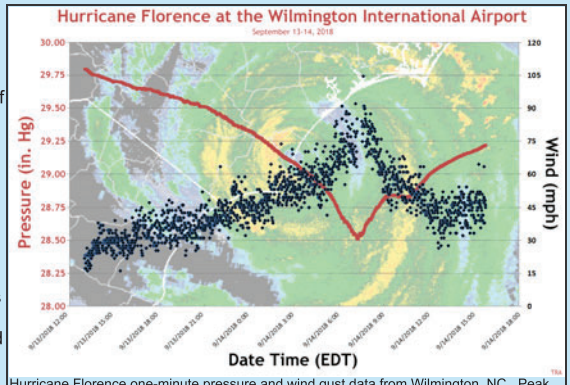
Hurricane Florence: September 14, 2018

NWS Wilmington, NC
Weather Forecast Office

Hurricane Florence, a large and slow moving category one hurricane, made landfall during the morning of September 14, 2018. After the eye crossed Wrightsville Beach, NC at 7:15 a.m. the storm spent the next two days producing record-breaking rainfall across eastern North Carolina and a portion of northeastern South Carolina. Over 30 inches of rain were measured in a few North Carolina locations, exceeding the highest single-storm rainfall amounts ever seen in this portion of the state. A station in Loris, SC recorded 23.63 inches rain, setting a new state tropical cyclone rainfall record for the state of South Carolina.



Hurricane Florence one-minute pressure and wind gust data from Wilmington, NC. Peak wind gust at the ILM airport was 105 mph and lowest pressure was 28.51 inches of mercury or 965.5 millibars. (credit: NWS/Tim Armstrong)

Record river flooding developed over the next several days along the Cape Fear, Northeast Cape Fear, Lumberton, and Waccamaw Rivers, destroying roads and damaging thousands of homes and businesses. A USGS report indicated nine river gauges reported floods exceeding their 1-in-500 year expected return intervals. Although Florence will be remembered primarily for its record-breaking flooding, wind gusts over 100 mph caused significant damage to buildings, trees, and electrical service across the Cape Fear area, and a storm surge of over four feet eroded beaches and damaged property between Cape Fear and Cape Lookout.

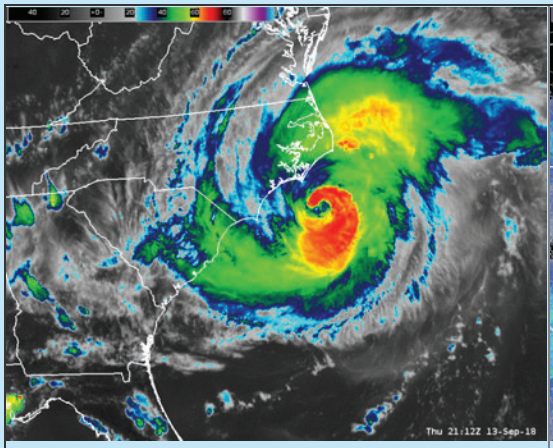
The state of North Carolina reported 42 fatalities due to the hurricane and preliminary damage estimates of $16.7 billion. An estimated 74,563 structures were flooded and 5,214 people were reportedly rescued from flooding. Nearly 140,000 North Carolinians registered for disaster assistance after the storm. South Carolina Emergency Management reported 9 fatalities across the state; $607 million damage; 11,386 homes with moderate or major damage; 455,000 people evacuated, and 11 dams breached or failed.

Meteorological History

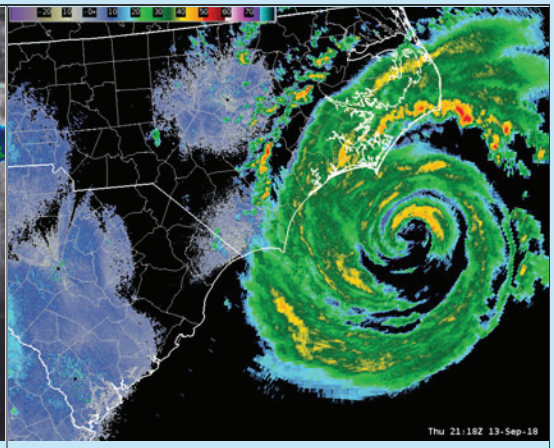
A tropical depression developed during the afternoon of August 31 just southwest of the Cape Verde islands. Becoming better organized, Tropical Storm Florence developed during the early morning of September 1. Florence strengthened into a hurricane, then a major hurricane, while moving northwestward across the open Atlantic Ocean. Winds peaked at 130 mph on September 5th before increasing southwesterly wind shear disrupted the storm's organization. Florence weakened to a 60-mph tropical storm on September 7th while over the central Atlantic 1300 miles southeast of Bermuda.

Due to lessening wind shear and warmer ocean water temperatures, Florence regained hurricane strength on Sunday, September 9th about 750 miles southeast of Bermuda. The hurricane strengthened rapidly on Monday, September 10th with winds increasing to 140 mph. Florence maintained winds of 130-140 mph through Tuesday September 11th, but began to weaken during the afternoon of Tuesday September 12th due to increasing wind shear and several pulses of dry air pulled into the inner core of the storm. Atmospheric conditions never improved significantly, and Florence continued to slowly weaken as it approached the North Carolina coast and made landfall near Wrightsville Beach during the morning of Friday September 14th with maximum sustained winds near 90 mph.

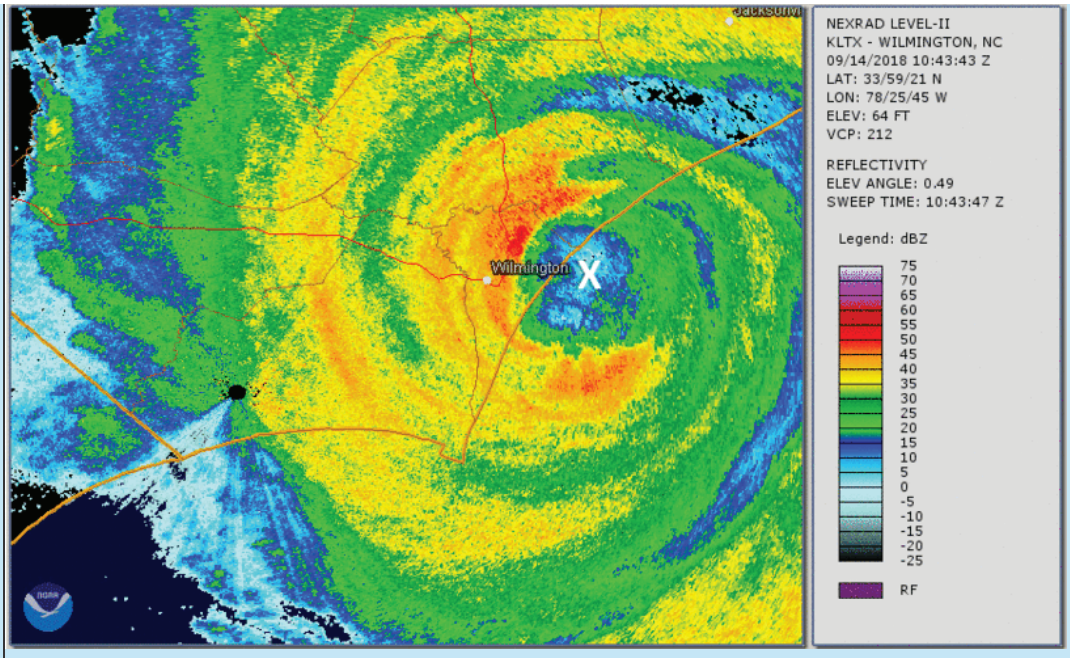
After landfall, Florence's winds steadily weakened as it moved farther inland across South Carolina. However torrential rain continued to fall for days, causing historic flooding across large portions of eastern North Carolina and some areas in South Carolina. Many areas damaged heavily by flooding during Hurricane Matthew in 2016 were devastated once again during Florence. Tornadoes also developed within the stronger rain bands; dozens of tornado touchdowns were confirmed by NWS Storm Survey crews.



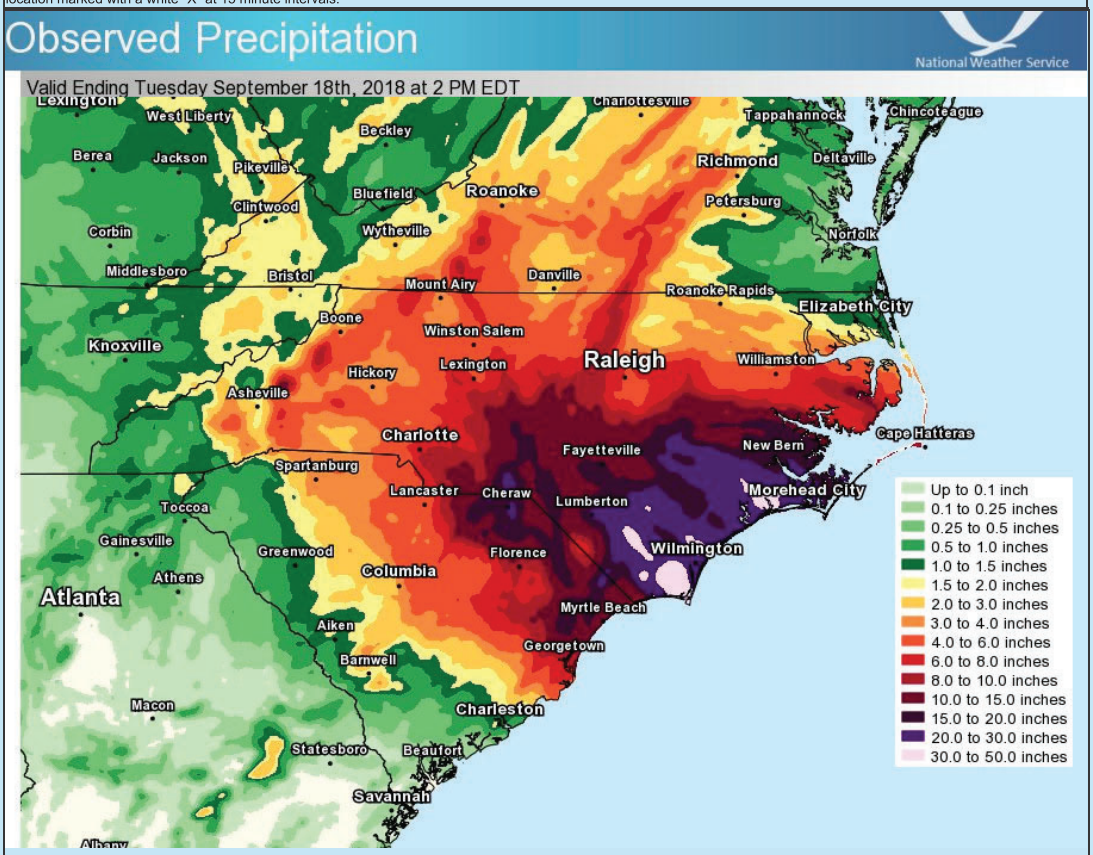
Infrared satellite loop of Hurricane Florence making landfall in southeastern North Carolina. Orange and red colors indicate cold clouds tops from deep convection near the center of the storm. Loop runs from the early morning of September 13 through the afternoon of September 14, 2018



Composite radar loop of Hurricane Florence making landfall. Although the general motion of the storm was toward the west, note the pronounced southward wobble that happened at landfall. Loop runs from the late afternoon of September 13 through late afternoon of September 14, 2018



Hurricane Florence made a sudden southward jog at landfall across southern New Hanover and eastern Brunswick counties. The storm then resumed a westward course across Brunswick county and into South Carolina. This radar loop shows runs from 6:43 am until 11:15 am on September 14, 2018 and shows the apparent circulation center location marked with a white "X" at 15 minute intervals.



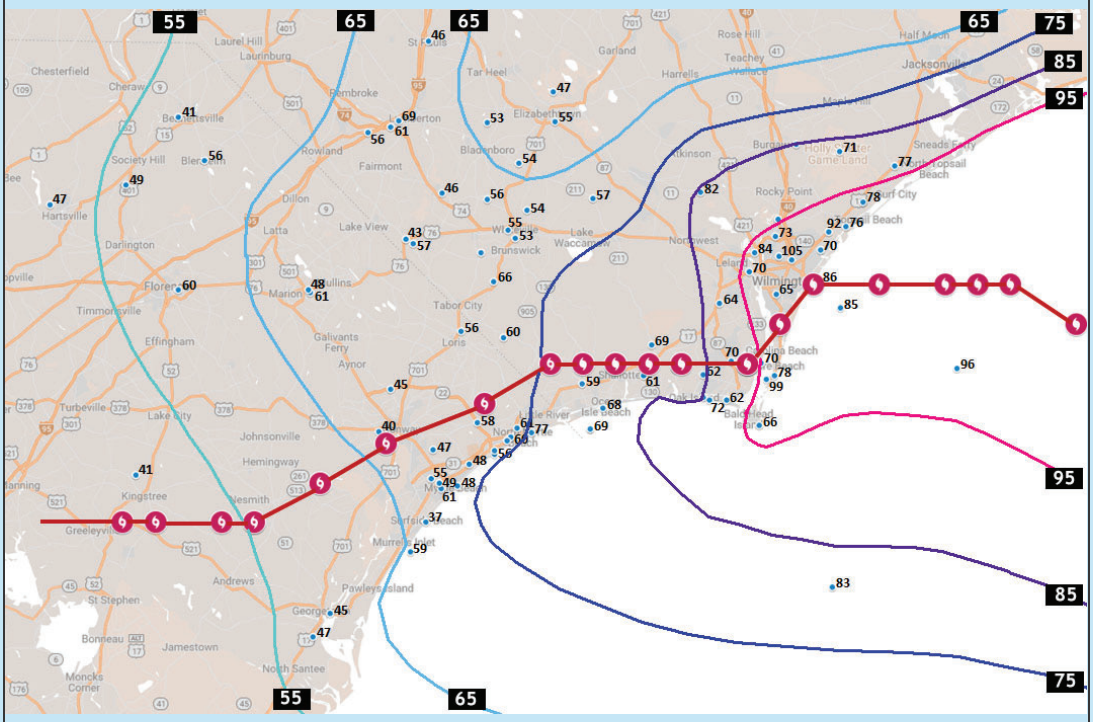
Multi-sensor rainfall estimates from Hurricane Florence, produced by National Weather Service Eastern Region Headquarters.

Location	Rainfall Total	Location	Rainfall Total
6.2 miles NW Elizabethtown, NC	35.93"	Bennettsville, SC	18.05"
3.7 miles S Wilmington, NC	30.10"	Watha, NC	17.49"
4.1 miles WNW Hampstead, NC	29.52"	Lumberton, NC	17.49"
Sunny Point Military Terminal, NC	27.44"	Gallivants Ferry, SC	17.01"
Green Swamp/Nature Conservancy, NC	27.40"	3 miles N Lumberton, NC	16.11"
0.8 miles E Smith Creek, NC	27.20"	Marion, SC	15.79"

0.9 miles ENE Oak Island, NC	26.98"	2.6 miles N Pawleys Island, SC	15.75"
7.3 miles NE Wilmington, NC	26.58"	8.4 miles WNW Myrtle Beach, SC	15.41"
6.1 miles NW Whiteville, NC	25.91"	Whiteville, NC	15.38"
Turnbull Creek/Bladen Lakes State Park, NC	23.67"	7 miles SE Hemingway, SC	15.26"
2.9 miles WSW Loris, SC	23.63"	2 miles SW Pawleys Island, SC	14.41"
7.8 miles SW Bolivia, NC	23.33"	Blenheim, SC	14.38"
1.4 miles ENE Loris, SC	23.18"	Bald Head Island, NC	12.17"
Wilmington International Airport, NC	23.02"	Soules Swamp/Whiteville, NC	11.50"
2.3 miles NE Lumberton, NC	22.76"	Conway, SC	11.43"
Whiteville, NC	22.58"	3 miles NE Socastee, SC	11.11"
Caswell Beach, NC	22.57"	6.0 miles S Georgetown, SC	11.08"
Cape Fear Lock & Dam #1 near E. Arcadia, NC	22.21"	Hartsville, SC	11.02"
0.2 miles SSW Yaupon Beach, NC	22.07"	Darlington, SC	11.02"
4 miles E Burgaw, NC	22.06"	6.2 miles E Conway, SC	9.63"
Back Island/Holly Shelter Swamp, NC	20.87"	Myrtle Beach International Airport, SC	9.50"
3.0 miles SE Wilmington, NC	20.11"	Hemingway, SC	9.32"
Marion, SC	19.56"	Bennettsville, SC	9.08"
8.6 miles SSE Lumberton, NC	18.51"	Georgetown, SC	8.55"
3.8 miles NW Dillon, SC	18.38"	Florence, SC	7.62"

* A newspaper report claimed 36" fell in Southport, NC at a fire department. Although radar data suggests exceptional rain fell across this area, insufficient evidence has been collected so far to verify this report.

Peak Wind Gusts (mph) observed during Hurricane Florence



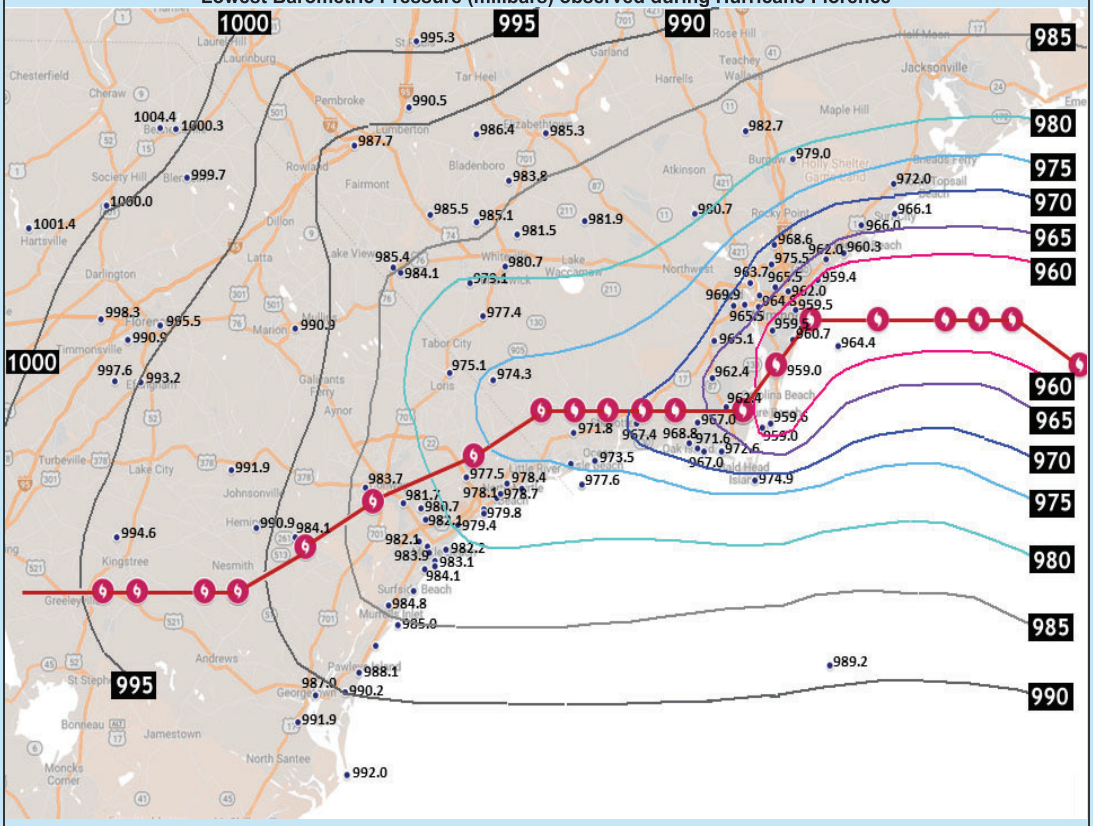
Map of peak wind gusts (mph) observed during Hurricane Florence on September 14, 2018. NHC hourly position updates are also shown. Isopleths indicate the highest observed wind gusts in open locations like airports, parks, and farms.

Location	Max Wind Gust (mph)	Location	Max Wind Gust (mph)
Wilmington, NC (airport)	105	Sunny Point, NC (RAWS station)	70
Cape Fear Comm. College, Wilmington	100	Lumberton, NC (airport)	69
Federal Point, NC	99	Ocean Isle Beach, NC	68
Hampstead, NC (EMS/Fire station)	92	Tabor City, NC	66
Wrightsville Beach, NC (J. Mercer Pier)	86	Bald Head Island, NC (NC ECOnet)	66
I-140 near Cape Fear River, NC	84	Fayetteville, NC (airport)	65

Currie, NC	82	Fort Bragg, NC	62
Hampstead, NC (Kiwanis Park)	78	Myrtle Beach, SC (airport)	61
Fort Fisher, NC	78	Marion, SC	61
Holly Ridge, NC	77	Florence, SC (airport)	61
Cherry Grove Beach, SC	77	North Myrtle Beach, SC (airport)	60
Myrtle Grove, NC	76	Chadbourn, NC	60
Castle Hayne, NC	73	Murrells Inlet, SC	59
Oak Island, NC	72	Whiteville, NC	56
Leland, NC	70	Elizabethtown, NC	48

* Newspaper reports claim an anemometer on the roof of the Emergency Operations Center in Southport, NC recorded a gust to 105 mph. The highest wind gust on land associated with Hurricane Florence occurred at Cape Lookout, NC: 106 mph.

Lowest Barometric Pressure (millbars) observed during Hurricane Florence



Lowest barometric pressure observed during Hurricane Florence on September 14-15, 2018

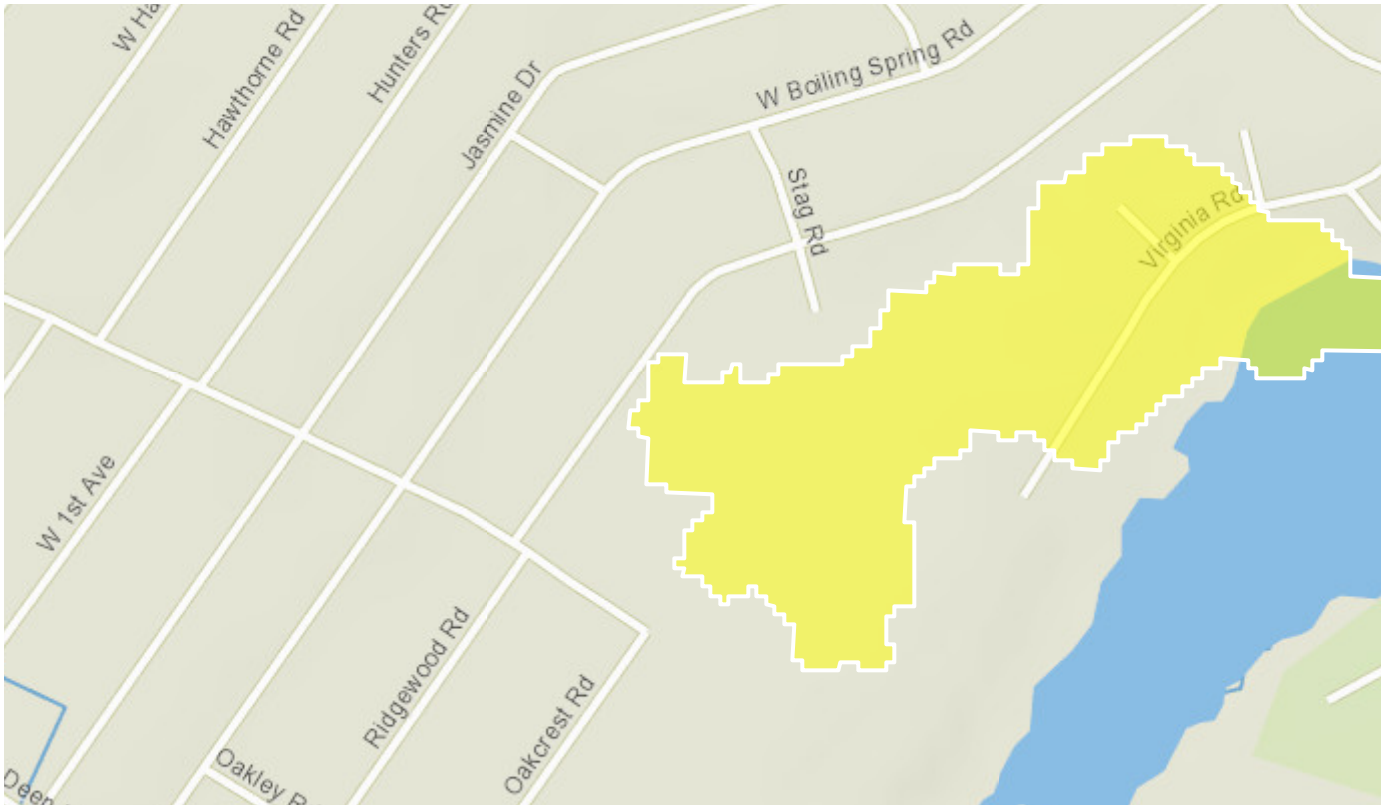
Location	Lowest Pressure	Location	Lowest Pressure
Wrightsville Beach, NC (USGS gauge)	958.3 mb, 28.30 in. Hg	Caswell Beach, NC (mesonet)	972.6 mb, 28.72 in. Hg
Federal Point, NC (Weatherflow sensor)	959.0 mb, 28.32 in. Hg	Bald Head Island, NC (NC ECOnet)	974.9 mb, 28.79 in. Hg
Myrtle Grove, NC (Veterans Park, Texas Tech Sticknet)	959.0 mb, 28.32 in. Hg	Tabor City, NC (Texas Tech Sticknet)	977.4 mb, 28.86 in. Hg
Wrightsville Beach, NC (Storm chaser Sean Waugh)	959.0 mb, 28.32 in. Hg	North Myrtle Beach, SC (airport)	978.7 mb, 28.90 in. Hg
Wrightsville Beach, NC (J. Mercer Pier)	959.3 mb, 28.32 in. Hg	Burgaw, NC (mesonet)	979.0 mb, 28.91 in. Hg
Hampstead, NC (Texas Tech Sticknet)	960.3 mb, 28.36 in. Hg	Watha, NC (mesonet)	982.7 mb, 29.02 in. Hg
Masonboro Island, NC (NERRS)	960.7 mb, 28.37 in. Hg	Conway, NC (airport)	983.7 mb, 29.05 in. Hg
Wilmington, NC (Kings Grant neighborhood)	962.0 mb, 28.41 in. Hg	Myrtle Beach, SC (airport)	983.9 mb, 29.05 in. Hg
Boiling Spring Lakes, NC (South Brunswick Middle School, Texas Tech Sticknet)	962.4 mb, 28.42 in. Hg	Whiteville, NC (NC ECOnet)	985.1 mb, 29.09 in. Hg
Bolivia, NC (mesonet)	962.4 mb,	Elizabethtown, NC (airport,	985.3 mb,

	28.42 in. Hg	Texas Tech Sticknet)	29.10 in. Hg
Winnabow, NC (Texas Tech Sticknet)	965.1 mb, 28.50 in. Hg	Lumberton, NC (mesonet)	990.5 mb, 29.25 in. Hg
Wilmington, NC (airport*)	965.5 mb, 28.51 in. Hg	Florence, SC (airport)	995.5 mb, 29.40 in. Hg
Oak Island, NC (Weatherflow)	967.0 mb, 28.56 in. Hg	Darlington, SC (mesonet)	998.3 mb, 29.48 in. Hg
Castle Hayne, NC (Texas Tech Sticknet)	968.6 mb, 28.60 in. Hg	Blemheim, SC (mesonet)	999.7 mb, 29.52 in. Hg

* The pressure of 965.5 mb at the Wilmington International Airport was the fourth lowest pressure ever measured locally.

Upper Lake A

Region ID: NC
Workspace ID: NC20191205203138645000
Clicked Point (Latitude, Longitude): 34.02088, -78.06902
Time: 2019-12-05 15:31:54 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.0627	square miles
PCTREG1	Percentage of drainage area located in Region 1	0	percent
PCTREG2	Percentage of drainage area located in Region 2	0	percent
PCTREG3	Percentage of drainage area located in Region 3	0	percent
PCTREG4	Percentage of drainage area located in Region 4	100	percent
PCTREG5	Percentage of drainage area located in Region 5	0	percent

Parameter Code	Parameter Description	Value	Unit
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	1.26	percent
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	11.3	inches
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	2	miles
BSLDEM30FT	Mean basin slope, based on slope percent grid	1.71	percent
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	19.55	feet per mi
ELEV	Mean Basin Elevation	49.1	feet
ELEVMAX	Maximum basin elevation	57	feet
LC01BARE	Percentage of area barren land, NLCD 2001 category 31	0	percent
LC01CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2001	0	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	11.529	percent
LC01FOREST	Percentage of forest from NLCD 2001 classes 41-43	36.696	percent
LC01HERB	Percentage of herbaceous upland from NLCD 2001 class 71	0.051	percent
LC01IMP	Percent imperviousness of basin area 2001 NLCD	1.26	percent
LC01SHRUB	Percent of area covered by shrubland using 2001 NLCD	2.47	percent
LC01WATER	Percentage of open water, class 11, from NLCD 2001	6.125	percent
LC01WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2001	43.129	percent
LC06BARE	Percent of area covered by barren rock using 2006 NLCD	0	percent
LC06DEV	Percentage of land-use from NLCD 2006 classes 21-24	11.529	percent
LC06FOREST	Percentage of forest from NLCD 2006 classes 41-43	36.696	percent
LC06GRASS	Percent of area covered by grassland/herbaceous using 2006 NLCD	0.051	percent
LC06PLANT	Percent of area in cultivation using 2006 NLCD	0	percent
LC06SHRUB	Percent of area covered by shrubland using 2006 NLCD	2.47	percent
LC06WATER	Percent of open water, class 11, from NLCD 2006	6.125	percent
LC06WETLND	Percent of area covered by wetland using 2006 NLCD	43.129	percent

Parameter Code	Parameter Description	Value	Unit
LC11BARE	Percentage of barren from NLCD 2011 class 31	0	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	11.5	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	36.696	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	0.051	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	1.26	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	2.47	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	6.125	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	43.129	percent
LC92FOREST	Percentage of forest from NLCD 1992 classes 41-43	71.848	percent
LFPLENGTH	Length of longest flow path	0.722	miles
LU92BARE	Percent of area covered by barren rock using 1992 NLCD	0	percent
LU92DEV	Percent of area covered by all densities of developed land using 1992 NLCD	0	percent
LU92PLANT	Percent of area in cultivation using 1992 NLCD	0	percent
LU92WATER	Percent of area covered by water using 1992 NLCD	4.323	percent
LU92WETLN	Percent of area covered by wetland using 1992 NLCD	23.829	percent
MINBELEV	Minimum basin elevation	37.2	feet
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	37	feet
PRECIP	Mean Annual Precipitation	61.4	inches
PROTECTED	Percent of area of protected Federal and State owned land	0	percent
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	57.1	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	33.2	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	0	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent

Peak-Flow Statistics Parameters[Region 4 CoastalPlain rural under 1 sqmi 2014 5030]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0627	square miles	0.1	1
LC06IMP	Percent Impervious NLCD2006	1.26	percent	0.2	34.8
I24H50Y	24 Hour 50 Year Precipitation	11.3	inches	6.51	10.9

Peak-Flow Statistics Disclaimers[Region 4 CoastalPlain rural under 1 sqmi 2014 5030]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Peak-Flow Statistics Flow Report[Region 4 CoastalPlain rural under 1 sqmi 2014 5030]

Statistic	Value	Unit
2 Year Peak Flood	20.6	ft^3/s
5 Year Peak Flood	40.9	ft^3/s
10 Year Peak Flood	57.2	ft^3/s
25 Year Peak Flood	80.6	ft^3/s
50 Year Peak Flood	100	ft^3/s
100 Year Peak Flood	121	ft^3/s
200 Year Peak Flood	144	ft^3/s
500 Year Peak Flood	175	ft^3/s

Peak-Flow Statistics Citations

Feaster, T.D., Gotvald, A.J., and Weaver, J.C.,2014, Methods for estimating the magnitude and frequency of floods for urban and small, rural streams in Georgia, South Carolina, and North Carolina, 2011 (ver. 1.1, March 2014): U.S. Geological Survey Scientific Investigations Report 2014–5030, 104 p. (http://pubs.usgs.gov/sir/2014/5030/)

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Application Version: 4.3.11

Upper Lake 2

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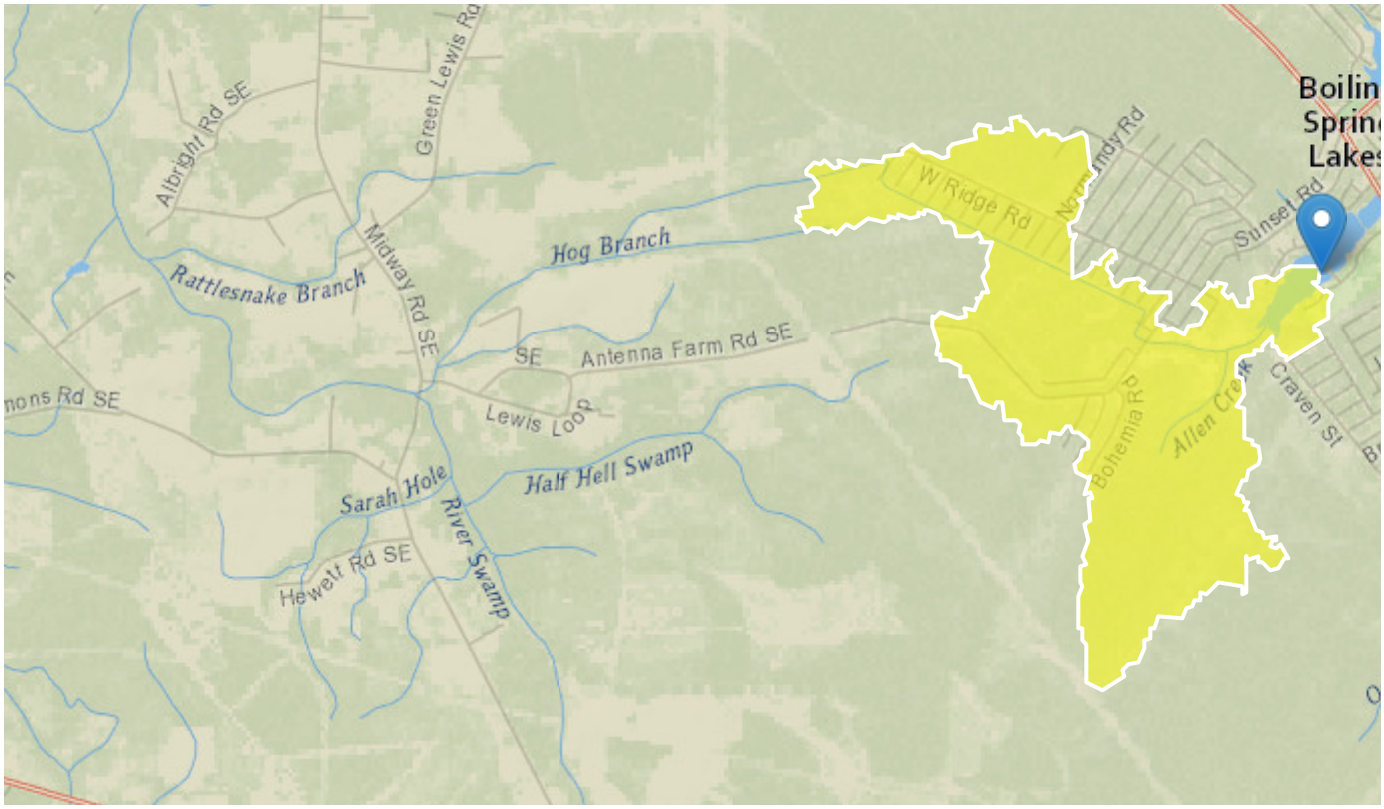
Workspace ID: NC20191205204508589000
Clicked Point (Latitude, Longitude): 34.02033, -78.06934
Time: 2019-12-05 15:45:25 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	2.56	square miles
PCTREG1	Percentage of drainage area located in Region 1	0	percent
PCTREG2	Percentage of drainage area located in Region 2	0	percent
PCTREG3	Percentage of drainage area located in Region 3	0	percent
PCTREG4	Percentage of drainage area located in Region 4	100	percent
PCTREG5	Percentage of drainage area located in Region 5	0	percent

Parameter Code	Parameter Description	Value	Unit
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	0.26	percent
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	11.3	inches
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	18.8	miles
BSLDEM30FT	Mean basin slope, based on slope percent grid	1.67	percent
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	3.54	feet per mi
ELEV	Mean Basin Elevation	53.6	feet
ELEVMAX	Maximum basin elevation	65	feet
LC01BARE	Percentage of area barren land, NLCD 2001 category 31	0	percent
LC01CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2001	0	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	3.724	percent
LC01FOREST	Percentage of forest from NLCD 2001 classes 41-43	27.069	percent
LC01HERB	Percentage of herbaceous upland from NLCD 2001 class 71	0.066	percent
LC01IMP	Percent imperviousness of basin area 2001 NLCD	0.26	percent
LC01SHRUB	Percent of area covered by shrubland using 2001 NLCD	1.521	percent
LC01WATER	Percentage of open water, class 11, from NLCD 2001	1.249	percent
LC01WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2001	66.372	percent
LC06BARE	Percent of area covered by barren rock using 2006 NLCD	0	percent
LC06DEV	Percentage of land-use from NLCD 2006 classes 21-24	3.724	percent
LC06FOREST	Percentage of forest from NLCD 2006 classes 41-43	25.018	percent
LC06GRASS	Percent of area covered by grassland/herbaceous using 2006 NLCD	2.131	percent
LC06PLANT	Percent of area in cultivation using 2006 NLCD	0	percent
LC06SHRUB	Percent of area covered by shrubland using 2006 NLCD	1.521	percent
LC06WATER	Percent of open water, class 11, from NLCD 2006	1.249	percent
LC06WETLND	Percent of area covered by wetland using 2006 NLCD	66.357	percent

Parameter Code	Parameter Description	Value	Unit
LC11BARE	Percentage of barren from NLCD 2011 class 31	0	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	3.72	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	24.652	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	0.277	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.26	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	3.74	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	1.249	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	66.357	percent
LC92FOREST	Percentage of forest from NLCD 1992 classes 41-43	10.455	percent
LFPLENGTH	Length of longest flow path	4.371	miles
LU92BARE	Percent of area covered by barren rock using 1992 NLCD	5.801	percent
LU92DEV	Percent of area covered by all densities of developed land using 1992 NLCD	0.054	percent
LU92PLANT	Percent of area in cultivation using 1992 NLCD	0	percent
LU92WATER	Percent of area covered by water using 1992 NLCD	0.899	percent
LU92WETLN	Percent of area covered by wetland using 1992 NLCD	82.791	percent
MINBELEV	Minimum basin elevation	37.6	feet
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	39	feet
PRECIP	Mean Annual Precipitation	61.3	inches
PROTECTED	Percent of area of protected Federal and State owned land	0	percent
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	56.5	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	36.7	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	2.39	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	2.64	percent

Peak-Flow Statistics Parameters[Peak Southeast US over 1 sqmi 2009 5158]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.56	square miles	1	9000
PCTREG1	Percent Area in Region 1	0	percent	0	100
PCTREG2	Percent Area in Region 2	0	percent	0	100
PCTREG3	Percent Area in Region 3	0	percent	0	100
PCTREG4	Percent Area in Region 4	100	percent	0	100
PCTREG5	Percent Area in Region 5	0	percent	0	100

Peak-Flow Statistics Flow Report[Peak Southeast US over 1 sqmi 2009 5158]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp
2 Year Peak Flood	111	ft^3/s	63.7	193	34.5
5 Year Peak Flood	222	ft^3/s	128	383	34
10 Year Peak Flood	310	ft^3/s	177	546	35.1
25 Year Peak Flood	434	ft^3/s	238	790	37.5
50 Year Peak Flood	543	ft^3/s	289	1020	39.6
100 Year Peak Flood	664	ft^3/s	342	1290	41.9
200 Year Peak Flood	777	ft^3/s	386	1570	44.3
500 Year Peak Flood	951	ft^3/s	449	2010	47.7

Peak-Flow Statistics Citations

Weaver, J.C., Feaster, T.D., and Gotvald, A.J.,2009, Magnitude and frequency of rural floods in the Southeastern United States, through 2006—Volume 2, North Carolina: U.S. Geological Survey Scientific Investigations Report 2009–5158, 111 p. (http://pubs.usgs.gov/sir/2009/5158/)

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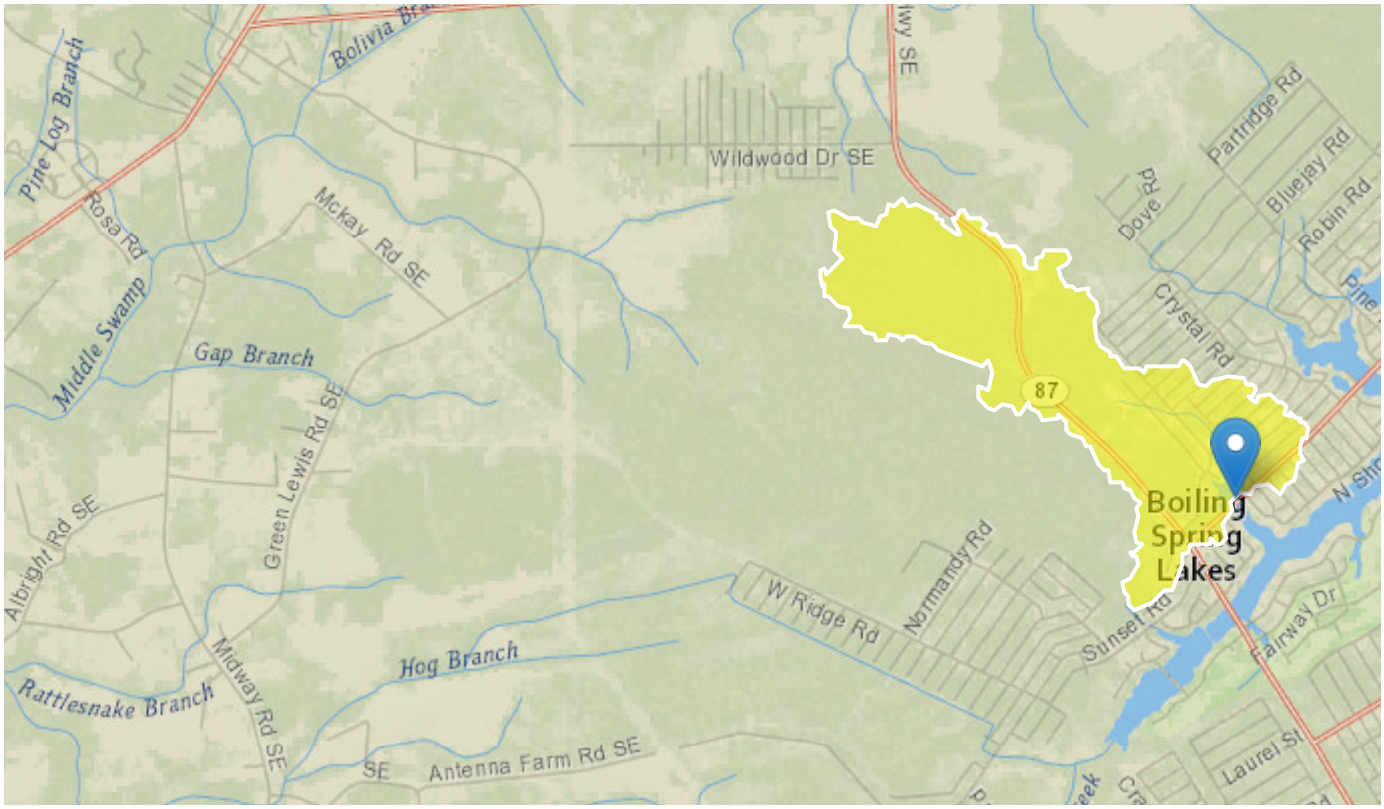
Application Version: 4.3.11

Pine Lake

Region ID: NC
Workspace ID: NC20191206132605872000
Clicked Point (Latitude, Longitude): 34.03381, -78.06370
Time: 2019-12-06 08:26:21 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.62	square miles
PCTREG1	Percentage of drainage area located in Region 1	0	percent
PCTREG2	Percentage of drainage area located in Region 2	0	percent
PCTREG3	Percentage of drainage area located in Region 3	0	percent
PCTREG4	Percentage of drainage area located in Region 4	100	percent
PCTREG5	Percentage of drainage area located in Region 5	0	percent

Parameter Code	Parameter Description	Value	Unit
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	2.39	percent
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	11.2	inches
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	12.2	miles
BSLDEM30FT	Mean basin slope, based on slope percent grid	1.57	percent
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	5	feet per mi
ELEV	Mean Basin Elevation	54.6	feet
ELEVMAX	Maximum basin elevation	66.9	feet
LC01BARE	Percentage of area barren land, NLCD 2001 category 31	0	percent
LC01CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2001	0.733	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	14.026	percent
LC01FOREST	Percentage of forest from NLCD 2001 classes 41-43	17.941	percent
LC01HERB	Percentage of herbaceous upland from NLCD 2001 class 71	0	percent
LC01IMP	Percent imperviousness of basin area 2001 NLCD	2.3	percent
LC01SHRUB	Percent of area covered by shrubland using 2001 NLCD	1.316	percent
LC01WATER	Percentage of open water, class 11, from NLCD 2001	1.312	percent
LC01WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2001	64.673	percent
LC06BARE	Percent of area covered by barren rock using 2006 NLCD	0.453	percent
LC06DEV	Percentage of land-use from NLCD 2006 classes 21-24	14.026	percent
LC06FOREST	Percentage of forest from NLCD 2006 classes 41-43	17.38	percent
LC06GRASS	Percent of area covered by grassland/herbaceous using 2006 NLCD	0	percent
LC06PLANT	Percent of area in cultivation using 2006 NLCD	0.733	percent
LC06SHRUB	Percent of area covered by shrubland using 2006 NLCD	1.316	percent
LC06WATER	Percent of open water, class 11, from NLCD 2006	1.312	percent
LC06WETLND	Percent of area covered by wetland using 2006 NLCD	64.781	percent

Parameter Code	Parameter Description	Value	Unit
LC11BARE	Percentage of barren from NLCD 2011 class 31	0.453	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0.733	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	14	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	17.25	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	0.13	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	2.41	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	1.316	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	1.312	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	64.781	percent
LC92FOREST	Percentage of forest from NLCD 1992 classes 41-43	32.861	percent
LFPLENGTH	Length of longest flow path	3.523	miles
LU92BARE	Percent of area covered by barren rock using 1992 NLCD	0	percent
LU92DEV	Percent of area covered by all densities of developed land using 1992 NLCD	2.194	percent
LU92PLANT	Percent of area in cultivation using 1992 NLCD	0.399	percent
LU92WATER	Percent of area covered by water using 1992 NLCD	1.402	percent
LU92WETLN	Percent of area covered by wetland using 1992 NLCD	63.143	percent
MINBELEV	Minimum basin elevation	39.4	feet
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	40	feet
PRECIP	Mean Annual Precipitation	61.2	inches
PROTECTED	Percent of area of protected Federal and State owned land	0	percent
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	39.4	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	35.9	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	23.3	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent

Peak-Flow Statistics Parameters[Peak Southeast US over 1 sqmi 2009 5158]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.62	square miles	1	9000
PCTREG1	Percent Area in Region 1	0	percent	0	100
PCTREG2	Percent Area in Region 2	0	percent	0	100
PCTREG3	Percent Area in Region 3	0	percent	0	100
PCTREG4	Percent Area in Region 4	100	percent	0	100
PCTREG5	Percent Area in Region 5	0	percent	0	100

Peak-Flow Statistics Flow Report[Peak Southeast US over 1 sqmi 2009 5158]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp
2 Year Peak Flood	82.4	ft^3/s	47.3	144	34.5
5 Year Peak Flood	166	ft^3/s	96.2	288	34
10 Year Peak Flood	234	ft^3/s	133	412	35.1
25 Year Peak Flood	329	ft^3/s	180	599	37.5
50 Year Peak Flood	413	ft^3/s	219	777	39.6
100 Year Peak Flood	506	ft^3/s	260	986	41.9
200 Year Peak Flood	593	ft^3/s	294	1200	44.3
500 Year Peak Flood	728	ft^3/s	344	1540	47.7

Peak-Flow Statistics Citations

Weaver, J.C., Feaster, T.D., and Gotvald, A.J.,2009, Magnitude and frequency of rural floods in the Southeastern United States, through 2006—Volume 2, North Carolina: U.S. Geological Survey Scientific Investigations Report 2009–5158, 111 p. (http://pubs.usgs.gov/sir/2009/5158/)

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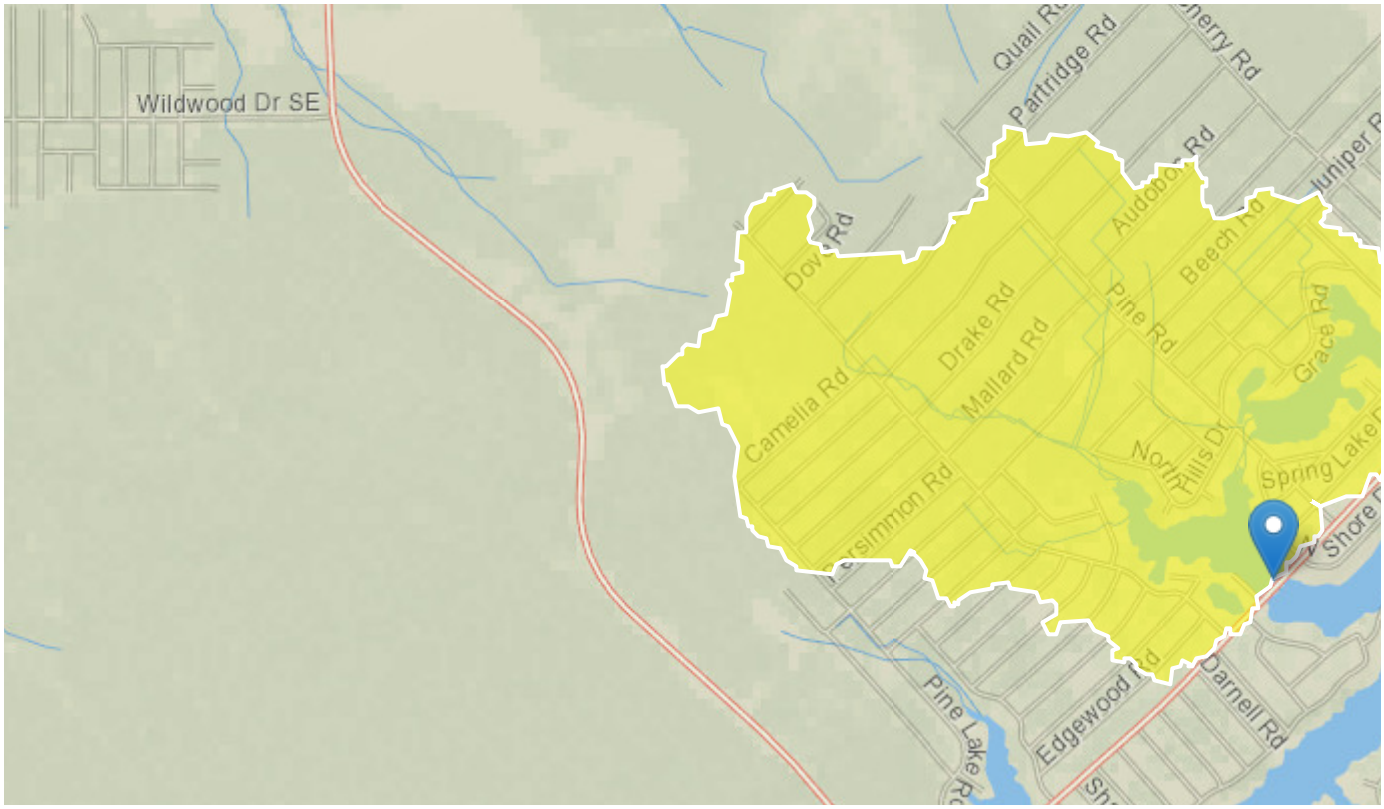
Application Version: 4.3.11

North Lake

Region ID: NC
Workspace ID: NC20191206132107738000
Clicked Point (Latitude, Longitude): 34.04272, -78.05252
Time: 2019-12-06 08:21:24 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.6	square miles
PCTREG1	Percentage of drainage area located in Region 1	0	percent
PCTREG2	Percentage of drainage area located in Region 2	0	percent
PCTREG3	Percentage of drainage area located in Region 3	0	percent
PCTREG4	Percentage of drainage area located in Region 4	100	percent
PCTREG5	Percentage of drainage area located in Region 5	0	percent

Parameter Code	Parameter Description	Value	Unit
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	2.65	percent
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	11.2	inches
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	8.77	miles
BSLDEM30FT	Mean basin slope, based on slope percent grid	1.98	percent
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	11.88	feet per mi
ELEV	Mean Basin Elevation	52.6	feet
ELEVMAX	Maximum basin elevation	70.7	feet
LC01BARE	Percentage of area barren land, NLCD 2001 category 31	0	percent
LC01CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2001	0.429	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	22.283	percent
LC01FOREST	Percentage of forest from NLCD 2001 classes 41-43	29.488	percent
LC01HERB	Percentage of herbaceous upland from NLCD 2001 class 71	0	percent
LC01IMP	Percent imperviousness of basin area 2001 NLCD	2.64	percent
LC01SHRUB	Percent of area covered by shrubland using 2001 NLCD	5.719	percent
LC01WATER	Percentage of open water, class 11, from NLCD 2001	6.785	percent
LC01WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2001	35.296	percent
LC06BARE	Percent of area covered by barren rock using 2006 NLCD	0	percent
LC06DEV	Percentage of land-use from NLCD 2006 classes 21-24	22.283	percent
LC06FOREST	Percentage of forest from NLCD 2006 classes 41-43	29.488	percent
LC06GRASS	Percent of area covered by grassland/herbaceous using 2006 NLCD	0	percent
LC06PLANT	Percent of area in cultivation using 2006 NLCD	0.429	percent
LC06SHRUB	Percent of area covered by shrubland using 2006 NLCD	5.719	percent
LC06WATER	Percent of open water, class 11, from NLCD 2006	6.785	percent
LC06WETLND	Percent of area covered by wetland using 2006 NLCD	35.296	percent

Parameter Code	Parameter Description	Value	Unit
LC11BARE	Percentage of barren from NLCD 2011 class 31	0	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0.429	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	22.3	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	29.203	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	0.109	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	2.67	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	5.895	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	6.785	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	35.296	percent
LC92FOREST	Percentage of forest from NLCD 1992 classes 41-43	61.572	percent
LFPLENGTH	Length of longest flow path	2.494	miles
LU92BARE	Percent of area covered by barren rock using 1992 NLCD	0	percent
LU92DEV	Percent of area covered by all densities of developed land using 1992 NLCD	1.145	percent
LU92PLANT	Percent of area in cultivation using 1992 NLCD	0	percent
LU92WATER	Percent of area covered by water using 1992 NLCD	7.165	percent
LU92WETLN	Percent of area covered by wetland using 1992 NLCD	30.118	percent
MINBELEV	Minimum basin elevation	34.1	feet
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	36	feet
PRECIP	Mean Annual Precipitation	61.3	inches
PROTECTED	Percent of area of protected Federal and State owned land	0	percent
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	40.3	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	47.9	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	5.1	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent

Peak-Flow Statistics Parameters[Peak Southeast US over 1 sqmi 2009 5158]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.6	square miles	1	9000
PCTREG1	Percent Area in Region 1	0	percent	0	100
PCTREG2	Percent Area in Region 2	0	percent	0	100
PCTREG3	Percent Area in Region 3	0	percent	0	100
PCTREG4	Percent Area in Region 4	100	percent	0	100
PCTREG5	Percent Area in Region 5	0	percent	0	100

Peak-Flow Statistics Flow Report[Peak Southeast US over 1 sqmi 2009 5158]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp
2 Year Peak Flood	81.7	ft^3/s	46.9	142	34.5
5 Year Peak Flood	165	ft^3/s	95.5	286	34
10 Year Peak Flood	232	ft^3/s	132	409	35.1
25 Year Peak Flood	326	ft^3/s	179	595	37.5
50 Year Peak Flood	410	ft^3/s	218	771	39.6
100 Year Peak Flood	503	ft^3/s	258	979	41.9
200 Year Peak Flood	589	ft^3/s	292	1190	44.3
500 Year Peak Flood	723	ft^3/s	341	1530	47.7

Peak-Flow Statistics Citations

Weaver, J.C., Feaster, T.D., and Gotvald, A.J.,2009, Magnitude and frequency of rural floods in the Southeastern United States, through 2006—Volume 2, North Carolina: U.S. Geological Survey Scientific Investigations Report 2009–5158, 111 p. (http://pubs.usgs.gov/sir/2009/5158/)

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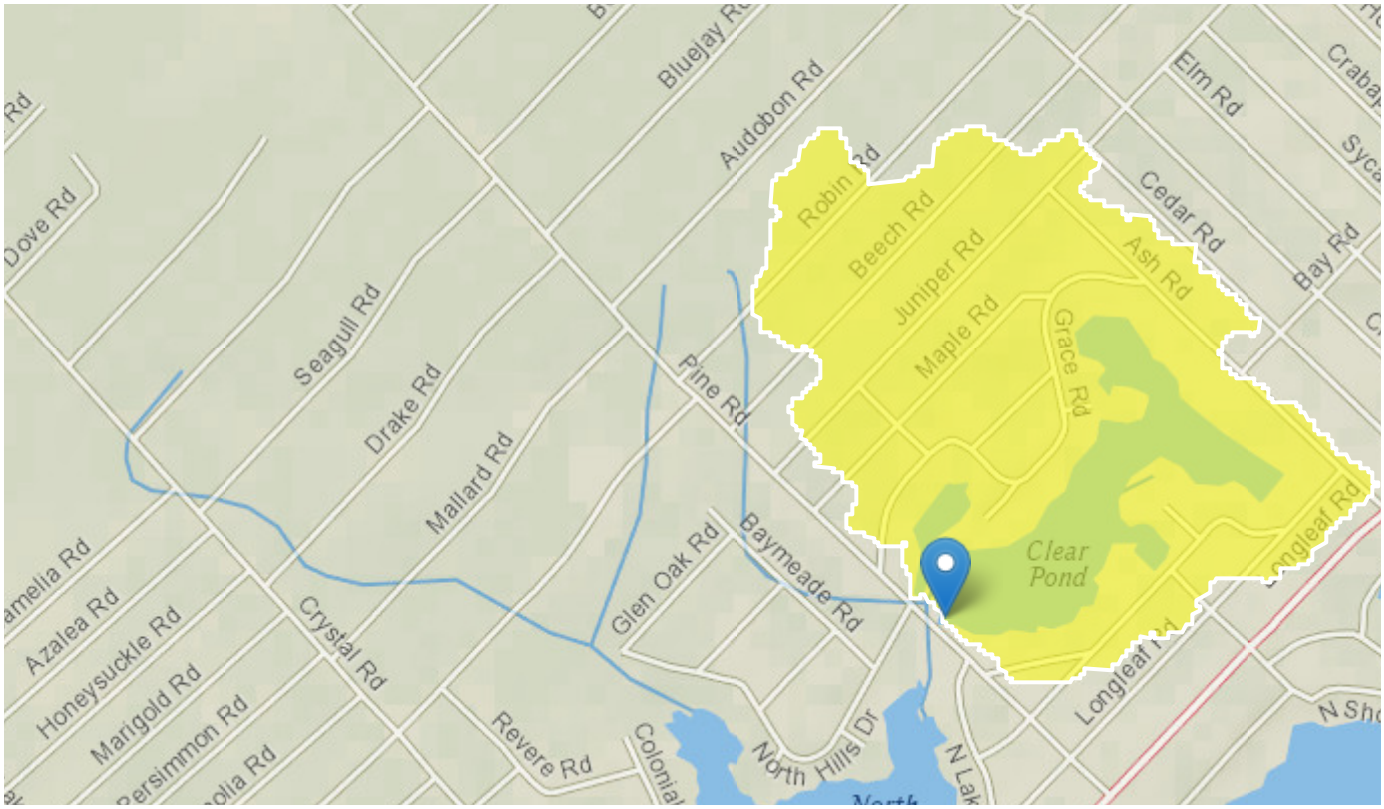
Application Version: 4.3.11

Spring Lake

Region ID: NC
Workspace ID: NC20191206133550358000
Clicked Point (Latitude, Longitude): 34.04781, -78.05342
Time: 2019-12-06 08:36:05 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.32	square miles
PCTREG1	Percentage of drainage area located in Region 1	0	percent
PCTREG2	Percentage of drainage area located in Region 2	0	percent
PCTREG3	Percentage of drainage area located in Region 3	0	percent
PCTREG4	Percentage of drainage area located in Region 4	100	percent
PCTREG5	Percentage of drainage area located in Region 5	0	percent

Parameter Code	Parameter Description	Value	Unit
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	3.44	percent
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	11.3	inches
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	3.49	miles
BSLDEM30FT	Mean basin slope, based on slope percent grid	2.19	percent
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	19.7	feet per mi
ELEV	Mean Basin Elevation	48.5	feet
ELEVMAX	Maximum basin elevation	65.3	feet
LC01BARE	Percentage of area barren land, NLCD 2001 category 31	0	percent
LC01CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2001	0	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	25.36	percent
LC01FOREST	Percentage of forest from NLCD 2001 classes 41-43	34.027	percent
LC01HERB	Percentage of herbaceous upland from NLCD 2001 class 71	0	percent
LC01IMP	Percent imperviousness of basin area 2001 NLCD	3.44	percent
LC01SHRUB	Percent of area covered by shrubland using 2001 NLCD	15.131	percent
LC01WATER	Percentage of open water, class 11, from NLCD 2001	16.247	percent
LC01WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2001	9.235	percent
LC06BARE	Percent of area covered by barren rock using 2006 NLCD	0	percent
LC06DEV	Percentage of land-use from NLCD 2006 classes 21-24	25.36	percent
LC06FOREST	Percentage of forest from NLCD 2006 classes 41-43	34.027	percent
LC06GRASS	Percent of area covered by grassland/herbaceous using 2006 NLCD	0	percent
LC06PLANT	Percent of area in cultivation using 2006 NLCD	0	percent
LC06SHRUB	Percent of area covered by shrubland using 2006 NLCD	15.131	percent
LC06WATER	Percent of open water, class 11, from NLCD 2006	16.247	percent
LC06WETLND	Percent of area covered by wetland using 2006 NLCD	9.235	percent

Parameter Code	Parameter Description	Value	Unit
LC11BARE	Percentage of barren from NLCD 2011 class 31	0	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	25.4	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	34.027	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	0	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	3.5	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	15.131	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	16.247	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	9.235	percent
LC92FOREST	Percentage of forest from NLCD 1992 classes 41-43	70.652	percent
LFPLENGTH	Length of longest flow path	1.138	miles
LU92BARE	Percent of area covered by barren rock using 1992 NLCD	0	percent
LU92DEV	Percent of area covered by all densities of developed land using 1992 NLCD	3.582	percent
LU92PLANT	Percent of area in cultivation using 1992 NLCD	0	percent
LU92WATER	Percent of area covered by water using 1992 NLCD	18.084	percent
LU92WETLN	Percent of area covered by wetland using 1992 NLCD	7.682	percent
MINBELEV	Minimum basin elevation	37.5	feet
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	39	feet
PRECIP	Mean Annual Precipitation	61.3	inches
PROTECTED	Percent of area of protected Federal and State owned land	0	percent
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	47.4	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	35.7	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	0	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent

Peak-Flow Statistics Parameters[Region 4 CoastalPlain rural under 1 sqmi 2014 5030]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.32	square miles	0.1	1
LC06IMP	Percent Impervious NLCD2006	3.44	percent	0.2	34.8
I24H50Y	24 Hour 50 Year Precipitation	11.3	inches	6.51	10.9

Peak-Flow Statistics Disclaimers[Region 4 CoastalPlain rural under 1 sqmi 2014 5030]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Peak-Flow Statistics Flow Report[Region 4 CoastalPlain rural under 1 sqmi 2014 5030]

Statistic	Value	Unit
2 Year Peak Flood	58.8	ft^3/s
5 Year Peak Flood	115	ft^3/s
10 Year Peak Flood	160	ft^3/s
25 Year Peak Flood	225	ft^3/s
50 Year Peak Flood	279	ft^3/s
100 Year Peak Flood	337	ft^3/s
200 Year Peak Flood	401	ft^3/s
500 Year Peak Flood	488	ft^3/s

Peak-Flow Statistics Citations

Feaster, T.D., Gotvald, A.J., and Weaver, J.C.,2014, Methods for estimating the magnitude and frequency of floods for urban and small, rural streams in Georgia, South Carolina, and North Carolina, 2011 (ver. 1.1, March 2014): U.S. Geological Survey Scientific Investigations Report 2014–5030, 104 p. (http://pubs.usgs.gov/sir/2014/5030/)

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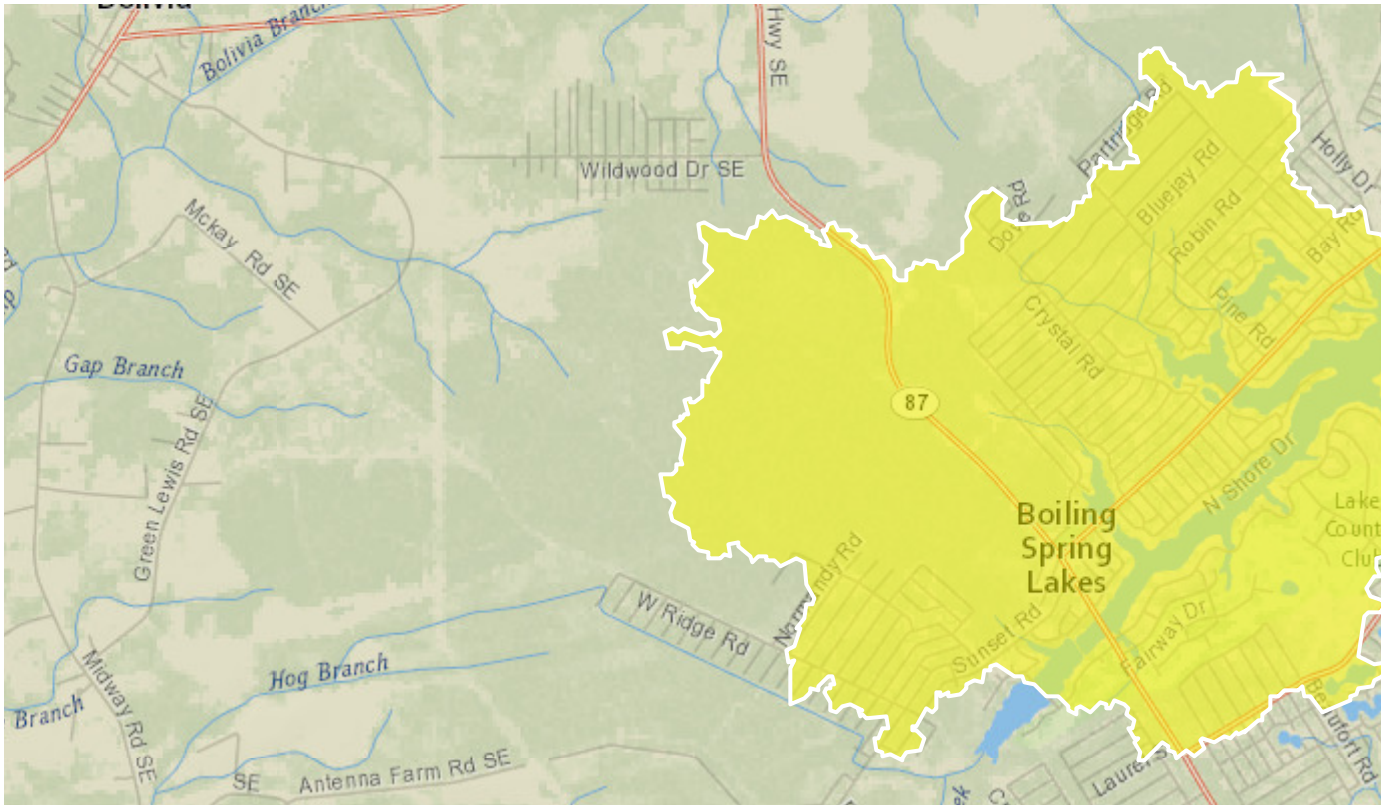
Application Version: 4.3.11

Sanford Dam

Region ID: NC
Workspace ID: NC20191205202548965000
Clicked Point (Latitude, Longitude): 34.04631, -78.03677
Time: 2019-12-05 15:26:05 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	8.61	square miles
PCTREG1	Percentage of drainage area located in Region 1	0	percent
PCTREG2	Percentage of drainage area located in Region 2	0	percent
PCTREG3	Percentage of drainage area located in Region 3	0	percent
PCTREG4	Percentage of drainage area located in Region 4	100	percent
PCTREG5	Percentage of drainage area located in Region 5	0	percent

Parameter Code	Parameter Description	Value	Unit
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	3.73	percent
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	11.3	inches
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	25	miles
BSLDEM30FT	Mean basin slope, based on slope percent grid	1.84	percent
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	6.93	feet per mi
ELEV	Mean Basin Elevation	51.2	feet
ELEVMAX	Maximum basin elevation	74.5	feet
LC01BARE	Percentage of area barren land, NLCD 2001 category 31	0	percent
LC01CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2001	0.235	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	25.541	percent
LC01FOREST	Percentage of forest from NLCD 2001 classes 41-43	20.563	percent
LC01HERB	Percentage of herbaceous upland from NLCD 2001 class 71	0.272	percent
LC01IMP	Percent imperviousness of basin area 2001 NLCD	3.65	percent
LC01SHRUB	Percent of area covered by shrubland using 2001 NLCD	4.669	percent
LC01WATER	Percentage of open water, class 11, from NLCD 2001	6.502	percent
LC01WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2001	42.218	percent
LC06BARE	Percent of area covered by barren rock using 2006 NLCD	0.113	percent
LC06DEV	Percentage of land-use from NLCD 2006 classes 21-24	25.541	percent
LC06FOREST	Percentage of forest from NLCD 2006 classes 41-43	20.047	percent
LC06GRASS	Percent of area covered by grassland/herbaceous using 2006 NLCD	0.617	percent
LC06PLANT	Percent of area in cultivation using 2006 NLCD	0.235	percent
LC06SHRUB	Percent of area covered by shrubland using 2006 NLCD	4.616	percent
LC06WATER	Percent of open water, class 11, from NLCD 2006	6.502	percent
LC06WETLND	Percent of area covered by wetland using 2006 NLCD	42.329	percent

Parameter Code	Parameter Description	Value	Unit
LC11BARE	Percentage of barren from NLCD 2011 class 31	0.113	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0.235	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	25.5	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	19.768	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	0.457	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	3.74	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	5.054	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	6.502	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	42.329	percent
LC92FOREST	Percentage of forest from NLCD 1992 classes 41-43	45.698	percent
LFPLENGTH	Length of longest flow path	5.978	miles
LU92BARE	Percent of area covered by barren rock using 1992 NLCD	0.003	percent
LU92DEV	Percent of area covered by all densities of developed land using 1992 NLCD	2.291	percent
LU92PLANT	Percent of area in cultivation using 1992 NLCD	2.916	percent
LU92WATER	Percent of area covered by water using 1992 NLCD	7.725	percent
LU92WETLN	Percent of area covered by wetland using 1992 NLCD	41.367	percent
MINBELEV	Minimum basin elevation	12.8	feet
OUTLETELEV	Elevation of the stream outlet in thousands of feet above NAVD88.	14	feet
PRECIP	Mean Annual Precipitation	61.3	inches
PROTECTED	Percent of area of protected Federal and State owned land	0	percent
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	36.5	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	37.1	percent

Parameter Code	Parameter Description	Value	Unit
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	18.8	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0.00637	percent

Peak-Flow Statistics Parameters[Peak Southeast US over 1 sqmi 2009 5158]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	8.61	square miles	1	9000
PCTREG1	Percent Area in Region 1	0	percent	0	100
PCTREG2	Percent Area in Region 2	0	percent	0	100
PCTREG3	Percent Area in Region 3	0	percent	0	100
PCTREG4	Percent Area in Region 4	100	percent	0	100
PCTREG5	Percent Area in Region 5	0	percent	0	100

Peak-Flow Statistics Flow Report[Peak Southeast US over 1 sqmi 2009 5158]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	SEp
2 Year Peak Flood	244	ft^3/s	140	423	34.5
5 Year Peak Flood	475	ft^3/s	275	819	34
10 Year Peak Flood	656	ft^3/s	374	1150	35.1
25 Year Peak Flood	905	ft^3/s	498	1640	37.5
50 Year Peak Flood	1120	ft^3/s	599	2110	39.6
100 Year Peak Flood	1370	ft^3/s	704	2650	41.9
200 Year Peak Flood	1590	ft^3/s	790	3190	44.3
500 Year Peak Flood	1930	ft^3/s	914	4070	47.7

Peak-Flow Statistics Citations

Weaver, J.C., Feaster, T.D., and Gotvald, A.J.,2009, Magnitude and frequency of rural floods in the Southeastern United States, through 2006—Volume 2, North Carolina: U.S. Geological

Survey Scientific Investigations Report 2009–5158, 111 p.
(http://pubs.usgs.gov/sir/2009/5158/)

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Application Version: 4.3.11

Energy Dissipator Design for North Lake, Pine Lake, and Upper Lake Dams

	Upper Lake Dam	North Lake Dam	Pine Lake Dam
Design Storm Event	1/3 PMP	1/3 PMP	1/3 PMP
Peak Flow (cfs)	941.5	849	320
Culvert Rise (ft)	5	6	4
Culvert Width (ft)	6	6	5
No. Culverts	5	2	1
Culvert Outlet Invert (ft)	32.4	24.1	24.6
Flow/Barrel (cfs)	188.3	424.5	320
Tail Water Depth, TW (ft)	2.6	5.9	5.4
Riprap Size, D_{50} (in)	12	12	15
Riprap Type	Class 2	Class 2	Class 2
Length of Apron, L_a (ft)	36	36	30
Start Width of Apron, W1 (ft)	42	24	15
End Width of Apron, W2 (ft)	66	48	35
Depth of Apron (ft)	3	3	3

Notes:

***Calculations for the riprap apron of the dams listed above are outlined in Figure 1 and the following equations:**

$$D_{50} = 0.2\,D\left(\frac{Q}{D^{2.5}\sqrt{g}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

(Ref: HEC 14 - Chapter 10)

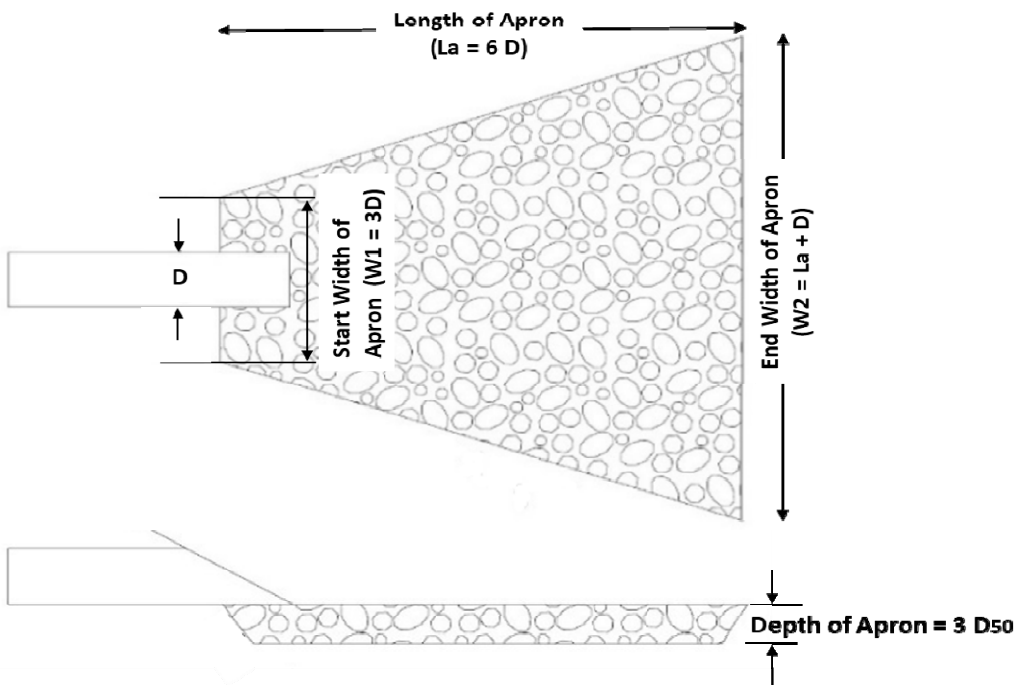

Figure 1. Schematic of Riprap Apron

Energy Dissipator Design

HYDRAULICS OF FLOW AT CULVERT OUTLET

Design Flow (Q)	5379.0	cfs	Acceleration of Gravity (g)	32.2	ft/s^2
Energy Elevation (E)	35.00	ft	Density of Water (ρ)	62.4	lb/ft^3
Elevation of outlet invert (H_{invert})	15.0	ft			

HYDRAULICS OF STEPPED CHUTE

Stepped Shute Energy Dissipation

Chute Top Elevation	15.0	ft	
Width of Chute (W)	60.0	ft	
Chute Toe Elevation	4.0	ft	
Total Chute Height (H_{crest})	11.0	ft	
Unit discharge (q) per foot width	89.65	cfs/ft	
Critical Depth (d_c)	6.30	ft	$d_c = \sqrt[3]{q^2/g}$ *for a rectangular channel*
Chute Critical Velocity (V_c)	14.24	ft/s	$V_c = \sqrt[3]{gq}$ *for a rectangular channel*
Steps slope (Height(h):Length(l))	0.25		
Chute Angle (θ)	14.04	°	
Min Step height for Nappe Flow (h_{nappe})	7.97	ft	*Upper Limit for Nappe Flow:* $\frac{d_c}{h} = 0.89 - 0.4\frac{h}{l}$
Max Step height for Skimming Flow (h_{skim})	5.63	ft	*Lower Limit for Skimming Flow:* $\frac{d_c}{h} = 1.2 - 0.325\frac{h}{l}$
Step Height (h)	4.0	ft	
Step Length (l)	16.0	ft	
Flow Regime	Skimming Flow		
Step Roughness (K_s)	3.88	ft	$K_s = h\cos(\theta)$
Chute Froude Number (F*)	4.20		$F* = q/\sqrt{g(\sin\theta)K_s^3}$
Chute Length (L)	48.0	ft	
Length of Inception (Li)	72.18	ft	$L_i = 5.19\ (F^*)^{0.89}\ K_s$ for $0.1<F^*\leq 28$
L/Li	0.66		
Mean Air Concentration (C_{mean})	0.09		$c_{mean} = 0.11 - \frac{0.22}{\frac{L}{L_i}} + 0.0645 + 0.216\left(\frac{h}{d_c}\right) + 0.453\sin\theta$
Clear Water Depth (y_{cw})	2.68	ft	$y_{cw} = d_c\left[0.34\left(\frac{h}{d_c}\right)^{0.063}\cos\theta^{0.063}\sin\theta^{-0.18}\right]$
Depth at end of Chute (y)	2.93	ft	$y = d_c\left(\frac{L}{L_i}\right)^{-0.22}\left[0.34\left(\frac{h}{d_c}\right)^{0.063}\cos\theta^{0.063}\sin\theta^{-0.18}\right]$
Bulked Flow Depth (y_{90})	2.95	ft	$y_{90}=y_{cw}/(1 - C_{mean})$
Wall Height Safety Factor (FS)	1.50		
Recommended Wall Height (H_w)	4.42	ft	
Total Head (H_0)	20.44	ft	$H_0 = H_{crest}+1.5d_c$
Energy Coefficient (α)	1.03		
Relative Energy Loss ($\Delta H/H_0$)	0.10		$\Delta H/H_0 = 1 - \exp(-0.3\ (L/L_i)^{2.5})$
Head Loss	2.10	ft	
Residual Energy (H_{res})	18.35	ft	
Residual Velocity (V_{res})	31.51	ft/s	

References

Hunt, S. et al, "Simplistic Design Methods for Moderate-Sloped Stepped Chutes." Journal of Hydraulic Engineering, 2014

Energy Dissipator Design

Hydraulic Jump Downstream of Stepped Chute

velocity at the exit of the dissipator (V1)	31.51	ft/s	
Flow depth at the exit of the dissipator (Y1)	2.93	ft	
Fr	3.24		Fr = V1 / (g Y1)^0.5
Conjugate Depth (Y2)	12.06	ft	Y2/Y1 = 0.5 [(1+8F12)^0.5 - 1]
Length of Hydraulic Jump	65.99	ft	L = 220 Y1 tanh[(Fr-1)/22]
Velocity D/S of Hydraulic Jump (V2)	0.08	ft/s	V2=Q/(W*Y2)

Design of Riprap Protection

Since the simulated tailwater condition exceeds the conjugated depth, the hydraulic jump will be forced upstream and likely becoming submerged. Conservatively, riprap is recommended for the length of the computed jump and extending on the slopes to cover the conjugate depth (i.e., Elevation 16 ft NAVD) The stepped chute sill is designed with 5 feet longer end step at the sill, so the riprap protection in front of the sill should extend 60 feet.

References

USBR, Engineering Monograph No. 25 Hydraulic Design of Stilling Basins and Energy Dissipators, 1984.
Chow, VT, Open Channel Hydraulics, 1959.
Chawdhry, MH, Open-Channel Flow, Second Edition, 2008

McGill Associates
5400 Trinity Road
Suite 107
Raleigh, NC 27607

PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - Sanford Dam - US Face**
PREPARED BY	DNS — **DATE** 7/2/20
CHECKED BY	LN — **DATE** 9/14/20

Reservoir Information

Bottom Elevation	13	ft
Normal Still Water El.	30	ft
Depth of Water (h)	17	ft
Embankment Slope (H:V)	3	

General Parameters

Acceleration of Gravity (g)	32.2	ft/s^2
Specific Gravity of riprap (G_s)	2.65	
Specific Unit Weight of Water	62.4	lb/ft^3

Wind Parameters

Design Wind Direction	135	°	(Figure 1)
Effective Fectch (F_e)	0.543	mi	(Table 1)
Overland Wind Velocity (U_L)	120	mph	(Figure 4 - From Reference)
Wind Ratio (U_W/U_L)	1.1		(Figure 7 - From Reference)
Overwater Wind Velocity (U_W)	132	mph	
Design Wind Velocity (U_d)	132	mph	(U_d=U_W)

Significant Wave Height

Significant Wave Height (H_s)	3.1	ft	$H_s = 0.0026\left(\frac{gF_e}{U^2}\right)^{0.47}\frac{U^2}{g}$
Wave Period (T)	3	s	$T = 0.46\left(\frac{gF_e}{U^2}\right)^{0.28}\frac{U}{g}$
Wave Length (L)	46.3	ft	$L = \left[1.041\left(\frac{gF_e}{U^2}\right)^{0.28}\frac{U}{g}\right]^2$
H_s/L	0.07		
Relative Runup Ratio (R/H_s)	1.30		(Figure 12 - From Reference)
Wave Runup (R)	4.0	ft	
Wind Setup (s)	0.3	ft	$s = 0.1H_s$ to a maximum of 0.5 foot

Riprap Sizing

Proper Rock Weight (W_{50})	112	(lb)	$W_{50} = \frac{19.5\ G_s\ H_s^3}{(G_s-1)^3\cot\alpha}$
Median Riprap Diameter (D_{50})	13	in	$D_{50} = 1.24\sqrt[3]{\frac{W_{50}}{62.4\ G_s}}$

Riprap Design

Use Riprap Class	2		
Minimum Thickness	36	in	
Lower Elevation	25.4	ft	(1.5 times H_s below normal water)
Upper Elevation	34.3	ft	(R+s above normal water)

Place Riprap over filter fabric and bedding stone

Reference

United States Department of Agriculture - Soil Conservation Service. 1983. "Riprap for Slope Protection against Wave Action." Technical Release No. 69.

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Wind Direction Computation (Method 2)

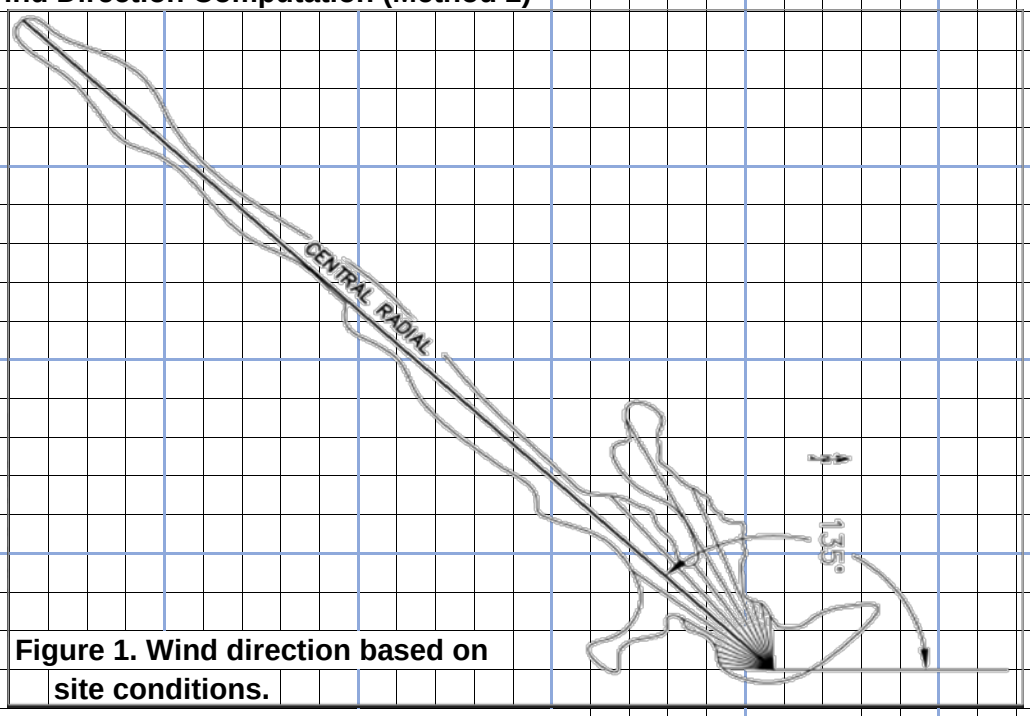

Figure 1. Wind direction based on site conditions.

Based on direction of longest stretch of open water 135 °

Table 1. Effective Fetch Computation

Radial	α	cosα	$\cos^2\alpha$	Dist. X (ft)	$\cos^2\alpha$ X (ft)
1	42	0.743	0.552	942	520
2	36	0.809	0.655	1152	754
3	30	0.866	0.750	1226	920
4	24	0.914	0.835	3344	2791
5	18	0.951	0.905	4830	4369
6	12	0.978	0.957	2165	2071
7	6	0.995	0.989	3858	3816
8	0	1.000	1.000	15840	15840
9	6	0.995	0.989	2729	2699
10	12	0.978	0.957	1703	1629
11	18	0.951	0.905	1012	915
12	24	0.914	0.835	909	759
13	30	0.866	0.750	866	650
14	36	0.809	0.655	830	543
15	42	0.743	0.552	773	427
TOTAL		13.511		42179	38703

Effective Fetch (F_e) 2865 ft
0.543 mi
Check F_e for comparison 0.533 mi

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SUBJECT	**Wave Protection - Sanford Dam - US Face**
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CHECKED BY LN	**DATE** 9/14/20

SHEET 3 **of** 4

REF. (13)

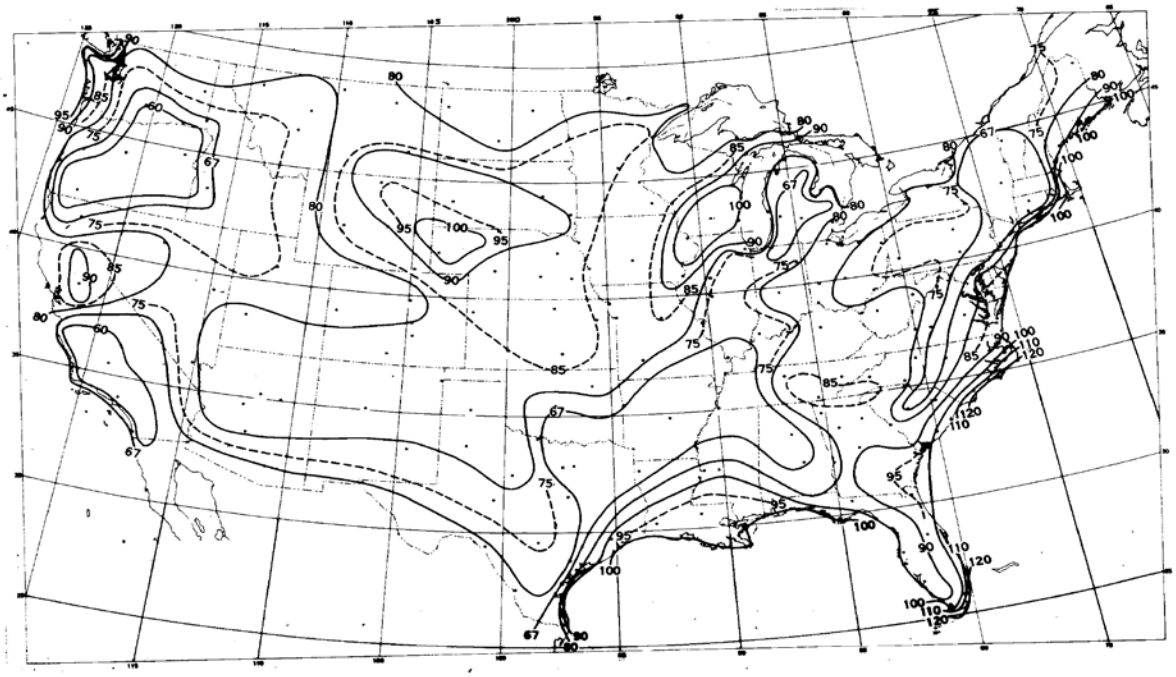

FIGURE 4
MAXIMUM BASIC
WIND VELOCITY (mph)
(50-year recurrence)

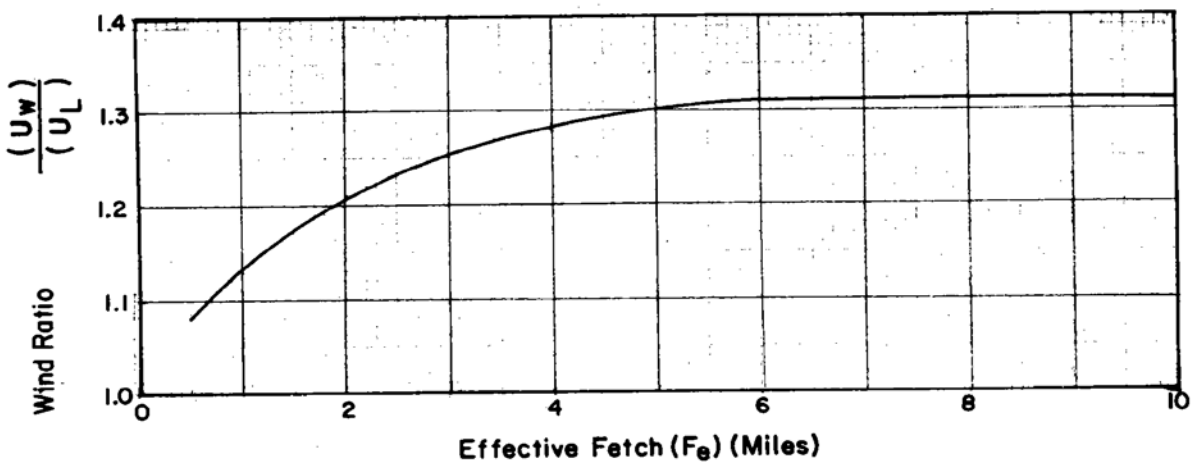

FIGURE 7
WIND RELATIONSHIP OVERWATER TO OVERLAND

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	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - Sanford Dam - US Face**
PREPARED BY DNS	**DATE** 7/2/20
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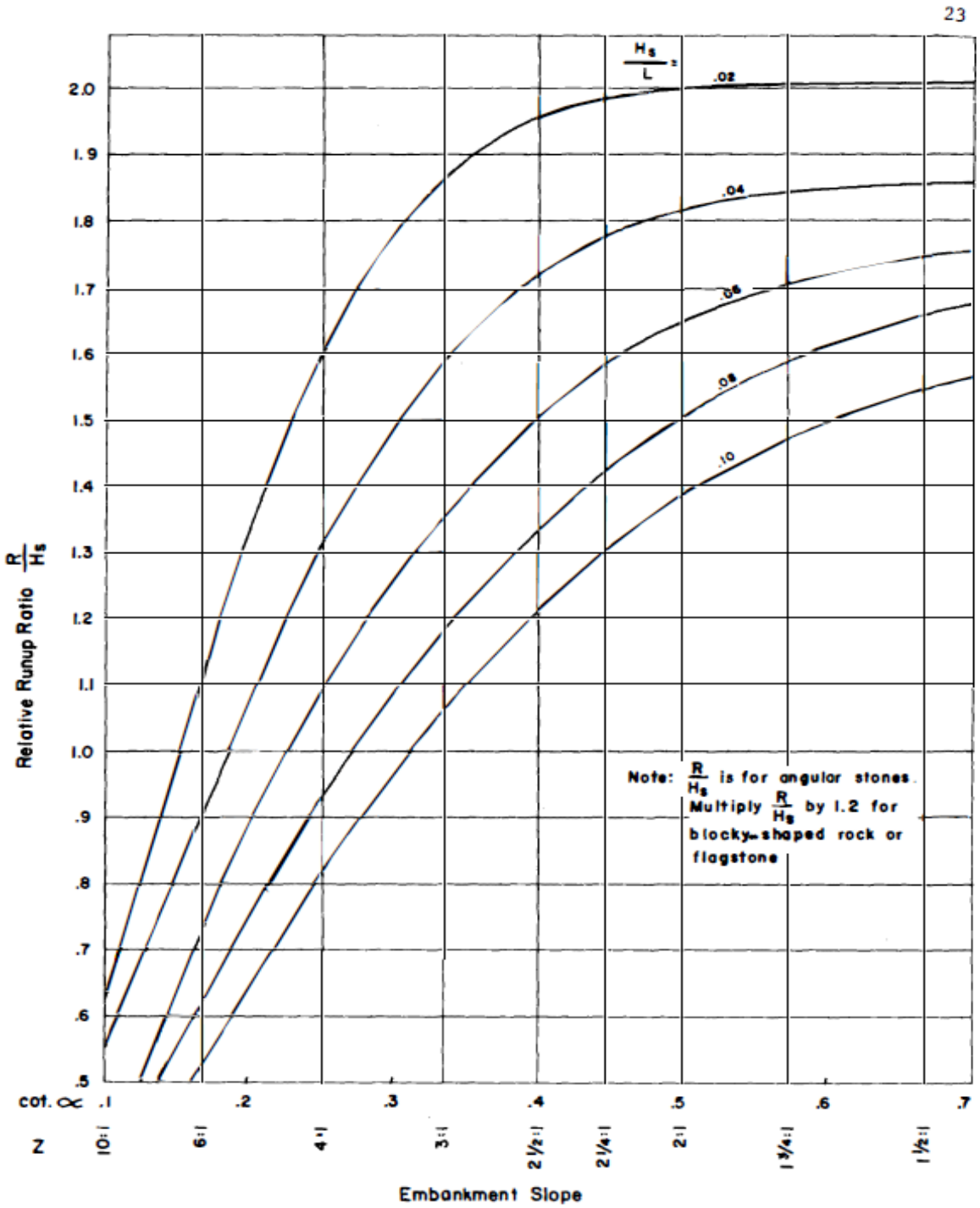

Note: See Ref. (2) and (20) and footnote 1 on page 9.

The surface smoothness represented by these curves is simulated by a single layer of rocks of uniform size.

FIGURE 12
WAVE RUNUP RATIO
WNTC ENG. STAFF
PORTLAND, OREGON

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PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - North Lake Dam - US Face**
PREPARED BY	DNS — **DATE** 7/2/20
CHECKED BY	LN — **DATE** 9/14/20

Reservoir Information

Bottom Elevation	25	ft
Normal Still Water El.	35	ft
Depth of Water (h)	10	ft
Embankment Slope (H:V)	3	

General Parameters

Acceleration of Gravity (g)	32.2	ft/s^2
Specific Gravity of riprap (G_s)	2.65	
Specific Unit Weight of Water	62.4	lb/ft^3

Wind Parameters

Design Wind Direction	67	°	(Figure 1)
Effective Fectch (F_e)	0.163	mi	(Table 1)
Overland Wind Velocity (U_L)	120	mph	(Figure 4 - From Reference)
Wind Ratio (U_W/U_L)	1.04		(Figure 7 - From Reference)
Overwater Wind Velocity (U_W)	124.8	mph	
Design Wind Velocity (U_d)	124.8	mph	(U_d=U_W)

Significant Wave Height

Significant Wave Height (H_s)	1.6	ft	$H_s = 0.0026\left(\frac{gF_e}{U^2}\right)^{0.47}\frac{U^2}{g}$
Wave Period (T)	2	s	$T = 0.46\left(\frac{gF_e}{U^2}\right)^{0.28}\frac{U}{g}$
Wave Length (L)	22.5	ft	$L = \left[1.041\left(\frac{gF_e}{U^2}\right)^{0.28}\frac{U}{g}\right]^2$
H_s/L	0.07		
Relative Runup Ratio (R/H_s)	1.30		(Figure 12 - From Reference)
Wave Runup (R)	2.1	ft	
Wind Setup (s)	0.2	ft	$s = 0.1H_s$ to a maximum of 0.5 foot

Riprap Sizing

Proper Rock Weight (W_{50})	17	(lb)	$W_{50} = \frac{19.5\ G_s\ H_s^3}{(G_s - 1)^3 \cot\alpha}$
Median Riprap Diameter (D_{50})	7	in	$D_{50} = 1.24\sqrt[3]{\frac{W_{50}}{62.4\ G_s}}$

Riprap Design

Use Riprap Class	B		
Minimum Thickness	24	in	
Lower Elevation	32.5	ft	(1.5 times H_s below normal water)
Upper Elevation	37.3	ft	(R+s above normal water)

Place Riprap over filter fabric and bedding stone

Reference

United States Department of Agriculture - Soil Conservation Service. 1983. "Riprap for Slope Protection against Wave Action." Technical Release No. 69.

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Wind Direction Computation (Method 2)

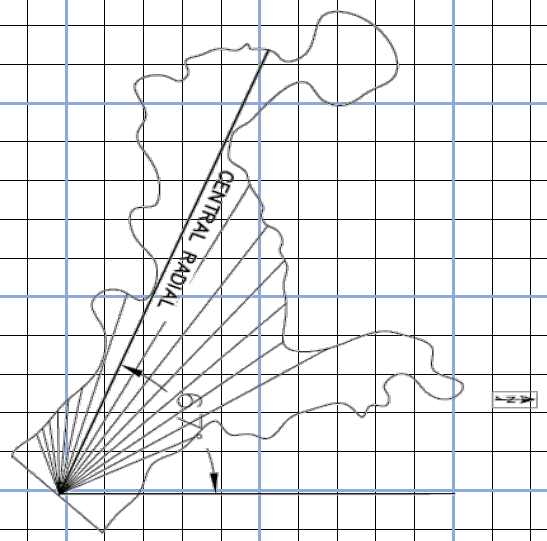

Figure 1. Wind direction based on site conditions.

Based on direction of longest stretch of open water 67 °

Table 1. Effective Fetch Computation

Radial	α	cosα	$\cos^2\alpha$	Dist. X (ft)	$\cos^2\alpha$ X (ft)
1	42	0.743	0.552	576	318
2	36	0.809	0.655	1210	792
3	30	0.866	0.750	1082	812
4	24	0.914	0.835	1197	999
5	18	0.951	0.905	1327	1200
6	12	0.978	0.957	1404	1343
7	6	0.995	0.989	1517	1500
8	0	1.000	1.000	2068	2068
9	6	0.995	0.989	897	887
10	12	0.978	0.957	464	444
11	18	0.951	0.905	407	368
12	24	0.914	0.835	358	299
13	30	0.866	0.750	317	238
14	36	0.809	0.655	289	189
15	42	0.743	0.552	271	150
TOTAL		13.511		13384	11607

Effective Fetch (F_e) 859 ft
0.163 mi
Check F_e for comparison 0.169 mi

McGill Associates
5400 Trinity Road
Suite 107
Raleigh, NC 27607

PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - North Lake Dam - US Face**
PREPARED BY DNS	**DATE** 7/2/20
CHECKED BY LN	**DATE** 9/14/20

SHEET 3 **of** 4

REF. (13)

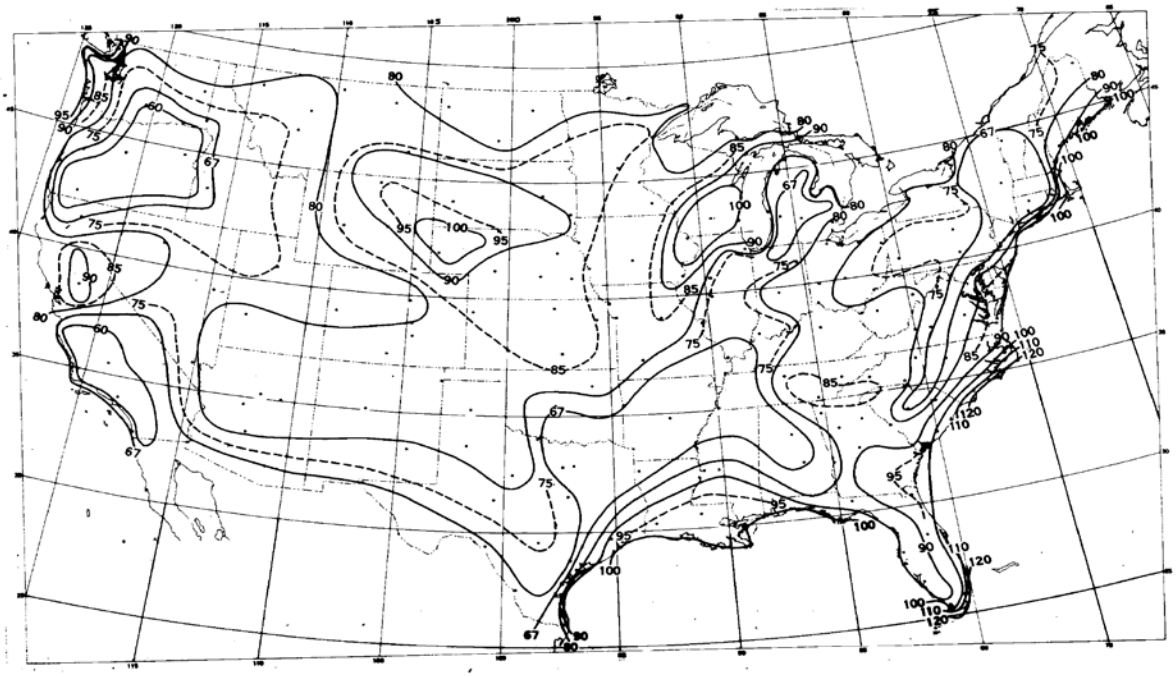

FIGURE 4
MAXIMUM BASIC
WIND VELOCITY (mph)
(50-year recurrence)

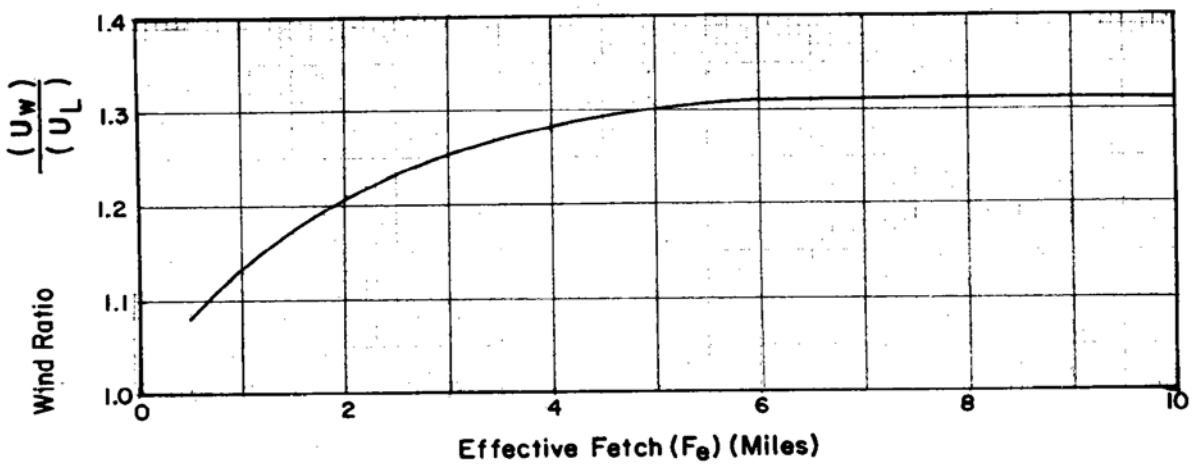

FIGURE 7
WIND RELATIONSHIP OVERWATER TO OVERLAND

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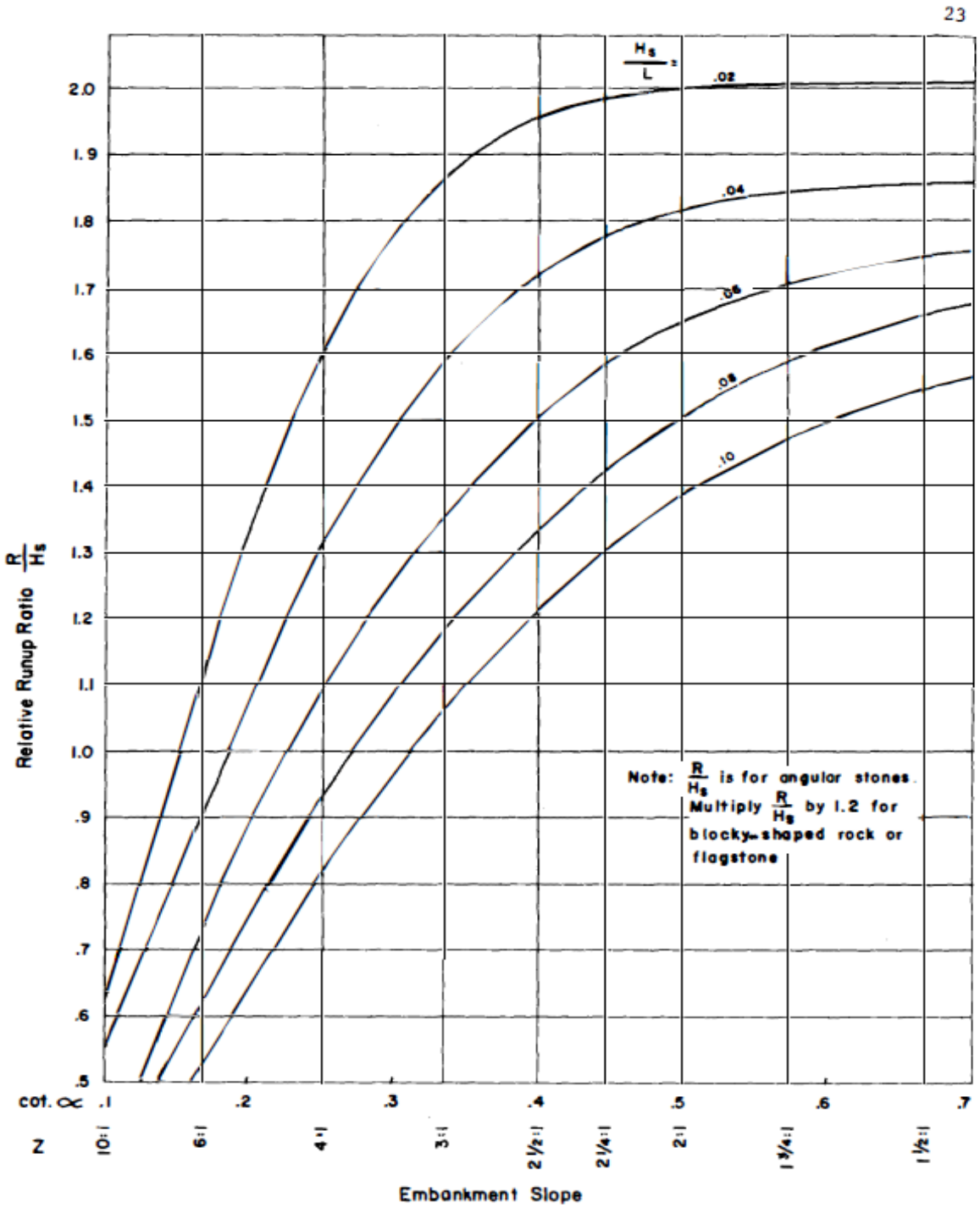
Raleigh, NC 27607

PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - North Lake Dam - US Face**
PREPARED BY DNS	**DATE** 7/2/20
CHECKED BY LN	**DATE** 9/14/20



Note: See Ref. (2) and (20) and footnote 1 on page 9.

The surface smoothness represented by these curves is simulated by a single layer of rocks of uniform size.

FIGURE 12
WAVE RUNUP RATIO
WNTC ENG. STAFF
PORTLAND, OREGON

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Raleigh, NC 27607

PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - Pine Lake Dam - US Face**
PREPARED BY	DNS — **DATE** 7/2/20
CHECKED BY	LN — **DATE** 9/14/20

Reservoir Information

Bottom Elevation	25	ft
Normal Still Water El.	35	ft
Depth of Water (h)	10	ft
Embankment Slope (H:V)	3	

General Parameters

Acceleration of Gravity (g)	32.2	ft/s^2
Specific Gravity of riprap (G_s)	2.65	
Specific Unit Weight of Water	62.4	lb/ft^3

Wind Parameters

Design Wind Direction	11	°	(Figure 1)
Effective Fectch (F_e)	0.128	mi	(Table 1)
Overland Wind Velocity (U_L)	120	mph	(Figure 4 - From Reference)
Wind Ratio (U_W/U_L)	1.03		(Figure 7 - From Reference)
Overwater Wind Velocity (U_W)	123.6	mph	
Design Wind Velocity (U_d)	123.6	mph	(U_d=U_W)

Significant Wave Height

Significant Wave Height (H_s)	1.5	ft	$H_s = 0.0026\left(\frac{gF_e}{U^2}\right)^{0.47}\frac{U^2}{g}$
Wave Period (T)	2	s	$T = 0.46\left(\frac{gF_e}{U^2}\right)^{0.28}\frac{U}{g}$
Wave Length (L)	19.4	ft	$L = \left[1.041\left(\frac{gF_e}{U^2}\right)^{0.28}\frac{U}{g}\right]^2$
H_s/L	0.07		
Relative Runup Ratio (R/H_s)	1.19		(Figure 12 - From Reference)
Wave Runup (R)	1.7	ft	
Wind Setup (s)	0.1	ft	$s = 0.1H_s$ to a maximum of 0.5 foot

Riprap Sizing

Proper Rock Weight (W_{50})	12	(lb)	$W_{50} = \frac{19.5\ G_s\ H_s^3}{(G_s-1)^3\cot\alpha}$
Median Riprap Diameter (D_{50})	6	in	$D_{50} = 1.24\sqrt[3]{\frac{W_{50}}{62.4\ G_s}}$

Riprap Design

Use Riprap Class	B		
Minimum Thickness	24	in	
Lower Elevation	32.8	ft	(1.5 times H_s below normal water)
Upper Elevation	36.9	ft	(R+s above normal water)

Place Riprap over filter fabric and bedding stone

Reference

United States Department of Agriculture - Soil Conservation Service. 1983. "Riprap for Slope Protection against Wave Action." Technical Release No. 69.

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Raleigh, NC 27607

Wind Direction Computation (Method 2)

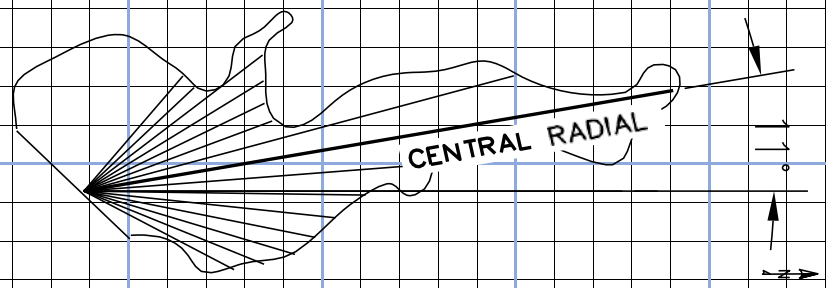

Figure 1. Wind direction based on site conditions.

Based on direction of longest stretch of open water 11 °

Table 1. Effective Fetch Computation

Radial	α	cosα	$\cos^2\alpha$	Dist. X (ft)	$\cos^2\alpha$ X (ft)
1	42	0.743	0.552	466	257
2	36	0.809	0.655	528	346
3	30	0.866	0.750	593	445
4	24	0.914	0.835	630	526
5	18	0.951	0.905	673	609
6	12	0.978	0.957	748	716
7	6	0.995	0.989	934	924
8	0	1.000	1.000	1595	1595
9	6	0.995	0.989	1195	1182
10	12	0.978	0.957	544	520
11	18	0.951	0.905	549	497
12	24	0.914	0.835	584	487
13	30	0.866	0.750	630	473
14	36	0.809	0.655	430	281
15	42	0.743	0.552	438	242
TOTAL		13.511		10537	9099

Effective Fetch (F_e)	673	ft
	0.128	mi
Check F_e for comparison	0.133	mi

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PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - Pine Lake Dam - US Face**
PREPARED BY DNS	**DATE** 7/2/20
CHECKED BY LN	**DATE** 9/14/20

SHEET 3 **of** 4

REF. (13)

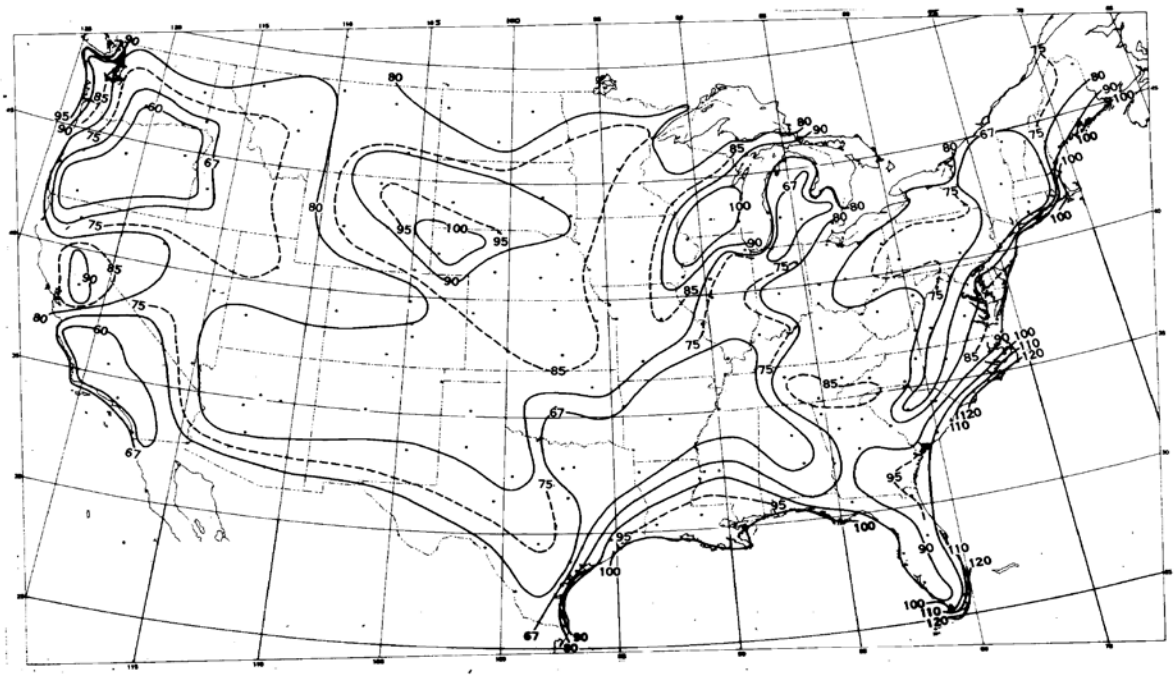


FIGURE 4
MAXIMUM BASIC
WIND VELOCITY (mph)
(50-year recurrence)

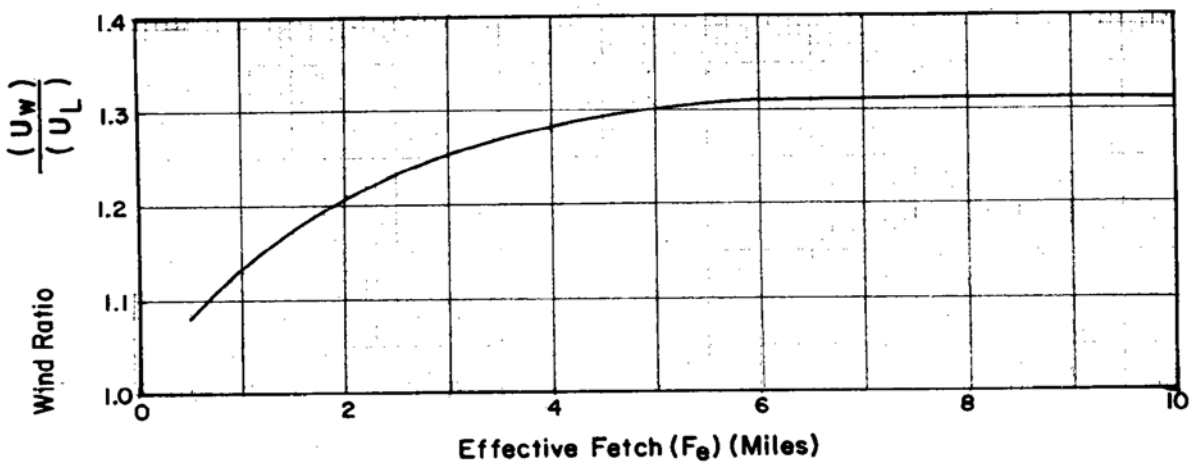
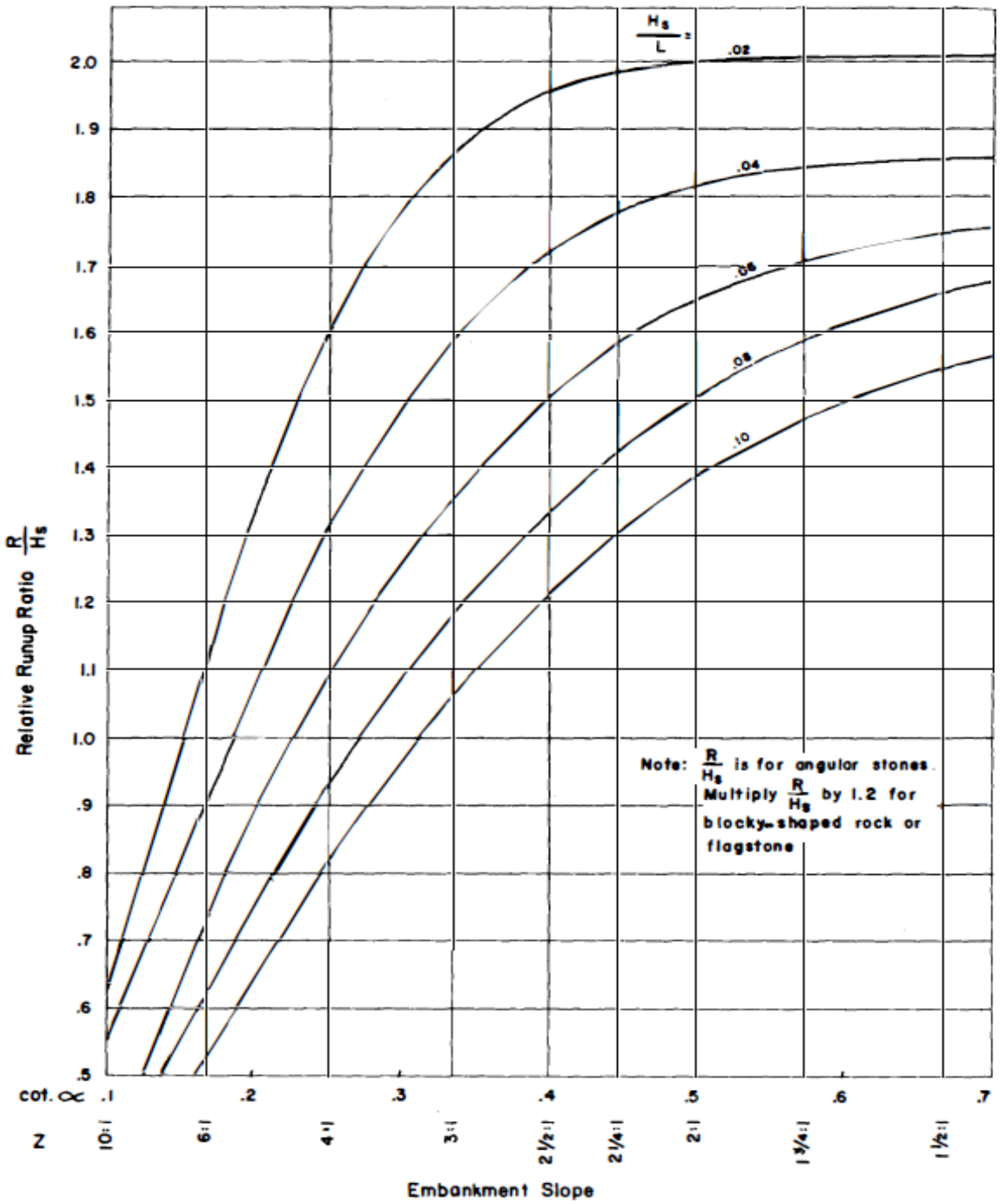


FIGURE 7
WIND RELATIONSHIP OVERWATER TO OVERLAND

McGill Associates
5400 Trinity Road
Suite 107
Raleigh, NC 27607

PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - Pine Lake Dam - US Face**
PREPARED BY DNS	**DATE** 7/2/20
CHECKED BY LN	**DATE** 9/14/20



Note: See Ref. (2) and (20) and footnote 1 on page 9.

The surface smoothness represented by these curves is simulated by a single layer of rocks of uniform size.

FIGURE 12
WAVE RUNUP RATIO
WNTC ENG. STAFF
PORTLAND, OREGON

McGill Associates
5400 Trinity Road
Suite 107
Raleigh, NC 27607

PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - Upper Lake Dam - US Face**
PREPARED BY	DNS — **DATE** 7/2/20
CHECKED BY	LN — **DATE** 9/14/20

Reservoir Information

Bottom Elevation	24	ft
Normal Still Water El.	38	ft
Depth of Water (h)	14	ft
Embankment Slope (H:V)	3	

General Parameters

Acceleration of Gravity (g)	32.2	ft/s^2
Specific Gravity of riprap (G_s)	2.65	
Specific Unit Weight of Water	62.4	lb/ft^3

Wind Parameters

Design Wind Direction	135	°	(Figure 1)
Effective Fectch (F_e)	0.216	mi	(Table 1)
Overland Wind Velocity (U_L)	120	mph	(Figure 4 - From Reference)
Wind Ratio (U_W/U_L)	1.05		(Figure 7 - From Reference)
Overwater Wind Velocity (U_W)	126	mph	
Design Wind Velocity (U_d)	126	mph	(U_d=U_W)

Significant Wave Height

Significant Wave Height (H_s)	1.9	ft	$H_s = 0.0026\left(\frac{gF_e}{U^2}\right)^{0.47}\frac{U^2}{g}$
Wave Period (T)	2	s	$T = 0.46\left(\frac{gF_e}{U^2}\right)^{0.28}\frac{U}{g}$
Wave Length (L)	26.5	ft	$L = \left[1.041\left(\frac{gF_e}{U^2}\right)^{0.28}\frac{U}{g}\right]^2$
H_s/L	0.07		
Relative Runup Ratio (R/H_s)	1.30		(Figure 12 - From Reference)
Wave Runup (R)	2.5	ft	
Wind Setup (s)	0.2	ft	$s = 0.1H_s$ to a maximum of 0.5 foot

Riprap Sizing

Proper Rock Weight (W_{50})	26	(lb)	$W_{50} = \frac{19.5\ G_s\ H_s^3}{(G_s-1)^3\cot\alpha}$
Median Riprap Diameter (D_{50})	8	in	$D_{50} = 1.24\sqrt[3]{\frac{W_{50}}{62.4\ G_s}}$

Riprap Design

Use Riprap Class	B		
Minimum Thickness	24	in	
Lower Elevation	35.1	ft	(1.5 times H_s below normal water)
Upper Elevation	40.7	ft	(R+s above normal water)

Place Riprap over filter fabric and bedding stone

Reference

United States Department of Agriculture - Soil Conservation Service. 1983. "Riprap for Slope Protection against Wave Action." Technical Release No. 69.

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Wind Direction Computation (Method 2)

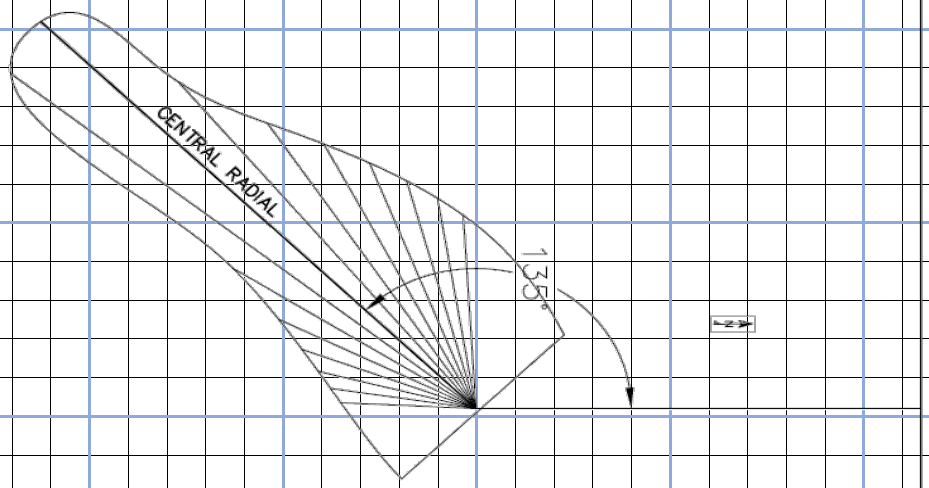


Figure 1. Wind direction based on site conditions.

Based on direction of longest stretch of open water 135 °

Table 1. Effective Fetch Computation

Radial	α	cosα	$\cos^2\alpha$	Dist. X (ft)	$\cos^2\alpha$ X (ft)
1	42	0.743	0.552	834	461
2	36	0.809	0.655	918	601
3	30	0.866	0.750	1018	764
4	24	0.914	0.835	1137	949
5	18	0.951	0.905	1284	1161
6	12	0.978	0.957	1473	1409
7	6	0.995	0.989	1822	1802
8	0	1.000	1.000	2375	2375
9	6	0.995	0.989	2313	2288
10	12	0.978	0.957	1123	1074
11	18	0.951	0.905	857	775
12	24	0.914	0.835	722	603
13	30	0.866	0.750	634	476
14	36	0.809	0.655	571	374
15	42	0.743	0.552	525	290
TOTAL		13.511		17606	15401

Effective Fetch (F_e) 1140 ft
0.216 mi
Check F_e for comparison 0.222 mi

REF. (13)

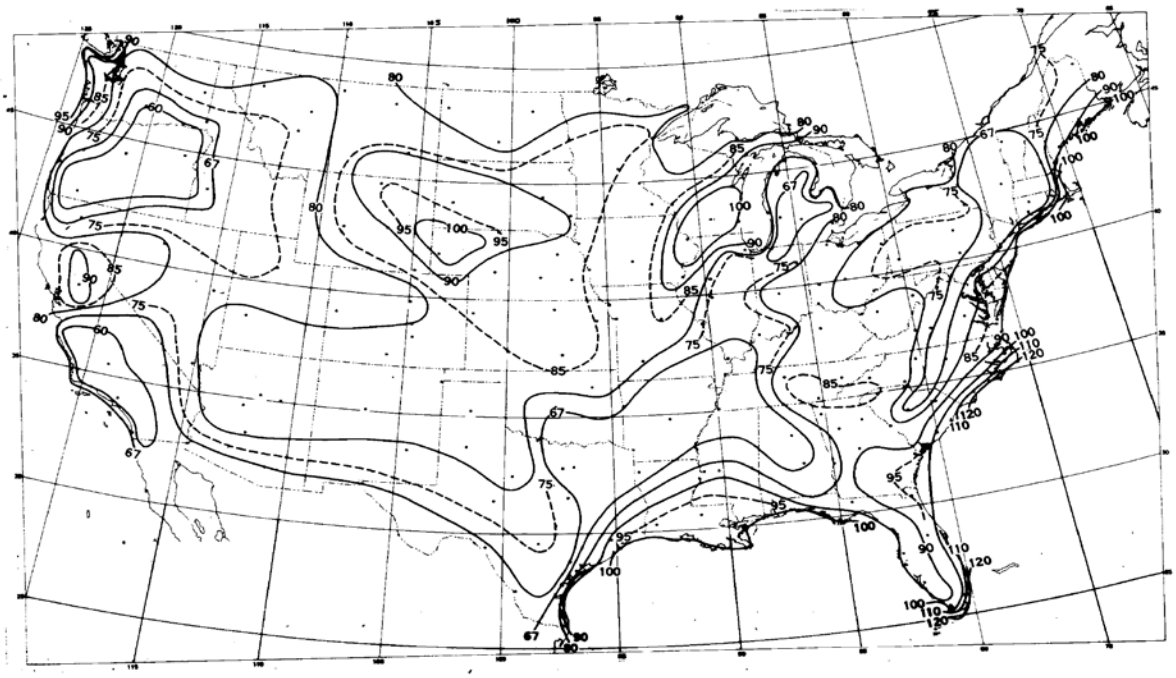


FIGURE 4
MAXIMUM BASIC
WIND VELOCITY (mph)
(50-year recurrence)

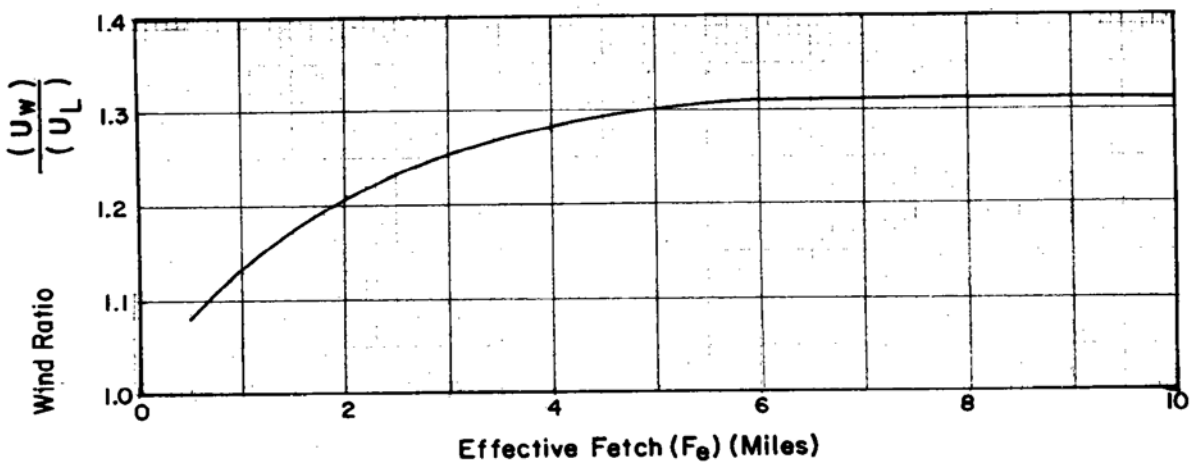
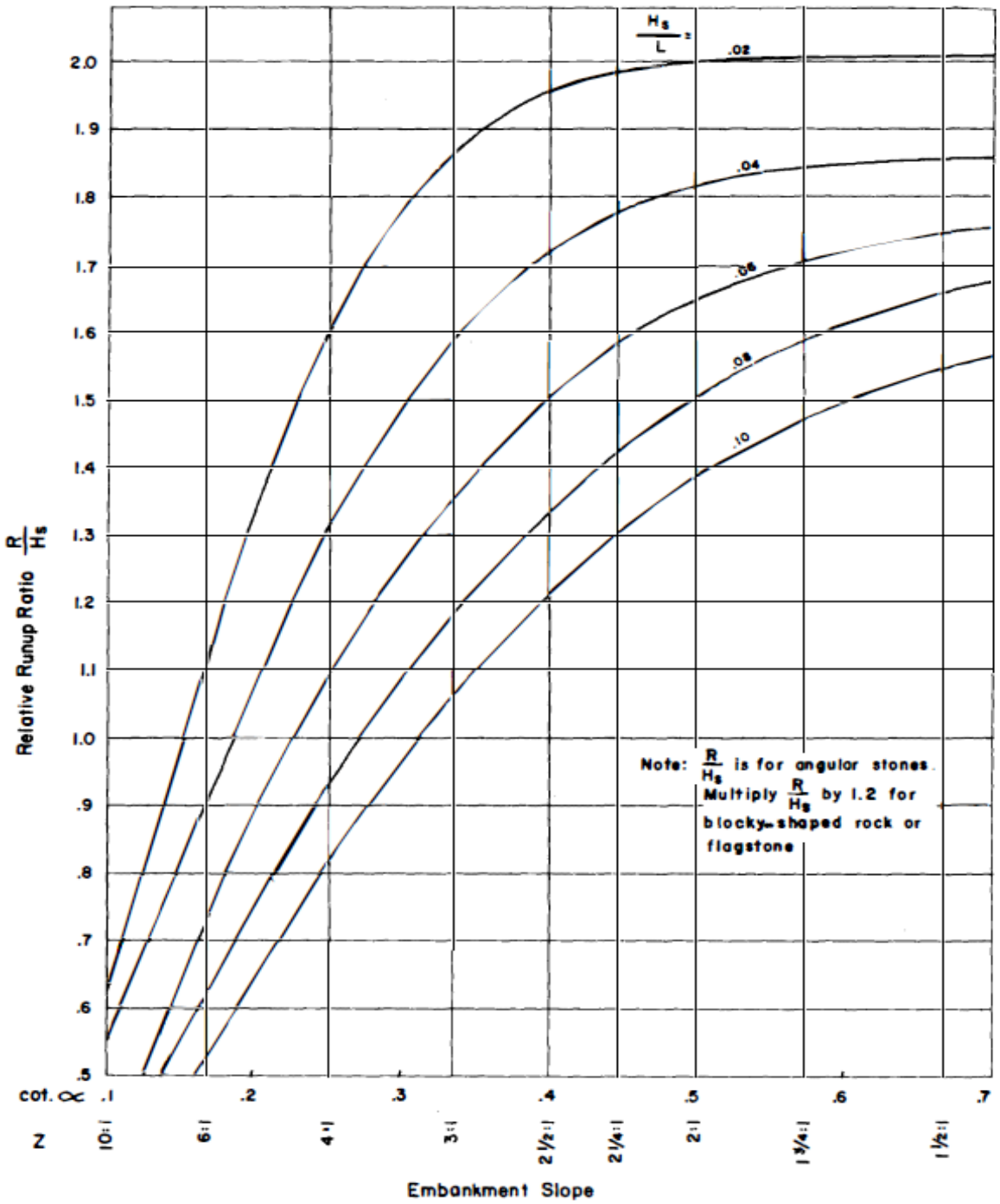


FIGURE 7
WIND RELATIONSHIP OVERWATER TO OVERLAND

McGill Associates
5400 Trinity Road
Suite 107
Raleigh, NC 27607

PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - Upper Lake Dam - US Face**
PREPARED BY DNS	**DATE** 7/2/20
CHECKED BY LN	**DATE** 9/14/20



Note: See Ref. (2) and (20) and footnote 1 on page 9.

The surface smoothness represented by these curves is simulated by a single layer of rocks of uniform size.

FIGURE 12
WAVE RUNUP RATIO
WNTC ENG. STAFF
PORTLAND, OREGON

McGill Associates
5400 Trinity Road
Suite 107
Raleigh, NC 27607

PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - Upper Lake Dam - DS Face**
PREPARED BY	DNS — **DATE** 7/2/20
CHECKED BY	LN — **DATE** 9/14/20

Reservoir Information

Bottom Elevation	25	ft
Normal Still Water El.	35	ft
Depth of Water (h)	10	ft
Embankment Slope (H:V)	3	

General Parameters

Acceleration of Gravity (g)	32.2	ft/s^2
Specific Gravity of riprap (G_s)	2.65	
Specific Unit Weight of Water	62.4	lb/ft^3

Wind Parameters

Design Wind Direction	26	°	(Figure 1)
Effective Fectch (F_e)	0.171	mi	(Table 1)
Overland Wind Velocity (U_L)	120	mph	(Figure 4 - From Reference)
Wind Ratio (U_W/U_L)	1.04		(Figure 7 - From Reference)
Overwater Wind Velocity (U_W)	124.8	mph	
Design Wind Velocity (U_d)	124.8	mph	(U_d=U_W)

Significant Wave Height

Significant Wave Height (H_s)	1.7	ft	$H_s = 0.0026\left(\frac{gF_e}{U^2}\right)^{0.47}\frac{U^2}{g}$
Wave Period (T)	2	s	$T = 0.46\left(\frac{gF_e}{U^2}\right)^{0.28}\frac{U}{g}$
Wave Length (L)	23.1	ft	$L = \left[1.041\left(\frac{gF_e}{U^2}\right)^{0.28}\frac{U}{g}\right]^2$
H_s/L	0.07		
Relative Runup Ratio (R/H_s)	1.30		(Figure 12 - From Reference)
Wave Runup (R)	2.2	ft	
Wind Setup (s)	0.2	ft	$s = 0.1H_s$ to a maximum of 0.5 foot

Riprap Sizing

Proper Rock Weight (W_{50})	18	(lb)	$W_{50} = \frac{19.5\ G_s\ H_s^3}{(G_s-1)^3\cot\alpha}$
Median Riprap Diameter (D_{50})	7	in	$D_{50} = 1.24\sqrt[3]{\frac{W_{50}}{62.4\ G_s}}$

Riprap Design

Use Riprap Class	B		
Minimum Thickness	24	in	
Lower Elevation	32.5	ft	(1.5 times H_s below normal water)
Upper Elevation	37.4	ft	(R+s above normal water)

Place Riprap over filter fabric and bedding stone

Reference

United States Department of Agriculture - Soil Conservation Service. 1983. "Riprap for Slope Protection against Wave Action." Technical Release No. 69.

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Wind Direction Computation (Method 2)

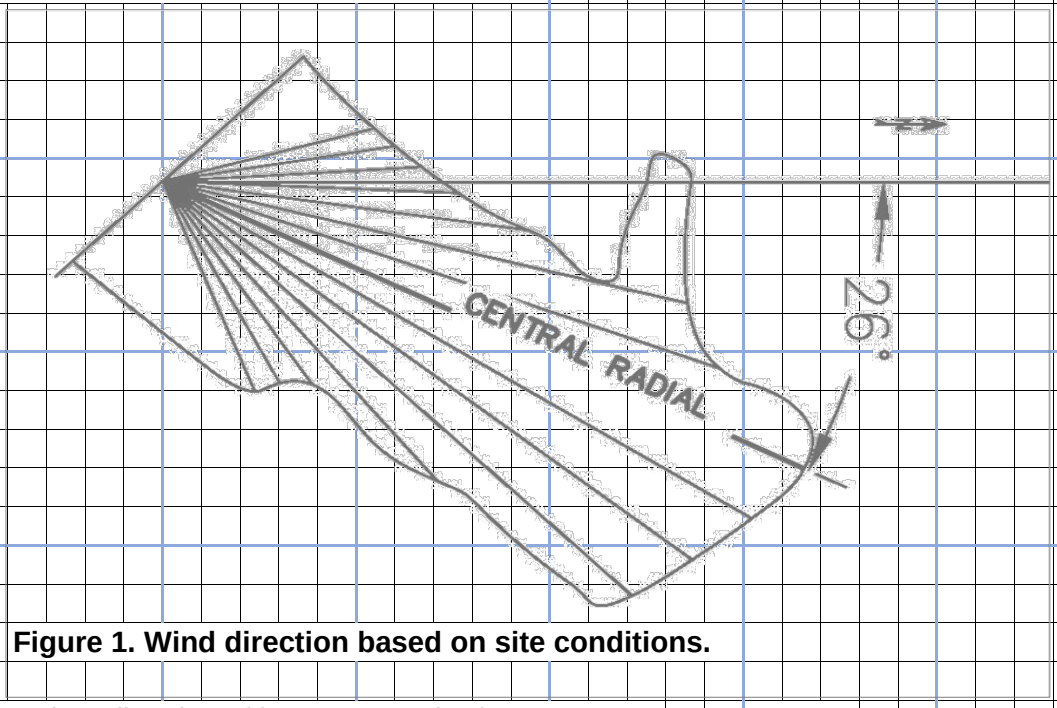

Figure 1. Wind direction based on site conditions.

Based on direction of longest stretch of open water 26 °

Table 1. Effective Fetch Computation

Radial	α	cosα	$\cos^2\alpha$	Dist. X (ft)	$\cos^2\alpha$ X (ft)
1	42	0.743	0.552	472.02	261
2	36	0.809	0.655	506.46	331
3	30	0.866	0.750	555.44	417
4	24	0.914	0.835	632.31	528
5	18	0.951	0.905	793.6	718
6	12	0.978	0.957	1164.14	1114
7	6	0.995	0.989	1275.45	1262
8	0	1.000	1.000	1536.32	1536
9	6	0.995	0.989	1499.45	1483
10	12	0.978	0.957	1453.55	1391
11	18	0.951	0.905	1412.36	1277
12	24	0.914	0.835	927.82	774
13	30	0.866	0.750	581.41	436
14	36	0.809	0.655	543.1	355
15	42	0.743	0.552	539.15	298
TOTAL		13.511		13892.58	12181

Effective Fetch (F_e) 902 ft
0.171 mi
Check F_e for comparison 0.175 mi

McGill Associates
5400 Trinity Road
Suite 107
Raleigh, NC 27607

PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - Upper Lake Dam - DS Face**
PREPARED BY DNS	**DATE** 7/2/20
CHECKED BY LN	**DATE** 9/14/20

REF. (13)

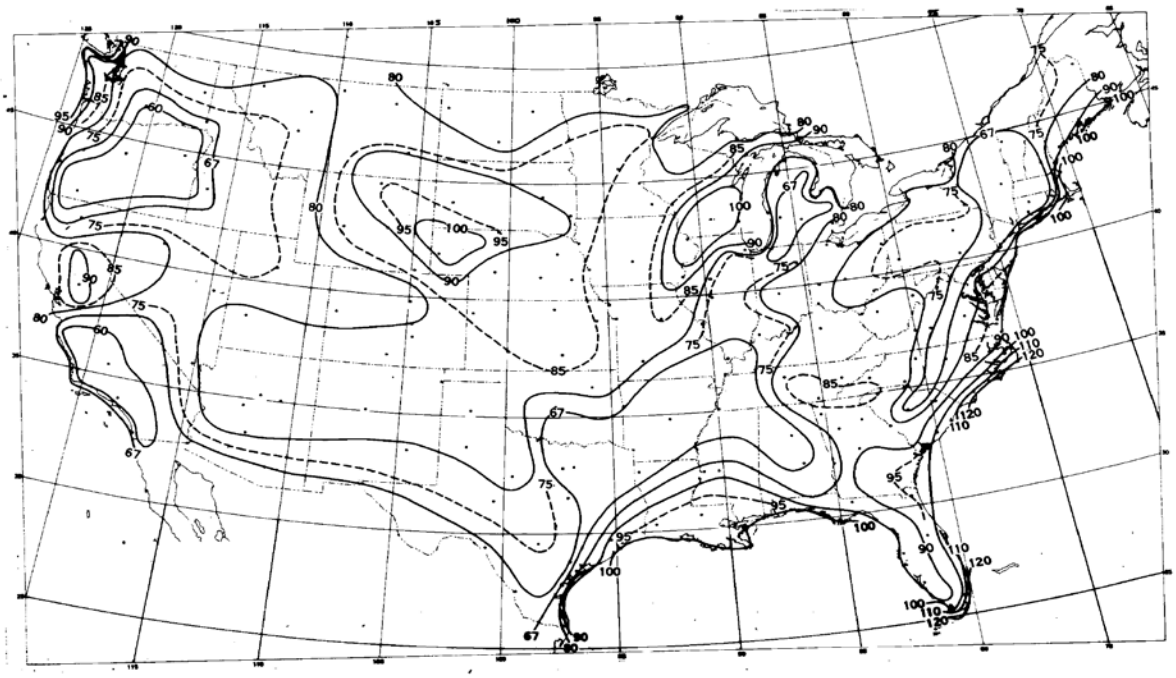

FIGURE 4
MAXIMUM BASIC
WIND VELOCITY (mph)
(50-year recurrence)

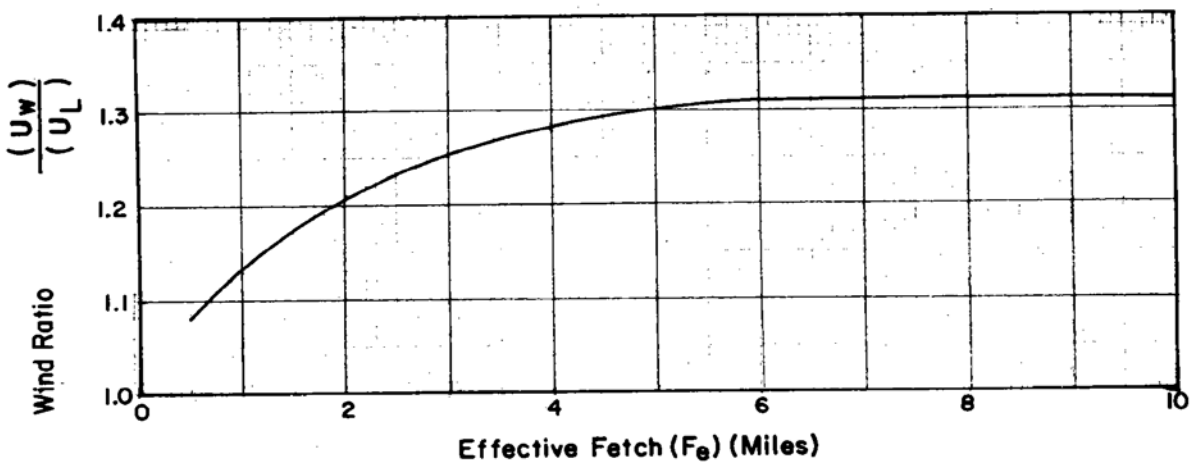

FIGURE 7
WIND RELATIONSHIP OVERWATER TO OVERLAND

McGill Associates
5400 Trinity Road
Suite 107
Raleigh, NC 27607

PROJECT	**Boiling Spring Lakes**
	Dam Construction/Reconstruction
SUBJECT	**Wave Protection - Upper Lake Dam - DS Face**
PREPARED BY DNS	**DATE** 7/2/20
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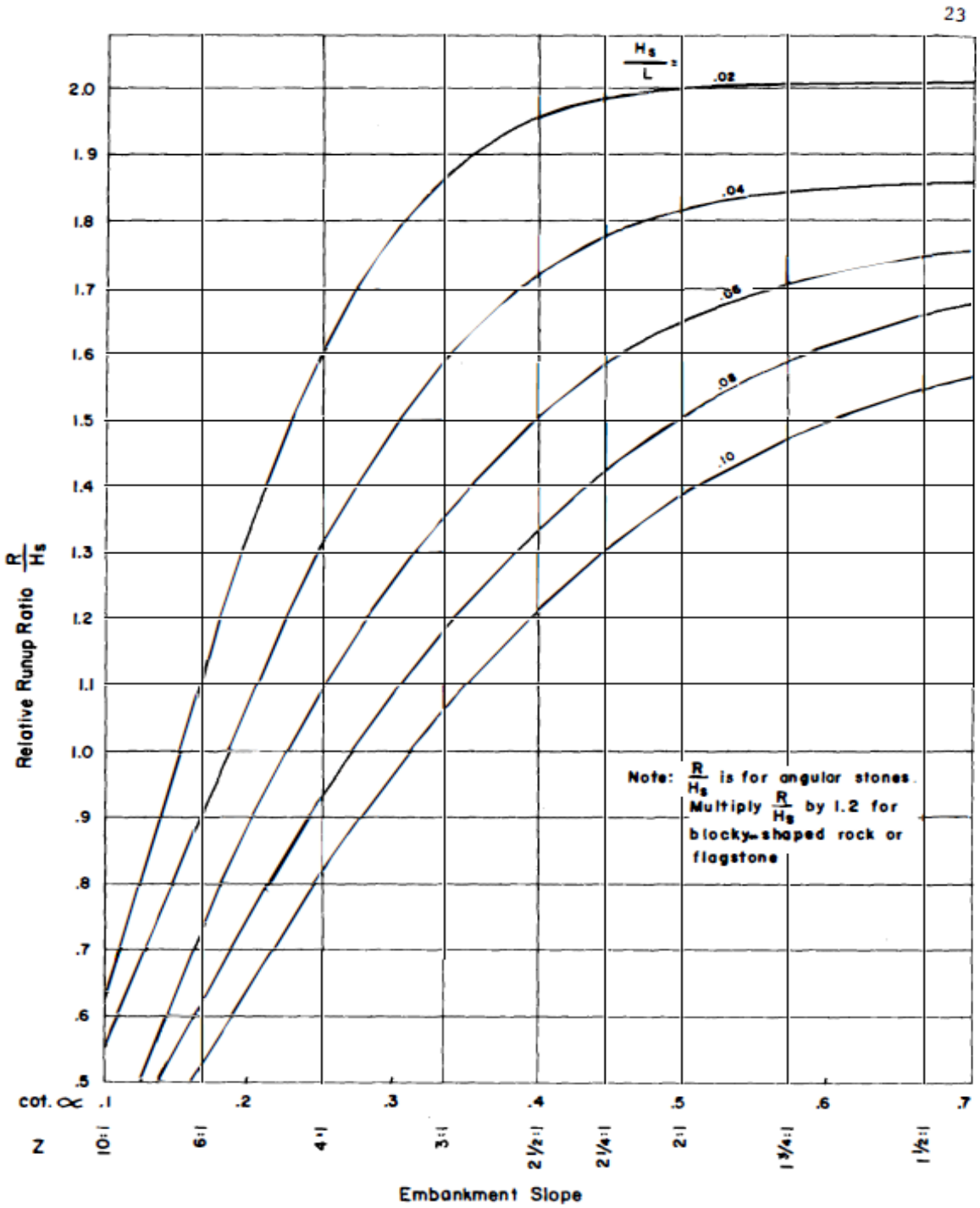

Note: See Ref. (2) and (20) and footnote 1 on page 9.

The surface smoothness represented by these curves is simulated by a single layer of rocks of uniform size.

FIGURE 12
WAVE RUNUP RATIO
WNTC ENG. STAFF
PORTLAND, OREGON

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
S. DANIEL SMITH
Director

NORTH CAROLINA
Environmental Quality

September 8, 2020

Dori Sabeh, PE, GISP
McGill Associates, P.A.
5400 Trinity Road, Suite 107
Raleigh, NC 27607

RE: Boiling Springs Lake Dam (BRUNS-003), Allen Creek, Brunswick County
Flow Requirement

~~Dear Sir:~~ Dori,

This letter is in response to your request for a determination of a flow requirement for the Boiling Springs Lake (Sanford) Dam and near-by dams that sit within the footprint of the main impoundment, i.e., North Lake Dam (BRUNS-001), Pine Lake Dam (BRUNS-002), and Upper Lake Dam (BRUNS-012). The dams were breached by flood flows associated with Hurricane Florence in September 2018. The dams are subject to the Dam Safety Law and associated rules. 15A NCAC 02K .0500, et seq., provides the process for establishing minimum flow requirements for subject dams.

Because the impounded waters of Boiling Springs Lake reach up to the toe of each of the three dams that sit within the footprint of the impoundment, those dams should be operated such that the outflow from each dam approximately equals inflow to each impoundment, or "run-of-river."

For the following reasons the Division of Water Resources (DWR) requests that the Boiling Springs Lake Dam be operated in a run-of-river mode of operation as well.

- Establishing a flow requirement for the dam would require a site-specific field study that would be a challenge given the dam's location in the outer coastal plain and the associated topographic, geologic and hydrologic characteristics of the watershed.
- Given that there appears to be no off-stream water usage, for all intents and purposes the dam will spill water in a run-of-river manner. Thus, the commitment of staff time and resources and potential cost to the dam owner does not seem justified at this time.

DWR will reconsider the need for a site-specific study at such time that off-stream uses put the run-of-river mode of operation in jeopardy.

If you have questions or wish to discuss further, please contact me at 919.707.9029 or by email at fred.tarver@ncdenr.gov.

Sincerely,

Fred R Tarver III
Water Planning Section

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project Boiling Spring Lakes Dams Construction/Reconstruction	**Project Number** 19C21022
Title Soil and Rock Properties	
Computer Programs Used Microsoft Excel	**Version/Release No.** 2016
Purpose and Objective Develop soil parameters for use in geotechnical and structural designs and analyses for Sanford Dam, North Lake Dam, Pine Lake Dam, and Upper Lake Dam.	
Summary of Conclusions See attached memorandum and calculations.	

Originator			
Austin Spencer, PE		Austin Spencer	Jul 24, 2020
	Print	Sign	Date
Checked			
Adam Paisley, PE		Adam Paisley	Jul 24, 2020
	Print	Sign	Date

SCHNABEL ENGINEERING SOUTH, P.C.
11A Oak Branch Drive
Greensboro, NC 27407
T/ 336-274-9456
F/ 336-274-9486

TECHNICAL MEMORANDUM

BY:	Austin Spencer, PE	**DATE:**	July 24, 2020
PROJECT:	Boiling Spring Lakes Dams Construction/Reconstruction	**SUBJECT:**	Soil and Rock Properties
LOCATION:	Boiling Spring Lakes, North Carolina	**PROJECT NO.:**	19C21022
CHECKED BY:	Adam Paisley, PE	**DATE:**	July 24, 2020

INTRODUCTION

Sanford Dam (SD), North Lake Dam (NLD), Pine Lake Dam (PLD), and Upper Lake Dam (ULD) (collectively herein referred to as the BSL Dams) breached during Hurricane Florence in September 2018. The four BSL Dams are part of a system of dams where NLD, PLD, and ULD are situated upstream of Sanford Dam and independent of each other. NLD and PLD are directly upstream, such that the SD headwater is the tailwater for NLD and PLD. A fifth dam named Middle Lake Dam (MLD) is founded between SD and ULD and also breached during Hurricane Florence but is not part of the BSL Dams rehabilitation project.

The Boiling Spring Lakes Dams Rehabilitation project includes the replacement of the spillway structures at each dam, as well as the repair of breached sections at SD and ULD. The existing spillway structures will be demolished and replaced with new cast-in-place concrete spillway elements. Imported earthfill will be used to rehabilitate each of the BSL Dams.

At Sanford Dam, the existing spillway near the right abutment will be removed and the alluvial/coastal deposits (Foundation Soils) will be excavated to top of rock and replaced between the right abutment and the intact embankment left of the breach. A new embankment section and the new spillway will be constructed within the excavation. The proposed SD embankment section includes a low-permeability core (Proposed Core Fill), upstream and downstream shell zones, and a seepage collection system consisting of filter sand (Proposed Fine Drainfill) and fine gravel (Proposed Coarse Drainfill). The upstream and downstream shell zones will be constructed of common shell fill (Proposed Common Fill) above elevation (EL) 16 and denser shell fill (Proposed Select Fill) below EL 16. The SD embankment to the left (looking downstream) of the breached area and spillway excavation will generally not be modified except for the installation of the cutoff wall through the embankment crest, installation of mix-in-place soil-cement panels (MIP Panels) below the upstream and downstream slopes, and the repair of an area that was partially scoured by overtopping during Hurricane Florence. The cutoff wall and MIP Panels are discussed in separate documents.

The proposed spillway structures at NLD, PLD, and ULD will be founded on the Foundation Soils. NLD, PLD, and ULD proposed embankment sections will consist of Proposed Embankment Common Fill and will include filter diaphragms installed around the proposed spillway conduits.

This memorandum describes the selection of the soil parameters for use in the design of the Boiling Spring Lakes Dams Construction/Reconstruction project.

EXTERNAL INFORMATION

The analyses discussed herein were prepared based on available geologic and geotechnical data presented in the Schnabel 2020 Phase 1 and Phase 2 Geotechnical Data Report (GDR) (Schnabel, 2020).

SOIL AND ROCK PROPERTIES

Summary

We selected geotechnical materials and properties based on the data presented in the GDR, the proposed rehabilitation design elements, and our experience with similar materials. The following subsections describe the approach for selecting geotechnical materials and properties, which are summarized in Table 1.

Table 1 – Summary of Soil and Rock Properties

Material	Site	Unit Weight		Effective Stress Shear Strength Parameters		Total Stress Shear Strength Parameters		Saturated Horiz. Hydraulic Conductivity	Vert. to Horiz. Hyd Cond. Ratio
		Moist	Saturated						
		γ_m (pcf)	γ_{sat} (pcf)	ϕ' (deg)	c' (psf)	ϕ (deg)	c (psf)	kx (cm/s)	ky/kx
Existing Embankment Common Fill	All	120	125	32	0	24	50	1E-04	0.5
Existing Embankment Core Fill	SD	120	125	32	100	20	200	1E-06	1
Foundation Soils	All	115	120	29	0	20	100	1E-03	0.5
Foundation Bedrock	All	Impenetrable						1E-02	1
Proposed Select Fill	SD	125	130	35	0	24	50	1E-04	0.5
Proposed Common Fill	All	120	125	32	0	24	50	1E-04	0.5
Proposed Core Fill	SD	120	125	32	100	20	200	1E-06	1
Proposed Fine Drainfill	All	120	125	34	0	34	0	1E-02	1
Proposed Coarse Drainfill	SD	120	125	36	0	36	0	1E-01	1

Shear Strength Parameters

Existing Embankment Common Fill

During the Phase 1 and Phase 2 subsurface explorations, we sampled Existing Embankment Common Fill at each of the four dam sites. The Existing Embankment Common Fill materials at each site were generally classified as medium dense to dense sands with varying amounts of fines. Soil samples were obtained with a split-barrel sampler during performance of Standard Penetration Tests (SPTs). Cone Penetration Tests (CPTs) were also performed.

The field-recorded SPT N-values for the Existing Embankment Common Fill were corrected for overburden and sampling effects using the procedure outlined in "Performance and Use of the Standard Penetration Test in Geotechnical Engineering Practice" (McGregor and Duncan, 1998). Based on guidance from our senior geotechnical engineer, the average corrected SPT N-values (N_{60} and $N_{1,60}$) for each site, as well as average values for the entire project, were reduced by one standard deviation such that approximately 2/3 of the observations were greater than the selected values (assuming a normal distribution). We then calculated effective stress friction angles using SPT N-value correlations developed by Meyerhof (1956), Duncan and Buchignani (1976), Terzaghi et al. (1996), and Duncan et al. (2014).

CPT tip resistance measurements were recorded at approximately 0.1-foot depth intervals throughout each sounding. We used the Kulhawy and Mayne (1990) and Robertson and Campanella (1983) corrected tip resistance (qt) correlations to calculate effective stress friction angles at each depth interval. The calculated effective stress friction angles were averaged for each site, as well as for the entire project, and were reduced by one standard deviation such that approximately 2/3 of the observations were greater than the selected values (assuming a normal distribution).

The effective stress friction angles shown in Table 1 were selected based on the results of the SPT and CPT analyses. The selected corrected N-values and average corrected CPT tip resistances for the Existing Embankment Common Fill are summarized in Table 2 below. The SPT N-value correction calculations for the Existing Embankment Common Fill are included as Attachment 1, and the calculated effective stress friction angles from each of the SPT N-value correlations are included in Attachment 2. Published SPT N-value correlations are included in Attachment 3. The CPT tip resistance correlation calculations for the Existing Embankment Common Fill are included in Attachment 4.

Table 2 – Summary of Corrected N-Values and CPT Tip Resistances for Existing Embankment Common Fill

Dam	Selected N_{60} (blows per foot)	Selected $N_{1,60}$ (blows per foot)	Avg qt (tsf)
SD	7	9	158.2
NLD	14	21	143.5
PLD	12	21	83.3
ULD	5	7	103.4
All Dams	6	10	143.5

The correlations referenced above do not account for effective stress cohesion. Based on our observation of near-vertical slope faces at partially failed embankment sections at SD and our experience with similar materials, we consider it reasonable to assign an effective stress cohesion of 50 psi for Existing Embankment Common Fill.

Existing Embankment Core Fill

At Sanford Dam, a grab sample of Existing Embankment Core Fill was retained from the breached section at the general location of the core shown on the 1960 Drawings (Henry von Oesen and Associates, 1960) and was classified as sandy lean clay (CL) based on laboratory index testing. No in-situ or laboratory shear strength testing was performed on this material. We selected the parameters for this soil shown in Table 1 based on our experience with similar materials. Existing Embankment Core Fill was not encountered at any of the other three sites.

Foundation Soils

The Foundation Soils at each of the four dam sites were generally classified as very loose to medium dense sands with varying amounts of fines. Relatively small pockets of lean clay (CL) and fat clay (CH) were encountered infrequently beneath Sanford, North Lake, and Pine Lake Dams. The fine-grained soils do not appear to be laterally continuous across each site.

The same approach as was used to calculate the effective stress friction angle for the Existing Embankment Fill was used for Foundation Soils. The corrected N-values and CPT tip resistances for Foundation Soils were relatively low. The referenced SPT and CPT effective stress friction angle correlations were generally developed for N-values greater than 4 blows per foot, normalized tip resistances greater than 10 (Kulhawy and Mayne, 1990), and corrected tip resistances greater than 20 tsf (Robertson and Campanella, 1983). These correlations also have a minimum effective stress friction angle of 30 degrees. Based on these limitations, we limited the minimum effective stress friction angle to 25 degrees in our analysis.

The selected effective stress friction angle shown in Table 1 is based on the results of the SPT and CPT analyses. The selected corrected N-values and average corrected CPT tip resistances for the Foundation Soils are summarized in Table 3 below. The SPT N-value correction calculations for the Foundation Soils are included as Attachment 5, and the calculated effective stress friction angles from each of the SPT N-value correlations are included in Attachment 6. The CPT tip resistance correlation calculations for the Foundation Soils are included in Attachment 4.

Table 3 – Summary of Corrected N-Values and CPT Tip Resistances for Foundation Soils

Dam	Selected N_{60} (blows per foot)	Selected $N_{1,60}$ (blows per foot)	Avg qt (tsf)
SD	7	3	53.2
NLD	3	3	48.6
PLD	1	1	51.0
ULD	3	4	48.4
All Dams	2	1	51.9

Foundation Bedrock

The top layer of rock encountered in each cored boring was described as vuggy, fossiliferous, weak (700 to 2,200 psi) calcirudite limestone, where the vugs often appear to be molds of shells that have been washed out in an apparent solutioning process. Underlying the calcirudite limestone, the encountered rock was described as fossiliferous, fine-to-medium-grained, very weak (600 psi) calcarenite limestone that contained a significant amount of sand-sized shell fragments. The foundation bedrock will be modeled as “impenetrable” in the stability analyses because the strength of the rock is not expected to control stability. Detailed unconfined compressive strength results are provided in the GDR.

Proposed Embankment Fill Materials

As discussed above, Sanford Dam will be reconstructed with Proposed Common Fill, Proposed Core Fill, Proposed Select Fill, Proposed Fine Drainfill, and Proposed Coarse Drainfill. North Lake Dam, Pine Lake Dam, and Upper Lake Dam will be reconstructed with Proposed Embankment Common Fill, Proposed Fine Drainfill, and Proposed Coarse Drainfill. Proposed fill materials that will be used to reconstruct the embankments are expected to originate from off-site sources.

Off-site soils used as proposed fill soils will meet specified soil property requirements, which will limit allowable soils to those which are similar to the existing embankment soils. In accordance with the specified requirements and our assumption that modern equipment and methods will compact the proposed soils to an equal or greater density than the existing soils, the Proposed Common Fill and Proposed Core Fill are assumed to have the same shear strength parameters as the Existing Embankment Fill and Existing Embankment Core Fill, respectively.

The Proposed Select Fill will meet the same specified requirements as the Proposed Embankment Common Fill and will be compacted to meet at least 95% of the maximum density as determined by the Modified Proctor test (ASTM D1557). The other embankment fill materials will be compacted to meet at least 95% of the maximum density as determined by the Standard Proctor test (ASTM D698). Therefore, the unit weight and shear strength parameters for the Proposed Select Fill were increased slightly to account for the additional compaction effort.

The Fine Drainfill and Coarse Drainfill parameters were selected based on our experience with similar materials.

Seepage Parameters

Existing Embankment Fill Materials

Permeability testing was not performed on Existing Embankment Common Fill or Existing Embankment Core Fill. We selected the seepage parameters presented in Table 1 for these materials based on our experience with similar materials.

Foundation Soils

During the Phase 1 subsurface investigation, we performed in-situ rising head and falling head permeability tests (slug tests) in piezometer SB-08B, which has a screen section that is installed in the Foundation Soils beneath the downstream toe of Sanford Dam. A horizontal hydraulic conductivity value of 1×10^{-3} cm/s was selected based on permeability values calculated from the slug test data. This value is assigned to the Foundation Soils at the other three sites based on similar soil descriptions and depositional environments as the Foundation Soils at Sanford Dam.

Foundation Bedrock

Two piezometers were installed in rock in two of borings located near the downstream toe of the dam (SB-15A and SB-15B), and two additional piezometers located in the right abutment were also installed in rock (SB-16A and SB-16B). In-situ permeability testing was performed using packers in every boring where rock was cored (packer testing), and slug testing was performed in each of the four piezometers installed in rock. The performance of 22 packer tests resulted in Lugeon values as low as 106 (with the exception of two tests with values of 31 and 66) and as high as over 1,000, which approximately translates to permeability values between 1×10^{-3} cm/s and 1×10^{-2} cm/s. The performance of four slug tests resulted in permeability values between 7×10^{-3} cm/s and 9×10^{-2} cm/s. We did not recognize a relationship between either packer test or slug test results and rock type. Additional information regarding the packer tests and slug tests is provided in the GDR.

Proposed Embankment Fill Materials

We expect that the Proposed Common Fill and Proposed Select Fill materials will originate from a nearby borrow source and will have similar soil classifications to and will be compacted to similar densities as the existing embankment fill materials. Therefore, the Proposed Common Fill and Proposed Select Fill are assumed to have the same seepage parameters as the Existing Embankment Common Fill, and the Proposed Core Fill is expected to have the same seepage parameters as the Existing Embankment Core Fill.

The Fine Drainfill and Coarse Drainfill seepage parameters were based on our experience with similar materials.

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ATTACHMENTS

1) SPT N-Value Corrections – Existing Embankment Common Fill
2) SPT N-Value Shear Strength Correlations – Existing Embankment Common Fill
3) SPT Correlation Reference Charts
4) CPT Shear Strength Correlations
5) SPT N-Value Corrections – Foundation Soils
6) SPT N-Value Shear Strength Correlations – Foundation Soils

Boiling Spring Lakes Dams Rehabilitation
19C21022
SPT N-Value Corrections - Existing Embankment Common Fill

Site	Strata	Boring ID	Depth of Top of Sample (ft)	Assumed Average γ_m (pcf)	[1]Depth to Groundwater (feet)	Blows per foot, N_f	σ_v (psf)	σ_v' (psf)	[2]C_E	[3]C_N	[4]C_B	[5]C_R	[6]C_S	[7]N_{60}	[8]$N_{1,60}$
Sanford Dam	Common Fill	SB-01	2	120	20.0	14	240	240	1.3	1.7	1.0	0.75	1.0	13.7	23.2
Sanford Dam	Common Fill	SB-01	4	120	20.0	14	480	480	1.3	1.7	1.0	0.75	1.0	13.7	23.2
Sanford Dam	Common Fill	SB-01	6	120	20.0	2	720	720	1.3	1.7	1.0	0.80	1.0	2.1	3.5
Sanford Dam	Common Fill	SB-02	3	120	20.9	19	360	360	1.3	1.7	1.0	0.75	1.0	18.5	31.5
Sanford Dam	Common Fill	SB-03	3	120	20.3	25	360	360	1.3	1.7	1.0	0.75	1.0	24.4	41.4
Sanford Dam	Common Fill	SB-03	8	120	20.3	17	960	960	1.3	1.4	1.0	0.80	1.0	17.7	25.5
Sanford Dam	Common Fill	SB-03	13	120	20.3	5	1560	1560	1.3	1.1	1.0	0.80	1.0	5.2	5.9
Sanford Dam	Common Fill	SB-04	3	120	20.5	18	360	360	1.3	1.7	1.0	0.75	1.0	17.6	29.8
Sanford Dam	Common Fill	SB-04	8	120	20.5	24	960	960	1.3	1.4	1.0	0.80	1.0	25.0	36.0
Sanford Dam	Common Fill	SB-04	13	120	20.5	35	1560	1560	1.3	1.1	1.0	0.80	1.0	36.4	41.2
Sanford Dam	Common Fill	SB-05	3	120	22.9	14	360	360	1.3	1.7	1.0	0.75	1.0	13.7	23.2
Sanford Dam	Common Fill	SB-05	8	120	22.9	29	960	960	1.3	1.4	1.0	0.80	1.0	30.2	43.5
Sanford Dam	Common Fill	SB-05	13	120	22.9	31	1560	1560	1.3	1.1	1.0	0.80	1.0	32.2	36.5
Sanford Dam	Common Fill	SB-06	3	120	21.4	4	360	360	1.3	1.7	1.0	0.75	1.0	3.9	6.6
Sanford Dam	Common Fill	SB-06	8	120	21.4	1	960	960	1.3	1.4	1.0	0.80	1.0	1.0	1.5
Sanford Dam	Common Fill	SB-06	13	120	21.4	2	1560	1560	1.3	1.1	1.0	0.80	1.0	2.1	2.4
Sanford Dam	Common Fill	SB-06	18	120	21.4	25	2160	2160	1.3	1.0	1.0	0.85	1.0	27.6	26.6
Sanford Dam	Common Fill	SB-06	23	120	21.4	17	2760	2660	1.3	0.9	1.0	0.95	1.0	21.0	18.2
Sanford Dam	Common Fill	SB-07	3	120	22.9	2	360	360	1.3	1.7	1.0	0.75	1.0	2.0	3.3
Sanford Dam	Common Fill	SB-07	8	120	22.9	6	960	960	1.3	1.4	1.0	0.80	1.0	6.2	9.0
Sanford Dam	Common Fill	SB-07	13	120	22.9	20	1560	1560	1.3	1.1	1.0	0.80	1.0	20.8	23.6
Sanford Dam	Common Fill	SB-07	18	120	22.9	13	2160	2160	1.3	1.0	1.0	0.85	1.0	14.4	13.8
Sanford Dam	Common Fill	SB-07	23	120	22.9	11	2760	2754	1.3	0.9	1.0	0.95	1.0	13.6	11.6
Sanford Dam	Common Fill	SB-07	28	120	22.9	12	3360	3042	1.3	0.8	1.0	0.95	1.0	14.8	12.0
Sanford Dam	Common Fill	SB-10	3	120	20.0	36	360	360	1.3	1.7	1.0	0.75	1.0	35.1	59.7
Sanford Dam	Common Fill	SB-10	5	120	20.0	31	600	600	1.3	1.7	1.0	0.80	1.0	32.2	54.8
Sanford Dam	Common Fill	SB-10	7	120	20.0	29	840	840	1.3	1.5	1.0	0.80	1.0	30.2	46.5
Sanford Dam	Common Fill	SB-10	9	120	20.0	13	1080	1080	1.3	1.4	1.0	0.80	1.0	13.5	18.4
Sanford Dam	Common Fill	SB-11	3	120	23.0	30	360	360	1.3	1.7	1.0	0.75	1.0	29.3	49.7
Sanford Dam	Common Fill	SB-11	5	120	23.0	26	600	600	1.3	1.7	1.0	0.80	1.0	27.0	46.0
Sanford Dam	Common Fill	SB-11	7	120	23.0	19	840	840	1.3	1.5	1.0	0.80	1.0	19.8	30.5
Sanford Dam	Common Fill	SB-11	9	120	23.0	32	1080	1080	1.3	1.4	1.0	0.80	1.0	33.3	45.3
Sanford Dam	Common Fill	SB-11	11	120	23.0	21	1320	1320	1.3	1.2	1.0	0.80	1.0	21.8	26.9
Sanford Dam	Common Fill	SB-11	13	120	23.0	3	1560	1560	1.3	1.1	1.0	0.80	1.0	3.1	3.5
Sanford Dam	Common Fill	SB-12	3	120	12.0	13	360	360	1.3	1.7	1.0	0.75	1.0	12.7	21.5
Sanford Dam	Common Fill	SB-12	5	120	12.0	9	600	600	1.3	1.7	1.0	0.80	1.0	9.4	15.9
Sanford Dam	Common Fill	SB-13	3	120	11.4	4	360	360	1.3	1.7	1.0	0.75	1.0	3.9	6.6
Sanford Dam	Common Fill	SB-14	3	120	2.6	13	360	335	1.3	1.7	1.0	0.75	1.0	12.7	21.5
Sanford Dam	Common Fill	SB-16A	3	120	19.2	14	360	360	1.3	1.7	1.0	0.75	1.0	13.7	23.2
Sanford Dam	Common Fill	SB-16A	8	120	19.2	11	960	960	1.3	1.4	1.0	0.80	1.0	11.4	16.5
Sanford Dam	Common Fill	SB-17	3	120	9.2	6	360	360	1.3	1.7	1.0	0.75	1.0	5.9	9.9
					Sanford Dam Mean:	**16**	**810**	**801**						**17**	**24**
					Sanford Dam Standard Deviation:	**10**								**10**	**16**
					Sanford Dam Mean Minus One Standard Deviation:	**6**								**7**	**9**
North Lake Dam	Common Fill	NB-02	3	120	13.5	14	360	360	1.3	1.7	1.0	0.75	1.0	13.7	23.2
North Lake Dam	Common Fill	NB-02	8	120	13.5	24	960	960	1.3	1.4	1.0	0.80	1.0	25.0	36.0
North Lake Dam	Common Fill	NB-03	2	120	16.0	13	240	240	1.3	1.7	1.0	0.75	1.0	12.7	21.5
North Lake Dam	Common Fill	NB-03	4	120	16.0	19	480	480	1.3	1.7	1.0	0.75	1.0	18.5	31.5
North Lake Dam	Common Fill	NB-03	6	120	16.0	28	720	720	1.3	1.7	1.0	0.80	1.0	29.1	48.5
North Lake Dam	Common Fill	NB-03	8	120	16.0	15	960	960	1.3	1.4	1.0	0.80	1.0	15.6	22.5
North Lake Dam	Common Fill	NB-03	10	120	16.0	21	1200	1200	1.3	1.3	1.0	0.80	1.0	21.8	28.2
					North Lake Dam Mean:	**19**	**492**	**492**						**19**	**30**
					North Lake Dam Standard Deviation:	**5**								**6**	**9**
					North Lake Dam Mean Minus One Standard Deviation:	**14**								**14**	**21**
Pine Lake Dam	Common Fill	PB-02	3	120	11.6	13	360	360	1.30	1.7	1.0	0.75	1.0	12.7	21.5
Pine Lake Dam	Common Fill	PB-03	2	120	6.5	29	240	240	1.30	1.7	1.0	0.75	1.0	28.3	48.1
Pine Lake Dam	Common Fill	PB-03	4	120	6.5	25	480	480	1.30	1.7	1.0	0.75	1.0	24.4	41.4
Pine Lake Dam	Common Fill	PB-03	6	120	6.5	12	720	720	1.30	1.7	1.0	0.80	1.0	12.5	20.8
Pine Lake Dam	Common Fill	PB-04	3	120	7.3	16	360	360	1.30	1.7	1.0	0.75	1.0	15.6	26.5
					Pine Lake Dam Mean:	**19**	**270**	**270**						**19**	**32**
					Pine Lake Dam Standard Deviation:	**7**								**6**	**11**
					Pine Lake Dam Mean Minus One Standard Deviation:	**12**								**12**	**21**
Upper Lake Dam	Common Fill	UB-01	3	120	3.5	7	360	360	1.30	1.7	1.0	0.75	1.0	6.8	11.6
Upper Lake Dam	Common Fill	UB-01	8	120	3.5	4	960	679	1.30	1.7	1.0	0.80	1.0	4.2	7.1
Upper Lake Dam	Common Fill	UB-01	13	120	3.5	5	1560	967	1.30	1.4	1.0	0.80	1.0	5.2	7.5
Upper Lake Dam	Common Fill	UB-03	3	120	5.3	13	360	360	1.30	1.7	1.0	0.75	1.0	12.7	21.5
Upper Lake Dam	Common Fill	UB-03	3	120	5.3	10	360	360	1.3	1.7	1.0	0.75	1.0	9.8	16.6
					Upper Lake Dam Mean:	**8**	**600**	**454**						**8**	**13**
					Upper Lake Dam Standard Deviation:	**3**								**3**	**6**
					Upper Lake Dam Mean Minus One Standard Deviation:	**4**								**5**	**7**
					Overall Mean:	**16**	**445**	**409**						**16**	**25**
					Overall Standard Deviation:	**9**								**10**	**15**
					Overall Mean Minus One Standard Deviation:	**7**								**6**	**10**

[1]Groundwater depths are based on boring data. Assumed values shown in red.
[2]C_E = hammer energy correction factor (Idriss and Boulanger 2008)
[3]C_N = overburden correction factor = $(2000\ psf/\sigma'_v)^{0.5}$, where C_N is less than or equal to 1.7 (Liao and Whitman 1986)
[4]C_B = correction for borehole diameter (Skempton 1986)
[5]C_R = rod length correction factor assuming 5 feet of stick-up (Youd and Idriss 1997)
[6]C_S = sampler correction factor = 1.0 for standard sampler
[7]$N_{60} = N_f*C_E*C_B*C_R*C_S$
[8]$N_{1,60} = N_f*C_E*C_N*C_B*C_R*C_S$

	C_E
Donut hammer	0.5-1.0
Safety hammer	0.7-1.2
Automatic trip hammer	0.8-1.3

Borehole diameter	C_B
65-115 mm	1
150 mm	1.05
200 mm	1.15

Rod Length	C_R
<3m, <9.8ft	0.75
3-4m, 9.8-13.1ft	0.8
4-6m, 13.1-19.7ft	0.85
6-10m, 19.7-32.8ft	0.95
10-30m, 32.8-98.4ft	1

Boiling Spring Lakes Dams Rehabilitation
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SPT N-Value Shear Strength Correlations - Existing Embankment Common Fill

Duncan et al. (2014) Co	Sanford Dam	North Lake Dam	Pine Lake Dam	Upper Lake Dam	Overall
	Common Fill	Common Fill	Common Fill	Common Fill	Common Fill
Selected N_{60}	7	14	12	5	6
Selected $N_{1,60}$	9	21	21	7	10
Average σ'_v (psi)	5.6	3.4	1.9	3.2	2.8

Correlation Reference	Soil Type	ϕ (degrees)	ϕ (degrees)	ϕ (degrees)	ϕ (degrees)	ϕ (degrees)	Correlation (see Attachment 3)
Meyerhof (1956)	Clean sand	32	36	36	30	32	See Table 5.3
	Clayey sand	27	31	31	25	27	See Table 5.3
	Very fine or silty sand	34	36	36	34	34	See Table 5.3
Duncan and Buchignani (1976)	Freshly deposited NC sand	31	34	34	31	32	See Table 21
Terzaghi et al. (1996)	Fine Sands	31	35	35	30	32	See Figure 34
Duncan et al. (2014)	Sands	37	41	42	37	38	See Chart on next page
	Min =	27	31	31	25	27	
	Average =	31	35	35	31	32	
	Selected Values:	**32**	**35**	**35**	**31**	**32**	

Duncan et al. (2014) Correlation - Exisiting Embankment Common Fill

$$\phi = A + B(D_r) - \left[C + D(D_r)\right]\log_{10}\left(\frac{\sigma_N}{p_a}\right)$$

Material type	A	B	C	D	Standard Deviation
Gravel with $C_u > 4$	44	10	7	2	3.1°
Sand with $C_u > 6$	39	10	3	2	3.2°
Sand with $C_u < 6$	34	10	3	2	3.2°

	Sanford Dam Common Fill	North Lake Dam Common Fill	Pine Lake Dam Common Fill	Upper Lake Dam Common Fill	Overall Common Fill
ϕ' (estimate)	31	35	35	31	32
[1]Dr	40.7%	63.7%	63.0%	36.3%	42.9%
average σ'_v (psi)	5.6	3.4	1.9	3.2	2.8
[2]Ko	0.48	0.42	0.42	0.48	0.47
σ'_N (psi)	4.05	2.28	1.25	2.31	2.03
[3]D60	0.200	0.270	0.230	0.250	0.238
[3]D10	0.060	0.110	0.100	0.120	0.098
[4]Cu	3.3	2.5	2.3	2.1	2.4

[1]Dr averaged from published N-Value correlations
[2]Ko = 1-SIN(RADIANS(Dr))
[3]D60 and D10 based on gradation test results.
[4]Cu = D60/D10

	Sanford Dam Common Fill			North Lake Dam Common Fill			Pine Lake Dam Common Fill			Upper Lake Dam Common Fill			Overall Common Fill		
	ϕ' (degrees)	ϕ' - 1σ	ϕ' - 2σ	ϕ' (degrees)	ϕ' - 1σ	ϕ' - 2σ	ϕ' (degrees)	ϕ' - 1σ	ϕ' - 2σ	ϕ' (degrees)	ϕ' - 1σ	ϕ' - 2σ	ϕ' (degrees)	ϕ' - 1σ	ϕ' - 2σ
Gravel with Cu > 4	52.5	**49.4**	46.3	57.1	**54.0**	50.9	59.1	**56.0**	52.9	53.8	**50.7**	47.6	55.1	**52.0**	48.9
Sand with Cu > 6	45.2	**42.0**	38.8	48.8	**45.6**	42.4	49.9	**46.7**	43.5	45.6	**42.4**	39.2	46.6	**43.4**	40.2
Sand with Cu < 6	40.2	**37.0**	33.8	43.8	**40.6**	37.4	44.9	**41.7**	38.5	40.6	**37.4**	34.2	41.6	**38.4**	35.2

Table 5.3 Relationship among relative density, SPT blow count, and angle of internal friction for clean sands. From Meyerhof (1956).

State of Packing	Relative Density D_r (Percent)	SPT blow count N (blows/ft)	Angle of Internal Friction ϕ' (degrees)
Very Loose	< 20	< 4	< 30
Loose	20 - 40	4 - 10	30 - 35
Compact	40 - 60	10 - 30	35 - 40
Dense	60 - 80	30 - 50	40 - 45
Very Dense	> 80	> 50	> 45

$N = 15 + \left(\frac{(N' - 15)}{2}\right)$ for N' > 15 in saturated very fine or silty sand, where N = blow count corrected for dynamic pore pressure effects during the SPT, and N' = measured blow count.

The values of ϕ' are for clean sand.

Reduce ϕ' by 5 degrees for clayey sand.

Increase ϕ' by 5 degrees for gravelly sand.

Table 21. Relationship among relative density, penetration resistance, dry unit weight, and angle of internal friction of cohesionless soils (after Duncan and Buchignani, 1976)

Descriptive Relative Density	Relative Density **	Standard Penetration Resistance N_1 (see Note) *	Static Cone Resistance q_c	Angle of Internal Friction ϕ	Dry Unit Weight
	%	blows/foot	tsf or kgf/cm^2	degrees	KN/m^3
Very Loose	< 15	< 4	< 50	< 30	< 14
Loose	15 - 35	4 - 10	50 - 100	30 - 32	14 - 16
Medium Dense	35 - 65	10 - 30	100 - 150	32 - 35	16 - 18
Dense	65 - 85	30 - 50	150 - 200	35 - 38	18 - 20
Very Dense	85 - 100	> 50	> 200	> 38	> 20

* N_1 = N -value corrected to an effective vertical overburden pressure of 1.0 tsf or 100 kPa

** Freshly deposited, normally consolidated sand

Note: As originally proposed, this correlation used the uncorrected SPT blowcount, N_1. However, hammers delivering 60% of the theoretical energy have been the most commonly used hammers for SPT tests, and it seems likely that the data on which the correlation was based was obtained primarily from tests with such hammers. It therefore seems logical to use $N_{1,60}$ with this correlation, and it is the recommendation of this report that this be done.

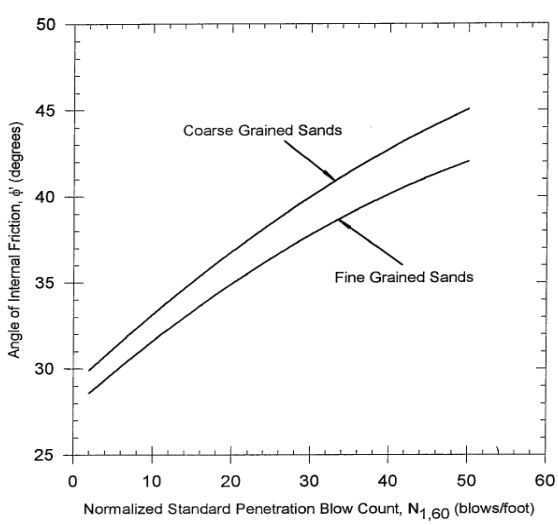

Figure 34. Empirical correlation between friction angle of sands and normalized standard penetration blow count (after Terzaghi et al., 1996)

Boiling Spring Lakes Dams Rehabilitation
19C21022
CPT Shear Strength Correlations

Row Labels	Top Depth (ft)	Bottom Depth (ft)	Avg Eff. Stress (tsf)	Avg qt (tsf)1	Avg Rf (%)2	Phi (K&M 1990)3	Phi (R&C 1983)4	Avg Phi	Std Dev of Phi	Avg Phi - 1 Std Dev
Existing Common Fill			**0.35**	**143.5**	**0.93**	**43.3**	**47.4**	**45.5**	**4.3**	**41.2**
North Lake Dam			**0.38**	**151.1**	**0.72**	**43.9**	**47.9**	**46.0**		**43.6**
NC-01	0.2	10.4	0.33	141.1	0.60	44.0	48.3	46.3	1.5	44.7
NC-02	0.1	13.9	0.43	146.9	0.77	43.4	47.2	45.4	2.9	42.5
NC-03	0.1	12.0	0.37	164.8	0.76	44.3	48.3	46.4	2.8	43.6
Pine Lake Dam			**0.23**	**83.3**	**0.69**	**42.3**	**47.5**	**45.0**		**42.8**
PC-01	0.3	2.8	0.10	62.2	0.71	42.6	49.4	46.3	1.7	44.6
PC-02	0.2	9.2	0.29	87.6	0.62	41.7	46.1	44.0	3.9	40.1
PC-03	0.2	5.6	0.18	86.1	0.81	43.2	48.7	46.1	2.4	43.7
Sanford Dam			**0.39**	**158.2**	**1.05**	**43.5**	**47.3**	**45.5**		**41.9**
SC-01	0.6	14.7	0.47	202.5	1.08	44.6	47.6	46.2	4.5	41.6
SC-02	1.0	18.9	0.62	190.3	0.97	43.4	45.9	44.7	4.8	39.9
SC-03	0.7	16.2	0.53	213.5	1.18	44.8	47.7	46.3	3.0	43.3
SC-04	0.7	16.4	0.53	181.7	1.29	43.4	46.2	44.8	5.0	39.8
SC-06	0.3	13.0	0.42	236.5	1.02	45.8	49.0	47.5	4.0	43.5
SC-07	0.2	6.5	0.21	101.9	0.72	43.4	48.7	46.2	1.2	45.0
SC-08	0.2	7.0	0.22	51.6	1.50	39.7	44.7	42.4	5.0	37.4
SC-09	0.5	6.6	0.21	46.6	1.43	38.0	43.2	40.7	3.9	36.7
SC-10	0.3	1.7	0.06	44.3	0.60	42.0	49.7	46.1	1.5	44.6
SC-12	0.3	3.6	0.12	45.6	1.48	40.7	47.2	44.1	3.0	41.1
SC-13	0.2	5.2	0.17	104.3	0.61	43.2	48.6	46.1	4.3	41.8
SC-14	0.4	5.3	0.18	90.3	0.58	42.3	47.9	45.3	2.8	42.5
SC-16	0.3	4.7	0.15	111.4	0.71	43.9	49.4	46.8	3.9	42.9
SC-17	0.2	5.1	0.16	120.2	0.74	44.1	49.6	47.0	3.5	43.5
SC-18	0.1	4.3	0.13	134.1	0.83	45.0	51.0	48.2	2.7	45.4
Upper Lake Dam			**0.22**	**103.4**	**0.78**	**42.7**	**47.4**	**45.2**		**41.0**
UC-01	0.4	9.4	0.28	55.6	0.98	38.9	42.9	41.0	5.8	35.2
UC-02	0.1	6.0	0.19	129.8	0.53	44.7	49.7	47.3	4.4	42.9
UC-02A	0.1	6.4	0.20	111.0	0.77	43.9	48.8	46.4	4.8	41.7
UC-03	0.1	5.2	0.16	147.6	0.71	45.8	50.8	48.4	4.3	44.1
Foundation Soils			**1.05**	**51.9**	**1.15**	**34.0**	**33.9**	**34.0**	**6.0**	**28.0**
North Lake Dam			**1.19**	**48.6**	**1.03**	**33.8**	**33.1**	**33.5**		**27.7**
NC-01	15.5	43.3	1.35	56.7	0.51	35.3	34.4	34.8	3.6	31.2
NC-02	13.9	24.9	1.05	37.8	1.32	32.0	31.4	31.7	6.1	25.7
NC-03	12.1	24.9	0.97	40.4	1.88	32.3	31.9	32.1	5.9	26.2
Pine Lake Dam			**1.04**	**51.0**	**1.21**	**33.8**	**33.5**	**33.7**		**27.4**
PC-01	2.9	58.6	1.18	55.3	1.08	34.5	34.1	34.3	4.8	29.5
PC-02	9.3	24.9	0.90	29.7	1.32	30.3	29.5	29.9	5.8	24.1
PC-03	5.7	24.8	0.74	56.1	1.51	34.7	35.3	35.0	6.3	28.7
Sanford Dam			**1.06**	**53.2**	**1.12**	**34.0**	**33.9**	**33.9**		**28.8**
SC-01	14.8	40.0	1.38	24.2	1.57	30.1	27.9	29.0	4.0	25.1
SC-02	19.0	40.3	1.51	42.4	1.22	32.3	30.3	31.4	4.7	26.6
SC-03	16.3	39.2	1.44	30.2	1.56	31.4	29.4	30.4	4.1	26.3
SC-04	16.5	39.5	1.46	40.9	1.72	32.7	31.2	31.9	4.5	27.4
SC-06	13.1	38.1	1.39	37.3	1.14	31.6	30.3	31.0	5.0	26.0
SC-07	6.6	36.0	1.08	59.3	1.13	34.5	34.3	34.4	5.6	28.8
SC-08	7.1	34.2	1.00	26.1	1.21	31.0	29.9	30.5	4.3	26.2
SC-09	6.7	28.7	0.83	33.8	1.35	31.2	31.1	31.1	6.0	25.1
SC-10	1.8	23.3	0.53	40.0	1.19	34.6	36.6	35.7	5.5	30.2
SC-11	0.2	23.4	0.56	79.8	0.74	38.7	41.6	40.2	3.7	36.5
SC-12	3.7	26.7	0.67	20.0	1.26	32.0	32.3	32.2	3.6	28.6
SC-13	5.2	24.5	0.64	30.8	0.80	32.9	33.5	33.2	4.8	28.4
SC-14	5.4	23.7	0.64	35.5	0.57	33.4	34.4	33.9	5.1	28.8
SC-15	0.3	22.1	0.48	102.2	0.53	40.9	44.1	42.6	3.9	38.7
SC-16	4.8	39.5	1.21	69.5	0.96	35.4	35.4	35.4	6.6	28.9
SC-17	5.2	40.8	1.27	73.4	1.06	35.6	35.2	35.4	6.7	28.7
SC-18	4.3	42.0	1.27	106.8	1.04	36.8	36.8	36.8	7.6	29.3
Upper Lake Dam			**0.93**	**48.4**	**1.25**	**34.5**	**34.8**	**34.7**		**29.1**
UC-01	9.5	24.9	0.69	40.3	1.12	34.0	35.1	34.6	5.9	28.6
UC-02	6.1	10.7	0.52	16.0	1.44	31.3	32.1	31.7	3.8	27.8
UC-02A	6.5	24.9	0.68	35.8	1.07	33.1	33.6	33.3	4.7	28.6
UC-03	5.2	58.7	1.11	57.9	1.33	35.4	35.4	35.4	4.1	31.3

[1]qt = corrected tip resistence
[2]Rf = relative sleeve friction
[3]Phi = 17.6 + 11*log[qt / (eff. stress^0.5)] (Kulhawy and Mayne 1990), Phi >= 25 deg
[4]Phi = atan[0.1 + 0.38*log(qt / eff. stress)] (Robertson and Campanella 1983), Phi >= 25 deg

Boiling Spring Lakes Dams Rehabilitation
19C21022
SPT N-Value Corrections - Foundation Soils

Site	Strata	Boring ID	Depth of Top of Sample (ft)	Assumed Average γ_m (pcf)	[1]Depth to Groundwater (feet)	Blows per foot, N_f	σ_v (psf)	σ_v' (psf)	[2]C_E	[3]C_N	[4]C_B	[5]C_R	[6]C_S	[7]N_{60}	[8]$N_{1,60}$
Sanford Dam	Foundation Soils	SB-02	13	120	20.9	1	1560	1560	1.3	1.1	1.0	0.80	1.0	1.0	1.2
Sanford Dam	Foundation Soils	SB-02	18	120	20.9	2	2160	2160	1.3	1.0	1.0	0.85	1.0	2.2	2.1
Sanford Dam	Foundation Soils	SB-02	23	120	20.9	6	2760	2629	1.3	0.9	1.0	0.95	1.0	7.4	6.5
Sanford Dam	Foundation Soils	SB-02	28	120	20.9	7	3360	2917	1.3	0.8	1.0	0.95	1.0	8.6	7.2
Sanford Dam	Foundation Soils	SB-02	33	120	20.9	13	3960	3205	1.3	0.8	1.0	1.00	1.0	16.9	13.4
Sanford Dam	Foundation Soils	SB-02	38	120	20.9	7	4560	3493	1.3	0.8	1.0	1.00	1.0	9.1	6.9
Sanford Dam	Foundation Soils	SB-03	13	120	20.3	5	1560	1560	1.3	1.1	1.0	0.80	1.0	5.2	5.9
Sanford Dam	Foundation Soils	SB-03	33	120	20.3	4	3960	3168	1.3	0.8	1.0	1.00	1.0	5.2	4.1
Sanford Dam	Foundation Soils	SB-03	38	120	20.3	7	4560	3456	1.3	0.8	1.0	1.00	1.0	9.1	6.9
Sanford Dam	Foundation Soils	SB-04	18	120	20.5	2	2160	2160	1.3	1.0	1.0	0.85	1.0	2.2	2.1
Sanford Dam	Foundation Soils	SB-04	23	120	20.5	3	2760	2604	1.3	0.9	1.0	0.95	1.0	3.7	3.2
Sanford Dam	Foundation Soils	SB-04	28	120	20.5	7	3360	2892	1.3	0.8	1.0	0.95	1.0	8.6	7.2
Sanford Dam	Foundation Soils	SB-04	33	120	20.5	5	3960	3180	1.3	0.8	1.0	1.00	1.0	6.5	5.2
Sanford Dam	Foundation Soils	SB-04	88	120	20.5	18	10560	6348	1.3	0.6	1.0	1.00	1.0	23.4	13.1
Sanford Dam	Foundation Soils	SB-05	18	120	22.9	4	2160	2160	1.3	1.0	1.0	0.85	1.0	4.4	4.3
Sanford Dam	Foundation Soils	SB-05	23	120	22.9	3	2760	2754	1.3	0.9	1.0	0.95	1.0	3.7	3.2
Sanford Dam	Foundation Soils	SB-05	28	120	22.9	5	3360	3042	1.3	0.8	1.0	0.95	1.0	6.2	5.0
Sanford Dam	Foundation Soils	SB-05	33	120	22.9	11	3960	3330	1.3	0.8	1.0	1.00	1.0	14.3	11.1
Sanford Dam	Foundation Soils	SB-05	38	120	22.9	11	4560	3618	1.3	0.7	1.0	1.00	1.0	14.3	10.6
Sanford Dam	Foundation Soils	SB-06	28	120	21.4	4	3360	2948	1.3	0.8	1.0	0.95	1.0	4.9	4.1
Sanford Dam	Foundation Soils	SB-06	33	120	21.4	4	3960	3236	1.3	0.8	1.0	1.00	1.0	5.2	4.1
Sanford Dam	Foundation Soils	SB-07	28	120	22.9	10	3360	3042	1.3	0.8	1.0	0.95	1.0	12.4	10.0
Sanford Dam	Foundation Soils	SB-07	33	120	22.9	8	3960	3330	1.3	0.8	1.0	1.00	1.0	10.4	8.1
Sanford Dam	Foundation Soils	SB-08A	3	120	9.2	5	360	360	1.3	1.7	1.0	0.75	1.0	4.9	8.3
Sanford Dam	Foundation Soils	SB-08A	8	120	9.2	2	960	960	1.3	1.4	1.0	0.80	1.0	2.1	3.0
Sanford Dam	Foundation Soils	SB-08A	18	120	9.2	5	2160	1611	1.3	1.1	1.0	0.85	1.0	5.5	6.2
Sanford Dam	Foundation Soils	SB-08A	23	120	9.2	8	2760	1899	1.3	1.0	1.0	0.95	1.0	9.9	10.1
Sanford Dam	Foundation Soils	SB-09	3	120	7.9	6	360	360	1.3	1.7	1.0	0.75	1.0	5.9	9.9
Sanford Dam	Foundation Soils	SB-09	8	120	7.9	2	960	954	1.3	1.4	1.0	0.80	1.0	2.1	3.0
Sanford Dam	Foundation Soils	SB-09	13	120	7.9	5	1560	1242	1.3	1.3	1.0	0.80	1.0	5.2	6.6
Sanford Dam	Foundation Soils	SB-09	18	120	7.9	8	2160	1530	1.3	1.1	1.0	0.85	1.0	8.8	10.1
Sanford Dam	Foundation Soils	SB-10	11	120	20.0	8	1320	1320	1.3	1.2	1.0	0.80	1.0	8.3	10.2
Sanford Dam	Foundation Soils	SB-10	13	120	20.0	6	1560	1560	1.3	1.1	1.0	0.80	1.0	6.2	7.1
Sanford Dam	Foundation Soils	SB-10	15	120	20.0	5	1800	1800	1.3	1.1	1.0	0.85	1.0	5.5	5.8
Sanford Dam	Foundation Soils	SB-10	17	120	20.0	3	2040	2040	1.3	1.0	1.0	0.85	1.0	3.3	3.3
Sanford Dam	Foundation Soils	SB-10	19	120	20.0	1	2280	2280	1.3	0.9	1.0	0.85	1.0	1.1	1.0
Sanford Dam	Foundation Soils	SB-10	21	120	20.0	3	2520	2458	1.3	0.9	1.0	0.95	1.0	3.7	3.3
Sanford Dam	Foundation Soils	SB-10	27	120	20.0	2	3240	2803	1.3	0.8	1.0	0.95	1.0	2.5	2.1
Sanford Dam	Foundation Soils	SB-10	31	120	20.0	3	3720	3034	1.3	0.8	1.0	0.95	1.0	3.7	3.0
Sanford Dam	Foundation Soils	SB-10	33	120	20.0	2	3960	3149	1.3	0.8	1.0	1.00	1.0	2.6	2.1
Sanford Dam	Foundation Soils	SB-10	35	120	20.0	4	4200	3264	1.3	0.8	1.0	1.00	1.0	5.2	4.1
Sanford Dam	Foundation Soils	SB-10	37	120	20.0	10	4440	3379	1.3	0.8	1.0	1.00	1.0	13.0	10.0
Sanford Dam	Foundation Soils	SB-11	15	120	23.0	3	1800	1800	1.3	1.1	1.0	0.85	1.0	3.3	3.5
Sanford Dam	Foundation Soils	SB-11	19	120	23.0	1	2280	2280	1.3	0.9	1.0	0.85	1.0	1.1	1.0
Sanford Dam	Foundation Soils	SB-11	23	120	23.0	4	2760	2760	1.3	0.9	1.0	0.95	1.0	4.9	4.2
Sanford Dam	Foundation Soils	SB-11	25	120	23.0	4	3000	2875	1.3	0.8	1.0	0.95	1.0	4.9	4.1
Sanford Dam	Foundation Soils	SB-11	27	120	23.0	7	3240	2990	1.3	0.8	1.0	0.95	1.0	8.6	7.1
Sanford Dam	Foundation Soils	SB-11	29	120	23.0	12	3480	3106	1.3	0.8	1.0	0.95	1.0	14.8	11.9
Sanford Dam	Foundation Soils	SB-11	31	120	23.0	6	3720	3221	1.3	0.8	1.0	0.95	1.0	7.4	5.8
Sanford Dam	Foundation Soils	SB-11	33	120	23.0	9	3960	3336	1.3	0.8	1.0	1.00	1.0	11.7	9.1
Sanford Dam	Foundation Soils	SB-11	35	120	23.0	14	4200	3451	1.3	0.8	1.0	1.00	1.0	18.2	13.9
Sanford Dam	Foundation Soils	SB-12	7	120	12.0	5	840	840	1.3	1.5	1.0	0.80	1.0	5.2	8.0
Sanford Dam	Foundation Soils	SB-12	9	120	12.0	3	1080	1080	1.3	1.4	1.0	0.80	1.0	3.1	4.2
Sanford Dam	Foundation Soils	SB-12	13	120	12.0	2	1560	1498	1.3	1.2	1.0	0.80	1.0	2.1	2.4
Sanford Dam	Foundation Soils	SB-12	15	120	12.0	4	1800	1613	1.3	1.1	1.0	0.85	1.0	4.4	4.9

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Site	Strata	Boring ID	Depth of Top of Sample (ft)	Assumed Average γ_m (pcf)	[1]Depth to Groundwater (feet)	Blows per foot, N_f	σ_v (psf)	σ_v' (psf)	[2]C_E	[3]C_N	[4]C_B	[5]C_R	[6]C_S	[7]N_{60}	[8]$N_{1,60}$
Sanford Dam	Foundation Soils	SB-12	17	120	12.0	3	2040	1728	1.3	1.1	1.0	0.85	1.0	3.3	3.6
Sanford Dam	Foundation Soils	SB-12	19	120	12.0	14	2280	1843	1.3	1.0	1.0	0.85	1.0	15.5	16.1
Sanford Dam	Foundation Soils	SB-12	21	120	12.0	11	2520	1958	1.3	1.0	1.0	0.95	1.0	13.6	13.7
Sanford Dam	Foundation Soils	SB-12	23	120	12.0	13	2760	2074	1.3	1.0	1.0	0.95	1.0	16.1	15.8
Sanford Dam	Foundation Soils	SB-12	25	120	12.0	19	3000	2189	1.3	1.0	1.0	0.95	1.0	23.5	22.4
Sanford Dam	Foundation Soils	SB-12	27	120	12.0	8	3240	2304	1.3	0.9	1.0	0.95	1.0	9.9	9.2
Sanford Dam	Foundation Soils	SB-12	29	120	12.0	11	3480	2419	1.3	0.9	1.0	0.95	1.0	13.6	12.4
Sanford Dam	Foundation Soils	SB-12	31	120	12.0	7	3720	2534	1.3	0.9	1.0	0.95	1.0	8.6	7.7
Sanford Dam	Foundation Soils	SB-12	33	120	12.0	7	3960	2650	1.3	0.9	1.0	1.00	1.0	9.1	7.9
Sanford Dam	Foundation Soils	SB-13	8	120	11.4	1	960	960	1.3	1.4	1.0	0.80	1.0	1.0	1.5
Sanford Dam	Foundation Soils	SB-13	13	120	11.4	2	1560	1460	1.3	1.2	1.0	0.80	1.0	2.1	2.4
Sanford Dam	Foundation Soils	SB-13	23	120	11.4	6	2760	2036	1.3	1.0	1.0	0.95	1.0	7.4	7.3
Sanford Dam	Foundation Soils	SB-13	28	120	11.4	16	3360	2324	1.3	0.9	1.0	0.95	1.0	19.8	18.3
Sanford Dam	Foundation Soils	SB-13	33	120	11.4	15	3960	2612	1.3	0.9	1.0	1.00	1.0	19.5	17.1
Sanford Dam	Foundation Soils	SB-14	8	120	2.6	9	960	623	1.3	1.7	1.0	0.80	1.0	9.4	15.9
Sanford Dam	Foundation Soils	SB-14	13	120	2.6	8	1560	911	1.3	1.5	1.0	0.80	1.0	8.3	12.3
Sanford Dam	Foundation Soils	SB-14	18	120	2.6	16	2160	1199	1.3	1.3	1.0	0.85	1.0	17.7	22.8
Sanford Dam	Foundation Soils	SB-15A	3	120	3.5	18	360	360	1.3	1.7	1.0	0.75	1.0	17.6	29.8
Sanford Dam	Foundation Soils	SB-15A	8	120	3.5	2	960	679	1.3	1.7	1.0	0.80	1.0	2.1	3.5
Sanford Dam	Foundation Soils	SB-15A	13	120	3.5	8	1560	967	1.3	1.4	1.0	0.80	1.0	8.3	12.0
Sanford Dam	Foundation Soils	SB-16A	13	120	19.2	2	1560	1560	1.3	1.1	1.0	0.80	1.0	2.1	2.4
Sanford Dam	Foundation Soils	SB-16A	18	120	19.2	4	2160	2160	1.3	1.0	1.0	0.85	1.0	4.4	4.3
Sanford Dam	Foundation Soils	SB-16A	23	120	19.2	9	2760	2523	1.3	0.9	1.0	0.95	1.0	11.1	9.9
Sanford Dam	Foundation Soils	SB-16A	28	120	19.2	7	3360	2811	1.3	0.8	1.0	0.95	1.0	8.6	7.3
Sanford Dam	Foundation Soils	SB-17	8	120	9.2	6	960	960	1.3	1.4	1.0	0.80	1.0	6.2	9.0
Sanford Dam	Foundation Soils	SB-17	18	120	9.2	8	2160	1611	1.3	1.1	1.0	0.85	1.0	8.8	9.8
Sanford Dam	Foundation Soils	SB-17	23	120	9.2	3	2760	1899	1.3	1.0	1.0	0.95	1.0	3.7	3.8
Sanford Dam	Foundation Soils	SB-18	3	120	3.5	11	360	360	1.3	1.7	1.0	0.75	1.0	10.7	18.2
Sanford Dam	Foundation Soils	SB-18	8	120	3.5	3	960	679	1.3	1.7	1.0	0.80	1.0	3.1	5.3
Sanford Dam	Foundation Soils	SB-18	13	120	3.5	2	1560	967	1.3	1.4	1.0	0.80	1.0	2.1	3.0
Sanford Dam	Foundation Soils	SB-19	3	120	5.8	6	360	360	1.3	1.7	1.0	0.75	1.0	5.9	9.9
Sanford Dam	Foundation Soils	SB-19	8	120	5.8	6	960	823	1.3	1.6	1.0	0.80	1.0	6.2	9.7
Sanford Dam	Foundation Soils	SB-19	13	120	5.8	1	1560	1111	1.3	1.3	1.0	0.80	1.0	1.0	1.4
Sanford Dam	Foundation Soils	SB-19	18	120	5.8	6	2160	1399	1.3	1.2	1.0	0.85	1.0	6.6	7.9
Sanford Dam	Foundation Soils	SB-19	23	120	5.8	12	2760	1687	1.3	1.1	1.0	0.95	1.0	14.8	16.1
Sanford Dam	Foundation Soils	SB-20	3	120	4.5	11	360	360	1.3	1.7	1.0	0.75	1.0	10.7	18.2
Sanford Dam	Foundation Soils	SB-20	8	120	4.5	2	960	742	1.3	1.6	1.0	0.80	1.0	2.1	3.4
Sanford Dam	Foundation Soils	SB-20	13	120	4.5	6	1560	1030	1.3	1.4	1.0	0.80	1.0	6.2	8.7
Sanford Dam	Foundation Soils	SB-20	18	120	4.5	7	2160	1318	1.3	1.2	1.0	0.85	1.0	7.7	9.5
Sanford Dam	Foundation Soils	SB-21	3	120	5.0	19	360	360	1.3	1.7	1.0	0.75	1.0	18.5	31.5
Sanford Dam	Foundation Soils	SB-21	8	120	5.0	11	960	773	1.3	1.6	1.0	0.80	1.0	11.4	18.4
Sanford Dam	Foundation Soils	SB-21	18	120	5.0	6	2160	1349	1.3	1.2	1.0	0.85	1.0	6.6	8.1
Sanford Dam	Foundation Soils	SB-22	13	120	24.5	14	1560	1560	1.3	1.1	1.0	0.80	1.0	14.6	16.5
Sanford Dam	Foundation Soils	SB-22	28	120	24.5	9	3360	3142	1.3	0.8	1.0	0.95	1.0	11.1	8.9
Sanford Dam	Foundation Soils	SB-22	33	120	24.5	8	3960	3430	1.3	0.8	1.0	1.00	1.0	10.4	7.9
Sanford Dam	Foundation Soils	SB-22	38	120	24.5	8	4560	3718	1.3	0.7	1.0	1.00	1.0	10.4	7.6
Sanford Dam	Foundation Soils	SB-23	18	120	28.6	7	2160	2160	1.3	1.0	1.0	0.85	1.0	7.7	7.4
Sanford Dam	Foundation Soils	SB-23	28	120	28.6	21	3360	3360	1.3	0.8	1.0	0.95	1.0	25.9	20.0
Sanford Dam	Foundation Soils	SB-23	33	120	28.6	12	3960	3685	1.3	0.7	1.0	1.00	1.0	15.6	11.5
Sanford Dam	Foundation Soils	SB-23	38	120	28.6	7	4560	3973	1.3	0.7	1.0	1.00	1.0	9.1	6.5
					Sanford Dam Mean:	**7**	**2555**	**2108**						**8**	**8**
					Sanford Dam Standard Deviation:	**5**								**5**	**6**
					Sanford Dam Mean Minus One Standard Deviation:	**2**								**3**	**3**

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Site	Strata	Boring ID	Depth of Top of Sample (ft)	Assumed Average γ_m (pcf)	[1]Depth to Groundwater (feet)	Blows per foot, N_f	σ_v (psf)	σ_v' (psf)	[2]C_E	[3]C_N	[4]C_B	[5]C_R	[6]C_S	[7]N_{60}	[8]$N_{1,60}$
North Lake Dam	Foundation Soils	NB-01	3	120	10.9	3	360	360	1.3	1.7	1.0	0.75	1.0	2.9	5.0
North Lake Dam	Foundation Soils	NB-01	8	120	10.9	1	960	960	1.3	1.4	1.0	0.80	1.0	1.0	1.5
North Lake Dam	Foundation Soils	NB-01	13	120	10.9	1	1560	1429	1.3	1.2	1.0	0.80	1.0	1.0	1.2
North Lake Dam	Foundation Soils	NB-02	13	120	13.5	12	1560	1560	1.3	1.1	1.0	0.80	1.0	12.5	14.1
North Lake Dam	Foundation Soils	NB-02	23	120	13.5	2	2760	2167	1.3	1.0	1.0	0.95	1.0	2.5	2.4
North Lake Dam	Foundation Soils	NB-02	25.5	120	13.5	6	3060	2311	1.3	0.9	1.0	0.95	1.0	7.4	6.9
North Lake Dam	Foundation Soils	NB-03	12	120	16.0	16	1440	1440	1.3	1.2	1.0	0.80	1.0	16.6	19.6
North Lake Dam	Foundation Soils	NB-03	14	120	16.0	9	1680	1680	1.3	1.1	1.0	0.85	1.0	9.9	10.9
North Lake Dam	Foundation Soils	NB-03	16	120	16.0	19	1920	1920	1.3	1.0	1.0	0.85	1.0	21.0	21.4
North Lake Dam	Foundation Soils	NB-03	18	120	16.0	15	2160	2035	1.3	1.7	1.0	0.85	1.0	16.6	28.2
North Lake Dam	Foundation Soils	NB-03	23	120	16.0	2	2760	2323	1.3	0.9	1.0	0.95	1.0	2.5	2.3
North Lake Dam	Foundation Soils	NB-04	3	120	10.8	9	360	360	1.3	1.7	1.0	0.75	1.0	8.8	14.9
North Lake Dam	Foundation Soils	NB-04	8	120	10.8	8	960	960	1.3	1.4	1.0	0.80	1.0	8.3	12.0
North Lake Dam	Foundation Soils	NB-04	13	120	10.8	3	1560	1423	1.3	1.2	1.0	0.80	1.0	3.1	3.7
North Lake Dam	Foundation Soils	NB-04	18	120	10.8	13	2160	1711	1.3	1.1	1.0	0.85	1.0	14.4	15.5
North Lake Dam	Foundation Soils	NB-04	23	120	10.8	7	2760	1999	1.3	1.0	1.0	0.95	1.0	8.6	8.6
					North Lake Dam Mean:	**8**	**1751**	**1540**						**9**	**11**
					North Lake Dam Standard Deviation:	**6**								**6**	**8**
					North Lake Dam Mean Minus One Standard Deviation:	**2**								**3**	**3**
Pine Lake Dam	Foundation Soils	PB-01	3	120	10.6	6	360	360	1.3	1.7	1.0	0.75	1.0	5.9	9.9
Pine Lake Dam	Foundation Soils	PB-01	8	120	10.6	10	960	960	1.3	1.4	1.0	0.80	1.0	10.4	15.0
Pine Lake Dam	Foundation Soils	PB-01	13	120	10.6	10	1560	1410	1.3	1.2	1.0	0.80	1.0	10.4	12.4
Pine Lake Dam	Foundation Soils	PB-01	18	120	10.6	2	2160	1698	1.3	1.1	1.0	0.85	1.0	2.2	2.4
Pine Lake Dam	Foundation Soils	PB-01	23	120	10.6	19	2760	1986	1.3	1.0	1.0	0.95	1.0	23.5	23.5
Pine Lake Dam	Foundation Soils	PB-02	8	120	11.6	4	960	960	1.3	1.4	1.0	0.80	1.0	4.2	6.0
Pine Lake Dam	Foundation Soils	PB-02	13	120	11.6	6	1560	1473	1.3	1.2	1.0	0.80	1.0	6.2	7.3
Pine Lake Dam	Foundation Soils	PB-02	18	120	11.6	3	2160	1761	1.3	1.1	1.0	0.85	1.0	3.3	3.5
Pine Lake Dam	Foundation Soils	PB-02	23	120	11.6	12	2760	2049	1.3	1.0	1.0	0.95	1.0	14.8	14.6
Pine Lake Dam	Foundation Soils	PB-03	8	120	6.5	4	960	866	1.3	1.5	1.0	0.80	1.0	4.2	6.3
Pine Lake Dam	Foundation Soils	PB-03	10	120	6.5	8	1200	982	1.3	1.4	1.0	0.80	1.0	8.3	11.9
Pine Lake Dam	Foundation Soils	PB-03	12	120	6.5	4	1440	1097	1.3	1.4	1.0	0.80	1.0	4.2	5.6
Pine Lake Dam	Foundation Soils	PB-03	14	120	6.5	3	1680	1212	1.3	1.3	1.0	0.85	1.0	3.3	4.3
Pine Lake Dam	Foundation Soils	PB-03	16	120	6.5	8	1920	1327	1.3	1.2	1.0	0.85	1.0	8.8	10.9
Pine Lake Dam	Foundation Soils	PB-03	18	120	6.5	4	2160	1442	1.3	1.2	1.0	0.85	1.0	4.4	5.2
Pine Lake Dam	Foundation Soils	PB-03	23	120	6.5	10	2760	1730	1.3	1.1	1.0	0.95	1.0	12.4	13.3
Pine Lake Dam	Foundation Soils	PB-04	3	120	7.3	14	360	360	1.3	1.7	1.0	0.75	2.0	27.3	46.4
Pine Lake Dam	Foundation Soils	PB-04	8	120	7.3	9	960	916	1.3	1.5	1.0	0.80	3.0	28.1	41.5
Pine Lake Dam	Foundation Soils	PB-04	13	120	7.3	7	1560	1204	1.3	1.3	1.0	0.80	4.0	29.1	37.5
Pine Lake Dam	Foundation Soils	PB-04	18	120	7.3	5	2160	1492	1.3	1.2	1.0	0.85	5.0	27.6	32.0
Pine Lake Dam	Foundation Soils	PB-04	23	120	7.3	8	2760	1780	1.3	1.1	1.0	0.95	6.0	59.3	62.8
					Pine Lake Dam Mean:	**7**	**1674**	**1289**						**14**	**18**
					Pine Lake Dam Standard Deviation:	**4**								**14**	**16**
					Pine Lake Dam Mean Minus One Standard Deviation:	**3**								**1**	**1**
Upper Lake Dam	Foundation Soils	UB-01	8	120	3.5	6	960	679	1.3	1.7	1.0	0.80	1.0	6.2	10.6
Upper Lake Dam	Foundation Soils	UB-01	13	120	3.5	5	1560	967	1.3	1.4	1.0	0.80	1.0	5.2	7.5
Upper Lake Dam	Foundation Soils	UB-01	18	120	3.5	4	2160	1255	1.3	1.3	1.0	0.85	1.0	4.4	5.6
Upper Lake Dam	Foundation Soils	UB-01	23	120	3.5	19	2760	1543	1.3	1.1	1.0	0.95	1.0	23.5	26.7
Upper Lake Dam	Foundation Soils	UB-02	8	120	7.5	8	960	929	1.3	1.5	1.0	0.80	1.0	8.3	12.2
Upper Lake Dam	Foundation Soils	UB-02	13	120	7.5	18	1560	1217	1.3	1.3	1.0	0.80	1.0	18.7	24.0
Upper Lake Dam	Foundation Soils	UB-02	18	120	7.5	2	2160	1505	1.3	1.2	1.0	0.85	1.0	2.2	2.5
Upper Lake Dam	Foundation Soils	UB-02	23	120	7.5	11	2760	1793	1.3	1.1	1.0	0.95	1.0	13.6	14.3
Upper Lake Dam	Foundation Soils	UB-03	8	120	5.3	5	960	792	1.3	1.6	1.0	0.80	1.0	5.2	8.3
Upper Lake Dam	Foundation Soils	UB-03	18	120	5.3	8	2160	1368	1.3	1.2	1.0	0.85	1.0	8.8	10.7
Upper Lake Dam	Foundation Soils	UB-03	23	120	5.3	3	2760	1656	1.3	1.1	1.0	0.95	1.0	3.7	4.1
					Upper Lake Dam Mean:	**8**	**1860**	**1232**						**9**	**12**
					Upper Lake Dam Standard Deviation:	**5**								**6**	**7**
					Upper Lake Dam Mean Minus One Standard Deviation:	**3**								**3**	**4**
					Overall Mean:	**7**	**2302**	**1874**						**9**	**10**
					Overall Standard Deviation:	**5**								**8**	**9**
					Overall Mean Minus One Standard Deviation:	**3**								**2**	**1**

[1]Groundwater depths are based on boring data. Assumed values shown in red.
[2]C_E = hammer energy correction factor (Idriss and Boulanger 2008)
[3]C_N = overburden correction factor = $(2000\ psf/\sigma'_v)^{0.5}$, where C_N is less than or equal to 1.7 (Liao and Whitman 1986)
[4]C_B = correction for borehole diameter (Skempton 1986)
[5]C_R = rod length correction factor assuming 5 feet of stick-up (Youd and Idriss 1997)
[6]C_S = sampler correction factor = 1.0 for standard sampler
[7]$N_{60} = N_f*C_E*C_B*C_R*C_S$
[8]$N_{1,60} = N_f*C_E*C_N*C_B*C_R*C_S$

	C_E
Donut hammer	0.5-1.0
Safety hammer	0.7-1.2
Automatic trip hammer	0.8-1.3

Borehole diameter	C_B
65-115 mm	1
150 mm	1.05
200 mm	1.15

Rod Length	C_R
<3m, <9.8ft	0.75
3-4m, 9.8-13.1ft	0.8
4-6m, 13.1-19.7ft	0.85
6-10m, 19.7-32.8ft	0.95
10-30m, 32.8-98.4ft	1

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	Sanford Dam Foundation Soils	North Lake Dam Foundation Soils	Pine Lake Dam Foundation Soils	Upper Lake Dam Foundation Soils	Overall Foundation Soils
Selected N_{60}	3	3	1	3	2
Selected $N_{1,60}$	3	3	1	4	1
Average σ'_v (psi)	14.6	10.7	9.0	8.6	13.0

Correlation Reference	Soil Type	ϕ (degrees)	ϕ (degrees)	ϕ (degrees)	ϕ (degrees)	ϕ (degrees)	Correlation (see Attachment 3)
Meyerhof (1956)	Clean sand	29	29	27	29	28	See Table 5.3
	Clayey sand	24	24	22	24	23	See Table 5.3
	Very fine or silty sand	33	33	33	33	33	See Table 5.3
Duncan and Buchignani (1976)	Freshly deposited NC sand	29	29	28	30	28	See Table 21
Terzaghi et al. (1996)	Fine Sands	29	29	28	29	28	See Figure 34
Duncan et al. (2014)	Sands	33	34	33	35	33	See Chart on next page
	Min =	24	24	22	24	23	
	Average =	29	30	29	30	29	
	Selected Values:	**29**	**30**	**29**	**30**	**29**	

[1]Values shown in red interpolated using trend function in Excel.

Duncan et al. (2014) Correlation - Foundation Soils

$$\phi = A + B(D_r) - \left[C + D(D_r)\right]\log_{10}\left(\frac{\sigma_N}{p_a}\right)$$

Material type	A	B	C	D	Standard Deviation
Gravel with $C_u > 4$	44	10	7	2	3.1°
Sand with $C_u > 6$	39	10	3	2	3.2°
Sand with $C_u < 6$	34	10	3	2	3.2°

	Sanford Dam Foundation Soils	North Lake Dam Foundation Soils	Pine Lake Dam Foundation Soils	Upper Lake Dam Foundation Soils	Overall Foundation Soils
ϕ' (estimate)	29	30	29	30	29
[1]Dr	22.7%	23.2%	15.6%	26.7%	16.5%
average σ'_v (psi)	14.6	10.7	9.0	8.6	13.0
[2]Ko	0.52	0.51	0.52	0.50	0.52
σ'_N (psi)	11.28	8.09	6.91	6.41	9.98
[3]D60	0.200	0.200	0.250	0.300	0.238
[3]D10	0.080	0.095	0.100	0.050	0.081
[4]Cu	2.5	2.1	2.5	6.0	2.9

[1]Dr averaged from published N-Value correlations
[2]Ko = 1-SIN(RADIANS(Dr))
[3]D60 and D10 based on gradation test results.
[4]Cu = D60/D10

	Sanford Dam Foundation Soils			North Lake Dam Foundation Soils			Pine Lake Dam Foundation Soils			Upper Lake Dam Foundation Soils			Overall Foundation Soils		
	ϕ' (degrees)	ϕ' - 1σ	ϕ' - 2σ	ϕ' (degrees)	ϕ' - 1σ	ϕ' - 2σ	ϕ' (degrees)	ϕ' - 1σ	ϕ' - 2σ	ϕ' (degrees)	ϕ' - 1σ	ϕ' - 2σ	ϕ' (degrees)	ϕ' - 1σ	ϕ' - 2σ
Gravel with Cu > 4	47.1	**44.0**	40.9	48.3	**45.2**	42.1	48.0	**44.9**	41.8	49.4	**46.3**	43.2	46.9	**43.8**	40.7
Sand with Cu > 6	41.7	**38.5**	35.3	42.2	**39.0**	35.8	41.7	**38.5**	35.3	42.9	**39.7**	36.5	41.2	**38.0**	34.8
Sand with Cu < 6	36.7	**33.5**	30.3	37.2	**34.0**	30.8	36.7	**33.5**	30.3	37.9	**34.7**	31.5	36.2	**33.0**	29.8

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project Boiling Spring Lakes Dams Construction/Reconstruction	**Project Number** 19C21022
Title Soil and Rock Properties	
Computer Programs Used Microsoft Excel	**Version/Release No.** 2016
Purpose and Objective Develop soil parameters for use in geotechnical and structural designs and analyses for Sanford Dam, North Lake Dam, Pine Lake Dam, and Upper Lake Dam.	
Summary of Conclusions See attached memorandum and calculations.	

Originator			
Austin Spencer, PE			Jul 24, 2020
	Print	Sign	Date
Checked			
Adam Paisley, PE	Emily Gibson		Jul 24, 2020
	Print	Sign	Date

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TECHNICAL MEMORANDUM

BY:	Zachary Ostrum	**DATE:**	5/15/2020
PROJECT:	Boiling Spring Lakes Dams Construction/Reconstruction	**SUBJECT:**	Seismic Hazard
LOCATION:	Boiling Spring Lakes, North Carolina	**PROJECT NO.:**	19C21022
CHECKED BY:	Emily Gibson, PE	**DATE:**	5/21/2020

INTRODUCTION

Sanford Dam (SD), North Lake Dam (NLD), Pine Lake Dam (PLD), and Upper Lake Dam (ULD) (collectively herein referred to as the BSL Dams) breached during Hurricane Florence in September 2018. The four BSL Dams are part of a system of dams where NLD, PLD, and ULD are situated upstream of SD and independent of each other. NLD and PLD are directly upstream, such that the Sanford Dam headwater is the tailwater for NLD and PLD. A fifth dam named Middle Lake Dam (MLD) is founded between SD and ULD and also breached during Hurricane Florence, but is not part of the BSL Dams rehabilitation project.

The existing alluvial/coastal deposits (Foundation Soils) beneath the proposed SD spillway and within the existing breached section will be excavated to top of rock and replaced with engineered fill materials. The proposed SD embankment within the excavation section also includes the installation of a low-permeability core, upstream and downstream shells, and a seepage collection system. A cutoff wall will be installed for the entire length of SD. The SD embankment to the left (looking downstream) of the breached area will generally not be modified except for the installation of the cutoff wall and mix-in-pace soil-cement panels (MIP panels).

The proposed spillway structures at NLD, PLD, and ULD will be founded on alluvial/costal deposits (Foundation Soils). NLD, PLD, and ULD will be homogeneous embankments consisting and will include filter diaphragms installed around the proposed spillway conduits.

This memorandum presents the development of the design peak ground acceleration (PGA) and representative earthquake moment magnitude (Mw) to be used for analysis of the dams included in the Boiling Spring Lakes Dams Construction/Reconstruction project.

PEAK GROUND ACCELERATIONS

General

The United States Geological Survey (USGS) publishes seismic hazard data for the United States, which is accessible through their website. The seismic parameters to be used for the analysis of the Boiling Springs Dams were obtained from the USGS Seismic Hazard Maps, which provide the seismic parameter of interest associated with a particular annual frequency of exceedance at a specified site.

The USGS Seismic Hazard Maps were developed through performance of a probabilistic seismic hazard analysis (PSHA), which is based on the model originally developed by Cornell (1968) and expanded by McGuire (1974; 1978) and

others. This methodology produces a frequency of exceedance or, equivalently, the return period (the inverse of the annual frequency of exceedance) of selected seismic parameters given the location, type, and geometric features of the seismic sources that are located within a given distance of the site. The USGS Unified Hazard Tool (USGS, 2019) produces seismic parameters based on seismic hazard map data developed from the 2014 National Seismic Hazard Mapping Project (NSHMP, Petersen et al., 2014). The UHT generates seismic hazard curves with consideration for the composite contribution of each seismic source which affects a site, the individual probability of rupture of each seismic source, and the proximity of each seismic source to the site. The curves present values of ground motion (expressed as a percentage of Earth's gravitational acceleration constant, g) with respect to annual frequency of exceedance. To obtain seismic hazard curves from the UHT, the user must enter the site location, the site class, and a return period. Additionally, the user may select a seismic parameter – peak ground acceleration (PGA) or spectral acceleration – which the UHT will determine from the generated hazard curves.

Site Class B/C Peak Ground Acceleration

The ground motions values produced by the UHT represent accelerations experienced by a reference site of a Site Class B/C boundary (approximating soft rock). Ground motions for sites with site classifications other than B/C are adjusted prior to use in seismic analyses, as is described later in this document. Return periods of 5,000 years and 2,500 years were selected for SD and for NLD, PLD, and ULD, respectively, based on current industry practices, the size and hazard classification of the dams, and the magnitude of the design storms for the dams. A single location was used to represent the project based on the short distance (less than three miles) between any two dam sites and low spatial variability of the ground motions (0.002g) in the vicinity of the project site.

According to the USGS Unified Hazard Tool, the Site Class B/C PGAs associated with the 5,000-year and 2,500-year seismic events are 0.13 g and 0.09 g, respectively. Seismic hazard curves and Site Class B/C PGAs produced by the UHT are presented in Attachment 1.

Soil Peak Ground Acceleration

The soil overlying the Site Class B/C boundary has the potential to either amplify or deamplify ground motions at a site. To account for this behavior, soil amplification factors were selected from Chapter 11 of "Minimum Design Loads for Buildings and Other Structures" (ASCE 7-16) (ASCE, 2016). Amplification factors are dependant on the Site Class B/C ground motions and the seismic site classificaton of the dam site. Chapter 20 of ASCE 7-16 provides procedures to classify a site given the relative stiffness of the upper 100 ft (30 m) of the site soil profile below the base of the embankment, which is referred to herein as Vs30.

Site Classifications at each dam were evaluated based on data collected during the Phase 2 subsurface exploration program. Shear wave velocity data was collected from seismic cone penetrometer tests (SCPTs) performed at each dam site. Calculation of the Vs30 for each SCPT are included as Attachment 2.

Seven SCPTs were performed at SD. The foundation shear wave velocity profile generally consisted of two layers, a softer foundation layer and firmer foundation layer. For the seven SCPTs, the average shear wave velocities of the softer foundation layer and firmer foundation layer were 650 ft/s and 986 ft/s, respectively. Additionally, the average thickness of the Foundation Soils was 15.1 ft. The CPT soundings refused on limestone at a depth ranging from 12.5 to 42.0 feet below ground surface. Since the CPT soundings did not penetrate the rock, shear wave velocity was not recorded below CPT refusal. The limestone was assumed to have an average shear wave velocity of 1200 ft/s since it was characterized as weak to very weak and had low rock quality designation (RQD) values. Calculated Vs30 values ranged between 909 ft/s and 1125 ft/s, and SD can be characterized as a Site Class D in accordance wtih Table 20.3-1 of ASCE 7-16.

Three SCPTs were also performed at NLD, PLD, and ULD (one SCPT at each site). Shear wave velocity data was collected to depths less than 25 feet even though CPT refusal was encountered below these depths in adjacent CPT soundings. The soil below the bottom depth of each SCPT was assumed to have the same shear wave velocity of the deepest record. As was assumed at SD, rock was assumed to have an average shear wave velocity of 1200 ft/s, and depths to top of rock were approximated from adjacent CPTs that were pushed to refusal at each dam site (except ULD where refusal was not observed). Calculated Vs30 values for NLD, PLD, and ULD are included in Attachment 2 and range from 631 to 729 ft/s. Based on these values North Lake Dam, Pine Lake Dam, and Upper Lake Dam can all be characterized as Site Class D in accordance wtih Table 20.3-1 of ASCE 7-16.

A Site Coefficient (FPGA) specified in Table 11.8-1 of ASCE 7-16 was selected to estimate the effects of potential amplification of the B/C boundary ground motions at each dam site given the Site Class D characterizations. The coefficient was multiplied by the Class B/C Rock PGA to calculate the Site Class D Soil PGA, which is summarized in Table 1 for each dam site. Site Class D ground motions should be used when assessing the seismic performance of the BSL Dams.

Table 1: Design Ground Motions

Site	Return Period (YR)	Site Class	Site Class B/C PGA (g)	FPGA	Amplified PGA (g)
NLD, PLD, and ULD	2,500	D	0.09	1.60	0.14
SD	5,000	D	0.13	1.54	0.20

EARTHQUAKE MAGNITUDE

The USGS Unified Hazard Tool also provides deaggregations associated with each return period ground motion. The deaggregation plots for the 2,500 and 5,000 year PGA shown in Attachment 1 are graphical representations of the relative contribution of various seismic sources based on earthquake magnitude and distance from the site. The Charleston Seismic Zone is the dominant source and contributes 69% and 73% to the overall hazard, for the 5,000-year and 2,500-year seismic events, respectively. The contribution of the Charleston Seismic Zone is supported by historic regional seismicity. The USGS earthquake catalog provides the following historic earthquake events with a magnitude larger than 4.5 within a 200-mile radius of the project site:

- 1817 Charleston, South Carloina, Mw 5.0
- 1886 Charleston, South Carolina, Mw 7.0
- 1974 Near Charleston, South Carolina, Mw 4.7

Since the Charleston Zone is the dominant contributor, we recommend the modal event be used to represent the controlling earthquake associated with each return period PGA. For both the 2,500-year and 5,000-year PGA, the representative event is a Mw 7.3 earthquake at a distance of approximately 190 km from the site. This event should be used when using the simplified approach to assess liquefaction potential. If an embankment seismic deformation analysis is performed, the USGS Unified Hazard Tool should be used to confirm that this magnitude is still associated with the modal event at the spectral acceleration corresponding to the fundamental period of the embankment.

REFERENCES

- ASCE (2016). "Site Classification Procedure for Seismic Design," *ASCE 7-16 Chapter 20*, American Society of Civil Engineers, Reston, VA.
- Cornell, C.A. 1968. "Engineering Seismic Risk Analysis." Bulletin of the Seismological Society of America, Vol. 58, pp. 1583-1606.
- McGuire, R.K. 1974. Seismic Structural Response Risk Analysis Incorporating Peak Response Regressions on Earthquake Magnitude and Distance, Research Report R74-51. Massachusetts Institute of Technology, Department of Civil Engineering, Cambridge, Massachusetts.
- McGuire, R.K. 1978. "Seismic Ground Motion Parameter Relations," Journal of the Geotechnical Engineering Division, Vol. 104, Issue 4, pp. 481-490.
- Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, Ned, Chen, Rui, Rukstales, K.S., Luco, Nico, Wheeler, R.L., Williams, R.A., and Olsen, A.H. (2014). Documentation for the 2014 update of the United States national seismic hazard maps: U.S. Geological Survey Open-File Report 2014–1091, 243 p., http://dx.doi.org/10.3133/ofr20141091
- USGS (2014). "Documentation for the 2014 Update of the United States National Seismic Harzard Maps". Open-File Report 2014-1091. U.S. Department of the Interior, U.S. Geological Suvery, Reston, VA
- USGS (2019). *Unified Hazard Tool.* Vers. v4.2.0. https://earthquake.usgs.gov/hazards/interactive/.
- USGS (2020). *Earthquake Catalog.* https://earthquake.usgs.gov/earthquakes/search/.

ATTACHMENTS

1. USGS Unified Hazard Tool Results for 2,500-year and 5,000-year return periods
2. Vs30 and Site Class Estimation

ATTACHMENT 1

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (upd

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.048

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

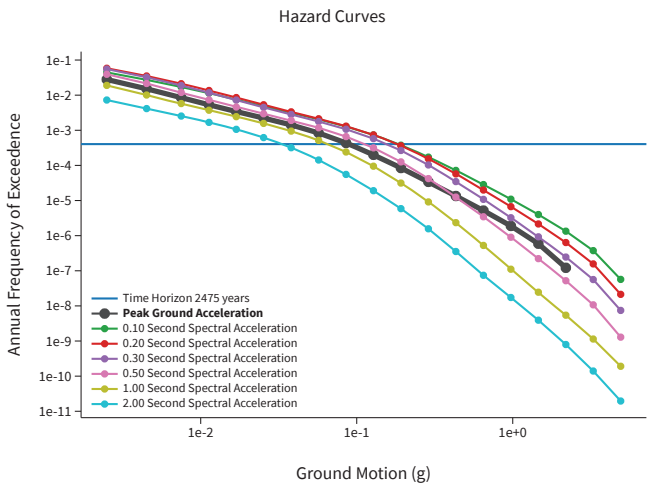
-78.038

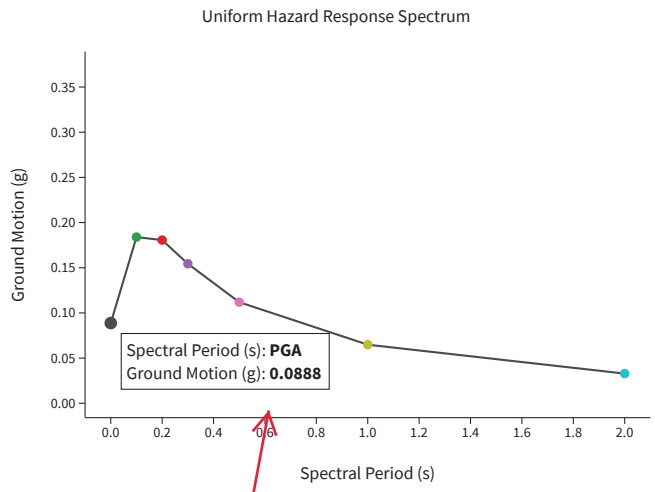
Site Class

760 m/s (B/C boundary)

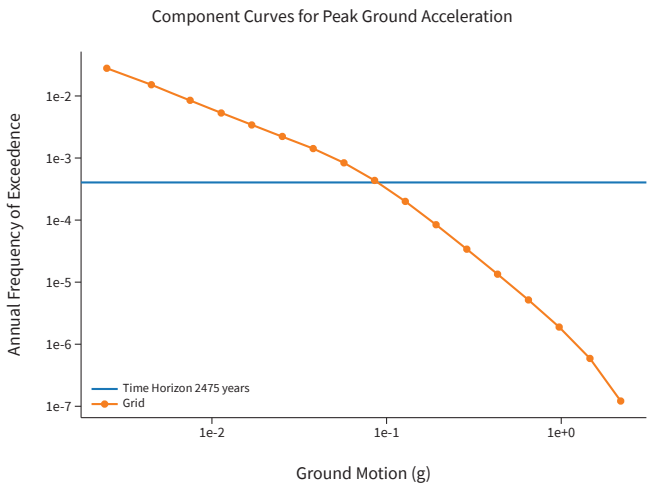
ATTACHMENT 1

Hazard Curve





Use 0.09g for Site Class B/C PGA



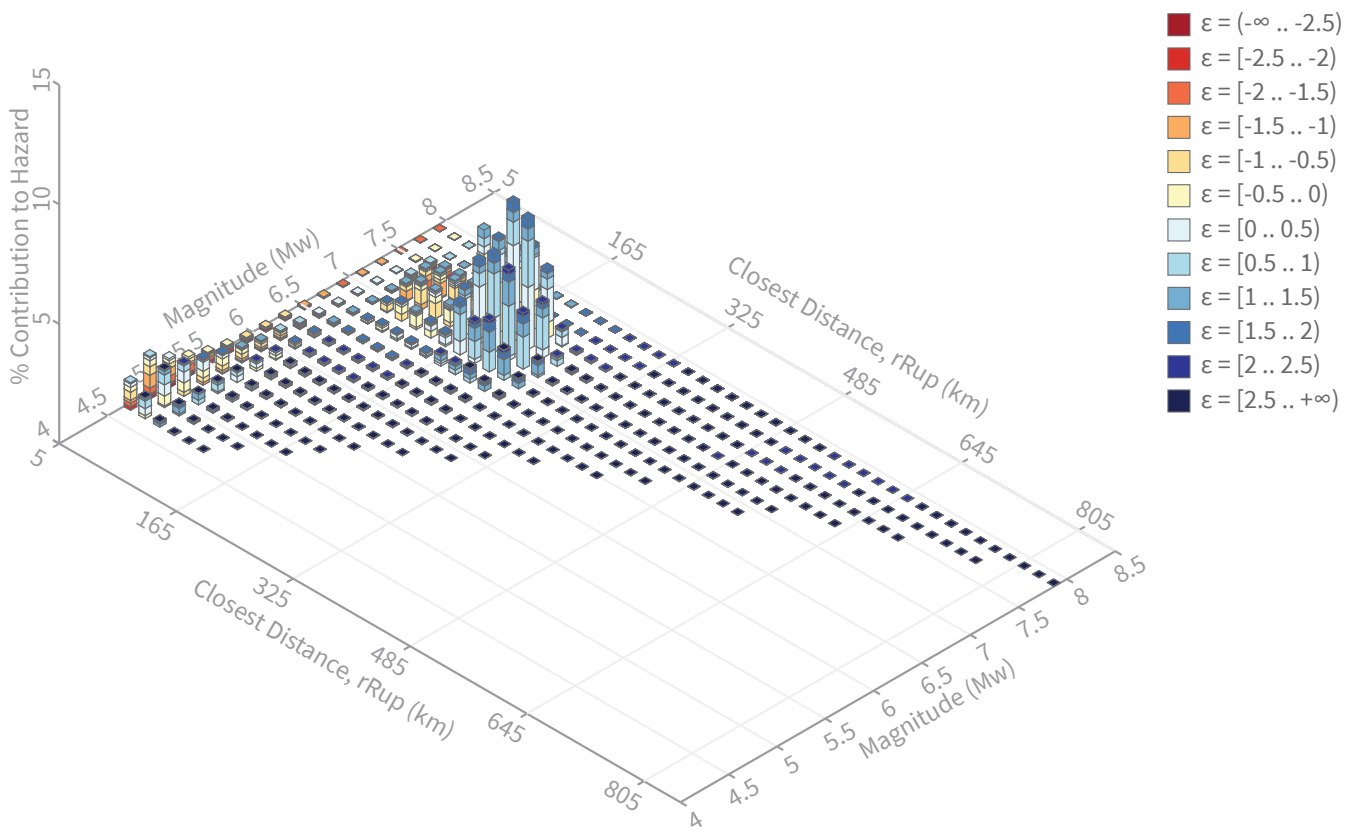
View Raw Data

ATTACHMENT 1

Deaggregation

Component

Total



ATTACHMENT 1

Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.088798291 g

Recovered targets

Return period: 2462.6687 yrs
Exceedance rate: 0.00040606356 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 1.53 %

Mean (over all sources)

m: 6.81
r: 145.7 km
ε_0: 0.24 σ

Mode (largest m-r bin)

m: 7.3
r: 189.78 km
ε_0: 0.44 σ
Contribution: 5.77 %

Mode (largest m-r-ε_0 bin)

m: 7.3
r: 190.12 km
ε_0: 0.2 σ
Contribution: 3.67 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

ATTACHMENT 1

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
Charleston Local Zone	Grid							35.63
PointSourceFixedStrike: -79.600, 33.100		149.86	7.20	0.05	79.600°W	33.100°N	234.36	1.42
PointSourceFixedStrike: -79.700, 33.200		151.54	7.20	0.08	79.700°W	33.200°N	238.96	1.39
PointSourceFixedStrike: -79.800, 33.300		154.50	7.20	0.12	79.800°W	33.300°N	243.46	1.33
PointSourceFixedStrike: -79.600, 33.000		156.33	7.20	0.14	79.600°W	33.000°N	231.61	1.30
PointSourceFixedStrike: -79.700, 33.100		157.19	7.20	0.15	79.700°W	33.100°N	236.07	1.28
PointSourceFixedStrike: -79.800, 33.200		159.32	7.21	0.18	79.800°W	33.200°N	240.46	1.24
PointSourceFixedStrike: -79.900, 33.300		162.65	7.21	0.22	79.900°W	33.300°N	244.75	1.18
PointSourceFixedStrike: -79.700, 33.000		163.38	7.21	0.22	79.700°W	33.000°N	233.36	1.17
PointSourceFixedStrike: -79.800, 33.100		164.71	7.21	0.24	79.800°W	33.100°N	237.64	1.14
PointSourceFixedStrike: -79.900, 33.200		167.24	7.21	0.27	79.900°W	33.200°N	241.84	1.10
PointSourceFixedStrike: -79.800, 33.000		170.65	7.22	0.31	79.800°W	33.000°N	234.98	1.04
PointSourceFixedStrike: -79.900, 33.100		172.41	7.22	0.33	79.900°W	33.100°N	239.09	1.01
Charleston Regional Zone	Grid							20.75
Charleston Narrow Zone	Grid							16.88
PointSourceFixedStrike: -80.000, 33.200		185.03	7.21	0.50	80.000°W	33.200°N	243.11	1.43
PointSourceFixedStrike: -80.000, 33.100		189.21	7.22	0.54	80.000°W	33.100°N	240.43	1.33
PointSourceFixedStrike: -80.100, 33.200		193.57	7.22	0.59	80.100°W	33.200°N	244.29	1.24
PointSourceFixedStrike: -80.000, 33.000		193.91	7.22	0.59	80.000°W	33.000°N	237.90	1.23
PointSourceFixedStrike: -80.100, 33.100		197.56	7.22	0.63	80.100°W	33.100°N	241.68	1.16
PointSourceFixedStrike: -80.200, 33.200		202.15	7.23	0.68	80.200°W	33.200°N	245.38	1.07
PointSourceFixedStrike: -80.100, 33.000		202.06	7.23	0.67	80.100°W	33.000°N	239.20	1.07
PointSourceFixedStrike: -80.200, 33.100		205.98	7.23	0.71	80.200°W	33.100°N	242.84	1.00
USGS Fixed Smoothing Zone 2 (opt)	Grid							8.65
SSCn Fixed Smoothing Zone 4 (opt)	Grid							8.62
USGS Adaptive Smoothing Zone 2 (opt)	Grid							4.47
SSCn Adaptive Smoothing Zone 4 (opt)	Grid							4.45

ATTACHMENT 1

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (upd

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.048

Time Horizon

Return period in years

5000

Longitude

Decimal degrees, negative values for western longitudes

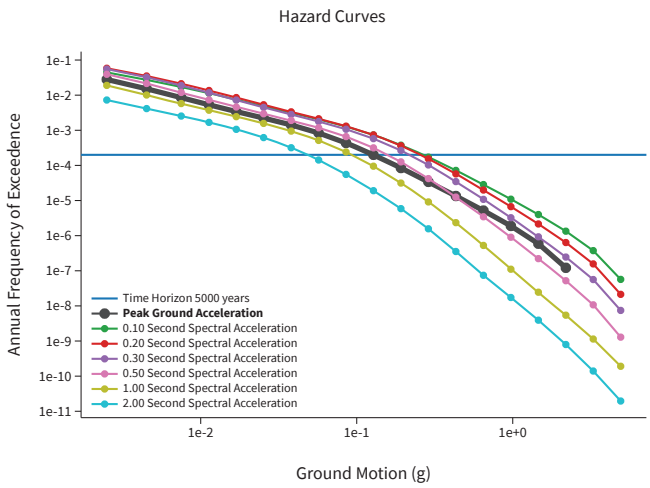
-78.038

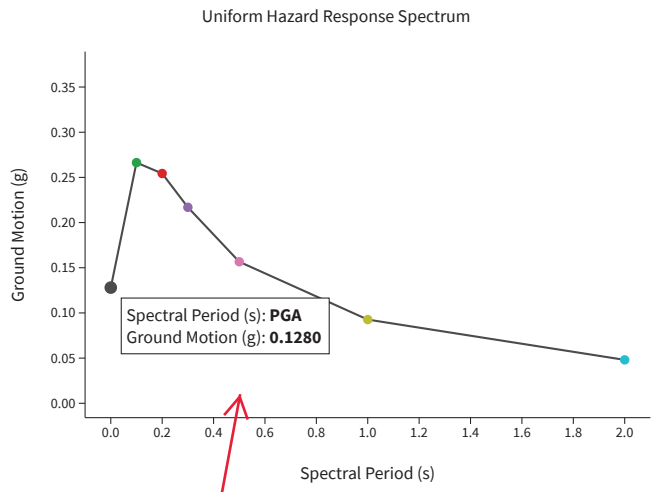
Site Class

760 m/s (B/C boundary)

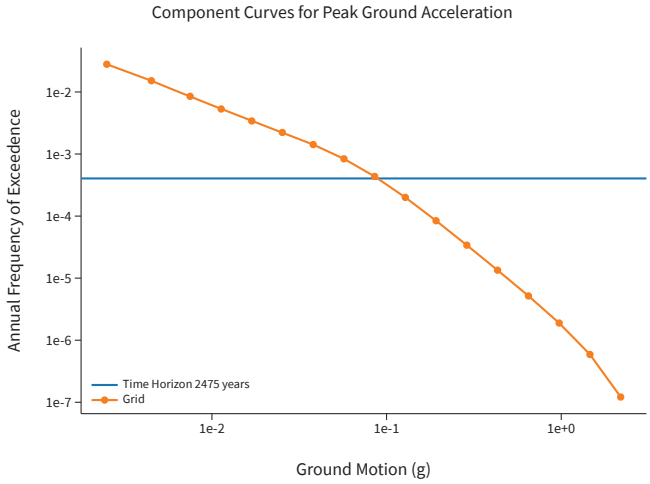
ATTACHMENT 1

Hazard Curve





Use 0.13g for Site Class B/C PGA



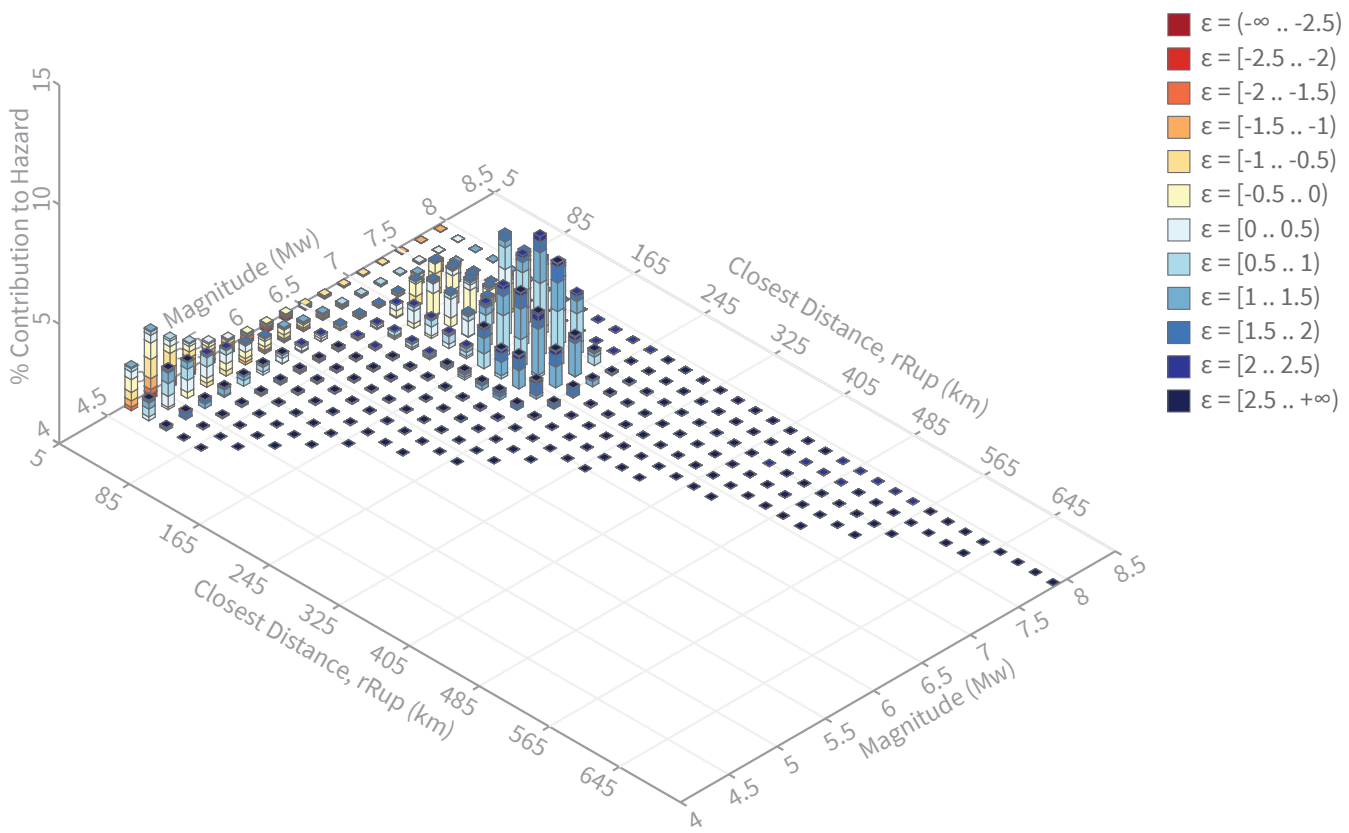
View Raw Data

ATTACHMENT 1

Deaggregation

Component

Total



ATTACHMENT 1

Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 5000 yrs
Exceedance rate: 0.0002 yr^{-1}
PGA ground motion: 0.12803331 g

Recovered targets

Return period: 4999.887 yrs
Exceedance rate: 0.00020000452 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 1.19 %

Mean (over all sources)

m: 6.74
r: 127.68 km
ε_0: 0.47 σ

Mode (largest m-r bin)

m: 7.3
r: 189.64 km
ε_0: 0.96 σ
Contribution: 5 %

Mode (largest m-r-ε_0 bin)

m: 7.3
r: 189.79 km
ε_0: 0.68 σ
Contribution: 3.06 %

Assume Charleston seismic event controls, use modal seismic event

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

ATTACHMENT 1

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
Charleston Local Zone	Grid							31.57
PointSourceFixedStrike: -79.600, 33.100		148.21	7.23	0.53	79.600°W	33.100°N	234.36	1.48
PointSourceFixedStrike: -79.700, 33.200		149.91	7.24	0.55	79.700°W	33.200°N	238.96	1.43
PointSourceFixedStrike: -79.800, 33.300		152.92	7.24	0.59	79.800°W	33.300°N	243.46	1.35
PointSourceFixedStrike: -79.600, 33.000		154.67	7.24	0.61	79.600°W	33.000°N	231.61	1.30
PointSourceFixedStrike: -79.700, 33.100		155.55	7.24	0.62	79.700°W	33.100°N	236.07	1.28
PointSourceFixedStrike: -79.800, 33.200		157.71	7.24	0.65	79.800°W	33.200°N	240.46	1.23
PointSourceFixedStrike: -79.900, 33.300		161.10	7.24	0.69	79.900°W	33.300°N	244.75	1.14
PointSourceFixedStrike: -79.700, 33.000		161.75	7.25	0.69	79.700°W	33.000°N	233.36	1.13
PointSourceFixedStrike: -79.800, 33.100		163.10	7.25	0.71	79.800°W	33.100°N	237.64	1.10
PointSourceFixedStrike: -79.900, 33.200		165.67	7.25	0.74	79.900°W	33.200°N	241.84	1.04
Charleston Regional Zone	Grid							24.05
Charleston Narrow Zone	Grid							13.41
PointSourceFixedStrike: -80.000, 33.200		184.20	7.24	0.96	80.000°W	33.200°N	243.11	1.23
PointSourceFixedStrike: -80.000, 33.100		188.32	7.25	1.00	80.000°W	33.100°N	240.43	1.13
PointSourceFixedStrike: -80.100, 33.200		192.78	7.25	1.04	80.100°W	33.200°N	244.29	1.03
PointSourceFixedStrike: -80.000, 33.000		192.97	7.25	1.04	80.000°W	33.000°N	237.90	1.02
USGS Fixed Smoothing Zone 2 (opt)	Grid							10.19
PointSourceFinite: -78.038, 34.115		8.89	5.16	-1.51	78.038°W	34.115°N	0.00	1.68
PointSourceFinite: -78.038, 34.205		17.85	5.26	-0.46	78.038°W	34.205°N	0.00	1.39
PointSourceFinite: -78.038, 34.250		22.55	5.34	-0.14	78.038°W	34.250°N	0.00	1.27
SSCn Fixed Smoothing Zone 4 (opt)	Grid							10.18
PointSourceFinite: -78.038, 34.115		8.89	5.16	-1.51	78.038°W	34.115°N	0.00	1.68
PointSourceFinite: -78.038, 34.205		17.85	5.26	-0.46	78.038°W	34.205°N	0.00	1.39
PointSourceFinite: -78.038, 34.250		22.55	5.34	-0.14	78.038°W	34.250°N	0.00	1.27
USGS Adaptive Smoothing Zone 2 (opt)	Grid							5.08
SSCn Adaptive Smoothing Zone 4 (opt)	Grid							5.08

Project:	Boiling Spring Lakes				
Purpose:	Seismic Hazard Memorandum				
Project Location:	Brunswick County, NC				
Schnabel Office:	Greensboro,NC				
Project Number:	19C21022.00				
		By:	EMG	Checked:	ZAO
	ATTACHMENT 2	Date:	5/21/2020	Date:	5/15/2020

SC-03 SHEAR WAVE VELOCITY TEST RESULTS - Vs

Top of Layer (ft)	Bottom of Layer (ft)	Layer Thickness (ft)	Interval Velocity (ft/s)	Thickness /Velocity	
16.30	19.03	2.73	584.00	0.0047	Foundation begins at depth of 16.3ft
19.03	22.31	3.28	628.00	0.0052	
22.31	25.59	3.28	548.00	0.0060	
25.59	28.87	3.28	604.00	0.0054	
28.87	32.15	3.28	854.00	0.0038	
32.15	35.43	3.28	1024.00	0.0032	
35.43	38.71	3.28	871.00	0.0038	
38.71	116.30	77.59	1200.00	0.0647	Estimated Vs
			Sum	0.097	
			Vs30	1033	
			Site Class	D	

Project:	Boiling Spring Lakes				
Purpose:	Seismic Hazard Memorandum				
Project Location:	Brunswick County, NC				
Schnabel Office:	Greensboro,NC				
Project Number:	19C21022.00				
		By:	EMG	Checked:	ZAO
	ATTACHMENT 2	Date:	5/21/2020	Date:	5/15/2020

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SC-06 SHEAR WAVE VELOCITY TEST RESULTS - Vs

Top of Layer (ft)	Bottom of Layer (ft)	Layer Thickness (ft)	Interval Velocity (ft/s)	Thickness /Velocity	
13.10	15.75	2.65	506	0.0052	Foundation begins at depth of 13.1ft
15.75	19.03	3.28	384	0.0085	
19.03	22.31	3.28	452	0.0073	
22.31	25.59	3.28	607	0.0054	
25.59	28.87	3.28	807	0.0041	
28.87	32.15	3.28	1538	0.0021	
32.15	35.43	3.28	1443	0.0023	
35.43	113.10	77.67	1200	0.0647	Estimated Vs
			Sum	0.100	
			Vs30	1004	
			Site Class	D	

Project:	Boiling Spring Lakes				
Purpose:	Seismic Hazard Memorandum				
Project Location:	Brunswick County, NC				
Schnabel Office:	Greensboro,NC				
Project Number:	19C21022.00				
		By:	EMG	Checked:	ZAO
	ATTACHMENT 2	Date:	5/21/2020	Date:	5/15/2020

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SC-07 SHEAR WAVE VELOCITY TEST RESULTS - Vs

Top of Layer (ft)	Bottom of Layer (ft)	Layer Thickness (ft)	Interval Velocity (ft/s)	Thickness /Velocity	
6.50	9.19	2.69	488	0.0055	Foundation begins at depth of 6.5ft
9.19	12.47	3.28	374	0.0088	
12.47	15.75	3.28	400	0.0082	
15.75	19.03	3.28	570	0.0058	
19.03	22.31	3.28	1111	0.0030	
22.31	25.59	3.28	912	0.0036	
25.59	28.87	3.28	813	0.0040	
28.87	32.15	3.28	781	0.0042	
32.15	35.43	3.28	1307	0.0025	
35.43	106.50	71.07	1200	0.0592	Estimated Vs
			Sum	0.105	
			Vs30	955	
			Site Class	D	

Project:	Boiling Spring Lakes				
Purpose:	Seismic Hazard Memorandum				
Project Location:	Brunswick County, NC				
Schnabel Office:	Greensboro,NC				
Project Number:	19C21022.00				
		By:	EMG	Checked:	ZAO
	ATTACHMENT 2	Date:	5/15/2020	Date:	5/15/2020

SC-11 SHEAR WAVE VELOCITY TEST RESULTS - Vs

Top of Layer (ft)	Bottom of Layer (ft)	Layer Thickness (ft)	Interval Velocity (ft/s)	Thickness /Velocity	
2.62	5.91	3.29	885	0.0067	Foundation begins at surface recording began at
5.91	9.12	3.21	744	0.0043	this depth
9.12	12.47	3.35	668	0.0050	
12.47	15.75	3.28	851	0.0039	
15.75	19.03	3.28	1361	0.0024	
19.03	22.31	3.28	1751	0.0019	
22.31	100.00	77.69	1200	0.0647	Estimated Vs
			Sum	0.089	
			Vs30	1125	
			Site Class	D	

Project:	Boiling Spring Lakes				
Purpose:	Seismic Hazard Memorandum				
Project Location:	Brunswick County, NC				
Schnabel Office:	Greensboro,NC				
Project Number:	19C21022.00				
		By:	EMG	Checked:	ZAO
	ATTACHMENT 2	Date:	5/21/2020	Date:	5/15/2020

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SC-12 SHEAR WAVE VELOCITY TEST RESULTS - Vs

Top of Layer (ft)	Bottom of Layer (ft)	Layer Thickness (ft)	Interval Velocity (ft/s)	Thickness /Velocity	
3.61	5.91	2.30	397	0.0058	Foundation begins at depth of 3.6 ft
5.91	9.12	3.21	390	0.0082	
9.12	12.47	3.35	460	0.0073	
12.47	15.75	3.28	479	0.0068	
15.75	19.03	3.28	485	0.0068	
19.03	22.31	3.28	556	0.0059	
22.31	25.51	3.20	784	0.0041	
25.51	103.61	78.10	1200	0.0651	Estimated Vs
			Sum	0.110	
			Vs30	909	
			Site Class	D	

Project:	Boiling Spring Lakes				
Purpose:	Seismic Hazard Memorandum				
Project Location:	Brunswick County, NC				
Schnabel Office:	Greensboro,NC				
Project Number:	19C21022.00				
		By:	EMG	Checked:	ZAO
	ATTACHMENT 2	Date:	5/21/2020	Date:	5/15/2020

Schnabel ENGINEERING

SC-15 SHEAR WAVE VELOCITY TEST RESULTS - Vs

Top of Layer (ft)	Bottom of Layer (ft)	Layer Thickness (ft)	Interval Velocity (ft/s)	Thickness /Velocity	
2.62	5.91	3.29	738	0.0045	Foundation begins at surface recording began at
5.91	9.19	3.28	603	0.0054	this depth
9.19	12.47	3.28	468	0.0070	
12.47	15.75	3.28	1049	0.0031	
15.75	19.03	3.28	1442	0.0023	
19.03	100.00	80.97	1200	0.0675	Estimated Vs
			Sum	0.090	
			Vs30	1114	
			Site Class	D	

Project:	Boiling Spring Lakes				
Purpose:	Seismic Hazard Memorandum				
Project Location:	Brunswick County, NC				
Schnabel Office:	Greensboro,NC				
Project Number:	19C21022.00				
		By:	EMG	Checked:	ZAO
	ATTACHMENT 2	Date:	5/21/2020	Date:	5/15/2020

SC-17 SHEAR WAVE VELOCITY TEST RESULTS - Vs

Top of Layer (ft)	Bottom of Layer (ft)	Layer Thickness (ft)	Interval Velocity (ft/s)	Thickness /Velocity	
5.20	9.19	3.99	734	0.0054	Foundation begins at depth of 5.2 ft
9.19	12.47	3.28	870	0.0038	
12.47	15.75	3.28	991	0.0033	
15.75	19.03	3.28	615	0.0053	
19.03	22.31	3.28	516	0.0064	
22.31	25.59	3.28	525	0.0062	
25.59	28.87	3.28	673	0.0049	
28.87	32.15	3.28	1240	0.0026	
32.15	35.43	3.28	1315	0.0025	
35.43	38.71	3.28	1930	0.0017	
38.71	105.20	66.49	1200	0.0554	Estimated Vs
			Sum	0.098	
			Vs30	1025	
			Site Class	D	

Project:	Boiling Spring Lakes				
Purpose:	Seismic Hazard Memorandum				
Project Location:	Brunswick County, NC				
Schnabel Office:	Greensboro,NC				
Project Number:	19C21022.00				
		By:	EMG	Checked:	ZAO
	ATTACHMENT 2	Date:	5/21/2020	Date:	5/15/2020

NC-02 SHEAR WAVE VELOCITY TEST RESULTS - Vs

Top of Layer (ft)	Bottom of Layer (ft)	Layer Thickness (ft)	Interval Velocity (ft/s)	Thickness /Velocity	
13.90	15.75	1.85	582	0.0032	Foundation begins at depth of 13.9 ft
15.75	19.03	3.28	536	0.0061	
19.03	22.31	3.28	337	0.0097	
22.31	43.63	21.32	337	0.0633	Estimated Vs
43.63	113.90	70.27	1200	0.0586	Estimated Vs
			Sum	0.141	
			Vs30	710	
			Site Class	D	

Project:	Boiling Spring Lakes				
Purpose:	Seismic Hazard Memorandum				
Project Location:	Brunswick County, NC				
Schnabel Office:	Greensboro,NC				
Project Number:	19C21022.00				
		By:	EMG	Checked:	ZAO
	ATTACHMENT 2	Date:	5/21/2020	Date:	5/15/2020

Schnabel ENGINEERING

PC-02 SHEAR WAVE VELOCITY TEST RESULTS - Vs

Top of Layer (ft)	Bottom of Layer (ft)	Layer Thickness (ft)	Interval Velocity (ft/s)	Thickness /Velocity	
9.30	12.47	3.17	437	0.0073	Foundation begins at depth of 9.3 ft
12.47	15.75	3.28	548	0.0060	
15.75	19.03	3.28	537	0.0061	
19.03	22.31	3.28	526	0.0062	
22.31	58.89	36.58	526	0.0695	Estimated Vs
58.89	109.30	50.41	1200	0.0420	Estimated Vs
			Sum	0.137	
			Vs30	729	
			Site Class	D	

Project:	Boiling Spring Lakes				
Purpose:	Seismic Hazard Memorandum				
Project Location:	Brunswick County, NC				
Schnabel Office:	Greensboro,NC				
Project Number:	19C21022.00				
		By:	EMG	Checked:	ZAO
	ATTACHMENT 2	Date:	5/21/2020	Date:	5/15/2020

Schnabel ENGINEERING

UC-02A SHEAR WAVE VELOCITY TEST RESULTS - Vs

Top of Layer (ft)	Bottom of Layer (ft)	Layer Thickness (ft)	Interval Velocity (ft/s)	Thickness /Velocity	
6.50	9.19	2.69	386	0.0070	Foundation begins at depth of 6.5 ft
9.19	12.47	3.28	413	0.0079	
12.47	15.75	3.28	359	0.0091	
15.75	19.03	3.28	450	0.0073	
19.03	22.31	3.28	456	0.0072	
22.31	58.89	36.58	456	0.0802	Estimated Vs
58.89	106.50	47.61	1200	0.0397	Estimated Vs
			Sum	0.158	
			Vs30	631	
			Site Class	D	

Sanford Dam, NC: Cut-off Options

Dr. Donald A. Bruce, Ph.D, C.Eng., D.GE

June 5, 2020

Even the best engineered and constructed grout curtain will have a finite residual permeability, no matter how small. Therefore, seepage through it will persist in proportion to the hydraulic head it resists. In most lithologies, this is not a concern regarding the long-term durability and performance of the curtain. However, for two geological conditions in particular, the situation can deteriorate significantly in time scales of decades:

- The foundation has gypsum (or another salt), which is soluble in fresh water and so will permit solution along the surface of previously ungrouted discontinuities, and
- The foundation rock mass engaged by the grout curtain contains clay, or very soft and erodible clastic materials which will be eroded from the curtain's volume by residual flow. This has been observed to occur in curtains built in heavily karstified areas wherein there are residual clays which are not groutable, and so may be displaced with time.

  In both soluble and erodible terrains, "positive" cut-off walls are chosen due to their assurance of constant long-term performance. However, such cut-offs come with a certain price point, and they require substantial access areas to accommodate the excavation equipment and the attendant equipment such as cranes, mixing plants and so on.

  Regarding Sanford Dam, NC, the head is modest (38 feet at maximum), and the horizon of concern (calcirudite, up to 13 thick feet immediately under the dam according to the Phase 1 GDR) has been well investigated. It is not soluble but is potentially erodible in the long-term. In my opinion , an intense grout curtain (minimum 3 rows, the

holes in each being at no more than 6 feet centers) can provide a robust and durable cut-off in the foundation, if properly engineered and constructed.

Therefore, as an exercise to guide risk tolerance, I suggest you produce a design and so generate quantities and costs for a curtain through the calcirudite and say, 5 feet, into the underlying competent and low permeability calcarenite. It is impossible to precisely predict the longevity of a curtain, but the conditions at Sanford are encouraging (i.e., low head, insoluble lithology). Hence it is therefore reasonable to anticipate many decades of effective performance. Cost is the key to the Owner's decision : unless there is a substantial construction cost savings with a grout curtain, then a "positive" cut-off wall would be the pragmatic choice.

In considering this path, it is important to bear in mind that the concepts and details of the grouting conducted in the 1970s (and as clearly illustrated in your excellent GDR of January 2020) would not now be considered appropriate or responsive. Note, however, the statistical distribution of grout takes (Appendix B-5 of the Phase 1 GDR) from the 1978-1979 grouting. In general, the takes were either very small, or very large (with volume refusal). This is typical of a rock mass featuring discrete flow conduits/preferential paths, as opposed to regularly distributed fissures or joints.

As a final point, even the closely spaced, reticulated standpipes which will be required through the embankment (to grant access to the rock below) cannot be relied upon to prevent internal erosion of the embankment itself. This point (which you yourselves have raised) is very persuasive towards selecting a "positive" cut-off wall option. Based on field observations, however, a separate limited grouting program may well be necessary to explore and treat karstic features beyond the dam (but which are currently not dam safety threats).

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project	Project Number
Boiling Spring Lakes Dams Construction/Reconstruction	19C21022

Title

Filter Compatibility Criteria

Computer Programs Used	Version/Release No.
Microsoft Excel	2016

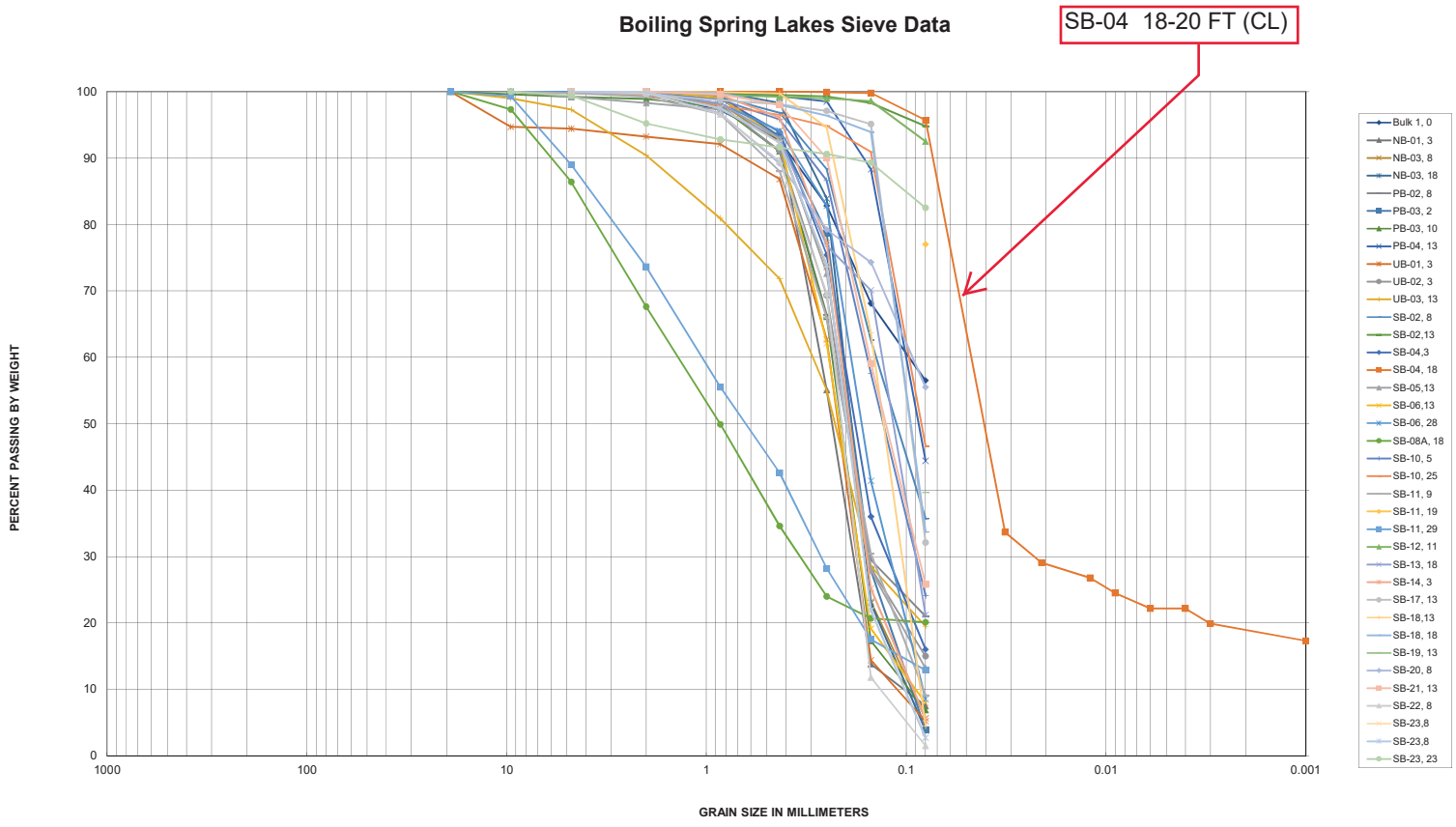
Purpose and Objective

Filter compatibility analyses were performed for Boiling Spring Lakes Dam Construction/Reconstruction to select material gradations for Fine Drainfill, Coarse Drainfill, and Backfill Stone. The analyses were performed in general accordance with the procedure outlined in the USDA-NRCS NEH 633, Chapter 26 (2017). The selected base soil gradation for proposed earthfill, which will be filtered by Fine Drainfill, was the sample from boring SB-04, 18-20 ft, which was the material with the highest fines content sampled at any of the four BSL dams sites during the Schnabel 2020 geotechnical investigation.

Summary of Conclusions

Based on the results of the attached filter compatibility analyses, ASTM C33 fine aggregate can adequately filter the selected base soil gradation. Soils for earthwork are expected to have similar gradations or have lower fines contents than the selected base soil. Therefore, any soil used as proposed earthfill is expected to be adequately filtered by ASTM C33 fine aggregate, which will be specified for Fine Drainfill. In addition, NCDOT 78M coarse aggregate, which will be specified for Coarse Drainfill, will adequately filter ASTM C33 fine aggregate, and NCDOT 57M coarse aggregate, which will be specified for Backfill Stone, will adequately filter NCDOT 78M coarse aggregate.

Originator		
Austin Spencer, PE	Austin Spencer	Nov 16, 2020
Print	Sign	Date
Checked		
Corey Schaal, PE	Corey Schaal	Nov 17, 2020
Print	Sign	Date


Boiling Spring Lakes Sieve Data
SB-04 18-20 FT (CL)
PERCENT PASSING BY WEIGHT
GRAIN SIZE IN MILLIMETERS
100
90
80
70
60
50
40
30
20
10
0
1000
100
10
1
0.1
0.01
0.001
Bulk 1, 0
NB-01, 3
NB-03, 8
NB-03, 18
PB-02, 8
PB-03, 2
PB-03, 10
PB-04, 13
UB-01, 3
UB-02, 3
UB-03, 13
SB-02, 8
SB-02,13
SB-04,3
SB-04, 18
SB-05,13
SB-06,13
SB-06, 28
SB-08A, 18
SB-10, 5
SB-10, 25
SB-11, 9
SB-11, 19
SB-11, 29
SB-12, 11
SB-13, 18
SB-14, 3
SB-17, 13
SB-18,13
SB-18, 18
SB-19, 13
SB-20, 8
SB-21, 13
SB-22, 8
SB-23,8
SB-23,8
SB-23, 23

Project: Boiling Spring Lakes Dams Construction/Reconstruction
Subject: Filter Compatibility of SB-04, 18-20 ft (CL) and ASTM C33 fine aggregate

By: RAS Checked: CDS
Date: 11/16/2020 Date: 11/17/2020

Data Source: Phase 1 and Phase 2 Geotechnical Data Report
Notes: USDA-NRCS NEH 633, Chapter 26 Method

Gradation Design of Sand and Gravel Filters

Step 1: Plot the gradation curve (grain-size distribution) of the base soil material.

See Attached Graph

Step 2: Proceed to step 4 if the base soil contains no gravel (material larger than No. 4 Sieve).

Base soil contains gravel (Y/N)? N

Step 3: Prepare adjusted gradation curves for base soils that have particles larger than the No. 4 Sieve.

Percent passing No. 4 Sieve (base material) = 100 %

Correction Factor = N/A

Sieve No.	Percent Passing	Correction Factor	Adjusted Value
4		N/A	N/A
8		N/A	N/A
16		N/A	N/A
30		N/A	N/A
50		N/A	N/A
100		N/A	N/A
200		N/A	N/A

Step 4: Place the base soil in a category determined by the percent passing the No. 200 sieve from the regradation curve data.

Base Soil Category	% finer than No. 200 sieve	Base soil description
1	>85	Fine silt and clays
2	40-85	Sands, silts, clays, and silty & clayey soils
3	15-39	Silty & clayey sands and gravel
4	<15	Sands and gravel

Base Soil Category = 1

Project: Boiling Spring Lakes Dams Construction/Reconstruction
Subject: Filter Compatibility of SB-04, 18-20 ft (CL) and ASTM C33 fine aggregate

Schnabel ENGINEERING

By: RAS Checked: CDS
Date: 11/16/2020 Date: 11/17/2020

Data Source: Phase 1 and Phase 2 Geotechnical Data Report
Notes: USDA-NRCS NEH 633, Chapter 26 Method

Step 5: To satisfy filtration requirements, determine the maximum allowable D_{15} size for the filter.

d_{85}* = 0.07
A = _____ Not Required

* - For Category 4, d_{85} value is after regrading
A = % passing #200 Sieve after regrading

Maximum D_{15} = 0.63

Step 6: If permeability is a requirement, determine the minimum allowable D_{15}.

d_{15}* = 0.0006

* - before regrading

Minimum D_{15} = 0.1

Step 7: The width of the allowable filter design band must be kept relatively narrow to prevent the use of gap-graded filters. Adjust the maximum and minimum D_{15} sizes for the filter band determined in steps 5 and 6 so that the ratio is 5 or less at any given percentage passing of 60 or less.

What is the most important function of the filter: Drainage (D), Filtration (F), or a Combination (C) ?

D, F, or C = C

Combination: enter values in the Custom blocks. Values must be within the range of the original max and min. Ensure your ratio is less than or equal to 5.

	Calculated		Custom	Ratio
Maximum D_{15} =	N/A	--->	0.63	4.2
Minimum D_{15} =	N/A	--->	0.15	

Project:	Boiling Spring Lakes Dams Construction/Reconstruction				
Subject:	Filter Compatibility of SB-04, 18-20 ft (CL) and ASTM C33 fine aggregate				
		By:	RAS	Checked:	CDS
		Date:	11/16/2020	Date:	11/17/2020
Data Source:	Phase 1 and Phase 2 Geotechnical Data Report				
Notes:	USDA-NRCS NEH 633, Chapter 26 Method				

Step 8: **The designed filter band must not have an extremely broad range of particle sizes to prevent the use of possibly gap graded filters. Adjust the limits of the design filter band so that the coarse and fine sides have a coefficient of uniformity of 6 or less. The width of the filter band should be such that the ratio of maximum to minimum diameters is less than or equal to 5 for all percent passing values of 60 or less.**

Coefficient of Uniformity = 5

Maximum D_{60} = 2.63

Minimum D_{60} = 0.53

Step 9: **Determine the minimum D_5 and the maximum D_{100} sizes of the filter**

Base Soil Category	maximum D_{100}	minimum D_5
All	75	0.075

Step 10: **To minimize segregation during construction, the relationship between the maximum D_{90} and the minimum D_{10} of the filter is important.**

Maximum D_{90} = 20

Step 11: **Connect Control points 4,2, and 5 to form a partial design for the fine side of the filter band. Connect Control points 6,7,3, and 1 to form a design for the coarse side of the filter band. Complete the design by extrapolating the coarse and fine curves to the 100 percent finer value.**

Extrapolation Estimate (Min D_{100}) = 1.60

Step 12: **Design filters adjacent to perforated pipe to have a D_{85} size no smaller than shown below.**

Drain Condition	Design Criteria
Noncritical drains where surging or gradient reversal is not anticipated	The Filter D_{85} must be greater than or equal to the perforation size
Critical drains where surging or gradient reversal is anticipated	The Filter D_{15} must be greater than or equal to the perforation size

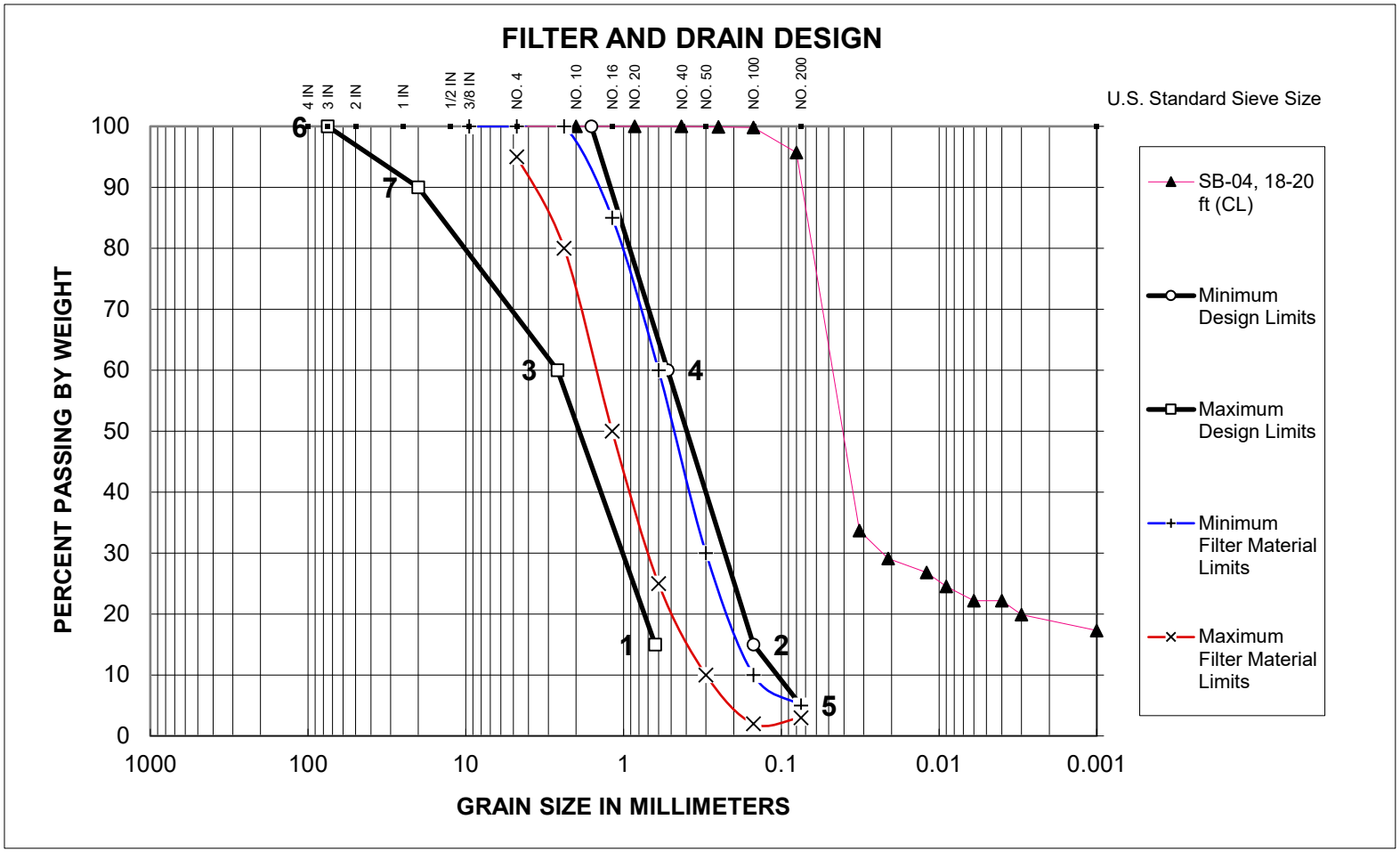
Final Values:

Control Points

Min D_5	5	**0.075**
Min D_{15}	2	**0.15**
Min D_{60}	4	**0.53**
Min D_{100}	Extrapolation Estimate	**1.60**
Max D_{15}	1	**0.63**
Max D_{60}	3	**2.63**
Max D_{90}	7	**20**
Max D_{100}	6	**75**

Project: Boiling Spring Lakes Dams Construction/Reconstruction

Subject: Filter Compatibility of SB-04, 18-20 ft (CL) and ASTM C33 fine aggregate



Remarks:

Control Points:

1 = 0.63	4 = 0.53	7 = 20	Filter Material:	Base Material:
2 = 0.15	5 = 0.075		ASTM	SB-04, 18-20 ft (CL)
3 = 2.63	6 = 75		C33 Fine Aggregate	

Project: Boiling Spring Lakes Dams Construction/Reconstruction
Subject: Filter Compatibility of ASTM C33 fine aggregate and NC DOT 78M coarse aggregate

By: RAS Checked: CDS
Date: 11/16/2020 Date: 11/17/2020

Data Source: Phase 1 and Phase 2 Geotechnical Data Report
Notes: USDA-NRCS NEH 633, Chapter 26 Method

Gradation Design of Sand and Gravel Filters

Step 1: Plot the gradation curve (grain-size distribution) of the base soil material.

See Attached Graph

Step 2: Proceed to step 4 if the base soil contains no gravel (material larger than No. 4 Sieve).

Base soil contains gravel (Y/N)? N

Step 3: Prepare adjusted gradation curves for base soils that have particles larger than the No. 4 Sieve.

Percent passing No. 4 Sieve (base material) = 100 %

Correction Factor = N/A

Sieve No.	Percent Passing	Correction Factor	Adjusted Value
4		N/A	N/A
8		N/A	N/A
16		N/A	N/A
30		N/A	N/A
50		N/A	N/A
100		N/A	N/A
200		N/A	N/A

Step 4: Place the base soil in a category determined by the percent passing the No. 200 sieve from the regradation curve data.

Base Soil Category	% finer than No. 200 sieve	Base soil description
1	>85	Fine silt and clays
2	40-85	Sands, silts, clays, and silty & clayey soils
3	15-39	Silty & clayey sands and gravel
4	<15	Sands and gravel

Base Soil Category = 4

Project: Boiling Spring Lakes Dams Construction/Reconstruction
Subject: Filter Compatibility of ASTM C33 fine aggregate and NC DOT 78M coarse aggregate

Schnabel ENGINEERING

By: RAS Checked: CDS
Date: 11/16/2020 Date: 11/17/2020

Data Source: Phase 1 and Phase 2 Geotechnical Data Report
Notes: USDA-NRCS NEH 633, Chapter 26 Method

Step 5: To satisfy filtration requirements, determine the maximum allowable D_{15} size for the filter.

d_{85}* = 1.18
A = _____ Not Required

* - For Category 4, d_{85} value is after regrading
A = % passing #200 Sieve after regrading

Maximum D_{15} = 4.72

Step 6: If permeability is a requirement, determine the minimum allowable D_{15}.

d_{15}* = 0.17

* - before regrading

Minimum D_{15} = 0.68

Step 7: The width of the allowable filter design band must be kept relatively narrow to prevent the use of gap-graded filters. Adjust the maximum and minimum D_{15} sizes for the filter band determined in steps 5 and 6 so that the ratio is 5 or less at any given percentage passing of 60 or less.

What is the most important function of the filter: Drainage (D), Filtration (F), or a Combination (C) ?

D, F, or C = C

Combination: enter values in the Custom blocks. Values must be within the range of the original max and min. Ensure your ratio is less than or equal to 5.

	Calculated		Custom	Ratio
Maximum D_{15} =	N/A	--->	4.72	2.36
Minimum D_{15} =	N/A	--->	2	

Step 8: **The designed filter band must not have an extremely broad range of particle sizes to prevent the use of possibly gap graded filters. Adjust the limits of the design filter band so that the coarse and fine sides have a coefficient of uniformity of 6 or less. The width of the filter band should be such that the ratio of maximum to minimum diameters is less than or equal to 5 for all percent passing values of 60 or less.**

Coefficient of Uniformity = 5

Maximum D_{60} = 19.67
Minimum D_{60} = 3.93

Step 9: **Determine the minimum D_5 and the maximum D_{100} sizes of the filter**

Base Soil Category	maximum D_{100}	minimum D_5
All	75	0.075

Step 10: **To minimize segregation during construction, the relationship between the maximum D_{90} and the minimum D_{10} of the filter is important.**

Maximum D_{90} = 30

Step 11: **Connect Control points 4,2, and 5 to form a partial design for the fine side of the filter band. Connect Control points 6,7,3, and 1 to form a design for the coarse side of the filter band. Complete the design by extrapolating the coarse and fine curves to the 100 percent finer value.**

Extrapolation Estimate (Min D_{100}) = 7.18

Project: Boiling Spring Lakes Dams Construction/Reconstruction
Subject: Filter Compatibility of ASTM C33 fine aggregate and NC DOT 78M coarse aggregate

By: RAS Checked: CDS
Date: 11/16/2020 Date: 11/17/2020

Data Source: Phase 1 and Phase 2 Geotechnical Data Report
Notes: USDA-NRCS NEH 633, Chapter 26 Method

Step 12: Design filters adjacent to perforated pipe to have a D_{85} size no smaller than shown below.

Drain Condition	Design Criteria
Noncritical drains where surging or gradient reversal is not anticipated	The Filter D_{85} must be greater than or equal to the perforation size
Critical drains where surging or gradient reversal is anticipated	The Filter D_{15} must be greater than or equal to the perforation size

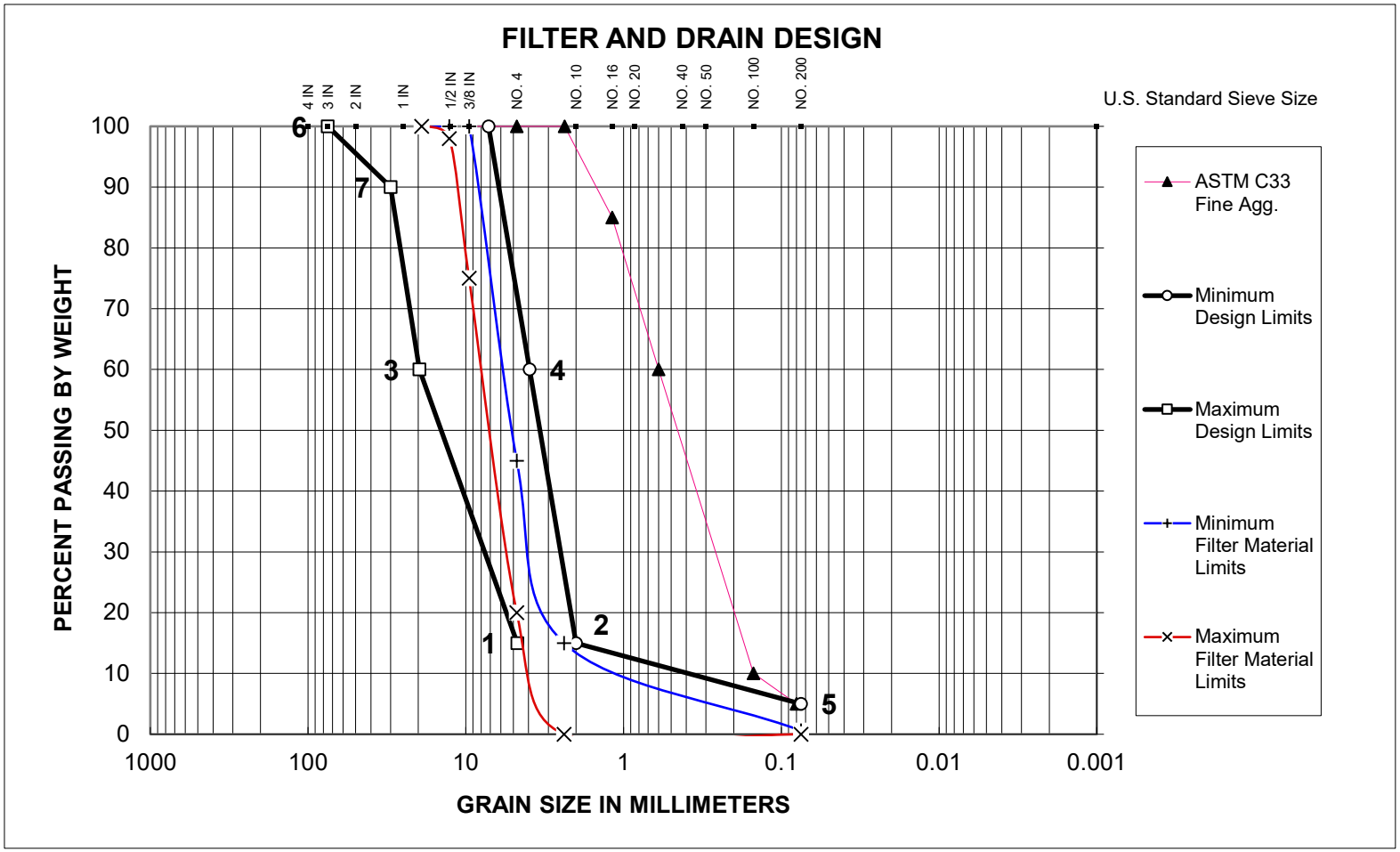
Final Values:

Control Points

Min D_5	5	**0.075**
Min D_{15}	2	**2.00**
Min D_{60}	4	**3.93**
Min D_{100}	Extrapolation Estimate	**7.18**
Max D_{15}	1	**4.72**
Max D_{60}	3	**19.67**
Max D_{90}	7	**30**
Max D_{100}	6	**75**

Project: Boiling Spring Lakes Dams Construction/Reconstruction

Subject: Filter Compatibility of ASTM C33 fine aggregate and NC DOT 78M coarse aggregate



Remarks:

Control Points:

1 = 4.72	4 = 3.93	7 = 30
2 = 2.00	5 = 0.075	
3 = 19.67	6 = 75	

Filter Material:	Base Material:
NC DOT	ASTM
78M	C33 Fine Aggregate

Project: Boiling Spring Lakes Dams Construction/Reconstruction
Subject: Filter Compatibility of NC DOT 78M coarse aggregate and NC DOT 57M coarse aggregate

By: RAS Checked: CDS
Date: 11/16/2020 Date: 11/17/2020

Data Source: Phase 1 and Phase 2 Geotechnical Data Report
Notes: USDA-NRCS NEH 633, Chapter 26 Method

Gradation Design of Sand and Gravel Filters

Step 1: Plot the gradation curve (grain-size distribution) of the base soil material.

See Attached Graph

Step 2: Proceed to step 4 if the base soil contains no gravel (material larger than No. 4 Sieve).

Base soil contains gravel (Y/N)? Y

Step 3: Prepare adjusted gradation curves for base soils that have particles larger than the No. 4 Sieve.

Percent passing No. 4 Sieve (base material) = 45 %

Correction Factor = 2.222

Sieve No.	Percent Passing	Correction Factor	Adjusted Value
4	45	2.222	100.0
8	15	2.222	33.3
16		2.222	0.0
30		2.222	0.0
50		2.222	0.0
100		2.222	0.0
200	0	2.222	0.0

Step 4: Place the base soil in a category determined by the percent passing the No. 200 sieve from the regradation curve data.

Base Soil Category	% finer than No. 200 sieve	Base soil description
1	>85	Fine silt and clays
2	40-85	Sands, silts, clays, and silty & clayey soils
3	15-39	Silty & clayey sands and gravel
4	<15	Sands and gravel

Base Soil Category = 4

Project: Boiling Spring Lakes Dams Construction/Reconstruction
Subject: Filter Compatibility of NC DOT 78M coarse aggregate and NC DOT 57M coarse aggregate

Schnabel ENGINEERING

By: RAS Checked: CDS
Date: 11/16/2020 Date: 11/17/2020

Data Source: Phase 1 and Phase 2 Geotechnical Data Report
Notes: USDA-NRCS NEH 633, Chapter 26 Method

Step 5: To satisfy filtration requirements, determine the maximum allowable D_{15} size for the filter.

d_{85}* = 8
A = Not Required

* - For Category 4, d_{85} value is after regrading
A = % passing #200 Sieve after regrading

Maximum D_{15} = 32

Step 6: If permeability is a requirement, determine the minimum allowable D_{15}.

d_{15}* = 2.36 Permeability is judged to be sufficient for selected filter

* - before regrading

Minimum D_{15} = 9.44

Step 7: The width of the allowable filter design band must be kept relatively narrow to prevent the use of gap-graded filters. Adjust the maximum and minimum D_{15} sizes for the filter band determined in steps 5 and 6 so that the ratio is 5 or less at any given percentage passing of 60 or less.

What is the most important function of the filter: Drainage (D), Filtration (F), or a Combination (C) ?

D, F, or C = C

Combination: enter values in the Custom blocks. Values must be within the range of the original max and min. Ensure your ratio is less than or equal to 5.

	Calculated		Custom	Ratio
Maximum D_{15} =	N/A	--->	15	3
Minimum D_{15} =	N/A	--->	5	

Minimum D15 criteria is not met for selected filter. However, permeability is judged to be sufficient for selected filter. Maximum D15 is the critical criteria and is met.

Project: Boiling Spring Lakes Dams Construction/Reconstruction
Subject: Filter Compatibility of NC DOT 78M coarse aggregate and NC DOT 57M coarse aggregate

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By: RAS Checked: CDS
Date: 11/16/2020 Date: 11/17/2020

Data Source: Phase 1 and Phase 2 Geotechnical Data Report
Notes: USDA-NRCS NEH 633, Chapter 26 Method

Step 8: The designed filter band must not have an extremely broad range of particle sizes to prevent the use of possibly gap graded filters. Adjust the limits of the design filter band so that the coarse and fine sides have a coefficient of uniformity of 6 or less. The width of the filter band should be such that the ratio of maximum to minimum diameters is less than or equal to 5 for all percent passing values of 60 or less.

Coefficient of Uniformity = 3

Maximum D_{60} = 30.00
Minimum D_{60} = 10.00

Step 9: Determine the minimum D_5 and the maximum D_{100} sizes of the filter

Base Soil Category	maximum D_{100}	minimum D_5
All	75	0.075

Step 10: To minimize segregation during construction, the relationship between the maximum D_{90} and the minimum D_{10} of the filter is important.

Maximum D_{90} = 40

Step 11: Connect Control points 4,2, and 5 to form a partial design for the fine side of the filter band. Connect Control points 6,7,3, and 1 to form a design for the coarse side of the filter band. Complete the design by extrapolating the coarse and fine curves to the 100 percent finer value.

Extrapolation Estimate (Min D_{100}) = 18.52

Step 12: **Design filters adjacent to perforated pipe to have a D_{85} size no smaller than shown below.**

Drain Condition	Design Criteria
Noncritical drains where surging or gradient reversal is not anticipated	The Filter D_{85} must be greater than or equal to the perforation size
Critical drains where surging or gradient reversal is anticipated	The Filter D_{15} must be greater than or equal to the perforation size

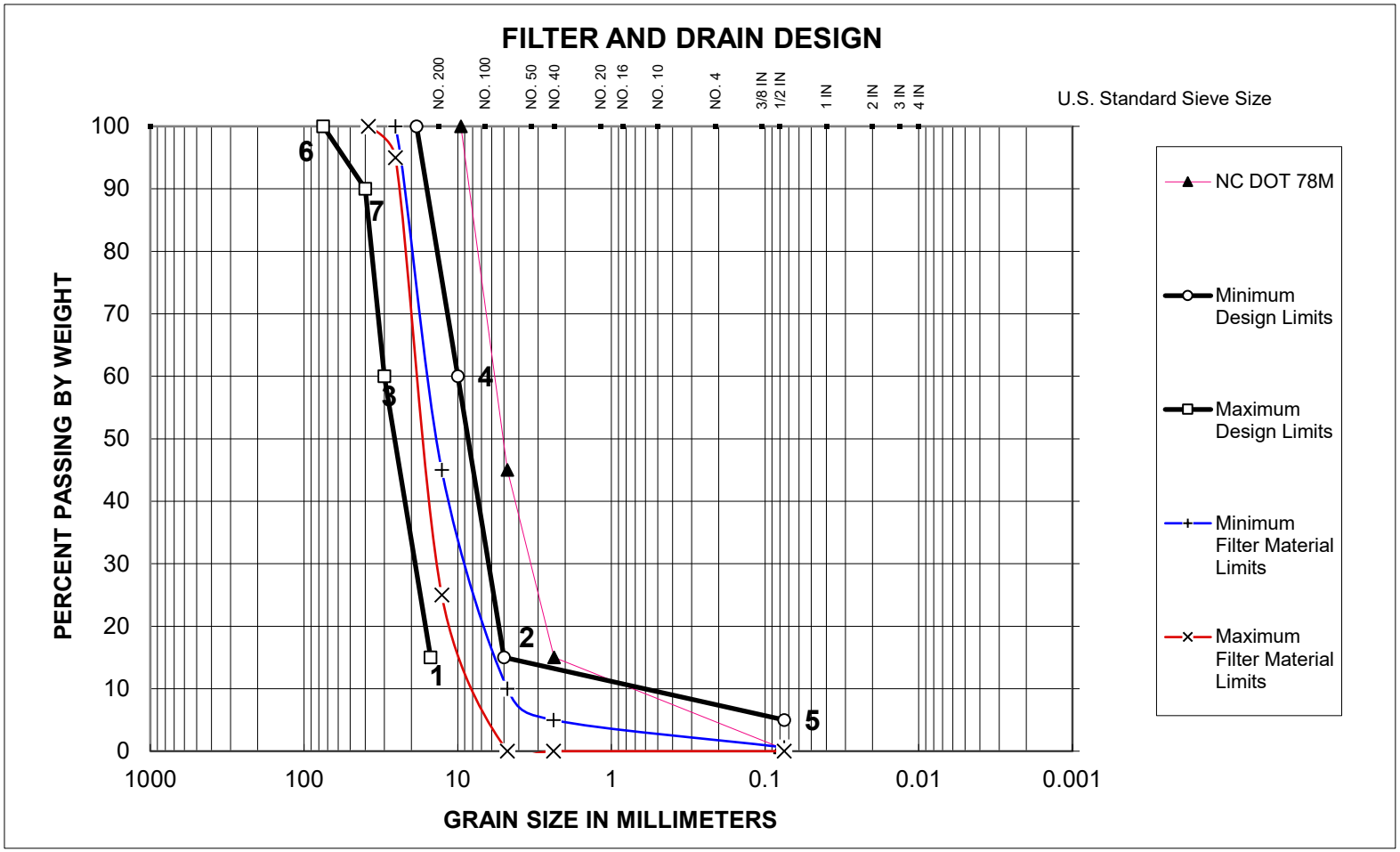
Final Values:

Control Points

Min D_5	5	**0.075**
Min D_{15}	2	**5.00**
Min D_{60}	4	**10.00**
Min D_{100}	Extrapolation Estimate	**18.52**
Max D_{15}	1	**15.00**
Max D_{60}	3	**30.00**
Max D_{90}	7	**40**
Max D_{100}	6	**75**

Project: Boiling Spring Lakes Dams Construction/Reconstruction

Subject: Filter Compatibility of NC DOT 78M coarse aggregate and NC DOT 57M coarse aggregate



Remarks:

Control Points:

1 = 15.00	4 = 10.00	7 = 40
2 = 5.00	5 = 0.075	
3 = 30.00	6 = 75	

Filter Material: NC DOT 57M

Base Material: NC DOT 78M

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project Boiling Spring Lakes Dams Rehabilitations	**Project Number** 19C21022
Title Embankment Seepage and Slope Stability Analyses	
Computer Programs Used GeoStudio 2018 R2	**Version/Release No.** Version 9.1.2.

Purpose and Objective

Evaluate seepage conditions and embankment slope stability for the proposed sections at Sanford Dam, North Lake Dam, Pine Lake Dam, and Upper Lake Dam under various loading conditions, including normal operating conditions, flood loading, maintenance conditions, and seismic loading.

Summary of Conclusions

Based on the results of analyses detailed herein, the proposed SD, NLD, PLD, and ULD embankment geometries are expected to be stable under the analyzed static load cases.

With the exception of the proposed SD section within the breach area, the BSL dams are not expected to remain stable following the design seismic event due to cyclic liquefaction of the Foundation Soils.

The proposed SD section within the breach area is expected to experience negligible permanent slope deformations due to the due to the design seismic event.

Proposed Common Fill materials should have soil classifications of SM or SP-SM to mitigate potential rapid drawdown failures. Drawdown rates should be limited to 1 foot per day.

Originator Corey Schaal, PE, GIT		Dec 4, 2020
Print	Sign	Date
Checked Adam Paisley, PE		Jan 8, 2021
Print	Sign	Date

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TECHNICAL MEMORANDUM

BY:	Corey Schaal, PE, GIT	**DATE:**	December 4, 2020
PROJECT:	Boiling Spring Lakes Dams Construction/Reconstruction	**SUBJECT:**	Embankment Seepage and Slope Stability Analyses
LOCATION:	Boiling Spring Lakes, North Carolina	**PROJECT NO.:**	19C21022
CHECKED BY:	Adam Paisley, PE	**DATE:**	

INTRODUCTION

Sanford Dam (SD), North Lake Dam (NLD), Pine Lake Dam (PLD), and Upper Lake Dam (ULD) (collectively herein referred to as the BSL Dams) breached during Hurricane Florence in September 2018. The four BSL Dams are part of a system of dams where NLD, PLD, and ULD are situated upstream of SD and independent of each other. NLD and PLD are directly upstream, such that the Sanford Dam headwater is the tailwater for NLD and PLD. A fifth dam named Middle Lake Dam (MLD) is founded between SD and ULD and also breached during Hurricane Florence, but is not part of the BSL Dams rehabilitation project. However, the ULD analyses described herein were prepared assuming MLD is reconstructed and assuming MLD is not reconstructed.

The Boiling Spring Lakes Dams Rehabilitation project includes the replacement of the spillway structures at each dam, as well as the repair of breached sections at SD and ULD. The existing spillway structures will be demolished and replaced with new cast-in-place concrete spillway elements. The asphalt roadways atop SD, NLD, and PLD and the gravel roadway atop ULD will be reconstructed

The existing alluvial/coastal deposits (Foundation Soils) beneath the proposed SD spillway and within the existing breached section will be excavated to top of rock and replaced with engineered fill materials (Proposed Select Fill). The proposed SD embankment within the excavation section also includes the installation of a low-permeability core (Proposed Core Fill), upstream and downstream shells (Proposed Common Fill), and a seepage collection system consisting of filter sand (Proposed Fine Drainfill) and drainfill aggregate (Proposed Coarse Drainfill). A cutoff wall will be installed for the entire length of SD. The SD embankment to the left (looking downstream) of the breached area will generally not be modified except for the installation of the cutoff wall and mix-in-pace soil-cement panels (MIP panels).

The proposed spillway structures at NLD, PLD, and ULD will be founded on alluvial/costal deposits (Foundation Soils). NLD, PLD, and ULD will be homogeneous embankments consisting of Proposed Common Fill and will include filter diaphragms installed around the proposed spillway conduits.

A summary of the proposed geometry for each of the BSL Dams is given in Table 1.

Table 1 – Summary of Proposed Embankment Geometries

Feature	**Dam**			
	Sanford Dam	**North Lake Dam**	**Pine Lake Dam**	**Upper Lake Dam**
Type	Zoned Earthfill	Homogeneous Earthfill	Homogeneous Earthfill	Homogeneous Earthfill
Crest Elevation	38.4 feet	40.0 feet	44.0 feet	41.3 feet
Crest Width	32 feet	50 feet	50 feet	20 feet
Structural Height	38.4 feet	12 feet	18 feet	13 feet
Hydraulic Height	30 feet	7 feet	9 feet	10 feet
Length	1,580 feet	600 feet	750 feet	720 feet
Upstream Slope	3H:1V	3H:1V	3H:1V	3H:1V
Downstream Slope	2.5H:1V	3H:1V	3H:1V	3H:1V

This memorandum describes the seepage and slope stability analyses that were performed for each of the BSL Dams.

EXTERNAL INFORMATION

A summary of the geotechnical materials and properties used in the analyses presented herein is provided in Table 2. Details about the selection of geotechnical properties for soil and rock materials are provided in the memorandum entitled "Soil and Rock Properties." Hydraulic conductivity and shear strength of the proposed cutoff wall at SD is based on anticipated specification requirements.

Table 2 – Summary of Soil and Rock Properties

Material	Site	Unit Weight		Effective Stress Shear Strength Parameters		Total Stress Shear Strength Parameters		Saturated Horiz. Hydraulic Conductivity	Vert. to Horiz. Hyd Cond. Ratio
		Moist	Saturated						
		γ_m (pcf)	γ_{sat} (pcf)	ϕ' (deg)	c' (psf)	ϕ (deg)	c (psf)	kx (cm/s)	ky/kx
Existing Embankment Common Fill	All	120	125	32	0	24	50	1E-04	0.5
Existing Embankment Core Fill	SD	120	125	32	100	20	200	1E-06	1
Foundation Soils	All	115	120	29	0	20	100	1E-03	0.5
Foundation Bedrock	All	Impenetrable						1E-02	1
Proposed Select Fill	SD	125	130	35	0	24	50	1E-04	0.5
Proposed Common Fill	All	120	125	32	0	24	50	1E-04	0.5
Proposed Core Fill	SD	120	125	32	100	20	200	1E-06	1
Proposed Fine Drainfill	All	120	125	34	0	34	0	1E-02	1
Proposed Coarse Drainfill	SD	120	125	36	0	36	0	1E-01	1
Proposed Cutoff Wall	SD	125	125	0	1,800	0	1,800	1E-06	1
Treated Foundation Soils	All	125	125	0	1,500	0	1,500	N/A	N/A

Seismic parameters are defined in the memorandum entitled “Seismic Hazard” and are summarized in Table 3 below.

Table 3 – Summary of Design Ground Motions

Site	Return Period (yr)	Design PGA (g)
NLD, PLD, and ULD	2,500	0.14
SD	5,000	0.20

Based on the results of the liquefaction potential analysis, the Foundation Soils at each of the BSL Dams sites have the potential to experience cyclic liquefaction and lose strength when subjected to the design ground motions. The liquefaction potential analyses are presented in the memorandum entitled “Liquefaction Potential Analysis.”

ANALYZED SECTIONS

The embankment sections which were analyzed for slope stability are listed below. Each section is designated according to the respective Dam Baseline Alignment stationing at each site. The analyzed sections listed below are the approximate maximum sections of each embankment.

- Sanford Dam STA 17+50 – generally unmodified embankment section, except for the installation of the cutoff wall and MIP panels, located to the left of the breached area
- Sanford Dam STA 20+25 – proposed embankment section within the breached area and adjacent to the proposed spillway
- North Lake Dam STA 13+10 – proposed embankment section adjacent to the proposed spillway
- Pine Lake Dam STA 14+85 – proposed embankment section adjacent to the proposed spillway
- Upper Lake Dam STA 12+00 – proposed embankment section within the breached area
- Upper Lake Dam STA 16+60 – proposed embankment section adjacent to the proposed spillway

Site plans for SD, NLD, PLD, and ULD are included in Attachments 1 through 4, respectively.

SEEPAGE ANALYSES

Numerical analyses were performed for each of the typical sections to develop pore water pressure distributions for the embankment and foundation materials to be used in subsequent slope stability analyses. Two-dimensional finite element models were developed and analyzed using the SEEP/W module of the Geostudio (2018) computer program.

Headwater and tailwater elevations from hydraulic modeling results presented in “Headwater/Tailwater Charts, Boiling Spring Lakes Dams Construction/Reconstruction” prepared by McGill Associates and dated May 2020 were used as boundary conditions in the normal operating conditions and flood conditions seepage analyses. The tailwater elevations for the SD Station 17+50 normal operating conditions model and the maintenance conditions model for all sites, except for the SD Station 20+25 section, were conservatively assumed to coincide with the ground surface. A summary of the headwater and tailwater elevations for each of the BSL Dams is given in Table 4. Load cases are described in the “Slope Stability Analyses” section below.

Table 4 – Summary of Headwater and Tailwater Elevations

Boundary Condition	Dam				
	Sanford Dam	**North Lake Dam**	**Pine Lake Dam**	**Upper Lake Dam, Middle Lake Dam is Not Reconstructed**	**Upper Lake Dam, Middle Lake Dam is Reconstructed**
Normal Pool EL	EL 30.0	EL 35.0	EL 35.0	EL 38.0	EL 38.0
Normal Tailwater EL	STA 17+50: GS STA 20+25: EL 11.0	EL 30.0	EL 30.0	EL 30.0	EL 36.0
1/2 PMP Pool EL	EL 36.4	--	--	--	--
1/2 PMP Tailwater EL	EL 19.9	--	--	--	--
1/3 PMP Pool EL	--	EL 38.0	EL 40.8	EL 40.0	EL 40.0
1/3 PMP Tailwater EL	--	EL 33.9	EL 33.3	EL 33.9	EL 37.5
Maintenance Tailwater EL	STA 17+50: GS STA 20+25: EL 6.0	GS	GS	GS	GS

Table 4 Notes:

1. “GS” = ground surface at downstream toe of embankment
2. “--” = not analyzed

The seepage analysis calculations for SD, NLD, PLD, and ULD are included in Attachments 1 through 4, respectively.

SLOPE STABILITY ANALYSES

Methodology

Static limit-equilibrium slope stability analyses under various load cases were performed for each of the typical sections listed above using GeoStudio’s SLOPE/W module. Spencer’s method (Spencer 1967) was used to compute factors of safety against slope failure (FS). Critical failure surfaces were defined as circular surfaces intersecting the crest of the dam. Failure surfaces originating on the face were not considered because they are not expected to lead to failure of the dam. In order to prevent the program from selecting an infinite slope failure as the critical slip surface, a nominal amount of effective stress cohesive strength (50 psf) was added to the Proposed Common Fill as described in the “Soil Properties” memorandum.

The following subsections are summaries of the considered load cases. The stability analysis calculations for SD, NLD, PLD, and ULD are included as Attachments 1 through 4, respectively.

Load Cases

Temporary Excavation Slopes

Portions of the embankments will be excavated in order to construct the new spillways at each of the BSL Dams. The temporary excavation slope grade of 2H:1V shown on the construction drawings was selected based on the design of similar projects. The stability of the excavation slopes is based on the assumption that the excavation will remain in a dewatered state throughout construction because excavation slope stability is dependent on the piezometric surface during construction. The contractor will be responsible for temporary excavation stability and will be required to provide an effective dewatering system capable of lowering the groundwater level to provide stable excavation slopes.

End of Construction

The foundation materials at each of the BSL Dams consist primarily of granular soils. Excess pore water pressures generated during fill placement are expected to dissipate relatively quickly such that the dams will have sufficient factors of safety at the end of construction. Therefore, end of construction loading was not analyzed further.

Normal Operating Conditions

Factor of safety against slope failure was computed for normal operating conditions for each of the representative embankment sections. Pore water pressures computed from the normal operating conditions steady-state seepage models were applied to this analysis. This load case was analyzed assuming that all soils behave in a drained state. Therefore, only effective stress strength parameters were used.

The normal operating conditions analyses include traffic loading at the crest of SD, NLD, and PLD. An HS-20 truck load with an axle weight of 32 kips distributed across two 2.5-ft by 2.5-ft tires (2,560 psf per tire) was modeled. Based on our conversations with City of Boiling Spring Lakes staff, ULD will not be used by large vehicles. Therefore, HS-20 truck loading was not included in the ULD stability analyses. Shallow roadway failures were not evaluated because the roadways at each of the BSL Dams will be designed by others.

Flood Loading

Factors of safety against slope failure were computed for design flood loading at each dam. It is unlikely that steady-state seepage conditions will develop as a result of the design flood events. The wetting front will likely not progress through the embankment before reservoir and outlet channel water levels return to normal operating conditions. However, it was conservatively assumed that steady-state seepage conditions were allowed to develop for the stability analyses. Pore water pressures computed from the flood loading steady-state seepage models were applied to this analysis. This load case was analyzed assuming that all soils behave in a drained state. Therefore, only effective stress strength parameters were used. This load case also includes traffic loading at the crest of SD, NLD, and PLD as described above.

Rapid Drawdown Loading

Duncan, Wright, and Wong (1992) (DWW) state that the drainage state of soils within a slope to which drawdown loading is being applied can be determined by calculating the dimensionless Consolidation Time Factor (T). The Consolidation Time Factor (T) is defined as:

$$\mathrm{T} = \mathrm{c_v}\frac{\mathrm{t}}{D^2}$$

Where:

T = Consolidation Time Factor
c_v = Coefficient of Consolidation
t = time required to complete drawdown
D = length of the drainage path

DWW state that the soil that is used to construct the slope will behave as a drained soil during drawdown if the calculated value of T is equal to or greater than 3. If it is assumed that a value of T equal to 3 is indicative of a soil behaving in a drained state, then the minimum value of the Coefficient of Consolidation ($c_{v,min}$) is calculated as:

$$c_{v,min} = 3 \cdot \frac{D^2}{t}$$

Calculations for $c_{v,min}$ are summarized in Table 5 below.

Table 5 – Summary of $c_{v,min}$ Calculations

Dam	T	Normal Pool EL	Low-Level Drain Invert EL[1]	Depth of Water (ft)	Drawdown Rate (ft/day)[2]	t (day)	U/S Slope Grade (H:V)	D (ft)[3]	$c_{v,min}$ (ft^2/day)
NLD	3	35	25	10	1	10	3	30	270
PLD	3	35	26	9	1	9	3	27	243
ULD	3	38	33	5	1	5	3	15	135
SD	3	30	17	13	1	13	3	39	351

Table 5 Notes:

1. Low-level drain invert elevations from hydraulic modeling presented in “Low Level Drains, Boiling Spring Lakes Dams Construction/Reconstruction” prepared by McGill Associates and dated June 2020.
2. Assume drawdown rate is limited to 1 foot per day.
3. Assume that the longest drainage path is the horizontal distance between the bottom of the embankment below the crest and the upstream toe of the embankment.

Table 6, which is included in DWW, provides ranges of typical values of c_v based on soil type and grain size.

Table 6 – Typical Values of c_v

Soil Type	Values of c_v (ft^2/day)
Coarse Sand	> 10,000
Fine Sand	100 to 10,000
Silty Sand	10 to 1,000
Silt	0.5 to 100
Compacted Clay	0.05 to 5
Soft Clay	< 0.02

At this time, a potential borrow source has not been identified. However, we expect that the Proposed Common Fill will originate from a nearby borrow source and will consist of fine-to-medium sand classifying as silty sand (SM) or poorly-graded sand with silt (SP-SM). Based on the recommended ranges of values of c_v provided by DWW (Table 6) and the anticipated fill materials, we think that it is reasonable to assume that c_v values greater than those shown in Table 5 can be used to represent the soils that will be used to construct the embankments. Therefore, the embankment slopes are expected to behave as a drained soil during drawdown of each reservoir through the low-level drains. As a result, rapid drawdown loading was not evaluated further.

Maintenance Conditions

Stability of the downstream slope during maintenance conditions was evaluated for each of the BSL Dams. Under this load case, the difference in hydraulic head differential across the embankment is greater than normal operating conditions. For NLD, PLD, and ULD, maintenance conditions were defined as tailwater being drained from the normal operating conditions elevation to the ground surface downstream of the embankment toe while the reservoir remains at normal pool. For the SD Station 20+25 section, maintenance conditions were defined as tailwater at the elevation shown in Table 4, which is based on hydraulic modeling presented in McGill (2020b), while the reservoir remains at normal pool. For the SD Station 17+50 section, tailwater during maintenance conditions was assumed to be at the ground surface downstream of the toe, which is the same as normal operating conditions; therefore, maintenance conditions were not analyzed for this section. Pore water pressures computed from the maintenance conditions steady-state seepage models were applied to this analysis. This load case was analyzed assuming that all soils behave in a drained state. Therefore, only effective stress strength parameters were used. The FS under steady-state seepage conditions after draining the reservoir pool (e.g., maintenance of the inlet structure) is expected to be satisfactory by inspection and was not calculated.

Seismic Conditions

As noted above, the Foundation Soils beneath the proposed spillway structures at SD will be excavated and replaced with engineered fill materials, as shown in the Station 20+25 section. This section is not expected to experience cyclic liquefaction due to the design seismic event. Pseudo-static seismic stability analyses were performed to evaluate embankment performance under seismic loading. The pseudo-static approach consists of translating seismically-induced ground motions into a horizontal acceleration in the direction of slip-surface failure, which is used to generate a horizontal force based on the weight of the soil mass. Factors of safety under pseudo-static seismic loading were calculated for the downstream and upstream slopes. Soils below the normal operating conditions phreatic surface were assumed to behave in an undrained (total stress) state, and soils above the normal operating conditions phreatic surface were assumed to behave in a drained (effective stress) state.

Post-Earthquake Conditions

Based on the results of the liquefaction potential analysis presented in the “Liquefaction Potential Analysis” memorandum, the Foundation Soils at each site are expected to experience cyclic liquefaction due to the design seismic events. Post-earthquake slope stability analyses were performed for each embankment section listed above where Foundation Soils are present (i.e., all sections except SD Station 20+25). No seismic accelerations were applied as liquefaction is expected to occur following the earthquake. The SHANSEP function within SLOPE/W was used to model the residual undrained shear strength of the Foundation Soils where the undrained strength ratio (USR) was set to 0.09. See the “Liquefaction Potential Analysis” memorandum for additional details regarding the selection of this USR value. Soils below the normal operating conditions phreatic surface were assumed to behave in an undrained (total stress) state, and soils above the normal operating conditions phreatic surface were assumed to behave in a drained (effective stress) state. A 6-inch thick material with effective stress strength parameters was modelled at the surface of the dam on the upstream and downstream slopes to force the program to apply the surcharge from the reservoir to the slopes. The phreatic surface was not applied to materials where total stress strength parameters were assigned.

Results

Detailed slope stability calculations are included as Attachments 1 through 4. Table 7 is a summary of the calculated FS for each analyzed section. The USACE Engineering Manual (EM) 1110-2-1902 (2003) provides generally accepted industry standards for embankment stability under static loading conditions. Minimum FS guidance for maintenance conditions load case is not given in USACE 2003; the minimum FS shown in Table 7 is based on the criteria for rapid drawdown loading. The selected minimum FS for the post-earthquake load case is based on current industry practices.

Table 7 – Summary of Factors of Safety from Slope Stability Analyses

Load Case	Slope	Calculated FS								Minimum Recommended FS
		Sanford Dam STA 17+50	Sanford Dam STA 20+25	North Lake Dam STA 13+10	Pine Lake Dam STA 14+85	Upper Lake Dam, No MLD STA 12+00	Upper Lake Dam, w/ MLD STA 12+00	Upper Lake Dam, No MLD STA 16+60	Upper Lake Dam, w/ MLD STA 16+60	
Normal Operating Conditions	Downstream	**1.40**	1.51	1.72	1.74	1.50	1.85	1.74	1.88	1.5
Flood Loading	Downstream	**1.23**	1.43	1.77	1.71	1.55	1.89	1.74	1.96	1.4
Maintenance Conditions[2]	Downstream	--	1.57	1.71	1.72	1.58	1.58	1.72	1.72	1.3
Seismic Conditions	Downstream	--	1.04	--	--	--	--	--	--	N/A
	Upstream	--	1.07	--	--	--	--	--	--	N/A
Post-Earthquake Conditions	Downstream	**0.59**	--	**0.76**	**0.72**	**0.73**	**1.06**	**0.70**	**1.00**	1.2
	Upstream	**1.04**	--	**1.08**	**0.91**	1.26	1.25	1.22	1.20	1.2

Table 7 Notes:

1. "--" = not analyzed
2. See below for discussion about sections that do not meet minimum FS criteria.

As shown in Table 7, the calculated FS for the SD Station 17+50 normal operating conditions and flood load cases do not meet the minimum FS criteria. The calculated FS for the post-earthquake load case for all four sites also do not meet the target FS, with the exception of the ULD upstream slopes. For all other load cases, the calculated FS for the proposed SD, NLD, PLD, and ULD sections exceed the minimum FS criteria.

To mitigate potential embankment instability due to cyclic liquefaction of the Foundation Soils, mix-in-place soil-cement panels (MIP panels) will be installed beneath the SD upstream and downstream slopes to the left of the breached area. MIP panels are not necessary within the footprint of the proposed SD spillway and breached area excavation because the Foundation Soils will be entirely removed and replaced with engineered fill materials. The installation of the MIP panels beneath SD will also increase the FS for normal operating conditions and flood load cases; a composite shear strength of at least 1,000 psf for a 10-foot-wide treated zone beneath the downstream slope and extending to top of rock is required to achieve the FS minimum criteria for these load cases (see calculations included in Attachment 1). Additional details about design of the MIP panels are provided in the “Mix-In-Place Panels Analyses and Design” memorandum.

MIP panels will not be installed at the NLD, PLD, and ULD sites based on the results of the semi-quantitative risk analysis (SQRA) detailed in the memorandum entitled “Liquefaction SQRA.”

For the SD pseudo-static seismic stability analysis at Station 20+25, the calculated FS for the upstream and downstream slopes are greater than 1.0. This indicates that the design ground motions are less than the yield accelerations for both slopes. Because the yield accelerations are greater than the design ground motions, the proposed embankment geometry represented by the Station 20+25 section is expected to experience negligible permanent slope deformations due to the design seismic event.

CONCLUSIONS

The following list is a summary of the conclusions from the embankment stability analyses:

- Based on the results of these analyses, the proposed SD, NLD, PLD, and ULD embankment geometries shown in Table 1 above are expected to be stable under the analyzed static load cases.
- With the exception of the proposed SD section within the breach area, the BSL dams are not expected to remain stable following the design seismic event due to cyclic liquefaction of the Foundation Soils.
- The proposed SD section within the breach area is expected to experience negligible permanent slope deformations due to the due to the design seismic event.
- Proposed Common Fill materials should have soil classifications of SM or SP-SM to mitigate potential rapid drawdown failures. Drawdown rates should be limited to 1 foot per day.

The analyses above are based on available geologic and geotechnical data and on conservative assumptions. There is a possibility that soil types and subsurface conditions may differ from those assumed. These conditions may not be realized until construction. In these cases, the seepage and stability analyses should be re-evaluated to accommodate the updated information.

REFERENCES

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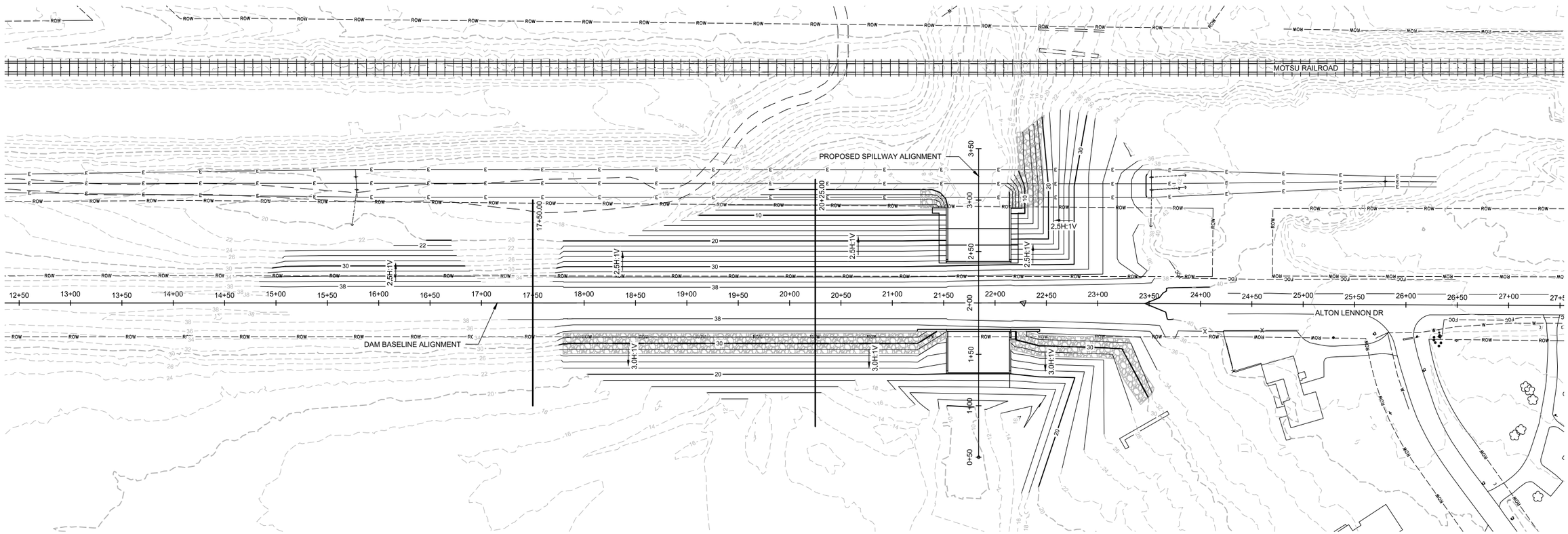
- U.S. Army Corps of Engineers (2003). "Engineering and design – slope stability," EM 1110-2-1902, Department of the Army, Washington, D.C., October 2003.

ATTACHMENTS

1. Sanford Dam Seepage and Slope Stability Calculations
2. North Lake Dam Seepage and Slope Stability Calculations
3. Pine Lake Dam Seepage and Slope Stability Calculations
4. Upper Lake Dam Seepage and Slope Stability Calculations



1 SANFORD DAM PROPOSED SITE PLAN

0 50' 100'

Schnabel ENGINEERING

DAM CONSTRUCTION/RECONSTRUCTION PROJECT
BOILING SPRING LAKES, NORTH CAROLINA
MCGILL ASSOCIATES, P.A.
SCHNABEL PROJECT NO. 19C21022

SANFORD DAM
PROPOSED SITE PLAN

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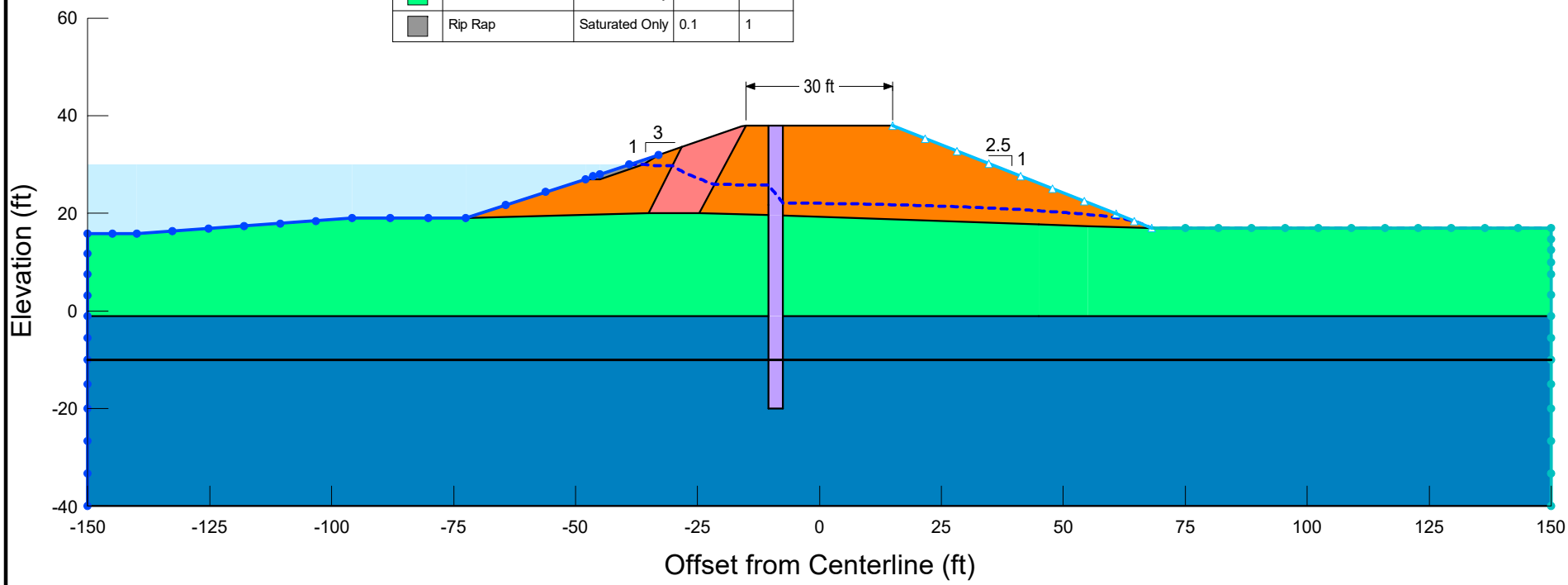
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Cut-Off Wall	Saturated Only	1e-06	1
	Existing Embankment Common Fill	Saturated Only	0.0001	0.5
	Existing Embankment Core Fill	Saturated Only	1e-06	1
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Rip Rap	Saturated Only	0.1	1

Color	Name	Kind	Parameters
	Normal Headwater	Water Total Head	30 ft
	Normal Tailwater	Water Total Head	17 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 17+50
Analysis: 1 - Normal Operating Conditions
Method: Steady-State
Created By: CDS / Checked By: ACP

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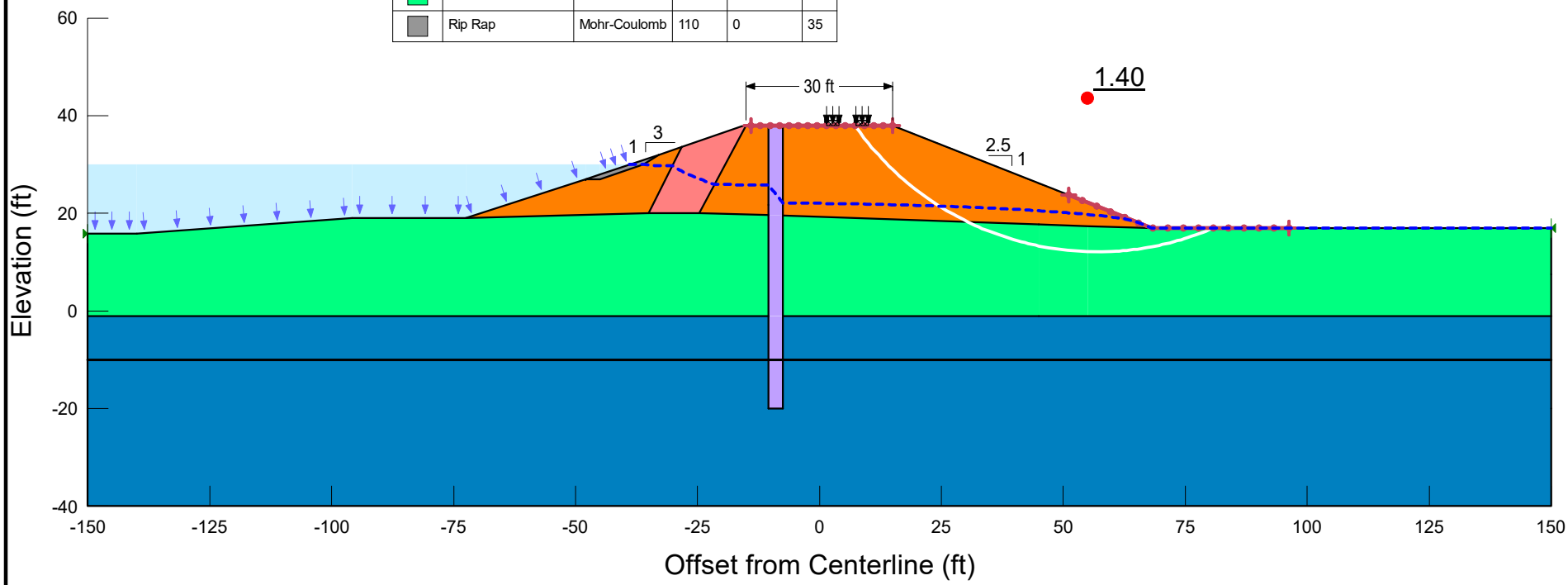
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb	125	1,800	0
	Existing Embankment Common Fill	Mohr-Coulomb	120	50	32
	Existing Embankment Core Fill	Mohr-Coulomb	120	50	32
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	10	29
	Rip Rap	Mohr-Coulomb	110	0	35

Surcharge 1: 2,560 psf (AASHTO HS-20)
Surcharge 2: 2,560 psf (AASHTO HS-20)



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Boiling Spring Lakes Dams Rehabilitation
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Schnabel Project: 19C21022

Section: Sanford Dam - STA 17+50
Analysis: 1 - Normal Operating Conditions Stability
Method: Spencer
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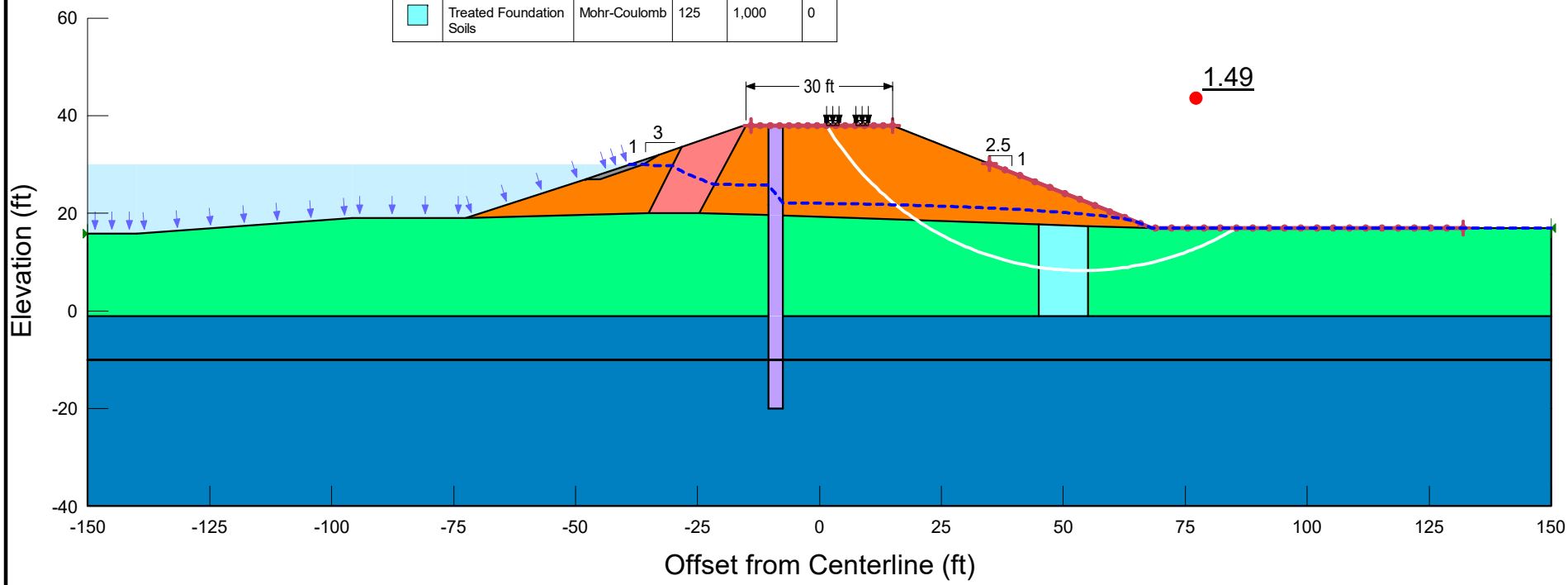
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb	125	1,800	0
	Existing Embankment Common Fill	Mohr-Coulomb	120	50	32
	Existing Embankment Core Fill	Mohr-Coulomb	120	50	32
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	10	29
	Rip Rap	Mohr-Coulomb	110	0	35
	Treated Foundation Soils	Mohr-Coulomb	125	1,000	0

Surcharge 1: 2,560 psf (AASHTO HS-20)
Surcharge 2: 2,560 psf (AASHTO HS-20)



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 17+50
Analysis: 1 - Normal Operating Conditions Stability w/ MIP Panels
Method: Spencer
Created By: CDS / Checked By: ACP

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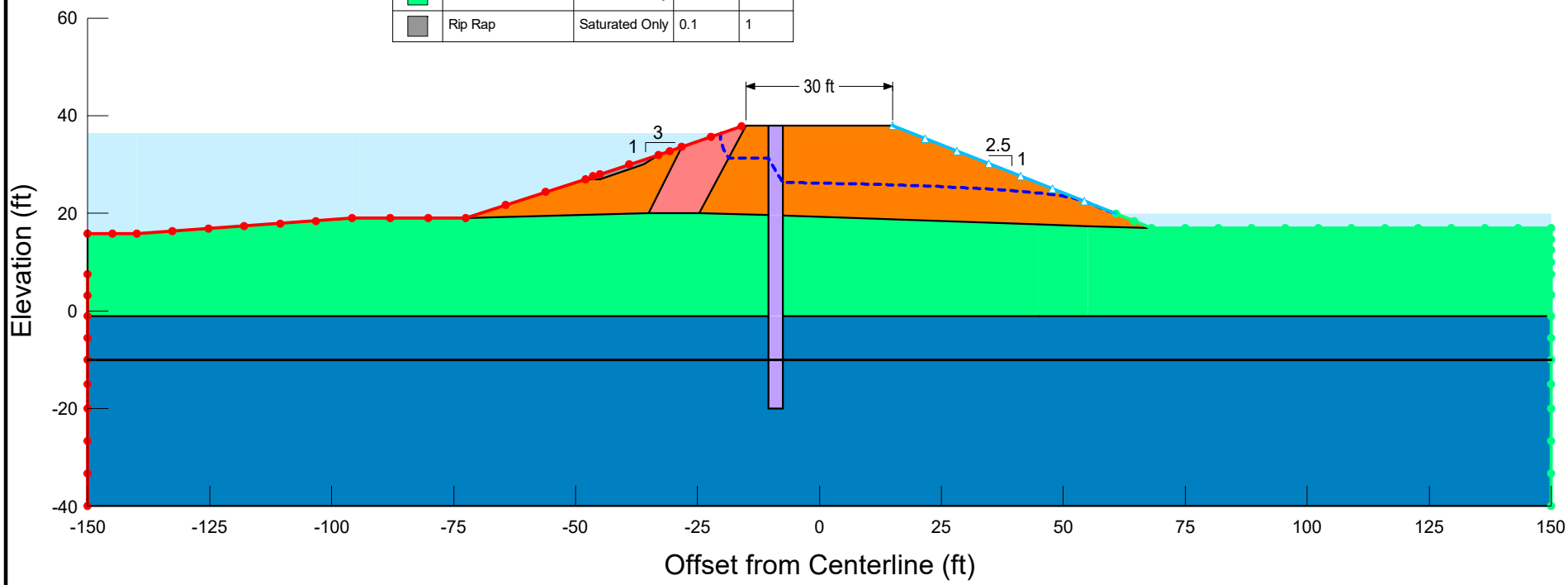
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Cut-Off Wall	Saturated Only	1e-06	1
	Existing Embankment Common Fill	Saturated Only	0.0001	0.5
	Existing Embankment Core Fill	Saturated Only	1e-06	1
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Rip Rap	Saturated Only	0.1	1

Color	Name	Kind	Parameters
	1/2 PMF Headwater	Water Total Head	36.4 ft
	1/2 PMF Tailwater	Water Total Head	19.9 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



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Boiling Spring Lakes Dams Rehabilitation
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Schnabel Project: 19C21022

Section: Sanford Dam - STA 17+50
Analysis: 2 - 1/2 PMP
Method: Steady-State
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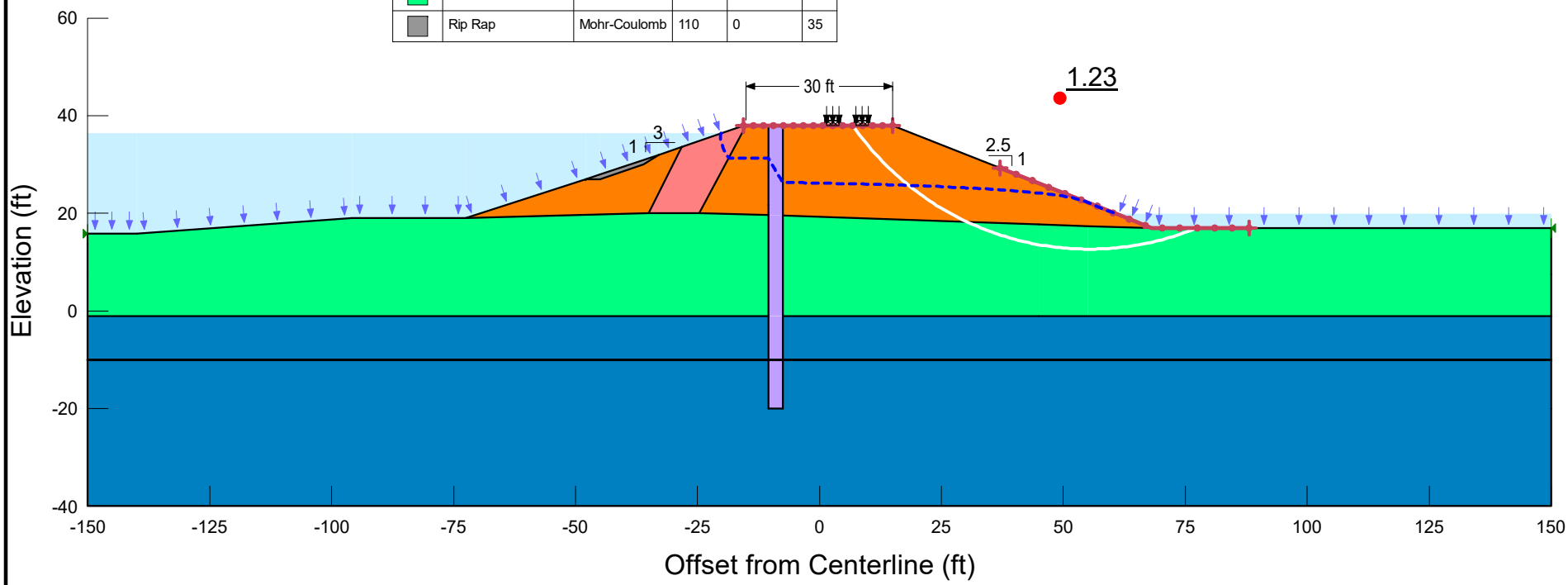
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb	125	1,800	0
	Existing Embankment Common Fill	Mohr-Coulomb	120	50	32
	Existing Embankment Core Fill	Mohr-Coulomb	120	50	32
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	10	29
	Rip Rap	Mohr-Coulomb	110	0	35

Surcharge 1: 2,560 psf (AASHTO HS-20)
Surcharge 2: 2,560 psf (AASHTO HS-20)



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Boiling Spring Lakes Dams Rehabilitation
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Schnabel Project: 19C21022

Section: Sanford Dam - STA 17+50
Analysis: 2 - 1/2 PMP Stability
Method: Spencer
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Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb	125	1,800	0
	Existing Embankment Common Fill	Mohr-Coulomb	120	50	32
	Existing Embankment Core Fill	Mohr-Coulomb	120	50	32
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	10	29
	Rip Rap	Mohr-Coulomb	110	0	35
	Treated Foundation Soils	Mohr-Coulomb	125	1,000	0

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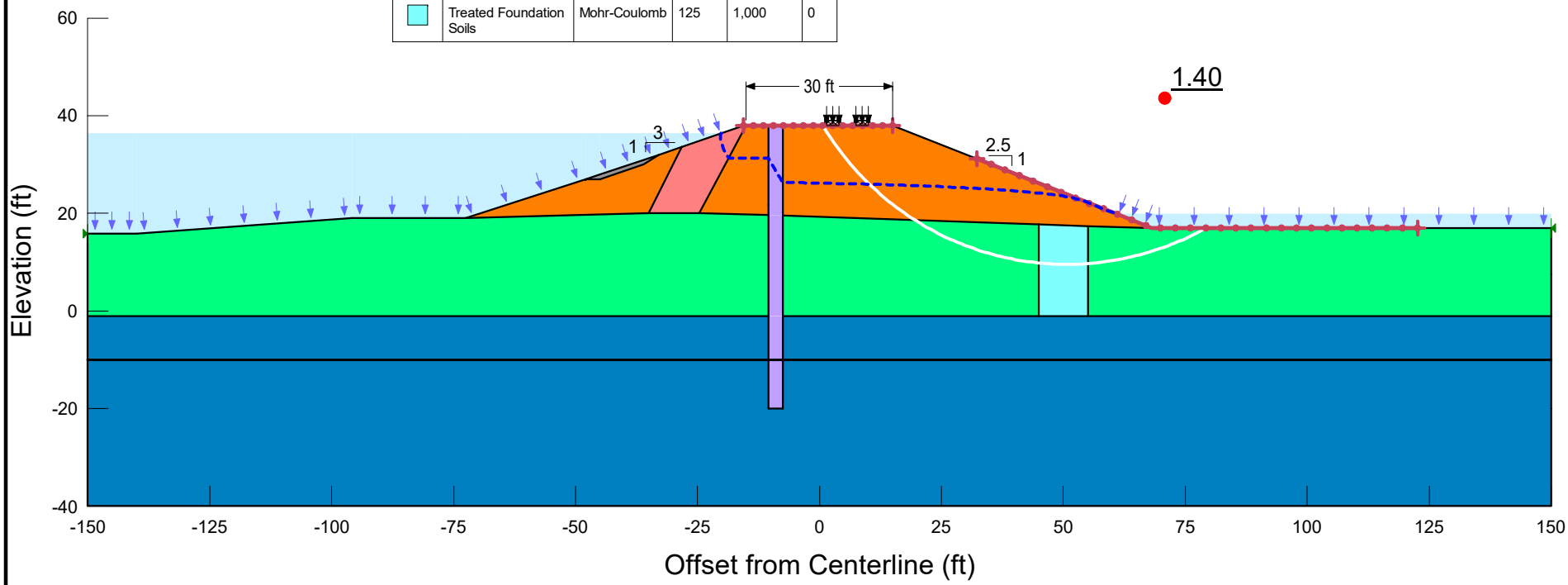
Surcharge 2: 2,560 psf (AASHTO HS-20)



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 17+50
Analysis: 2 - 1/2 PMP Stability w/ MIP Panels
Method: Spencer
Created By: CDS / Checked By: ACP

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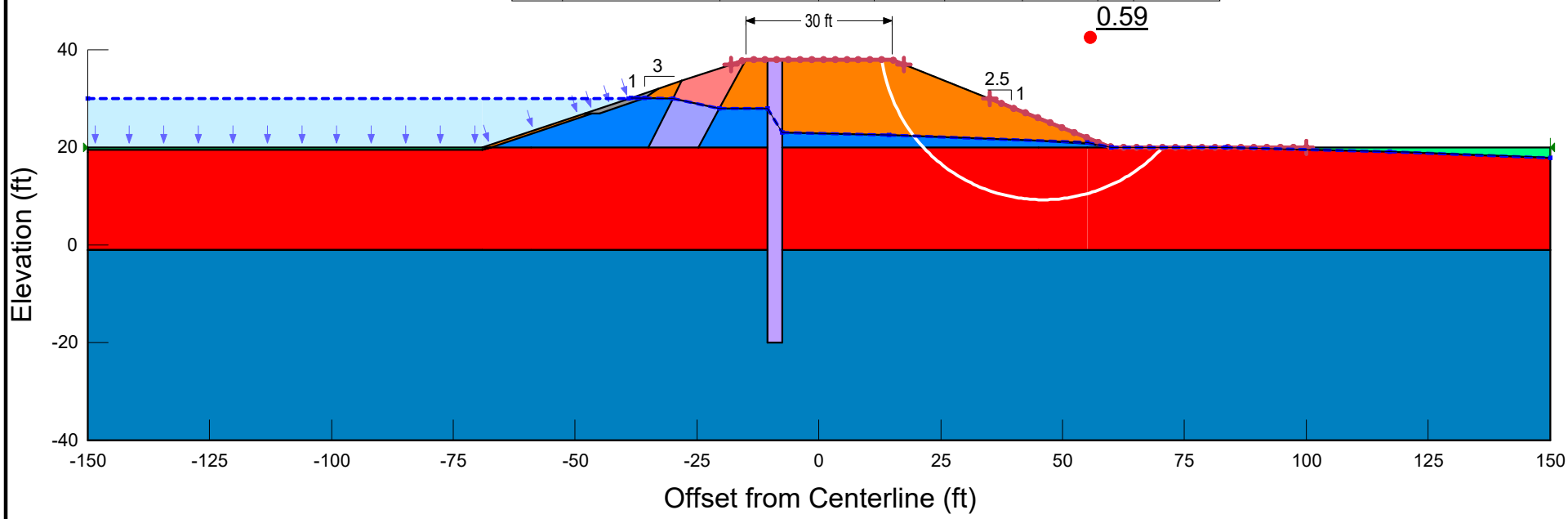
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Cut-Off Wall	Mohr-Coulomb	125			1,800	0	1
	Existing Embankment Common Fill	Mohr-Coulomb	120			50	32	1
	Existing Embankment Common Fill - Undrained	Mohr-Coulomb	125			50	24	
	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	125			200	20	
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Rip Rap	Mohr-Coulomb	110			0	35	1



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 17+50
Analysis: 3 - Post Earthquake Stability - D/S
Method: Spencer
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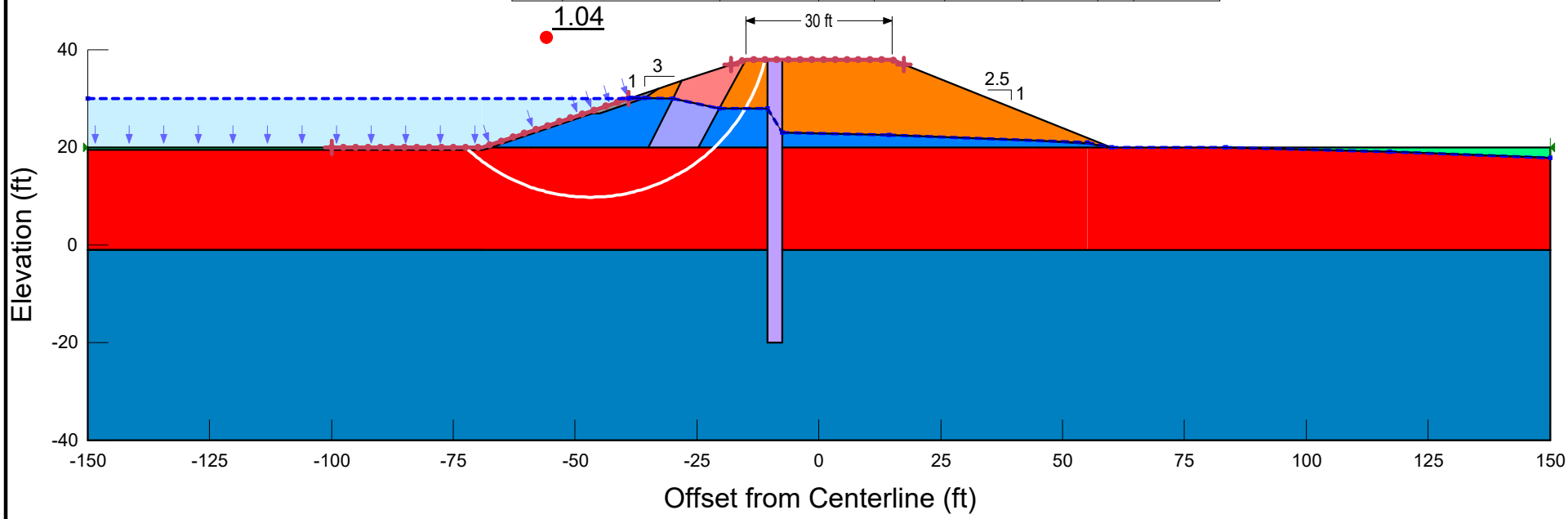
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Cut-Off Wall	Mohr-Coulomb	125			1,800	0	1
	Existing Embankment Common Fill	Mohr-Coulomb	120			50	32	1
	Existing Embankment Common Fill - Undrained	Mohr-Coulomb	125			50	24	
	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	125			200	20	
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Rip Rap	Mohr-Coulomb	110			0	35	1



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 17+50
Analysis: 3 - Post Earthquake Stability - U/S
Method: Spencer
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Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Cut-Off Wall	Saturated Only	1e-06	1
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Coarse Drainfill	Saturated Only	0.1	1
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Core Fill	Saturated Only	1e-06	1
	Proposed Fine Drainfill	Saturated Only	0.01	1
	Proposed Select Fill	Saturated Only	0.0001	0.5
	Rip Rap	Saturated Only	0.1	1

Color	Name	Kind	Parameters
	Normal Headwater	Water Total Head	30 ft
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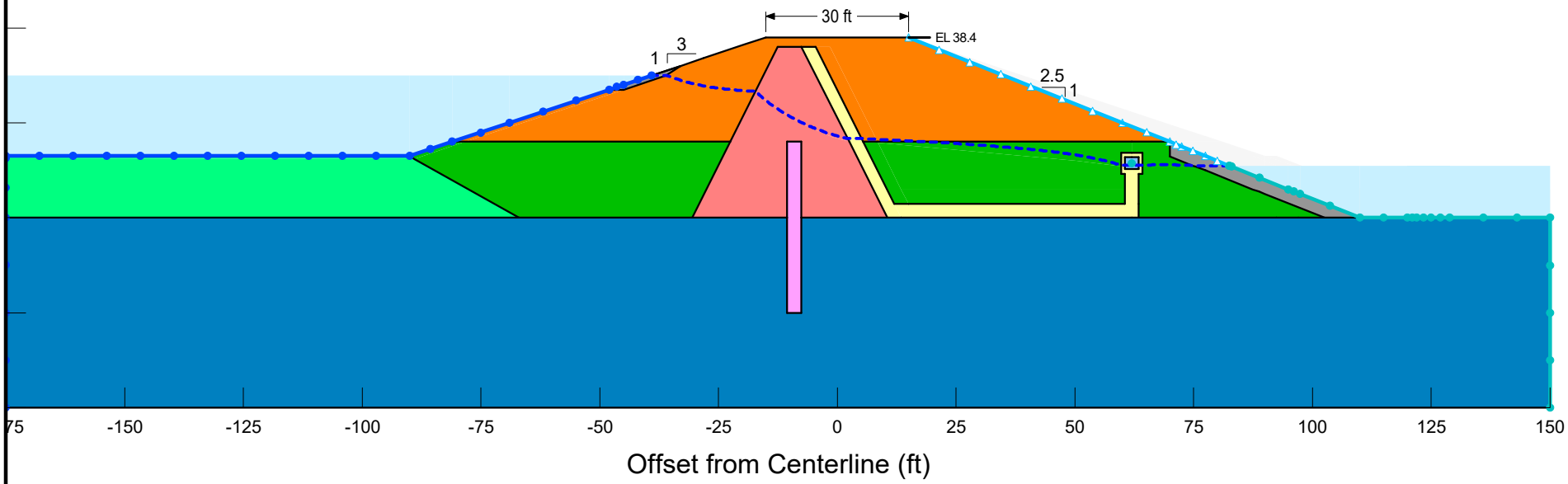
	Potential Seepage Face	Water Rate	0 ft³/sec



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 20+25
Analysis: 1 - Normal Operating Conditions, 2.5:1
Method: Steady-State
Created By: CDS / Checked By: ACP

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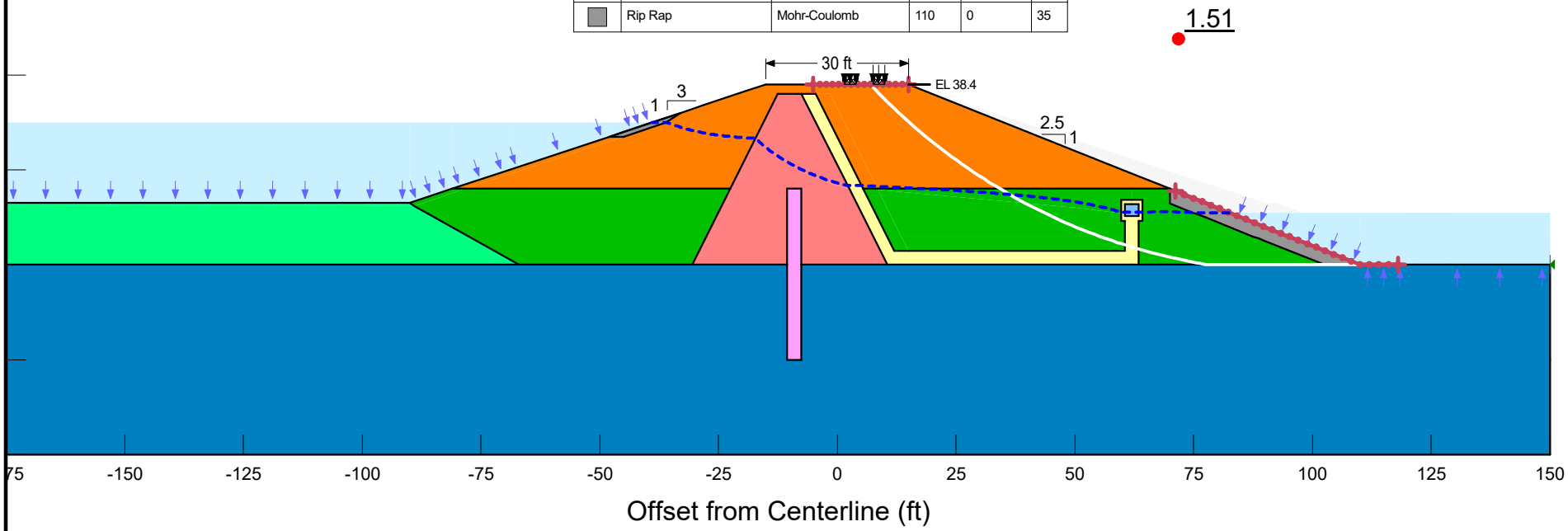
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb	125	1,800	0
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Coarse Drainfill	Mohr-Coulomb	120	0	36
	Proposed Common Fill	Mohr-Coulomb	125	50	32
	Proposed Core Fill	Mohr-Coulomb	120	50	32
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34
	Proposed Select Fill	Mohr-Coulomb	125	10	35
	Rip Rap	Mohr-Coulomb	110	0	35

Surcharge 1: 2,560 psf (AASHTO HS-20)
Surcharge 2: 2,560 psf (AASHTO HS-20)



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 20+25
Analysis: 1 - Normal Operating Conditions Stability, 2.5:1
Method: Spencer
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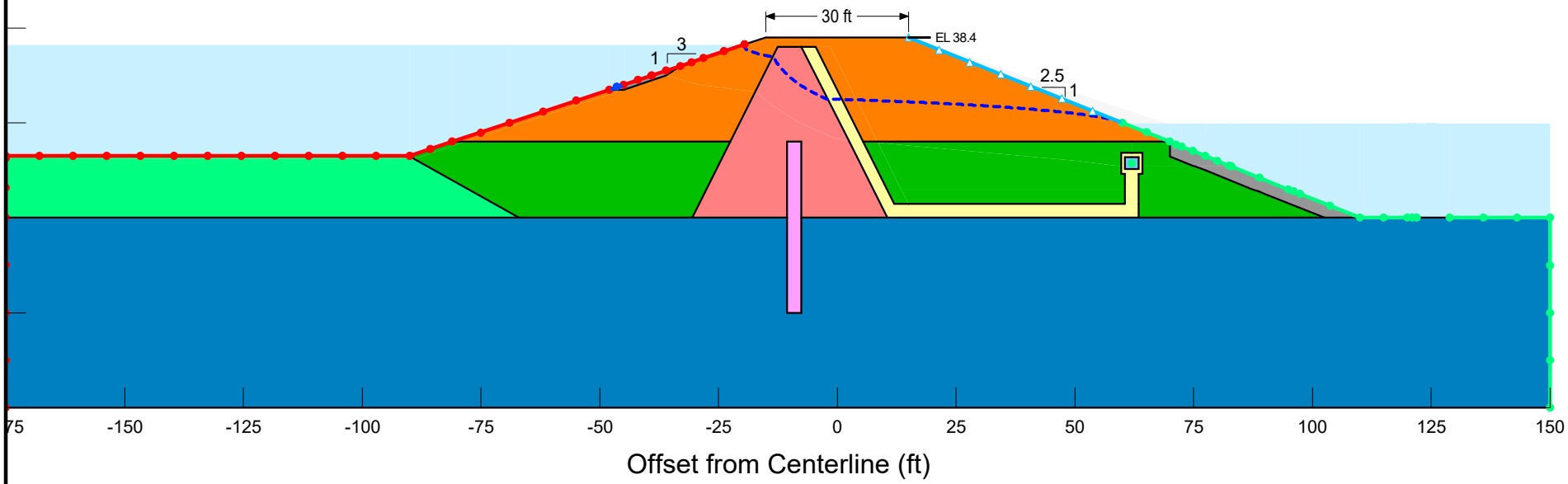
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Cut-Off Wall	Saturated Only	1e-06	1
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Coarse Drainfill	Saturated Only	0.1	1
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Core Fill	Saturated Only	1e-06	1
	Proposed Fine Drainfill	Saturated Only	0.01	1
	Proposed Select Fill	Saturated Only	0.0001	0.5
	Rip Rap	Saturated Only	0.1	1

Color	Name	Kind	Parameters
	1/2 PMF Headwater	Water Total Head	36.4 ft
	1/2 PMF Tailwater	Water Total Head	19.9 ft
	Normal Headwater	Water Total Head	30 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 20+25
Analysis: 2 - 1/2 PMP, 2.5:1
Method: Steady-State
Created By: CDS / Checked By: ACP

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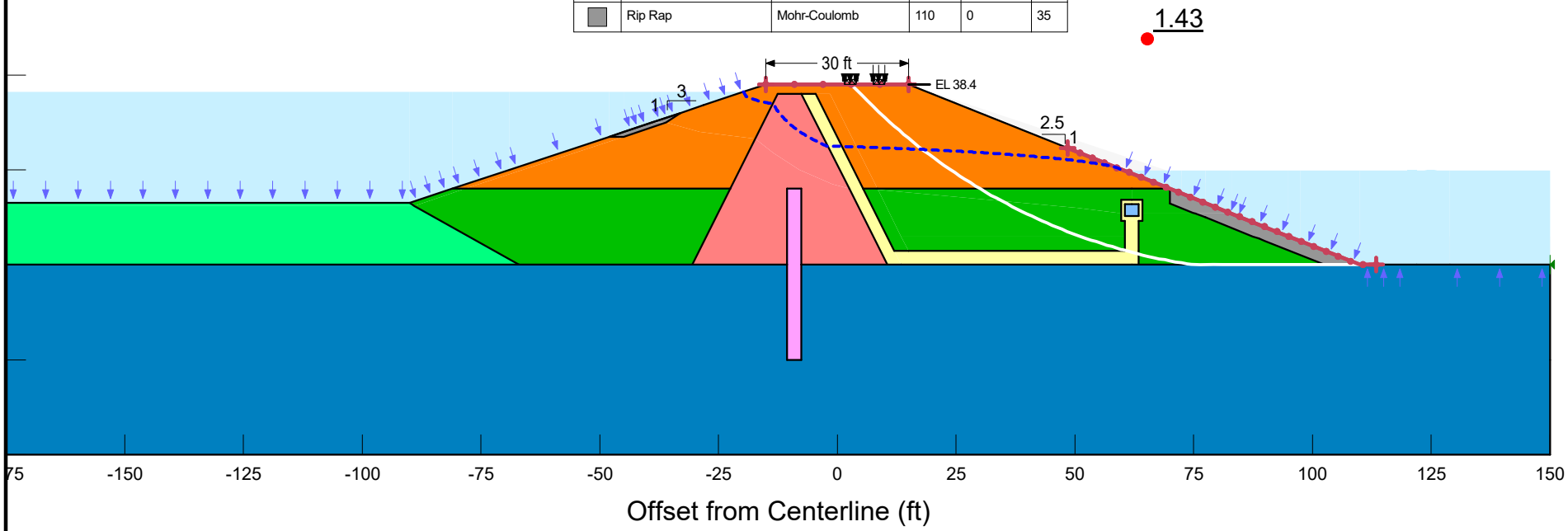
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb	125	1,800	0
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Coarse Drainfill	Mohr-Coulomb	120	0	36
	Proposed Common Fill	Mohr-Coulomb	125	50	32
	Proposed Core Fill	Mohr-Coulomb	120	50	32
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34
	Proposed Select Fill	Mohr-Coulomb	125	10	35
	Rip Rap	Mohr-Coulomb	110	0	35

Surcharge 1: 2,560 psf (AASHTO HS-20)
Surcharge 2: 2,560 psf (AASHTO HS-20)



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 20+25
Analysis: 2 - 1/2 PMP Stability, 2.5:1
Method: Spencer
Created By: CDS / Checked By: ACP

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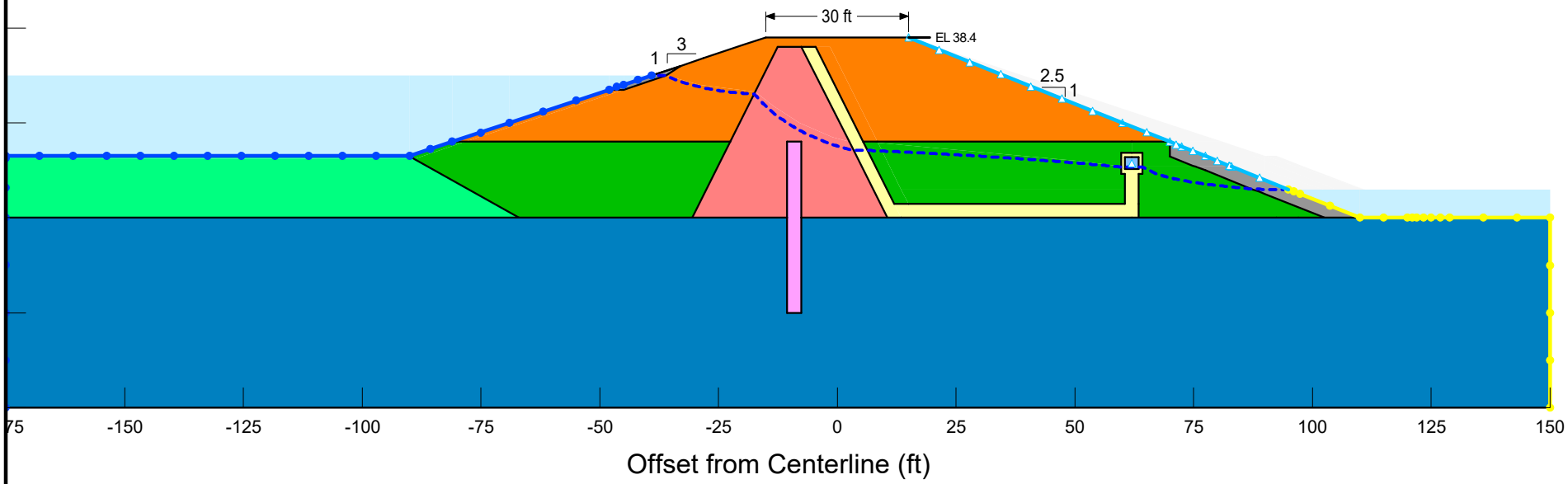
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Cut-Off Wall	Saturated Only	1e-06	1
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Coarse Drainfill	Saturated Only	0.1	1
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Core Fill	Saturated Only	1e-06	1
	Proposed Fine Drainfill	Saturated Only	0.01	1
	Proposed Select Fill	Saturated Only	0.0001	0.5
	Rip Rap	Saturated Only	0.1	1

Color	Name	Kind	Parameters
	Maintenance Tailwater	Water Total Head	6 ft
	Normal Headwater	Water Total Head	30 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 20+25
Analysis: 3 - Maintenance Conditions, 2.5:1
Method: Steady-State
Created By: CDS / Checked By: ACP

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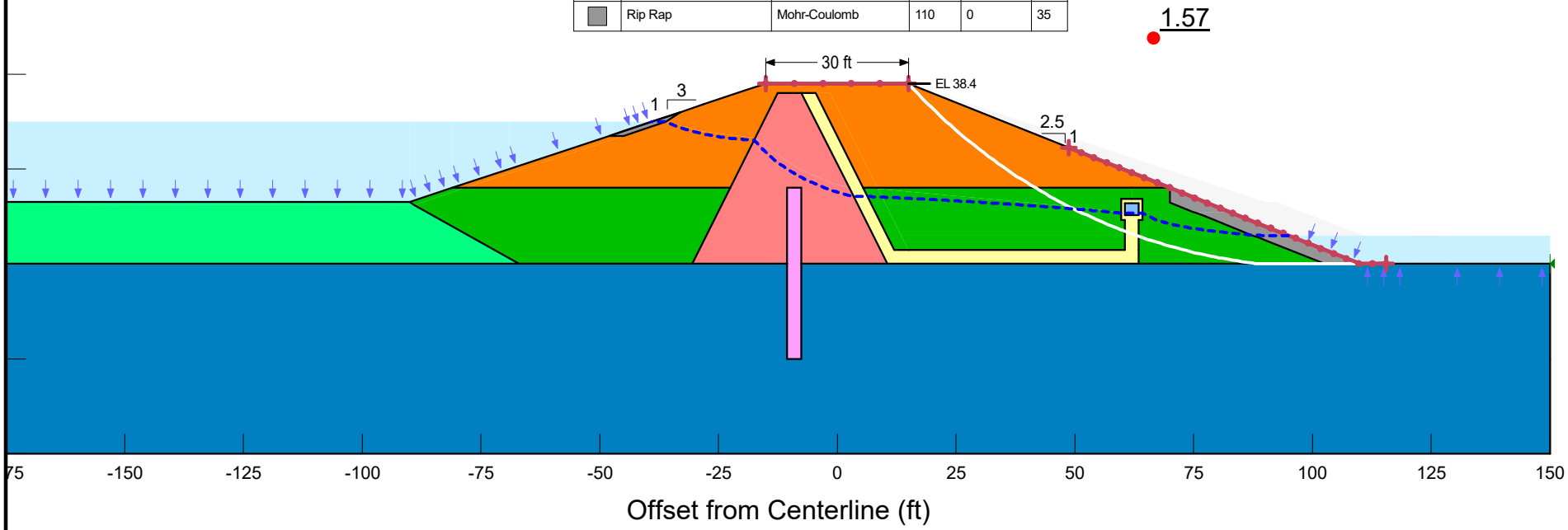
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb	125	1,800	0
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Coarse Drainfill	Mohr-Coulomb	120	0	36
	Proposed Common Fill	Mohr-Coulomb	125	50	32
	Proposed Core Fill	Mohr-Coulomb	120	50	32
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34
	Proposed Select Fill	Mohr-Coulomb	125	10	35
	Rip Rap	Mohr-Coulomb	110	0	35



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 20+25
Analysis: 3 - Maintenance Conditions Stability, 2.5:1
Method: Spencer
Created By: CDS / Checked By: ACP

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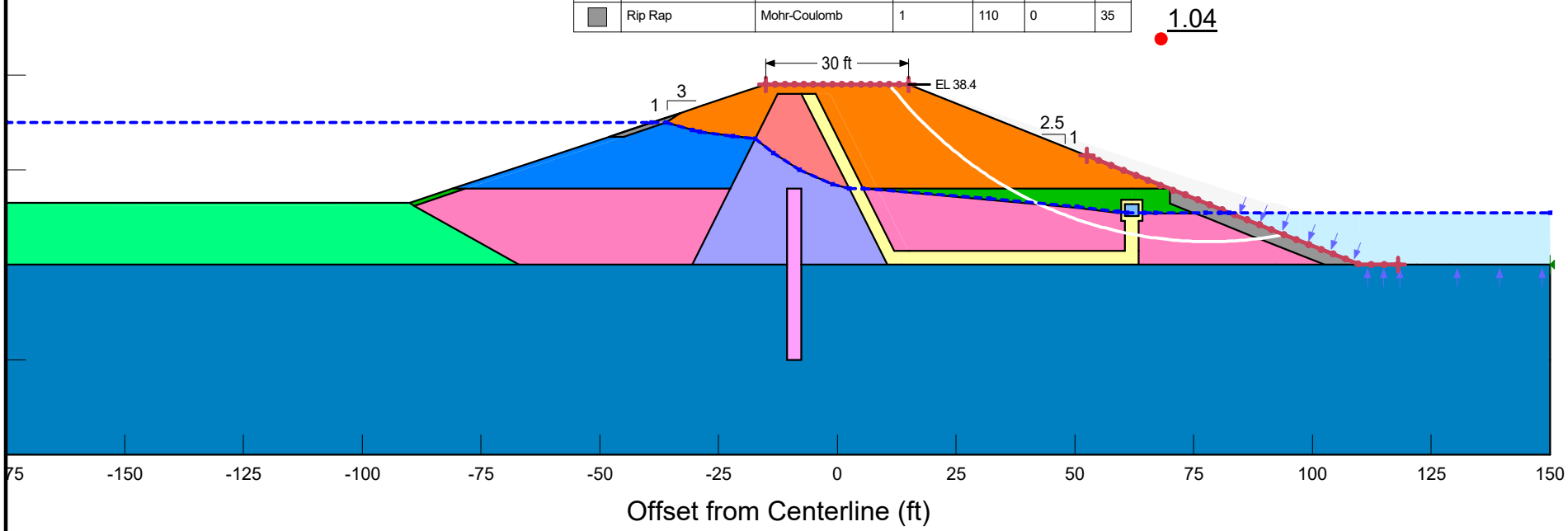
Color	Name	Model	Piezometric Line	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb		125	1,800	0
	Foundation Bedrock	Bedrock (Impenetrable)	1			
	Foundation Soils	Mohr-Coulomb		120	0	29
	Proposed Coarse Drainfill	Mohr-Coulomb		120	0	36
	Proposed Common Fill	Mohr-Coulomb		125	50	32
	Proposed Common Fill - Undrained	Mohr-Coulomb		120	50	24
	Proposed Core Fill	Mohr-Coulomb		120	50	32
	Proposed Core Fill - Undrained	Mohr-Coulomb		120	200	20
	Proposed Fine Drainfill	Mohr-Coulomb		125	0	34
	Proposed Select Fill	Mohr-Coulomb		125	10	35
	Proposed Select Fill - Undrained	Mohr-Coulomb		120	50	24
	Rip Rap	Mohr-Coulomb	1	110	0	35

Horz Seismic Coef.: 0.2 g



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 20+25
Analysis: 4 - Pseudo-Static Stability, 5000-yr event, D/S, 2.5:1
Method: Spencer
Created By: CDS / Checked By: ACP

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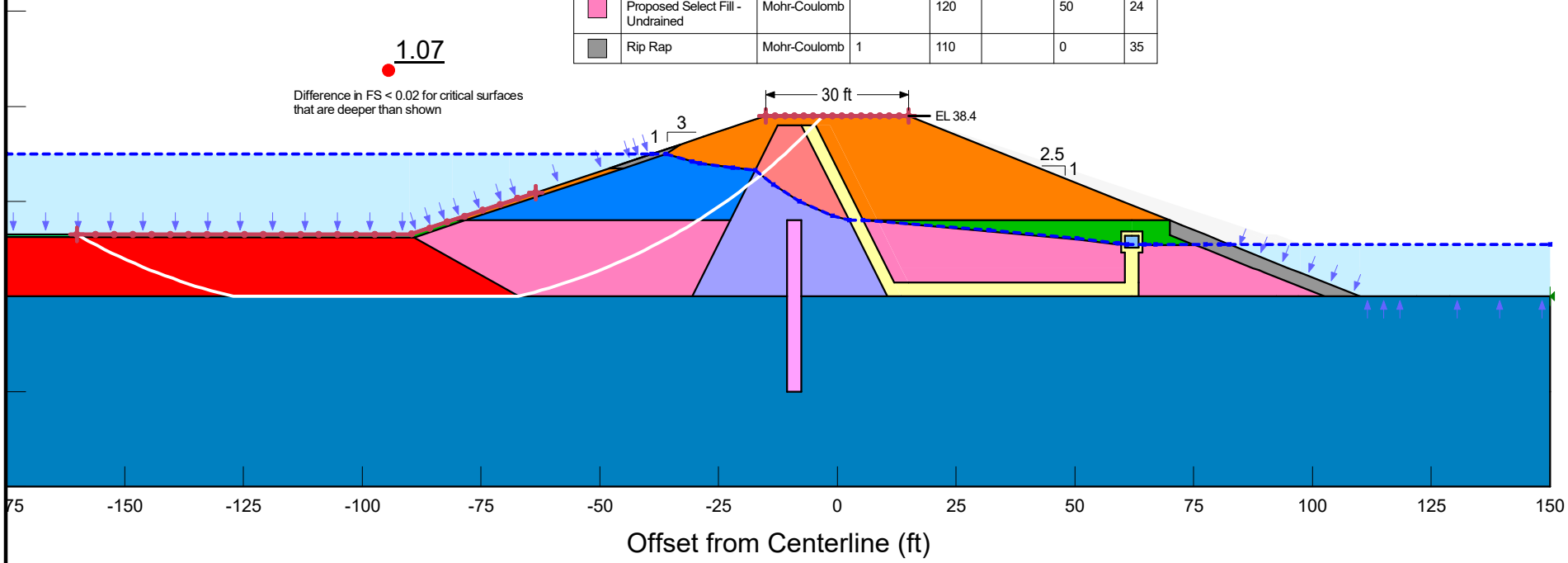
Color	Name	Model	Piezometric Line	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb		125		1,800	0
	Foundation Bedrock	Bedrock (Impenetrable)	1				
	Foundation Soils	Mohr-Coulomb	1	120		0	29
	Foundation Soils - Liquefied	SHANSEP		120	0.09		
	Proposed Coarse Drainfill	Mohr-Coulomb		120		0	36
	Proposed Common Fill	Mohr-Coulomb	1	125		50	32
	Proposed Common Fill - Undrained	Mohr-Coulomb		120		50	24
	Proposed Core Fill	Mohr-Coulomb		120		50	32
	Proposed Core Fill - Undrained	Mohr-Coulomb		120		200	20
	Proposed Fine Drainfill	Mohr-Coulomb		125		0	34
	Proposed Select Fill	Mohr-Coulomb	1	125		10	35
	Proposed Select Fill - Undrained	Mohr-Coulomb		120		50	24
	Rip Rap	Mohr-Coulomb	1	110		0	35



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 20+25
Analysis: 4 - Pseudo-Static Stability, 5000-yr event, U/S
Method: Spencer
Created By: CDS / Checked By: ACP

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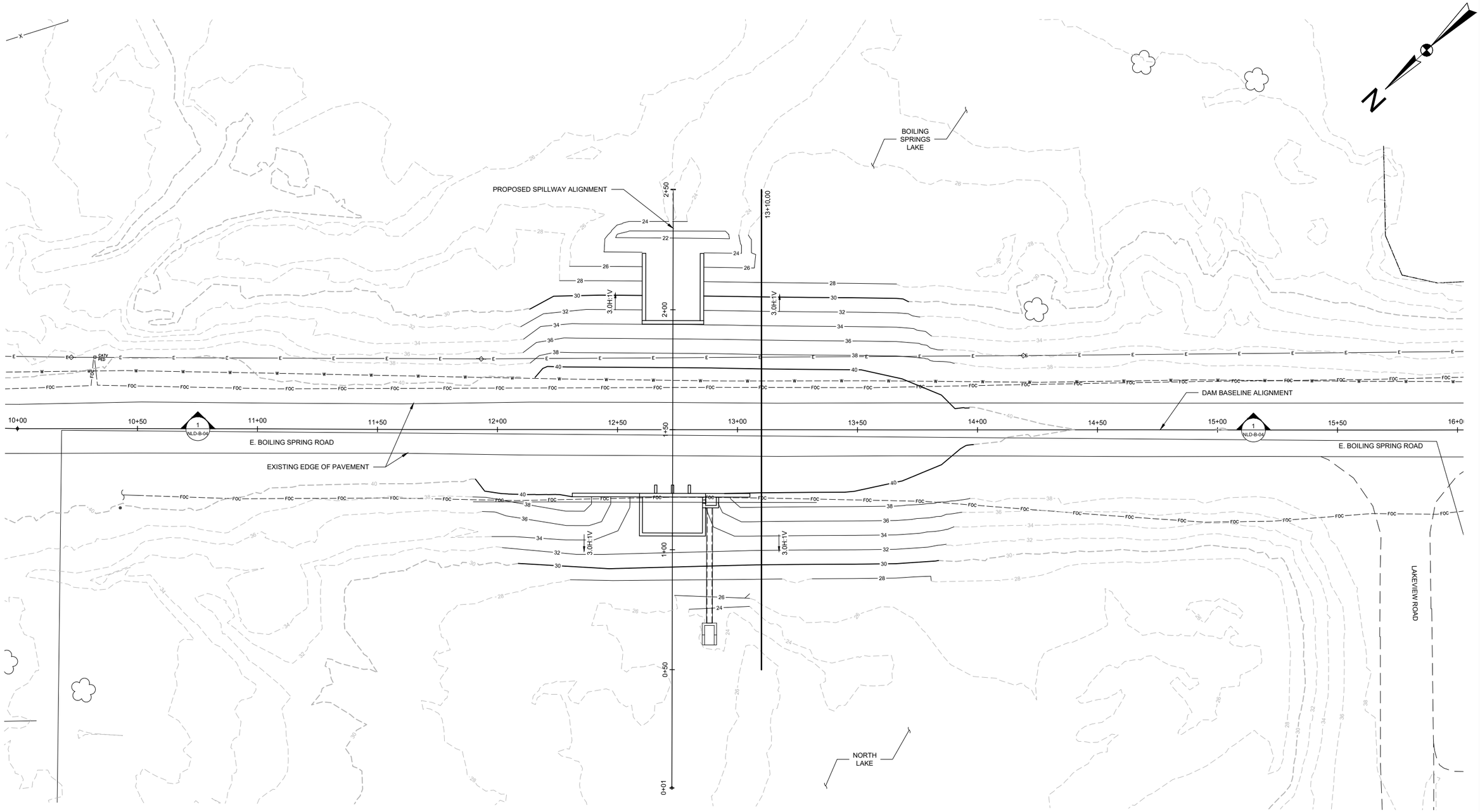

1 NORTH LAKE DAM PROPOSED SITE PLAN

0 20' 40'

Schnabel ENGINEERING

DAM CONSTRUCTION/RECONSTRUCTION PROJECT
BOILING SPRING LAKES, NORTH CAROLINA
MCGILL ASSOCIATES, P.A.
SCHNABEL PROJECT NO. 19C21022

NORTH LAKE DAM
PROPOSED SITE PLAN

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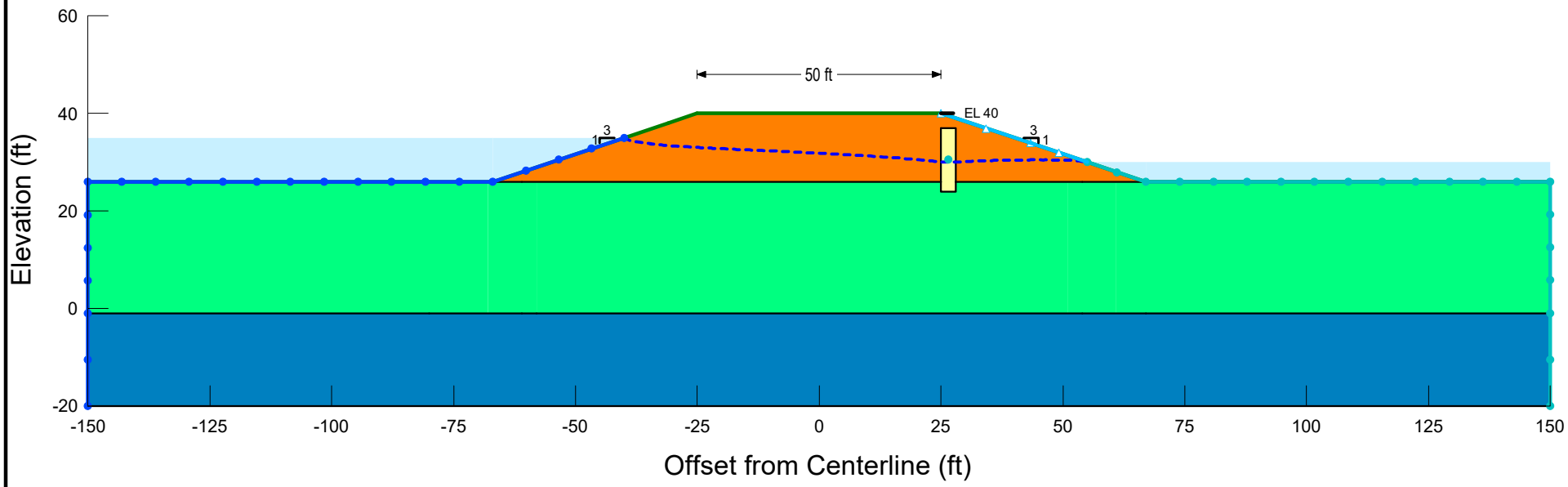
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	Normal Headwater	Water Total Head	35 ft
	Normal Tailwater	Water Total Head	30 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: North Lake Dam - STA 13+10
Analysis: 1 - Normal Operating Conditions
Method: Steady-State
Created By: CDS / Checked By: ACP

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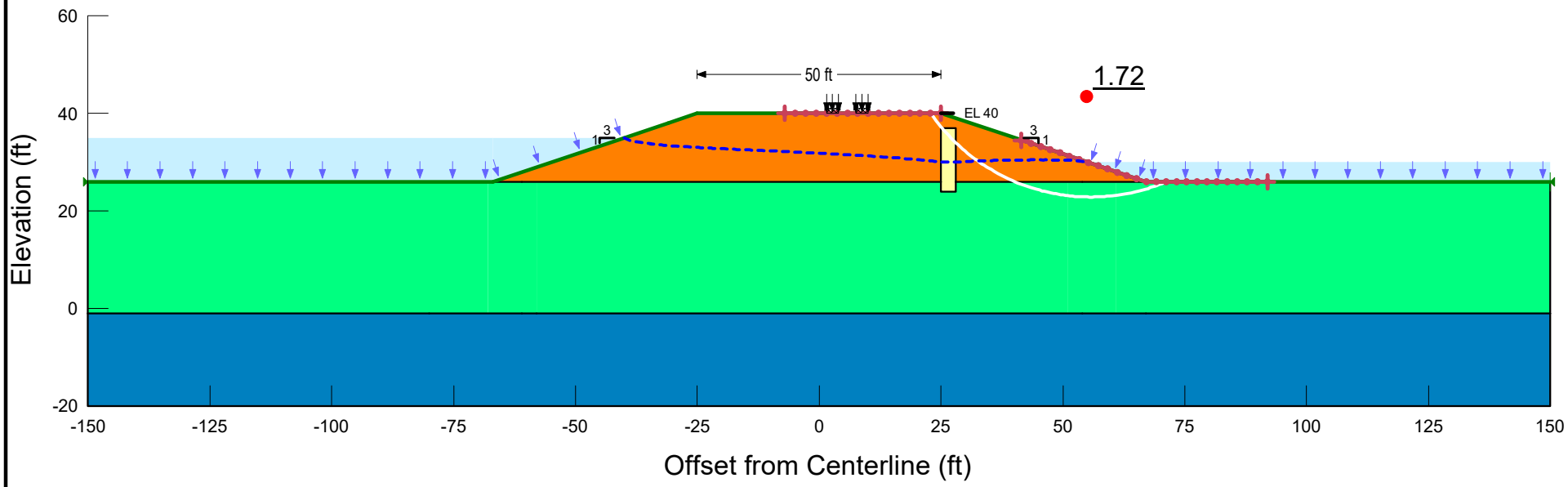
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34

Surcharge 1: 2,560 psf (AASHTO HS-20)
Surcharge 2: 2,560 psf (AASHTO HS-20)



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: North Lake Dam - STA 13+10
Analysis: 1 - Normal Operating Conditions Stability
Method: Spencer
Created By: CDS / Checked By: ACP

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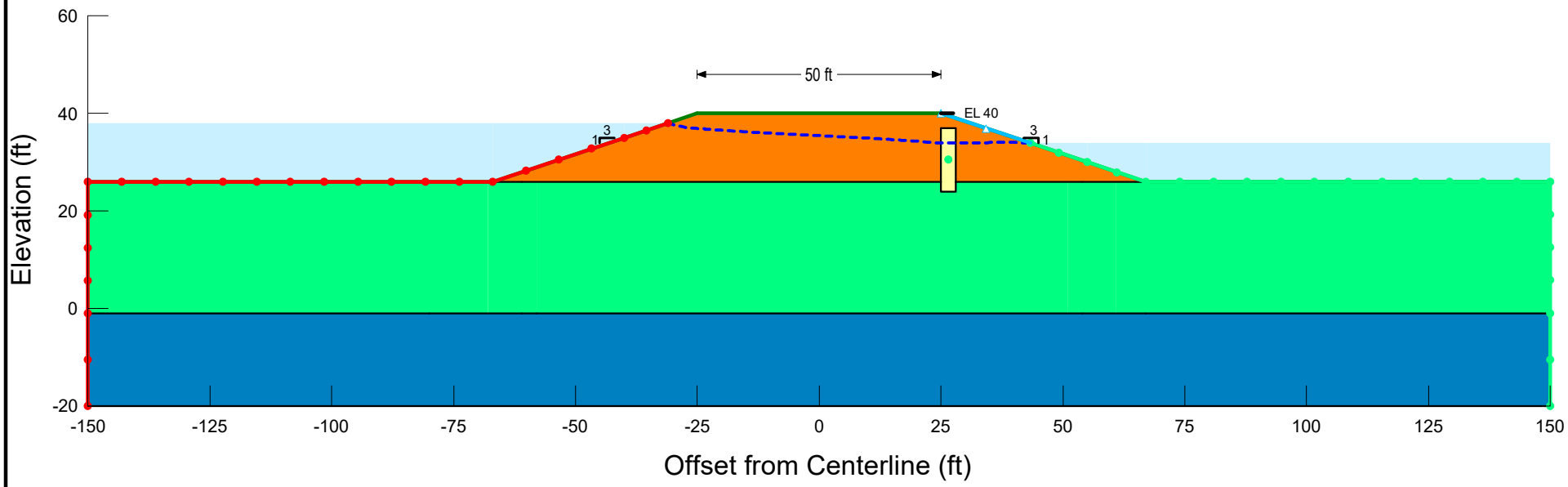
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	1/3 PMP Headwater	Water Total Head	38 ft
	1/3 PMP Tailwater	Water Total Head	33.9 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: North Lake Dam - STA 13+10
Analysis: 2 - 1/3 PMP
Method: Steady-State
Created By: CDS / Checked By: ACP

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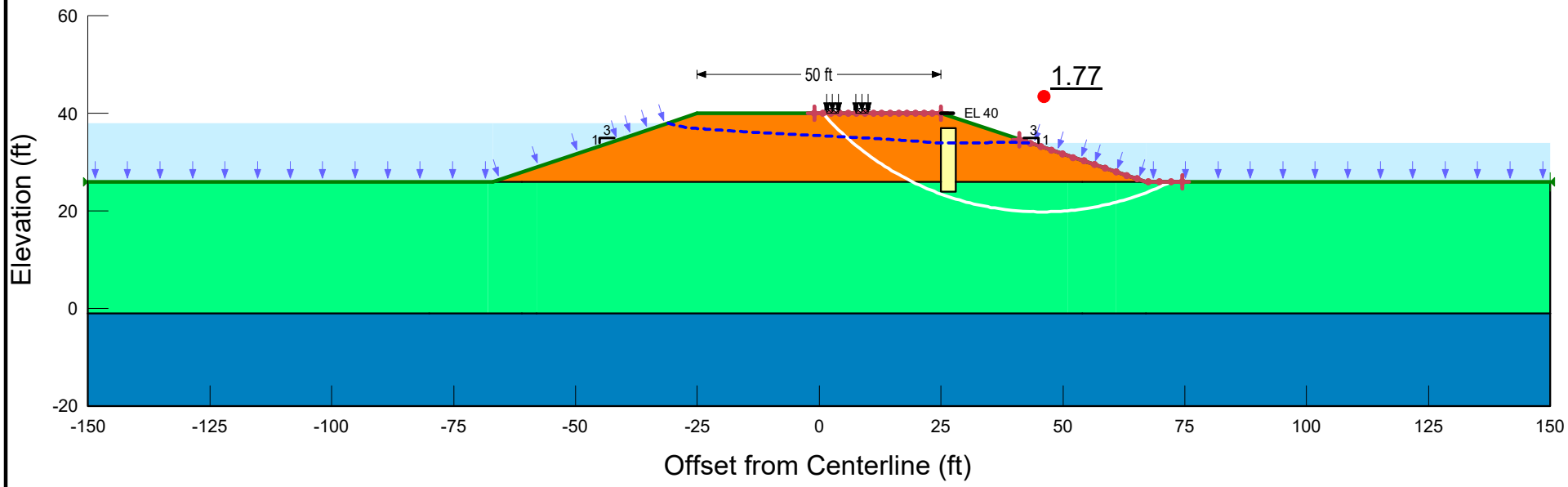
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34

Surcharge 1: 2,560 psf (AASHTO HS-20)
Surcharge 2: 2,560 psf (AASHTO HS-20)



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: North Lake Dam - STA 13+10
Analysis: 2 - 1/3 PMP Stability
Method: Spencer
Created By: CDS / Checked By: ACP

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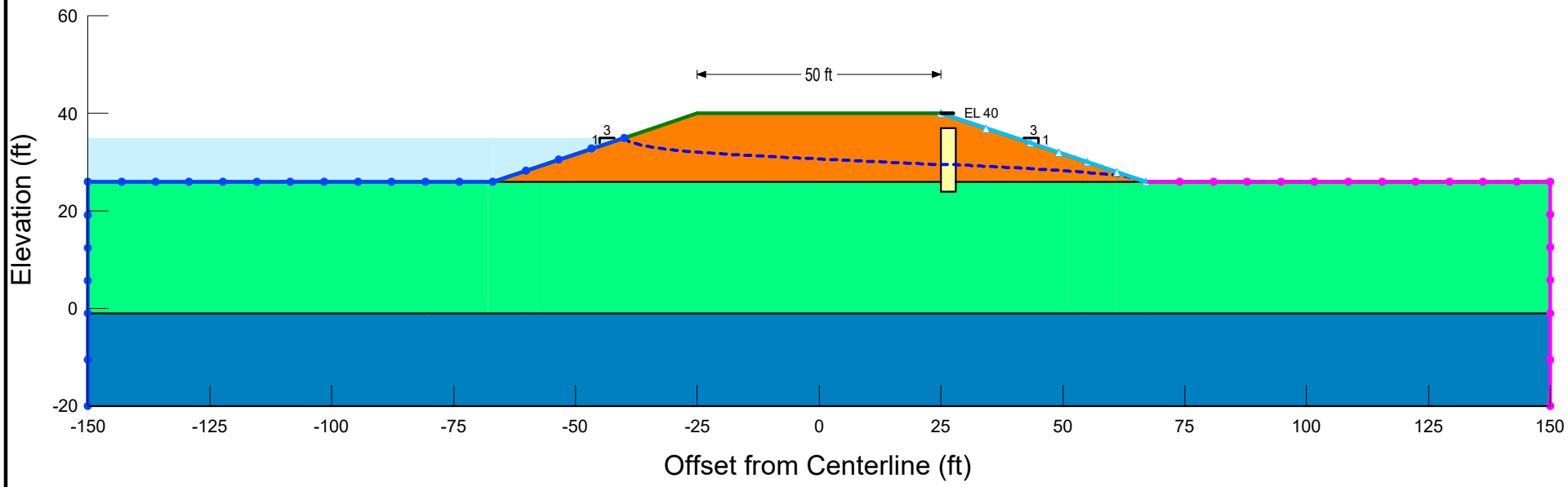
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	Maintenance Tailwater	Water Total Head	26 ft
	Normal Headwater	Water Total Head	35 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: North Lake Dam - STA 13+10
Analysis: 3 - Maintenance Conditions
Method: Steady-State
Created By: CDS / Checked By: ACP

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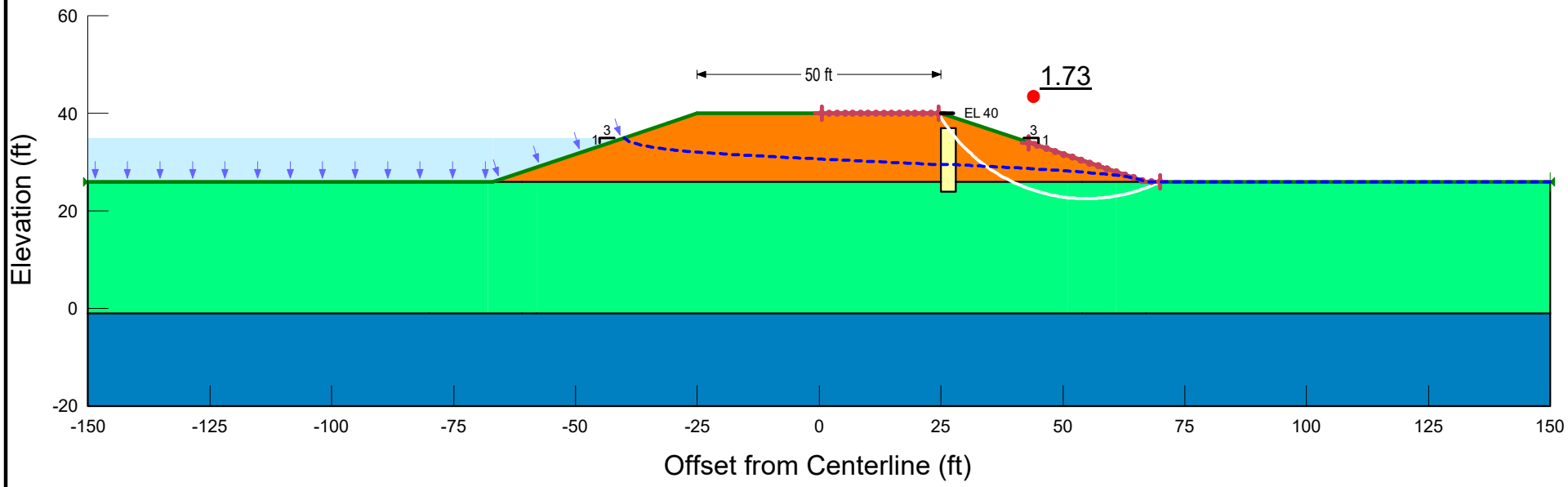
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: North Lake Dam - STA 13+10
Analysis: 3 - Maintenance Conditions Stability
Method: Spencer
Created By: CDS / Checked By: ACP

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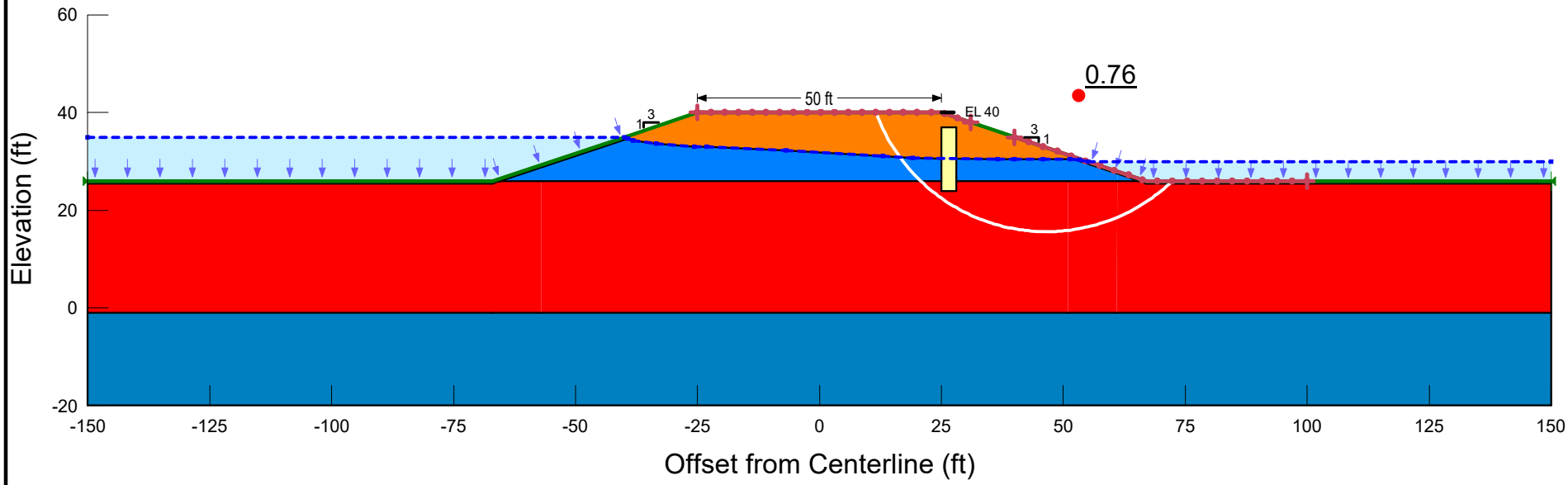
Color	Name	Model	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Fine Drainfill	Mohr-Coulomb	125		0	34	1
	Foundation Bedrock	Bedrock (Impenetrable)					1
	Foundation Soils	Mohr-Coulomb	120		0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0.09			
	Proposed Common Fill	Mohr-Coulomb	125		50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125		50	24	



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: North Lake Dam - STA 13+10
Analysis: 4 - Post-Earthquake Stability - D/S
Method: Spencer
Created By: CDS / Checked By: ACP

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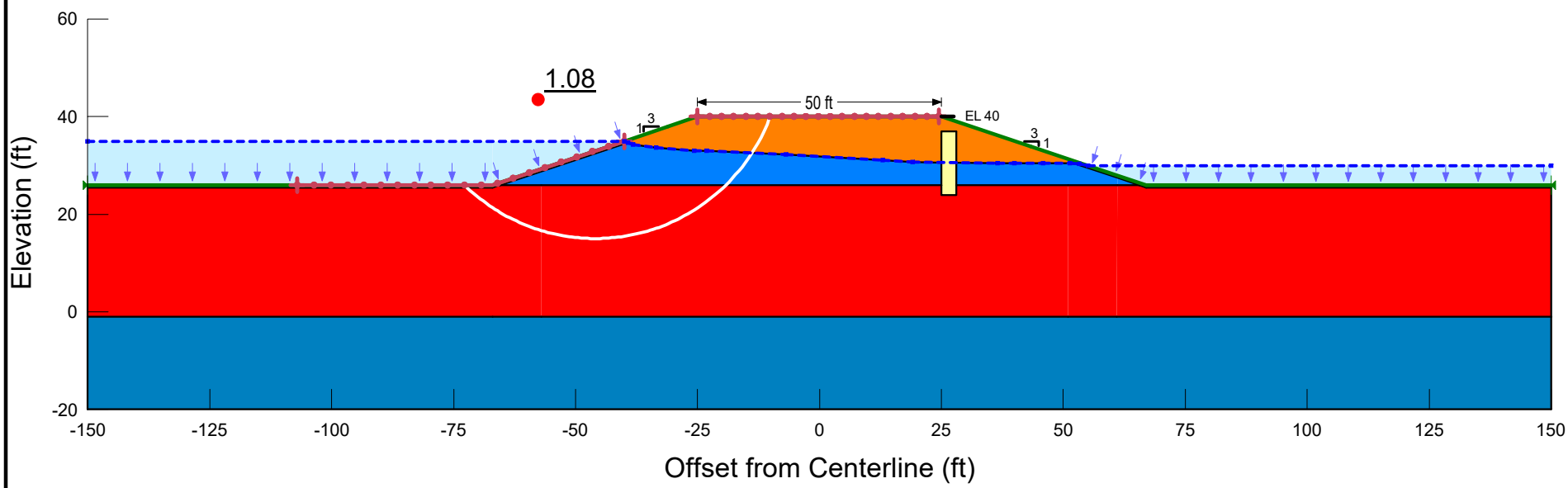
Color	Name	Model	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Fine Drainfill	Mohr-Coulomb	125		0	34	1
	Foundation Bedrock	Bedrock (Impenetrable)					1
	Foundation Soils	Mohr-Coulomb	120		0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0.09			
	Proposed Common Fill	Mohr-Coulomb	125		50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125		50	24	



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: North Lake Dam - STA 13+10
Analysis: 4 - Post-Earthquake Stability - U/S
Method: Spencer
Created By: CDS / Checked By: ACP

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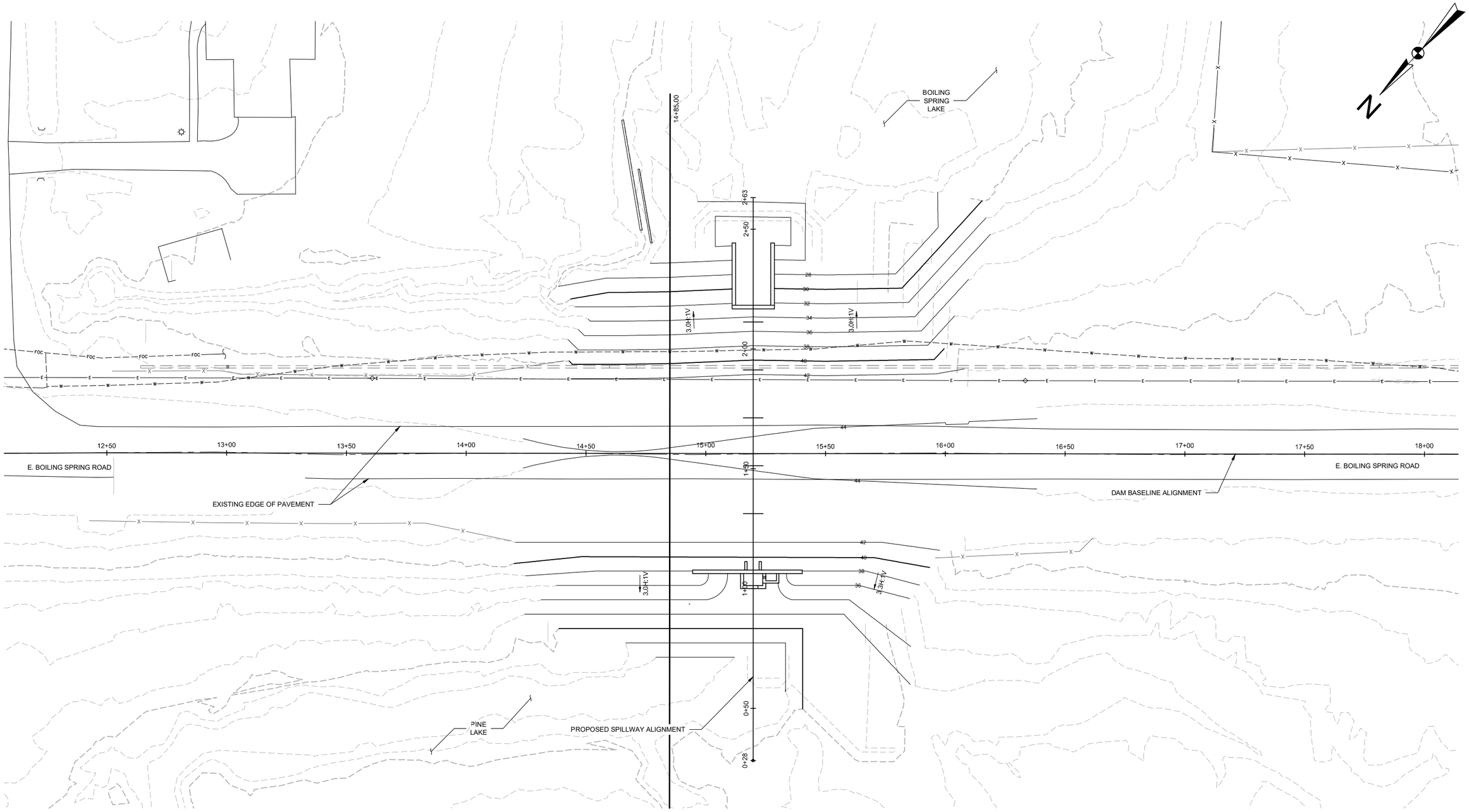

1 PINE LAKE DAM PROPOSED SITE PLAN

Schnabel ENGINEERING

DAM CONSTRUCTION/RECONSTRUCTION PROJECT
BOILING SPRING LAKES, NORTH CAROLINA
MCGILL ASSOCIATES, P.A.
SCHNABEL PROJECT NO. 19C21022

PINE LAKE DAM
PROPOSED SITE PLAN

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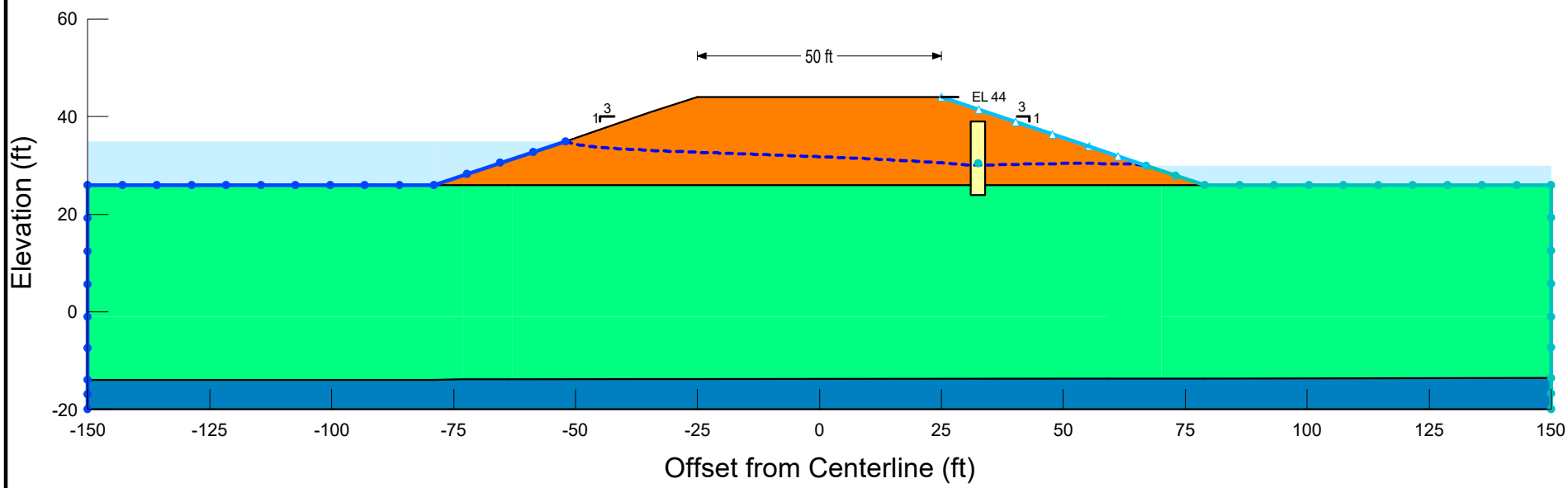
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	Normal Headwater	Water Total Head	35 ft
	Normal Tailwater	Water Total Head	30 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Pine Lake Dam - STA 14+85
Analysis: 1 - Normal Operating Conditions
Method: Steady-State
Created By: CDS / Checked By: ACP

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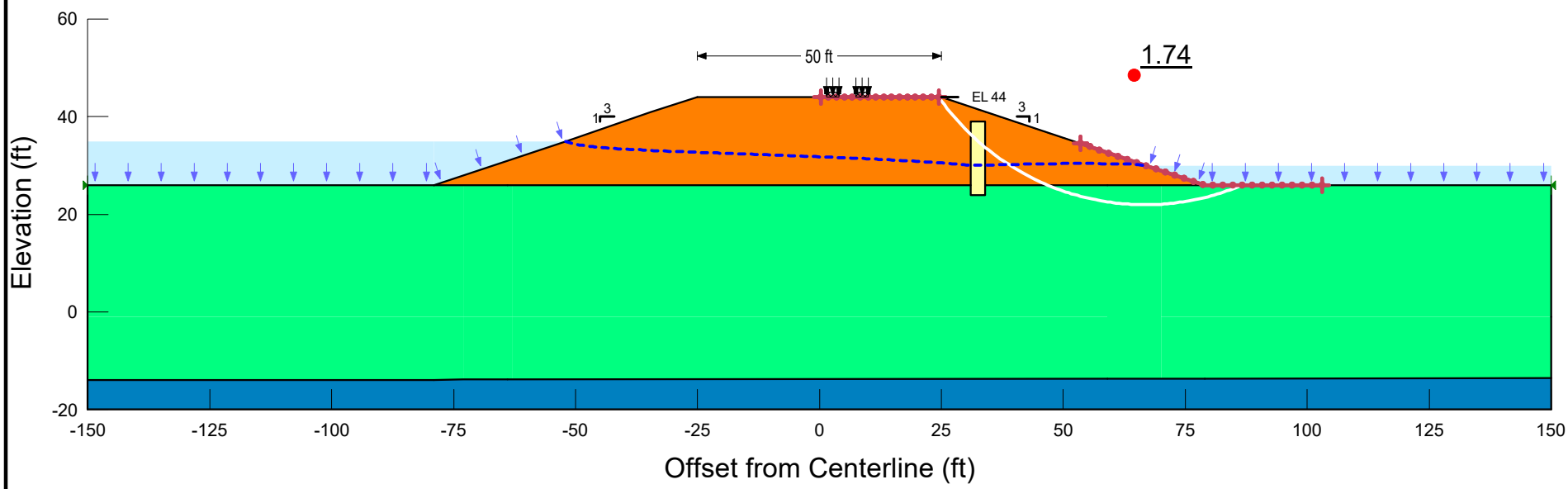
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34

Surcharge 1: 2,560 psf (AASHTO HS-20)
Surcharge 2: 2,560 psf (AASHTO HS-20)



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Pine Lake Dam - STA 14+85
Analysis: 1 - Norm. Operating Conditions Stability
Method: Spencer
Created By: CDS / Checked By: ACP

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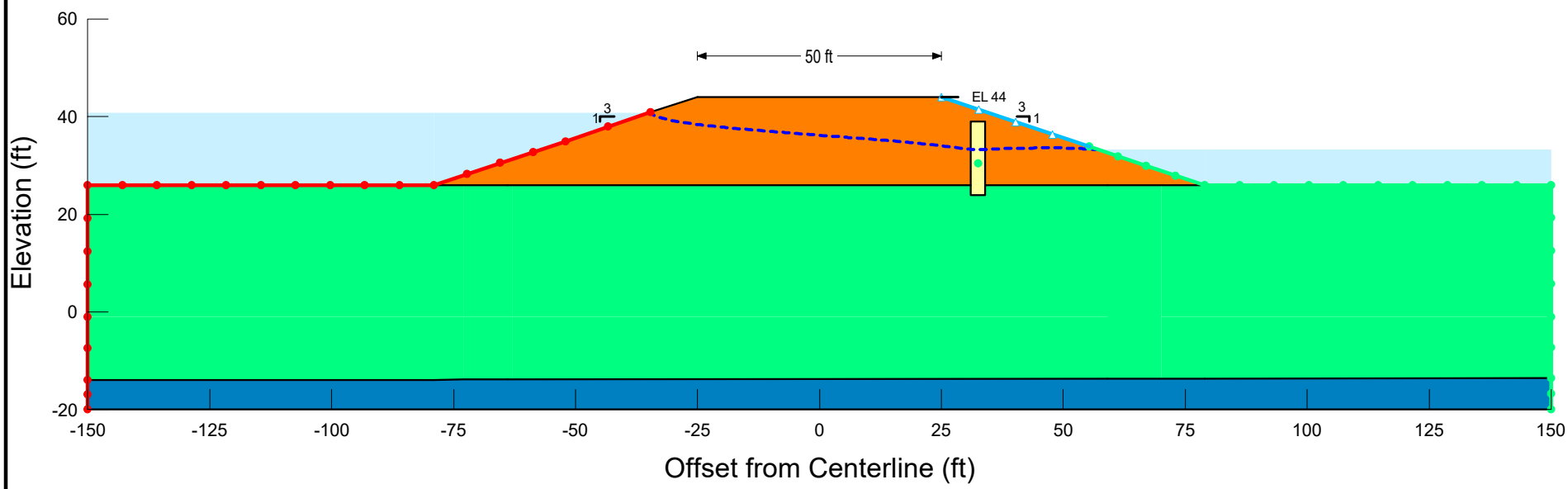
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	1/3 PMP Headwater	Water Total Head	40.8 ft
	1/3 PMP Tailwater	Water Total Head	33.3 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Pine Lake Dam - STA 14+85
Analysis: 2 - 1/3 PMP
Method: Steady-State
Created By: CDS / Checked By: ACP

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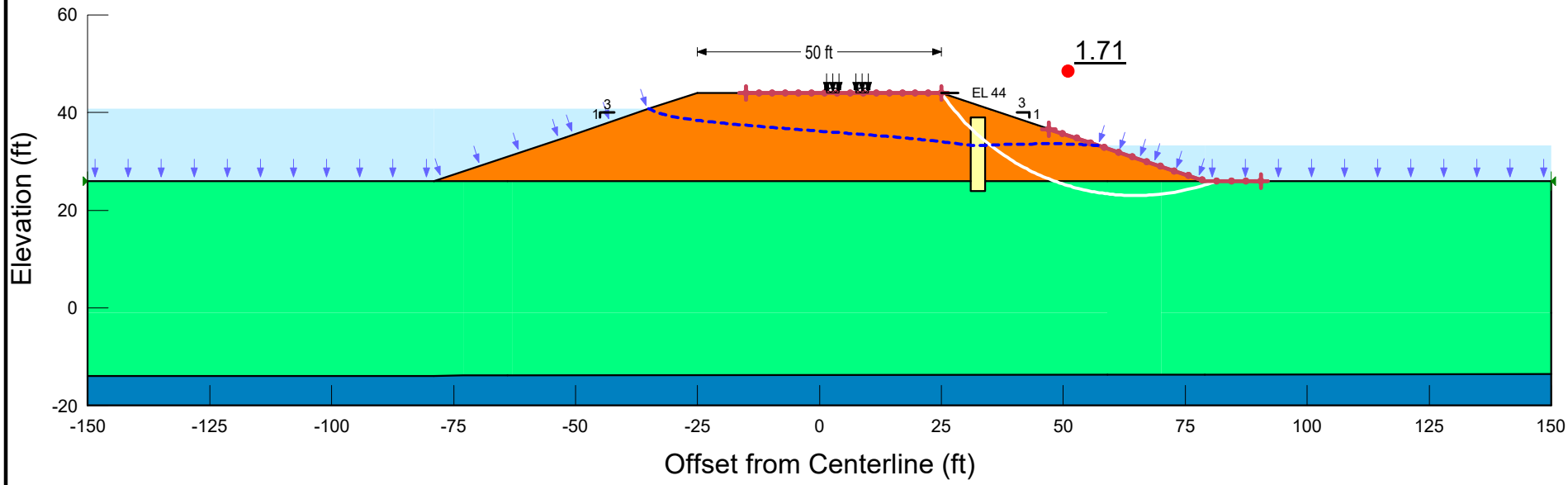
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34

Surcharge 1: 2,560 psf (AASHTO HS-20)
Surcharge 2: 2,560 psf (AASHTO HS-20)



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Pine Lake Dam - STA 14+85
Analysis: 2 - 1/3 PMP Stability
Method: Spencer
Created By: CDS / Checked By: ACP

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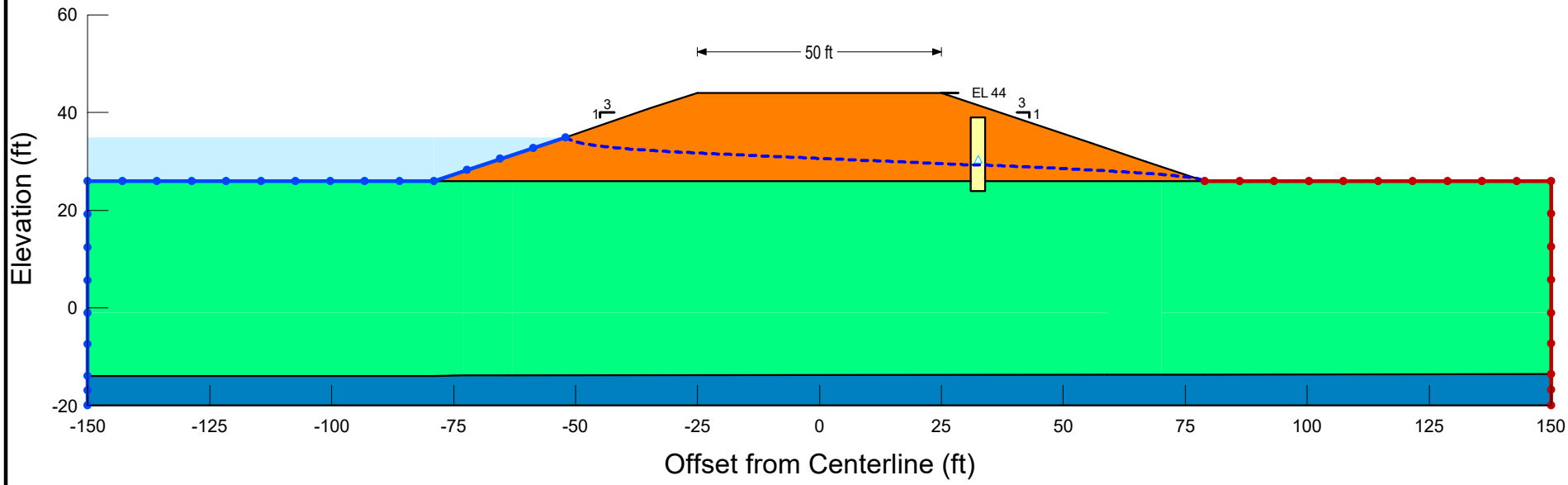
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Bedrock	Saturated Only	0.01	1
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	Maintenance Tailwater	Water Total Head	26 ft
	Normal Headwater	Water Total Head	35 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Pine Lake Dam - STA 14+85
Analysis: 3 - Maintenance Conditions
Method: Steady-State
Created By: CDS / Checked By: ACP

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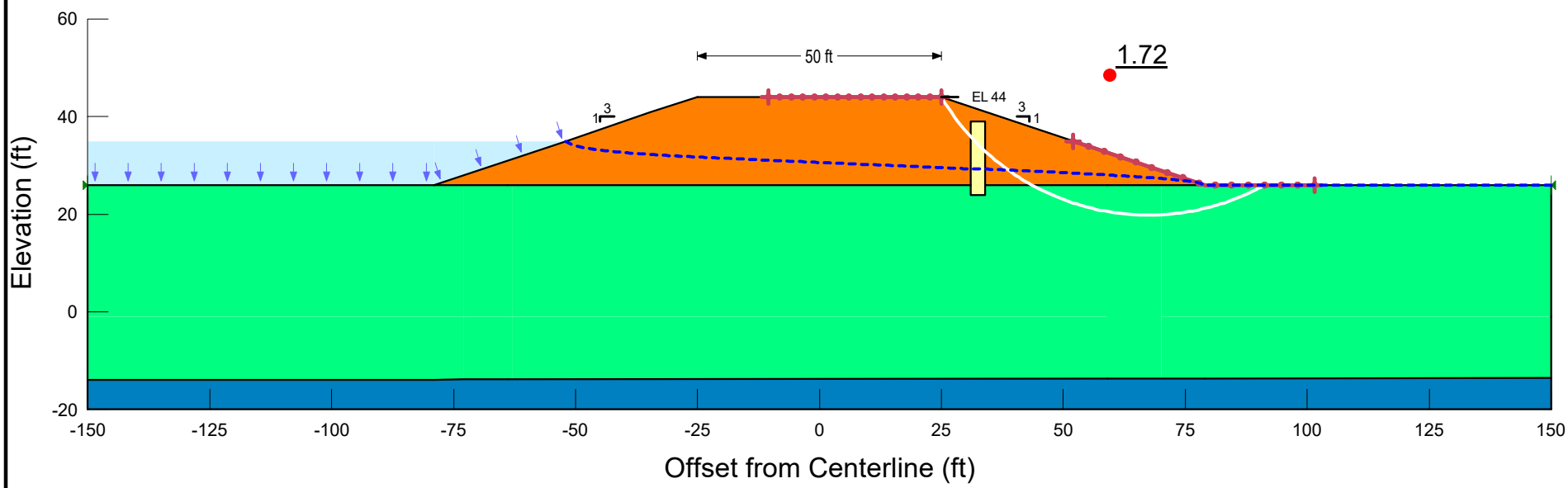
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Bedrock	Bedrock (Impenetrable)			
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Pine Lake Dam - STA 14+85
Analysis: 3 - Maintenance Conditions Stability
Method: Spencer
Created By: CDS / Checked By: ACP

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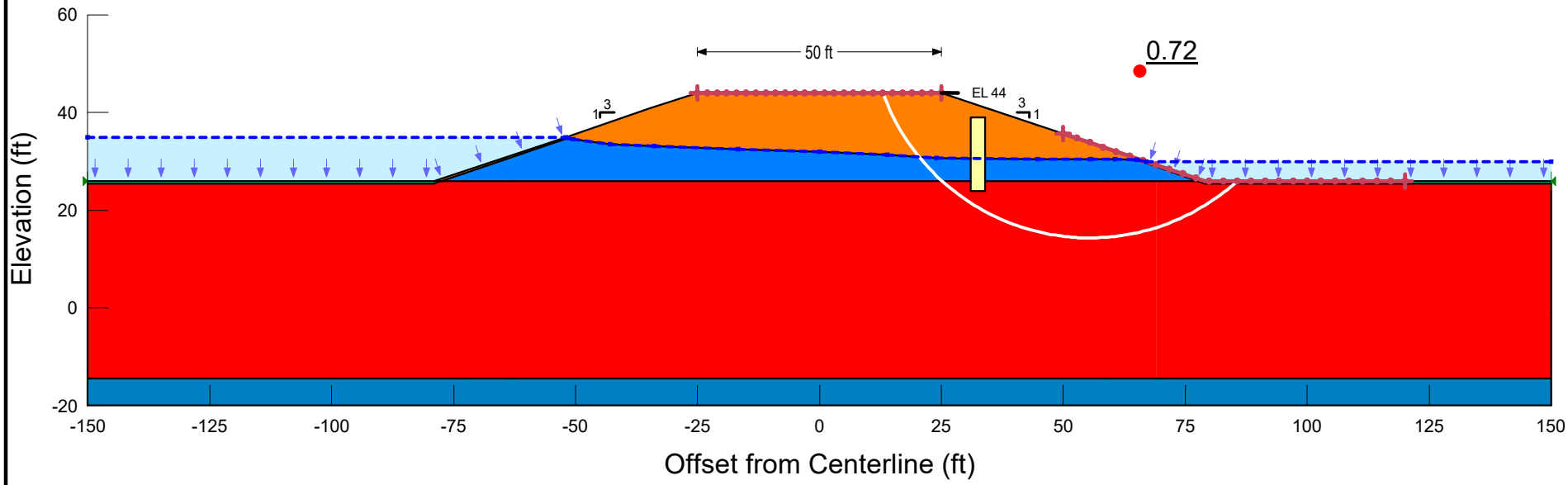
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Fine Drainfill	Mohr-Coulomb	125	0	34	1
	Foundation Bedrock	Bedrock (Impenetrable)				1
	Foundation Soils	Mohr-Coulomb	120	0	29	1
	Foundation Soils - Liquefied	SHANSEP	120			
	Proposed Common Fill	Mohr-Coulomb	125	50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125	50	24	



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Pine Lake Dam - STA 14+85
Analysis: 4 - Post-Earthquake Stability - D/S
Method: Spencer
Created By: CDS / Checked By: ACP

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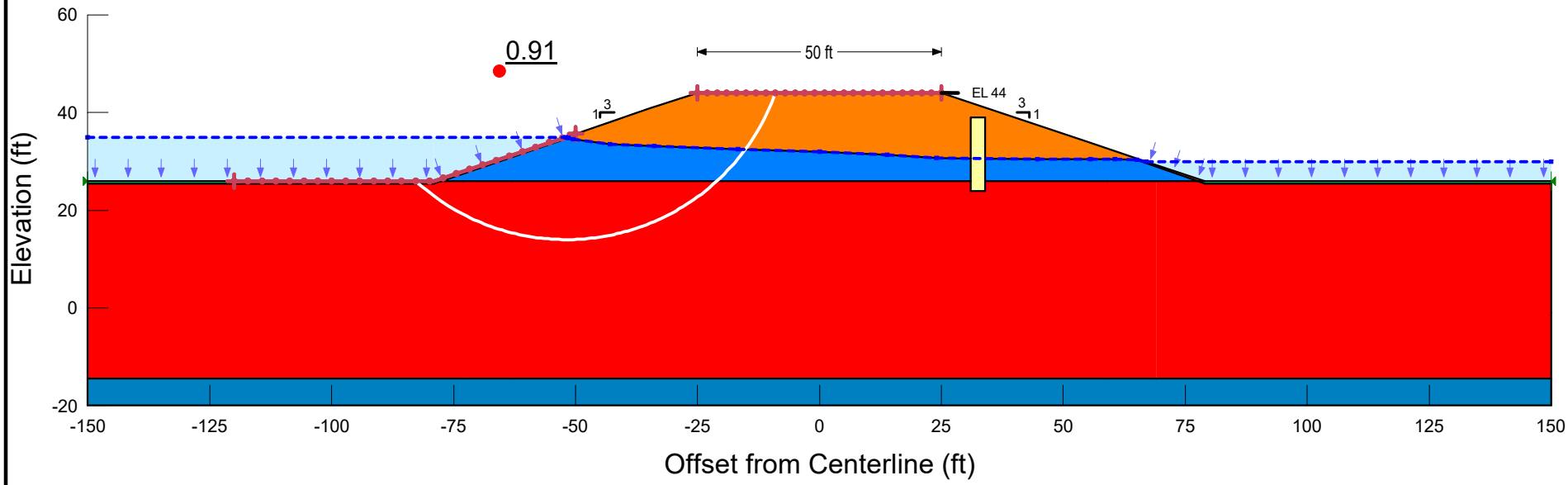
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Fine Drainfill	Mohr-Coulomb	125	0	34	1
	Foundation Bedrock	Bedrock (Impenetrable)				1
	Foundation Soils	Mohr-Coulomb	120	0	29	1
	Foundation Soils - Liquefied	SHANSEP	120			
	Proposed Common Fill	Mohr-Coulomb	125	50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125	50	24	



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Pine Lake Dam - STA 14+85
Analysis: 4 - Post-Earthquake Stability - U/S
Method: Spencer
Created By: CDS / Checked By: ACP

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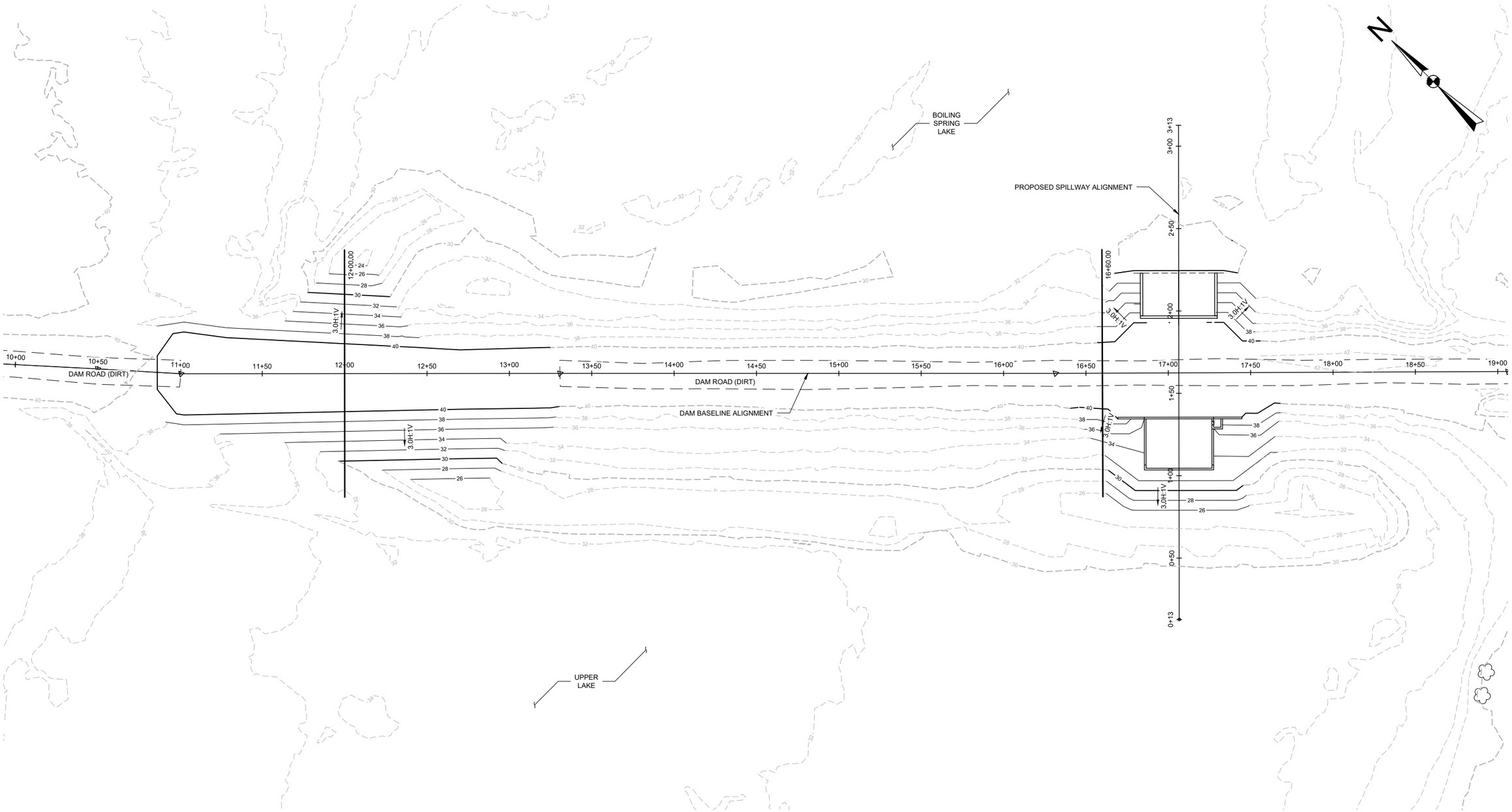

1 UPPER LAKE DAM PROPOSED SITE PLAN

Schnabel ENGINEERING	DAM CONSTRUCTION/RECONSTRUCTION PROJECT BOILING SPRING LAKES, NORTH CAROLINA MCGILL ASSOCIATES, P.A. SCHNABEL PROJECT NO. 19C21022	UPPER LAKE DAM PROPOSED SITE PLAN

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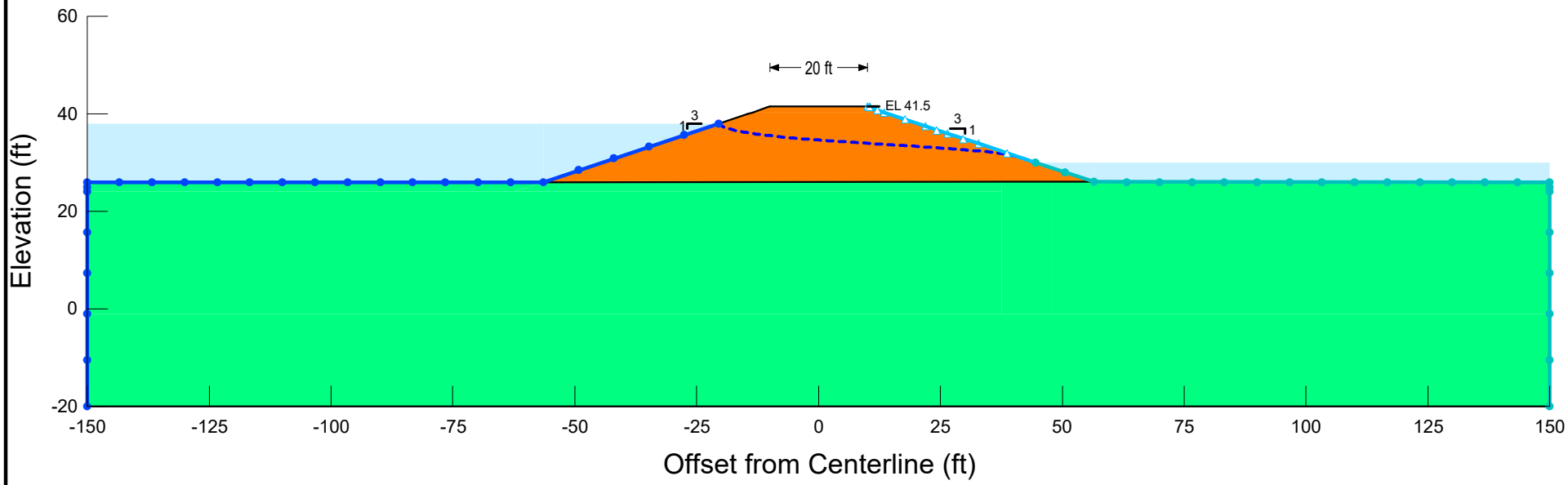
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5

Color	Name	Kind	Parameters
	Normal Headwater	Water Total Head	38 ft
	Normal Tailwater - No MLD	Water Total Head	30 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 1 - Norm. Operating Conditions - No MLD
Method: Steady-State
Created By: CDS / Checked By: ACP

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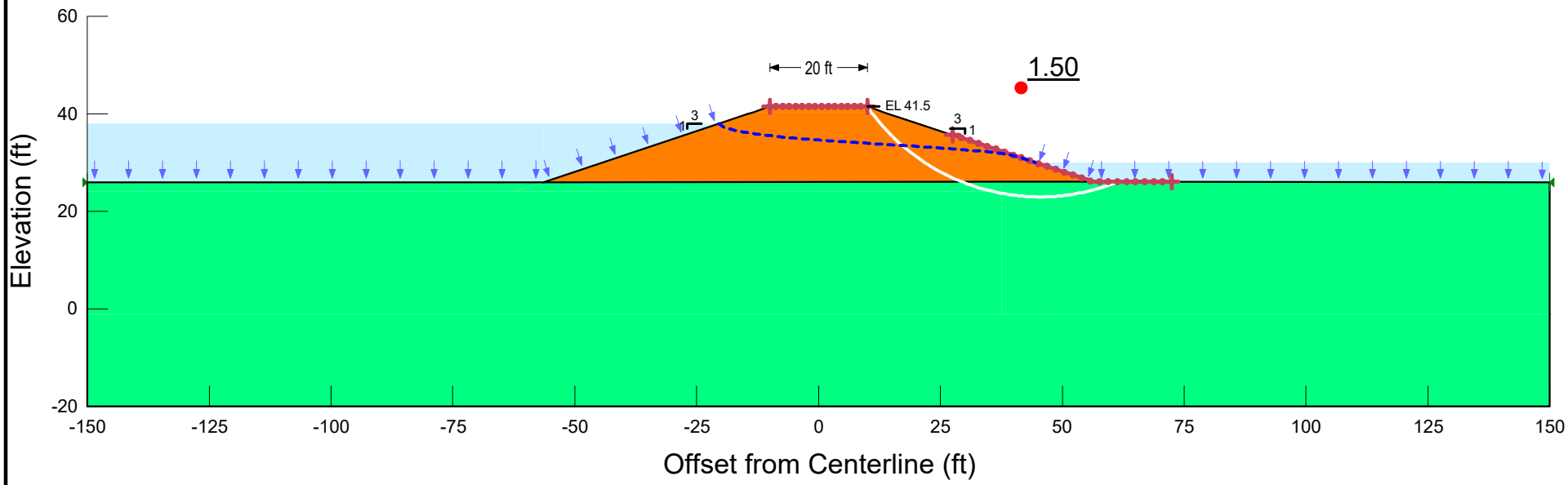
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 1 - Norm. Operating Conditions Stability - No MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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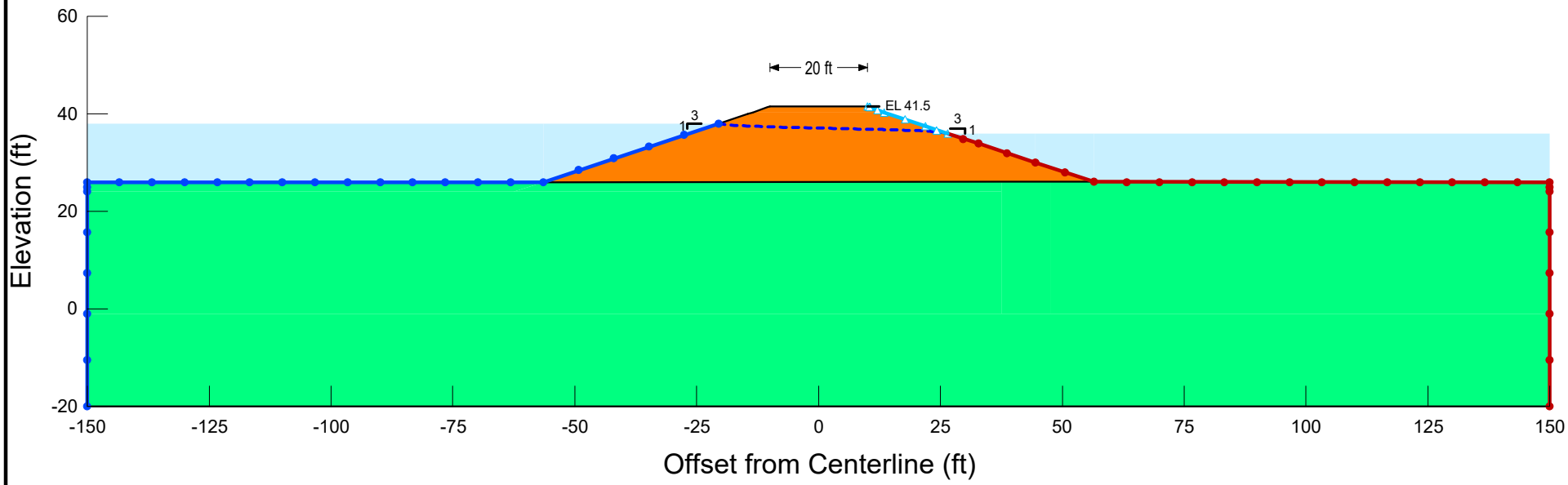
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5

Color	Name	Kind	Parameters
	Normal Headwater	Water Total Head	38 ft
	Normal Tailwater - w/MLD	Water Total Head	36 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 1 - Norm. Operating Conditions - w/MLD
Method: Steady-State
Created By: CDS / Checked By: ACP

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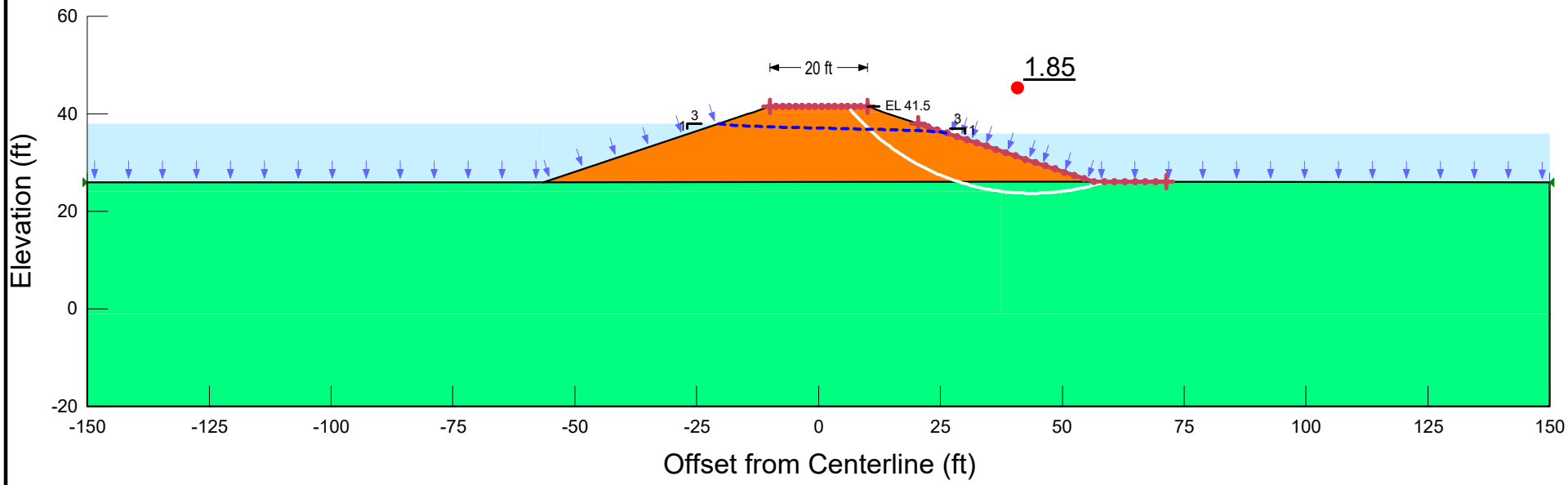
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 1 - Norm. Operating Conditions Stability - w/MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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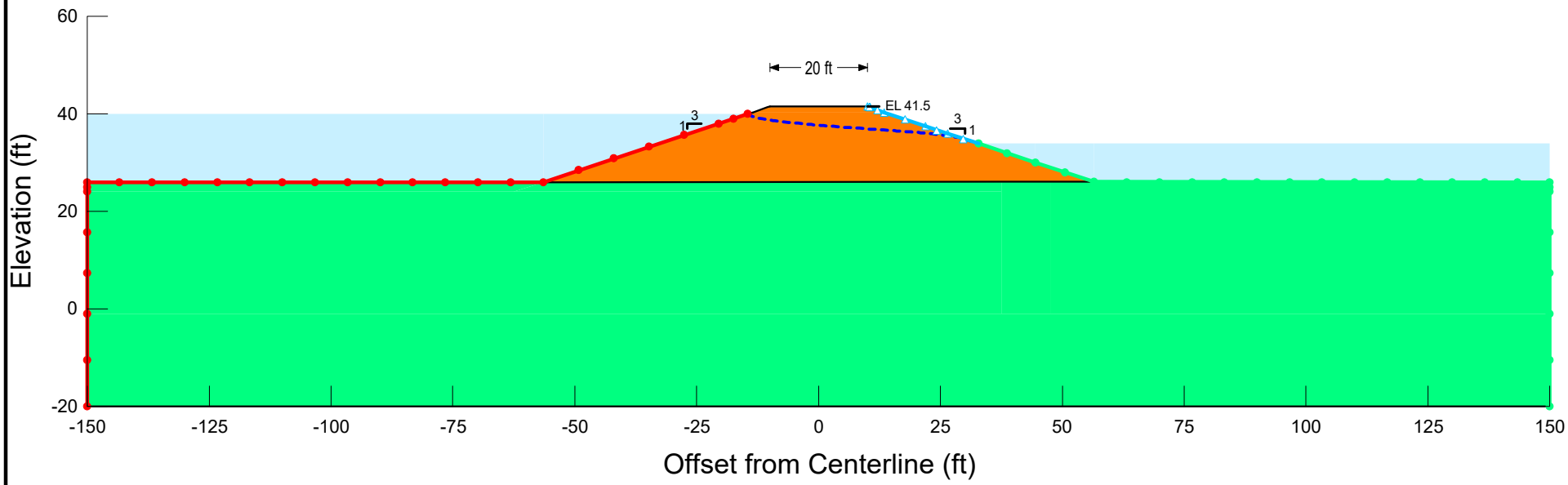
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5

Color	Name	Kind	Parameters
	1/3 PMP Headwater	Water Total Head	40 ft
	1/3 PMP Tailwater - No MLD	Water Total Head	33.9 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 2 - 1/3 PMP - No MLD
Method: Steady-State
Created By: CDS / Checked By: ACP

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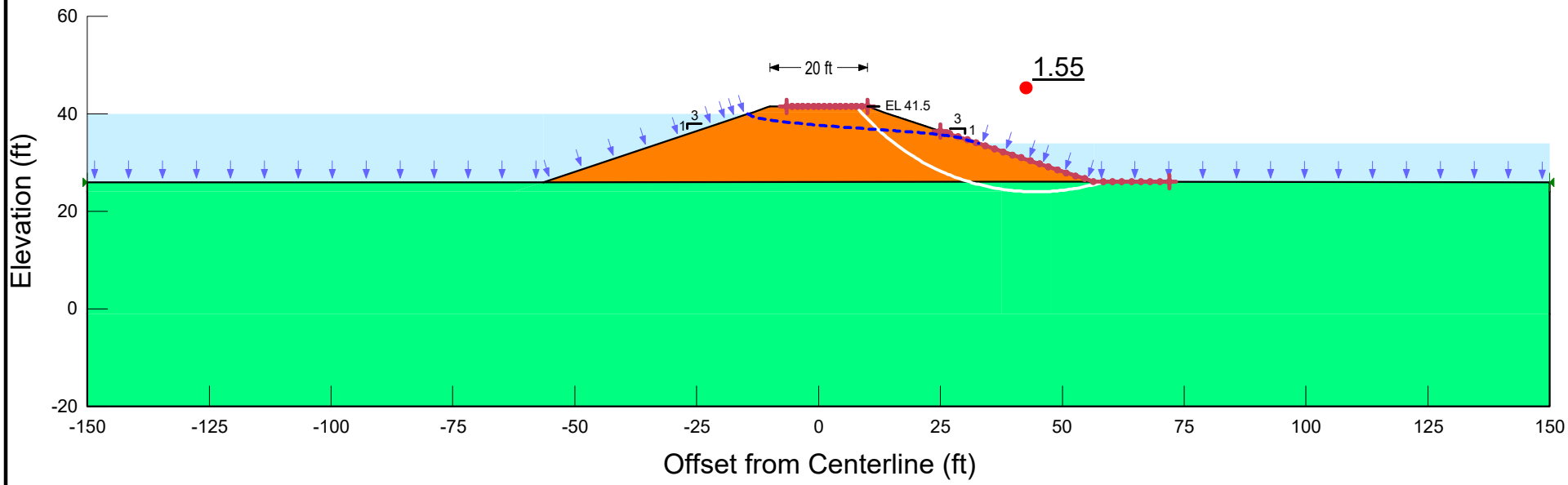
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 2 - 1/3 PMP Stability - No MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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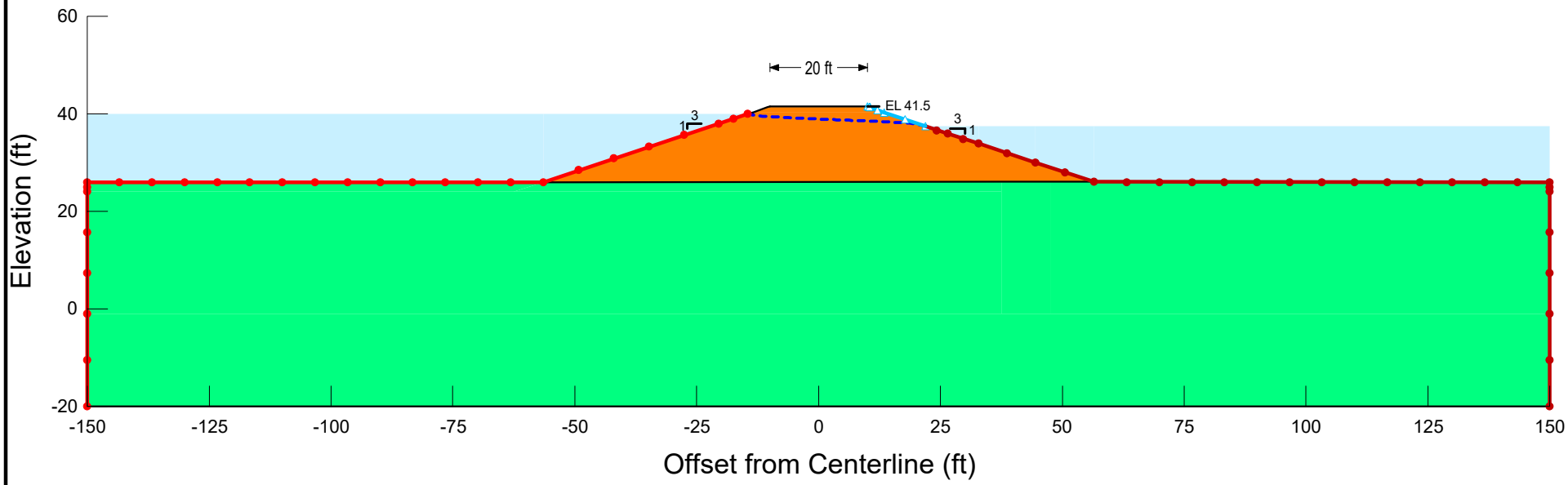
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5

Color	Name	Kind	Parameters
	1/3 PMP Headwater	Water Total Head	40 ft
	1/3 PMP Tailwater - w/MLD	Water Total Head	37.5 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 2 - 1/3 PMP - w/MLD
Method: Steady-State
Created By: CDS / Checked By: ACP

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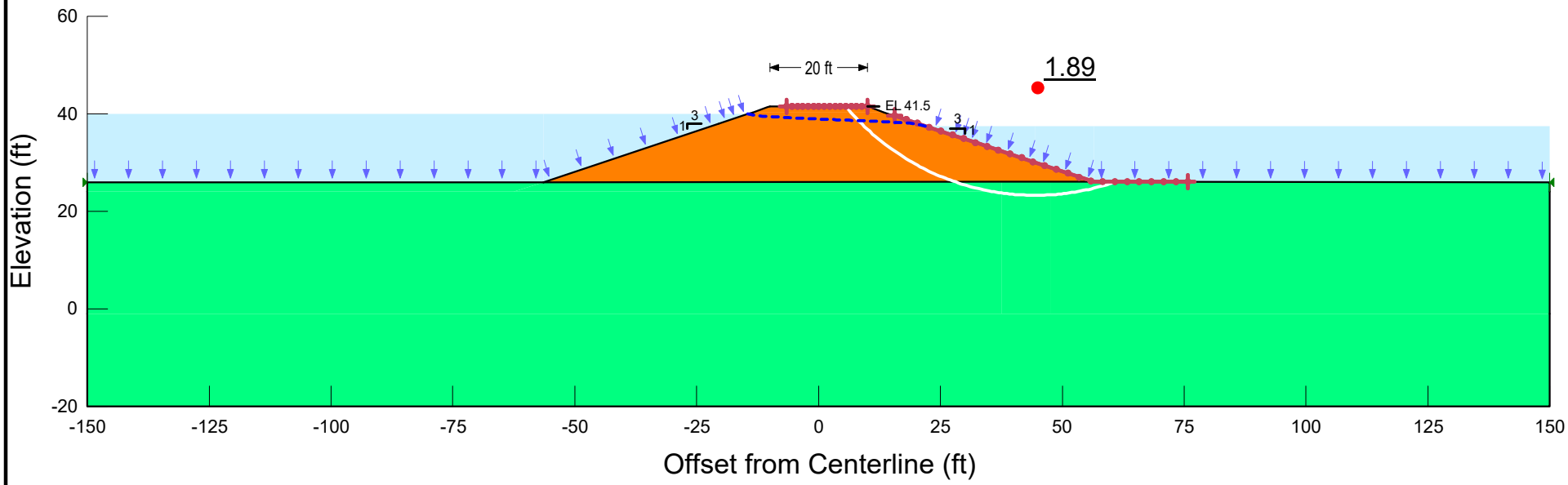
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 2 - 1/3 PMP Stability - w/MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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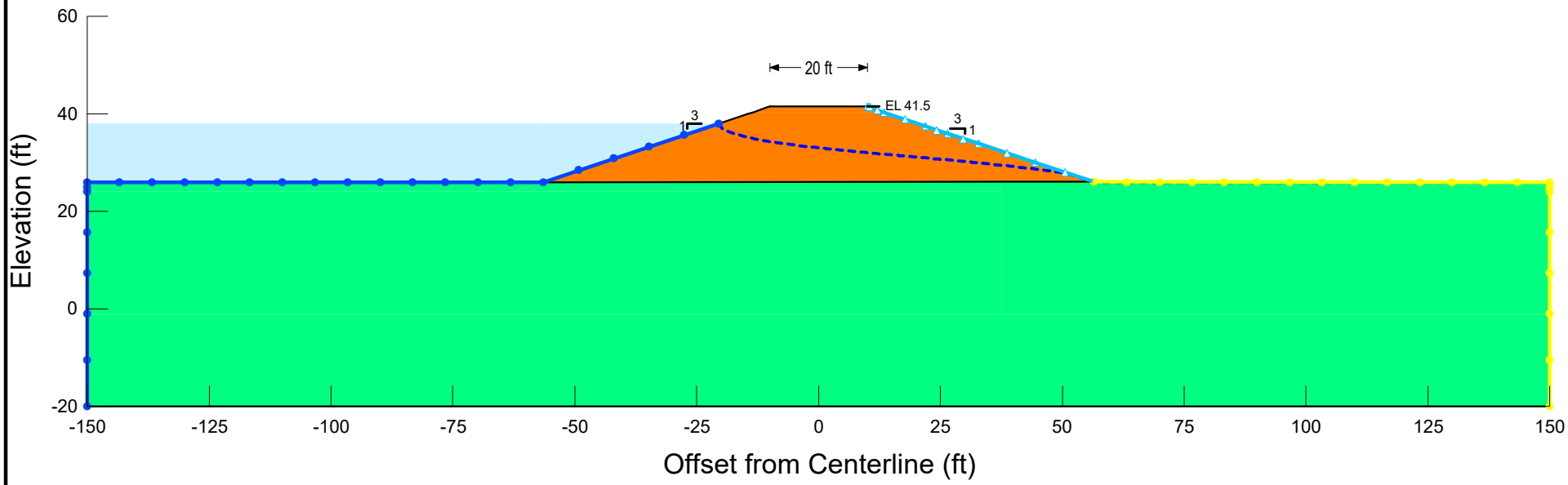
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5

Color	Name	Kind	Parameters
	Maintenance Tailwater	Water Total Head	26 ft
	Normal Headwater	Water Total Head	38 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 3 - Maintenance Conditions
Method: Steady-State
Created By: CDS / Checked By: ACP

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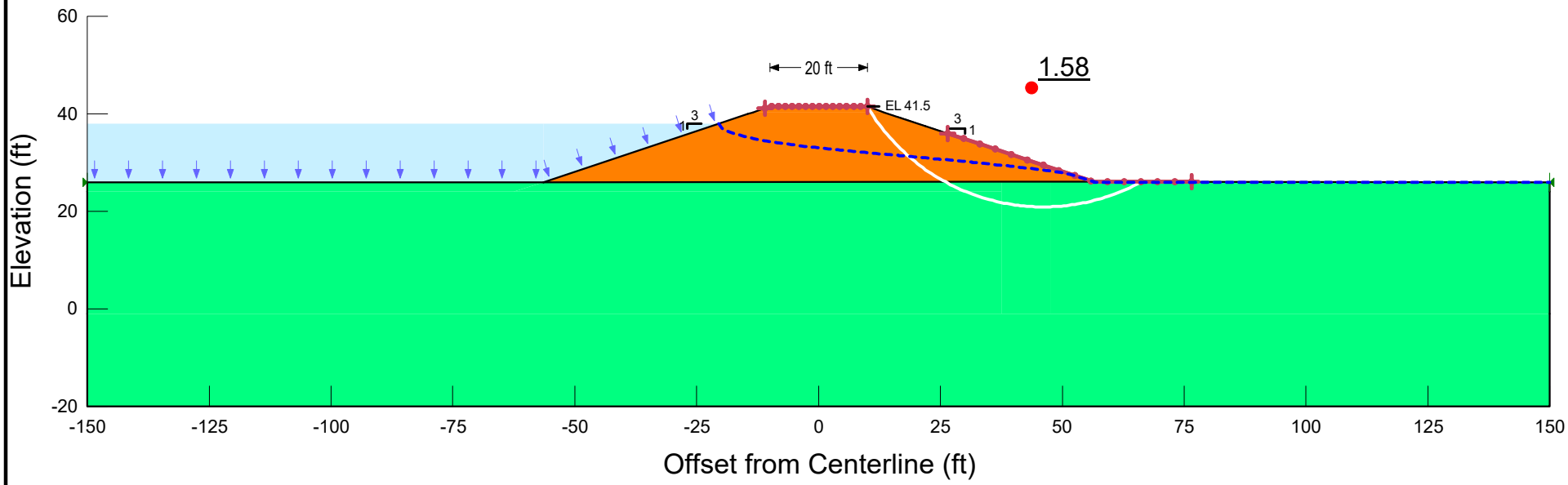
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Foundation Soils	Mohr-Coulomb	120	0	29
	Proposed Common Fill	Mohr-Coulomb	125	50	32



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 3 - Maintenance Conditions Stability
Method: Spencer
Created By: CDS / Checked By: ACP

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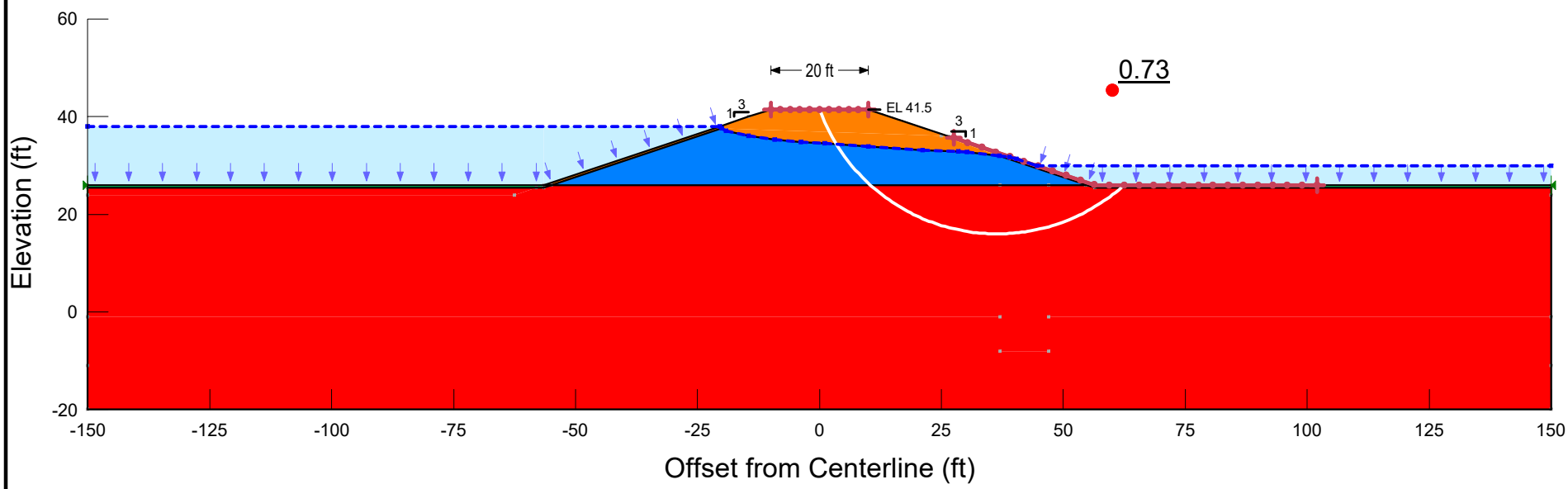
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Proposed Common Fill	Mohr-Coulomb	125			50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125			50	24	



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 4 - Post-Earthquake Stability - D/S - No MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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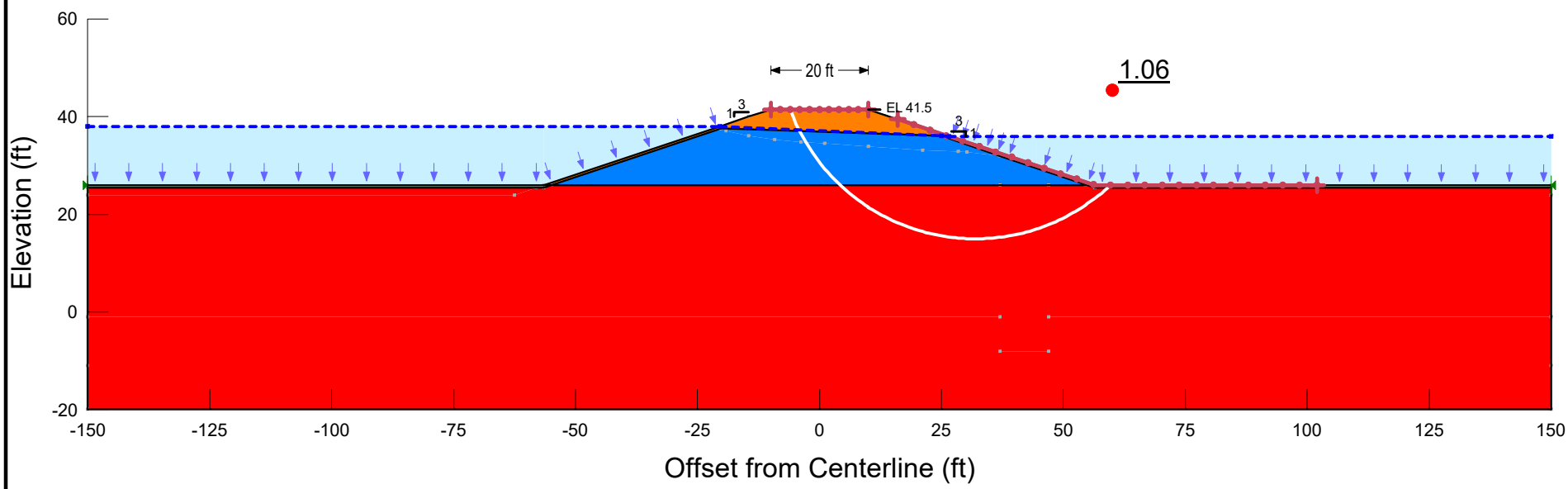
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Proposed Common Fill	Mohr-Coulomb	125			50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125			50	24	



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 4 - Post-Earthquake Stability - D/S - w/MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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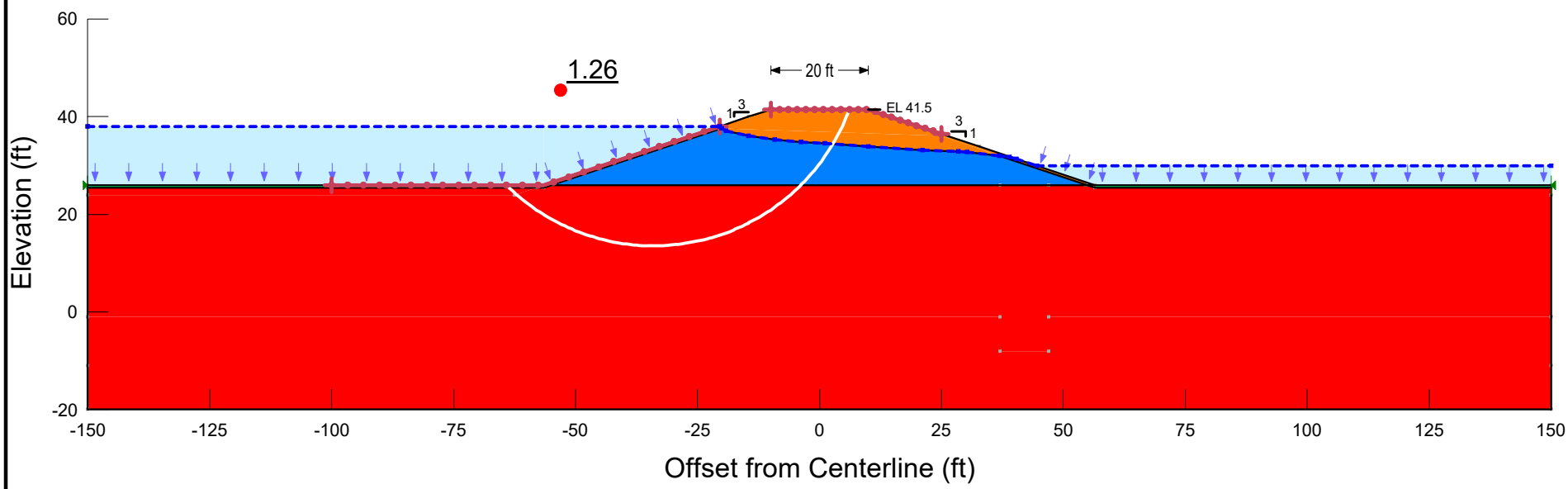
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Proposed Common Fill	Mohr-Coulomb	125			50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125			50	24	



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 4 - Post-Earthquake Stability - U/S - No MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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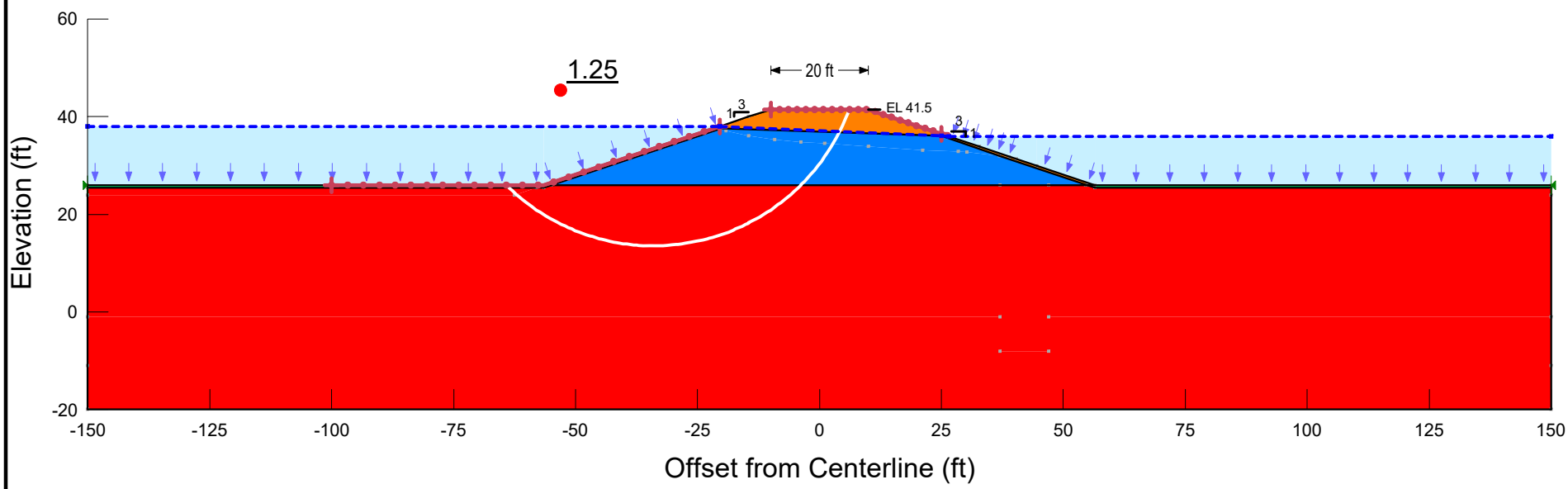
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Proposed Common Fill	Mohr-Coulomb	125			50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125			50	24	



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 12+00
Analysis: 4 - Post-Earthquake Stability - U/S - w/MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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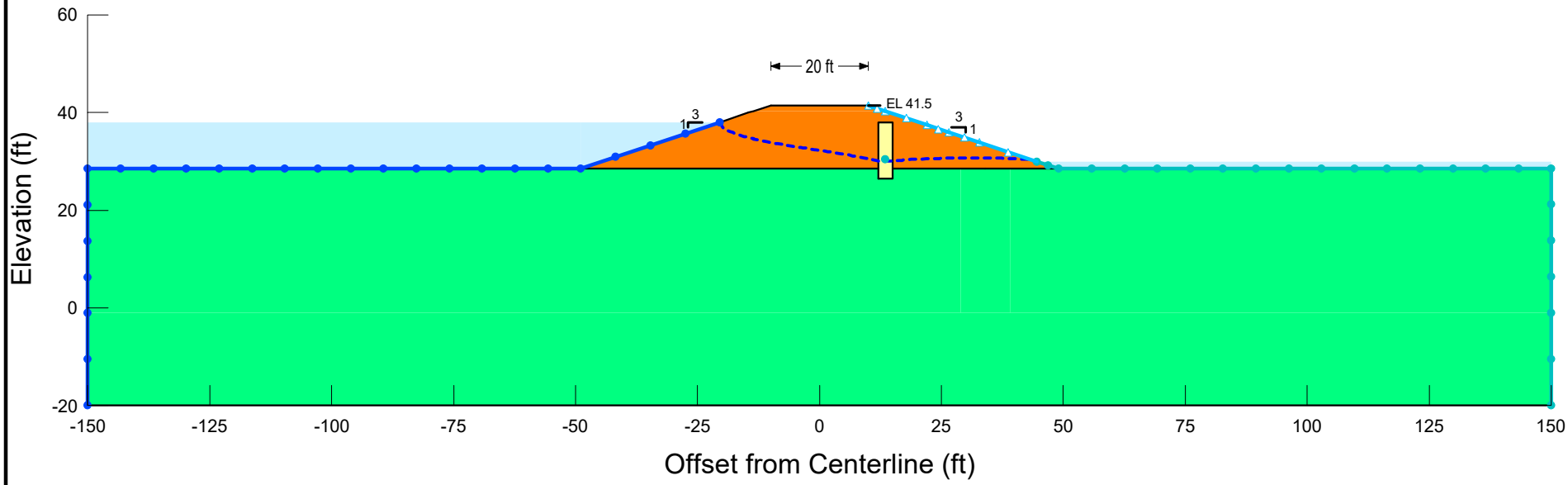
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	Normal Headwater	Water Total Head	38 ft
	Normal Tailwater - No MLD	Water Total Head	30 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+75
Analysis: 1 - Norm. Operating Conditions - No MLD
Method: Steady-State
Created By: CDS / Checked By: ACP

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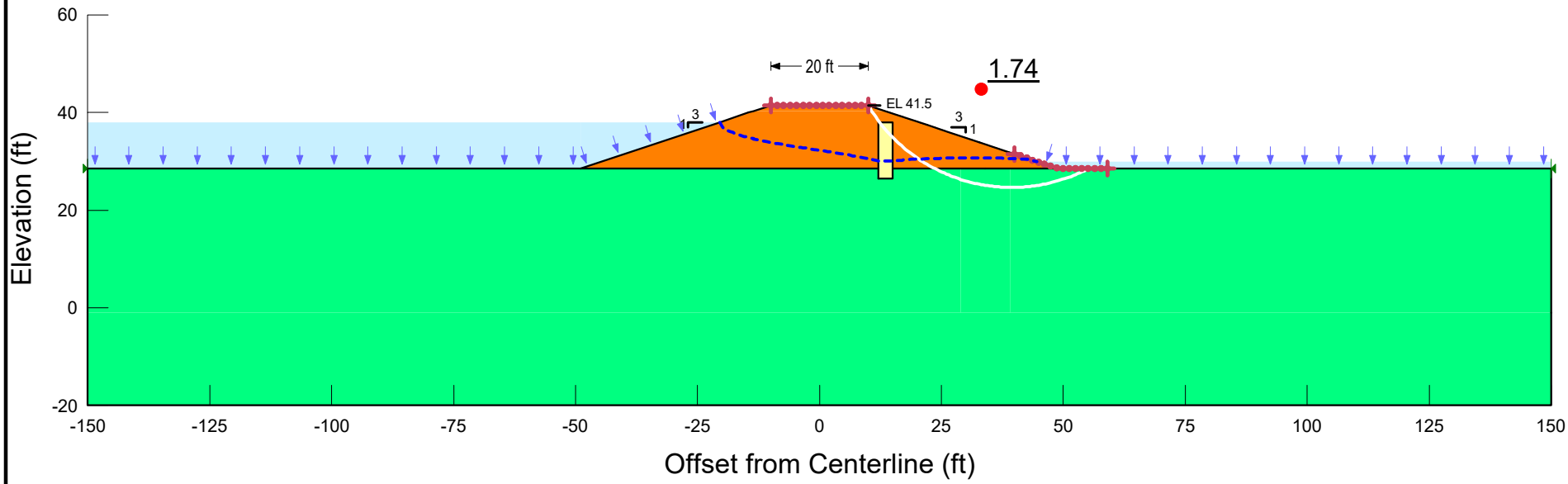
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)
	Foundation Soils	Mohr-Coulomb	120	0	29	0
	Proposed Common Fill	Mohr-Coulomb	125	50	32	0
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34	0



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+75
Analysis: 1 - Norm. Operating Conditions Stability - No MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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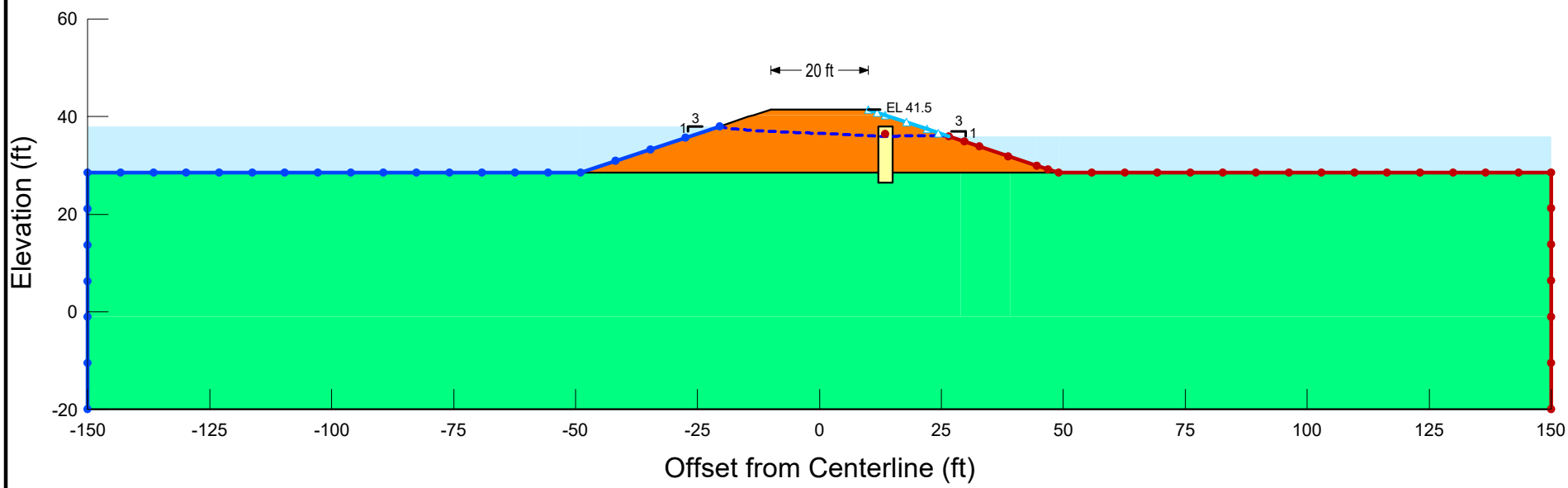
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	Normal Headwater	Water Total Head	38 ft
	Normal Tailwater - w/MLD	Water Total Head	36 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+75
Analysis: 1 - Norm. Operating Conditions - w/MLD
Method: Steady-State
Created By: CDS / Checked By: ACP

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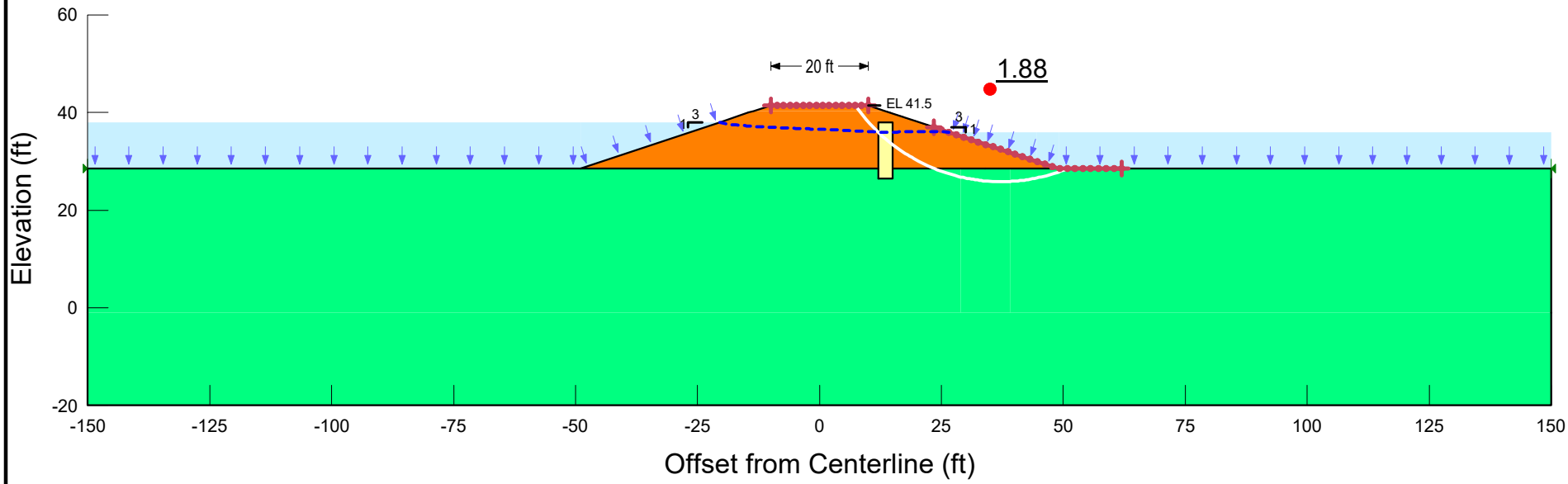
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)
	Foundation Soils	Mohr-Coulomb	120	0	29	0
	Proposed Common Fill	Mohr-Coulomb	125	50	32	0
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34	0



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+75
Analysis: 1 - Norm. Operating Conditions Stability - w/MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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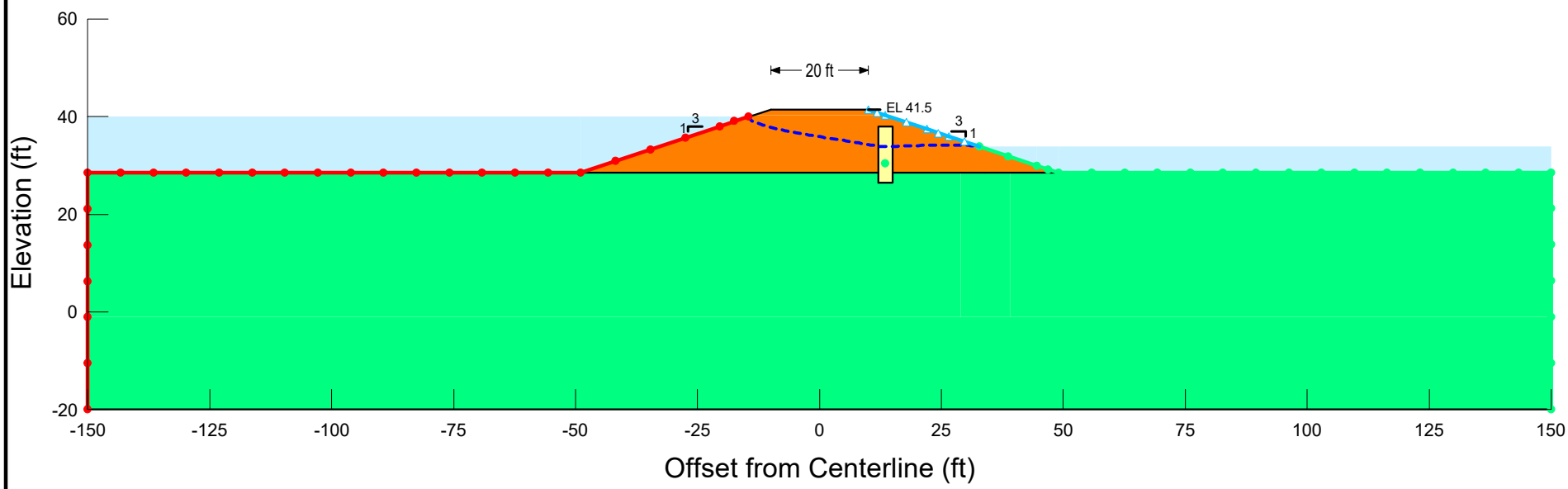
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	1/3 PMP Headwater	Water Total Head	40 ft
	1/3 PMP Tailwater - No MLD	Water Total Head	33.9 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+75
Analysis: 2 - 1/3 PMP - No MLD
Method: Steady-State
Created By: CDS / Checked By: ACP

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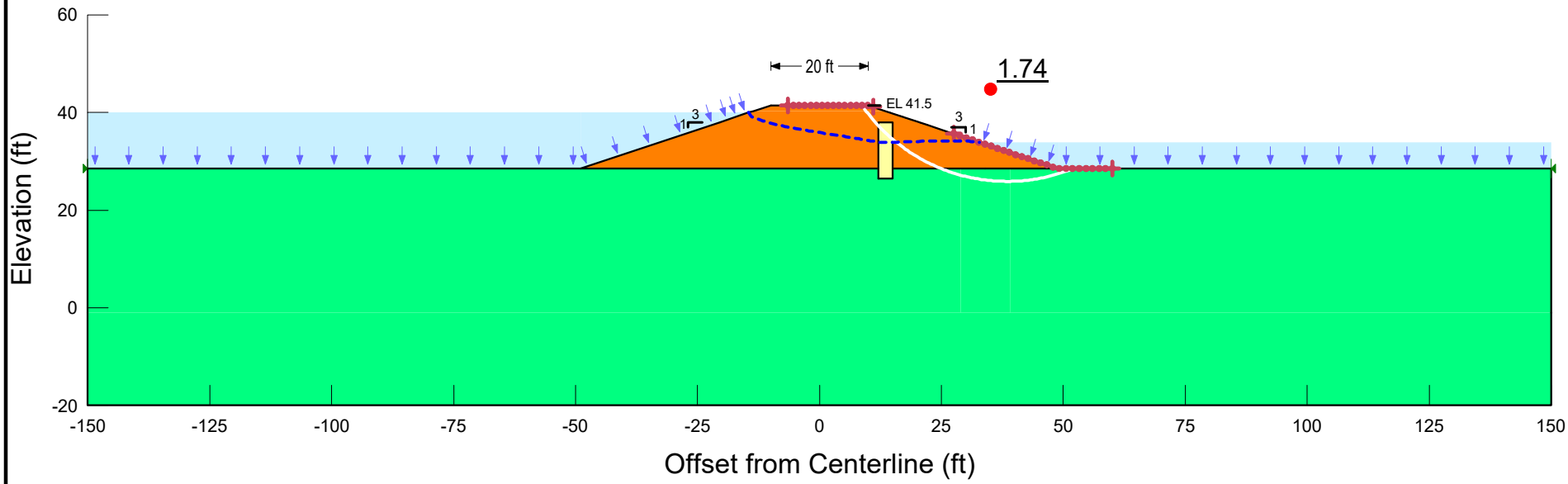
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)
	Foundation Soils	Mohr-Coulomb	120	0	29	0
	Proposed Common Fill	Mohr-Coulomb	125	50	32	0
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34	0



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+75
Analysis: 2 - 1/3 PMP Stability - No MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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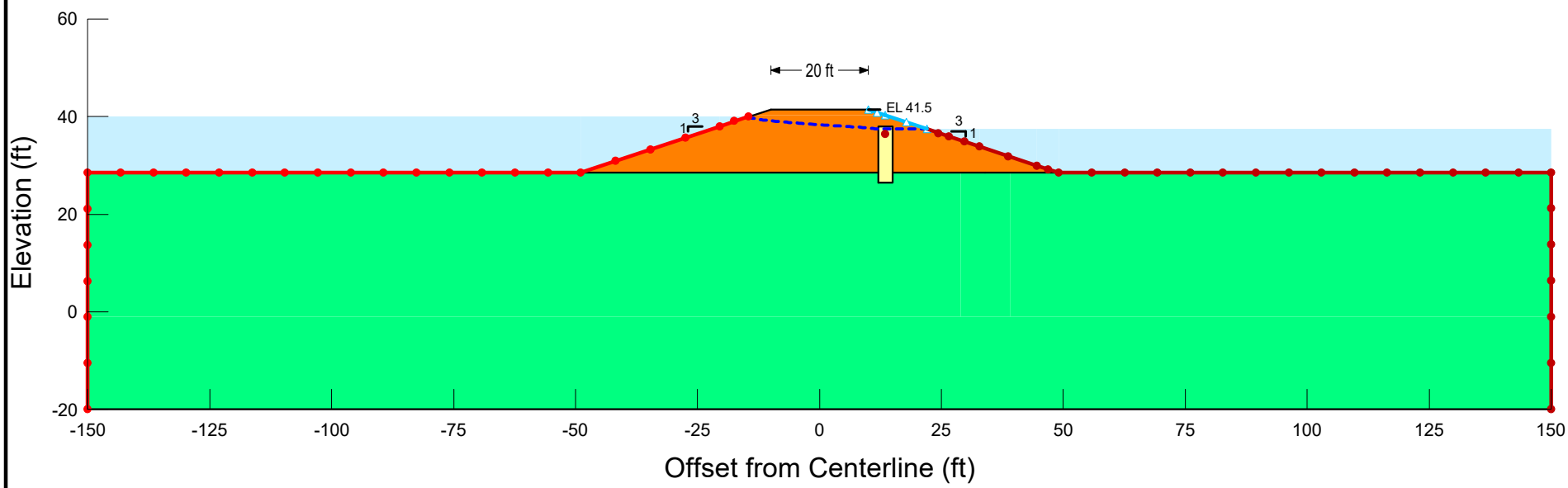
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	1/3 PMP Headwater	Water Total Head	40 ft
	1/3 PMP Tailwater - w/MLD	Water Total Head	37.5 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+75
Analysis: 2 - 1/3 PMP - w/MLD
Method: Steady-State
Created By: CDS / Checked By: ACP

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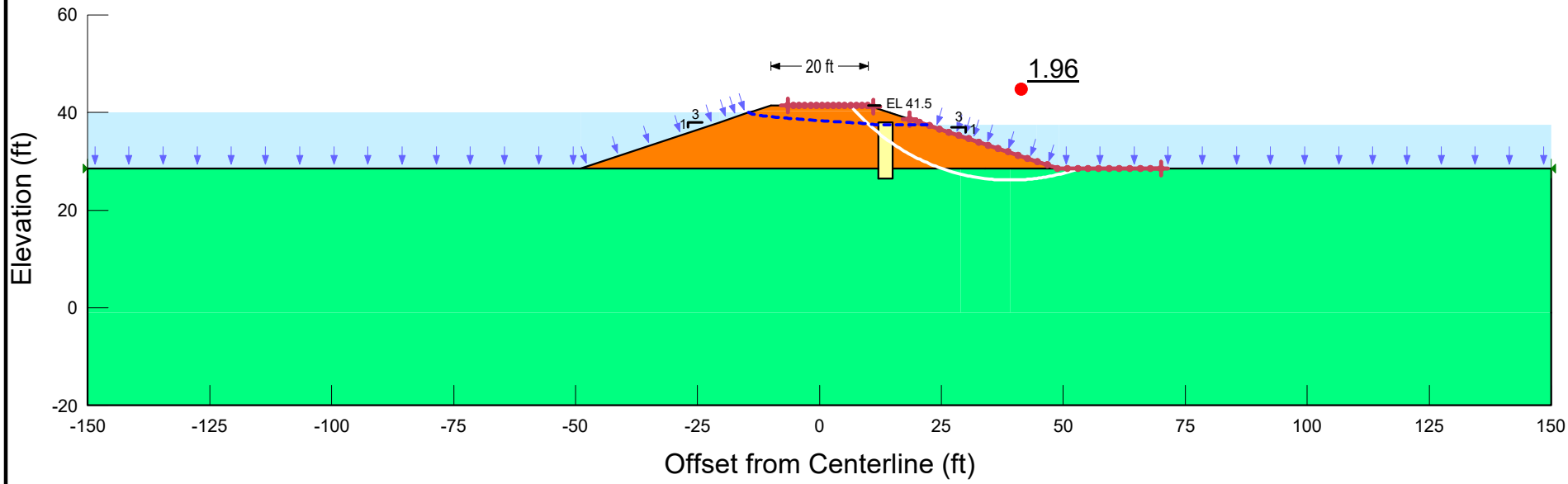
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)
	Foundation Soils	Mohr-Coulomb	120	0	29	0
	Proposed Common Fill	Mohr-Coulomb	125	50	32	0
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34	0



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+75
Analysis: 2 - 1/3 PMP Stability - w/MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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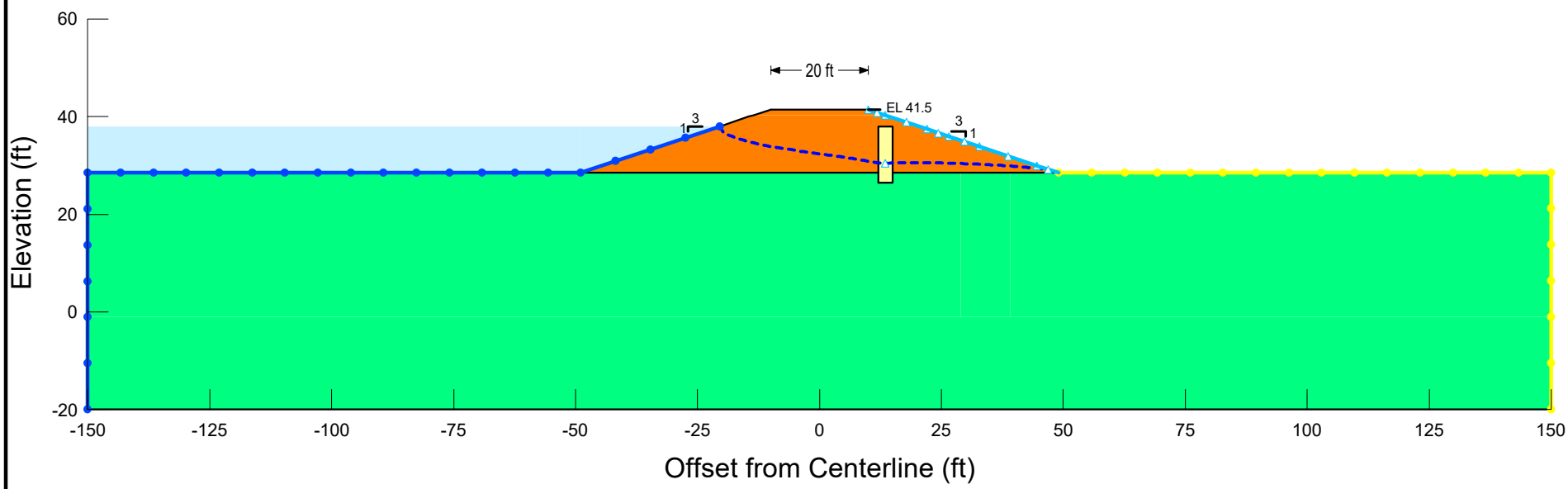
Color	Name	Model	Sat Kx (cm/sec)	Ky'/Kx' Ratio
	Foundation Soils	Saturated Only	0.001	0.5
	Proposed Common Fill	Saturated Only	0.0001	0.5
	Proposed Fine Drainfill	Saturated Only	0.01	1

Color	Name	Kind	Parameters
	Maintenance Tailwater	Water Total Head	28.5 ft
	Normal Headwater	Water Total Head	38 ft
	Potential Seepage Face	Water Rate	0 ft³/sec



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+75
Analysis: 3 - Maintenance Conditions
Method: Steady-State
Created By: CDS / Checked By: ACP

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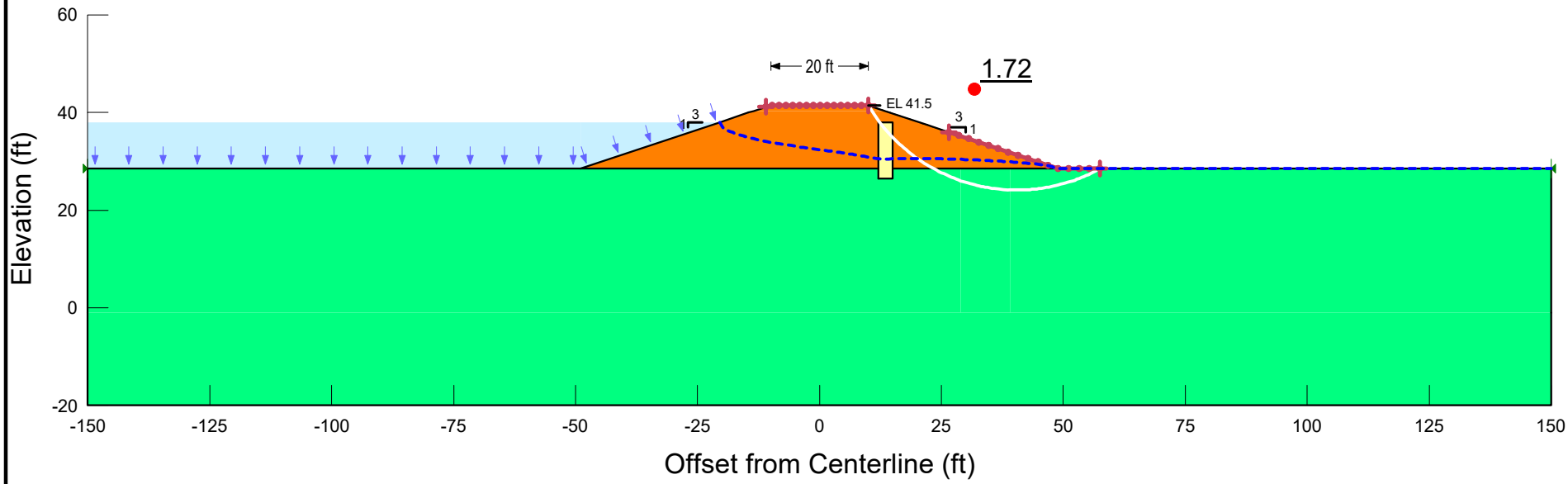
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)
	Foundation Soils	Mohr-Coulomb	120	0	29	0
	Proposed Common Fill	Mohr-Coulomb	125	50	32	0
	Proposed Fine Drainfill	Mohr-Coulomb	125	0	34	0



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+75
Analysis: 3 - Maintenance Conditions Stability
Method: Spencer
Created By: CDS / Checked By: ACP

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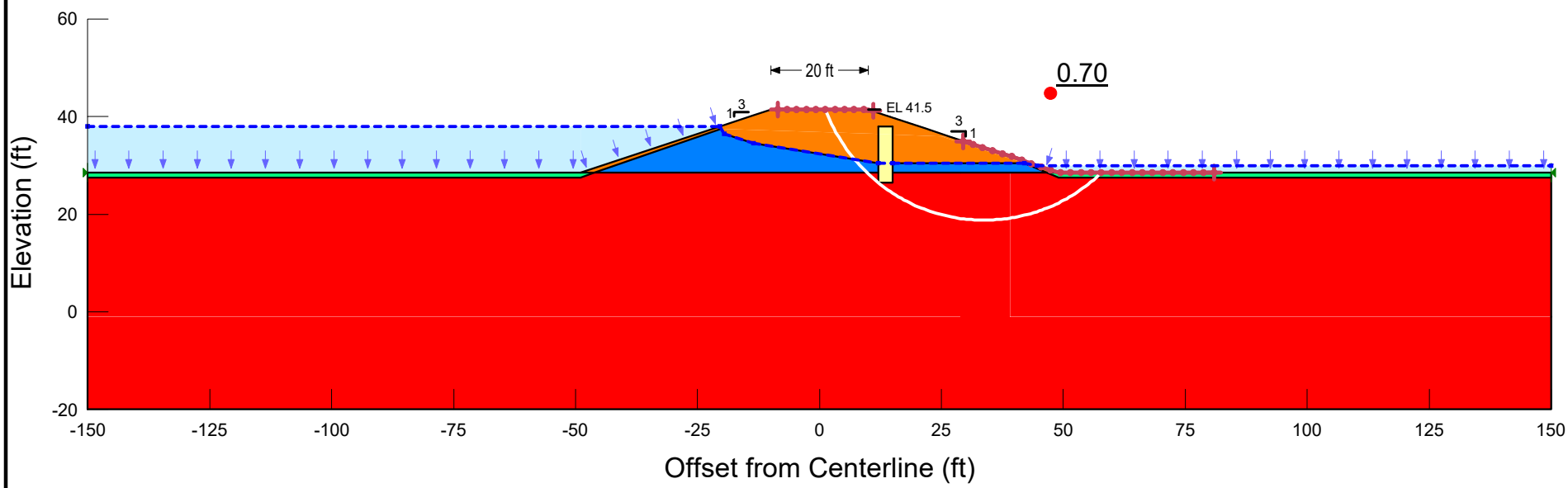
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Fine Drainfill	Mohr-Coulomb	125			0	34	1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Proposed Common Fill	Mohr-Coulomb	125			50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125			50	24	



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+60
Analysis: 4 - Post-Earthquake Stability - D/S - No MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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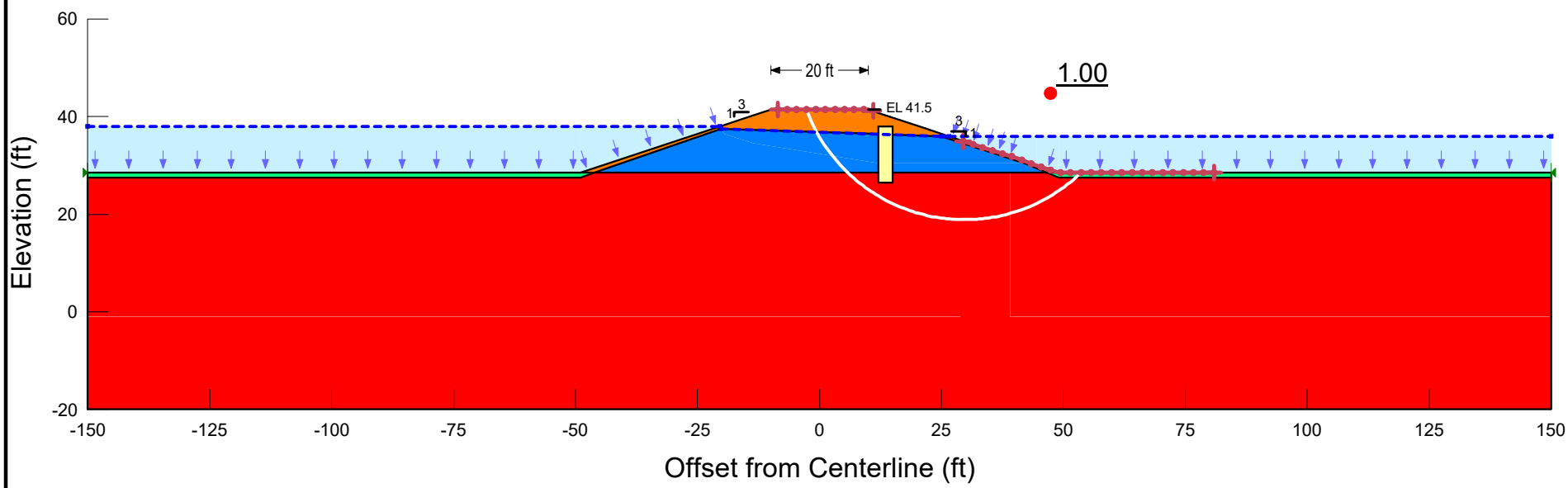
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Fine Drainfill	Mohr-Coulomb	125			0	34	1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Proposed Common Fill	Mohr-Coulomb	125			50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125			50	24	



Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+60
Analysis: 4 - Post-Earthquake Stability - D/S - w/MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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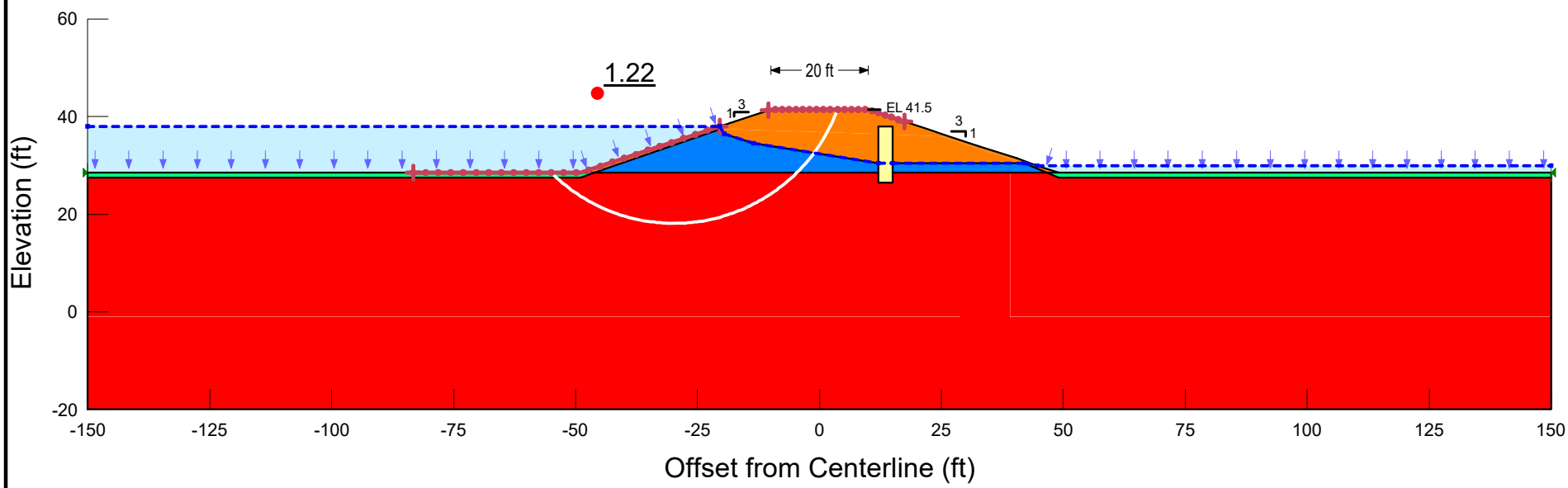
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Fine Drainfill	Mohr-Coulomb	125			0	34	1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Proposed Common Fill	Mohr-Coulomb	125			50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125			50	24	



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+60
Analysis: 4 - Post-Earthquake Stability - U/S - No MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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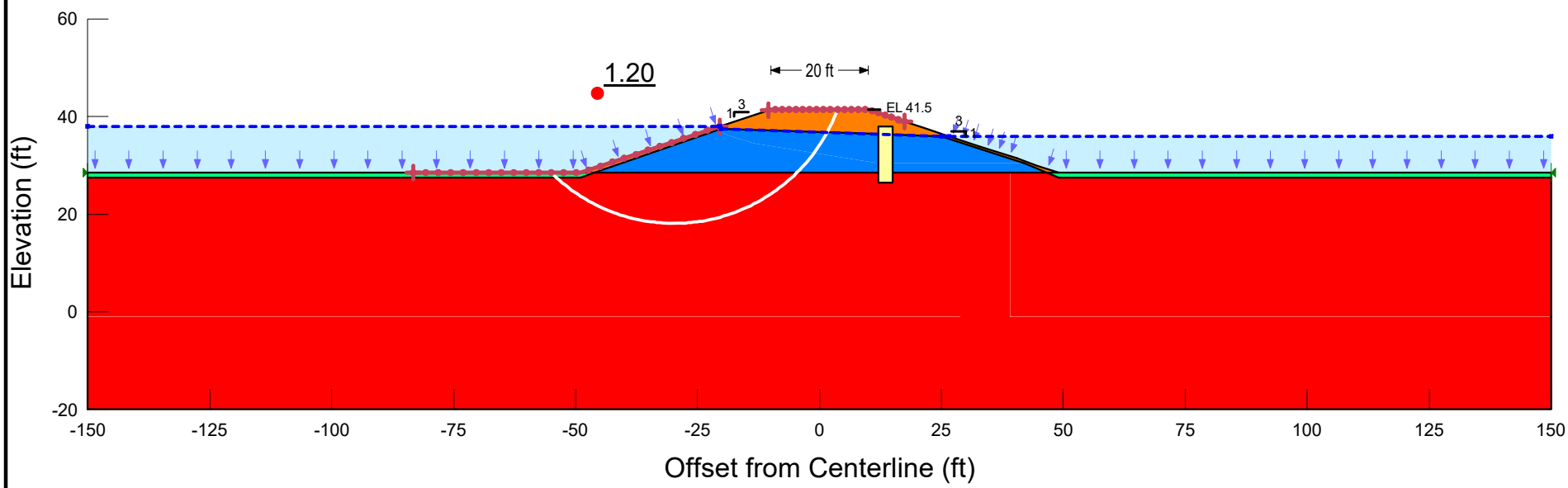
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Fine Drainfill	Mohr-Coulomb	125			0	34	1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Proposed Common Fill	Mohr-Coulomb	125			50	32	1
	Proposed Common Fill - Undrained	Mohr-Coulomb	125			50	24	



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Upper Lake Dam - STA 16+60
Analysis: 4 - Post-Earthquake Stability - U/S - w/MLD
Method: Spencer
Created By: CDS / Checked By: ACP

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CALCULATION COVER SHEET

Project Boiling Spring Lakes Dams Construction/Reconstruction	**Project Number** 19C21022
Title Soil and Rock Properties	
Computer Programs Used Microsoft Excel	**Version/Release No.** 2016

Purpose and Objective

Develop soil parameters for use in geotechnical and structural designs and analyses for Sanford Dam, North Lake Dam, Pine Lake Dam, and Upper Lake Dam.

Summary of Conclusions

See attached memorandum and calculations.

Originator			
Austin Spencer, PE			Jul 24, 2020
	Print	Sign	Date
Checker			
Adam Paisley, PE		Emily Gibson	Jul 24, 2020
	Print	Sign	Date
Reviewer			
Gerald Robblee, PE			Jul 17, 2020
	Print	Sign	Date

SCHNABEL ENGINEERING SOUTH, P.C.
11A Oak Branch Drive
Greensboro, NC 27407
T/ 336-274-9456
F/ 336-274-9486

TECHNICAL MEMORANDUM

BY:	Corey Schaal, PE, GIT	**DATE:**	June 26, 2020
PROJECT:	Boiling Spring Lakes Dams Construction/Reconstruction	**SUBJECT:**	Liquefaction Potential Analysis
LOCATION:	Boiling Spring Lakes, North Carolina	**PROJECT NO.:**	19C21022
REVIEWED BY:	Gerald Robblee, PE	**DATE:**	July 17, 2020

INTRODUCTION

Sanford Dam (SD), North Lake Dam (NLD), Pine Lake Dam (PLD), and Upper Lake Dam (ULD) (collectively herein referred to as the BSL Dams) breached during Hurricane Florence in September 2018. Subsequently, NCDOT repaired the breaches and installed corrugated metal culverts at NLD and PLD, including upstream and downstream corrugated metal headwalls. The presence of the culverts prevents impoundment of a reservoir. SD and ULD currently remain breached. McGill Associates, P.A. (McGill) was hired by the City of Boiling Spring Lakes to develop designs for rehabilitating the BSL Dams, and McGill retained Schnabel Engineering South, P.C. (Schnabel) to provide geotechnical, structural, and general dam design services.

The four BSL Dams are part of a system of dams where NLD, PLD, and ULD are situated upstream of SD and independent of each other. NLD and PLD are directly upstream, such the Sanford Dam headwater is the tailwater for NLD and PLD. As part of the rehabilitation of the BSL Dams, the existing culverts at NLD and PLD and existing spillways at SD and ULD will be removed and replaced with new spillways. The breached areas at SD and ULD, as well as the scoured area on the downstream slope of SD will be repaired, including removal of loose materials from the surface and placement and compaction of engineered fill soils. The existing foundation materials beneath the proposed SD spillway will be excavated to top of rock and replaced with engineered fill materials. The proposed spillway structures at the other three sites will be founded on generally cohesionless alluvial/coastal deposits (Foundation Soils).

This memorandum presents our assumptions, the methodology used to analyze liquefaction potential for the BSL Dams, and the analysis results.

EXTERNAL INFORMATION

The analyses discussed herein were prepared based on the CPT data and laboratory test results presented in the Schnabel 2020 Phase 1 and Phase 2 Geotechnical Data Report (GDR). The following quantities of CPT soundings were completed across the four dam sites:

- Sanford Dam
  - 5 CPT soundings completed through the embankment crest (SC-01 through SC-06)
  - 5 CPT soundings completed near the downstream toe of the embankment (SC-07 through SC-11)
  - 4 CPT soundings completed near the upstream toe of the embankment (SC-12 through SC-15)
- North Lake Dam – 3 CPT soundings completed through the embankment crest (NC-01 through NC-03)
- Pine Lake Dam – 3 CPT soundings completed through the embankment crest (PC-01 through PC-03)
- Upper Lake Dam – 4 CPT soundings completed through the embankment crest (UC-01 through UC-03, including UC-2A)

Seismic parameters which are used in the liquefaction potential analysis are defined in the memorandum entitled "Seismic Hazard." The memorandum presents the selection of design ground motions and earthquake magnitude, which are summarized in Table 1 below.

Table 1: Summary of Design Ground Motions and Earthquake Magnitudes

Site	Return Period (yr)	Design PGA (g)	Earthquake Magnitude (Mw)
NLD, PLD, and ULD	2,500	0.14	7.3
SD	5,000	0.20	7.3

SUBSURFACE CONDITIONS

Relatively low standard penetration test (SPT) blow counts and cone penetration test (CPT) penetration resistances were recorded in the Foundation Soils encountered beneath each of the BSL Dams during the 2019 and 2020 Phase 1 and Phase 2 subsurface explorations. The relatively low-strength soils appear to be laterally continuous across each site. The Foundation Soils at each of the four dam sites were generally classified as very loose to medium dense sands with varying amounts of fines. Relatively thin layers of lean clay (CL) and fat clay (CH) were observed beneath Sanford, North Lake, and Pine Lake Dams. The fines contents determined from gradation testing of Foundation Soils samples collected across the four sites are summarized in Table 2 below. Five gradation test samples collected in the SD Foundation Soils had fines contents greater than 50%; these results are excluded from the data presented in Table 2 because the fine-grained soils do not appear to be laterally continuous. As shown in Table 2, the average fines content for all coarse-grained Foundation Soils samples is approximately 20 percent. In general, loose sandy soils with fines contents less than 30 percent are potentially susceptible to cyclic liquefaction. Soft cohesive soils are generally not subject to cyclic liquefaction, but they may be susceptible to some loss of shear strength under seismic loading.

Table 2: Summary of Foundation Soils Fines Contents Based on Gradation Test Results

Site	Number of Gradation Tests	Average Fines Content (%)	Min. Fines Content (%)	Max. Fines Content (%)
NLD	2	6	4	8
PLD	3	24	7	44
SD	11	23	5	47
ULD	1	12	4	20
Overall	19	20	4	47

METHODOLOGY

The liquefaction potential of the Foundation Soils beneath each of the BSL Dams was evaluated in general accordance with the simplified CPT procedure presented in "CPT and SPT Based Liquefaction Triggering Procedures" (Boulanger & Idriss 2014). This is a stress-based approach which compares the earthquake-induced cyclic stress ratios (CSR) with the cyclic resistance ratios (CRR) of the soil. The factor of safety against liquefaction (FS_{LIQ}) is defined as the ratio of CRR to CSR. CPT tip resistance measurements were recorded at approximately 0.1-foot depth intervals throughout each sounding. The recorded CPT tip resistances were corrected for unequal end area effects. CSR and CRR were calculated for each corrected CPT tip resistance data point. Gradation test results from adjacent borings were used to estimate fines content in the CRR calculations. The minimum visual percentage fines estimate from the boring logs was used to estimate fines content where gradation test results were not available. Only soils encountered below the measured water level were analyzed for liquefaction potential.

Undrained strength ratios (USRs), which is the ratio of residual undrained shear strength after liquefaction has occurred to effective overburden stress, were calculated using correlations from Idriss and Boulanger (2008) for soils which have the potential to liquefy and lose strength during the design seismic event. Based on the observed subsurface conditions across the four BSL Dams sites, the effects of void redistribution are judged to be negligible such that dissipation of excess pore pressures and soil densification can occur.

RESULTS

The liquefaction potential calculations for SD are included as Attachment 1 to this memorandum, and the liquefaction potential calculations for NLD, PLD, and ULD are included as Attachment 2. The calculated FS_{LIQ} for the majority of the Foundation Soils at each of the BSL Dams were less than 1.0. Therefore, the Foundation Soils have the potential to experience cyclic liquefaction and lose strength when subjected to the design ground motions. There are locations where the FS_{LIQ} is greater than 1.0, but, as shown on the FS_{LIQ} versus depth distributions provided in Attachment 3, these locations appear to be discontinuous. Therefore, the entire Foundation Soils layer at each of the BSL Dams should be assumed to experience cyclic liquefaction when analyzing post-earthquake embankment stability. The post-earthquake embankment stability analyses are detailed in the "Embankment Seepage and Slope Stability" memorandum.

Based on the USR calculations, the Foundation soils have an average USR of approximately 0.09 across the four sites. Therefore, a USR of 0.09 should be used when analyzing post-earthquake embankment stability for each of the BSL Dams. A summary of the calculated USR for each site is given in Table 3.

Table 3: Summary of Undrained Strength Ratio Calculations for Foundation Soils

Site	**Average USR for FS_{LIQ} < 1**
NLD	0.08
PLD	0.09
SD	0.09
ULD	0.08
Overall	**0.09**

REFERENCES

- Boulanger, R.W., Idriss, I.M. (2014). “CPT and SPT Based Liquefaction Triggering Procedures.” Report No. UCD/CGM-14/01. Center for Geotechnical Modeling, University of California-Davis.
- Idriss, I.M. and Boulanger, R.W. (2008). “Soil liquefaction during earthquakes.” Earthquake Engineering Research Institute MNO 12, Earthquake Engineering Research Institute, Oakland, CA.
- Schnabel Engineering (2020). “Phase 1 and Phase 2 Geotechnical Data Report, Boiling Spring Lakes Dams Remediation, Boiling Spring Lakes, North Carolina,” Prepared for McGill Associates, P.A., July 2020.

ATTACHMENTS

1) Liquefaction Potential Calculations – Sanford Dam
2) Liquefaction Potential Calculations – North Lake, Pine Lake, and Upper Lake Dams
3) Distributions of FS_{LIQ} versus depth

ANALYSIS OF LIQUEFACTION POTENTIAL FOR EMBANKMENT AND FOUNDATION

By: CDS 5/28/2020 Site: Sanford Dam Method: Boulanger&Idriss, CPT and SPT Based Liquefaction Triggering Procedures, April 2014

Checked: EMG 6/1/2020 Location: Boiling Spring Lakes, NC https://faculty.engineering.ucdavis.edu/boulanger/wp-content/uploads/sites/71/2014/09/Boulanger_Idriss_CPT_and_SPT_Liq_triggering_CGM-14-01_20141.pdf

[1]Earthquake Magnitude, M: 7.3

[2]Peak Ground Acceleration, PHGA (g): 0.20

Jndrained Residual Shear Strengtl

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-01	SB-10	Foundation Soils	20.0	18.2	111	1.2	1.2	38.6	0.685	0.9	15	34.4	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.084	0.122	0.690	75.4	79.7	0.090
SC-01	SB-10	Foundation Soils	20.1	18.1	111	1.2	1.2	38.6	0.685	0.9	15	34.4	38.6	1.0	-0.4	0.0	0.9	0.084	1.007	0.084	0.123	0.688	75.4	79.7	0.090
SC-01	SB-10	Foundation Soils	20.2	18.0	111	1.2	1.2	38.7	0.684	0.9	15	34.4	38.7	1.0	-0.4	0.0	0.9	0.085	1.007	0.084	0.123	0.687	75.4	79.7	0.090
SC-01	SB-10	Foundation Soils	20.3	17.9	111	1.2	1.2	39.5	0.681	0.9	15	34.5	39.5	1.0	-0.4	0.0	0.9	0.085	1.007	0.085	0.123	0.690	75.4	80.4	0.091
SC-01	SB-10	Foundation Soils	20.3	17.8	111	1.2	1.2	40.3	0.677	0.9	15	34.6	40.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.085	0.123	0.693	75.4	81.0	0.092
SC-01	SB-10	Foundation Soils	20.4	17.8	111	1.2	1.2	40.3	0.677	0.9	15	34.6	40.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.085	0.123	0.692	75.4	81.1	0.092
SC-01	SB-10	Foundation Soils	20.5	17.7	111	1.2	1.2	41.0	0.674	0.9	15	34.7	41.0	1.0	-0.4	0.0	0.9	0.086	1.007	0.086	0.124	0.695	75.4	81.6	0.092
SC-01	SB-10	Foundation Soils	20.6	17.6	115	1.2	1.2	45.2	0.657	0.9	15	35.2	45.2	1.0	-0.4	0.0	0.9	0.089	1.007	0.089	0.124	0.716	66.0	76.0	0.085
SC-01	SB-10	Foundation Soils	20.7	17.5	121	1.2	1.2	53.9	0.625	0.9	15	35.0	53.9	1.0	-0.4	0.0	0.9	0.095	1.008	0.095	0.124	0.764	42.6	61.4	0.067
SC-01	SB-10	Foundation Soils	20.8	17.4	121	1.3	1.2	72.5	0.567	0.9	15	32.5	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.109	0.124	0.878	25.9	65.8	0.072
SC-01	SB-10	Foundation Soils	20.8	17.3	121	1.3	1.2	72.8	0.566	0.9	15	32.3	72.8	1.0	-0.4	0.0	0.9	0.110	1.011	0.109	0.124	0.879	25.6	66.1	0.072
SC-01	SB-10	Foundation Soils	20.9	17.3	121	1.3	1.2	71.1	0.570	0.9	15	34.0	71.1	1.0	-0.4	0.0	0.9	0.108	1.010	0.108	0.125	0.866	28.8	65.9	0.072
SC-01	SB-10	Foundation Soils	21.0	17.2	121	1.3	1.2	69.2	0.576	0.9	15	33.1	69.2	1.0	-0.4	0.0	0.9	0.107	1.010	0.106	0.125	0.852	27.5	63.6	0.069
SC-01	SB-10	Foundation Soils	21.1	17.1	121	1.3	1.2	72.2	0.567	0.9	15	31.9	72.2	1.0	-0.4	0.0	0.9	0.109	1.010	0.109	0.125	0.870	25.1	65.4	0.071
SC-01	SB-10	Foundation Soils	21.2	17.0	124	1.3	1.2	74.9	0.560	0.9	15	30.2	74.9	1.0	-0.4	0.0	0.9	0.111	1.011	0.111	0.125	0.886	22.9	67.5	0.074
SC-01	SB-10	Foundation Soils	21.2	16.9	124	1.3	1.2	76.3	0.556	0.9	15	30.0	76.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.112	0.125	0.895	22.5	68.8	0.076
SC-01	SB-10	Foundation Soils	21.3	16.9	124	1.3	1.2	75.2	0.559	0.9	15	31.5	75.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.111	0.126	0.886	24.2	67.9	0.075
SC-01	SB-10	Foundation Soils	21.4	16.8	121	1.3	1.2	74.3	0.561	0.9	15	33.7	74.3	1.0	-0.4	0.0	0.9	0.111	1.011	0.110	0.126	0.878	27.4	68.0	0.075
SC-01	SB-10	Foundation Soils	21.5	16.7	121	1.3	1.3	72.0	0.568	0.9	15	35.6	72.0	1.0	-0.4	0.0	0.9	0.109	1.010	0.108	0.126	0.861	32.5	68.9	0.076
SC-01	SB-10	Foundation Soils	21.6	16.6	121	1.3	1.3	67.0	0.583	0.9	15	37.0	67.0	1.0	-0.4	0.0	0.9	0.105	1.010	0.104	0.126	0.827	42.0	71.9	0.080
SC-01	SB-10	Foundation Soils	21.7	16.5	115	1.3	1.3	60.9	0.601	0.9	15	37.0	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.126	0.789	52.2	76.0	0.085
SC-01	SB-10	Foundation Soils	21.7	16.4	115	1.3	1.3	54.8	0.621	0.9	15	36.7	54.8	1.0	-0.4	0.0	0.9	0.096	1.008	0.095	0.127	0.753	66.4	84.5	0.096
SC-01	SB-10	Foundation Soils	21.8	16.4	111	1.3	1.3	47.8	0.647	0.9	15	35.8	47.8	1.0	-0.4	0.0	0.9	0.091	1.007	0.090	0.127	0.713	75.4	87.4	0.100
SC-01	SB-10	Foundation Soils	21.9	16.3	111	1.3	1.3	42.6	0.667	0.9	15	35.0	42.6	1.0	-0.4	0.0	0.9	0.087	1.007	0.087	0.127	0.684	75.4	83.0	0.094
SC-01	SB-10	Foundation Soils	22.0	16.2	111	1.3	1.3	40.3	0.677	0.9	15	34.6	40.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.085	0.127	0.671	75.4	81.1	0.092
SC-01	SB-10	Foundation Soils	22.1	16.1	111	1.3	1.3	39.0	0.683	0.9	15	34.4	39.0	1.0	-0.4	0.0	0.9	0.085	1.007	0.084	0.127	0.663	75.4	80.0	0.090
SC-01	SB-10	Foundation Soils	22.1	16.0	111	1.3	1.3	38.6	0.685	0.9	15	34.3	38.6	1.0	-0.4	0.0	0.9	0.084	1.007	0.084	0.127	0.659	75.4	79.6	0.090
SC-01	SB-10	Foundation Soils	22.2	16.0	111	1.3	1.3	38.4	0.685	0.9	15	34.3	38.4	1.0	-0.4	0.0	0.9	0.084	1.007	0.084	0.128	0.657	75.4	79.5	0.090
SC-01	SB-10	Foundation Soils	22.3	15.9	111	1.3	1.3	38.4	0.686	0.9	15	34.3	38.4	1.0	-0.4	0.0	0.9	0.084	1.007	0.084	0.128	0.656	75.4	79.4	0.089
SC-01	SB-10	Foundation Soils	22.4	15.8	111	1.3	1.3	37.6	0.689	0.9	15	34.2	37.6	1.0	-0.4	0.0	0.9	0.084	1.007	0.083	0.128	0.651	75.4	78.8	0.089
SC-01	SB-10	Foundation Soils	22.5	15.7	111	1.4	1.3	37.5	0.690	0.9	15	34.2	37.5	1.0	-0.4	0.0	0.9	0.084	1.007	0.083	0.128	0.649	75.4	78.7	0.088
SC-01	SB-10	Foundation Soils	22.6	15.6	111	1.4	1.3	37.4	0.690	0.9	15	34.1	37.4	1.0	-0.4	0.0	0.9	0.084	1.007	0.083	0.128	0.648	75.4	78.6	0.088
SC-01	SB-10	Foundation Soils	22.6	15.5	111	1.4	1.3	37.4	0.690	0.9	15	34.2	37.4	1.0	-0.4	0.0	0.9	0.084	1.007	0.083	0.129	0.647	75.4	78.7	0.088
SC-01	SB-10	Foundation Soils	22.7	15.5	111	1.4	1.3	37.6	0.689	0.9	15	34.2	37.6	1.0	-0.4	0.0	0.9	0.084	1.007	0.083	0.129	0.647	75.4	78.8	0.089
SC-01	SB-10	Foundation Soils	22.8	15.4	111	1.4	1.3	37.8	0.689	0.9	15	34.2	37.8	1.0	-0.4	0.0	0.9	0.084	1.007	0.083	0.129	0.647	75.4	78.9	0.089
SC-01	SB-10	Foundation Soils	22.9	15.3	111	1.4	1.3	4.4	0.782	0.9	0	0.5	4.4	1.0	-0.4	0.0	0.9	0.063	1.006	0.063	0.129	0.489	75.4	79.3	0.089
SC-01	SB-10	Foundation Soils	23.0	15.2	111	1.4	1.3	4.7	0.782	0.9	0	0.5	4.7	1.0	-0.4	0.0	0.9	0.063	1.006	0.063	0.129	0.490	75.4	79.6	0.090
SC-01	SB-10	Foundation Soils	23.0	15.1	111	1.4	1.3	6.0	0.782	0.9	0	0.5	6.0	1.0	-0.4	0.0	0.9	0.064	1.006	0.064	0.129	0.494	75.4	80.9	0.091
SC-01	SB-10	Foundation Soils	23.1	15.1	111	1.4	1.3	5.3	0.782	0.9	0	0.5	5.3	1.0	-0.4	0.0	0.9	0.064	1.006	0.064	0.130	0.491	75.4	80.2	0.090
SC-01	SB-10	Foundation Soils	23.2	15.0	111	1.4	1.3	5.1	0.782	0.9	0	0.5	5.1	1.0	-0.4	0.0	0.9	0.064	1.006	0.063	0.130	0.489	75.4	80.0	0.090
SC-01	SB-10	Foundation Soils	23.3	14.9	111	1.4	1.3	5.6	0.782	0.9	0	0.5	5.6	1.0	-0.4	0.0	0.9	0.064	1.006	0.064	0.130	0.491	75.4	80.5	0.091
SC-01	SB-10	Foundation Soils	23.4	14.8	111	1.4	1.3	6.0	0.782	0.9	0	0.5	6.0	1.0	-0.4	0.0	0.9	0.064	1.006	0.064	0.130	0.492	75.4	80.9	0.091
SC-01	SB-10	Foundation Soils	23.5	14.7	111	1.4	1.3	6.5	0.782	0.9	0	0.5	6.5	1.0	-0.4	0.0	0.9	0.064	1.006	0.064	0.130	0.493	75.4	81.4	0.092
SC-01	SB-10	Foundation Soils	23.5	14.6	115	1.4	1.3	7.3	0.782	0.9	0	0.5	7.3	1.0	-0.4	0.0	0.9	0.065	1.006	0.065	0.131	0.496	75.4	82.2	0.093
SC-01	SB-10	Foundation Soils	23.6	14.6	111	1.4	1.3	8.1	0.782	0.9	0	0.5	8.1	1.0	-0.4	0.0	0.9	0.065	1.006	0.065	0.131	0.498	75.4	82.9	0.094
SC-01	SB-10	Foundation Soils	23.7	14.5	111	1.4	1.3	9.1	0.782	0.8	0	0.5	9.1	1.0	-0.4	0.0	0.9	0.066	1.006	0.066	0.131	0.502	75.4	84.0	0.096
SC-01	SB-10	Foundation Soils	23.8	14.4	111	1.4	1.3	11.3	0.782	0.8	0	0.5	11.3	1.0	-0.4	0.0	0.9	0.067	1.006	0.067	0.131	0.511	73.5	84.2	0.096
SC-01	SB-10	Foundation Soils	23.9	14.3	111	1.4	1.3	11.7	0.782	0.8	0	0.5	11.7	1.0	-0.4	0.0	0.9	0.067	1.006	0.067	0.131	0.512	73.3	84.5	0.096
SC-01	SB-10	Foundation Soils	23.9	14.2	111	1.4	1.3	10.8	0.782	0.8	0	0.5	10.8	1.0	-0.4	0.1	0.9	0.067	1.006	0.067	0.131	0.508	75.4	85.7	0.098
SC-01	SB-10	Foundation Soils	24.0	14.1	111	1.4	1.3	8.4	0.782	0.8	0	0.5	8.4	1.0	-0.4	0.1	0.9	0.065	1.006	0.065	0.132	0.496	75.4	83.3	0.095
SC-01	SB-10	Foundation Soils	24.1	14.1	111	1.4	1.3	7.7	0.782	0.8	0	0.5	7.7	1.0	-0.4	0.1	0.9	0.065	1.006	0.065	0.132	0.493	75.4	82.6	0.094
SC-01	SB-10	Foundation Soils	24.2	14.0	111	1.4	1.3	7.7	0.782	0.8	0	0.5	7.7	1.0	-0.5	0.1	0.9	0.065	1.006	0.065	0.132	0.492	75.4	82.6	0.094
SC-01	SB-10	Foundation Soils	24.3	13.9	111	1.5	1.3	58.0	0.611	0.9	47	50.7	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.132	0.737	75.4	82.7	0.094
SC-01	SB-10	Foundation Soils	24.4	13.8	111	1.5	1.3	58.2	0.610	0.9	47	50.7	58.2	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.132	0.736	75.4	82.8	0.094
SC-01	SB-10	Foundation Soils	24.4	13.7	111	1.5	1.3	59.2	0.607	0.9	47	51.0	59.2	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.132	0.741	75.4	83.6	0.095
SC-01	SB-10	Foundation Soils	24.5	13.7	115	1.5	1.3	60.6	0.602	0.9	47	51.2	60.6	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.132	0.748	74.2	83.5	0.095
SC-01	SB-10	Foundation Soils	24.6	13.6	115	1.5	1.3	60.4	0.603	0.9	47	51.2	60.4	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.133	0.746	74.5	83.7	0.095
SC-01	SB-10	Foundation Soils	24.7	13.5	111	1.5	1.3	61.1	0.600	0.9	47	51.4	61.1	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.133	0.749	75.4	85.1	0.097
SC-01	SB-10	Foundation Soils	24.8	13.4	111	1.5	1.3	60.9	0.601	0.9	47	51.3	60.9	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.133	0.746	75.4	84.9	0.097
SC-01	SB-10	Foundation Soils	24.9	13.3	111	1.5	1.3	61.3	0.600	0.9	47	51.4	61.3	1.0	-0.5	0.1	0.9	0.101	1.009	0.100	0.133	0.748	75.4	85.3	0.097
SC-01	SB-10	Foundation Soils	24.9	13.2	111	1.5	1.3	61.1	0.601	0.9	47	51.4	61.1	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.133	0.746	75.4	85.1	0.097
SC-01	SB-10	Foundation Soils	25.0	13.2	111	1.5	1.3	60.6	0.602	0.9	47	51.3	60.6	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.133	0.742	75.4	84.7	0.097

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-01	SB-10	Foundation Soils	25.1	13.1	115	1.5	1.3	62.4	0.596	0.9	47	51.6	62.4	1.0	-0.5	0.1	0.9	0.101	1.009	0.100	0.134	0.751	72.2	83.0	0.094
SC-01	SB-10	Foundation Soils	25.2	13.0	115	1.5	1.3	64.0	0.591	0.9	47	51.8	64.0	1.0	-0.5	0.1	0.9	0.103	1.009	0.102	0.134	0.759	67.9	80.2	0.090
SC-01	SB-10	Foundation Soils	25.3	12.9	115	1.5	1.3	64.2	0.591	0.9	47	51.8	64.2	1.0	-0.5	0.1	0.9	0.103	1.009	0.102	0.134	0.760	66.6	79.1	0.089
SC-01	SB-10	Foundation Soils	25.3	12.8	111	1.5	1.3	63.2	0.594	0.9	47	51.8	63.2	1.0	-0.5	0.1	0.9	0.102	1.009	0.101	0.134	0.753	74.2	85.6	0.098
SC-01	SB-10	Foundation Soils	25.4	12.8	111	1.5	1.3	61.3	0.600	0.9	47	51.4	61.3	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.134	0.741	75.4	85.2	0.097
SC-01	SB-10	Foundation Soils	25.5	12.7	111	1.5	1.4	61.1	0.601	0.9	47	51.4	61.1	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.134	0.739	75.4	85.1	0.097
SC-01	SB-10	Foundation Soils	25.6	12.6	111	1.5	1.4	59.3	0.606	0.9	47	51.0	59.3	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.134	0.729	75.4	83.7	0.095
SC-01	SB-10	Foundation Soils	25.7	12.5	111	1.5	1.4	59.0	0.607	0.9	47	50.9	59.0	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.135	0.726	75.4	83.4	0.095
SC-01	SB-10	Foundation Soils	25.8	12.4	111	1.5	1.4	59.3	0.606	0.9	47	51.0	59.3	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.135	0.727	75.4	83.7	0.095
SC-01	SB-10	Foundation Soils	25.8	12.3	111	1.5	1.4	59.3	0.606	0.9	47	51.0	59.3	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.135	0.726	75.4	83.7	0.095
SC-01	SB-10	Foundation Soils	25.9	12.3	111	1.5	1.4	59.1	0.607	0.9	47	51.0	59.1	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.135	0.724	75.4	83.6	0.095
SC-01	SB-10	Foundation Soils	26.0	12.2	111	1.6	1.4	59.7	0.605	0.9	47	51.1	59.7	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.135	0.726	75.4	84.0	0.096
SC-01	SB-10	Foundation Soils	26.1	12.1	111	1.6	1.4	60.3	0.603	0.9	47	51.2	60.3	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.135	0.729	75.4	84.4	0.096
SC-01	SB-10	Foundation Soils	26.2	12.0	111	1.6	1.4	59.3	0.606	0.9	47	51.0	59.3	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.135	0.723	75.4	83.7	0.095
SC-01	SB-10	Foundation Soils	26.2	11.9	111	1.6	1.4	58.6	0.609	0.9	47	50.8	58.6	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.136	0.718	75.4	83.1	0.094
SC-01	SB-10	Foundation Soils	26.3	11.9	111	1.6	1.4	58.7	0.608	0.9	47	50.9	58.7	1.0	-0.5	0.1	0.9	0.099	1.008	0.097	0.136	0.718	75.4	83.2	0.095
SC-01	SB-10	Foundation Soils	26.4	11.8	111	1.6	1.4	58.5	0.609	0.9	47	50.8	58.5	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.136	0.715	75.4	83.0	0.094
SC-01	SB-10	Foundation Soils	26.5	11.7	111	1.6	1.4	58.6	0.609	0.9	47	50.8	58.6	1.0	-0.5	0.1	0.9	0.099	1.008	0.097	0.136	0.716	75.4	83.2	0.095
SC-01	SB-10	Foundation Soils	26.6	11.6	111	1.6	1.4	58.9	0.608	0.9	47	50.9	58.9	1.0	-0.5	0.1	0.9	0.099	1.008	0.098	0.136	0.716	75.4	83.4	0.095
SC-01	SB-10	Foundation Soils	26.7	11.5	111	1.6	1.4	58.9	0.608	0.9	47	50.9	58.9	1.0	-0.5	0.1	0.9	0.099	1.008	0.098	0.136	0.715	75.4	83.4	0.095
SC-01	SB-10	Foundation Soils	26.7	11.4	111	1.6	1.4	58.1	0.610	0.9	47	50.7	58.1	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.136	0.711	75.4	82.8	0.094
SC-01	SB-10	Foundation Soils	26.8	11.4	111	1.6	1.4	57.7	0.612	0.8	47	50.6	57.7	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.137	0.707	75.4	82.4	0.093
SC-01	SB-10	Foundation Soils	26.9	11.3	111	1.6	1.4	57.9	0.611	0.8	47	50.7	57.9	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.137	0.708	75.4	82.6	0.094
SC-01	SB-10	Foundation Soils	27.0	11.2	111	1.6	1.4	58.3	0.610	0.8	47	50.8	58.3	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.137	0.709	75.4	82.9	0.094
SC-01	SB-10	Foundation Soils	27.1	11.1	111	1.6	1.4	59.5	0.606	0.8	47	51.0	59.5	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.137	0.715	75.4	83.9	0.095
SC-01	SB-10	Foundation Soils	27.1	11.0	111	1.6	1.4	59.9	0.604	0.8	47	51.1	59.9	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.137	0.716	75.4	84.2	0.096
SC-01	SB-10	Foundation Soils	27.2	10.9	111	1.6	1.4	59.2	0.607	0.8	47	51.0	59.2	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.137	0.712	75.4	83.6	0.095
SC-01	SB-10	Foundation Soils	27.3	10.9	111	1.6	1.4	60.0	0.604	0.8	47	51.1	60.0	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.137	0.715	75.4	84.2	0.096
SC-01	SB-10	Foundation Soils	27.4	10.8	111	1.6	1.4	61.2	0.600	0.8	47	51.4	61.2	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.138	0.720	75.4	85.2	0.097
SC-01	SB-10	Foundation Soils	27.5	10.7	111	1.6	1.4	61.1	0.601	0.8	47	51.4	61.1	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.138	0.719	75.4	85.1	0.097
SC-01	SB-10	Foundation Soils	27.6	10.6	111	1.6	1.4	60.8	0.602	0.8	47	51.3	60.8	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.138	0.717	75.4	84.8	0.097
SC-01	SB-10	Foundation Soils	27.6	10.5	111	1.6	1.4	60.4	0.603	0.8	47	51.2	60.4	1.0	-0.5	0.1	0.9	0.100	1.009	0.098	0.138	0.714	75.4	84.5	0.096
SC-01	SB-10	Foundation Soils	27.7	10.5	111	1.6	1.4	60.1	0.604	0.8	47	51.2	60.1	1.0	-0.5	0.1	0.9	0.100	1.009	0.098	0.138	0.712	75.4	84.3	0.096
SC-01	SB-10	Foundation Soils	27.8	10.4	111	1.7	1.4	60.1	0.604	0.8	47	51.2	60.1	1.0	-0.5	0.1	0.9	0.100	1.009	0.098	0.138	0.711	75.4	84.3	0.096
SC-01	SB-10	Foundation Soils	27.9	10.3	115	1.7	1.4	61.8	0.598	0.8	47	51.5	61.8	1.0	-0.5	0.1	0.9	0.101	1.009	0.100	0.138	0.720	73.8	84.1	0.096
SC-01	SB-10	Foundation Soils	28.0	10.2	111	1.7	1.4	61.0	0.601	0.8	47	51.4	61.0	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.138	0.714	75.4	85.0	0.097
SC-01	SB-10	Foundation Soils	28.1	10.1	111	1.7	1.4	60.8	0.601	0.8	47	51.3	60.8	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.139	0.713	75.4	84.9	0.097
SC-01	SB-10	Foundation Soils	28.1	10.0	111	1.7	1.4	60.2	0.603	0.8	47	51.2	60.2	1.0	-0.6	0.1	0.9	0.100	1.009	0.098	0.139	0.709	75.4	84.4	0.096
SC-01	SB-10	Foundation Soils	28.2	10.0	111	1.7	1.4	59.1	0.607	0.8	47	50.9	59.1	1.0	-0.6	0.1	0.9	0.099	1.009	0.097	0.139	0.702	75.4	83.5	0.095
SC-01	SB-10	Foundation Soils	28.3	9.9	111	1.7	1.4	57.8	0.611	0.8	47	50.7	57.8	1.0	-0.6	0.1	0.9	0.098	1.008	0.097	0.139	0.695	75.4	82.5	0.094
SC-01	SB-10	Foundation Soils	28.4	9.8	111	1.7	1.4	57.7	0.612	0.8	47	50.6	57.7	1.0	-0.6	0.1	0.9	0.098	1.008	0.096	0.139	0.693	75.4	82.4	0.093
SC-01	SB-10	Foundation Soils	28.5	9.7	111	1.7	1.4	57.4	0.613	0.8	47	50.6	57.4	1.0	-0.6	0.1	0.9	0.098	1.008	0.096	0.139	0.691	75.4	82.2	0.093
SC-01	SB-10	Foundation Soils	28.5	9.6	111	1.7	1.4	56.7	0.615	0.8	47	50.4	56.7	1.0	-0.6	0.1	0.9	0.097	1.008	0.096	0.139	0.687	75.4	81.6	0.092
SC-01	SB-10	Foundation Soils	28.6	9.6	111	1.7	1.4	57.9	0.611	0.8	47	50.7	57.9	1.0	-0.6	0.1	0.9	0.098	1.008	0.097	0.139	0.693	75.4	82.6	0.094
SC-01	SB-10	Foundation Soils	28.7	9.5	111	1.7	1.4	62.1	0.597	0.8	47	51.6	62.1	1.0	-0.6	0.1	0.9	0.101	1.009	0.100	0.140	0.714	74.9	85.5	0.098
SC-01	SB-10	Foundation Soils	28.8	9.4	115	1.7	1.4	64.6	0.590	0.8	47	52.0	64.6	1.0	-0.6	0.1	0.9	0.103	1.009	0.101	0.140	0.726	69.8	82.5	0.094
SC-01	SB-10	Foundation Soils	28.9	9.3	115	1.7	1.4	65.3	0.588	0.8	47	52.2	65.3	1.0	-0.6	0.1	0.9	0.104	1.009	0.102	0.140	0.729	70.7	83.8	0.095
SC-01	SB-10	Foundation Soils	29.0	9.2	111	1.7	1.4	62.9	0.595	0.8	47	51.8	62.9	1.0	-0.6	0.1	0.9	0.102	1.009	0.100	0.140	0.716	75.4	86.5	0.099
SC-01	SB-10	Foundation Soils	29.0	9.1	111	1.7	1.4	61.1	0.601	0.8	47	51.4	61.1	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.140	0.706	75.4	85.1	0.097
SC-01	SB-10	Foundation Soils	29.1	9.1	111	1.7	1.4	60.7	0.602	0.8	47	51.3	60.7	1.0	-0.6	0.1	0.9	0.100	1.009	0.098	0.140	0.703	75.4	84.7	0.097
SC-01	SB-10	Foundation Soils	29.2	9.0	111	1.7	1.4	61.4	0.600	0.8	47	51.4	61.4	1.0	-0.6	0.1	0.9	0.101	1.009	0.099	0.140	0.706	75.4	85.3	0.097
SC-01	SB-10	Foundation Soils	29.3	8.9	111	1.7	1.4	61.0	0.601	0.8	47	51.4	61.0	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.140	0.703	75.4	85.0	0.097
SC-01	SB-10	Foundation Soils	29.4	8.8	111	1.7	1.4	59.8	0.605	0.8	47	51.1	59.8	1.0	-0.6	0.1	0.9	0.099	1.009	0.098	0.140	0.696	75.4	84.1	0.096
SC-01	SB-10	Foundation Soils	29.4	8.7	111	1.7	1.4	57.7	0.612	0.8	47	50.6	57.7	1.0	-0.6	0.1	0.9	0.098	1.008	0.096	0.141	0.685	75.4	82.5	0.094
SC-01	SB-10	Foundation Soils	29.5	8.7	111	1.7	1.5	57.1	0.614	0.8	47	50.5	57.1	1.0	-0.6	0.1	0.9	0.097	1.008	0.096	0.141	0.681	75.4	82.0	0.093
SC-01	SB-10	Foundation Soils	29.6	8.6	111	1.8	1.5	56.2	0.617	0.8	47	50.3	56.2	1.0	-0.6	0.1	0.9	0.097	1.008	0.095	0.141	0.676	75.4	81.3	0.092
SC-01	SB-10	Foundation Soils	29.7	8.5	111	1.8	1.5	56.7	0.615	0.8	47	50.4	56.7	1.0	-0.6	0.1	0.9	0.097	1.008	0.096	0.141	0.678	75.4	81.6	0.092
SC-01	SB-10	Foundation Soils	29.8	8.4	111	1.8	1.5	57.1	0.614	0.8	47	50.5	57.1	1.0	-0.6	0.1	0.9	0.097	1.008	0.096	0.141	0.679	75.4	81.9	0.093
SC-01	SB-10	Foundation Soils	29.9	8.3	111	1.8	1.5	57.6	0.612	0.8	47	50.6	57.6	1.0	-0.6	0.1	0.9	0.098	1.008	0.096	0.141	0.682	75.4	82.4	0.093
SC-01	SB-10	Foundation Soils	29.9	8.2	111	1.8	1.5	58.2	0.610	0.8	47	50.7	58.2	1.0	-0.6	0.1	0.9	0.098	1.008	0.097	0.141	0.684	75.4	82.8	0.094
SC-01	SB-10	Foundation Soils	30.0	8.2	111	1.8	1.5	59.4	0.606	0.8	47	51.0	59.4	1.0	-0.6	0.1	0.9	0.099	1.009	0.097	0.141	0.690	75.4	83.8	0.095
SC-01	SB-10	Foundation Soils	30.1	8.1	111	1.8	1.5	59.8	0.605	0.8	47	51.1	59.8	1.0	-0.6	0.1	0.9	0.099	1.009	0.098	0.141	0.691	75.4	84.1	0.096
SC-01	SB-10	Foundation Soils	30.2	8.0	111	1.8	1.5	59.4	0.606	0.8	47	51.0	59.4	1.0	-0.6	0.1	0.9	0.099	1.009	0.097	0.142	0.688	75.4	83.8	0.095
SC-01	SB-10	Foundation Soils	30.3	7.9	111	1.8	1.5	61.2	0.600	0.8	47	51.4	61.2	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.142	0.697	75.4	85.2	0.097
SC-01	SB-10	Foundation Soils	30.3	7.8	111	1.8	1.5	65.9	0.586	0.8	47	52.4	65.9	1.0	-0.6	0.1	0.9	0.104	1.009	0.102	0.142	0.721	73.3	86.8	0.100
SC-01	SB-10	Foundation Soils	30.4	7.8	111	1.8	1.5	65.4	0.587	0.8	47	52.3	65.4	1.0	-0.6	0.1	0.9	0.104	1.009	0.102	0.142	0.717	73.0	86.1	0.099
SC-01	SB-10	Foundation Soils	30.5	7.7	111	1.8	1.5	62.2	0.597	0.8	47	51.6	62.2	1.0	-0.6	0.1	0.9	0.101	1.009	0.099	0.142	0.700	75.4	86.0	0.098
SC-01	SB-10	Foundation Soils	30.6	7.6	111	1.8	1.5	59.5	0.606	0.8	47	51.0	59.5	1.0	-0.6	0.1	0.9	0.099	1.009	0.097	0.142	0.686	75.4	83.8	0.095
SC-01	SB-10	Foundation Soils	30.7	7.5	111	1.8	1.5	58.9	0.608	0.8	47	50.9	58.9	1.0	-0.6	0.1	0.9	0.099	1.008	0.097	0.142	0.682	75.4	83.4	0.095
SC-01	SB-10	Foundation Soils	30.8	7.4	111	1.8	1.5	58.5	0.609	0.8	47	50.8	58.5	1.0	-0.6	0.1	0.9	0.098	1.008	0.097	0.142	0.680	75.4	83.1	0.094
SC-01	SB-10	Foundation Soils	30.8	7.3	111	1.8	1.5	58.8	0.608	0.8	47	50.9	58.8	1.0	-0.6	0.1	0.9	0.099	1.008	0.097	0.142	0.680	75.4	83.3	0.095

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-01	SB-10	Foundation Soils	30.9	7.3	111	1.8	1.5	59.5	0.606	0.8	47	51.0	59.5	1.0	-0.6	0.1	0.9	0.099	1.009	0.097	0.143	0.684	75.4	83.9	0.095
SC-01	SB-10	Foundation Soils	31.0	7.2	115	1.8	1.5	61.4	0.600	0.8	47	51.4	61.4	1.0	-0.6	0.1	0.9	0.101	1.009	0.099	0.143	0.693	73.5	83.5	0.095
SC-01	SB-10	Foundation Soils	31.1	7.1	115	1.8	1.5	62.2	0.597	0.8	47	51.5	62.2	1.0	-0.6	0.1	0.9	0.101	1.009	0.099	0.143	0.696	72.2	82.9	0.094
SC-01	SB-10	Foundation Soils	31.2	7.0	115	1.8	1.5	62.6	0.596	0.8	47	51.7	62.6	1.0	-0.6	0.1	0.9	0.101	1.009	0.100	0.143	0.697	73.5	84.5	0.096
SC-01	SB-10	Foundation Soils	31.2	6.9	115	1.8	1.5	63.0	0.595	0.8	47	51.7	63.0	1.0	-0.6	0.1	0.9	0.102	1.009	0.100	0.143	0.699	72.7	84.0	0.096
SC-01	SB-10	Foundation Soils	31.3	6.8	111	1.8	1.5	63.3	0.594	0.8	47	51.9	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.100	0.143	0.700	74.6	86.1	0.099
SC-01	SB-10	Foundation Soils	31.4	6.8	111	1.9	1.5	62.8	0.595	0.8	47	51.8	62.8	1.0	-0.6	0.1	0.9	0.102	1.009	0.100	0.143	0.697	75.3	86.4	0.099
SC-01	SB-10	Foundation Soils	31.5	6.7	111	1.9	1.5	62.6	0.596	0.8	47	51.7	62.6	1.0	-0.6	0.1	0.9	0.101	1.009	0.100	0.143	0.695	75.0	85.9	0.098
SC-01	SB-10	Foundation Soils	31.6	6.6	115	1.9	1.5	64.7	0.589	0.8	47	52.0	64.7	1.0	-0.6	0.1	0.9	0.103	1.009	0.101	0.143	0.706	69.0	81.8	0.093
SC-01	SB-10	Foundation Soils	31.7	6.5	115	1.9	1.5	66.0	0.585	0.8	47	52.2	66.0	1.0	-0.6	0.1	0.9	0.104	1.009	0.102	0.143	0.712	66.4	80.2	0.091
SC-01	SB-10	Foundation Soils	31.7	6.4	115	1.9	1.5	65.0	0.588	0.8	47	51.8	65.0	1.0	-0.7	0.1	0.9	0.103	1.009	0.101	0.143	0.706	64.0	77.2	0.086
SC-01	SB-10	Foundation Soils	31.8	6.4	115	1.9	1.5	63.6	0.593	0.8	47	51.7	63.6	1.0	-0.7	0.1	0.9	0.102	1.009	0.100	0.144	0.698	69.1	80.9	0.091
SC-01	SB-10	Foundation Soils	31.9	6.3	111	1.9	1.5	62.6	0.596	0.8	47	51.7	62.6	1.0	-0.7	0.1	0.9	0.101	1.009	0.100	0.144	0.693	74.5	85.4	0.098
SC-01	SB-10	Foundation Soils	32.0	6.2	111	1.9	1.5	60.8	0.601	0.8	47	51.3	60.8	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.144	0.683	75.4	84.9	0.097
SC-01	SB-10	Foundation Soils	32.1	6.1	111	1.9	1.5	59.6	0.605	0.8	47	51.1	59.6	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.144	0.676	75.4	83.9	0.096
SC-01	SB-10	Foundation Soils	32.2	6.0	111	1.9	1.5	62.0	0.598	0.8	47	51.6	62.0	1.0	-0.7	0.1	0.9	0.101	1.009	0.099	0.144	0.688	75.4	85.8	0.098
SC-01	SB-10	Foundation Soils	32.2	5.9	115	1.9	1.5	63.8	0.592	0.8	47	51.9	63.8	1.0	-0.7	0.1	0.9	0.102	1.009	0.100	0.144	0.697	72.6	84.5	0.096
SC-01	SB-10	Foundation Soils	32.3	5.9	111	1.9	1.5	62.8	0.595	0.8	47	51.7	62.8	1.0	-0.7	0.1	0.9	0.102	1.009	0.100	0.144	0.691	74.6	85.7	0.098
SC-01	SB-10	Foundation Soils	32.4	5.8	111	1.9	1.5	60.7	0.602	0.8	47	51.3	60.7	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.144	0.680	75.4	84.8	0.097
SC-01	SB-10	Foundation Soils	32.5	5.7	111	1.9	1.5	60.7	0.602	0.8	47	51.3	60.7	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.144	0.679	75.4	84.8	0.097
SC-01	SB-10	Foundation Soils	32.6	5.6	115	1.9	1.5	65.4	0.587	0.8	47	52.1	65.4	1.0	-0.7	0.1	0.9	0.104	1.009	0.102	0.144	0.703	68.1	81.4	0.092
SC-01	SB-10	Foundation Soils	32.6	5.5	121	1.9	1.5	77.7	0.552	0.8	47	53.0	77.7	1.0	-0.7	0.1	0.9	0.114	1.012	0.111	0.144	0.770	45.3	70.0	0.077
SC-01	SB-10	Foundation Soils	32.7	5.5	121	1.9	1.5	83.1	0.538	0.8	47	53.9	83.1	1.0	-0.7	0.1	0.9	0.119	1.013	0.116	0.145	0.803	43.6	72.9	0.081
SC-01	SB-10	Foundation Soils	32.8	5.4	115	1.9	1.5	80.0	0.546	0.8	47	53.9	80.0	1.0	-0.7	0.1	0.9	0.116	1.012	0.113	0.145	0.783	48.3	74.4	0.083
SC-01	SB-10	Foundation Soils	32.9	5.3	115	1.9	1.5	73.5	0.564	0.8	47	53.8	73.5	1.0	-0.7	0.1	0.9	0.110	1.011	0.108	0.145	0.745	65.9	85.7	0.098
SC-01	SB-10	Foundation Soils	33.0	5.2	111	1.9	1.5	70.8	0.571	0.8	47	53.4	70.8	1.0	-0.7	0.1	0.9	0.108	1.010	0.106	0.145	0.729	71.0	88.4	0.102
SC-01	SB-10	Foundation Soils	33.1	5.1	111	1.9	1.5	66.7	0.583	0.8	47	52.6	66.7	1.0	-0.7	0.1	0.9	0.105	1.010	0.102	0.145	0.707	75.4	89.5	0.103
SC-01	SB-10	Foundation Soils	33.1	5.0	111	2.0	1.5	63.3	0.594	0.8	47	51.9	63.3	1.0	-0.7	0.1	0.9	0.102	1.009	0.100	0.145	0.689	75.4	86.8	0.100
SC-01	SB-10	Foundation Soils	33.2	5.0	111	2.0	1.5	61.3	0.600	0.8	47	51.4	61.3	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.145	0.678	75.4	85.2	0.097
SC-01	SB-10	Foundation Soils	33.3	4.9	111	2.0	1.5	66.4	0.584	0.8	47	52.5	66.4	1.0	-0.7	0.1	0.9	0.104	1.010	0.102	0.145	0.704	75.4	89.3	0.103
SC-01	SB-10	Foundation Soils	33.4	4.8	115	2.0	1.5	69.0	0.577	0.8	47	52.9	69.0	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.145	0.717	68.6	84.7	0.097
SC-01	SB-10	Foundation Soils	33.5	4.7	111	2.0	1.5	66.2	0.585	0.8	47	52.5	66.2	1.0	-0.7	0.1	0.9	0.104	1.009	0.102	0.145	0.702	75.4	89.1	0.103
SC-01	SB-10	Foundation Soils	33.5	4.6	111	2.0	1.6	66.8	0.583	0.8	47	52.6	66.8	1.0	-0.7	0.1	0.9	0.105	1.010	0.102	0.145	0.704	75.4	89.5	0.103
SC-01	SB-10	Foundation Soils	33.6	4.6	111	2.0	1.6	72.0	0.568	0.8	47	53.6	72.0	1.0	-0.7	0.1	0.9	0.109	1.010	0.106	0.146	0.732	70.5	89.0	0.103
SC-01	SB-10	Foundation Soils	33.7	4.5	111	2.0	1.6	68.7	0.577	0.8	47	53.0	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.146	0.713	73.1	88.8	0.102
SC-01	SB-10	Foundation Soils	33.8	4.4	111	2.0	1.6	64.9	0.589	0.8	47	52.2	64.9	1.0	-0.7	0.1	0.9	0.103	1.009	0.101	0.146	0.693	75.4	88.1	0.101
SC-01	SB-10	Foundation Soils	33.9	4.3	111	2.0	1.6	61.6	0.599	0.8	47	51.5	61.6	1.0	-0.7	0.1	0.9	0.101	1.009	0.099	0.146	0.676	75.4	85.5	0.098
SC-01	SB-10	Foundation Soils	34.0	4.2	111	2.0	1.6	62.9	0.595	0.8	47	51.8	62.9	1.0	-0.7	0.1	0.9	0.102	1.009	0.099	0.146	0.682	75.4	86.5	0.099
SC-01	SB-10	Foundation Soils	34.0	4.1	111	2.0	1.6	63.3	0.594	0.8	47	51.9	63.3	1.0	-0.7	0.1	0.9	0.102	1.009	0.100	0.146	0.684	75.4	86.8	0.100
SC-01	SB-10	Foundation Soils	34.1	4.1	111	2.0	1.6	64.2	0.591	0.8	47	52.0	64.2	1.0	-0.7	0.1	0.9	0.103	1.009	0.100	0.146	0.688	74.6	86.7	0.099
SC-01	SB-10	Foundation Soils	34.2	4.0	115	2.0	1.6	68.9	0.577	0.8	47	52.9	68.9	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.146	0.711	69.9	85.9	0.098
SC-01	SB-10	Foundation Soils	34.3	3.9	115	2.0	1.6	72.2	0.567	0.8	47	53.5	72.2	1.0	-0.7	0.1	0.9	0.109	1.010	0.106	0.146	0.729	66.4	85.1	0.097
SC-01	SB-10	Foundation Soils	34.4	3.8	115	2.0	1.6	71.7	0.569	0.8	47	53.4	71.7	1.0	-0.7	0.1	0.9	0.109	1.010	0.106	0.146	0.726	65.6	84.0	0.096
SC-01	SB-10	Foundation Soils	34.4	3.7	115	2.0	1.6	68.6	0.578	0.8	47	52.9	68.6	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.146	0.709	71.0	86.7	0.099
SC-01	SB-10	Foundation Soils	34.5	3.7	111	2.0	1.6	64.4	0.590	0.8	47	52.1	64.4	1.0	-0.7	0.1	0.9	0.103	1.009	0.100	0.146	0.686	75.4	87.6	0.101
SC-01	SB-10	Foundation Soils	34.6	3.6	111	2.0	1.6	62.9	0.595	0.8	47	51.8	62.9	1.0	-0.7	0.1	0.9	0.102	1.009	0.099	0.146	0.679	75.4	86.5	0.099
SC-01	SB-10	Foundation Soils	34.7	3.5	111	2.0	1.6	62.0	0.598	0.8	47	51.6	62.0	1.0	-0.7	0.1	0.9	0.101	1.009	0.099	0.147	0.674	75.4	85.8	0.098
SC-01	SB-10	Foundation Soils	34.8	3.4	111	2.0	1.6	63.0	0.595	0.8	47	51.8	63.0	1.0	-0.7	0.1	0.9	0.102	1.009	0.099	0.147	0.679	75.4	86.6	0.099
SC-01	SB-10	Foundation Soils	34.9	3.3	115	2.0	1.6	63.9	0.592	0.8	47	51.9	63.9	1.0	-0.7	0.1	0.9	0.102	1.009	0.100	0.147	0.682	71.6	83.6	0.095
SC-01	SB-10	Foundation Soils	34.9	3.2	115	2.1	1.6	70.2	0.573	0.8	47	52.7	70.2	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.147	0.714	58.8	76.3	0.085
SC-01	SB-10	Foundation Soils	35.0	3.2	121	2.1	1.6	77.4	0.553	0.8	47	52.9	77.4	1.0	-0.7	0.1	0.9	0.113	1.012	0.111	0.147	0.754	45.2	69.7	0.077
SC-01	SB-10	Foundation Soils	35.1	3.1	121	2.1	1.6	77.2	0.554	0.8	47	52.8	77.2	1.0	-0.7	0.1	0.9	0.113	1.011	0.110	0.147	0.752	44.7	69.1	0.076
SC-01	SB-10	Foundation Soils	35.2	3.0	121	2.1	1.6	75.9	0.557	0.8	47	52.3	75.9	1.0	-0.7	0.1	0.9	0.112	1.011	0.109	0.147	0.745	43.4	67.1	0.073
SC-01	SB-10	Foundation Soils	35.3	2.9	121	2.1	1.6	77.2	0.554	0.8	47	52.4	77.2	1.0	-0.8	0.1	0.9	0.113	1.011	0.110	0.147	0.751	42.6	67.4	0.074
SC-01	SB-10	Foundation Soils	35.4	2.8	121	2.1	1.6	89.3	0.523	0.8	47	49.5	89.3	1.0	-0.8	0.1	0.9	0.125	1.014	0.122	0.147	0.826	28.3	68.0	0.075
SC-01	SB-10	Foundation Soils	35.4	2.7	121	2.1	1.6	92.6	0.515	0.8	47	47.3	92.6	1.0	-0.8	0.1	0.9	0.128	1.015	0.125	0.147	0.850	25.0	70.4	0.078
SC-01	SB-10	Foundation Soils	35.5	2.7	124	2.1	1.6	92.6	0.515	0.8	47	43.9	92.6	1.0	-0.8	0.1	0.9	0.128	1.015	0.125	0.147	0.849	22.4	71.1	0.079
SC-01	SB-10	Foundation Soils	35.6	2.6	124	2.1	1.6	90.3	0.520	0.8	47	36.9	90.3	1.0	-0.8	0.1	0.9	0.126	1.015	0.123	0.147	0.832	19.1	72.5	0.080
SC-01	SB-10	Foundation Soils	35.7	2.5	124	2.1	1.6	88.0	0.526	0.8	47	30.4	88.0	1.0	-0.8	0.1	0.9	0.123	1.014	0.120	0.147	0.816	16.9	74.5	0.083
SC-01	SB-10	Foundation Soils	35.8	2.4	124	2.1	1.6	93.4	0.513	0.8	47	34.5	93.4	1.0	-0.8	0.1	0.9	0.129	1.016	0.126	0.147	0.854	18.0	76.9	0.086
SC-01	SB-10	Foundation Soils	35.8	2.3	124	2.1	1.6	98.5	0.501	0.8	47	41.8	98.5	1.0	-0.8	0.1	0.9	0.135	1.017	0.132	0.147	0.893	20.7	77.4	0.087
SC-01	SB-10	Foundation Soils	35.9	2.3	124	2.1	1.6	96.7	0.506	0.8	47	44.6	96.7	1.0	-0.8	0.1	0.9	0.133	1.017	0.129	0.147	0.878	22.5	74.5	0.083
SC-01	SB-10	Foundation Soils	36.0	2.2	121	2.1	1.6	99.4	0.499	0.8	47	50.1	99.4	1.0	-0.8	0.1	0.9	0.137	1.018	0.133	0.148	0.900	26.6	76.0	0.085
SC-01	SB-10	Foundation Soils	36.1	2.1	121	2.1	1.6	95.8	0.508	0.8	47	54.0	95.8	1.0	-0.8	0.1	0.9	0.132	1.016	0.128	0.148	0.870	34.1	76.0	0.085
SC-01	SB-10	Foundation Soils	36.2	2.0	121	2.1	1.6	94.3	0.511	0.8	47	54.6	94.3	1.0	-0.8	0.1	0.9	0.130	1.016	0.127	0.148	0.858	36.8	76.5	0.086
SC-01	SB-10	Foundation Soils	36.3	1.9	121	2.1	1.6	87.4	0.527	0.8	47	53.9	87.4	1.0	-0.8	0.1	0.9	0.123	1.014	0.120	0.148	0.809	39.4	72.9	0.081
SC-01	SB-10	Foundation Soils	36.3	1.8	121	2.1	1.6	83.6	0.537	0.8	47	53.6	83.6	1.0	-0.8	0.1	0.9	0.119	1.013	0.116	0.148	0.784	41.5	71.6	0.079
SC-01	SB-10	Foundation Soils	36.4	1.8	121	2.1	1.6	82.8	0.539	0.8	47	53.3	82.8	1.0	-0.8	0.1	0.9	0.118	1.013	0.115	0.148	0.779	40.9	70.4	0.078
SC-01	SB-10	Foundation Soils	36.5	1.7	121	2.1	1.6	81.9	0.541	0.8	47	52.6	81.9	1.0	-0.8	0.1	0.9	0.118	1.013	0.114	0.148	0.773	38.6	67.9	0.075
SC-01	SB-10	Foundation Soils	36.6	1.6	121	2.2	1.6	79.9	0.546	0.8	47	51.6	79.9	1.0	-0.8	0.1	0.9	0.116	1.012	0.112	0.148	0.761	36.7	64.9	0.071
SC-01	SB-10	Foundation Soils	36.7	1.5	121	2.2	1.6	79.7	0.547	0.8	47	51.8	79.7	1.0	-0.8	0.1	0.9	0.116	1.012	0.112	0.148	0.759	37.5	65.4	0.071

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-01	SB-10	Foundation Soils	36.7	1.4	121	2.2	1.6	79.2	0.548	0.8	47	52.8	79.2	1.0	-0.8	0.1	0.9	0.115	1.012	0.112	0.148	0.756	42.2	68.6	0.075
SC-01	SB-10	Foundation Soils	36.8	1.4	121	2.2	1.6	76.5	0.556	0.8	47	52.9	76.5	1.0	-0.8	0.1	0.9	0.113	1.011	0.110	0.148	0.740	46.5	70.1	0.077
SC-01	SB-10	Foundation Soils	36.9	1.3	115	2.2	1.6	72.5	0.567	0.8	47	53.3	72.5	1.0	-0.8	0.1	0.9	0.109	1.011	0.106	0.148	0.718	60.3	79.5	0.090
SC-01	SB-10	Foundation Soils	37.0	1.2	115	2.2	1.6	69.7	0.575	0.8	47	52.9	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.148	0.702	65.6	82.4	0.093
SC-01	SB-10	Foundation Soils	37.1	1.1	111	2.2	1.6	65.1	0.588	0.8	47	52.3	65.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.148	0.679	75.4	88.2	0.102
SC-01	SB-10	Foundation Soils	37.2	1.0	111	2.2	1.7	64.2	0.591	0.8	47	52.1	64.2	1.0	-0.8	0.1	0.9	0.103	1.009	0.100	0.148	0.674	75.4	87.5	0.101
SC-01	SB-10	Foundation Soils	37.2	0.9	115	2.2	1.7	65.8	0.586	0.8	47	52.3	65.8	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.148	0.682	72.2	85.7	0.098
SC-01	SB-10	Foundation Soils	37.3	0.9	115	2.2	1.7	72.6	0.566	0.8	47	53.0	72.6	1.0	-0.8	0.1	0.9	0.109	1.011	0.106	0.148	0.716	56.4	76.0	0.085
SC-01	SB-10	Foundation Soils	37.4	0.8	121	2.2	1.7	84.8	0.534	0.8	47	49.9	84.8	1.0	-0.8	0.1	0.9	0.120	1.013	0.117	0.148	0.787	30.1	65.1	0.071
SC-01	SB-10	Foundation Soils	37.5	0.7	124	2.2	1.7	87.5	0.527	0.8	47	41.2	87.5	1.0	-0.8	0.1	0.9	0.123	1.014	0.119	0.149	0.803	21.3	67.6	0.074
SC-01	SB-10	Foundation Soils	37.6	0.6	124	2.2	1.7	77.6	0.552	0.8	47	24.1	77.6	1.0	-0.8	0.1	0.9	0.114	1.012	0.110	0.149	0.743	15.5	69.1	0.076
SC-01	SB-10	Foundation Soils	37.6	0.5	124	2.2	1.7	57.7	0.612	0.8	47	0.7	57.7	1.0	-0.8	0.1	0.9	0.098	1.008	0.095	0.149	0.641	9.7	66.7	0.073
SC-01	SB-10	Foundation Soils	37.7	0.5	124	2.2	1.7	61.7	0.599	0.8	47	0.0	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.149	0.660	6.5	68.2	0.075
SC-01	SB-10	Foundation Soils	37.8	0.4	124	2.2	1.7	65.6	0.587	0.8	47	0.0	65.6	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.149	0.678	6.0	71.6	0.079
SC-01	SB-10	Foundation Soils	37.9	0.3	124	2.2	1.7	69.0	0.576	0.8	47	0.0	69.0	1.0	-0.8	0.1	0.9	0.106	1.010	0.103	0.149	0.695	6.0	75.0	0.084
SC-01	SB-10	Foundation Soils	38.0	0.2	124	2.2	1.7	67.1	0.582	0.8	47	0.0	67.1	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.149	0.685	6.0	73.1	0.081
SC-01	SB-10	Foundation Soils	38.1	0.1	124	2.2	1.7	68.0	0.579	0.8	47	0.0	68.0	1.0	-0.8	0.1	0.9	0.106	1.010	0.103	0.149	0.690	6.0	74.0	0.082
SC-01	SB-10	Foundation Soils	38.1	0.0	124	2.2	1.7	67.1	0.582	0.8	47	0.0	67.1	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.149	0.685	6.0	73.1	0.081
SC-01	SB-10	Foundation Soils	38.2	-0.0	124	2.3	1.7	69.8	0.574	0.8	47	0.0	69.8	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.149	0.698	6.0	75.8	0.085
SC-01	SB-10	Foundation Soils	38.3	-0.1	124	2.3	1.7	70.9	0.571	0.8	47	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.149	0.704	6.0	76.9	0.086
SC-01	SB-10	Foundation Soils	38.4	-0.2	119	2.3	1.7	73.9	0.563	0.8	47	0.0	73.9	1.0	-0.8	0.1	0.9	0.111	1.011	0.107	0.149	0.719	6.0	79.9	0.090
SC-01	SB-10	Foundation Soils	38.5	-0.3	124	2.3	1.7	73.4	0.564	0.8	47	0.0	73.4	1.0	-0.8	0.1	0.9	0.110	1.011	0.107	0.149	0.716	6.0	79.4	0.089
SC-01	SB-10	Foundation Soils	38.5	-0.4	124	2.3	1.7	70.5	0.572	0.8	47	0.0	70.5	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.149	0.701	6.0	76.5	0.086
SC-01	SB-10	Foundation Soils	38.6	-0.5	124	2.3	1.7	67.5	0.581	0.8	47	0.0	67.5	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.149	0.685	6.0	73.5	0.082
SC-01	SB-10	Foundation Soils	38.7	-0.5	124	2.3	1.7	67.1	0.582	0.8	47	0.0	67.1	1.0	-0.9	0.1	0.9	0.105	1.010	0.102	0.149	0.683	6.6	73.7	0.082
SC-01	SB-10	Foundation Soils	38.8	-0.6	124	2.3	1.7	63.3	0.594	0.8	47	0.2	63.3	1.0	-0.9	0.1	0.9	0.102	1.009	0.099	0.149	0.664	9.1	72.2	0.080
SC-01	SB-10	Foundation Soils	38.9	-0.7	124	2.3	1.7	65.2	0.588	0.8	47	1.4	65.2	1.0	-0.9	0.1	0.9	0.103	1.009	0.100	0.149	0.673	10.1	74.0	0.082
SC-01	SB-10	Foundation Soils	39.0	-0.8	124	2.3	1.7	74.4	0.561	0.8	47	8.7	74.4	1.0	-0.9	0.1	0.9	0.111	1.011	0.108	0.149	0.720	12.2	77.9	0.087
SC-01	SB-10	Foundation Soils	39.0	-0.9	124	2.3	1.7	93.0	0.514	0.8	47	24.5	93.0	1.0	-0.9	0.1	0.9	0.129	1.015	0.125	0.149	0.834	15.3	83.8	0.095
SC-01	SB-10	Foundation Soils	39.1	-0.9	124	2.3	1.7	80.4	0.545	0.8	47	15.4	80.4	1.0	-0.9	0.1	0.9	0.116	1.012	0.112	0.149	0.753	13.5	78.6	0.088
SC-01	SB-10	Foundation Soils	39.2	-1.0	124	2.3	1.7	92.9	0.514	0.8	47	35.4	92.9	1.0	-0.9	0.1	0.9	0.129	1.015	0.124	0.149	0.832	18.4	75.8	0.085
SC-01	SB-10	Foundation Soils	39.3	-1.1	124	2.3	1.7	94.6	0.510	0.8	47	40.1	94.6	1.0	-0.9	0.1	0.9	0.131	1.016	0.126	0.149	0.844	20.2	74.6	0.083
SC-01	SB-10	Foundation Soils	39.4	-1.2	124	2.3	1.7	96.6	0.506	0.8	47	40.4	96.6	1.0	-0.9	0.1	0.9	0.133	1.017	0.128	0.149	0.860	20.1	76.4	0.085
SC-01	SB-10	Foundation Soils	39.5	-1.3	124	2.3	1.7	86.5	0.530	0.8	47	23.6	86.5	1.0	-0.9	0.1	0.9	0.122	1.014	0.118	0.150	0.789	15.2	78.1	0.088
SC-01	SB-10	Foundation Soils	39.5	-1.4	124	2.3	1.7	80.4	0.545	0.8	47	17.6	80.4	1.0	-0.9	0.1	0.8	0.116	1.012	0.112	0.150	0.752	14.0	76.8	0.086
SC-01	SB-10	Foundation Soils	39.6	-1.4	124	2.3	1.7	67.7	0.580	0.8	47	5.9	67.7	1.0	-0.9	0.1	0.8	0.105	1.010	0.102	0.150	0.683	11.6	73.4	0.081
SC-01	SB-10	Foundation Soils	39.7	-1.5	124	2.3	1.7	70.1	0.573	0.8	47	7.9	70.1	1.0	-0.9	0.1	0.8	0.107	1.010	0.104	0.150	0.695	12.0	74.2	0.083
SC-01	SB-10	Foundation Soils	39.8	-1.6	124	2.3	1.7	74.2	0.562	0.8	47	12.1	74.2	1.0	-0.9	0.1	0.8	0.111	1.011	0.107	0.150	0.716	12.9	75.0	0.084
SC-01	SB-10	Foundation Soils	39.9	-1.7	124	2.4	1.7	62.3	0.597	0.7	47	0.8	62.3	1.0	-0.9	0.1	0.8	0.101	1.009	0.098	0.150	0.656	9.8	71.3	0.079
SC-01	SB-10	Foundation Soils	39.9	-1.8	124	2.4	1.7	107.2	0.483	0.8	47	35.8	107.2	0.9	-0.9	0.1	0.8	0.148	1.020	0.142	0.150	0.950	17.9	89.3	0.103
SC-01	SB-10	Foundation Soils	40.0	-1.8	121	2.4	1.7	147.2	0.408	0.8	47	65.9	147.2	0.9	-0.9	0.1	0.8	0.271	1.043	0.261	0.150	1.743	38.2	119.6	
SC-02	SB-03 & SB-04	Foundation Soils	21.1	17.4	111	1.3	1.3	57.2	0.613	0.9	30	46.5	57.2	1.0	-0.4	0.0	0.9	0.097	1.008	0.097	0.122	0.794	75.4	86.0	0.098
SC-02	SB-03 & SB-04	Foundation Soils	21.2	17.3	111	1.3	1.3	59.3	0.607	0.9	30	46.9	59.3	1.0	-0.4	0.0	0.9	0.099	1.009	0.098	0.122	0.805	75.4	87.7	0.101
SC-02	SB-03 & SB-04	Foundation Soils	21.2	17.2	111	1.3	1.3	61.4	0.599	0.9	30	47.3	61.4	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.122	0.817	72.0	86.2	0.099
SC-02	SB-03 & SB-04	Foundation Soils	21.3	17.1	111	1.3	1.3	60.7	0.602	0.9	30	47.1	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.099	0.122	0.811	72.6	86.2	0.099
SC-02	SB-03 & SB-04	Foundation Soils	21.4	17.0	111	1.3	1.3	59.2	0.607	0.9	30	46.9	59.2	1.0	-0.4	0.0	0.9	0.099	1.009	0.098	0.123	0.801	75.4	87.7	0.101
SC-02	SB-03 & SB-04	Foundation Soils	21.5	17.0	111	1.3	1.3	57.8	0.611	0.9	30	46.6	57.8	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.123	0.791	75.4	86.6	0.099
SC-02	SB-03 & SB-04	Foundation Soils	21.6	16.9	111	1.3	1.3	57.6	0.612	0.9	30	46.6	57.6	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.123	0.788	75.4	86.4	0.099
SC-02	SB-03 & SB-04	Foundation Soils	21.7	16.8	111	1.3	1.3	61.8	0.598	0.9	30	47.3	61.8	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.123	0.812	72.2	86.6	0.099
SC-02	SB-03 & SB-04	Foundation Soils	21.7	16.7	115	1.3	1.3	67.6	0.581	0.9	30	48.1	67.6	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.123	0.847	61.4	80.9	0.091
SC-02	SB-03 & SB-04	Foundation Soils	21.8	16.6	115	1.3	1.3	71.9	0.568	0.9	30	48.2	71.9	1.0	-0.4	0.0	0.9	0.109	1.010	0.108	0.124	0.873	51.1	74.7	0.083
SC-02	SB-03 & SB-04	Foundation Soils	21.9	16.5	121	1.3	1.3	81.2	0.543	0.9	30	49.3	81.2	1.0	-0.4	0.0	0.9	0.117	1.012	0.116	0.124	0.937	44.8	76.7	0.086
SC-02	SB-03 & SB-04	Foundation Soils	22.0	16.5	115	1.3	1.3	78.8	0.549	0.9	30	49.5	78.8	1.0	-0.4	0.0	0.9	0.115	1.012	0.114	0.124	0.918	50.6	79.8	0.090
SC-02	SB-03 & SB-04	Foundation Soils	22.1	16.4	115	1.3	1.3	73.1	0.565	0.9	30	49.2	73.1	1.0	-0.4	0.0	0.9	0.110	1.011	0.109	0.124	0.877	61.2	85.1	0.097
SC-02	SB-03 & SB-04	Foundation Soils	22.1	16.3	115	1.4	1.3	69.4	0.575	0.9	30	48.7	69.4	1.0	-0.4	0.0	0.9	0.107	1.010	0.106	0.124	0.852	66.1	86.8	0.100
SC-02	SB-03 & SB-04	Foundation Soils	22.2	16.2	111	1.4	1.3	62.5	0.596	0.9	30	47.6	62.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.125	0.807	75.4	90.3	0.105
SC-02	SB-03 & SB-04	Foundation Soils	22.3	16.1	111	1.4	1.3	58.5	0.609	0.9	30	46.8	58.5	1.0	-0.4	0.0	0.9	0.098	1.008	0.098	0.125	0.782	75.4	87.2	0.100
SC-02	SB-03 & SB-04	Foundation Soils	22.4	16.1	111	1.4	1.3	56.9	0.614	0.9	30	46.4	56.9	1.0	-0.4	0.0	0.9	0.097	1.008	0.096	0.125	0.772	75.4	85.8	0.098
SC-02	SB-03 & SB-04	Foundation Soils	22.5	16.0	111	1.4	1.3	56.4	0.616	0.9	30	46.3	56.4	1.0	-0.4	0.0	0.9	0.097	1.008	0.096	0.125	0.767	75.4	85.4	0.098
SC-02	SB-03 & SB-04	Foundation Soils	22.6	15.9	111	1.4	1.3	56.4	0.616	0.9	30	46.3	56.4	1.0	-0.4	0.0	0.9	0.097	1.008	0.096	0.125	0.766	75.4	85.4	0.098
SC-02	SB-03 & SB-04	Foundation Soils	22.6	15.8	111	1.4	1.3	55.2	0.620	0.9	30	46.1	55.2	1.0	-0.4	0.0	0.9	0.096	1.008	0.095	0.125	0.759	75.4	84.5	0.096
SC-02	SB-03 & SB-04	Foundation Soils	22.7	15.7	111	1.4	1.3	57.9	0.611	0.9	30	46.6	57.9	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.126	0.773	75.4	86.6	0.099
SC-02	SB-03 & SB-04	Foundation Soils	22.8	15.6	111	1.4	1.3	62.1	0.597	0.9	30	47.4	62.1	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.126	0.796	71.9	86.6	0.099
SC-02	SB-03 & SB-04	Foundation Soils	22.9	15.6	111	1.4	1.3	58.2	0.610	0.9	30	46.7	58.2	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.126	0.772	75.4	86.9	0.100
SC-02	SB-03 & SB-04	Foundation Soils	23.0	15.5	111	1.4	1.3	55.4	0.619	0.9	30	46.1	55.4	1.0	-0.4	0.0	0.9	0.096	1.008	0.095	0.126	0.755	75.4	84.6	0.097
SC-02	SB-03 & SB-04	Foundation Soils	23.0	15.4	111	1.4	1.3	55.4	0.619	0.9	30	46.1	55.4	1.0	-0.4	0.0	0.9	0.096	1.008	0.095	0.126	0.754	75.4	84.7	0.097
SC-02	SB-03 & SB-04	Foundation Soils	23.1	15.3	111	1.4	1.3	52.5	0.630	0.9	30	45.6	52.5	1.0	-0.4	0.0	0.9	0.094	1.008	0.093	0.127	0.737	75.4	82.3	0.093
SC-02	SB-03 & SB-04	Foundation Soils	23.2	15.2	111	1.4	1.3	51.5	0.633	0.9	30	45.4	51.5	1.0	-0.4	0.0	0.9	0.093	1.008	0.092	0.127	0.730	75.4	81.5	0.092
SC-02	SB-03 & SB-04	Foundation Soils	23.3	15.2	111	1.4	1.3	51.3	0.634	0.9	30	45.3	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.092	0.127	0.728	75.4	81.4	0.092
SC-02	SB-03 & SB-04	Foundation Soils	23.4	15.1	111	1.4	1.3	51.4	0.634	0.9	30	45.3	51.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.092	0.127	0.727	75.4	81.4	0.092

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-02	SB-03 & SB-04	Foundation Soils	23.5	15.0	111	1.4	1.3	51.8	0.632	0.9	30	45.4	51.8	1.0	-0.4	0.0	0.9	0.094	1.008	0.093	0.127	0.728	75.4	81.8	0.093
SC-02	SB-03 & SB-04	Foundation Soils	23.5	14.9	111	1.4	1.4	51.1	0.635	0.9	30	45.3	51.1	1.0	-0.4	0.0	0.9	0.093	1.008	0.092	0.127	0.724	75.4	81.2	0.092
SC-02	SB-03 & SB-04	Foundation Soils	23.6	14.8	111	1.4	1.4	50.0	0.639	0.9	30	45.0	50.0	1.0	-0.4	0.0	0.9	0.092	1.008	0.091	0.128	0.716	75.4	80.3	0.091
SC-02	SB-03 & SB-04	Foundation Soils	23.7	14.7	111	1.4	1.4	49.8	0.639	0.9	30	45.0	49.8	1.0	-0.4	0.0	0.9	0.092	1.008	0.091	0.128	0.714	75.4	80.1	0.090
SC-02	SB-03 & SB-04	Foundation Soils	23.8	14.7	111	1.4	1.4	49.8	0.639	0.9	30	45.0	49.8	1.0	-0.4	0.0	0.9	0.092	1.008	0.091	0.128	0.713	75.4	80.2	0.090
SC-02	SB-03 & SB-04	Foundation Soils	23.9	14.6	111	1.4	1.4	51.0	0.635	0.9	30	45.2	51.0	1.0	-0.4	0.0	0.9	0.093	1.008	0.092	0.128	0.719	75.4	81.1	0.092
SC-02	SB-03 & SB-04	Foundation Soils	23.9	14.5	111	1.5	1.4	54.2	0.624	0.9	30	45.9	54.2	1.0	-0.4	0.1	0.9	0.095	1.008	0.094	0.128	0.735	75.4	83.7	0.095
SC-02	SB-03 & SB-04	Foundation Soils	24.0	14.4	111	1.5	1.4	56.0	0.617	0.9	30	46.3	56.0	1.0	-0.4	0.1	0.9	0.097	1.008	0.096	0.128	0.744	75.4	85.1	0.097
SC-02	SB-03 & SB-04	Foundation Soils	24.1	14.3	115	1.5	1.4	59.5	0.606	0.9	30	46.7	59.5	1.0	-0.4	0.1	0.9	0.099	1.009	0.098	0.129	0.763	65.7	78.5	0.088
SC-02	SB-03 & SB-04	Foundation Soils	24.2	14.3	111	1.5	1.4	57.4	0.613	0.9	30	46.5	57.4	1.0	-0.5	0.1	0.9	0.098	1.008	0.096	0.129	0.750	74.4	85.3	0.097
SC-02	SB-03 & SB-04	Foundation Soils	24.3	14.2	111	1.5	1.4	56.0	0.617	0.9	30	46.3	56.0	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.129	0.742	75.4	85.2	0.097
SC-02	SB-03 & SB-04	Foundation Soils	24.4	14.1	111	1.5	1.4	54.4	0.623	0.9	30	45.9	54.4	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.129	0.732	75.4	83.9	0.095
SC-02	SB-03 & SB-04	Foundation Soils	24.4	14.0	111	1.5	1.4	53.2	0.627	0.9	30	45.7	53.2	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.129	0.724	75.4	82.9	0.094
SC-02	SB-03 & SB-04	Foundation Soils	24.5	13.9	111	1.5	1.4	52.8	0.629	0.8	30	45.6	52.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.129	0.721	75.4	82.6	0.094
SC-02	SB-03 & SB-04	Foundation Soils	24.6	13.8	111	1.5	1.4	53.3	0.627	0.8	30	45.7	53.3	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.129	0.722	75.4	82.9	0.094
SC-02	SB-03 & SB-04	Foundation Soils	24.7	13.8	115	1.5	1.4	56.3	0.616	0.9	30	46.3	56.3	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.130	0.738	72.4	82.5	0.094
SC-02	SB-03 & SB-04	Foundation Soils	24.8	13.7	115	1.5	1.4	59.4	0.606	0.9	30	46.6	59.4	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.130	0.754	64.0	76.9	0.086
SC-02	SB-03 & SB-04	Foundation Soils	24.9	13.6	115	1.5	1.4	56.3	0.616	0.8	30	46.2	56.3	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.130	0.736	69.3	79.5	0.090
SC-02	SB-03 & SB-04	Foundation Soils	24.9	13.5	115	1.5	1.4	54.8	0.621	0.8	30	45.9	54.8	1.0	-0.5	0.1	0.9	0.096	1.008	0.095	0.130	0.727	71.0	80.0	0.090
SC-02	SB-03 & SB-04	Foundation Soils	25.0	13.4	111	1.5	1.4	53.2	0.627	0.8	30	45.7	53.2	1.0	-0.5	0.1	0.9	0.095	1.008	0.093	0.130	0.717	75.4	82.9	0.094
SC-02	SB-03 & SB-04	Foundation Soils	25.1	13.3	111	1.5	1.4	51.8	0.632	0.8	30	45.4	51.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.092	0.130	0.709	75.4	81.8	0.093
SC-02	SB-03 & SB-04	Foundation Soils	25.2	13.3	111	1.5	1.4	51.1	0.634	0.8	30	45.3	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.131	0.705	75.4	81.2	0.092
SC-02	SB-03 & SB-04	Foundation Soils	25.3	13.2	111	1.5	1.4	50.9	0.635	0.8	30	45.2	50.9	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.131	0.703	75.4	81.1	0.092
SC-02	SB-03 & SB-04	Foundation Soils	25.3	13.1	111	1.5	1.4	51.3	0.634	0.8	30	45.3	51.3	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.131	0.704	75.4	81.4	0.092
SC-02	SB-03 & SB-04	Foundation Soils	25.4	13.0	115	1.5	1.4	57.9	0.611	0.8	30	46.5	57.9	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.131	0.738	68.9	80.4	0.091
SC-02	SB-03 & SB-04	Foundation Soils	25.5	12.9	115	1.5	1.4	64.7	0.589	0.8	30	47.3	64.7	1.0	-0.5	0.1	0.9	0.103	1.009	0.102	0.131	0.776	58.1	75.5	0.084
SC-02	SB-03 & SB-04	Foundation Soils	25.6	12.9	115	1.5	1.4	66.5	0.584	0.8	30	47.7	66.5	1.0	-0.5	0.1	0.9	0.104	1.010	0.103	0.131	0.785	58.4	77.1	0.086
SC-02	SB-03 & SB-04	Foundation Soils	25.7	12.8	115	1.5	1.4	67.8	0.580	0.8	30	47.9	67.8	1.0	-0.5	0.1	0.9	0.106	1.010	0.104	0.131	0.792	57.8	77.7	0.087
SC-02	SB-03 & SB-04	Foundation Soils	25.8	12.7	121	1.6	1.4	72.2	0.567	0.9	30	48.0	72.2	1.0	-0.5	0.1	0.9	0.109	1.011	0.108	0.132	0.818	47.7	72.0	0.080
SC-02	SB-03 & SB-04	Foundation Soils	25.8	12.6	121	1.6	1.4	79.8	0.547	0.9	30	47.7	79.8	1.0	-0.5	0.1	0.9	0.116	1.012	0.114	0.132	0.865	37.6	69.8	0.077
SC-02	SB-03 & SB-04	Foundation Soils	25.9	12.5	121	1.6	1.4	78.8	0.549	0.9	30	47.6	78.8	1.0	-0.5	0.1	0.9	0.115	1.012	0.113	0.132	0.858	38.1	69.3	0.076
SC-02	SB-03 & SB-04	Foundation Soils	26.0	12.4	121	1.6	1.4	73.7	0.563	0.9	30	47.3	73.7	1.0	-0.5	0.1	0.9	0.110	1.011	0.109	0.132	0.824	41.1	67.5	0.074
SC-02	SB-03 & SB-04	Foundation Soils	26.1	12.4	121	1.6	1.4	73.8	0.563	0.8	30	46.6	73.8	1.0	-0.5	0.1	0.9	0.110	1.011	0.109	0.132	0.823	38.0	65.2	0.071
SC-02	SB-03 & SB-04	Foundation Soils	26.2	12.3	121	1.6	1.4	77.6	0.552	0.9	30	45.5	77.6	1.0	-0.5	0.1	0.9	0.114	1.012	0.112	0.132	0.847	32.3	64.4	0.070
SC-02	SB-03 & SB-04	Foundation Soils	26.2	12.2	121	1.6	1.4	79.5	0.548	0.9	30	46.2	79.5	1.0	-0.5	0.1	0.9	0.115	1.012	0.114	0.132	0.858	33.2	66.4	0.073
SC-02	SB-03 & SB-04	Foundation Soils	26.3	12.1	121	1.6	1.4	79.5	0.547	0.9	30	47.0	79.5	1.0	-0.5	0.1	0.9	0.115	1.012	0.114	0.133	0.857	35.5	68.0	0.075
SC-02	SB-03 & SB-04	Foundation Soils	26.4	12.0	121	1.6	1.4	79.1	0.549	0.9	30	46.4	79.1	1.0	-0.5	0.1	0.9	0.115	1.012	0.113	0.133	0.853	34.0	66.6	0.073
SC-02	SB-03 & SB-04	Foundation Soils	26.5	12.0	121	1.6	1.4	76.7	0.555	0.8	30	47.6	76.7	1.0	-0.5	0.1	0.9	0.113	1.011	0.111	0.133	0.836	39.8	68.9	0.076
SC-02	SB-03 & SB-04	Foundation Soils	26.6	11.9	121	1.6	1.4	74.2	0.562	0.8	30	47.9	74.2	1.0	-0.5	0.1	0.9	0.111	1.011	0.109	0.133	0.820	44.6	70.8	0.078
SC-02	SB-03 & SB-04	Foundation Soils	26.7	11.8	115	1.6	1.4	70.8	0.571	0.8	30	48.0	70.8	1.0	-0.5	0.1	0.9	0.108	1.010	0.106	0.133	0.798	50.4	73.2	0.081
SC-02	SB-03 & SB-04	Foundation Soils	26.7	11.7	115	1.6	1.4	65.7	0.586	0.8	30	47.8	65.7	1.0	-0.5	0.1	0.9	0.104	1.009	0.102	0.133	0.768	63.5	81.4	0.092
SC-02	SB-03 & SB-04	Foundation Soils	26.8	11.6	115	1.6	1.4	63.1	0.594	0.8	30	47.4	63.1	1.0	-0.5	0.1	0.9	0.102	1.009	0.100	0.133	0.752	65.5	81.1	0.092
SC-02	SB-03 & SB-04	Foundation Soils	26.9	11.5	115	1.6	1.4	59.2	0.607	0.8	30	46.8	59.2	1.0	-0.5	0.1	0.9	0.099	1.009	0.097	0.133	0.730	71.4	83.8	0.095
SC-02	SB-03 & SB-04	Foundation Soils	27.0	11.5	111	1.6	1.4	57.0	0.614	0.8	30	46.4	57.0	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.134	0.718	74.1	84.7	0.097
SC-02	SB-03 & SB-04	Foundation Soils	27.1	11.4	111	1.6	1.4	56.2	0.617	0.8	30	46.3	56.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.095	0.134	0.712	74.6	84.6	0.096
SC-02	SB-03 & SB-04	Foundation Soils	27.1	11.3	111	1.6	1.4	54.0	0.624	0.8	30	45.9	54.0	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.134	0.700	75.4	83.5	0.095
SC-02	SB-03 & SB-04	Foundation Soils	27.2	11.2	111	1.6	1.4	53.4	0.626	0.8	30	45.7	53.4	1.0	-0.5	0.1	0.9	0.095	1.008	0.093	0.134	0.696	75.4	83.1	0.094
SC-02	SB-03 & SB-04	Foundation Soils	27.3	11.1	111	1.6	1.4	53.0	0.628	0.8	30	45.7	53.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.134	0.693	75.4	82.7	0.094
SC-02	SB-03 & SB-04	Foundation Soils	27.4	11.1	111	1.7	1.5	52.2	0.630	0.8	30	45.5	52.2	1.0	-0.5	0.1	0.9	0.094	1.008	0.092	0.134	0.688	75.4	82.1	0.093
SC-02	SB-03 & SB-04	Foundation Soils	27.5	11.0	111	1.7	1.5	51.5	0.633	0.8	30	45.4	51.5	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.134	0.684	75.4	81.6	0.092
SC-02	SB-03 & SB-04	Foundation Soils	27.6	10.9	111	1.7	1.5	51.3	0.634	0.8	30	45.3	51.3	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.135	0.682	75.4	81.4	0.092
SC-02	SB-03 & SB-04	Foundation Soils	27.6	10.8	111	1.7	1.5	51.2	0.634	0.8	30	45.3	51.2	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.135	0.681	75.4	81.3	0.092
SC-02	SB-03 & SB-04	Foundation Soils	27.7	10.7	111	1.7	1.5	51.0	0.635	0.8	30	45.3	51.0	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.135	0.679	75.4	81.2	0.092
SC-02	SB-03 & SB-04	Foundation Soils	27.8	10.6	111	1.7	1.5	51.0	0.635	0.8	30	45.3	51.0	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.135	0.679	75.4	81.1	0.092
SC-02	SB-03 & SB-04	Foundation Soils	27.9	10.6	111	1.7	1.5	51.0	0.635	0.8	30	45.2	51.0	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.135	0.678	75.4	81.1	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.0	10.5	111	1.7	1.5	50.7	0.636	0.8	30	45.2	50.7	1.0	-0.5	0.1	0.9	0.093	1.008	0.091	0.135	0.676	75.4	80.9	0.091
SC-02	SB-03 & SB-04	Foundation Soils	28.1	10.4	111	1.7	1.5	51.1	0.635	0.8	30	45.3	51.1	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.135	0.677	75.4	81.2	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.1	10.3	111	1.7	1.5	51.2	0.634	0.8	30	45.3	51.2	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.135	0.677	75.4	81.3	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.2	10.2	111	1.7	1.5	51.2	0.634	0.8	30	45.3	51.2	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.136	0.676	75.4	81.3	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.3	10.1	111	1.7	1.5	51.3	0.634	0.8	30	45.3	51.3	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.136	0.676	75.4	81.4	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.4	10.1	111	1.7	1.5	51.4	0.634	0.8	30	45.3	51.4	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.136	0.676	75.4	81.4	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.5	10.0	111	1.7	1.5	51.4	0.633	0.8	30	45.3	51.4	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.136	0.675	75.4	81.5	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.5	9.9	111	1.7	1.5	51.5	0.633	0.8	30	45.4	51.5	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.136	0.675	75.4	81.5	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.6	9.8	111	1.7	1.5	51.5	0.633	0.8	30	45.4	51.5	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.136	0.674	75.4	81.6	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.7	9.7	111	1.7	1.5	51.4	0.633	0.8	30	45.3	51.4	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.136	0.673	75.4	81.5	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.8	9.7	111	1.7	1.5	51.3	0.634	0.8	30	45.3	51.3	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.136	0.672	75.4	81.4	0.092
SC-02	SB-03 & SB-04	Foundation Soils	28.9	9.6	111	1.7	1.5	51.3	0.634	0.8	30	45.3	51.3	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.137	0.671	75.4	81.4	0.092
SC-02	SB-03 & SB-04	Foundation Soils	29.0	9.5	111	1.7	1.5	51.6	0.633	0.8	30	45.4	51.6	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.137	0.672	75.4	81.6	0.092
SC-02	SB-03 & SB-04	Foundation Soils	29.0	9.4	111	1.7	1.5	52.8	0.628	0.8	30	45.6	52.8	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.137	0.678	75.4	82.6	0.094
SC-02	SB-03 & SB-04	Foundation Soils	29.1	9.3	115	1.7	1.5	54.2	0.624	0.8	30	45.9	54.2	1.0	-0.6	0.1	0.9	0.095	1.008	0.094	0.137	0.684	74.6	82.9	0.094
SC-02	SB-03 & SB-04	Foundation Soils	29.2	9.2	115	1.8	1.5	54.0	0.624	0.8	30	45.9	54.0	1.0	-0.6	0.1	0.9	0.095	1.008	0.093	0.137	0.682	75.4	83.5	0.095

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-02	SB-03 & SB-04	Foundation Soils	29.3	9.2	115	1.8	1.5	42.2	0.669	0.8	15	34.9	42.2	1.0	-0.6	0.1	0.9	0.087	1.007	0.085	0.137	0.623	75.3	82.5	0.094
SC-02	SB-03 & SB-04	Foundation Soils	29.4	9.1	111	1.8	1.5	42.2	0.669	0.8	15	34.9	42.2	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.137	0.623	75.4	82.7	0.094
SC-02	SB-03 & SB-04	Foundation Soils	29.4	9.0	115	1.8	1.5	44.4	0.660	0.8	15	35.1	44.4	1.0	-0.6	0.1	0.9	0.088	1.007	0.087	0.137	0.633	68.9	78.2	0.088
SC-02	SB-03 & SB-04	Foundation Soils	29.5	8.9	115	1.8	1.5	47.3	0.649	0.8	15	35.3	47.3	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.137	0.647	58.6	70.7	0.078
SC-02	SB-03 & SB-04	Foundation Soils	29.6	8.8	121	1.8	1.5	51.0	0.635	0.8	15	34.9	51.0	1.0	-0.6	0.1	0.9	0.093	1.008	0.091	0.138	0.664	45.4	61.4	0.067
SC-02	SB-03 & SB-04	Foundation Soils	29.7	8.8	121	1.8	1.5	50.0	0.638	0.8	15	35.5	50.0	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.138	0.659	55.3	69.8	0.077
SC-02	SB-03 & SB-04	Foundation Soils	29.8	8.7	115	1.8	1.5	48.8	0.643	0.8	15	35.6	48.8	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.138	0.652	61.2	74.4	0.083
SC-02	SB-03 & SB-04	Foundation Soils	29.9	8.6	115	1.8	1.5	49.6	0.640	0.8	15	35.8	49.6	1.0	-0.6	0.1	0.9	0.092	1.008	0.090	0.138	0.656	63.9	77.7	0.087
SC-02	SB-03 & SB-04	Foundation Soils	29.9	8.5	115	1.8	1.5	51.4	0.634	0.8	15	36.1	51.4	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.138	0.664	63.6	78.9	0.089
SC-02	SB-03 & SB-04	Foundation Soils	30.0	8.4	115	1.8	1.5	50.7	0.636	0.8	15	36.1	50.7	1.0	-0.6	0.1	0.9	0.093	1.008	0.091	0.138	0.660	67.0	81.6	0.092
SC-02	SB-03 & SB-04	Foundation Soils	30.1	8.3	111	1.8	1.5	47.9	0.646	0.8	15	35.8	47.9	1.0	-0.6	0.1	0.9	0.091	1.007	0.089	0.138	0.646	74.0	86.1	0.099
SC-02	SB-03 & SB-04	Foundation Soils	30.2	8.3	111	1.8	1.5	46.3	0.653	0.8	15	35.6	46.3	1.0	-0.6	0.1	0.9	0.090	1.007	0.088	0.138	0.637	75.4	86.1	0.099
SC-02	SB-03 & SB-04	Foundation Soils	30.3	8.2	111	1.8	1.5	46.6	0.651	0.8	15	35.6	46.6	1.0	-0.6	0.1	0.9	0.090	1.007	0.088	0.138	0.638	74.6	85.6	0.098
SC-02	SB-03 & SB-04	Foundation Soils	30.3	8.1	111	1.8	1.5	45.5	0.656	0.8	15	35.5	45.5	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.138	0.632	75.4	85.4	0.098
SC-02	SB-03 & SB-04	Foundation Soils	30.4	8.0	111	1.8	1.5	45.5	0.656	0.8	15	35.5	45.5	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.139	0.632	75.4	85.5	0.098
SC-02	SB-03 & SB-04	Foundation Soils	30.5	7.9	111	1.8	1.5	45.3	0.657	0.8	15	35.4	45.3	1.0	-0.6	0.1	0.9	0.089	1.007	0.087	0.139	0.630	74.9	84.8	0.097
SC-02	SB-03 & SB-04	Foundation Soils	30.6	7.9	115	1.8	1.5	45.2	0.657	0.8	15	35.4	45.2	1.0	-0.6	0.1	0.9	0.089	1.007	0.087	0.139	0.629	74.3	84.1	0.096
SC-02	SB-03 & SB-04	Foundation Soils	30.7	7.8	111	1.8	1.5	43.6	0.663	0.8	15	35.2	43.6	1.0	-0.6	0.1	0.9	0.088	1.007	0.086	0.139	0.621	75.4	83.9	0.095
SC-02	SB-03 & SB-04	Foundation Soils	30.8	7.7	111	1.8	1.5	43.9	0.662	0.8	15	35.2	43.9	1.0	-0.6	0.1	0.9	0.088	1.007	0.086	0.139	0.622	75.4	84.1	0.096
SC-02	SB-03 & SB-04	Foundation Soils	30.8	7.6	115	1.8	1.5	46.4	0.652	0.8	15	35.5	46.4	1.0	-0.6	0.1	0.9	0.090	1.007	0.088	0.139	0.633	69.8	80.7	0.091
SC-02	SB-03 & SB-04	Foundation Soils	30.9	7.5	115	1.8	1.5	48.6	0.644	0.8	15	35.8	48.6	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.139	0.644	66.7	79.6	0.090
SC-02	SB-03 & SB-04	Foundation Soils	31.0	7.4	115	1.9	1.5	49.8	0.639	0.8	15	35.9	49.8	1.0	-0.6	0.1	0.9	0.092	1.008	0.090	0.139	0.649	64.4	78.3	0.088
SC-02	SB-03 & SB-04	Foundation Soils	31.1	7.4	115	1.9	1.5	51.7	0.632	0.8	15	36.1	51.7	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.139	0.658	62.1	77.7	0.087
SC-02	SB-03 & SB-04	Foundation Soils	31.2	7.3	115	1.9	1.5	53.5	0.626	0.8	15	36.3	53.5	1.0	-0.6	0.1	0.9	0.095	1.008	0.093	0.140	0.666	60.0	77.2	0.086
SC-02	SB-03 & SB-04	Foundation Soils	31.2	7.2	121	1.9	1.5	56.6	0.615	0.8	15	36.0	56.6	1.0	-0.6	0.1	0.9	0.097	1.008	0.095	0.140	0.681	48.0	68.5	0.075
SC-02	SB-03 & SB-04	Foundation Soils	31.3	7.1	121	1.9	1.6	58.9	0.608	0.8	15	35.6	58.9	1.0	-0.6	0.1	0.9	0.099	1.008	0.097	0.140	0.692	40.7	64.1	0.070
SC-02	SB-03 & SB-04	Foundation Soils	31.4	7.0	121	1.9	1.6	61.2	0.600	0.8	15	34.3	61.2	1.0	-0.6	0.1	0.9	0.100	1.009	0.098	0.140	0.703	33.4	60.3	0.065
SC-02	SB-03 & SB-04	Foundation Soils	31.5	7.0	121	1.9	1.6	62.8	0.595	0.8	15	33.4	62.8	1.0	-0.6	0.1	0.9	0.102	1.009	0.099	0.140	0.711	30.0	59.4	0.064
SC-02	SB-03 & SB-04	Foundation Soils	31.6	6.9	121	1.9	1.6	66.0	0.585	0.8	15	33.8	66.0	1.0	-0.6	0.1	0.9	0.104	1.009	0.102	0.140	0.727	29.8	62.0	0.067
SC-02	SB-03 & SB-04	Foundation Soils	31.7	6.8	121	1.9	1.6	67.9	0.580	0.8	15	34.8	67.9	1.0	-0.6	0.1	0.9	0.106	1.010	0.103	0.140	0.737	31.7	64.8	0.071
SC-02	SB-03 & SB-04	Foundation Soils	31.7	6.7	121	1.9	1.6	65.7	0.586	0.8	15	35.5	65.7	1.0	-0.7	0.1	0.9	0.104	1.009	0.102	0.140	0.725	35.0	65.3	0.071
SC-02	SB-03 & SB-04	Foundation Soils	31.8	6.6	121	1.9	1.6	64.9	0.589	0.8	15	35.8	64.9	1.0	-0.7	0.1	0.9	0.103	1.009	0.101	0.140	0.720	37.1	66.2	0.072
SC-02	SB-03 & SB-04	Foundation Soils	31.9	6.5	121	1.9	1.6	62.9	0.595	0.8	15	36.3	62.9	1.0	-0.7	0.1	0.9	0.102	1.009	0.099	0.140	0.709	41.9	68.5	0.075
SC-02	SB-03 & SB-04	Foundation Soils	32.0	6.5	121	1.9	1.6	60.1	0.604	0.8	15	36.5	60.1	1.0	-0.7	0.1	0.9	0.100	1.009	0.097	0.140	0.694	46.7	70.3	0.078
SC-02	SB-03 & SB-04	Foundation Soils	32.1	6.4	121	1.9	1.6	59.2	0.607	0.8	15	36.4	59.2	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.141	0.689	47.8	70.6	0.078
SC-02	SB-03 & SB-04	Foundation Soils	32.2	6.3	121	1.9	1.6	59.5	0.606	0.8	15	36.5	59.5	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.141	0.689	48.2	71.2	0.079
SC-02	SB-03 & SB-04	Foundation Soils	32.2	6.2	115	1.9	1.6	58.7	0.608	0.8	15	36.5	58.7	1.0	-0.7	0.1	0.9	0.099	1.008	0.096	0.141	0.685	49.3	71.5	0.079
SC-02	SB-03 & SB-04	Foundation Soils	32.3	6.1	115	1.9	1.6	58.1	0.610	0.8	15	36.9	58.1	1.0	-0.7	0.1	0.9	0.098	1.008	0.096	0.141	0.682	56.3	77.5	0.087
SC-02	SB-03 & SB-04	Foundation Soils	32.4	6.0	115	1.9	1.6	57.9	0.611	0.8	15	36.9	57.9	1.0	-0.7	0.1	0.9	0.098	1.008	0.096	0.141	0.680	57.3	78.4	0.088
SC-02	SB-03 & SB-04	Foundation Soils	32.5	6.0	115	1.9	1.6	57.2	0.613	0.8	15	36.7	57.2	1.0	-0.7	0.1	0.9	0.097	1.008	0.095	0.141	0.676	56.8	77.3	0.087
SC-02	SB-03 & SB-04	Foundation Soils	32.6	5.9	121	1.9	1.6	55.7	0.618	0.8	15	35.5	55.7	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.141	0.668	43.6	63.9	0.070
SC-02	SB-03 & SB-04	Foundation Soils	32.6	5.8	121	2.0	1.6	55.7	0.618	0.8	15	35.7	55.7	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.141	0.668	45.8	65.8	0.072
SC-02	SB-03 & SB-04	Foundation Soils	32.7	5.7	115	2.0	1.6	58.5	0.609	0.8	15	36.9	58.5	1.0	-0.7	0.1	0.9	0.098	1.008	0.096	0.141	0.681	56.8	78.3	0.088
SC-02	SB-03 & SB-04	Foundation Soils	32.8	5.6	121	2.0	1.6	64.4	0.590	0.8	15	36.8	64.4	1.0	-0.7	0.1	0.9	0.103	1.009	0.100	0.141	0.710	43.6	71.2	0.079
SC-02	SB-03 & SB-04	Foundation Soils	32.9	5.6	121	2.0	1.6	61.0	0.601	0.8	15	36.5	61.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.141	0.693	45.7	70.2	0.077
SC-02	SB-03 & SB-04	Foundation Soils	33.0	5.5	121	2.0	1.6	67.2	0.582	0.8	15	37.3	67.2	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.141	0.725	44.2	74.2	0.082
SC-02	SB-03 & SB-04	Foundation Soils	33.1	5.4	115	2.0	1.6	65.8	0.586	0.8	15	37.5	65.8	1.0	-0.7	0.1	0.9	0.104	1.009	0.101	0.142	0.717	48.2	76.5	0.086
SC-02	SB-03 & SB-04	Foundation Soils	33.1	5.3	115	2.0	1.6	63.4	0.593	0.8	15	37.8	63.4	1.0	-0.7	0.1	0.9	0.102	1.009	0.100	0.142	0.703	57.9	83.5	0.095
SC-02	SB-03 & SB-04	Foundation Soils	33.2	5.2	115	2.0	1.6	61.4	0.600	0.8	15	37.6	61.4	1.0	-0.7	0.1	0.9	0.101	1.009	0.098	0.142	0.693	60.9	84.7	0.097
SC-02	SB-03 & SB-04	Foundation Soils	33.3	5.1	115	2.0	1.6	67.9	0.580	0.8	15	37.8	67.9	1.0	-0.7	0.1	0.9	0.106	1.010	0.103	0.142	0.726	48.1	78.2	0.088
SC-02	SB-03 & SB-04	Foundation Soils	33.4	5.1	121	2.0	1.6	72.9	0.565	0.8	15	37.8	72.9	1.0	-0.7	0.1	0.9	0.110	1.011	0.107	0.142	0.753	41.3	76.4	0.085
SC-02	SB-03 & SB-04	Foundation Soils	33.5	5.0	121	2.0	1.6	75.1	0.559	0.8	15	37.0	75.1	1.0	-0.7	0.1	0.9	0.111	1.011	0.109	0.142	0.765	35.6	73.7	0.082
SC-02	SB-03 & SB-04	Foundation Soils	33.5	4.9	121	2.0	1.6	80.3	0.545	0.8	15	35.4	80.3	1.0	-0.7	0.1	0.9	0.116	1.012	0.113	0.142	0.795	29.0	73.9	0.082
SC-02	SB-03 & SB-04	Foundation Soils	33.6	4.8	121	2.0	1.6	84.4	0.535	0.8	15	34.9	84.4	1.0	-0.7	0.1	0.9	0.120	1.013	0.117	0.142	0.821	27.1	76.6	0.086
SC-02	SB-03 & SB-04	Foundation Soils	33.7	4.7	124	2.0	1.6	82.7	0.539	0.8	15	31.6	82.7	1.0	-0.7	0.1	0.9	0.118	1.013	0.115	0.142	0.809	23.3	74.3	0.083
SC-02	SB-03 & SB-04	Foundation Soils	33.8	4.7	124	2.0	1.6	78.1	0.551	0.8	15	24.8	78.1	1.0	-0.7	0.1	0.9	0.114	1.012	0.111	0.142	0.781	18.8	72.1	0.080
SC-02	SB-03 & SB-04	Foundation Soils	33.9	4.6	121	2.0	1.6	91.0	0.519	0.8	15	35.0	91.0	1.0	-0.7	0.1	0.9	0.127	1.015	0.123	0.142	0.865	26.0	81.9	0.093
SC-02	SB-03 & SB-04	Foundation Soils	34.0	4.5	121	2.0	1.6	93.6	0.513	0.8	15	36.5	93.6	1.0	-0.7	0.1	0.9	0.130	1.016	0.126	0.142	0.884	27.6	84.8	0.097
SC-02	SB-03 & SB-04	Foundation Soils	34.0	4.4	124	2.0	1.6	94.6	0.510	0.8	15	29.0	94.6	1.0	-0.7	0.1	0.9	0.131	1.016	0.127	0.142	0.891	20.2	85.8	0.098
SC-02	SB-03 & SB-04	Foundation Soils	34.1	4.3	124	2.0	1.6	89.5	0.522	0.8	15	15.9	89.5	1.0	-0.7	0.1	0.9	0.125	1.014	0.122	0.143	0.853	14.9	88.5	0.102
SC-02	SB-03 & SB-04	Foundation Soils	34.2	4.2	124	2.0	1.6	86.4	0.530	0.8	15	2.0	86.4	1.0	-0.7	0.1	0.9	0.122	1.014	0.118	0.143	0.830	10.7	95.0	0.112
SC-02	SB-03 & SB-04	Foundation Soils	34.3	4.2	124	2.1	1.6	89.3	0.523	0.8	15	0.0	89.3	1.0	-0.7	0.1	0.9	0.125	1.014	0.121	0.143	0.850	6.0	95.3	0.112
SC-02	SB-03 & SB-04	Foundation Soils	34.4	4.1	124	2.1	1.6	88.6	0.525	0.8	15	0.0	88.6	1.0	-0.7	0.1	0.9	0.124	1.014	0.121	0.143	0.844	6.0	94.6	0.111
SC-02	SB-03 & SB-04	Foundation Soils	34.4	4.0	124	2.1	1.6	93.5	0.513	0.8	15	0.0	93.5	1.0	-0.7	0.1	0.9	0.129	1.016	0.126	0.143	0.880	6.0	99.5	0.119
SC-02	SB-03 & SB-04	Foundation Soils	34.5	3.9	124	2.1	1.6	89.1	0.523	0.8	15	0.0	89.1	1.0	-0.7	0.1	0.9	0.125	1.014	0.121	0.143	0.847	6.0	95.1	0.112
SC-02	SB-03 & SB-04	Foundation Soils	34.6	3.8	124	2.1	1.6	69.9	0.574	0.8	15	0.2	69.9	1.0	-0.7	0.1	0.9	0.107	1.010	0.104	0.143	0.730	9.3	79.0	0.089
SC-02	SB-03 & SB-04	Foundation Soils	34.7	3.8	124	2.1	1.6	67.8	0.580	0.8	15	1.7	67.8	1.0	-0.7	0.1	0.9	0.106	1.010	0.103	0.143	0.718	10.6	76.7	0.086
SC-02	SB-03 & SB-04	Foundation Soils	34.8	3.7	124	2.1	1.7	68.2	0.579	0.8	15	0.0	68.2	1.0	-0.7	0.1	0.9	0.106	1.010	0.103	0.143	0.719	7.6	75.8	0.085
SC-02	SB-03 & SB-04	Foundation Soils	34.9	3.6	124	2.1	1.7	74.1	0.562	0.8	15	0.0	74.1	1.0	-0.7	0.1	0.9	0.111	1.011	0.107	0.143	0.751	6.0	80.0	0.090
SC-02	SB-03 & SB-04	Foundation Soils	34.9	3.5	124	2.1	1.7	76.6	0.555	0.8	15	0.0	76.6	1.0	-0.7	0.1	0.9	0.113	1.011	0.110	0.143	0.765	6.0	82.6	0.094
SC-02	SB-03 & SB-04	Foundation Soils	35.0	3.4	124	2.1	1.7	75.7	0.558	0.8	15	0.0	75.7	1.0	-0.7	0.1	0.9	0.112	1.011	0.109	0.143	0.759	6.0	81.7	0.092

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-02	SB-03 & SB-04	Foundation Soils	35.1	3.3	124	2.1	1.7	77.6	0.553	0.8	15	0.0	77.6	1.0	-0.7	0.1	0.9	0.114	1.012	0.110	0.143	0.770	6.0	83.6	0.095
SC-02	SB-03 & SB-04	Foundation Soils	35.2	3.3	124	2.1	1.7	80.8	0.544	0.8	15	0.0	80.8	1.0	-0.7	0.1	0.9	0.117	1.012	0.113	0.143	0.789	6.0	86.8	0.100
SC-02	SB-03 & SB-04	Foundation Soils	35.3	3.2	124	2.1	1.7	82.8	0.539	0.8	15	0.0	82.8	1.0	-0.8	0.1	0.9	0.118	1.013	0.115	0.143	0.801	6.0	88.8	0.102
SC-02	SB-03 & SB-04	Foundation Soils	35.4	3.1	124	2.1	1.7	83.5	0.537	0.8	15	0.0	83.5	1.0	-0.8	0.1	0.9	0.119	1.013	0.115	0.144	0.805	6.0	89.5	0.103
SC-02	SB-03 & SB-04	Foundation Soils	35.4	3.0	124	2.1	1.7	84.5	0.535	0.8	15	0.0	84.5	1.0	-0.8	0.1	0.9	0.120	1.013	0.116	0.144	0.811	6.0	90.5	0.105
SC-02	SB-03 & SB-04	Foundation Soils	35.5	2.9	124	2.1	1.7	85.2	0.533	0.8	15	0.0	85.2	1.0	-0.8	0.1	0.9	0.121	1.013	0.117	0.144	0.814	6.0	91.2	0.106
SC-02	SB-03 & SB-04	Foundation Soils	35.6	2.8	124	2.1	1.7	84.3	0.535	0.8	15	0.0	84.3	1.0	-0.8	0.1	0.9	0.120	1.013	0.116	0.144	0.808	6.0	90.3	0.105
SC-02	SB-03 & SB-04	Foundation Soils	35.7	2.8	124	2.1	1.7	77.4	0.553	0.8	15	0.0	77.4	1.0	-0.8	0.1	0.9	0.114	1.012	0.110	0.144	0.766	6.0	83.4	0.095
SC-02	SB-03 & SB-04	Foundation Soils	35.8	2.7	124	2.1	1.7	69.8	0.574	0.8	15	0.0	69.8	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.144	0.723	6.0	75.8	0.085
SC-02	SB-03 & SB-04	Foundation Soils	35.8	2.6	124	2.1	1.7	57.3	0.613	0.8	15	3.8	57.3	1.0	-0.8	0.1	0.9	0.098	1.008	0.095	0.144	0.659	11.5	65.0	0.071
SC-02	SB-03 & SB-04	Foundation Soils	35.9	2.5	124	2.2	1.7	68.8	0.577	0.8	15	28.6	68.8	1.0	-0.8	0.1	0.9	0.106	1.010	0.103	0.144	0.717	22.0	62.2	0.068
SC-02	SB-03 & SB-04	Foundation Soils	36.0	2.4	121	2.2	1.7	66.5	0.584	0.8	15	32.4	66.5	1.0	-0.8	0.1	0.9	0.104	1.010	0.101	0.144	0.705	27.0	61.1	0.066
SC-02	SB-03 & SB-04	Foundation Soils	36.1	2.4	121	2.2	1.7	66.0	0.585	0.8	15	33.8	66.0	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.144	0.702	29.8	62.1	0.067
SC-02	SB-03 & SB-04	Foundation Soils	36.2	2.3	121	2.2	1.7	67.6	0.581	0.8	15	34.7	67.6	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.144	0.710	31.7	64.6	0.070
SC-02	SB-03 & SB-04	Foundation Soils	36.3	2.2	121	2.2	1.7	67.0	0.583	0.8	15	33.6	67.0	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.144	0.706	29.1	62.5	0.068
SC-02	SB-03 & SB-04	Foundation Soils	36.3	2.1	121	2.2	1.7	63.2	0.594	0.8	15	34.1	63.2	1.0	-0.8	0.1	0.9	0.102	1.009	0.099	0.144	0.686	31.7	60.8	0.066
SC-02	SB-03 & SB-04	Foundation Soils	36.4	2.0	121	2.2	1.7	59.6	0.605	0.8	15	34.6	59.6	1.0	-0.8	0.1	0.9	0.099	1.009	0.096	0.144	0.669	35.1	60.1	0.065
SC-02	SB-03 & SB-04	Foundation Soils	36.5	1.9	121	2.2	1.7	59.4	0.606	0.8	15	33.5	59.4	1.0	-0.8	0.1	0.9	0.099	1.009	0.096	0.144	0.667	31.5	57.4	0.062
SC-02	SB-03 & SB-04	Foundation Soils	36.6	1.9	121	2.2	1.7	56.9	0.614	0.7	15	32.7	56.9	1.0	-0.8	0.1	0.9	0.097	1.008	0.095	0.144	0.655	30.3	54.5	0.058
SC-02	SB-03 & SB-04	Foundation Soils	36.7	1.8	121	2.2	1.7	56.3	0.616	0.7	15	33.3	56.3	1.0	-0.8	0.1	0.9	0.097	1.008	0.094	0.144	0.651	32.2	55.2	0.059
SC-02	SB-03 & SB-04	Foundation Soils	36.7	1.7	121	2.2	1.7	56.2	0.617	0.7	15	34.5	56.2	1.0	-0.8	0.1	0.9	0.097	1.008	0.094	0.145	0.651	36.9	58.6	0.063
SC-02	SB-03 & SB-04	Foundation Soils	36.8	1.6	121	2.2	1.7	56.2	0.617	0.7	15	35.1	56.2	1.0	-0.8	0.1	0.9	0.097	1.008	0.094	0.145	0.650	40.2	61.4	0.066
SC-02	SB-03 & SB-04	Foundation Soils	36.9	1.5	121	2.2	1.7	59.1	0.607	0.7	15	34.0	59.1	1.0	-0.8	0.1	0.9	0.099	1.009	0.096	0.145	0.664	33.3	58.4	0.063
SC-02	SB-03 & SB-04	Foundation Soils	37.0	1.5	121	2.2	1.7	65.7	0.586	0.8	15	33.1	65.7	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.145	0.696	28.5	61.1	0.066
SC-02	SB-03 & SB-04	Foundation Soils	37.1	1.4	121	2.2	1.7	71.6	0.569	0.8	15	32.3	71.6	1.0	-0.8	0.1	0.9	0.109	1.010	0.105	0.145	0.727	25.8	65.1	0.071
SC-02	SB-03 & SB-04	Foundation Soils	37.2	1.3	124	2.2	1.7	70.8	0.571	0.8	15	26.5	70.8	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.145	0.722	20.2	64.5	0.070
SC-02	SB-03 & SB-04	Foundation Soils	37.2	1.2	124	2.2	1.7	67.9	0.580	0.8	15	21.7	67.9	1.0	-0.8	0.1	0.9	0.106	1.010	0.102	0.145	0.706	17.7	63.9	0.070
SC-02	SB-03 & SB-04	Foundation Soils	37.3	1.1	124	2.2	1.7	66.5	0.584	0.8	15	19.2	66.5	1.0	-0.8	0.1	0.9	0.104	1.010	0.101	0.145	0.699	16.6	63.8	0.070
SC-02	SB-03 & SB-04	Foundation Soils	37.4	1.0	124	2.2	1.7	62.2	0.597	0.7	15	15.1	62.2	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.145	0.677	15.2	62.3	0.068
SC-02	SB-03 & SB-04	Foundation Soils	37.5	1.0	124	2.2	1.7	63.8	0.592	0.7	15	18.4	63.8	1.0	-0.8	0.1	0.9	0.102	1.009	0.099	0.145	0.685	16.4	61.8	0.067
SC-02	SB-03 & SB-04	Foundation Soils	37.6	0.9	124	2.3	1.7	66.4	0.584	0.7	15	22.4	66.4	1.0	-0.8	0.1	0.9	0.104	1.010	0.101	0.145	0.698	18.1	62.1	0.067
SC-02	SB-03 & SB-04	Foundation Soils	37.6	0.8	124	2.3	1.7	68.9	0.577	0.8	15	24.3	68.9	1.0	-0.8	0.1	0.9	0.106	1.010	0.103	0.145	0.710	19.0	63.6	0.069
SC-02	SB-03 & SB-04	Foundation Soils	37.7	0.7	124	2.3	1.7	74.3	0.561	0.8	15	28.2	74.3	1.0	-0.8	0.1	0.9	0.111	1.011	0.107	0.145	0.739	21.2	67.3	0.074
SC-02	SB-03 & SB-04	Foundation Soils	37.8	0.6	124	2.3	1.7	75.7	0.558	0.8	15	25.2	75.7	1.0	-0.8	0.1	0.9	0.112	1.011	0.108	0.145	0.746	19.1	69.6	0.077
SC-02	SB-03 & SB-04	Foundation Soils	37.9	0.6	124	2.3	1.7	69.9	0.574	0.8	15	8.4	69.9	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.145	0.714	12.9	74.4	0.083
SC-02	SB-03 & SB-04	Foundation Soils	38.0	0.5	124	2.3	1.7	66.3	0.584	0.7	15	0.0	66.3	1.0	-0.8	0.1	0.9	0.104	1.010	0.101	0.145	0.696	7.8	74.2	0.082
SC-02	SB-03 & SB-04	Foundation Soils	38.1	0.4	124	2.3	1.7	79.9	0.547	0.8	15	0.0	79.9	1.0	-0.8	0.1	0.9	0.116	1.012	0.112	0.145	0.769	6.0	85.9	0.098
SC-02	SB-03 & SB-04	Foundation Soils	38.1	0.3	124	2.3	1.8	91.3	0.518	0.8	15	0.0	91.3	1.0	-0.8	0.1	0.9	0.127	1.015	0.122	0.145	0.842	6.0	97.3	0.115
SC-02	SB-03 & SB-04	Foundation Soils	38.2	0.2	124	2.3	1.8	103.5	0.491	0.8	15	0.0	103.5	0.9	-0.8	0.1	0.9	0.142	1.019	0.137	0.145	0.940	6.0	109.5	0.136
SC-02	SB-03 & SB-04	Foundation Soils	38.3	0.1	124	2.3	1.8	107.6	0.482	0.8	15	0.0	107.6	0.9	-0.8	0.1	0.9	0.148	1.021	0.143	0.145	0.980	6.0	113.6	0.143
SC-02	SB-03 & SB-04	Foundation Soils	38.4	0.1	124	2.3	1.8	99.5	0.499	0.8	15	0.0	99.5	0.9	-0.8	0.1	0.9	0.137	1.018	0.132	0.145	0.904	6.0	105.5	0.128
SC-02	SB-03 & SB-04	Foundation Soils	38.5	-0.0	124	2.3	1.8	95.3	0.509	0.8	15	0.0	95.3	0.9	-0.8	0.1	0.9	0.132	1.016	0.127	0.146	0.870	6.0	101.3	0.121
SC-02	SB-03 & SB-04	Foundation Soils	38.5	-0.1	124	2.3	1.8	89.9	0.521	0.8	15	0.0	89.9	0.9	-0.8	0.1	0.9	0.125	1.015	0.121	0.146	0.831	6.0	95.9	0.113
SC-02	SB-03 & SB-04	Foundation Soils	38.6	-0.2	124	2.3	1.8	83.0	0.538	0.8	15	0.0	83.0	1.0	-0.8	0.1	0.9	0.119	1.013	0.114	0.146	0.786	6.0	89.0	0.103
SC-02	SB-03 & SB-04	Foundation Soils	38.7	-0.3	124	2.3	1.8	73.7	0.563	0.7	15	0.0	73.7	1.0	-0.9	0.1	0.9	0.110	1.011	0.107	0.146	0.731	6.0	79.7	0.090
SC-02	SB-03 & SB-04	Foundation Soils	38.8	-0.3	124	2.3	1.8	72.9	0.565	0.7	15	0.0	72.9	1.0	-0.9	0.1	0.9	0.110	1.011	0.106	0.146	0.727	6.0	78.9	0.089
SC-02	SB-03 & SB-04	Foundation Soils	38.9	-0.4	124	2.3	1.8	85.9	0.531	0.8	15	0.0	85.9	1.0	-0.9	0.1	0.9	0.121	1.014	0.117	0.146	0.803	6.0	91.9	0.107
SC-02	SB-03 & SB-04	Foundation Soils	39.0	-0.5	124	2.3	1.8	91.4	0.518	0.8	15	0.0	91.4	0.9	-0.9	0.1	0.9	0.127	1.015	0.122	0.146	0.839	6.0	97.4	0.115
SC-02	SB-03 & SB-04	Foundation Soils	39.0	-0.6	124	2.3	1.8	96.3	0.506	0.8	15	0.0	96.3	0.9	-0.9	0.1	0.9	0.133	1.017	0.128	0.146	0.876	6.0	102.3	0.123
SC-02	SB-03 & SB-04	Foundation Soils	39.1	-0.7	124	2.3	1.8	104.4	0.489	0.8	15	0.0	104.4	0.9	-0.9	0.1	0.9	0.143	1.019	0.138	0.146	0.944	6.0	110.4	0.137
SC-02	SB-03 & SB-04	Foundation Soils	39.2	-0.8	124	2.4	1.8	110.4	0.476	0.8	15	0.0	110.4	0.9	-0.9	0.1	0.9	0.153	1.022	0.147	0.146	1.005	6.0	116.4	
SC-02	SB-03 & SB-04	Foundation Soils	39.3	-0.8	124	2.4	1.8	116.7	0.463	0.8	15	0.0	116.7	0.9	-0.9	0.1	0.9	0.164	1.025	0.158	0.146	1.080	6.0	122.7	
SC-02	SB-03 & SB-04	Foundation Soils	39.4	-0.9	124	2.4	1.8	112.3	0.472	0.8	15	0.0	112.3	0.9	-0.9	0.1	0.9	0.156	1.023	0.150	0.146	1.026	6.0	118.3	
SC-02	SB-03 & SB-04	Foundation Soils	39.5	-1.0	124	2.4	1.8	109.1	0.479	0.8	15	0.0	109.1	0.9	-0.9	0.1	0.9	0.150	1.021	0.144	0.146	0.989	6.0	115.1	0.146
SC-02	SB-03 & SB-04	Foundation Soils	39.5	-1.1	124	2.4	1.8	105.5	0.486	0.8	15	0.0	105.5	0.9	-0.9	0.1	0.8	0.145	1.020	0.139	0.146	0.953	6.0	111.5	0.139
SC-02	SB-03 & SB-04	Foundation Soils	39.6	-1.2	124	2.4	1.8	102.1	0.493	0.8	15	0.0	102.1	0.9	-0.9	0.1	0.8	0.140	1.019	0.135	0.146	0.921	6.0	108.1	0.133
SC-02	SB-03 & SB-04	Foundation Soils	39.7	-1.3	124	2.4	1.8	100.0	0.498	0.8	15	0.0	100.0	0.9	-0.9	0.1	0.8	0.137	1.018	0.132	0.146	0.903	6.5	106.6	0.130
SC-02	SB-03 & SB-04	Foundation Soils	39.8	-1.3	124	2.4	1.8	101.7	0.494	0.8	15	5.9	101.7	0.9	-0.9	0.1	0.8	0.140	1.018	0.134	0.146	0.917	11.9	107.8	0.132
SC-02	SB-03 & SB-04	Foundation Soils	39.9	-1.4	124	2.4	1.8	116.3	0.464	0.8	15	21.1	116.3	0.9	-0.9	0.1	0.8	0.164	1.024	0.157	0.146	1.072	15.9	111.2	
SC-02	SB-03 & SB-04	Foundation Soils	39.9	-1.5	124	2.4	1.8	105.8	0.485	0.8	15	0.0	105.8	0.9	-0.9	0.1	0.8	0.145	1.020	0.140	0.146	0.954	6.0	111.8	0.140
SC-02	SB-03 & SB-04	Foundation Soils	40.0	-1.6	124	2.4	1.8	156.4	0.393	0.8	15	0.0	156.4	0.9	-0.9	0.1	0.8	0.337	1.051	0.322	0.146	2.200	6.0	162.4	
SC-02	SB-03 & SB-04	Foundation Soils	40.1	-1.7	115	2.4	1.8	56.6	0.615	0.7	15	37.1	56.6	1.0	-0.9	0.1	0.8	0.097	1.008	0.094	0.146	0.642	67.5	87.1	0.100
SC-02	SB-03 & SB-04	Foundation Soils	40.2	-1.7	111	2.4	1.8	46.0	0.654	0.7	15	35.5	46.0	1.0	-0.9	0.1	0.8	0.090	1.007	0.087	0.146	0.593	75.4	85.9	0.098
SC-02	SB-03 & SB-04	Foundation Soils	40.3	-1.8	111	2.4	1.8	41.1	0.674	0.7	15	34.7	41.1	1.0	-0.9	0.1	0.8	0.086	1.007	0.084	0.146	0.571	75.4	81.7	0.092
SC-03	SB-04	Foundation Soils	21.1	17.2	111	1.3	1.3	58.5	0.609	0.9	30	46.8	58.5	1.0	-0.4	0.0	0.9	0.098	1.008	0.098	0.122	0.802	75.4	87.1	0.100
SC-03	SB-04	Foundation Soils	21.2	17.1	115	1.3	1.3	61.1	0.601	0.9	30	47.1	61.1	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.122	0.816	69.1	83.0	0.094
SC-03	SB-04	Foundation Soils	21.2	17.0	115	1.3	1.3	63.3	0.594	0.9	30	47.4	63.3	1.0	-0.4	0.0	0.9	0.102	1.009	0.101	0.122	0.829	65.1	81.0	0.092
SC-03	SB-04	Foundation Soils	21.3	17.0	115	1.3	1.3	62.2	0.597	0.9	30	47.3	62.2	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.122	0.820	68.0	82.8	0.094
SC-03	SB-04	Foundation Soils	21.4	16.9	115	1.3	1.3	60.0	0.604	0.9	30	47.0	60.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.099	0.123	0.806	71.7	84.8	0.097
SC-03	SB-04	Foundation Soils	21.5	16.8	111	1.3	1.3	57.8	0.611	0.9	30	46.6	57.8	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.123	0.791	75.4	86.6	0.099

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-03	SB-04	Foundation Soils	21.6	16.7	111	1.3	1.3	54.6	0.622	0.9	30	46.0	54.6	1.0	-0.4	0.0	0.9	0.096	1.008	0.095	0.123	0.771	75.4	84.0	0.096
SC-03	SB-04	Foundation Soils	21.7	16.6	111	1.3	1.3	52.6	0.629	0.9	30	45.6	52.6	1.0	-0.4	0.0	0.9	0.094	1.008	0.093	0.123	0.758	75.4	82.4	0.093
SC-03	SB-04	Foundation Soils	21.7	16.6	111	1.3	1.3	52.2	0.631	0.9	30	45.5	52.2	1.0	-0.4	0.0	0.9	0.094	1.008	0.093	0.123	0.755	75.4	82.1	0.093
SC-03	SB-04	Foundation Soils	21.8	16.5	111	1.3	1.3	55.3	0.620	0.9	30	46.1	55.3	1.0	-0.4	0.0	0.9	0.096	1.008	0.095	0.124	0.771	75.4	84.5	0.096
SC-03	SB-04	Foundation Soils	21.9	16.4	111	1.3	1.3	60.1	0.604	0.9	30	47.0	60.1	1.0	-0.4	0.0	0.9	0.100	1.009	0.099	0.124	0.798	72.2	85.3	0.097
SC-03	SB-04	Foundation Soils	22.0	16.3	115	1.3	1.3	62.6	0.596	0.9	30	47.4	62.6	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.124	0.812	69.2	84.4	0.096
SC-03	SB-04	Foundation Soils	22.1	16.2	115	1.3	1.3	66.4	0.584	0.9	30	47.8	66.4	1.0	-0.4	0.0	0.9	0.104	1.010	0.104	0.124	0.834	61.0	79.5	0.090
SC-03	SB-04	Foundation Soils	22.1	16.1	115	1.3	1.3	66.4	0.584	0.9	30	47.9	66.4	1.0	-0.4	0.0	0.9	0.104	1.010	0.104	0.124	0.832	61.9	80.4	0.091
SC-03	SB-04	Foundation Soils	22.2	16.1	115	1.4	1.3	65.4	0.587	0.9	30	47.8	65.4	1.0	-0.4	0.0	0.9	0.104	1.009	0.103	0.125	0.825	65.2	82.7	0.094
SC-03	SB-04	Foundation Soils	22.3	16.0	111	1.4	1.3	61.5	0.599	0.9	30	47.4	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.125	0.800	75.0	89.1	0.103
SC-03	SB-04	Foundation Soils	22.4	15.9	111	1.4	1.3	57.4	0.613	0.9	30	46.5	57.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.125	0.775	75.4	86.3	0.099
SC-03	SB-04	Foundation Soils	22.5	15.8	111	1.4	1.3	55.1	0.621	0.9	30	46.1	55.1	1.0	-0.4	0.0	0.9	0.096	1.008	0.095	0.125	0.760	75.4	84.4	0.096
SC-03	SB-04	Foundation Soils	22.6	15.7	111	1.4	1.3	56.7	0.615	0.9	30	46.4	56.7	1.0	-0.4	0.0	0.9	0.097	1.008	0.096	0.125	0.768	75.4	85.7	0.098
SC-03	SB-04	Foundation Soils	22.6	15.7	111	1.4	1.3	60.9	0.601	0.9	30	47.3	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.099	0.125	0.792	75.4	89.1	0.103
SC-03	SB-04	Foundation Soils	22.7	15.6	111	1.4	1.3	60.0	0.604	0.9	30	47.1	60.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.099	0.126	0.785	75.4	88.3	0.102
SC-03	SB-04	Foundation Soils	22.8	15.5	111	1.4	1.3	58.8	0.608	0.9	30	46.8	58.8	1.0	-0.4	0.0	0.9	0.099	1.008	0.098	0.126	0.777	75.4	87.4	0.100
SC-03	SB-04	Foundation Soils	22.9	15.4	111	1.4	1.3	58.8	0.608	0.9	30	46.8	58.8	1.0	-0.4	0.0	0.9	0.099	1.008	0.098	0.126	0.776	75.4	87.4	0.100
SC-03	SB-04	Foundation Soils	23.0	15.3	111	1.4	1.3	55.5	0.619	0.9	30	46.2	55.5	1.0	-0.4	0.0	0.9	0.096	1.008	0.095	0.126	0.755	75.4	84.7	0.097
SC-03	SB-04	Foundation Soils	23.0	15.2	111	1.4	1.3	53.9	0.624	0.9	30	45.8	53.9	1.0	-0.4	0.0	0.9	0.095	1.008	0.094	0.126	0.746	75.4	83.5	0.095
SC-03	SB-04	Foundation Soils	23.1	15.2	111	1.4	1.3	54.1	0.624	0.9	30	45.9	54.1	1.0	-0.4	0.0	0.9	0.095	1.008	0.094	0.127	0.745	75.4	83.6	0.095
SC-03	SB-04	Foundation Soils	23.2	15.1	111	1.4	1.3	58.0	0.611	0.9	30	46.7	58.0	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.127	0.766	75.4	86.7	0.099
SC-03	SB-04	Foundation Soils	23.3	15.0	115	1.4	1.3	61.1	0.601	0.9	30	47.0	61.1	1.0	-0.4	0.0	0.9	0.100	1.009	0.099	0.127	0.783	67.4	81.5	0.092
SC-03	SB-04	Foundation Soils	23.4	14.9	115	1.4	1.3	62.1	0.597	0.9	30	47.3	62.1	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.127	0.788	67.5	82.4	0.093
SC-03	SB-04	Foundation Soils	23.5	14.8	111	1.4	1.3	58.1	0.610	0.9	30	46.7	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.127	0.764	75.4	86.8	0.100
SC-03	SB-04	Foundation Soils	23.5	14.7	111	1.4	1.3	55.2	0.620	0.9	30	46.1	55.2	1.0	-0.4	0.0	0.9	0.096	1.008	0.095	0.127	0.746	75.4	84.5	0.096
SC-03	SB-04	Foundation Soils	23.6	14.7	111	1.4	1.3	53.2	0.627	0.9	30	45.7	53.2	1.0	-0.4	0.0	0.9	0.095	1.008	0.094	0.128	0.734	75.4	82.9	0.094
SC-03	SB-04	Foundation Soils	23.7	14.6	111	1.4	1.3	52.4	0.630	0.9	30	45.5	52.4	1.0	-0.4	0.0	0.9	0.094	1.008	0.093	0.128	0.729	75.4	82.2	0.093
SC-03	SB-04	Foundation Soils	23.8	14.5	111	1.4	1.4	51.9	0.632	0.9	30	45.4	51.9	1.0	-0.4	0.0	0.9	0.094	1.008	0.093	0.128	0.725	75.4	81.8	0.093
SC-03	SB-04	Foundation Soils	23.9	14.4	111	1.4	1.4	51.6	0.633	0.9	30	45.4	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.092	0.128	0.722	75.4	81.6	0.092
SC-03	SB-04	Foundation Soils	23.9	14.3	111	1.4	1.4	51.4	0.633	0.9	30	45.3	51.4	1.0	-0.4	0.1	0.9	0.093	1.008	0.092	0.128	0.720	75.4	81.5	0.092
SC-03	SB-04	Foundation Soils	24.0	14.3	111	1.5	1.4	51.4	0.634	0.9	30	45.3	51.4	1.0	-0.4	0.1	0.9	0.093	1.008	0.092	0.128	0.719	75.4	81.4	0.092
SC-03	SB-04	Foundation Soils	24.1	14.2	111	1.5	1.4	53.3	0.627	0.9	30	45.7	53.3	1.0	-0.4	0.1	0.9	0.095	1.008	0.094	0.129	0.728	75.4	83.0	0.094
SC-03	SB-04	Foundation Soils	24.2	14.1	111	1.5	1.4	55.1	0.620	0.9	30	46.1	55.1	1.0	-0.5	0.1	0.9	0.096	1.008	0.095	0.129	0.737	75.4	84.4	0.096
SC-03	SB-04	Foundation Soils	24.3	14.0	111	1.5	1.4	54.9	0.621	0.9	30	46.0	54.9	1.0	-0.5	0.1	0.9	0.096	1.008	0.095	0.129	0.735	75.4	84.2	0.096
SC-03	SB-04	Foundation Soils	24.4	13.9	111	1.5	1.4	53.5	0.626	0.9	30	45.7	53.5	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.129	0.726	75.4	83.1	0.094
SC-03	SB-04	Foundation Soils	24.4	13.8	111	1.5	1.4	52.2	0.631	0.9	30	45.5	52.2	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.129	0.718	75.4	82.1	0.093
SC-03	SB-04	Foundation Soils	24.5	13.8	111	1.5	1.4	52.2	0.631	0.9	30	45.5	52.2	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.129	0.718	75.4	82.1	0.093
SC-03	SB-04	Foundation Soils	24.6	13.7	111	1.5	1.4	52.6	0.629	0.9	30	45.6	52.6	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.130	0.719	75.4	82.4	0.093
SC-03	SB-04	Foundation Soils	24.7	13.6	115	1.5	1.4	53.5	0.626	0.9	30	45.8	53.5	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.130	0.723	75.4	83.1	0.094
SC-03	SB-04	Foundation Soils	24.8	13.5	115	1.5	1.4	53.7	0.625	0.8	30	45.8	53.7	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.130	0.723	75.2	83.1	0.094
SC-03	SB-04	Foundation Soils	24.9	13.4	111	1.5	1.4	53.4	0.626	0.8	30	45.7	53.4	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.130	0.720	75.4	83.1	0.094
SC-03	SB-04	Foundation Soils	24.9	13.4	111	1.5	1.4	54.3	0.623	0.8	30	45.9	54.3	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.130	0.724	75.4	83.7	0.095
SC-03	SB-04	Foundation Soils	25.0	13.3	121	1.5	1.4	67.5	0.581	0.9	30	46.7	67.5	1.0	-0.5	0.1	0.9	0.105	1.010	0.104	0.130	0.798	44.7	65.5	0.072
SC-03	SB-04	Foundation Soils	25.1	13.2	124	1.5	1.4	80.1	0.546	0.9	30	34.9	80.1	1.0	-0.5	0.1	0.9	0.116	1.012	0.114	0.130	0.878	20.3	65.5	0.072
SC-03	SB-04	Foundation Soils	25.2	13.1	124	1.5	1.4	68.9	0.577	0.9	30	7.8	68.9	1.0	-0.5	0.1	0.9	0.106	1.010	0.105	0.131	0.804	12.2	73.3	0.081
SC-03	SB-04	Foundation Soils	25.3	13.0	124	1.5	1.4	85.1	0.533	0.9	30	23.3	85.1	1.0	-0.5	0.1	0.9	0.121	1.013	0.119	0.131	0.911	15.7	77.5	0.087
SC-03	SB-04	Foundation Soils	25.3	12.9	124	1.5	1.4	93.9	0.512	0.9	30	33.8	93.9	1.0	-0.5	0.1	0.9	0.130	1.016	0.128	0.131	0.980	18.9	79.0	0.089
SC-03	SB-04	Foundation Soils	25.4	12.9	124	1.5	1.4	90.5	0.520	0.9	30	30.0	90.5	1.0	-0.5	0.1	0.9	0.126	1.015	0.125	0.131	0.951	17.6	78.1	0.088
SC-03	SB-04	Foundation Soils	25.5	12.8	124	1.5	1.4	75.2	0.559	0.9	30	8.0	75.2	1.0	-0.5	0.1	0.9	0.112	1.011	0.110	0.131	0.839	12.2	79.4	0.089
SC-03	SB-04	Foundation Soils	25.6	12.7	124	1.5	1.4	72.9	0.565	0.9	30	0.0	72.9	1.0	-0.5	0.1	0.9	0.110	1.011	0.108	0.131	0.824	8.1	81.0	0.091
SC-03	SB-04	Foundation Soils	25.7	12.6	124	1.5	1.4	75.2	0.559	0.9	30	0.0	75.2	1.0	-0.5	0.1	0.9	0.112	1.011	0.110	0.131	0.837	6.0	81.1	0.092
SC-03	SB-04	Foundation Soils	25.8	12.5	124	1.6	1.4	71.7	0.569	0.9	30	0.0	71.7	1.0	-0.5	0.1	0.9	0.109	1.010	0.107	0.132	0.814	6.4	78.1	0.088
SC-03	SB-04	Foundation Soils	25.8	12.5	124	1.6	1.4	73.2	0.564	0.9	30	8.8	73.2	1.0	-0.5	0.1	0.9	0.110	1.011	0.108	0.132	0.823	12.4	76.9	0.086
SC-03	SB-04	Foundation Soils	25.9	12.4	124	1.6	1.4	94.9	0.510	0.9	30	33.3	94.9	1.0	-0.5	0.1	0.9	0.131	1.016	0.129	0.132	0.980	18.7	80.2	0.090
SC-03	SB-04	Foundation Soils	26.0	12.3	121	1.6	1.4	100.8	0.496	0.9	30	47.5	100.8	1.0	-0.5	0.1	0.9	0.138	1.018	0.137	0.132	1.034	28.3	81.6	
SC-03	SB-04	Foundation Soils	26.1	12.2	121	1.6	1.4	91.6	0.517	0.9	30	50.4	91.6	1.0	-0.5	0.1	0.9	0.127	1.015	0.126	0.132	0.950	39.6	80.9	0.091
SC-03	SB-04	Foundation Soils	26.2	12.1	115	1.6	1.4	73.7	0.563	0.8	30	49.4	73.7	1.0	-0.5	0.1	0.9	0.110	1.011	0.109	0.132	0.822	63.8	88.1	0.101
SC-03	SB-04	Foundation Soils	26.2	12.0	115	1.6	1.4	72.9	0.565	0.8	30	49.3	72.9	1.0	-0.5	0.1	0.9	0.110	1.011	0.108	0.132	0.816	64.7	88.2	0.102
SC-03	SB-04	Foundation Soils	26.3	12.0	111	1.6	1.4	65.2	0.588	0.8	30	48.1	65.2	1.0	-0.5	0.1	0.9	0.103	1.009	0.102	0.133	0.769	75.2	92.3	0.108
SC-03	SB-04	Foundation Soils	26.4	11.9	111	1.6	1.4	61.0	0.601	0.8	30	47.3	61.0	1.0	-0.5	0.1	0.9	0.100	1.009	0.099	0.133	0.744	75.4	89.1	0.103
SC-03	SB-04	Foundation Soils	26.5	11.8	111	1.6	1.4	57.9	0.611	0.8	30	46.6	57.9	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.133	0.727	75.4	86.7	0.099
SC-03	SB-04	Foundation Soils	26.6	11.7	111	1.6	1.4	57.3	0.613	0.8	30	46.5	57.3	1.0	-0.5	0.1	0.9	0.098	1.008	0.096	0.133	0.723	75.4	86.2	0.099
SC-03	SB-04	Foundation Soils	26.7	11.6	111	1.6	1.4	56.7	0.615	0.8	30	46.4	56.7	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.133	0.719	75.4	85.7	0.098
SC-03	SB-04	Foundation Soils	26.7	11.5	115	1.6	1.4	55.9	0.618	0.8	30	46.2	55.9	1.0	-0.5	0.1	0.9	0.097	1.008	0.095	0.133	0.714	73.1	82.9	0.094
SC-03	SB-04	Foundation Soils	26.8	11.5	115	1.6	1.4	55.4	0.619	0.8	30	46.0	55.4	1.0	-0.5	0.1	0.9	0.096	1.008	0.095	0.133	0.710	69.4	78.9	0.089
SC-03	SB-04	Foundation Soils	26.9	11.4	115	1.6	1.4	55.1	0.620	0.8	30	46.0	55.1	1.0	-0.5	0.1	0.9	0.096	1.008	0.095	0.134	0.708	70.6	79.8	0.090
SC-03	SB-04	Foundation Soils	27.0	11.3	115	1.6	1.4	55.1	0.621	0.8	30	46.0	55.1	1.0	-0.5	0.1	0.9	0.096	1.008	0.095	0.134	0.707	71.5	80.6	0.091
SC-03	SB-04	Foundation Soils	27.1	11.2	115	1.6	1.4	55.0	0.621	0.8	30	46.0	55.0	1.0	-0.5	0.1	0.9	0.096	1.008	0.094	0.134	0.706	72.4	81.4	0.092
SC-03	SB-04	Foundation Soils	27.1	11.1	115	1.6	1.4	55.0	0.621	0.8	30	46.0	55.0	1.0	-0.5	0.1	0.9	0.096	1.008	0.094	0.134	0.705	72.8	81.8	0.093
SC-03	SB-04	Foundation Soils	27.2	11.1	111	1.6	1.4	54.7	0.622	0.8	30	46.0	54.7	1.0	-0.5	0.1	0.9	0.096	1.008	0.094	0.134	0.703	75.4	84.1	0.096
SC-03	SB-04	Foundation Soils	27.3	11.0	111	1.6	1.4	54.5	0.623	0.8	30	46.0	54.5	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.134	0.701	75.4	83.9	0.096

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-03	SB-04	Foundation Soils	27.4	10.9	111	1.6	1.4	54.3	0.623	0.8	30	45.9	54.3	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.134	0.699	75.4	83.8	0.095
SC-03	SB-04	Foundation Soils	27.5	10.8	111	1.7	1.4	54.2	0.624	0.8	30	45.9	54.2	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.134	0.698	75.4	83.7	0.095
SC-03	SB-04	Foundation Soils	27.6	10.7	111	1.7	1.5	53.8	0.625	0.8	30	45.8	53.8	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.135	0.695	75.4	83.4	0.095
SC-03	SB-04	Foundation Soils	27.6	10.6	111	1.7	1.5	53.5	0.626	0.8	30	45.8	53.5	1.0	-0.5	0.1	0.9	0.095	1.008	0.093	0.135	0.693	75.4	83.2	0.094
SC-03	SB-04	Foundation Soils	27.7	10.6	111	1.7	1.5	53.2	0.627	0.8	30	45.7	53.2	1.0	-0.5	0.1	0.9	0.095	1.008	0.093	0.135	0.691	75.4	82.9	0.094
SC-03	SB-04	Foundation Soils	27.8	10.5	111	1.7	1.5	52.9	0.628	0.8	30	45.6	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.135	0.688	75.4	82.7	0.094
SC-03	SB-04	Foundation Soils	27.9	10.4	111	1.7	1.5	52.7	0.629	0.8	30	45.6	52.7	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.135	0.686	75.4	82.5	0.094
SC-03	SB-04	Foundation Soils	28.0	10.3	111	1.7	1.5	52.4	0.630	0.8	30	45.5	52.4	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.135	0.684	75.4	82.2	0.093
SC-03	SB-04	Foundation Soils	28.1	10.2	111	1.7	1.5	52.3	0.630	0.8	30	45.5	52.3	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.135	0.683	75.4	82.2	0.093
SC-03	SB-04	Foundation Soils	28.1	10.2	111	1.7	1.5	52.6	0.629	0.8	30	45.6	52.6	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.135	0.684	75.4	82.4	0.093
SC-03	SB-04	Foundation Soils	28.2	10.1	111	1.7	1.5	52.7	0.629	0.8	30	45.6	52.7	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.136	0.683	75.4	82.5	0.094
SC-03	SB-04	Foundation Soils	28.3	10.0	111	1.7	1.5	52.7	0.629	0.8	30	45.6	52.7	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.136	0.683	75.4	82.5	0.094
SC-03	SB-04	Foundation Soils	28.4	9.9	111	1.7	1.5	52.7	0.629	0.8	30	45.6	52.7	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.136	0.682	75.4	82.5	0.094
SC-03	SB-04	Foundation Soils	28.5	9.8	111	1.7	1.5	53.0	0.628	0.8	30	45.7	53.0	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.136	0.683	75.4	82.7	0.094
SC-03	SB-04	Foundation Soils	28.5	9.7	115	1.7	1.5	53.0	0.628	0.8	30	45.7	53.0	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.136	0.683	75.4	82.7	0.094
SC-03	SB-04	Foundation Soils	28.6	9.7	111	1.7	1.5	52.7	0.629	0.8	30	45.6	52.7	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.136	0.680	75.4	82.5	0.094
SC-03	SB-04	Foundation Soils	28.7	9.6	115	1.7	1.5	52.9	0.628	0.8	30	45.6	52.9	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.136	0.680	75.4	82.6	0.094
SC-03	SB-04	Foundation Soils	28.8	9.5	111	1.7	1.5	52.6	0.629	0.8	30	45.6	52.6	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.136	0.678	75.4	82.4	0.093
SC-03	SB-04	Foundation Soils	28.9	9.4	111	1.7	1.5	52.0	0.631	0.8	30	45.5	52.0	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.137	0.675	75.4	81.9	0.093
SC-03	SB-04	Foundation Soils	29.0	9.3	111	1.7	1.5	51.8	0.632	0.8	30	45.4	51.8	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.137	0.673	75.4	81.8	0.093
SC-03	SB-04	Foundation Soils	29.0	9.3	111	1.7	1.5	52.0	0.631	0.8	30	45.4	52.0	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.137	0.673	75.4	81.9	0.093
SC-03	SB-04	Foundation Soils	29.1	9.2	111	1.7	1.5	52.1	0.631	0.8	30	45.5	52.1	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.137	0.673	75.4	82.0	0.093
SC-03	SB-04	Foundation Soils	29.2	9.1	111	1.7	1.5	52.5	0.630	0.8	30	45.5	52.5	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.137	0.674	75.4	82.3	0.093
SC-03	SB-04	Foundation Soils	29.3	9.0	111	1.8	1.5	42.3	0.669	0.8	15	34.9	42.3	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.137	0.624	75.4	82.7	0.094
SC-03	SB-04	Foundation Soils	29.4	8.9	111	1.8	1.5	42.7	0.667	0.8	15	35.0	42.7	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.137	0.625	75.4	83.1	0.094
SC-03	SB-04	Foundation Soils	29.4	8.8	111	1.8	1.5	43.9	0.662	0.8	15	35.2	43.9	1.0	-0.6	0.1	0.9	0.088	1.007	0.087	0.137	0.631	75.4	84.1	0.096
SC-03	SB-04	Foundation Soils	29.5	8.8	111	1.8	1.5	45.9	0.654	0.8	15	35.5	45.9	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.137	0.640	75.4	85.8	0.098
SC-03	SB-04	Foundation Soils	29.6	8.7	115	1.8	1.5	51.1	0.635	0.8	15	36.1	51.1	1.0	-0.6	0.1	0.9	0.093	1.008	0.091	0.138	0.665	63.7	78.7	0.088
SC-03	SB-04	Foundation Soils	29.7	8.6	121	1.8	1.5	60.8	0.602	0.8	15	36.1	60.8	1.0	-0.6	0.1	0.9	0.100	1.009	0.098	0.138	0.713	42.5	67.2	0.074
SC-03	SB-04	Foundation Soils	29.8	8.5	121	1.8	1.5	63.8	0.592	0.8	15	36.2	63.8	1.0	-0.6	0.1	0.9	0.102	1.009	0.100	0.138	0.729	40.3	67.9	0.074
SC-03	SB-04	Foundation Soils	29.9	8.4	121	1.8	1.5	69.4	0.575	0.8	15	34.3	69.4	1.0	-0.6	0.1	0.9	0.107	1.010	0.105	0.138	0.759	29.9	65.0	0.071
SC-03	SB-04	Foundation Soils	29.9	8.4	124	1.8	1.5	67.1	0.582	0.8	15	29.5	67.1	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.138	0.745	23.1	60.7	0.066
SC-03	SB-04	Foundation Soils	30.0	8.3	124	1.8	1.5	67.0	0.582	0.8	15	29.5	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.138	0.744	23.1	60.6	0.066
SC-03	SB-04	Foundation Soils	30.1	8.2	124	1.8	1.5	66.3	0.585	0.8	15	25.4	66.3	1.0	-0.6	0.1	0.9	0.104	1.010	0.102	0.138	0.740	19.8	60.7	0.066
SC-03	SB-04	Foundation Soils	30.2	8.1	124	1.8	1.5	64.4	0.590	0.8	15	22.6	64.4	1.0	-0.6	0.1	0.9	0.103	1.009	0.101	0.138	0.729	18.3	60.1	0.065
SC-03	SB-04	Foundation Soils	30.3	8.0	124	1.8	1.5	66.8	0.583	0.8	15	29.2	66.8	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.138	0.741	22.8	60.4	0.065
SC-03	SB-04	Foundation Soils	30.3	7.9	121	1.8	1.5	67.8	0.580	0.8	15	34.0	67.8	1.0	-0.6	0.1	0.9	0.106	1.010	0.103	0.139	0.746	29.8	63.6	0.069
SC-03	SB-04	Foundation Soils	30.4	7.9	121	1.8	1.5	65.4	0.587	0.8	15	36.0	65.4	1.0	-0.6	0.1	0.9	0.104	1.009	0.102	0.139	0.733	37.4	66.9	0.073
SC-03	SB-04	Foundation Soils	30.5	7.8	121	1.8	1.5	60.4	0.603	0.8	15	36.3	60.4	1.0	-0.6	0.1	0.9	0.100	1.009	0.098	0.139	0.705	44.2	68.4	0.075
SC-03	SB-04	Foundation Soils	30.6	7.7	115	1.8	1.5	57.9	0.611	0.8	15	36.3	57.9	1.0	-0.6	0.1	0.9	0.098	1.008	0.096	0.139	0.692	49.0	70.6	0.078
SC-03	SB-04	Foundation Soils	30.7	7.6	121	1.8	1.5	58.0	0.611	0.8	15	36.2	58.0	1.0	-0.6	0.1	0.9	0.098	1.008	0.096	0.139	0.692	47.7	69.5	0.076
SC-03	SB-04	Foundation Soils	30.8	7.5	121	1.8	1.5	64.1	0.591	0.8	15	35.7	64.1	1.0	-0.6	0.1	0.9	0.103	1.009	0.100	0.139	0.723	36.9	65.4	0.071
SC-03	SB-04	Foundation Soils	30.8	7.4	121	1.8	1.5	67.9	0.580	0.8	15	34.4	67.9	1.0	-0.6	0.1	0.9	0.106	1.010	0.103	0.139	0.743	30.6	64.1	0.070
SC-03	SB-04	Foundation Soils	30.9	7.4	121	1.8	1.5	73.0	0.565	0.8	15	34.6	73.0	1.0	-0.6	0.1	0.9	0.110	1.011	0.107	0.139	0.771	29.4	67.8	0.074
SC-03	SB-04	Foundation Soils	31.0	7.3	121	1.9	1.5	73.1	0.565	0.8	15	34.5	73.1	1.0	-0.6	0.1	0.9	0.110	1.011	0.107	0.139	0.771	29.3	67.9	0.074
SC-03	SB-04	Foundation Soils	31.1	7.2	121	1.9	1.5	69.6	0.575	0.8	15	35.9	69.6	1.0	-0.6	0.1	0.9	0.107	1.010	0.105	0.139	0.751	34.6	68.3	0.075
SC-03	SB-04	Foundation Soils	31.2	7.1	121	1.9	1.5	68.7	0.578	0.8	15	36.3	68.7	1.0	-0.6	0.1	0.9	0.106	1.010	0.104	0.139	0.745	36.9	69.2	0.076
SC-03	SB-04	Foundation Soils	31.2	7.0	121	1.9	1.5	66.8	0.583	0.8	15	37.0	66.8	1.0	-0.6	0.1	0.9	0.105	1.010	0.102	0.140	0.734	42.4	72.2	0.080
SC-03	SB-04	Foundation Soils	31.3	7.0	121	1.9	1.6	64.9	0.589	0.8	15	37.3	64.9	1.0	-0.6	0.1	0.9	0.103	1.009	0.101	0.140	0.723	47.5	75.1	0.084
SC-03	SB-04	Foundation Soils	31.4	6.9	121	1.9	1.6	64.4	0.590	0.8	15	37.2	64.4	1.0	-0.6	0.1	0.9	0.103	1.009	0.101	0.140	0.720	47.3	74.5	0.083
SC-03	SB-04	Foundation Soils	31.5	6.8	115	1.9	1.6	62.9	0.595	0.8	15	37.6	62.9	1.0	-0.6	0.1	0.9	0.102	1.009	0.099	0.140	0.711	55.3	80.6	0.091
SC-03	SB-04	Foundation Soils	31.6	6.7	115	1.9	1.6	61.6	0.599	0.8	15	37.4	61.6	1.0	-0.6	0.1	0.9	0.101	1.009	0.099	0.140	0.704	56.4	80.5	0.091
SC-03	SB-04	Foundation Soils	31.7	6.6	115	1.9	1.6	62.0	0.598	0.8	15	37.5	62.0	1.0	-0.6	0.1	0.9	0.101	1.009	0.099	0.140	0.706	56.3	80.8	0.091
SC-03	SB-04	Foundation Soils	31.7	6.5	115	1.9	1.6	61.9	0.598	0.8	15	37.6	61.9	1.0	-0.7	0.1	0.9	0.101	1.009	0.099	0.140	0.705	59.0	83.3	0.095
SC-03	SB-04	Foundation Soils	31.8	6.5	115	1.9	1.6	62.0	0.598	0.8	15	37.5	62.0	1.0	-0.7	0.1	0.9	0.101	1.009	0.099	0.140	0.704	57.4	81.9	0.093
SC-03	SB-04	Foundation Soils	31.9	6.4	115	1.9	1.6	63.2	0.594	0.8	15	37.7	63.2	1.0	-0.7	0.1	0.9	0.102	1.009	0.100	0.140	0.710	56.3	81.9	0.093
SC-03	SB-04	Foundation Soils	32.0	6.3	115	1.9	1.6	60.9	0.601	0.8	15	37.4	60.9	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.140	0.698	58.4	81.9	0.093
SC-03	SB-04	Foundation Soils	32.1	6.2	115	1.9	1.6	61.1	0.601	0.8	15	36.9	61.1	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.141	0.698	49.8	74.0	0.082
SC-03	SB-04	Foundation Soils	32.2	6.1	115	1.9	1.6	61.6	0.599	0.8	15	36.9	61.6	1.0	-0.7	0.1	0.9	0.101	1.009	0.098	0.141	0.700	49.4	74.0	0.082
SC-03	SB-04	Foundation Soils	32.2	6.1	115	1.9	1.6	61.1	0.601	0.8	15	36.8	61.1	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.141	0.697	48.2	72.5	0.080
SC-03	SB-04	Foundation Soils	32.3	6.0	115	1.9	1.6	59.8	0.605	0.8	15	36.6	59.8	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.141	0.690	48.5	71.7	0.079
SC-03	SB-04	Foundation Soils	32.4	5.9	115	1.9	1.6	60.7	0.602	0.8	15	37.3	60.7	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.141	0.694	57.1	80.5	0.091
SC-03	SB-04	Foundation Soils	32.5	5.8	115	1.9	1.6	59.8	0.605	0.8	15	36.7	59.8	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.141	0.689	49.5	72.6	0.080
SC-03	SB-04	Foundation Soils	32.6	5.7	115	1.9	1.6	58.7	0.608	0.8	15	37.0	58.7	1.0	-0.7	0.1	0.9	0.099	1.008	0.096	0.141	0.683	58.1	79.8	0.090
SC-03	SB-04	Foundation Soils	32.6	5.6	115	2.0	1.6	56.3	0.616	0.8	15	36.8	56.3	1.0	-0.7	0.1	0.9	0.097	1.008	0.095	0.141	0.671	62.1	81.6	0.092
SC-03	SB-04	Foundation Soils	32.7	5.6	115	2.0	1.6	53.3	0.627	0.8	15	36.5	53.3	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.141	0.655	66.4	83.1	0.094
SC-03	SB-04	Foundation Soils	32.8	5.5	115	2.0	1.6	52.9	0.628	0.8	15	36.4	52.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.141	0.653	66.6	83.1	0.094
SC-03	SB-04	Foundation Soils	32.9	5.4	115	2.0	1.6	54.1	0.624	0.8	15	36.5	54.1	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.141	0.659	63.3	80.9	0.091
SC-03	SB-04	Foundation Soils	33.0	5.3	115	2.0	1.6	55.4	0.619	0.8	15	36.6	55.4	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.141	0.664	61.0	79.7	0.090
SC-03	SB-04	Foundation Soils	33.1	5.2	115	2.0	1.6	55.8	0.618	0.8	15	36.6	55.8	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.142	0.666	58.3	77.5	0.087
SC-03	SB-04	Foundation Soils	33.1	5.2	115	2.0	1.6	55.1	0.620	0.8	15	36.6	55.1	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.142	0.662	60.9	79.5	0.089

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-03	SB-04	Foundation Soils	33.2	5.1	115	2.0	1.6	54.4	0.623	0.8	15	36.6	54.4	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.142	0.658	64.7	82.5	0.094
SC-03	SB-04	Foundation Soils	33.3	5.0	115	2.0	1.6	53.5	0.626	0.8	15	36.6	53.5	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.142	0.653	68.0	84.9	0.097
SC-03	SB-04	Foundation Soils	33.4	4.9	115	2.0	1.6	52.2	0.631	0.8	15	36.4	52.2	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.142	0.646	70.5	86.3	0.099
SC-03	SB-04	Foundation Soils	33.5	4.8	115	2.0	1.6	52.1	0.631	0.8	15	36.2	52.1	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.142	0.646	62.5	78.5	0.088
SC-03	SB-04	Foundation Soils	33.5	4.7	115	2.0	1.6	52.0	0.631	0.8	15	35.9	52.0	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.142	0.645	55.9	72.0	0.080
SC-03	SB-04	Foundation Soils	33.6	4.7	121	2.0	1.6	52.1	0.631	0.8	15	35.1	52.1	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.142	0.645	45.9	62.8	0.068
SC-03	SB-04	Foundation Soils	33.7	4.6	121	2.0	1.6	50.1	0.638	0.8	15	34.9	50.1	1.0	-0.7	0.1	0.9	0.092	1.008	0.090	0.142	0.635	46.3	61.5	0.067
SC-03	SB-04	Foundation Soils	33.8	4.5	115	2.0	1.6	44.3	0.661	0.8	15	35.1	44.3	1.0	-0.7	0.1	0.9	0.088	1.007	0.086	0.142	0.607	66.8	76.1	0.085
SC-03	SB-04	Foundation Soils	33.9	4.4	111	2.0	1.6	40.2	0.678	0.8	15	34.6	40.2	1.0	-0.7	0.1	0.9	0.086	1.007	0.084	0.142	0.588	75.4	81.0	0.092
SC-03	SB-04	Foundation Soils	34.0	4.3	111	2.0	1.6	39.2	0.682	0.7	15	34.4	39.2	1.0	-0.7	0.1	0.9	0.085	1.007	0.083	0.142	0.583	75.4	80.1	0.090
SC-03	SB-04	Foundation Soils	34.0	4.2	111	2.0	1.6	38.1	0.687	0.7	15	34.3	38.1	1.0	-0.7	0.1	0.9	0.084	1.007	0.082	0.143	0.578	75.4	79.2	0.089
SC-03	SB-04	Foundation Soils	34.1	4.2	111	2.0	1.6	37.3	0.691	0.7	15	34.1	37.3	1.0	-0.7	0.1	0.9	0.084	1.007	0.082	0.143	0.574	75.4	78.5	0.088
SC-03	SB-04	Foundation Soils	34.2	4.1	111	2.0	1.6	36.6	0.694	0.7	15	34.0	36.6	1.0	-0.7	0.1	0.9	0.083	1.007	0.081	0.143	0.571	75.4	78.0	0.088
SC-03	SB-04	Foundation Soils	34.3	4.0	119	2.0	1.6	36.2	0.696	0.7	15	33.9	36.2	1.0	-0.7	0.1	0.9	0.083	1.007	0.081	0.143	0.568	75.4	77.6	0.087
SC-03	SB-04	Foundation Soils	34.4	3.9	119	2.0	1.6	35.6	0.699	0.7	15	33.9	35.6	1.0	-0.7	0.1	0.9	0.082	1.007	0.081	0.143	0.565	75.4	77.1	0.086
SC-03	SB-04	Foundation Soils	34.4	3.8	119	2.1	1.6	35.4	0.699	0.7	15	33.8	35.4	1.0	-0.7	0.1	0.9	0.082	1.007	0.081	0.143	0.564	75.4	77.0	0.086
SC-03	SB-04	Foundation Soils	34.5	3.8	119	2.1	1.6	35.6	0.699	0.7	15	33.9	35.6	1.0	-0.7	0.1	0.9	0.082	1.007	0.081	0.143	0.565	75.4	77.1	0.086
SC-03	SB-04	Foundation Soils	34.6	3.7	119	2.1	1.6	35.7	0.698	0.7	15	33.9	35.7	1.0	-0.7	0.1	0.9	0.083	1.007	0.081	0.143	0.565	75.4	77.2	0.086
SC-03	SB-04	Foundation Soils	34.7	3.6	119	2.1	1.6	35.9	0.697	0.7	15	33.9	35.9	1.0	-0.7	0.1	0.9	0.083	1.007	0.081	0.143	0.565	75.4	77.3	0.087
SC-03	SB-04	Foundation Soils	34.8	3.5	119	2.1	1.6	36.0	0.697	0.7	15	33.9	36.0	1.0	-0.7	0.1	0.9	0.083	1.007	0.081	0.143	0.566	75.4	77.5	0.087
SC-03	SB-04	Foundation Soils	34.9	3.4	119	2.1	1.6	36.1	0.696	0.7	15	33.9	36.1	1.0	-0.7	0.1	0.9	0.083	1.007	0.081	0.143	0.566	75.4	77.5	0.087
SC-03	SB-04	Foundation Soils	34.9	3.3	119	2.1	1.6	36.1	0.696	0.7	15	33.9	36.1	1.0	-0.7	0.1	0.9	0.083	1.007	0.081	0.143	0.566	75.4	77.6	0.087
SC-03	SB-04	Foundation Soils	35.0	3.3	111	2.1	1.6	36.8	0.693	0.7	15	34.1	36.8	1.0	-0.7	0.1	0.9	0.083	1.007	0.081	0.143	0.568	75.4	78.1	0.088
SC-03	SB-04	Foundation Soils	35.1	3.2	111	2.1	1.7	37.2	0.691	0.7	15	34.1	37.2	1.0	-0.7	0.1	0.9	0.083	1.007	0.082	0.143	0.569	75.4	78.4	0.088
SC-03	SB-04	Foundation Soils	35.2	3.1	111	2.1	1.7	37.6	0.690	0.7	15	34.2	37.6	1.0	-0.7	0.1	0.9	0.084	1.007	0.082	0.144	0.571	75.4	78.8	0.089
SC-03	SB-04	Foundation Soils	35.3	3.0	111	2.1	1.7	38.9	0.684	0.7	15	34.4	38.9	1.0	-0.8	0.1	0.9	0.085	1.007	0.083	0.144	0.576	75.4	79.9	0.090
SC-03	SB-04	Foundation Soils	35.4	2.9	111	2.1	1.7	41.2	0.674	0.7	15	34.7	41.2	1.0	-0.8	0.1	0.9	0.086	1.007	0.084	0.144	0.586	74.6	81.1	0.092
SC-03	SB-04	Foundation Soils	35.4	2.9	111	2.1	1.7	45.3	0.657	0.7	15	34.9	45.3	1.0	-0.8	0.1	0.9	0.089	1.007	0.087	0.144	0.604	57.7	68.1	0.075
SC-03	SB-04	Foundation Soils	35.5	2.8	121	2.1	1.7	47.0	0.650	0.7	15	34.0	47.0	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.144	0.612	42.3	55.4	0.059
SC-03	SB-04	Foundation Soils	35.6	2.7	121	2.1	1.7	47.4	0.648	0.7	15	34.0	47.4	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.144	0.613	41.9	55.3	0.059
SC-03	SB-04	Foundation Soils	35.7	2.6	121	2.1	1.7	46.6	0.652	0.7	15	34.0	46.6	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.144	0.609	43.3	55.9	0.060
SC-03	SB-04	Foundation Soils	35.8	2.5	111	2.1	1.7	45.2	0.657	0.7	15	34.1	45.2	1.0	-0.8	0.1	0.9	0.089	1.007	0.087	0.144	0.603	46.2	57.2	0.062
SC-03	SB-04	Foundation Soils	35.8	2.4	111	2.1	1.7	44.8	0.659	0.7	15	34.8	44.8	1.0	-0.8	0.1	0.9	0.089	1.007	0.087	0.144	0.601	58.5	68.4	0.075
SC-03	SB-04	Foundation Soils	35.9	2.4	111	2.1	1.7	44.8	0.659	0.7	15	34.9	44.8	1.0	-0.8	0.1	0.9	0.089	1.007	0.087	0.144	0.600	59.5	69.3	0.076
SC-03	SB-04	Foundation Soils	36.0	2.3	115	2.1	1.7	43.9	0.662	0.7	15	35.0	43.9	1.0	-0.8	0.1	0.9	0.088	1.007	0.086	0.144	0.596	68.2	77.0	0.086
SC-03	SB-04	Foundation Soils	36.1	2.2	115	2.1	1.7	43.8	0.663	0.7	15	35.1	43.8	1.0	-0.8	0.1	0.9	0.088	1.007	0.086	0.144	0.595	70.7	79.4	0.089
SC-03	SB-04	Foundation Soils	36.2	2.1	115	2.2	1.7	43.8	0.662	0.7	15	35.0	43.8	1.0	-0.8	0.1	0.9	0.088	1.007	0.086	0.144	0.595	67.5	76.3	0.085
SC-03	SB-04	Foundation Soils	36.3	2.0	115	2.2	1.7	45.2	0.657	0.7	15	35.1	45.2	1.0	-0.8	0.1	0.9	0.089	1.007	0.087	0.144	0.601	65.1	75.1	0.084
SC-03	SB-04	Foundation Soils	36.3	2.0	121	2.2	1.7	53.8	0.625	0.7	15	34.1	53.8	1.0	-0.8	0.1	0.9	0.095	1.008	0.092	0.144	0.640	36.9	56.6	0.061
SC-03	SB-04	Foundation Soils	36.4	1.9	121	2.2	1.7	59.9	0.604	0.8	15	32.9	59.9	1.0	-0.8	0.1	0.9	0.099	1.009	0.097	0.145	0.669	29.7	56.8	0.061
SC-03	SB-04	Foundation Soils	36.5	1.8	121	2.2	1.7	68.9	0.577	0.8	15	31.6	68.9	1.0	-0.8	0.1	0.9	0.106	1.010	0.103	0.145	0.714	25.3	62.6	0.068
SC-03	SB-04	Foundation Soils	36.6	1.7	124	2.2	1.7	70.0	0.574	0.8	15	26.3	70.0	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.145	0.720	20.2	63.9	0.070
SC-03	SB-04	Foundation Soils	36.7	1.6	124	2.2	1.7	78.5	0.550	0.8	15	29.9	78.5	1.0	-0.8	0.1	0.9	0.114	1.012	0.111	0.145	0.767	22.2	70.8	0.078
SC-03	SB-04	Foundation Soils	36.7	1.5	124	2.2	1.7	77.4	0.553	0.8	15	25.5	77.4	1.0	-0.8	0.1	0.9	0.113	1.012	0.110	0.145	0.760	19.2	71.1	0.079
SC-03	SB-04	Foundation Soils	36.8	1.5	124	2.2	1.7	76.0	0.557	0.8	15	22.4	76.0	1.0	-0.8	0.1	0.9	0.112	1.011	0.109	0.145	0.752	17.6	71.3	0.079
SC-03	SB-04	Foundation Soils	36.9	1.4	124	2.2	1.7	84.5	0.535	0.8	15	30.2	84.5	1.0	-0.8	0.1	0.9	0.120	1.013	0.116	0.145	0.802	21.8	76.1	0.085
SC-03	SB-04	Foundation Soils	37.0	1.3	124	2.2	1.7	84.5	0.535	0.8	15	28.0	84.5	1.0	-0.8	0.1	0.9	0.120	1.013	0.116	0.145	0.801	20.3	76.7	0.086
SC-03	SB-04	Foundation Soils	37.1	1.2	124	2.2	1.7	80.4	0.545	0.8	15	28.9	80.4	1.0	-0.8	0.1	0.9	0.116	1.012	0.112	0.145	0.776	21.2	72.7	0.081
SC-03	SB-04	Foundation Soils	37.2	1.1	124	2.2	1.7	78.9	0.549	0.8	15	23.0	78.9	1.0	-0.8	0.1	0.9	0.115	1.012	0.111	0.145	0.766	17.8	73.7	0.082
SC-03	SB-04	Foundation Soils	37.2	1.1	124	2.2	1.7	80.3	0.545	0.8	15	20.6	80.3	1.0	-0.8	0.1	0.9	0.116	1.012	0.112	0.145	0.774	16.8	76.4	0.085
SC-03	SB-04	Foundation Soils	37.3	1.0	124	2.2	1.7	80.5	0.545	0.8	15	10.4	80.5	1.0	-0.8	0.1	0.9	0.116	1.012	0.112	0.145	0.775	13.4	83.5	0.095
SC-03	SB-04	Foundation Soils	37.4	0.9	124	2.2	1.7	86.7	0.529	0.8	15	0.0	86.7	1.0	-0.8	0.1	0.9	0.122	1.014	0.118	0.145	0.814	6.0	92.7	0.108
SC-03	SB-04	Foundation Soils	37.5	0.8	124	2.2	1.7	106.6	0.484	0.8	15	0.0	106.6	0.9	-0.8	0.1	0.9	0.147	1.020	0.141	0.145	0.974	6.0	112.6	0.141
SC-03	SB-04	Foundation Soils	37.6	0.7	124	2.2	1.7	115.8	0.465	0.8	15	0.0	115.8	0.9	-0.8	0.1	0.9	0.163	1.024	0.157	0.145	1.079	6.0	121.8	
SC-03	SB-04	Foundation Soils	37.6	0.6	124	2.2	1.7	103.1	0.491	0.8	15	0.0	103.1	0.9	-0.8	0.1	0.9	0.142	1.019	0.137	0.145	0.940	6.0	109.1	0.135
SC-03	SB-04	Foundation Soils	37.7	0.6	124	2.2	1.7	81.0	0.544	0.8	15	0.0	81.0	1.0	-0.8	0.1	0.9	0.117	1.012	0.113	0.145	0.776	6.0	87.0	0.100
SC-03	SB-04	Foundation Soils	37.8	0.5	124	2.3	1.7	73.6	0.564	0.8	15	0.0	73.6	1.0	-0.8	0.1	0.9	0.110	1.011	0.107	0.145	0.733	6.0	79.5	0.090
SC-03	SB-04	Foundation Soils	37.9	0.4	124	2.3	1.7	76.6	0.555	0.8	15	0.0	76.6	1.0	-0.8	0.1	0.9	0.113	1.011	0.109	0.145	0.750	7.6	84.2	0.096
SC-03	SB-04	Foundation Soils	38.0	0.3	124	2.3	1.7	73.6	0.563	0.8	15	0.1	73.6	1.0	-0.8	0.1	0.9	0.110	1.011	0.107	0.146	0.733	9.1	82.5	0.094
SC-03	SB-04	Foundation Soils	38.1	0.2	124	2.3	1.7	71.5	0.569	0.8	15	0.0	71.5	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.146	0.721	6.0	77.5	0.087
SC-03	SB-04	Foundation Soils	38.1	0.1	124	2.3	1.7	71.5	0.569	0.8	15	0.0	71.5	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.146	0.721	6.0	77.5	0.087
SC-03	SB-04	Foundation Soils	38.2	0.1	124	2.3	1.7	72.7	0.566	0.8	15	0.0	72.7	1.0	-0.8	0.1	0.9	0.110	1.011	0.106	0.146	0.727	6.0	78.7	0.088
SC-03	SB-04	Foundation Soils	38.3	-0.0	124	2.3	1.7	66.0	0.585	0.7	15	0.0	66.0	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.146	0.692	6.0	72.0	0.080
SC-03	SB-04	Foundation Soils	38.4	-0.1	124	2.3	1.7	63.2	0.594	0.7	15	0.0	63.2	1.0	-0.8	0.1	0.9	0.102	1.009	0.099	0.146	0.678	6.0	69.2	0.076
SC-03	SB-04	Foundation Soils	38.5	-0.2	124	2.3	1.7	60.6	0.602	0.7	15	0.0	60.6	1.0	-0.8	0.1	0.9	0.100	1.009	0.097	0.146	0.665	6.0	66.6	0.073
SC-03	SB-04	Foundation Soils	38.5	-0.3	124	2.3	1.8	56.2	0.617	0.7	15	0.0	56.2	1.0	-0.8	0.1	0.9	0.097	1.008	0.094	0.146	0.643	6.2	62.3	0.068
SC-03	SB-04	Foundation Soils	38.6	-0.3	124	2.3	1.8	54.3	0.623	0.7	15	0.8	54.3	1.0	-0.8	0.1	0.9	0.095	1.008	0.093	0.146	0.634	10.0	63.5	0.069
SC-03	SB-04	Foundation Soils	38.7	-0.4	124	2.3	1.8	60.1	0.604	0.7	15	8.8	60.1	1.0	-0.9	0.1	0.9	0.100	1.009	0.097	0.146	0.661	13.2	64.5	0.070
SC-03	SB-04	Foundation Soils	38.8	-0.5	124	2.3	1.8	63.0	0.595	0.7	15	12.2	63.0	1.0	-0.9	0.1	0.9	0.102	1.009	0.099	0.146	0.675	14.2	65.0	0.071
SC-03	SB-04	Foundation Soils	38.9	-0.6	124	2.3	1.8	48.0	0.646	0.7	15	0.1	48.0	1.0	-0.9	0.1	0.9	0.091	1.007	0.088	0.146	0.605	9.1	57.0	0.061
SC-03	SB-04	Foundation Soils	39.0	-0.7	124	2.3	1.8	52.8	0.629	0.7	15	7.1	52.8	1.0	-0.9	0.1	0.9	0.094	1.008	0.091	0.146	0.626	12.7	58.4	0.063

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-03	SB-04	Foundation Soils	39.0	-0.8	124	2.3	1.8	49.9	0.639	0.7	15	4.7	49.9	1.0	-0.9	0.1	0.9	0.092	1.008	0.090	0.146	0.613	11.9	57.1	0.061
SC-03	SB-04	Foundation Soils	39.1	-0.8	124	2.3	1.8	51.0	0.635	0.7	15	2.6	51.0	1.0	-0.9	0.1	0.9	0.093	1.008	0.090	0.146	0.618	11.1	59.5	0.064
SC-03	SB-04	Foundation Soils	39.2	-0.9	121	2.3	1.8	96.2	0.507	0.8	15	41.5	96.2	0.9	-0.9	0.1	0.9	0.133	1.016	0.128	0.146	0.873	41.9	96.7	0.114
SC-04	SB-04 & SB-05	Foundation Soils	22.1	16.2	111	1.3	1.3	58.8	0.608	0.9	30	46.8	58.8	1.0	-0.4	0.0	0.9	0.099	1.008	0.098	0.121	0.805	75.4	87.4	0.100
SC-04	SB-04 & SB-05	Foundation Soils	22.1	16.1	111	1.3	1.3	62.0	0.598	0.9	30	47.4	62.0	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.121	0.823	74.4	88.9	0.103
SC-04	SB-04 & SB-05	Foundation Soils	22.2	16.0	111	1.3	1.3	63.0	0.595	0.9	30	47.6	63.0	1.0	-0.4	0.0	0.9	0.102	1.009	0.101	0.122	0.828	71.9	87.3	0.100
SC-04	SB-04 & SB-05	Foundation Soils	22.3	16.0	111	1.4	1.3	60.7	0.602	0.9	30	47.2	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.099	0.122	0.813	75.4	88.9	0.102
SC-04	SB-04 & SB-05	Foundation Soils	22.4	15.9	111	1.4	1.3	58.3	0.610	0.9	30	46.7	58.3	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.122	0.797	75.4	87.0	0.100
SC-04	SB-04 & SB-05	Foundation Soils	22.5	15.8	111	1.4	1.3	57.2	0.613	0.9	30	46.5	57.2	1.0	-0.4	0.0	0.9	0.097	1.008	0.097	0.122	0.790	75.4	86.1	0.099
SC-04	SB-04 & SB-05	Foundation Soils	22.6	15.7	111	1.4	1.3	57.1	0.614	0.9	30	46.5	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.096	0.122	0.788	75.4	86.0	0.098
SC-04	SB-04 & SB-05	Foundation Soils	22.6	15.6	111	1.4	1.3	62.4	0.597	0.9	30	47.4	62.4	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.123	0.818	71.6	86.5	0.099
SC-04	SB-04 & SB-05	Foundation Soils	22.7	15.5	111	1.4	1.4	65.0	0.588	0.9	30	47.9	65.0	1.0	-0.4	0.0	0.9	0.103	1.009	0.102	0.123	0.833	69.7	86.8	0.100
SC-04	SB-04 & SB-05	Foundation Soils	22.8	15.5	115	1.4	1.4	65.2	0.588	0.9	30	47.9	65.2	1.0	-0.4	0.0	0.9	0.103	1.009	0.102	0.123	0.833	68.6	85.9	0.098
SC-04	SB-04 & SB-05	Foundation Soils	22.9	15.4	111	1.4	1.4	62.1	0.597	0.9	30	47.5	62.1	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.123	0.812	74.6	89.2	0.103
SC-04	SB-04 & SB-05	Foundation Soils	23.0	15.3	111	1.4	1.4	58.7	0.608	0.9	30	46.8	58.7	1.0	-0.4	0.0	0.9	0.099	1.008	0.098	0.123	0.791	75.4	87.3	0.100
SC-04	SB-04 & SB-05	Foundation Soils	23.0	15.2	111	1.4	1.4	58.5	0.609	0.9	30	46.8	58.5	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.123	0.788	75.4	87.1	0.100
SC-04	SB-04 & SB-05	Foundation Soils	23.1	15.1	111	1.4	1.4	56.8	0.615	0.9	30	46.4	56.8	1.0	-0.4	0.0	0.9	0.097	1.008	0.096	0.124	0.777	75.4	85.8	0.098
SC-04	SB-04 & SB-05	Foundation Soils	23.2	15.1	111	1.4	1.4	56.6	0.615	0.9	30	46.4	56.6	1.0	-0.4	0.0	0.9	0.097	1.008	0.096	0.124	0.775	75.4	85.6	0.098
SC-04	SB-04 & SB-05	Foundation Soils	23.3	15.0	111	1.4	1.4	57.7	0.612	0.9	30	46.6	57.7	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.124	0.780	75.4	86.5	0.099
SC-04	SB-04 & SB-05	Foundation Soils	23.4	14.9	111	1.4	1.4	58.5	0.609	0.9	30	46.8	58.5	1.0	-0.4	0.0	0.9	0.098	1.008	0.097	0.124	0.784	75.4	87.1	0.100
SC-04	SB-04 & SB-05	Foundation Soils	23.5	14.8	115	1.4	1.4	61.8	0.598	0.9	30	47.1	61.8	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.124	0.802	66.1	80.8	0.091
SC-04	SB-04 & SB-05	Foundation Soils	23.5	14.7	115	1.4	1.4	63.6	0.593	0.9	30	47.4	63.6	1.0	-0.4	0.0	0.9	0.102	1.009	0.101	0.125	0.812	64.2	80.4	0.091
SC-04	SB-04 & SB-05	Foundation Soils	23.6	14.6	115	1.4	1.4	61.9	0.598	0.9	30	47.2	61.9	1.0	-0.4	0.0	0.9	0.101	1.009	0.100	0.125	0.800	68.5	83.1	0.094
SC-04	SB-04 & SB-05	Foundation Soils	23.7	14.6	111	1.4	1.4	59.0	0.607	0.9	30	46.8	59.0	1.0	-0.4	0.0	0.9	0.099	1.009	0.098	0.125	0.782	74.1	86.3	0.099
SC-04	SB-04 & SB-05	Foundation Soils	23.8	14.5	111	1.4	1.4	57.1	0.614	0.9	30	46.5	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.096	0.125	0.770	75.4	86.0	0.098
SC-04	SB-04 & SB-05	Foundation Soils	23.9	14.4	111	1.4	1.4	56.0	0.617	0.8	30	46.3	56.0	1.0	-0.4	0.0	0.9	0.097	1.008	0.095	0.125	0.763	75.4	85.2	0.097
SC-04	SB-04 & SB-05	Foundation Soils	23.9	14.3	111	1.4	1.4	54.8	0.622	0.8	30	46.0	54.8	1.0	-0.4	0.1	0.9	0.096	1.008	0.095	0.125	0.754	75.4	84.1	0.096
SC-04	SB-04 & SB-05	Foundation Soils	24.0	14.2	111	1.4	1.4	56.0	0.618	0.8	30	46.2	56.0	1.0	-0.4	0.1	0.9	0.097	1.008	0.095	0.126	0.760	75.4	85.1	0.097
SC-04	SB-04 & SB-05	Foundation Soils	24.1	14.1	111	1.5	1.4	57.1	0.614	0.8	30	46.5	57.1	1.0	-0.4	0.1	0.9	0.097	1.008	0.096	0.126	0.766	75.4	86.0	0.098
SC-04	SB-04 & SB-05	Foundation Soils	24.2	14.1	111	1.5	1.4	57.3	0.613	0.8	30	46.5	57.3	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.126	0.765	75.4	86.1	0.099
SC-04	SB-04 & SB-05	Foundation Soils	24.3	14.0	111	1.5	1.4	58.3	0.610	0.8	30	46.7	58.3	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.126	0.770	74.6	86.2	0.099
SC-04	SB-04 & SB-05	Foundation Soils	24.4	13.9	115	1.5	1.4	63.5	0.593	0.9	30	47.4	63.5	1.0	-0.5	0.1	0.9	0.102	1.009	0.101	0.126	0.800	63.3	79.5	0.089
SC-04	SB-04 & SB-05	Foundation Soils	24.4	13.8	121	1.5	1.4	76.4	0.556	0.9	30	47.5	76.4	1.0	-0.5	0.1	0.9	0.113	1.011	0.111	0.126	0.880	39.9	68.7	0.076
SC-04	SB-04 & SB-05	Foundation Soils	24.5	13.7	121	1.5	1.4	79.6	0.547	0.9	30	47.2	79.6	1.0	-0.5	0.1	0.9	0.115	1.012	0.114	0.126	0.901	36.0	68.4	0.075
SC-04	SB-04 & SB-05	Foundation Soils	24.6	13.7	121	1.5	1.4	77.3	0.553	0.9	30	47.0	77.3	1.0	-0.5	0.1	0.9	0.113	1.011	0.112	0.127	0.883	36.8	67.1	0.074
SC-04	SB-04 & SB-05	Foundation Soils	24.7	13.6	121	1.5	1.4	78.3	0.551	0.9	30	46.6	78.3	1.0	-0.5	0.1	0.9	0.114	1.012	0.113	0.127	0.889	34.8	66.5	0.073
SC-04	SB-04 & SB-05	Foundation Soils	24.8	13.5	121	1.5	1.4	82.5	0.540	0.9	30	44.7	82.5	1.0	-0.5	0.1	0.9	0.118	1.013	0.116	0.127	0.917	29.0	66.8	0.073
SC-04	SB-04 & SB-05	Foundation Soils	24.9	13.4	121	1.5	1.4	86.4	0.530	0.9	30	45.8	86.4	1.0	-0.5	0.1	0.9	0.122	1.014	0.120	0.127	0.945	29.7	70.3	0.077
SC-04	SB-04 & SB-05	Foundation Soils	24.9	13.3	121	1.5	1.4	86.3	0.530	0.9	30	47.9	86.3	1.0	-0.5	0.1	0.9	0.122	1.014	0.120	0.127	0.943	34.3	72.7	0.081
SC-04	SB-04 & SB-05	Foundation Soils	25.0	13.2	121	1.5	1.4	80.0	0.546	0.9	30	47.8	80.0	1.0	-0.5	0.1	0.9	0.116	1.012	0.114	0.127	0.896	38.1	70.3	0.078
SC-04	SB-04 & SB-05	Foundation Soils	25.1	13.2	121	1.5	1.4	74.5	0.561	0.9	30	47.9	74.5	1.0	-0.5	0.1	0.9	0.111	1.011	0.109	0.128	0.858	43.8	70.4	0.078
SC-04	SB-04 & SB-05	Foundation Soils	25.2	13.1	121	1.5	1.4	73.1	0.565	0.8	30	48.0	73.1	1.0	-0.5	0.1	0.9	0.110	1.011	0.108	0.128	0.847	46.5	71.6	0.079
SC-04	SB-04 & SB-05	Foundation Soils	25.3	13.0	121	1.5	1.4	71.6	0.569	0.8	30	48.0	71.6	1.0	-0.5	0.1	0.9	0.109	1.010	0.107	0.128	0.837	49.1	72.8	0.081
SC-04	SB-04 & SB-05	Foundation Soils	25.3	12.9	115	1.5	1.4	70.9	0.571	0.8	30	48.5	70.9	1.0	-0.5	0.1	0.9	0.108	1.010	0.106	0.128	0.831	57.1	79.5	0.090
SC-04	SB-04 & SB-05	Foundation Soils	25.4	12.8	115	1.5	1.4	67.8	0.580	0.8	30	48.1	67.8	1.0	-0.5	0.1	0.9	0.106	1.010	0.104	0.128	0.811	61.3	81.0	0.092
SC-04	SB-04 & SB-05	Foundation Soils	25.5	12.8	115	1.5	1.4	62.9	0.595	0.8	30	47.4	62.9	1.0	-0.5	0.1	0.9	0.102	1.009	0.100	0.128	0.781	68.2	83.7	0.095
SC-04	SB-04 & SB-05	Foundation Soils	25.6	12.7	115	1.5	1.4	59.9	0.605	0.8	30	47.0	59.9	1.0	-0.5	0.1	0.9	0.099	1.009	0.098	0.128	0.763	72.2	85.1	0.097
SC-04	SB-04 & SB-05	Foundation Soils	25.7	12.6	111	1.5	1.4	57.8	0.611	0.8	30	46.6	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.096	0.129	0.750	75.4	86.6	0.099
SC-04	SB-04 & SB-05	Foundation Soils	25.8	12.5	115	1.5	1.4	58.5	0.609	0.8	30	46.6	58.5	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.129	0.753	70.3	82.1	0.093
SC-04	SB-04 & SB-05	Foundation Soils	25.8	12.4	115	1.6	1.4	58.3	0.610	0.8	30	46.5	58.3	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.129	0.751	68.5	80.3	0.091
SC-04	SB-04 & SB-05	Foundation Soils	25.9	12.3	111	1.6	1.4	56.4	0.616	0.8	30	46.3	56.4	1.0	-0.5	0.1	0.9	0.097	1.008	0.095	0.129	0.739	74.4	84.4	0.096
SC-04	SB-04 & SB-05	Foundation Soils	26.0	12.3	111	1.6	1.4	53.9	0.625	0.8	30	45.8	53.9	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.129	0.725	75.4	83.4	0.095
SC-04	SB-04 & SB-05	Foundation Soils	26.1	12.2	111	1.6	1.4	53.4	0.627	0.8	30	45.7	53.4	1.0	-0.5	0.1	0.9	0.095	1.008	0.093	0.129	0.721	75.4	83.0	0.094
SC-04	SB-04 & SB-05	Foundation Soils	26.2	12.1	111	1.6	1.4	53.3	0.627	0.8	30	45.7	53.3	1.0	-0.5	0.1	0.9	0.095	1.008	0.093	0.129	0.720	75.4	82.9	0.094
SC-04	SB-04 & SB-05	Foundation Soils	26.2	12.0	111	1.6	1.4	53.7	0.625	0.8	30	45.8	53.7	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.130	0.721	75.4	83.3	0.095
SC-04	SB-04 & SB-05	Foundation Soils	26.3	11.9	111	1.6	1.4	56.1	0.617	0.8	30	46.3	56.1	1.0	-0.5	0.1	0.9	0.097	1.008	0.095	0.130	0.733	75.4	85.2	0.097
SC-04	SB-04 & SB-05	Foundation Soils	26.4	11.9	111	1.6	1.4	54.7	0.622	0.8	30	46.0	54.7	1.0	-0.5	0.1	0.9	0.096	1.008	0.094	0.130	0.725	75.4	84.1	0.096
SC-04	SB-04 & SB-05	Foundation Soils	26.5	11.8	111	1.6	1.4	52.7	0.629	0.8	30	45.6	52.7	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.130	0.714	75.4	82.5	0.094
SC-04	SB-04 & SB-05	Foundation Soils	26.6	11.7	111	1.6	1.5	51.3	0.634	0.8	30	45.3	51.3	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.130	0.705	75.4	81.3	0.092
SC-04	SB-04 & SB-05	Foundation Soils	26.7	11.6	111	1.6	1.5	50.2	0.638	0.8	30	45.1	50.2	1.0	-0.5	0.1	0.9	0.092	1.008	0.091	0.130	0.698	75.4	80.5	0.091
SC-04	SB-04 & SB-05	Foundation Soils	26.7	11.5	111	1.6	1.5	49.9	0.639	0.8	30	45.0	49.9	1.0	-0.5	0.1	0.9	0.092	1.008	0.091	0.130	0.696	75.4	80.2	0.090
SC-04	SB-04 & SB-05	Foundation Soils	26.8	11.4	111	1.6	1.5	49.8	0.639	0.8	30	45.0	49.8	1.0	-0.5	0.1	0.9	0.092	1.008	0.091	0.131	0.695	75.4	80.2	0.090
SC-04	SB-04 & SB-05	Foundation Soils	26.9	11.4	111	1.6	1.5	49.4	0.641	0.8	30	44.9	49.4	1.0	-0.5	0.1	0.9	0.092	1.008	0.090	0.131	0.692	75.4	79.8	0.090
SC-04	SB-04 & SB-05	Foundation Soils	27.0	11.3	111	1.6	1.5	48.3	0.645	0.8	30	44.7	48.3	1.0	-0.5	0.1	0.9	0.091	1.007	0.090	0.131	0.686	75.4	79.0	0.089
SC-04	SB-04 & SB-05	Foundation Soils	27.1	11.2	80	1.6	1.5	47.3	0.649	0.8	30	44.5	47.3	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.131	0.680	75.4	78.2	0.088
SC-04	SB-04 & SB-05	Foundation Soils	27.1	11.1	80	1.6	1.5	47.1	0.650	0.8	30	44.5	47.1	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.131	0.678	75.4	78.0	0.088
SC-04	SB-04 & SB-05	Foundation Soils	27.2	11.0	80	1.6	1.5	47.1	0.649	0.8	30	44.5	47.1	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.131	0.677	75.4	78.0	0.088
SC-04	SB-04 & SB-05	Foundation Soils	27.3	11.0	80	1.6	1.5	47.0	0.650	0.8	30	44.5	47.0	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.131	0.676	75.4	78.0	0.087
SC-04	SB-04 & SB-05	Foundation Soils	27.4	10.9	80	1.6	1.5	47.1	0.650	0.8	30	44.5	47.1	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.132	0.675	75.4	78.0	0.088
SC-04	SB-04 & SB-05	Foundation Soils	27.5	10.8	80	1.6	1.5	47.2	0.649	0.8	30	44.5	47.2	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.132	0.675	75.4	78.1	0.088

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-04	SB-04 & SB-05	Foundation Soils	27.6	10.7	80	1.6	1.5	47.4	0.648	0.8	30	44.5	47.4	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.132	0.675	75.4	78.3	0.088
SC-04	SB-04 & SB-05	Foundation Soils	27.6	10.6	111	1.6	1.5	47.6	0.648	0.8	30	44.6	47.6	1.0	-0.5	0.1	0.9	0.091	1.007	0.089	0.132	0.676	75.4	78.4	0.088
SC-04	SB-04 & SB-05	Foundation Soils	27.7	10.5	111	1.6	1.5	47.5	0.648	0.8	30	44.5	47.5	1.0	-0.5	0.1	0.9	0.091	1.007	0.089	0.132	0.674	75.4	78.3	0.088
SC-04	SB-04 & SB-05	Foundation Soils	27.8	10.5	111	1.7	1.5	47.5	0.648	0.8	30	44.5	47.5	1.0	-0.5	0.1	0.9	0.091	1.007	0.089	0.132	0.674	75.4	78.3	0.088
SC-04	SB-04 & SB-05	Foundation Soils	27.9	10.4	80	1.7	1.5	47.3	0.649	0.8	30	44.5	47.3	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.132	0.672	75.4	78.2	0.088
SC-04	SB-04 & SB-05	Foundation Soils	28.0	10.3	80	1.7	1.5	47.3	0.649	0.8	30	44.5	47.3	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.133	0.671	75.4	78.1	0.088
SC-04	SB-04 & SB-05	Foundation Soils	28.1	10.2	80	1.7	1.5	47.4	0.648	0.8	30	44.5	47.4	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.133	0.671	75.4	78.3	0.088
SC-04	SB-04 & SB-05	Foundation Soils	28.1	10.1	111	1.7	1.5	47.6	0.648	0.8	30	44.6	47.6	1.0	-0.6	0.1	0.9	0.091	1.007	0.089	0.133	0.671	75.4	78.4	0.088
SC-04	SB-04 & SB-05	Foundation Soils	28.2	10.0	111	1.7	1.5	47.5	0.648	0.8	30	44.6	47.5	1.0	-0.6	0.1	0.9	0.091	1.007	0.089	0.133	0.670	75.4	78.4	0.088
SC-04	SB-04 & SB-05	Foundation Soils	28.3	10.0	80	1.7	1.5	47.4	0.648	0.8	30	44.5	47.4	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.133	0.669	75.4	78.3	0.088
SC-04	SB-04 & SB-05	Foundation Soils	28.4	9.9	80	1.7	1.5	47.1	0.649	0.8	30	44.5	47.1	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.133	0.667	75.4	78.0	0.088
SC-04	SB-04 & SB-05	Foundation Soils	28.5	9.8	80	1.7	1.5	46.9	0.650	0.8	30	44.4	46.9	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.133	0.665	75.4	77.9	0.087
SC-04	SB-04 & SB-05	Foundation Soils	28.5	9.7	80	1.7	1.5	46.9	0.650	0.8	30	44.4	46.9	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.134	0.664	75.4	77.9	0.087
SC-04	SB-04 & SB-05	Foundation Soils	28.6	9.6	80	1.7	1.5	46.9	0.650	0.8	30	44.4	46.9	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.134	0.663	75.4	77.9	0.087
SC-04	SB-04 & SB-05	Foundation Soils	28.7	9.6	80	1.7	1.5	47.0	0.650	0.8	30	44.5	47.0	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.134	0.663	75.4	78.0	0.087
SC-04	SB-04 & SB-05	Foundation Soils	28.8	9.5	80	1.7	1.5	47.2	0.649	0.8	30	44.5	47.2	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.134	0.663	75.4	78.1	0.088
SC-04	SB-04 & SB-05	Foundation Soils	28.9	9.4	80	1.7	1.5	47.3	0.649	0.8	30	44.5	47.3	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.134	0.663	75.4	78.1	0.088
SC-04	SB-04 & SB-05	Foundation Soils	29.0	9.3	80	1.7	1.5	47.1	0.650	0.8	30	44.5	47.1	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.134	0.662	75.4	78.0	0.088
SC-04	SB-04 & SB-05	Foundation Soils	29.0	9.2	80	1.7	1.5	47.1	0.650	0.8	30	44.5	47.1	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.134	0.661	75.4	78.0	0.088
SC-04	SB-04 & SB-05	Foundation Soils	29.1	9.1	80	1.7	1.5	47.1	0.649	0.8	30	44.5	47.1	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.134	0.660	75.4	78.0	0.088
SC-04	SB-04 & SB-05	Foundation Soils	29.2	9.1	80	1.7	1.5	47.2	0.649	0.8	30	44.5	47.2	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.135	0.660	75.4	78.1	0.088
SC-04	SB-04 & SB-05	Foundation Soils	29.3	9.0	111	1.7	1.5	38.4	0.686	0.8	15	34.3	38.4	1.0	-0.6	0.1	0.9	0.084	1.007	0.083	0.135	0.616	75.4	79.5	0.090
SC-04	SB-04 & SB-05	Foundation Soils	29.4	8.9	111	1.7	1.5	37.7	0.689	0.8	15	34.2	37.7	1.0	-0.6	0.1	0.9	0.084	1.007	0.083	0.135	0.612	75.4	78.9	0.089
SC-04	SB-04 & SB-05	Foundation Soils	29.4	8.8	111	1.7	1.5	38.4	0.686	0.8	15	34.3	38.4	1.0	-0.6	0.1	0.9	0.084	1.007	0.083	0.135	0.615	75.4	79.5	0.090
SC-04	SB-04 & SB-05	Foundation Soils	29.5	8.7	111	1.7	1.5	39.1	0.682	0.8	15	34.4	39.1	1.0	-0.6	0.1	0.9	0.085	1.007	0.083	0.135	0.618	75.4	80.1	0.090
SC-04	SB-04 & SB-05	Foundation Soils	29.6	8.7	111	1.7	1.5	42.8	0.667	0.8	15	35.0	42.8	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.135	0.635	75.4	83.1	0.094
SC-04	SB-04 & SB-05	Foundation Soils	29.7	8.6	115	1.7	1.5	43.9	0.662	0.8	15	35.2	43.9	1.0	-0.6	0.1	0.9	0.088	1.007	0.087	0.135	0.640	75.4	84.1	0.096
SC-04	SB-04 & SB-05	Foundation Soils	29.8	8.5	111	1.7	1.5	44.3	0.661	0.8	15	35.3	44.3	1.0	-0.6	0.1	0.9	0.088	1.007	0.087	0.135	0.641	75.4	84.4	0.096
SC-04	SB-04 & SB-05	Foundation Soils	29.9	8.4	111	1.7	1.5	44.5	0.660	0.8	15	35.3	44.5	1.0	-0.6	0.1	0.9	0.088	1.007	0.087	0.136	0.642	75.4	84.6	0.096
SC-04	SB-04 & SB-05	Foundation Soils	29.9	8.3	111	1.8	1.5	44.5	0.660	0.8	15	35.3	44.5	1.0	-0.6	0.1	0.9	0.088	1.007	0.087	0.136	0.641	75.4	84.6	0.096
SC-04	SB-04 & SB-05	Foundation Soils	30.0	8.2	111	1.8	1.5	43.8	0.662	0.8	15	35.2	43.8	1.0	-0.6	0.1	0.9	0.088	1.007	0.087	0.136	0.637	75.4	84.0	0.096
SC-04	SB-04 & SB-05	Foundation Soils	30.1	8.2	111	1.8	1.5	43.3	0.665	0.8	15	35.1	43.3	1.0	-0.6	0.1	0.9	0.088	1.007	0.086	0.136	0.634	75.4	83.5	0.095
SC-04	SB-04 & SB-05	Foundation Soils	30.2	8.1	111	1.8	1.5	43.9	0.662	0.8	15	35.2	43.9	1.0	-0.6	0.1	0.9	0.088	1.007	0.087	0.136	0.636	75.4	84.1	0.096
SC-04	SB-04 & SB-05	Foundation Soils	30.3	8.0	115	1.8	1.5	44.8	0.659	0.8	15	35.3	44.8	1.0	-0.6	0.1	0.9	0.089	1.007	0.087	0.136	0.640	74.7	84.2	0.096
SC-04	SB-04 & SB-05	Foundation Soils	30.3	7.9	115	1.8	1.5	48.6	0.644	0.8	15	35.6	48.6	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.136	0.658	62.2	75.2	0.084
SC-04	SB-04 & SB-05	Foundation Soils	30.4	7.8	115	1.8	1.5	50.6	0.636	0.8	15	35.7	50.6	1.0	-0.6	0.1	0.9	0.093	1.008	0.091	0.136	0.668	57.9	72.8	0.081
SC-04	SB-04 & SB-05	Foundation Soils	30.5	7.8	121	1.8	1.5	51.8	0.632	0.8	15	35.4	51.8	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.136	0.673	49.3	65.7	0.072
SC-04	SB-04 & SB-05	Foundation Soils	30.6	7.7	121	1.8	1.5	52.3	0.630	0.8	15	35.4	52.3	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.137	0.675	48.3	65.2	0.071
SC-04	SB-04 & SB-05	Foundation Soils	30.7	7.6	121	1.8	1.5	53.7	0.625	0.8	15	34.9	53.7	1.0	-0.6	0.1	0.9	0.095	1.008	0.093	0.137	0.681	41.9	60.6	0.066
SC-04	SB-04 & SB-05	Foundation Soils	30.8	7.5	121	1.8	1.5	55.3	0.620	0.8	15	34.4	55.3	1.0	-0.6	0.1	0.9	0.096	1.008	0.094	0.137	0.689	37.3	58.2	0.063
SC-04	SB-04 & SB-05	Foundation Soils	30.8	7.4	121	1.8	1.5	58.8	0.608	0.8	15	33.7	58.8	1.0	-0.6	0.1	0.9	0.099	1.008	0.097	0.137	0.706	32.4	57.5	0.062
SC-04	SB-04 & SB-05	Foundation Soils	30.9	7.3	121	1.8	1.5	62.0	0.598	0.8	15	32.4	62.0	1.0	-0.6	0.1	0.9	0.101	1.009	0.099	0.137	0.722	28.1	57.7	0.062
SC-04	SB-04 & SB-05	Foundation Soils	31.0	7.3	121	1.8	1.5	64.5	0.590	0.8	15	33.0	64.5	1.0	-0.6	0.1	0.9	0.103	1.009	0.101	0.137	0.735	28.6	60.1	0.065
SC-04	SB-04 & SB-05	Foundation Soils	31.1	7.2	121	1.8	1.5	65.8	0.586	0.8	15	34.4	65.8	1.0	-0.6	0.1	0.9	0.104	1.009	0.102	0.137	0.742	31.6	63.0	0.068
SC-04	SB-04 & SB-05	Foundation Soils	31.2	7.1	121	1.8	1.5	65.5	0.587	0.8	15	35.8	65.5	1.0	-0.6	0.1	0.9	0.104	1.009	0.102	0.137	0.739	36.8	66.5	0.073
SC-04	SB-04 & SB-05	Foundation Soils	31.2	7.0	121	1.8	1.5	64.5	0.590	0.8	15	36.4	64.5	1.0	-0.6	0.1	0.9	0.103	1.009	0.101	0.137	0.734	40.5	68.6	0.075
SC-04	SB-04 & SB-05	Foundation Soils	31.3	6.9	121	1.8	1.5	63.5	0.593	0.8	15	36.6	63.5	1.0	-0.6	0.1	0.9	0.102	1.009	0.100	0.137	0.727	43.2	70.1	0.077
SC-04	SB-04 & SB-05	Foundation Soils	31.4	6.8	121	1.8	1.5	62.9	0.595	0.8	15	36.6	62.9	1.0	-0.6	0.1	0.9	0.102	1.009	0.100	0.138	0.724	44.3	70.6	0.078
SC-04	SB-04 & SB-05	Foundation Soils	31.5	6.8	121	1.8	1.5	59.8	0.605	0.8	15	36.5	59.8	1.0	-0.6	0.1	0.9	0.099	1.009	0.097	0.138	0.707	47.5	70.8	0.078
SC-04	SB-04 & SB-05	Foundation Soils	31.6	6.7	121	1.8	1.6	59.7	0.605	0.8	15	36.2	59.7	1.0	-0.6	0.1	0.9	0.099	1.009	0.097	0.138	0.706	44.7	68.2	0.075
SC-04	SB-04 & SB-05	Foundation Soils	31.7	6.6	121	1.9	1.6	61.2	0.600	0.8	15	36.5	61.2	1.0	-0.6	0.1	0.9	0.100	1.009	0.098	0.138	0.713	45.4	70.1	0.077
SC-04	SB-04 & SB-05	Foundation Soils	31.7	6.5	121	1.9	1.6	60.7	0.602	0.8	15	36.5	60.7	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.138	0.709	46.2	70.4	0.078
SC-04	SB-04 & SB-05	Foundation Soils	31.8	6.4	115	1.9	1.6	59.6	0.605	0.8	15	36.6	59.6	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.138	0.703	48.5	71.6	0.079
SC-04	SB-04 & SB-05	Foundation Soils	31.9	6.4	115	1.9	1.6	55.9	0.618	0.8	15	36.8	55.9	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.138	0.684	62.0	81.2	0.092
SC-04	SB-04 & SB-05	Foundation Soils	32.0	6.3	115	1.9	1.6	55.4	0.620	0.8	15	36.7	55.4	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.138	0.681	61.6	80.3	0.091
SC-04	SB-04 & SB-05	Foundation Soils	32.1	6.2	115	1.9	1.6	54.8	0.621	0.8	15	36.6	54.8	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.138	0.677	63.1	81.3	0.092
SC-04	SB-04 & SB-05	Foundation Soils	32.2	6.1	115	1.9	1.6	55.6	0.619	0.8	15	36.7	55.6	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.138	0.681	61.2	80.2	0.090
SC-04	SB-04 & SB-05	Foundation Soils	32.2	6.0	115	1.9	1.6	54.4	0.623	0.8	15	36.6	54.4	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.139	0.674	63.4	81.2	0.092
SC-04	SB-04 & SB-05	Foundation Soils	32.3	5.9	115	1.9	1.6	54.0	0.624	0.8	15	36.5	54.0	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.139	0.672	64.0	81.5	0.092
SC-04	SB-04 & SB-05	Foundation Soils	32.4	5.9	115	1.9	1.6	53.6	0.626	0.8	15	36.5	53.6	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.139	0.669	63.6	80.7	0.091
SC-04	SB-04 & SB-05	Foundation Soils	32.5	5.8	115	1.9	1.6	53.6	0.626	0.8	15	36.5	53.6	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.139	0.669	63.9	81.1	0.092
SC-04	SB-04 & SB-05	Foundation Soils	32.6	5.7	115	1.9	1.6	55.2	0.620	0.8	15	36.6	55.2	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.139	0.676	61.2	79.8	0.090
SC-04	SB-04 & SB-05	Foundation Soils	32.6	5.6	115	1.9	1.6	56.7	0.615	0.8	15	36.6	56.7	1.0	-0.7	0.1	0.9	0.097	1.008	0.095	0.139	0.683	55.5	75.7	0.084
SC-04	SB-04 & SB-05	Foundation Soils	32.7	5.5	115	1.9	1.6	56.4	0.616	0.8	15	36.7	56.4	1.0	-0.7	0.1	0.9	0.097	1.008	0.095	0.139	0.681	58.2	77.9	0.087
SC-04	SB-04 & SB-05	Foundation Soils	32.8	5.5	115	1.9	1.6	57.4	0.613	0.8	15	36.9	57.4	1.0	-0.7	0.1	0.9	0.098	1.008	0.095	0.139	0.685	58.9	79.4	0.089
SC-04	SB-04 & SB-05	Foundation Soils	32.9	5.4	115	1.9	1.6	60.1	0.604	0.8	15	37.2	60.1	1.0	-0.7	0.1	0.9	0.100	1.009	0.097	0.139	0.699	57.6	80.4	0.091
SC-04	SB-04 & SB-05	Foundation Soils	33.0	5.3	115	1.9	1.6	59.0	0.607	0.8	15	37.2	59.0	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.139	0.693	59.8	81.7	0.092
SC-04	SB-04 & SB-05	Foundation Soils	33.1	5.2	115	1.9	1.6	56.5	0.616	0.8	15	36.9	56.5	1.0	-0.7	0.1	0.9	0.097	1.008	0.095	0.139	0.679	63.4	83.0	0.094
SC-04	SB-04 & SB-05	Foundation Soils	33.1	5.1	115	1.9	1.6	60.5	0.603	0.8	15	37.4	60.5	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.140	0.699	59.2	82.3	0.093
SC-04	SB-04 & SB-05	Foundation Soils	33.2	5.0	115	1.9	1.6	65.2	0.588	0.8	15	38.0	65.2	1.0	-0.7	0.1	0.9	0.103	1.009	0.101	0.140	0.723	56.8	84.0	0.096
SC-04	SB-04 & SB-05	Foundation Soils	33.3	5.0	121	1.9	1.6	69.4	0.575	0.8	15	37.8	69.4	1.0	-0.7	0.1	0.9	0.107	1.010	0.104	0.140	0.745	45.4	77.0	0.086

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-04	SB-04 & SB-05	Foundation Soils	33.4	4.9	115	2.0	1.6	67.3	0.582	0.8	15	37.8	67.3	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.140	0.734	48.4	77.9	0.087
SC-04	SB-04 & SB-05	Foundation Soils	33.5	4.8	121	2.0	1.6	70.6	0.572	0.8	15	37.6	70.6	1.0	-0.7	0.1	0.9	0.108	1.010	0.105	0.140	0.751	42.2	75.2	0.084
SC-04	SB-04 & SB-05	Foundation Soils	33.5	4.7	121	2.0	1.6	81.4	0.542	0.8	15	35.4	81.4	1.0	-0.7	0.1	0.9	0.117	1.012	0.114	0.140	0.815	28.8	74.8	0.083
SC-04	SB-04 & SB-05	Foundation Soils	33.6	4.6	124	2.0	1.6	86.2	0.530	0.8	15	31.3	86.2	1.0	-0.7	0.1	0.9	0.122	1.014	0.118	0.140	0.846	22.6	77.5	0.087
SC-04	SB-04 & SB-05	Foundation Soils	33.7	4.6	124	2.0	1.6	86.1	0.531	0.8	15	27.2	86.1	1.0	-0.7	0.1	0.9	0.122	1.014	0.118	0.140	0.844	19.7	78.5	0.088
SC-04	SB-04 & SB-05	Foundation Soils	33.8	4.5	124	2.0	1.6	74.1	0.562	0.8	15	16.4	74.1	1.0	-0.7	0.1	0.9	0.111	1.011	0.108	0.140	0.769	15.4	73.0	0.081
SC-04	SB-04 & SB-05	Foundation Soils	33.9	4.4	124	2.0	1.6	74.2	0.562	0.8	15	15.9	74.2	1.0	-0.7	0.1	0.9	0.111	1.011	0.108	0.140	0.769	15.2	73.4	0.082
SC-04	SB-04 & SB-05	Foundation Soils	34.0	4.3	124	2.0	1.6	59.8	0.605	0.8	15	0.0	59.8	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.140	0.691	7.3	67.1	0.073
SC-04	SB-04 & SB-05	Foundation Soils	34.0	4.2	124	2.0	1.6	62.7	0.596	0.8	15	1.0	62.7	1.0	-0.7	0.1	0.9	0.102	1.009	0.099	0.140	0.705	10.2	71.9	0.080
SC-04	SB-04 & SB-05	Foundation Soils	34.1	4.1	124	2.0	1.6	72.9	0.565	0.8	15	0.0	72.9	1.0	-0.7	0.1	0.9	0.110	1.011	0.107	0.140	0.760	6.0	78.9	0.089
SC-04	SB-04 & SB-05	Foundation Soils	34.2	4.1	124	2.0	1.6	73.4	0.564	0.8	15	1.5	73.4	1.0	-0.7	0.1	0.9	0.110	1.011	0.107	0.141	0.762	10.4	82.4	0.093
SC-04	SB-04 & SB-05	Foundation Soils	34.3	4.0	124	2.0	1.6	93.5	0.513	0.8	15	9.0	93.5	1.0	-0.7	0.1	0.9	0.129	1.016	0.126	0.141	0.894	12.9	97.4	0.115
SC-04	SB-04 & SB-05	Foundation Soils	34.4	3.9	124	2.0	1.6	90.3	0.520	0.8	15	1.6	90.3	1.0	-0.7	0.1	0.9	0.126	1.015	0.122	0.141	0.869	10.4	99.2	0.118
SC-04	SB-04 & SB-05	Foundation Soils	34.4	3.8	124	2.0	1.6	94.9	0.510	0.8	15	6.3	94.9	1.0	-0.7	0.1	0.9	0.131	1.016	0.127	0.141	0.904	12.1	100.7	0.121
SC-04	SB-04 & SB-05	Foundation Soils	34.5	3.7	124	2.0	1.6	96.7	0.506	0.8	15	9.8	96.7	1.0	-0.7	0.1	0.9	0.133	1.017	0.129	0.141	0.918	13.1	100.0	0.119
SC-04	SB-04 & SB-05	Foundation Soils	34.6	3.7	124	2.0	1.6	83.1	0.538	0.8	15	3.9	83.1	1.0	-0.7	0.1	0.9	0.119	1.013	0.115	0.141	0.819	11.4	90.7	0.105
SC-04	SB-04 & SB-05	Foundation Soils	34.7	3.6	124	2.0	1.6	77.5	0.553	0.8	15	6.1	77.5	1.0	-0.7	0.1	0.9	0.114	1.012	0.110	0.141	0.783	12.2	83.6	0.095
SC-04	SB-04 & SB-05	Foundation Soils	34.8	3.5	124	2.0	1.6	69.7	0.574	0.8	15	0.0	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.104	0.141	0.738	6.0	75.7	0.085
SC-04	SB-04 & SB-05	Foundation Soils	34.9	3.4	124	2.0	1.6	69.1	0.576	0.8	15	0.0	69.1	1.0	-0.7	0.1	0.9	0.107	1.010	0.104	0.141	0.735	6.0	75.1	0.084
SC-04	SB-04 & SB-05	Foundation Soils	34.9	3.3	124	2.0	1.6	70.6	0.572	0.8	15	0.0	70.6	1.0	-0.7	0.1	0.9	0.108	1.010	0.105	0.141	0.742	6.0	76.6	0.086
SC-04	SB-04 & SB-05	Foundation Soils	35.0	3.2	124	2.1	1.6	70.4	0.572	0.8	15	0.0	70.4	1.0	-0.7	0.1	0.9	0.108	1.010	0.105	0.141	0.741	6.0	76.4	0.085
SC-04	SB-04 & SB-05	Foundation Soils	35.1	3.2	124	2.1	1.7	67.0	0.582	0.8	15	0.0	67.0	1.0	-0.7	0.1	0.9	0.105	1.010	0.102	0.141	0.722	6.0	73.0	0.081
SC-04	SB-04 & SB-05	Foundation Soils	35.2	3.1	124	2.1	1.7	65.3	0.587	0.8	15	0.0	65.3	1.0	-0.7	0.1	0.9	0.104	1.009	0.101	0.141	0.713	6.0	71.3	0.079
SC-04	SB-04 & SB-05	Foundation Soils	35.3	3.0	124	2.1	1.7	65.1	0.588	0.8	15	0.0	65.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.141	0.711	6.5	71.6	0.079
SC-04	SB-04 & SB-05	Foundation Soils	35.4	2.9	124	2.1	1.7	61.4	0.600	0.8	15	0.0	61.4	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.142	0.692	8.1	69.5	0.076
SC-04	SB-04 & SB-05	Foundation Soils	35.4	2.8	124	2.1	1.7	56.0	0.617	0.8	15	0.1	56.0	1.0	-0.8	0.1	0.9	0.097	1.008	0.094	0.142	0.664	9.1	65.0	0.071
SC-04	SB-04 & SB-05	Foundation Soils	35.5	2.7	124	2.1	1.7	56.0	0.617	0.8	15	4.6	56.0	1.0	-0.8	0.1	0.9	0.097	1.008	0.094	0.142	0.664	11.8	63.2	0.069
SC-04	SB-04 & SB-05	Foundation Soils	35.6	2.7	124	2.1	1.7	56.4	0.616	0.8	15	6.9	56.4	1.0	-0.8	0.1	0.9	0.097	1.008	0.094	0.142	0.665	12.6	62.1	0.067
SC-04	SB-04 & SB-05	Foundation Soils	35.7	2.6	124	2.1	1.7	52.6	0.629	0.8	15	0.9	52.6	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.142	0.647	10.1	61.8	0.067
SC-04	SB-04 & SB-05	Foundation Soils	35.8	2.5	124	2.1	1.7	57.1	0.614	0.8	15	0.0	57.1	1.0	-0.8	0.1	0.9	0.097	1.008	0.095	0.142	0.668	7.4	64.5	0.070
SC-04	SB-04 & SB-05	Foundation Soils	35.8	2.4	124	2.1	1.7	63.0	0.595	0.8	15	0.0	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.099	0.142	0.697	6.0	69.0	0.076
SC-04	SB-04 & SB-05	Foundation Soils	35.9	2.3	124	2.1	1.7	64.9	0.589	0.8	15	0.0	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.100	0.142	0.707	6.0	70.9	0.078
SC-04	SB-04 & SB-05	Foundation Soils	36.0	2.3	124	2.1	1.7	62.8	0.595	0.8	15	0.0	62.8	1.0	-0.8	0.1	0.9	0.102	1.009	0.099	0.142	0.695	6.0	68.8	0.076
SC-04	SB-04 & SB-05	Foundation Soils	36.1	2.2	124	2.1	1.7	60.4	0.603	0.8	15	0.0	60.4	1.0	-0.8	0.1	0.9	0.100	1.009	0.097	0.142	0.683	6.0	66.4	0.073
SC-04	SB-04 & SB-05	Foundation Soils	36.2	2.1	124	2.1	1.7	56.0	0.617	0.8	15	0.0	56.0	1.0	-0.8	0.1	0.9	0.097	1.008	0.094	0.142	0.661	6.0	62.0	0.067
SC-04	SB-04 & SB-05	Foundation Soils	36.3	2.0	124	2.1	1.7	52.1	0.631	0.7	15	0.2	52.1	1.0	-0.8	0.1	0.9	0.094	1.008	0.091	0.142	0.642	9.2	61.1	0.066
SC-04	SB-04 & SB-05	Foundation Soils	36.3	1.9	124	2.1	1.7	49.9	0.639	0.7	15	0.8	49.9	1.0	-0.8	0.1	0.9	0.092	1.008	0.090	0.142	0.631	10.1	59.1	0.064
SC-04	SB-04 & SB-05	Foundation Soils	36.4	1.8	124	2.1	1.7	53.9	0.625	0.7	15	0.0	53.9	1.0	-0.8	0.1	0.9	0.095	1.008	0.093	0.142	0.650	6.7	60.6	0.066
SC-04	SB-04 & SB-05	Foundation Soils	36.5	1.8	124	2.1	1.7	52.0	0.631	0.7	15	0.0	52.0	1.0	-0.8	0.1	0.9	0.094	1.008	0.091	0.142	0.641	7.2	59.2	0.064
SC-04	SB-04 & SB-05	Foundation Soils	36.6	1.7	124	2.2	1.7	49.1	0.642	0.7	15	0.0	49.1	1.0	-0.8	0.1	0.9	0.092	1.007	0.089	0.142	0.626	8.3	57.3	0.062
SC-04	SB-04 & SB-05	Foundation Soils	36.7	1.6	124	2.2	1.7	49.0	0.642	0.7	15	0.5	49.0	1.0	-0.8	0.1	0.9	0.092	1.007	0.089	0.143	0.626	9.7	58.2	0.063
SC-04	SB-04 & SB-05	Foundation Soils	36.7	1.5	124	2.2	1.7	47.9	0.646	0.7	15	1.6	47.9	1.0	-0.8	0.1	0.9	0.091	1.007	0.088	0.143	0.620	10.6	56.9	0.061
SC-04	SB-04 & SB-05	Foundation Soils	36.8	1.4	124	2.2	1.7	50.8	0.636	0.7	15	5.7	50.8	1.0	-0.8	0.1	0.9	0.093	1.008	0.090	0.143	0.633	12.2	57.3	0.062
SC-04	SB-04 & SB-05	Foundation Soils	36.9	1.4	124	2.2	1.7	57.6	0.612	0.7	15	11.5	57.6	1.0	-0.8	0.1	0.9	0.098	1.008	0.095	0.143	0.666	14.1	60.2	0.065
SC-04	SB-04 & SB-05	Foundation Soils	37.0	1.3	124	2.2	1.7	55.2	0.620	0.7	15	5.4	55.2	1.0	-0.8	0.1	0.9	0.096	1.008	0.093	0.143	0.654	12.1	61.9	0.067
SC-04	SB-04 & SB-05	Foundation Soils	37.1	1.2	124	2.2	1.7	58.2	0.610	0.7	15	9.0	58.2	1.0	-0.8	0.1	0.9	0.098	1.008	0.095	0.143	0.668	13.3	62.5	0.068
SC-04	SB-04 & SB-05	Foundation Soils	37.2	1.1	124	2.2	1.7	67.2	0.582	0.8	15	18.1	67.2	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.143	0.713	16.2	65.3	0.071
SC-04	SB-04 & SB-05	Foundation Soils	37.2	1.0	124	2.2	1.7	60.8	0.601	0.7	15	6.1	60.8	1.0	-0.8	0.1	0.9	0.100	1.009	0.097	0.143	0.680	12.3	67.0	0.073
SC-04	SB-04 & SB-05	Foundation Soils	37.3	0.9	124	2.2	1.7	67.6	0.581	0.8	15	3.7	67.6	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.143	0.714	11.5	75.3	0.084
SC-04	SB-04 & SB-05	Foundation Soils	37.4	0.9	124	2.2	1.7	73.2	0.565	0.8	15	0.0	73.2	1.0	-0.8	0.1	0.9	0.110	1.011	0.106	0.143	0.744	7.7	80.9	0.091
SC-04	SB-04 & SB-05	Foundation Soils	37.5	0.8	124	2.2	1.7	79.9	0.546	0.8	15	0.0	79.9	1.0	-0.8	0.1	0.9	0.116	1.012	0.112	0.143	0.782	7.2	87.2	0.100
SC-04	SB-04 & SB-05	Foundation Soils	37.6	0.7	124	2.2	1.7	96.0	0.507	0.8	15	0.0	96.0	0.9	-0.8	0.1	0.9	0.132	1.016	0.128	0.143	0.892	6.0	102.0	0.123
SC-04	SB-04 & SB-05	Foundation Soils	37.6	0.6	124	2.2	1.7	105.7	0.486	0.8	15	0.0	105.7	0.9	-0.8	0.1	0.9	0.145	1.020	0.140	0.143	0.978	6.0	111.7	0.140
SC-04	SB-04 & SB-05	Foundation Soils	37.7	0.5	124	2.2	1.7	105.0	0.487	0.8	15	0.0	105.0	0.9	-0.8	0.1	0.9	0.144	1.020	0.139	0.143	0.971	6.0	111.0	0.138
SC-04	SB-04 & SB-05	Foundation Soils	37.8	0.5	124	2.2	1.7	96.3	0.506	0.8	15	0.0	96.3	0.9	-0.8	0.1	0.9	0.133	1.017	0.128	0.143	0.893	6.0	102.3	0.123
SC-04	SB-04 & SB-05	Foundation Soils	37.9	0.4	124	2.2	1.7	90.6	0.520	0.8	15	0.0	90.6	1.0	-0.8	0.1	0.9	0.126	1.015	0.122	0.143	0.850	6.0	96.6	0.114
SC-04	SB-04 & SB-05	Foundation Soils	38.0	0.3	124	2.2	1.7	82.8	0.539	0.8	15	0.0	82.8	1.0	-0.8	0.1	0.9	0.118	1.013	0.114	0.143	0.798	6.0	88.8	0.102
SC-04	SB-04 & SB-05	Foundation Soils	38.1	0.2	124	2.2	1.7	71.7	0.569	0.8	15	0.0	71.7	1.0	-0.8	0.1	0.9	0.109	1.010	0.105	0.143	0.733	6.0	77.7	0.087
SC-04	SB-04 & SB-05	Foundation Soils	38.1	0.1	124	2.2	1.7	61.3	0.600	0.7	15	0.0	61.3	1.0	-0.8	0.1	0.9	0.101	1.009	0.097	0.144	0.679	6.0	67.3	0.074
SC-04	SB-04 & SB-05	Foundation Soils	38.2	0.0	124	2.3	1.7	55.5	0.619	0.7	15	0.0	55.5	1.0	-0.8	0.1	0.9	0.096	1.008	0.093	0.144	0.651	6.4	62.0	0.067
SC-04	SB-04 & SB-05	Foundation Soils	38.3	-0.0	124	2.3	1.7	52.9	0.628	0.7	15	0.0	52.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.144	0.638	7.6	60.5	0.065
SC-04	SB-04 & SB-05	Foundation Soils	38.4	-0.1	124	2.3	1.8	51.0	0.635	0.7	15	0.2	51.0	1.0	-0.8	0.1	0.9	0.093	1.008	0.090	0.144	0.629	9.3	60.1	0.065
SC-04	SB-04 & SB-05	Foundation Soils	38.5	-0.2	124	2.3	1.8	48.6	0.644	0.7	15	2.0	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.144	0.617	10.8	57.4	0.062
SC-04	SB-04 & SB-05	Foundation Soils	38.5	-0.3	124	2.3	1.8	50.8	0.636	0.7	15	5.3	50.8	1.0	-0.8	0.1	0.9	0.093	1.008	0.090	0.144	0.627	12.1	57.6	0.062
SC-04	SB-04 & SB-05	Foundation Soils	38.6	-0.4	124	2.3	1.8	64.5	0.590	0.7	15	19.4	64.5	1.0	-0.8	0.1	0.9	0.103	1.009	0.100	0.144	0.693	16.8	61.8	0.067
SC-04	SB-04 & SB-05	Foundation Soils	38.7	-0.5	124	2.3	1.8	58.7	0.608	0.7	15	12.1	58.7	1.0	-0.9	0.1	0.9	0.099	1.008	0.096	0.144	0.664	14.2	60.9	0.066
SC-04	SB-04 & SB-05	Foundation Soils	38.8	-0.5	124	2.3	1.8	61.2	0.600	0.7	15	14.7	61.2	1.0	-0.9	0.1	0.9	0.100	1.009	0.097	0.144	0.676	15.1	61.6	0.067
SC-04	SB-04 & SB-05	Foundation Soils	38.9	-0.6	124	2.3	1.8	62.7	0.596	0.7	15	11.3	62.7	1.0	-0.9	0.1	0.9	0.102	1.009	0.098	0.144	0.683	13.9	65.3	0.071
SC-04	SB-04 & SB-05	Foundation Soils	39.0	-0.7	124	2.3	1.8	56.8	0.615	0.7	15	0.9	56.8	1.0	-0.9	0.1	0.9	0.097	1.008	0.094	0.144	0.654	10.1	66.0	0.072
SC-04	SB-04 & SB-05	Foundation Soils	39.0	-0.8	124	2.3	1.8	63.0	0.595	0.7	15	8.1	63.0	1.0	-0.9	0.1	0.9	0.102	1.009	0.099	0.144	0.684	12.9	67.8	0.074
SC-04	SB-04 & SB-05	Foundation Soils	39.1	-0.9	124	2.3	1.8	75.3	0.559	0.7	15	19.2	75.3	1.0	-0.9	0.1	0.9	0.112	1.011	0.108	0.144	0.748	16.3	72.5	0.080

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-04	SB-04 & SB-05	Foundation Soils	39.2	-0.9	124	2.3	1.8	76.4	0.556	0.8	15	17.5	76.4	1.0	-0.9	0.1	0.9	0.113	1.011	0.109	0.144	0.754	15.7	74.6	0.083
SC-04	SB-04 & SB-05	Foundation Soils	39.3	-1.0	124	2.3	1.8	81.6	0.542	0.8	15	22.6	81.6	1.0	-0.9	0.1	0.9	0.117	1.012	0.113	0.144	0.785	17.5	76.6	0.086
SC-04	SB-04 & SB-05	Foundation Soils	39.4	-1.1	121	2.3	1.8	97.2	0.504	0.8	15	35.1	97.2	0.9	-0.9	0.1	0.9	0.134	1.017	0.129	0.144	0.892	25.0	87.2	0.100
SC-04	SB-04 & SB-05	Foundation Soils	39.5	-1.2	121	2.3	1.8	111.0	0.475	0.8	15	42.5	111.0	0.9	-0.9	0.1	0.9	0.154	1.022	0.148	0.144	1.023	36.4	104.8	
SC-04	SB-04 & SB-05	Foundation Soils	39.5	-1.3	115	2.3	1.8	127.4	0.443	0.8	15	46.3	127.4	0.9	-0.9	0.1	0.8	0.190	1.030	0.182	0.144	1.262	42.4	123.5	
SC-06	SB-11	Foundation Soils	23.0	16.0	121	1.4	1.4	25.0	0.756	0.8	0	0.5	25.0	1.0	-0.4	0.0	0.9	0.076	1.006	0.075	0.121	0.621	36.4	60.9	0.066
SC-06	SB-11	Foundation Soils	23.1	15.9	121	1.4	1.4	22.8	0.770	0.8	0	0.5	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.121	0.609	37.6	59.9	0.065
SC-06	SB-11	Foundation Soils	23.2	15.8	121	1.4	1.4	20.5	0.782	0.8	0	0.5	20.5	1.0	-0.4	0.0	0.9	0.073	1.006	0.072	0.121	0.596	37.7	57.7	0.062
SC-06	SB-11	Foundation Soils	23.3	15.7	121	1.4	1.4	20.5	0.782	0.8	0	0.5	20.5	1.0	-0.4	0.0	0.9	0.073	1.006	0.072	0.121	0.595	38.5	58.5	0.063
SC-06	SB-11	Foundation Soils	23.4	15.6	121	1.4	1.4	52.2	0.631	0.8	13	32.7	52.2	1.0	-0.4	0.0	0.9	0.094	1.008	0.093	0.121	0.764	43.1	62.7	0.068
SC-06	SB-11	Foundation Soils	23.5	15.6	115	1.4	1.4	51.1	0.635	0.8	13	33.5	51.1	1.0	-0.4	0.0	0.9	0.093	1.008	0.092	0.122	0.756	56.0	73.6	0.082
SC-06	SB-11	Foundation Soils	23.5	15.5	115	1.4	1.4	48.3	0.645	0.8	13	33.4	48.3	1.0	-0.4	0.0	0.9	0.091	1.007	0.090	0.122	0.739	64.8	79.7	0.090
SC-06	SB-11	Foundation Soils	23.6	15.4	111	1.4	1.4	45.5	0.656	0.8	13	33.2	45.5	1.0	-0.4	0.0	0.9	0.089	1.007	0.088	0.122	0.723	72.9	85.1	0.097
SC-06	SB-11	Foundation Soils	23.7	15.3	111	1.4	1.4	43.8	0.663	0.8	13	33.0	43.8	1.0	-0.4	0.0	0.9	0.088	1.007	0.087	0.122	0.712	75.4	86.1	0.099
SC-06	SB-11	Foundation Soils	23.8	15.2	111	1.4	1.4	44.4	0.660	0.8	13	33.1	44.4	1.0	-0.4	0.0	0.9	0.088	1.007	0.087	0.122	0.715	75.4	86.7	0.099
SC-06	SB-11	Foundation Soils	23.9	15.2	111	1.4	1.4	47.4	0.648	0.8	13	33.5	47.4	1.0	-0.4	0.0	0.9	0.090	1.007	0.089	0.122	0.730	74.6	88.5	0.102
SC-06	SB-11	Foundation Soils	23.9	15.1	111	1.4	1.4	48.6	0.644	0.8	13	33.6	48.6	1.0	-0.4	0.1	0.9	0.091	1.007	0.090	0.123	0.735	71.9	86.8	0.100
SC-06	SB-11	Foundation Soils	24.0	15.0	111	1.4	1.4	47.3	0.649	0.8	13	33.5	47.3	1.0	-0.4	0.1	0.9	0.090	1.007	0.089	0.123	0.728	74.7	88.5	0.102
SC-06	SB-11	Foundation Soils	24.1	14.9	111	1.4	1.4	46.5	0.652	0.8	13	33.4	46.5	1.0	-0.4	0.1	0.9	0.090	1.007	0.089	0.123	0.722	75.4	88.5	0.102
SC-06	SB-11	Foundation Soils	24.2	14.8	111	1.4	1.4	45.6	0.655	0.8	13	33.3	45.6	1.0	-0.5	0.1	0.9	0.089	1.007	0.088	0.123	0.716	74.8	87.2	0.100
SC-06	SB-11	Foundation Soils	24.3	14.7	115	1.4	1.4	45.6	0.655	0.8	13	33.2	45.6	1.0	-0.5	0.1	0.9	0.089	1.007	0.088	0.123	0.715	71.9	84.4	0.096
SC-06	SB-11	Foundation Soils	24.4	14.7	115	1.5	1.4	45.9	0.654	0.8	13	33.2	45.9	1.0	-0.5	0.1	0.9	0.089	1.007	0.088	0.123	0.715	70.7	83.3	0.095
SC-06	SB-11	Foundation Soils	24.4	14.6	115	1.5	1.4	45.2	0.657	0.8	13	33.1	45.2	1.0	-0.5	0.1	0.9	0.089	1.007	0.088	0.124	0.711	71.0	83.1	0.094
SC-06	SB-11	Foundation Soils	24.5	14.5	115	1.5	1.4	43.8	0.663	0.8	13	33.0	43.8	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.124	0.702	72.7	83.6	0.095
SC-06	SB-11	Foundation Soils	24.6	14.4	115	1.5	1.4	42.9	0.666	0.8	13	32.8	42.9	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.124	0.696	73.9	84.0	0.096
SC-06	SB-11	Foundation Soils	24.7	14.3	111	1.5	1.4	41.9	0.671	0.8	13	32.7	41.9	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.124	0.690	75.4	84.6	0.096
SC-06	SB-11	Foundation Soils	24.8	14.3	115	1.5	1.4	41.9	0.670	0.8	13	32.7	41.9	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.124	0.689	74.6	83.8	0.095
SC-06	SB-11	Foundation Soils	24.9	14.2	115	1.5	1.4	42.9	0.666	0.8	13	32.8	42.9	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.124	0.693	71.1	81.2	0.092
SC-06	SB-11	Foundation Soils	24.9	14.1	115	1.5	1.4	44.4	0.660	0.8	13	32.9	44.4	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.125	0.700	66.8	78.3	0.088
SC-06	SB-11	Foundation Soils	25.0	14.0	115	1.5	1.4	44.1	0.661	0.8	13	32.8	44.1	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.125	0.698	66.8	78.1	0.088
SC-06	SB-11	Foundation Soils	25.1	13.9	115	1.5	1.4	43.4	0.664	0.8	13	32.7	43.4	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.125	0.693	66.7	77.4	0.087
SC-06	SB-11	Foundation Soils	25.2	13.8	115	1.5	1.4	42.2	0.669	0.8	13	32.6	42.2	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.125	0.686	69.1	78.7	0.088
SC-06	SB-11	Foundation Soils	25.3	13.8	115	1.5	1.4	42.1	0.669	0.8	13	32.6	42.1	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.125	0.685	67.8	77.3	0.087
SC-06	SB-11	Foundation Soils	25.3	13.7	115	1.5	1.4	42.1	0.670	0.8	13	32.6	42.1	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.125	0.683	68.0	77.5	0.087
SC-06	SB-11	Foundation Soils	25.4	13.6	115	1.5	1.4	41.8	0.671	0.8	13	32.6	41.8	1.0	-0.5	0.1	0.9	0.087	1.007	0.085	0.125	0.681	69.3	78.5	0.088
SC-06	SB-11	Foundation Soils	25.5	13.5	115	1.5	1.4	41.7	0.671	0.8	13	32.6	41.7	1.0	-0.5	0.1	0.9	0.087	1.007	0.085	0.126	0.680	70.3	79.4	0.089
SC-06	SB-11	Foundation Soils	25.6	13.4	115	1.5	1.4	42.2	0.669	0.8	13	32.6	42.2	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.126	0.681	67.9	77.5	0.087
SC-06	SB-11	Foundation Soils	25.7	13.3	115	1.5	1.4	43.1	0.666	0.8	13	32.6	43.1	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.126	0.685	63.6	74.1	0.082
SC-06	SB-11	Foundation Soils	25.8	13.3	115	1.5	1.4	42.8	0.667	0.8	13	32.6	42.8	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.126	0.683	66.6	76.8	0.086
SC-06	SB-11	Foundation Soils	25.8	13.2	115	1.5	1.4	43.4	0.664	0.8	13	32.8	43.4	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.126	0.685	67.8	78.5	0.088
SC-06	SB-11	Foundation Soils	25.9	13.1	115	1.5	1.4	44.5	0.660	0.8	13	32.8	44.5	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.126	0.690	64.0	75.7	0.084
SC-06	SB-11	Foundation Soils	26.0	13.0	115	1.5	1.5	43.7	0.663	0.8	13	32.9	43.7	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.127	0.685	69.7	80.6	0.091
SC-06	SB-11	Foundation Soils	26.1	12.9	111	1.5	1.5	40.2	0.678	0.8	13	32.5	40.2	1.0	-0.5	0.1	0.9	0.086	1.007	0.084	0.127	0.666	75.4	83.1	0.094
SC-06	SB-11	Foundation Soils	26.2	12.9	111	1.6	1.5	38.5	0.685	0.8	13	32.2	38.5	1.0	-0.5	0.1	0.9	0.084	1.007	0.083	0.127	0.656	75.4	81.7	0.092
SC-06	SB-11	Foundation Soils	26.2	12.8	111	1.6	1.5	39.1	0.683	0.8	13	32.3	39.1	1.0	-0.5	0.1	0.9	0.085	1.007	0.084	0.127	0.658	75.4	82.2	0.093
SC-06	SB-11	Foundation Soils	26.3	12.7	115	1.6	1.5	44.5	0.660	0.8	13	33.0	44.5	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.127	0.686	70.9	82.4	0.093
SC-06	SB-11	Foundation Soils	26.4	12.6	115	1.6	1.5	46.9	0.650	0.8	13	33.2	46.9	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.127	0.698	63.2	76.9	0.086
SC-06	SB-11	Foundation Soils	26.5	12.5	115	1.6	1.5	48.2	0.645	0.8	13	33.2	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.090	0.127	0.704	60.0	75.0	0.084
SC-06	SB-11	Foundation Soils	26.6	12.4	115	1.6	1.5	52.3	0.630	0.8	13	33.3	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.092	0.128	0.724	49.7	68.6	0.075
SC-06	SB-11	Foundation Soils	26.7	12.4	121	1.6	1.5	56.8	0.615	0.8	13	33.8	56.8	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.128	0.748	48.4	71.3	0.079
SC-06	SB-11	Foundation Soils	26.7	12.3	115	1.6	1.5	56.0	0.617	0.8	13	34.2	56.0	1.0	-0.5	0.1	0.9	0.097	1.008	0.095	0.128	0.743	55.5	77.3	0.087
SC-06	SB-11	Foundation Soils	26.8	12.2	121	1.6	1.5	56.5	0.616	0.8	13	33.5	56.5	1.0	-0.5	0.1	0.9	0.097	1.008	0.095	0.128	0.745	45.5	68.5	0.075
SC-06	SB-11	Foundation Soils	26.9	12.1	121	1.6	1.5	59.2	0.607	0.8	13	33.0	59.2	1.0	-0.5	0.1	0.9	0.099	1.009	0.097	0.128	0.759	38.2	64.4	0.070
SC-06	SB-11	Foundation Soils	27.0	12.0	121	1.6	1.5	68.9	0.577	0.8	13	29.7	68.9	1.0	-0.5	0.1	0.9	0.106	1.010	0.104	0.128	0.814	25.5	64.7	0.071
SC-06	SB-11	Foundation Soils	27.1	12.0	124	1.6	1.5	75.8	0.558	0.8	13	28.8	75.8	1.0	-0.5	0.1	0.9	0.112	1.011	0.110	0.128	0.857	23.3	70.3	0.077
SC-06	SB-11	Foundation Soils	27.1	11.9	121	1.6	1.5	78.9	0.549	0.8	13	31.9	78.9	1.0	-0.5	0.1	0.9	0.115	1.012	0.113	0.129	0.877	27.0	74.0	0.082
SC-06	SB-11	Foundation Soils	27.2	11.8	121	1.6	1.5	76.6	0.555	0.8	13	33.7	76.6	1.0	-0.5	0.1	0.9	0.113	1.011	0.111	0.129	0.860	31.6	74.5	0.083
SC-06	SB-11	Foundation Soils	27.3	11.7	121	1.6	1.5	71.1	0.570	0.8	13	34.9	71.1	1.0	-0.5	0.1	0.9	0.108	1.010	0.106	0.129	0.824	39.6	75.8	0.085
SC-06	SB-11	Foundation Soils	27.4	11.6	121	1.6	1.5	68.5	0.578	0.8	13	35.1	68.5	1.0	-0.5	0.1	0.9	0.106	1.010	0.104	0.129	0.807	44.1	77.5	0.087
SC-06	SB-11	Foundation Soils	27.5	11.5	121	1.6	1.5	66.9	0.583	0.8	13	34.9	66.9	1.0	-0.5	0.1	0.9	0.105	1.010	0.103	0.129	0.797	44.1	76.1	0.085
SC-06	SB-11	Foundation Soils	27.6	11.5	121	1.6	1.5	70.8	0.571	0.8	13	34.5	70.8	1.0	-0.5	0.1	0.9	0.108	1.010	0.106	0.129	0.819	37.9	74.1	0.082
SC-06	SB-11	Foundation Soils	27.6	11.4	121	1.6	1.5	81.6	0.542	0.8	13	31.3	81.6	1.0	-0.5	0.1	0.9	0.117	1.012	0.115	0.129	0.889	25.6	75.9	0.085
SC-06	SB-11	Foundation Soils	27.7	11.3	124	1.6	1.5	82.7	0.539	0.8	13	18.0	82.7	1.0	-0.5	0.1	0.9	0.118	1.013	0.116	0.129	0.895	16.2	80.8	0.091
SC-06	SB-11	Foundation Soils	27.8	11.2	124	1.7	1.5	70.4	0.573	0.8	13	0.0	70.4	1.0	-0.5	0.1	0.9	0.108	1.010	0.105	0.130	0.814	8.6	78.9	0.089
SC-06	SB-11	Foundation Soils	27.9	11.1	124	1.7	1.5	81.4	0.543	0.8	13	0.0	81.4	1.0	-0.5	0.1	0.9	0.117	1.012	0.115	0.130	0.885	6.0	87.4	0.100
SC-06	SB-11	Foundation Soils	28.0	11.1	124	1.7	1.5	82.3	0.540	0.8	13	0.0	82.3	1.0	-0.5	0.1	0.9	0.118	1.013	0.115	0.130	0.890	6.0	88.3	0.102
SC-06	SB-11	Foundation Soils	28.1	11.0	124	1.7	1.5	78.6	0.550	0.8	13	0.0	78.6	1.0	-0.6	0.1	0.9	0.115	1.012	0.112	0.130	0.863	6.0	84.6	0.096
SC-06	SB-11	Foundation Soils	28.1	10.9	119	1.7	1.5	66.8	0.583	0.8	13	0.0	66.8	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.130	0.789	6.0	72.8	0.081
SC-06	SB-11	Foundation Soils	28.2	10.8	124	1.7	1.5	58.5	0.609	0.8	13	0.0	58.5	1.0	-0.6	0.1	0.9	0.098	1.008	0.097	0.130	0.742	6.0	64.5	0.070
SC-06	SB-11	Foundation Soils	28.3	10.7	124	1.7	1.5	47.3	0.649	0.8	13	0.9	47.3	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.130	0.682	10.2	56.6	0.061

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-06	SB-11	Foundation Soils	28.4	10.6	124	1.7	1.5	64.3	0.590	0.8	13	22.3	64.3	1.0	-0.6	0.1	0.9	0.103	1.009	0.101	0.130	0.772	19.0	61.1	0.066
SC-06	SB-11	Foundation Soils	28.5	10.6	124	1.7	1.5	58.1	0.610	0.8	13	25.4	58.1	1.0	-0.6	0.1	0.9	0.098	1.008	0.096	0.131	0.737	21.9	54.5	0.058
SC-06	SB-11	Foundation Soils	28.5	10.5	121	1.7	1.5	55.4	0.619	0.8	13	28.7	55.4	1.0	-0.6	0.1	0.9	0.096	1.008	0.094	0.131	0.722	26.6	53.3	0.057
SC-06	SB-11	Foundation Soils	28.6	10.4	121	1.7	1.5	51.8	0.632	0.8	13	30.0	51.8	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.131	0.702	30.5	52.3	0.056
SC-06	SB-11	Foundation Soils	28.7	10.3	121	1.7	1.5	44.7	0.659	0.8	13	31.5	44.7	1.0	-0.6	0.1	0.9	0.089	1.007	0.087	0.131	0.665	42.6	55.8	0.060
SC-06	SB-11	Foundation Soils	28.8	10.2	111	1.7	1.5	41.1	0.674	0.8	13	32.3	41.1	1.0	-0.6	0.1	0.9	0.086	1.007	0.085	0.131	0.646	62.1	71.0	0.078
SC-06	SB-11	Foundation Soils	28.9	10.2	111	1.7	1.5	39.7	0.680	0.8	13	32.2	39.7	1.0	-0.6	0.1	0.9	0.085	1.007	0.084	0.131	0.638	68.9	76.4	0.085
SC-06	SB-11	Foundation Soils	29.0	10.1	111	1.7	1.5	38.3	0.686	0.8	13	32.2	38.3	1.0	-0.6	0.1	0.9	0.084	1.007	0.083	0.131	0.631	75.4	81.5	0.092
SC-06	SB-11	Foundation Soils	29.0	10.0	111	1.7	1.5	38.4	0.686	0.8	13	32.2	38.4	1.0	-0.6	0.1	0.9	0.084	1.007	0.083	0.131	0.631	75.4	81.6	0.092
SC-06	SB-11	Foundation Soils	29.1	9.9	111	1.7	1.5	38.8	0.684	0.8	13	32.2	38.8	1.0	-0.6	0.1	0.9	0.085	1.007	0.083	0.132	0.632	73.9	80.5	0.091
SC-06	SB-11	Foundation Soils	29.2	9.8	111	1.7	1.5	38.7	0.685	0.8	13	32.2	38.7	1.0	-0.6	0.1	0.9	0.084	1.007	0.083	0.132	0.631	73.8	80.3	0.091
SC-06	SB-11	Foundation Soils	29.3	9.7	111	1.7	1.5	37.6	0.690	0.8	13	32.1	37.6	1.0	-0.6	0.1	0.9	0.084	1.007	0.082	0.132	0.625	75.4	80.9	0.091
SC-06	SB-11	Foundation Soils	29.4	9.7	111	1.7	1.5	37.2	0.691	0.8	13	32.0	37.2	1.0	-0.6	0.1	0.9	0.084	1.007	0.082	0.132	0.622	75.4	80.6	0.091
SC-06	SB-11	Foundation Soils	29.4	9.6	111	1.7	1.5	37.8	0.688	0.8	13	32.1	37.8	1.0	-0.6	0.1	0.9	0.084	1.007	0.082	0.132	0.625	73.5	79.2	0.089
SC-06	SB-11	Foundation Soils	29.5	9.5	111	1.8	1.5	38.3	0.686	0.8	13	32.1	38.3	1.0	-0.6	0.1	0.9	0.084	1.007	0.083	0.132	0.626	69.8	76.1	0.085
SC-06	SB-11	Foundation Soils	29.6	9.4	111	1.8	1.6	37.5	0.690	0.8	13	32.0	37.5	1.0	-0.6	0.1	0.9	0.084	1.007	0.082	0.132	0.622	75.4	80.8	0.091
SC-06	SB-11	Foundation Soils	29.7	9.3	111	1.8	1.6	37.7	0.689	0.8	13	32.1	37.7	1.0	-0.6	0.1	0.9	0.084	1.007	0.082	0.132	0.622	75.4	81.0	0.091
SC-06	SB-11	Foundation Soils	29.8	9.2	111	1.8	1.6	38.5	0.685	0.8	13	32.2	38.5	1.0	-0.6	0.1	0.9	0.084	1.007	0.083	0.132	0.625	75.4	81.7	0.092
SC-06	SB-11	Foundation Soils	29.9	9.2	111	1.8	1.6	40.7	0.676	0.8	13	32.5	40.7	1.0	-0.6	0.1	0.9	0.086	1.007	0.084	0.133	0.636	75.4	83.5	0.095
SC-06	SB-11	Foundation Soils	29.9	9.1	115	1.8	1.6	43.4	0.664	0.8	13	32.8	43.4	1.0	-0.6	0.1	0.9	0.088	1.007	0.086	0.133	0.649	69.9	80.5	0.091
SC-06	SB-11	Foundation Soils	30.0	9.0	115	1.8	1.6	47.4	0.648	0.8	13	33.1	47.4	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.133	0.668	58.3	72.7	0.081
SC-06	SB-11	Foundation Soils	30.1	8.9	121	1.8	1.6	50.8	0.636	0.8	13	32.1	50.8	1.0	-0.6	0.1	0.9	0.093	1.008	0.091	0.133	0.684	40.1	58.8	0.063
SC-06	SB-11	Foundation Soils	30.2	8.8	121	1.8	1.6	54.3	0.623	0.8	13	31.5	54.3	1.0	-0.6	0.1	0.9	0.095	1.008	0.093	0.133	0.702	34.5	57.3	0.062
SC-06	SB-11	Foundation Soils	30.3	8.8	121	1.8	1.6	56.0	0.617	0.8	13	29.8	56.0	1.0	-0.6	0.1	0.9	0.097	1.008	0.094	0.133	0.710	28.7	54.9	0.059
SC-06	SB-11	Foundation Soils	30.3	8.7	124	1.8	1.6	54.9	0.621	0.8	13	20.9	54.9	1.0	-0.6	0.1	0.9	0.096	1.008	0.094	0.133	0.704	18.7	52.7	0.056
SC-06	SB-11	Foundation Soils	30.4	8.6	124	1.8	1.6	51.7	0.633	0.8	13	10.7	51.7	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.133	0.686	14.2	55.1	0.059
SC-06	SB-11	Foundation Soils	30.5	8.5	124	1.8	1.6	51.1	0.634	0.8	13	4.1	51.1	1.0	-0.6	0.1	0.9	0.093	1.008	0.091	0.133	0.683	11.8	58.9	0.064
SC-06	SB-11	Foundation Soils	30.6	8.4	124	1.8	1.6	51.2	0.634	0.8	13	0.7	51.2	1.0	-0.6	0.1	0.9	0.093	1.008	0.091	0.134	0.683	10.0	60.5	0.066
SC-06	SB-11	Foundation Soils	30.7	8.3	124	1.8	1.6	50.4	0.637	0.8	13	1.0	50.4	1.0	-0.6	0.1	0.9	0.093	1.008	0.091	0.134	0.678	10.3	59.7	0.064
SC-06	SB-11	Foundation Soils	30.8	8.3	124	1.8	1.6	51.9	0.632	0.8	13	0.0	51.9	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.134	0.685	6.9	58.8	0.063
SC-06	SB-11	Foundation Soils	30.8	8.2	124	1.8	1.6	52.9	0.628	0.8	13	0.0	52.9	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.134	0.690	7.7	60.6	0.066
SC-06	SB-11	Foundation Soils	30.9	8.1	124	1.8	1.6	57.5	0.612	0.8	13	0.0	57.5	1.0	-0.6	0.1	0.9	0.098	1.008	0.095	0.134	0.713	6.1	63.6	0.069
SC-06	SB-11	Foundation Soils	31.0	8.0	124	1.8	1.6	57.2	0.613	0.8	13	0.0	57.2	1.0	-0.6	0.1	0.9	0.097	1.008	0.095	0.134	0.710	6.0	63.2	0.069
SC-06	SB-11	Foundation Soils	31.1	7.9	124	1.8	1.6	52.6	0.629	0.8	13	0.2	52.6	1.0	-0.6	0.1	0.9	0.094	1.008	0.092	0.134	0.686	9.3	61.7	0.067
SC-06	SB-11	Foundation Soils	31.2	7.9	124	1.9	1.6	54.9	0.621	0.8	13	6.4	54.9	1.0	-0.6	0.1	0.9	0.096	1.008	0.094	0.134	0.698	12.6	61.1	0.066
SC-06	SB-11	Foundation Soils	31.2	7.8	124	1.9	1.6	50.7	0.636	0.8	13	3.3	50.7	1.0	-0.6	0.1	0.9	0.093	1.008	0.091	0.134	0.675	11.5	58.9	0.064
SC-06	SB-11	Foundation Soils	31.3	7.7	124	1.9	1.6	54.9	0.621	0.8	13	10.0	54.9	1.0	-0.6	0.1	0.9	0.096	1.008	0.094	0.134	0.696	13.9	58.8	0.063
SC-06	SB-11	Foundation Soils	31.4	7.6	124	1.9	1.6	56.8	0.615	0.8	13	12.5	56.8	1.0	-0.6	0.1	0.9	0.097	1.008	0.095	0.135	0.706	14.7	59.0	0.064
SC-06	SB-11	Foundation Soils	31.5	7.5	124	1.9	1.6	54.9	0.621	0.8	13	12.6	54.9	1.0	-0.6	0.1	0.9	0.096	1.008	0.094	0.135	0.695	14.8	57.1	0.061
SC-06	SB-11	Foundation Soils	31.6	7.4	124	1.9	1.6	50.9	0.635	0.8	13	10.6	50.9	1.0	-0.6	0.1	0.9	0.093	1.008	0.091	0.135	0.674	14.1	54.4	0.058
SC-06	SB-11	Foundation Soils	31.7	7.4	124	1.9	1.6	53.5	0.626	0.8	13	15.0	53.5	1.0	-0.6	0.1	0.9	0.095	1.008	0.093	0.135	0.687	15.8	54.3	0.058
SC-06	SB-11	Foundation Soils	31.7	7.3	124	1.9	1.6	54.7	0.622	0.8	13	16.2	54.7	1.0	-0.7	0.1	0.9	0.096	1.008	0.093	0.135	0.693	16.3	54.8	0.059
SC-06	SB-11	Foundation Soils	31.8	7.2	124	1.9	1.6	55.6	0.619	0.8	13	16.7	55.6	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.135	0.696	16.4	55.4	0.059
SC-06	SB-11	Foundation Soils	31.9	7.1	124	1.9	1.6	60.1	0.604	0.8	13	22.8	60.1	1.0	-0.7	0.1	0.9	0.100	1.009	0.097	0.135	0.719	19.6	56.9	0.061
SC-06	SB-11	Foundation Soils	32.0	7.0	121	1.9	1.6	61.9	0.598	0.8	13	29.8	61.9	1.0	-0.7	0.1	0.9	0.101	1.009	0.098	0.135	0.728	27.0	59.2	0.064
SC-06	SB-11	Foundation Soils	32.1	7.0	121	1.9	1.6	62.1	0.597	0.8	13	31.7	62.1	1.0	-0.7	0.1	0.9	0.101	1.009	0.099	0.135	0.729	31.4	61.8	0.067
SC-06	SB-11	Foundation Soils	32.2	6.9	121	1.9	1.6	59.7	0.605	0.8	13	31.7	59.7	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.135	0.716	32.5	60.5	0.065
SC-06	SB-11	Foundation Soils	32.2	6.8	121	1.9	1.6	60.3	0.603	0.8	13	32.0	60.3	1.0	-0.7	0.1	0.9	0.100	1.009	0.097	0.135	0.718	33.1	61.4	0.067
SC-06	SB-11	Foundation Soils	32.3	6.7	121	1.9	1.6	60.7	0.602	0.8	13	32.5	60.7	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.136	0.719	34.9	63.1	0.069
SC-06	SB-11	Foundation Soils	32.4	6.6	121	1.9	1.6	62.4	0.596	0.8	13	32.3	62.4	1.0	-0.7	0.1	0.9	0.101	1.009	0.099	0.136	0.728	33.4	63.5	0.069
SC-06	SB-11	Foundation Soils	32.5	6.5	121	1.9	1.6	64.0	0.592	0.8	13	29.1	64.0	1.0	-0.7	0.1	0.9	0.103	1.009	0.100	0.136	0.736	25.5	60.4	0.065
SC-06	SB-11	Foundation Soils	32.6	6.5	124	1.9	1.6	64.5	0.590	0.8	13	26.9	64.5	1.0	-0.7	0.1	0.9	0.103	1.009	0.100	0.136	0.738	22.7	60.3	0.065
SC-06	SB-11	Foundation Soils	32.6	6.4	124	1.9	1.6	63.9	0.592	0.8	13	22.6	63.9	1.0	-0.7	0.1	0.9	0.103	1.009	0.100	0.136	0.735	19.2	60.6	0.066
SC-06	SB-11	Foundation Soils	32.7	6.3	124	1.9	1.6	69.4	0.576	0.8	13	24.6	69.4	1.0	-0.7	0.1	0.9	0.107	1.010	0.104	0.136	0.764	20.2	65.0	0.071
SC-06	SB-11	Foundation Soils	32.8	6.2	124	2.0	1.6	72.1	0.568	0.8	13	26.4	72.1	1.0	-0.7	0.1	0.9	0.109	1.010	0.106	0.136	0.779	21.5	67.1	0.073
SC-06	SB-11	Foundation Soils	32.9	6.1	124	2.0	1.6	68.7	0.577	0.8	13	23.9	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.103	0.136	0.759	19.8	64.6	0.070
SC-06	SB-11	Foundation Soils	33.0	6.0	124	2.0	1.7	69.9	0.574	0.8	13	25.0	69.9	1.0	-0.7	0.1	0.9	0.107	1.010	0.104	0.136	0.765	20.5	65.4	0.071
SC-06	SB-11	Foundation Soils	33.1	6.0	121	2.0	1.7	73.5	0.564	0.8	13	30.4	73.5	1.0	-0.7	0.1	0.9	0.110	1.011	0.107	0.136	0.785	25.7	68.8	0.076
SC-06	SB-11	Foundation Soils	33.1	5.9	121	2.0	1.7	76.2	0.556	0.8	13	33.0	76.2	1.0	-0.7	0.1	0.9	0.112	1.011	0.109	0.136	0.800	30.0	73.1	0.081
SC-06	SB-11	Foundation Soils	33.2	5.8	121	2.0	1.7	75.4	0.559	0.8	13	32.9	75.4	1.0	-0.7	0.1	0.9	0.112	1.011	0.109	0.136	0.795	30.0	72.4	0.080
SC-06	SB-11	Foundation Soils	33.3	5.7	121	2.0	1.7	73.5	0.564	0.8	13	32.5	73.5	1.0	-0.7	0.1	0.9	0.110	1.011	0.107	0.137	0.783	29.6	70.6	0.078
SC-06	SB-11	Foundation Soils	33.4	5.6	121	2.0	1.7	73.6	0.563	0.8	13	33.1	73.6	1.0	-0.7	0.1	0.9	0.110	1.011	0.107	0.137	0.784	31.1	71.6	0.079
SC-06	SB-11	Foundation Soils	33.5	5.6	121	2.0	1.7	75.3	0.559	0.8	13	34.6	75.3	1.0	-0.7	0.1	0.9	0.112	1.011	0.108	0.137	0.793	35.2	75.9	0.085
SC-06	SB-11	Foundation Soils	33.5	5.5	121	2.0	1.7	73.4	0.564	0.8	13	34.7	73.4	1.0	-0.7	0.1	0.9	0.110	1.011	0.107	0.137	0.781	36.7	75.5	0.084
SC-06	SB-11	Foundation Soils	33.6	5.4	121	2.0	1.7	70.1	0.573	0.8	13	34.2	70.1	1.0	-0.7	0.1	0.9	0.107	1.010	0.104	0.137	0.762	36.8	72.7	0.081
SC-06	SB-11	Foundation Soils	33.7	5.3	121	2.0	1.7	68.0	0.579	0.8	13	34.6	68.0	1.0	-0.7	0.1	0.9	0.106	1.010	0.103	0.137	0.750	40.7	74.1	0.082
SC-06	SB-11	Foundation Soils	33.8	5.2	121	2.0	1.7	77.4	0.553	0.8	13	33.9	77.4	1.0	-0.7	0.1	0.9	0.113	1.012	0.110	0.137	0.803	31.8	75.3	0.084
SC-06	SB-11	Foundation Soils	33.9	5.1	121	2.0	1.7	79.0	0.549	0.8	13	34.9	79.0	1.0	-0.7	0.1	0.9	0.115	1.012	0.111	0.137	0.813	34.4	78.5	0.088
SC-06	SB-11	Foundation Soils	34.0	5.1	115	2.0	1.7	67.3	0.582	0.8	13	35.4	67.3	1.0	-0.7	0.1	0.9	0.105	1.010	0.102	0.137	0.744	48.1	80.0	0.090
SC-06	SB-11	Foundation Soils	34.0	5.0	121	2.0	1.7	74.7	0.560	0.8	13	36.2	74.7	1.0	-0.7	0.1	0.9	0.111	1.011	0.108	0.137	0.786	45.6	84.1	0.096
SC-06	SB-11	Foundation Soils	34.1	4.9	115	2.0	1.7	71.7	0.569	0.8	13	36.0	71.7	1.0	-0.7	0.1	0.9	0.109	1.010	0.105	0.137	0.767	47.9	83.6	0.095

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-06	SB-11	Foundation Soils	34.2	4.8	115	2.0	1.7	76.3	0.556	0.8	13	36.5	76.3	1.0	-0.7	0.1	0.9	0.113	1.011	0.109	0.137	0.794	46.2	86.0	0.098
SC-06	SB-11	Foundation Soils	34.3	4.7	115	2.0	1.7	75.1	0.559	0.8	13	36.6	75.1	1.0	-0.7	0.1	0.9	0.111	1.011	0.108	0.138	0.786	48.6	87.1	0.100
SC-06	SB-11	Foundation Soils	34.4	4.7	115	2.0	1.7	79.1	0.549	0.8	13	37.0	79.1	1.0	-0.7	0.1	0.9	0.115	1.012	0.111	0.138	0.810	46.6	88.8	0.102
SC-06	SB-11	Foundation Soils	34.4	4.6	121	2.1	1.7	83.3	0.538	0.8	13	36.7	83.3	1.0	-0.7	0.1	0.9	0.119	1.013	0.115	0.138	0.836	40.1	86.7	0.099
SC-06	SB-11	Foundation Soils	34.5	4.5	121	2.1	1.7	93.5	0.513	0.8	13	34.8	93.5	1.0	-0.7	0.1	0.9	0.129	1.016	0.125	0.138	0.909	28.9	87.6	0.101
SC-06	SB-11	Foundation Soils	34.6	4.4	121	2.1	1.7	100.8	0.496	0.8	13	32.0	100.8	0.9	-0.7	0.1	0.9	0.138	1.018	0.134	0.138	0.970	23.6	92.4	0.108
SC-06	SB-11	Foundation Soils	34.7	4.3	124	2.1	1.7	105.3	0.487	0.8	13	26.1	105.3	0.9	-0.7	0.1	0.9	0.145	1.020	0.140	0.138	1.014	19.0	98.2	
SC-06	SB-11	Foundation Soils	34.8	4.2	124	2.1	1.7	100.0	0.498	0.8	13	19.9	100.0	0.9	-0.7	0.1	0.9	0.137	1.018	0.133	0.138	0.962	16.4	96.6	0.114
SC-06	SB-11	Foundation Soils	34.9	4.2	124	2.1	1.7	91.0	0.519	0.8	13	0.0	91.0	1.0	-0.7	0.1	0.9	0.127	1.015	0.122	0.138	0.887	7.1	98.0	0.116
SC-06	SB-11	Foundation Soils	34.9	4.1	124	2.1	1.7	99.7	0.499	0.8	13	0.0	99.7	0.9	-0.7	0.1	0.9	0.137	1.018	0.132	0.138	0.957	6.0	105.7	0.129
SC-06	SB-11	Foundation Soils	35.0	4.0	124	2.1	1.7	102.9	0.492	0.8	13	0.0	102.9	0.9	-0.7	0.1	0.9	0.141	1.019	0.136	0.138	0.987	8.4	111.3	0.139
SC-06	SB-11	Foundation Soils	35.1	3.9	124	2.1	1.7	113.4	0.470	0.8	13	0.0	113.4	0.9	-0.7	0.1	0.9	0.158	1.023	0.152	0.138	1.102	6.0	119.4	
SC-06	SB-11	Foundation Soils	35.2	3.8	124	2.1	1.7	113.9	0.469	0.8	13	0.0	113.9	0.9	-0.7	0.1	0.9	0.159	1.023	0.153	0.138	1.108	6.0	119.9	
SC-06	SB-11	Foundation Soils	35.3	3.8	124	2.1	1.7	115.5	0.466	0.8	13	0.0	115.5	0.9	-0.8	0.1	0.9	0.162	1.024	0.156	0.138	1.129	6.0	121.5	
SC-06	SB-11	Foundation Soils	35.4	3.7	124	2.1	1.7	122.6	0.452	0.8	13	0.0	122.6	0.9	-0.8	0.1	0.9	0.177	1.028	0.171	0.138	1.234	6.0	128.6	
SC-06	SB-11	Foundation Soils	35.4	3.6	124	2.1	1.7	130.1	0.438	0.8	13	0.0	130.1	0.9	-0.8	0.1	0.9	0.198	1.032	0.191	0.139	1.376	6.0	136.1	
SC-06	SB-11	Foundation Soils	35.5	3.5	124	2.1	1.7	126.7	0.444	0.8	13	0.0	126.7	0.9	-0.8	0.1	0.9	0.188	1.030	0.181	0.139	1.305	6.0	132.7	
SC-06	SB-11	Foundation Soils	35.6	3.4	124	2.1	1.7	117.1	0.462	0.8	13	0.0	117.1	0.9	-0.8	0.1	0.9	0.165	1.025	0.159	0.139	1.147	6.0	123.1	
SC-06	SB-11	Foundation Soils	35.7	3.3	124	2.1	1.7	112.2	0.472	0.8	13	0.0	112.2	0.9	-0.8	0.1	0.9	0.156	1.023	0.150	0.139	1.082	6.0	118.2	
SC-06	SB-11	Foundation Soils	35.8	3.3	124	2.1	1.7	105.0	0.487	0.8	13	0.0	105.0	0.9	-0.8	0.1	0.9	0.144	1.020	0.139	0.139	1.001	6.0	111.0	
SC-06	SB-11	Foundation Soils	35.8	3.2	124	2.1	1.7	98.9	0.501	0.8	13	0.0	98.9	0.9	-0.8	0.1	0.9	0.136	1.017	0.131	0.139	0.944	6.0	104.9	0.128
SC-06	SB-11	Foundation Soils	35.9	3.1	124	2.1	1.7	92.1	0.516	0.8	13	0.0	92.1	1.0	-0.8	0.1	0.9	0.128	1.015	0.123	0.139	0.888	6.0	98.1	0.116
SC-06	SB-11	Foundation Soils	36.0	3.0	124	2.1	1.7	84.2	0.535	0.8	13	0.0	84.2	1.0	-0.8	0.1	0.9	0.120	1.013	0.116	0.139	0.832	6.0	90.2	0.104
SC-06	SB-11	Foundation Soils	36.1	2.9	124	2.2	1.7	76.7	0.555	0.8	13	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.109	0.139	0.785	6.0	82.7	0.094
SC-06	SB-11	Foundation Soils	36.2	2.9	124	2.2	1.7	73.5	0.564	0.8	13	0.0	73.5	1.0	-0.8	0.1	0.9	0.110	1.011	0.107	0.139	0.766	6.0	79.5	0.090
SC-06	SB-11	Foundation Soils	36.3	2.8	124	2.2	1.7	72.3	0.567	0.8	13	0.0	72.3	1.0	-0.8	0.1	0.9	0.109	1.011	0.106	0.139	0.758	6.0	78.3	0.088
SC-06	SB-11	Foundation Soils	36.3	2.7	124	2.2	1.8	68.9	0.577	0.7	13	0.0	68.9	1.0	-0.8	0.1	0.9	0.106	1.010	0.103	0.139	0.740	6.0	74.9	0.083
SC-06	SB-11	Foundation Soils	36.4	2.6	124	2.2	1.8	66.4	0.584	0.7	13	0.0	66.4	1.0	-0.8	0.1	0.9	0.104	1.010	0.101	0.139	0.726	6.0	72.4	0.080
SC-06	SB-11	Foundation Soils	36.5	2.5	119	2.2	1.8	68.5	0.578	0.7	13	0.0	68.5	1.0	-0.8	0.1	0.9	0.106	1.010	0.103	0.139	0.736	6.0	74.5	0.083
SC-06	SB-11	Foundation Soils	36.6	2.4	119	2.2	1.8	67.0	0.582	0.7	13	0.0	67.0	1.0	-0.8	0.1	0.9	0.105	1.010	0.101	0.139	0.728	6.0	73.0	0.081
SC-06	SB-11	Foundation Soils	36.7	2.4	119	2.2	1.8	64.3	0.590	0.7	13	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.100	0.140	0.713	6.0	70.3	0.078
SC-06	SB-11	Foundation Soils	36.7	2.3	119	2.2	1.8	57.2	0.613	0.7	13	0.0	57.2	1.0	-0.8	0.1	0.9	0.097	1.008	0.095	0.140	0.677	6.0	63.2	0.069
SC-06	SB-11	Foundation Soils	36.8	2.2	119	2.2	1.8	50.1	0.638	0.7	13	0.0	50.1	1.0	-0.8	0.1	0.9	0.092	1.008	0.090	0.140	0.642	7.6	57.7	0.062
SC-06	SB-11	Foundation Soils	36.9	2.1	119	2.2	1.8	47.8	0.647	0.7	13	0.4	47.8	1.0	-0.8	0.1	0.9	0.091	1.007	0.088	0.140	0.631	9.7	57.1	0.061
SC-06	SB-11	Foundation Soils	37.0	2.0	119	2.2	1.8	59.7	0.605	0.7	13	11.7	59.7	1.0	-0.8	0.1	0.9	0.099	1.009	0.096	0.140	0.688	14.4	62.4	0.068
SC-06	SB-11	Foundation Soils	37.1	1.9	119	2.2	1.8	47.1	0.649	0.7	13	1.3	47.1	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.140	0.627	10.5	56.3	0.061
SC-06	SB-11	Foundation Soils	37.2	1.9	119	2.2	1.8	50.7	0.636	0.7	13	1.4	50.7	1.0	-0.8	0.1	0.9	0.093	1.008	0.090	0.140	0.644	10.5	59.8	0.065
SC-06	SB-11	Foundation Soils	37.2	1.8	119	2.2	1.8	49.2	0.641	0.7	13	0.0	49.2	1.0	-0.8	0.1	0.9	0.092	1.008	0.089	0.140	0.636	8.0	57.2	0.062
SC-06	SB-11	Foundation Soils	37.3	1.7	119	2.2	1.8	47.1	0.650	0.7	13	0.1	47.1	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.140	0.626	9.1	56.1	0.060
SC-06	SB-11	Foundation Soils	37.4	1.6	124	2.2	1.8	49.7	0.640	0.7	13	0.0	49.7	1.0	-0.8	0.1	0.9	0.092	1.008	0.089	0.140	0.638	7.6	57.3	0.062
SC-06	SB-11	Foundation Soils	37.5	1.5	124	2.2	1.8	55.0	0.621	0.7	13	0.0	55.0	1.0	-0.8	0.1	0.9	0.096	1.008	0.093	0.140	0.663	7.6	62.6	0.068
SC-06	SB-11	Foundation Soils	37.6	1.5	124	2.2	1.8	54.8	0.622	0.7	13	0.0	54.8	1.0	-0.8	0.1	0.9	0.096	1.008	0.093	0.140	0.662	6.2	61.0	0.066
SC-06	SB-11	Foundation Soils	37.6	1.4	124	2.2	1.8	66.1	0.585	0.7	13	14.1	66.1	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.140	0.718	15.1	67.1	0.074
SC-06	SB-11	Foundation Soils	37.7	1.3	124	2.3	1.8	71.8	0.568	0.7	13	20.2	71.8	1.0	-0.8	0.1	0.9	0.109	1.010	0.105	0.140	0.748	17.5	69.1	0.076
SC-06	SB-11	Foundation Soils	37.8	1.2	124	2.3	1.8	74.1	0.562	0.7	13	20.9	74.1	1.0	-0.8	0.1	0.9	0.111	1.011	0.107	0.140	0.761	17.7	71.0	0.078
SC-06	SB-11	Foundation Soils	37.9	1.1	124	2.3	1.8	77.7	0.552	0.7	13	27.0	77.7	1.0	-0.8	0.1	0.9	0.114	1.012	0.110	0.140	0.781	21.4	72.1	0.080
SC-06	SB-11	Foundation Soils	38.0	1.0	121	2.3	1.8	74.6	0.561	0.7	13	33.0	74.6	1.0	-0.8	0.1	0.9	0.111	1.011	0.107	0.140	0.763	30.3	71.9	0.080
SC-06	SB-11	Foundation Soils	38.1	1.0	115	2.3	1.8	70.8	0.571	0.7	13	36.8	70.8	1.0	-0.8	0.1	0.9	0.108	1.010	0.104	0.140	0.741	63.6	97.7	0.116
SC-06	SB-11	Foundation Soils	38.1	0.9	111	2.3	1.8	64.4	0.590	0.7	13	36.1	64.4	1.0	-0.8	0.1	0.9	0.103	1.009	0.099	0.141	0.707	73.9	102.3	0.123
SC-07	SB-12	Foundation Soils	17.1	16.6	121	1.0	1.0	75.5	0.558	1.0	15	37.0	75.5	1.0	-0.3	0.0	1.0	0.112	1.011	0.114	0.124	0.916	35.4	73.9	0.082
SC-07	SB-12	Foundation Soils	17.1	16.5	121	1.0	1.0	75.0	0.560	1.0	15	37.6	75.0	1.0	-0.3	0.0	1.0	0.111	1.011	0.113	0.124	0.910	38.3	75.7	0.085
SC-07	SB-12	Foundation Soils	17.2	16.4	121	1.0	1.0	67.9	0.580	1.0	15	37.8	67.9	1.0	-0.3	0.0	1.0	0.106	1.010	0.107	0.125	0.859	47.8	77.9	0.087
SC-07	SB-12	Foundation Soils	17.3	16.4	115	1.0	1.0	58.2	0.610	1.0	15	37.1	58.2	1.0	-0.3	0.0	1.0	0.098	1.008	0.099	0.125	0.796	61.4	82.5	0.094
SC-07	SB-12	Foundation Soils	17.4	16.3	111	1.0	1.0	52.7	0.629	1.0	15	36.5	52.7	1.0	-0.3	0.0	1.0	0.094	1.008	0.095	0.125	0.761	71.4	87.6	0.101
SC-07	SB-12	Foundation Soils	17.5	16.2	111	1.0	1.0	48.3	0.645	1.0	15	35.9	48.3	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.125	0.734	75.4	87.8	0.101
SC-07	SB-12	Foundation Soils	17.6	16.1	111	1.0	1.0	46.5	0.652	1.0	15	35.6	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.126	0.722	75.4	86.2	0.099
SC-07	SB-12	Foundation Soils	17.6	16.0	111	1.0	1.0	45.1	0.657	1.0	15	35.4	45.1	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.126	0.713	75.4	85.1	0.097
SC-07	SB-12	Foundation Soils	17.7	16.0	111	1.0	1.0	44.8	0.659	1.0	15	35.3	44.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.089	0.126	0.709	75.4	84.8	0.097
SC-07	SB-12	Foundation Soils	17.8	15.9	111	1.1	1.0	45.4	0.656	1.0	15	35.4	45.4	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.126	0.711	75.4	85.4	0.098
SC-07	SB-12	Foundation Soils	17.9	15.8	111	1.1	1.0	45.0	0.658	1.0	15	35.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.127	0.707	75.1	84.7	0.097
SC-07	SB-12	Foundation Soils	18.0	15.7	111	1.1	1.0	44.7	0.659	1.0	15	35.3	44.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.089	0.127	0.704	75.4	84.8	0.097
SC-07	SB-12	Foundation Soils	18.0	15.6	111	1.1	1.0	45.5	0.656	1.0	15	35.5	45.5	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.127	0.707	75.3	85.4	0.098
SC-07	SB-12	Foundation Soils	18.1	15.5	115	1.1	1.0	52.3	0.630	1.0	15	35.9	52.3	1.0	-0.3	0.0	0.9	0.094	1.008	0.095	0.127	0.744	56.0	72.4	0.080
SC-07	SB-12	Foundation Soils	18.2	15.5	121	1.1	1.0	57.7	0.612	1.0	15	35.6	57.7	1.0	-0.3	0.0	0.9	0.098	1.008	0.099	0.128	0.774	42.6	64.7	0.071
SC-07	SB-12	Foundation Soils	18.3	15.4	121	1.1	1.0	60.7	0.602	1.0	15	35.5	60.7	1.0	-0.3	0.0	0.9	0.100	1.009	0.101	0.128	0.790	38.6	63.8	0.070
SC-07	SB-12	Foundation Soils	18.4	15.3	121	1.1	1.0	64.6	0.590	1.0	15	35.0	64.6	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.128	0.812	33.9	63.5	0.069
SC-07	SB-12	Foundation Soils	18.5	15.2	121	1.1	1.0	64.1	0.591	1.0	15	35.2	64.1	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.128	0.807	34.9	63.8	0.069
SC-07	SB-12	Foundation Soils	18.5	15.1	121	1.1	1.0	64.4	0.590	1.0	15	34.8	64.4	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.129	0.807	33.5	63.0	0.068
SC-07	SB-12	Foundation Soils	18.6	15.1	121	1.1	1.0	68.0	0.580	1.0	15	34.1	68.0	1.0	-0.3	0.0	0.9	0.106	1.010	0.107	0.129	0.828	30.0	63.9	0.070

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-07	SB-12	Foundation Soils	18.7	15.0	121	1.1	1.1	70.6	0.572	1.0	15	33.6	70.6	1.0	-0.3	0.0	0.9	0.108	1.010	0.109	0.129	0.843	28.2	65.1	0.071
SC-07	SB-12	Foundation Soils	18.8	14.9	121	1.1	1.1	70.2	0.573	1.0	15	34.8	70.2	1.0	-0.3	0.0	0.9	0.107	1.010	0.109	0.129	0.839	30.9	66.3	0.073
SC-07	SB-12	Foundation Soils	18.9	14.8	121	1.1	1.1	65.8	0.586	1.0	15	36.4	65.8	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.130	0.809	39.4	68.8	0.076
SC-07	SB-12	Foundation Soils	18.9	14.7	121	1.1	1.1	62.6	0.596	1.0	15	36.7	62.6	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.130	0.788	45.4	71.2	0.079
SC-07	SB-12	Foundation Soils	19.0	14.6	115	1.1	1.1	57.4	0.612	1.0	15	36.5	57.4	1.0	-0.3	0.0	0.9	0.098	1.008	0.098	0.130	0.757	52.5	73.4	0.082
SC-07	SB-12	Foundation Soils	19.1	14.6	115	1.1	1.1	54.6	0.622	1.0	15	36.4	54.6	1.0	-0.3	0.0	0.9	0.096	1.008	0.096	0.130	0.739	57.8	76.0	0.085
SC-07	SB-12	Foundation Soils	19.2	14.5	115	1.1	1.1	51.6	0.633	1.0	15	36.0	51.6	1.0	-0.3	0.0	0.9	0.093	1.008	0.094	0.131	0.720	61.2	76.7	0.086
SC-07	SB-12	Foundation Soils	19.3	14.4	115	1.1	1.1	48.9	0.643	1.0	15	35.8	48.9	1.0	-0.3	0.0	0.9	0.091	1.007	0.092	0.131	0.704	66.9	80.0	0.090
SC-07	SB-12	Foundation Soils	19.4	14.3	115	1.1	1.1	47.4	0.648	1.0	15	35.5	47.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.131	0.695	66.5	78.4	0.088
SC-07	SB-12	Foundation Soils	19.4	14.2	115	1.1	1.1	48.2	0.645	1.0	15	35.6	48.2	1.0	-0.3	0.0	0.9	0.091	1.007	0.092	0.131	0.698	62.7	75.4	0.084
SC-07	SB-12	Foundation Soils	19.5	14.1	121	1.2	1.1	56.5	0.616	1.0	15	35.2	56.5	1.0	-0.3	0.0	0.9	0.097	1.008	0.098	0.131	0.743	41.0	62.3	0.068
SC-07	SB-12	Foundation Soils	19.6	14.1	121	1.2	1.1	59.4	0.606	1.0	15	34.8	59.4	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.132	0.758	36.1	60.7	0.066
SC-07	SB-12	Foundation Soils	19.7	14.0	121	1.2	1.1	56.2	0.617	1.0	15	35.5	56.2	1.0	-0.3	0.0	0.9	0.097	1.008	0.097	0.132	0.738	43.4	64.1	0.070
SC-07	SB-12	Foundation Soils	19.8	13.9	121	1.2	1.1	55.0	0.621	1.0	15	36.0	55.0	1.0	-0.3	0.0	0.9	0.096	1.008	0.097	0.132	0.730	50.2	69.2	0.076
SC-07	SB-12	Foundation Soils	19.8	13.8	115	1.2	1.1	55.8	0.618	1.0	15	36.2	55.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.097	0.132	0.733	51.9	71.5	0.079
SC-07	SB-12	Foundation Soils	19.9	13.7	121	1.2	1.1	58.5	0.609	1.0	15	36.4	58.5	1.0	-0.3	0.0	0.9	0.098	1.008	0.099	0.133	0.747	48.6	70.7	0.078
SC-07	SB-12	Foundation Soils	20.0	13.7	121	1.2	1.1	65.7	0.586	1.0	15	36.6	65.7	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.133	0.787	41.1	70.1	0.077
SC-07	SB-12	Foundation Soils	20.1	13.6	121	1.2	1.1	76.8	0.555	1.0	15	36.7	76.8	1.0	-0.4	0.0	0.9	0.113	1.011	0.114	0.133	0.857	33.5	73.7	0.082
SC-07	SB-12	Foundation Soils	20.2	13.5	121	1.2	1.1	93.1	0.514	1.0	15	35.4	93.1	1.0	-0.4	0.0	0.9	0.129	1.016	0.131	0.133	0.980	26.2	83.8	0.095
SC-07	SB-12	Foundation Soils	20.3	13.4	124	1.2	1.1	108.2	0.481	1.0	15	20.8	108.2	1.0	-0.4	0.0	0.9	0.149	1.021	0.152	0.133	1.136	16.0	103.4	
SC-07	SB-12	Foundation Soils	20.3	13.3	124	1.2	1.1	124.3	0.449	1.0	15	21.6	124.3	1.0	-0.4	0.0	0.9	0.181	1.028	0.186	0.134	1.389	15.9	118.6	
SC-07	SB-12	Foundation Soils	20.4	13.2	124	1.2	1.1	143.5	0.414	1.0	15	23.2	143.5	1.0	-0.4	0.0	0.9	0.251	1.041	0.260	0.134	1.939	16.0	136.3	
SC-07	SB-12	Foundation Soils	20.5	13.2	124	1.2	1.1	155.4	0.395	1.0	15	18.3	155.4	1.0	-0.4	0.0	0.9	0.328	1.050	0.342	0.134	2.553	14.5	151.6	
SC-07	SB-12	Foundation Soils	20.6	13.1	124	1.2	1.1	179.7	0.358	1.0	15	29.7	179.7	1.0	-0.4	0.0	0.9	0.719	1.074	0.765	0.134	5.695	17.0	167.1	
SC-07	SB-12	Foundation Soils	20.7	13.0	124	1.2	1.1	192.5	0.340	1.0	15	39.7	192.5	1.0	-0.4	0.0	0.9	1.268	1.082	1.356	0.134	10.082	20.2	173.0	
SC-07	SB-12	Foundation Soils	20.8	12.9	121	1.2	1.1	195.0	0.336	1.0	15	46.7	195.0	1.0	-0.4	0.0	0.9	1.441	1.082	1.541	0.135	11.438	24.2	172.5	
SC-07	SB-12	Foundation Soils	20.8	12.8	121	1.2	1.1	192.8	0.339	1.0	15	49.8	192.8	1.0	-0.4	0.0	0.9	1.288	1.082	1.376	0.135	10.200	27.4	170.4	
SC-07	SB-12	Foundation Soils	20.9	12.8	121	1.2	1.1	188.1	0.346	1.0	15	51.1	188.1	1.0	-0.4	0.0	0.9	1.030	1.082	1.101	0.135	8.151	30.1	167.1	
SC-07	SB-12	Foundation Soils	21.0	12.7	121	1.2	1.1	186.0	0.349	1.0	15	50.9	186.0	1.0	-0.4	0.0	0.9	0.933	1.081	0.997	0.135	7.367	30.2	165.2	
SC-07	SB-12	Foundation Soils	21.1	12.6	121	1.2	1.1	189.1	0.344	1.0	15	50.6	189.1	1.0	-0.4	0.0	0.9	1.076	1.082	1.149	0.136	8.477	29.1	167.6	
SC-07	SB-12	Foundation Soils	21.2	12.5	121	1.3	1.1	191.4	0.341	1.0	15	50.7	191.4	1.0	-0.4	0.0	0.9	1.200	1.082	1.280	0.136	9.434	28.8	169.4	
SC-07	SB-12	Foundation Soils	21.2	12.4	121	1.3	1.1	171.2	0.370	1.0	15	50.5	171.2	1.0	-0.4	0.0	0.9	0.524	1.065	0.552	0.136	4.060	33.6	154.3	
SC-07	SB-12	Foundation Soils	21.3	12.3	121	1.3	1.1	162.6	0.383	1.0	15	49.7	162.6	1.0	-0.4	0.0	0.9	0.400	1.056	0.418	0.136	3.070	34.9	147.8	
SC-07	SB-12	Foundation Soils	21.4	12.3	121	1.3	1.1	144.9	0.412	1.0	15	48.4	144.9	1.0	-0.4	0.0	0.9	0.258	1.042	0.266	0.136	1.953	39.3	135.8	
SC-07	SB-12	Foundation Soils	21.5	12.2	115	1.3	1.1	132.0	0.434	1.0	15	47.1	132.0	1.0	-0.4	0.0	0.9	0.204	1.033	0.209	0.136	1.528	43.0	127.9	
SC-07	SB-12	Foundation Soils	21.6	12.1	115	1.3	1.1	123.4	0.450	1.0	15	46.3	123.4	1.0	-0.4	0.0	0.9	0.179	1.028	0.183	0.137	1.337	46.1	123.2	
SC-07	SB-12	Foundation Soils	21.7	12.0	115	1.3	1.1	117.2	0.462	1.0	15	45.5	117.2	1.0	-0.4	0.0	0.9	0.165	1.025	0.168	0.137	1.227	47.6	119.3	
SC-07	SB-12	Foundation Soils	21.7	11.9	115	1.3	1.1	112.9	0.471	1.0	15	44.6	112.9	1.0	-0.4	0.0	0.9	0.157	1.023	0.159	0.137	1.162	45.9	114.2	
SC-07	SB-12	Foundation Soils	21.8	11.9	115	1.3	1.1	109.6	0.478	1.0	15	44.0	109.6	1.0	-0.4	0.0	0.9	0.151	1.021	0.153	0.137	1.117	45.2	110.8	
SC-07	SB-12	Foundation Soils	21.9	11.8	121	1.3	1.1	114.0	0.469	1.0	15	44.3	114.0	1.0	-0.4	0.0	0.9	0.159	1.023	0.161	0.137	1.174	42.8	112.4	
SC-07	SB-12	Foundation Soils	22.0	11.7	121	1.3	1.1	123.5	0.450	1.0	15	44.6	123.5	1.0	-0.4	0.0	0.9	0.179	1.028	0.183	0.138	1.326	36.9	115.8	
SC-07	SB-12	Foundation Soils	22.1	11.6	121	1.3	1.1	137.9	0.424	1.0	15	43.3	137.9	1.0	-0.4	0.0	0.9	0.226	1.037	0.231	0.138	1.677	28.9	123.5	
SC-07	SB-12	Foundation Soils	22.1	11.5	121	1.3	1.2	146.2	0.410	1.0	15	40.4	146.2	1.0	-0.4	0.0	0.9	0.265	1.042	0.273	0.138	1.978	24.1	129.9	
SC-07	SB-12	Foundation Soils	22.2	11.4	121	1.3	1.2	148.0	0.407	1.0	15	39.2	148.0	1.0	-0.4	0.0	0.9	0.276	1.044	0.284	0.138	2.056	22.9	131.7	
SC-07	SB-12	Foundation Soils	22.3	11.4	121	1.3	1.2	140.8	0.419	1.0	15	43.9	140.8	1.0	-0.4	0.0	0.9	0.238	1.039	0.244	0.138	1.763	29.1	126.0	
SC-07	SB-12	Foundation Soils	22.4	11.3	121	1.3	1.2	130.6	0.437	1.0	15	45.2	130.6	1.0	-0.4	0.0	0.9	0.199	1.032	0.203	0.139	1.468	35.3	120.8	
SC-07	SB-12	Foundation Soils	22.5	11.2	121	1.3	1.2	122.1	0.453	1.0	15	45.3	122.1	1.0	-0.4	0.0	0.9	0.176	1.027	0.179	0.139	1.288	41.0	117.8	
SC-07	SB-12	Foundation Soils	22.6	11.1	115	1.3	1.2	114.3	0.468	1.0	15	44.6	114.3	1.0	-0.4	0.0	0.9	0.160	1.024	0.162	0.139	1.163	44.4	114.1	
SC-07	SB-12	Foundation Soils	22.6	11.0	121	1.3	1.2	119.4	0.458	1.0	15	45.1	119.4	1.0	-0.4	0.0	0.9	0.170	1.026	0.172	0.139	1.239	42.4	116.7	
SC-07	SB-12	Foundation Soils	22.7	11.0	121	1.3	1.2	124.6	0.448	1.0	15	43.5	124.6	1.0	-0.4	0.0	0.9	0.182	1.029	0.185	0.139	1.330	33.1	114.2	
SC-07	SB-12	Foundation Soils	22.8	10.9	121	1.4	1.2	137.7	0.424	1.0	15	41.8	137.7	1.0	-0.4	0.0	0.9	0.225	1.037	0.229	0.139	1.646	26.7	122.6	
SC-07	SB-12	Foundation Soils	22.9	10.8	121	1.4	1.2	141.8	0.417	1.0	15	39.9	141.8	1.0	-0.4	0.0	0.9	0.242	1.039	0.248	0.140	1.778	24.2	126.0	
SC-07	SB-12	Foundation Soils	23.0	10.7	124	1.4	1.2	144.9	0.412	1.0	15	37.4	144.9	1.0	-0.4	0.0	0.9	0.258	1.042	0.265	0.140	1.895	21.9	129.4	
SC-07	SB-12	Foundation Soils	23.0	10.6	124	1.4	1.2	148.9	0.405	1.0	15	37.1	148.9	1.0	-0.4	0.0	0.9	0.281	1.045	0.289	0.140	2.066	21.4	133.2	
SC-07	SB-12	Foundation Soils	23.1	10.5	124	1.4	1.2	154.0	0.397	1.0	15	37.7	154.0	1.0	-0.4	0.0	0.9	0.317	1.049	0.327	0.140	2.332	21.5	137.7	
SC-07	SB-12	Foundation Soils	23.2	10.5	124	1.4	1.2	154.5	0.396	1.0	15	38.5	154.5	1.0	-0.4	0.0	0.9	0.321	1.049	0.331	0.140	2.360	21.9	137.9	
SC-07	SB-12	Foundation Soils	23.3	10.4	124	1.4	1.2	155.4	0.394	1.0	15	38.2	155.4	1.0	-0.4	0.0	0.9	0.329	1.050	0.339	0.140	2.414	21.6	138.9	
SC-07	SB-12	Foundation Soils	23.4	10.3	124	1.4	1.2	157.5	0.391	1.0	15	35.7	157.5	1.0	-0.4	0.0	0.9	0.347	1.052	0.358	0.141	2.549	20.1	142.0	
SC-07	SB-12	Foundation Soils	23.5	10.2	124	1.4	1.2	156.2	0.393	1.0	15	31.1	156.2	1.0	-0.4	0.0	0.9	0.335	1.050	0.345	0.141	2.453	18.2	143.3	
SC-07	SB-12	Foundation Soils	23.5	10.1	124	1.4	1.2	152.6	0.399	1.0	15	28.3	152.6	1.0	-0.4	0.0	0.9	0.307	1.047	0.315	0.141	2.235	17.3	141.6	
SC-07	SB-12	Foundation Soils	23.6	10.0	124	1.4	1.2	152.2	0.400	1.0	15	30.3	152.2	1.0	-0.4	0.0	0.9	0.304	1.047	0.312	0.141	2.213	18.1	140.0	
SC-07	SB-12	Foundation Soils	23.7	10.0	124	1.4	1.2	152.1	0.400	1.0	15	29.6	152.1	1.0	-0.4	0.0	0.9	0.303	1.047	0.311	0.141	2.202	17.8	140.3	
SC-07	SB-12	Foundation Soils	23.8	9.9	124	1.4	1.2	152.2	0.400	1.0	15	27.3	152.2	1.0	-0.4	0.0	0.9	0.304	1.047	0.312	0.141	2.207	17.0	141.9	
SC-07	SB-12	Foundation Soils	23.9	9.8	124	1.4	1.2	153.9	0.397	1.0	15	28.7	153.9	1.0	-0.4	0.0	0.9	0.316	1.049	0.325	0.142	2.295	17.4	142.6	
SC-07	SB-12	Foundation Soils	23.9	9.7	124	1.4	1.2	154.7	0.396	1.0	15	33.9	154.7	1.0	-0.4	0.1	0.9	0.323	1.049	0.332	0.142	2.341	19.4	140.2	
SC-07	SB-12	Foundation Soils	24.0	9.6	121	1.4	1.2	152.6	0.399	0.9	15	41.1	152.6	1.0	-0.4	0.1	0.9	0.307	1.048	0.315	0.142	2.219	24.0	135.5	
SC-07	SB-12	Foundation Soils	24.1	9.6	121	1.4	1.2	149.0	0.405	0.9	15	43.1	149.0	1.0	-0.4	0.1	0.9	0.282	1.045	0.288	0.142	2.030	26.5	132.3	
SC-07	SB-12	Foundation Soils	24.2	9.5	121	1.4	1.2	148.1	0.406	0.9	15	42.8	148.1	1.0	-0.5	0.1	0.9	0.276	1.044	0.283	0.142	1.987	26.2	131.5	
SC-07	SB-12	Foundation Soils	24.3	9.4	121	1.4	1.2	147.2	0.408	0.9	15	43.4	147.2	1.0	-0.5	0.1	0.9	0.271	1.043	0.277	0.142	1.944	27.2	130.9	
SC-07	SB-12	Foundation Soils	24.4	9.3	121	1.4	1.2	157.0	0.392	0.9	15	42.4	157.0	1.0	-0.5	0.1	0.9	0.342	1.051	0.351	0.142	2.465	24.6	139.2	
SC-07	SB-12	Foundation Soils	24.4	9.2	124	1.5	1.2	169.5	0.373	0.9	15	34.4	169.5	1.0	-0.5	0.1	0.9	0.495	1.063	0.512	0.143	3.592	19.0	154.1	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-07	SB-12	Foundation Soils	24.5	9.1	124	1.5	1.2	157.8	0.391	0.9	15	5.0	157.8	1.0	-0.5	0.1	0.9	0.350	1.052	0.359	0.143	2.515	11.4	164.3	
SC-07	SB-12	Foundation Soils	24.6	9.1	124	1.5	1.2	178.5	0.359	0.9	15	0.0	178.5	1.0	-0.5	0.1	0.9	0.683	1.072	0.711	0.143	4.974	6.0	184.5	
SC-07	SB-12	Foundation Soils	24.7	9.0	124	1.5	1.2	197.5	0.333	1.0	15	0.0	197.5	1.0	-0.5	0.1	0.9	1.644	1.082	1.712	0.143	11.965	6.0	203.5	
SC-07	SB-12	Foundation Soils	24.8	8.9	124	1.5	1.2	205.2	0.323	1.0	15	0.0	205.2	1.0	-0.5	0.1	0.9	2.569	1.082	2.664	0.143	18.603	6.0	211.2	
SC-07	SB-12	Foundation Soils	24.9	8.8	124	1.5	1.2	203.9	0.324	1.0	15	0.0	203.9	1.0	-0.5	0.1	0.9	2.367	1.082	2.454	0.143	17.121	6.0	209.9	
SC-07	SB-12	Foundation Soils	24.9	8.7	124	1.5	1.2	203.9	0.324	1.0	15	0.0	203.9	1.0	-0.5	0.1	0.9	2.372	1.082	2.458	0.143	17.130	6.0	209.9	
SC-07	SB-12	Foundation Soils	25.0	8.7	124	1.5	1.2	203.6	0.325	1.0	15	0.0	203.6	1.0	-0.5	0.1	0.9	2.335	1.082	2.419	0.144	16.841	6.0	209.6	
SC-07	SB-12	Foundation Soils	25.1	8.6	124	1.5	1.2	198.4	0.332	0.9	15	0.0	198.4	1.0	-0.5	0.1	0.9	1.727	1.082	1.792	0.144	12.468	6.0	204.4	
SC-07	SB-12	Foundation Soils	25.2	8.5	124	1.5	1.2	179.0	0.359	0.9	15	0.0	179.0	1.0	-0.5	0.1	0.9	0.698	1.073	0.724	0.144	5.034	7.4	186.4	
SC-07	SB-12	Foundation Soils	25.3	8.4	124	1.5	1.2	167.7	0.375	0.9	15	0.2	167.7	1.0	-0.5	0.1	0.9	0.467	1.061	0.480	0.144	3.334	9.1	176.6	
SC-07	SB-12	Foundation Soils	25.3	8.3	124	1.5	1.2	160.5	0.386	0.9	15	12.1	160.5	1.0	-0.5	0.1	0.9	0.376	1.054	0.385	0.144	2.672	13.1	161.4	
SC-07	SB-12	Foundation Soils	25.4	8.2	124	1.5	1.2	158.1	0.390	0.9	15	22.3	158.1	1.0	-0.5	0.1	0.9	0.353	1.052	0.361	0.144	2.499	15.4	151.3	
SC-07	SB-12	Foundation Soils	25.5	8.2	124	1.5	1.3	153.4	0.398	0.9	15	24.0	153.4	1.0	-0.5	0.1	0.9	0.313	1.048	0.319	0.144	2.209	16.0	145.5	
SC-07	SB-12	Foundation Soils	25.6	8.1	124	1.5	1.3	147.5	0.407	0.9	15	26.1	147.5	1.0	-0.5	0.1	0.9	0.273	1.044	0.277	0.145	1.919	16.8	138.2	
SC-07	SB-12	Foundation Soils	25.7	8.0	124	1.5	1.3	137.7	0.424	0.9	15	32.4	137.7	1.0	-0.5	0.1	0.9	0.224	1.036	0.227	0.145	1.568	19.6	124.8	
SC-07	SB-12	Foundation Soils	25.8	7.9	124	1.5	1.3	130.3	0.437	0.9	15	37.0	130.3	1.0	-0.5	0.1	0.9	0.198	1.032	0.200	0.145	1.380	22.9	116.2	
SC-07	SB-12	Foundation Soils	25.8	7.8	121	1.5	1.3	119.7	0.457	0.9	15	40.4	119.7	1.0	-0.5	0.1	0.9	0.170	1.026	0.171	0.145	1.180	28.2	107.5	
SC-07	SB-12	Foundation Soils	25.9	7.8	121	1.5	1.3	113.5	0.470	0.9	15	41.3	113.5	1.0	-0.5	0.1	0.9	0.158	1.023	0.158	0.145	1.092	31.5	103.8	
SC-07	SB-12	Foundation Soils	26.0	7.7	121	1.5	1.3	103.8	0.490	0.9	15	40.0	103.8	1.0	-0.5	0.1	0.9	0.142	1.019	0.142	0.145	0.980	31.9	95.7	0.113
SC-07	SB-12	Foundation Soils	26.1	7.6	121	1.6	1.3	98.1	0.502	0.9	15	39.8	98.1	1.0	-0.5	0.1	0.9	0.135	1.017	0.135	0.145	0.926	33.5	91.8	0.107
SC-07	SB-12	Foundation Soils	26.2	7.5	121	1.6	1.3	95.6	0.508	0.9	15	40.9	95.6	1.0	-0.5	0.1	0.9	0.132	1.016	0.132	0.145	0.904	39.4	94.1	0.110
SC-07	SB-12	Foundation Soils	26.2	7.4	121	1.6	1.3	93.4	0.513	0.9	15	41.1	93.4	1.0	-0.5	0.1	0.9	0.129	1.016	0.129	0.146	0.885	42.4	94.7	0.111
SC-07	SB-12	Foundation Soils	26.3	7.3	115	1.6	1.3	84.2	0.535	0.9	15	40.3	84.2	1.0	-0.5	0.1	0.9	0.120	1.013	0.119	0.146	0.817	47.6	91.4	0.106
SC-07	SB-12	Foundation Soils	26.4	7.3	115	1.6	1.3	80.8	0.544	0.9	15	39.9	80.8	1.0	-0.5	0.1	0.9	0.116	1.012	0.116	0.146	0.794	48.5	89.4	0.103
SC-07	SB-12	Foundation Soils	26.5	7.2	121	1.6	1.3	83.4	0.538	0.9	15	39.7	83.4	1.0	-0.5	0.1	0.9	0.119	1.013	0.118	0.146	0.810	43.6	87.3	0.100
SC-07	SB-12	Foundation Soils	26.6	7.1	121	1.6	1.3	91.8	0.517	0.9	15	39.3	91.8	1.0	-0.5	0.1	0.9	0.128	1.015	0.127	0.146	0.869	34.8	87.4	0.100
SC-07	SB-12	Foundation Soils	26.7	7.0	121	1.6	1.3	96.5	0.506	0.9	15	37.3	96.5	1.0	-0.5	0.1	0.9	0.133	1.017	0.132	0.146	0.906	28.4	87.6	0.101
SC-07	SB-12	Foundation Soils	26.7	6.9	124	1.6	1.3	91.1	0.519	0.9	15	28.4	91.1	1.0	-0.5	0.1	0.9	0.127	1.015	0.126	0.146	0.862	20.0	82.8	0.094
SC-07	SB-12	Foundation Soils	26.8	6.9	124	1.6	1.3	90.1	0.521	0.9	15	27.5	90.1	1.0	-0.5	0.1	0.9	0.126	1.015	0.125	0.147	0.854	19.6	82.2	0.093
SC-07	SB-12	Foundation Soils	26.9	6.8	124	1.6	1.3	93.0	0.514	0.9	15	33.3	93.0	1.0	-0.5	0.1	0.9	0.129	1.015	0.128	0.147	0.875	23.7	83.4	0.095
SC-07	SB-12	Foundation Soils	27.0	6.7	121	1.6	1.3	93.1	0.514	0.9	15	38.3	93.1	1.0	-0.5	0.1	0.9	0.129	1.016	0.128	0.147	0.874	31.4	86.2	0.099
SC-07	SB-12	Foundation Soils	27.1	6.6	121	1.6	1.3	86.9	0.529	0.9	15	39.3	86.9	1.0	-0.5	0.1	0.9	0.122	1.014	0.122	0.147	0.828	38.1	85.6	0.098
SC-07	SB-12	Foundation Soils	27.1	6.5	121	1.6	1.3	84.5	0.535	0.9	15	39.6	84.5	1.0	-0.5	0.1	0.9	0.120	1.013	0.119	0.147	0.811	41.7	86.6	0.099
SC-07	SB-12	Foundation Soils	27.2	6.4	121	1.6	1.3	86.3	0.530	0.9	15	39.2	86.3	1.0	-0.5	0.1	0.9	0.122	1.014	0.121	0.147	0.823	38.1	85.1	0.097
SC-07	SB-12	Foundation Soils	27.3	6.4	121	1.6	1.3	88.5	0.525	0.9	15	39.2	88.5	1.0	-0.5	0.1	0.9	0.124	1.014	0.123	0.147	0.837	36.5	85.8	0.098
SC-07	SB-12	Foundation Soils	27.4	6.3	121	1.6	1.3	88.3	0.525	0.9	15	39.9	88.3	1.0	-0.5	0.1	0.9	0.124	1.014	0.123	0.147	0.835	39.8	88.2	0.102
SC-07	SB-12	Foundation Soils	27.5	6.2	121	1.6	1.3	86.7	0.529	0.9	15	40.1	86.7	1.0	-0.5	0.1	0.9	0.122	1.014	0.121	0.147	0.823	42.3	88.9	0.103
SC-07	SB-12	Foundation Soils	27.6	6.1	121	1.6	1.3	84.3	0.535	0.9	15	39.9	84.3	1.0	-0.5	0.1	0.9	0.120	1.013	0.119	0.148	0.806	43.6	88.0	0.101
SC-07	SB-12	Foundation Soils	27.6	6.0	121	1.6	1.3	87.5	0.527	0.9	15	39.9	87.5	1.0	-0.5	0.1	0.9	0.123	1.014	0.122	0.148	0.827	40.9	88.4	0.102
SC-07	SB-12	Foundation Soils	27.7	5.9	121	1.7	1.3	99.3	0.500	0.9	15	39.8	99.3	1.0	-0.5	0.1	0.9	0.136	1.018	0.136	0.148	0.917	33.0	92.5	0.108
SC-07	SB-12	Foundation Soils	27.8	5.9	121	1.7	1.3	105.6	0.486	0.9	15	38.3	105.6	1.0	-0.5	0.1	0.9	0.145	1.020	0.144	0.148	0.976	28.0	95.3	0.112
SC-07	SB-12	Foundation Soils	27.9	5.8	124	1.7	1.3	109.1	0.479	0.9	15	34.2	109.1	1.0	-0.5	0.1	0.9	0.151	1.021	0.150	0.148	1.012	22.7	97.6	
SC-07	SB-12	Foundation Soils	28.0	5.7	124	1.7	1.3	99.1	0.500	0.9	15	14.9	99.1	1.0	-0.5	0.1	0.9	0.136	1.017	0.135	0.148	0.913	14.4	98.6	0.117
SC-07	SB-12	Foundation Soils	28.1	5.6	124	1.7	1.3	92.2	0.516	0.9	15	0.6	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.127	0.148	0.857	9.7	101.4	0.122
SC-07	SB-12	Foundation Soils	28.1	5.5	124	1.7	1.3	94.7	0.510	0.9	15	0.0	94.7	1.0	-0.6	0.1	0.9	0.131	1.016	0.130	0.148	0.875	7.9	102.6	0.124
SC-07	SB-12	Foundation Soils	28.2	5.5	124	1.7	1.3	93.2	0.514	0.9	15	1.6	93.2	1.0	-0.6	0.1	0.9	0.129	1.016	0.128	0.148	0.863	10.4	102.1	0.123
SC-07	SB-12	Foundation Soils	28.3	5.4	124	1.7	1.3	102.5	0.493	0.9	15	15.0	102.5	1.0	-0.6	0.1	0.9	0.141	1.019	0.140	0.149	0.940	14.4	101.8	0.122
SC-07	SB-12	Foundation Soils	28.4	5.3	124	1.7	1.3	108.0	0.481	0.9	15	24.2	108.0	1.0	-0.6	0.1	0.9	0.149	1.021	0.148	0.149	0.995	17.2	101.1	0.121
SC-07	SB-12	Foundation Soils	28.5	5.2	124	1.7	1.3	109.2	0.478	0.9	15	32.1	109.2	1.0	-0.6	0.1	0.9	0.151	1.021	0.150	0.149	1.007	21.1	98.3	
SC-07	SB-12	Foundation Soils	28.5	5.1	121	1.7	1.3	105.7	0.486	0.9	15	38.2	105.7	1.0	-0.6	0.1	0.9	0.145	1.020	0.144	0.149	0.969	27.7	95.2	0.112
SC-07	SB-12	Foundation Soils	28.6	5.0	121	1.7	1.3	106.2	0.485	0.9	15	38.0	106.2	1.0	-0.6	0.1	0.9	0.146	1.020	0.145	0.149	0.973	27.3	95.5	0.112
SC-07	SB-12	Foundation Soils	28.7	5.0	121	1.7	1.3	107.9	0.481	0.9	15	36.6	107.9	1.0	-0.6	0.1	0.9	0.149	1.021	0.148	0.149	0.990	25.2	96.5	0.114
SC-07	SB-12	Foundation Soils	28.8	4.9	121	1.7	1.3	106.7	0.484	0.9	15	35.4	106.7	1.0	-0.6	0.1	0.9	0.147	1.020	0.146	0.149	0.976	24.0	95.3	0.112
SC-07	SB-12	Foundation Soils	28.9	4.8	124	1.7	1.4	105.3	0.487	0.9	15	34.0	105.3	1.0	-0.6	0.1	0.9	0.145	1.020	0.144	0.149	0.962	23.0	94.3	0.110
SC-07	SB-12	Foundation Soils	29.0	4.7	124	1.7	1.4	102.9	0.492	0.9	15	32.6	102.9	1.0	-0.6	0.1	0.9	0.141	1.019	0.140	0.149	0.938	22.0	92.3	0.108
SC-07	SB-12	Foundation Soils	29.0	4.6	124	1.7	1.4	100.0	0.498	0.9	15	31.5	100.0	1.0	-0.6	0.1	0.9	0.137	1.018	0.136	0.149	0.910	21.4	90.0	0.104
SC-07	SB-12	Foundation Soils	29.1	4.6	124	1.7	1.4	96.6	0.506	0.9	15	31.0	96.6	1.0	-0.6	0.1	0.9	0.133	1.017	0.132	0.150	0.881	21.4	86.9	0.100
SC-07	SB-12	Foundation Soils	29.2	4.5	121	1.7	1.4	97.5	0.504	0.9	15	35.9	97.5	1.0	-0.6	0.1	0.9	0.134	1.017	0.133	0.150	0.888	26.1	87.7	0.101
SC-07	SB-12	Foundation Soils	29.3	4.4	121	1.7	1.4	96.2	0.507	0.9	15	37.6	96.2	1.0	-0.6	0.1	0.9	0.133	1.016	0.131	0.150	0.876	28.9	87.5	0.101
SC-07	SB-12	Foundation Soils	29.4	4.3	121	1.8	1.4	89.8	0.522	0.9	15	38.7	89.8	1.0	-0.6	0.1	0.9	0.125	1.015	0.124	0.150	0.828	34.0	85.1	0.097
SC-07	SB-12	Foundation Soils	29.4	4.2	121	1.8	1.4	83.4	0.538	0.9	15	38.8	83.4	1.0	-0.6	0.1	0.9	0.119	1.013	0.118	0.150	0.784	38.0	82.6	0.094
SC-07	SB-12	Foundation Soils	29.5	4.1	121	1.8	1.4	87.1	0.528	0.9	15	38.8	87.1	1.0	-0.6	0.1	0.9	0.123	1.014	0.121	0.150	0.808	35.8	84.1	0.096
SC-07	SB-12	Foundation Soils	29.6	4.1	121	1.8	1.4	88.9	0.524	0.9	15	38.9	88.9	1.0	-0.6	0.1	0.9	0.124	1.014	0.123	0.150	0.819	35.1	85.1	0.097
SC-07	SB-12	Foundation Soils	29.7	4.0	121	1.8	1.4	85.7	0.532	0.9	15	38.7	85.7	1.0	-0.6	0.1	0.9	0.121	1.013	0.120	0.150	0.797	36.2	83.2	0.094
SC-07	SB-12	Foundation Soils	29.8	3.9	121	1.8	1.4	84.1	0.536	0.9	15	38.7	84.1	1.0	-0.6	0.1	0.9	0.120	1.013	0.118	0.150	0.786	36.9	82.3	0.093
SC-07	SB-12	Foundation Soils	29.9	3.8	121	1.8	1.4	88.0	0.526	0.9	15	38.5	88.0	1.0	-0.6	0.1	0.9	0.124	1.014	0.122	0.150	0.811	34.0	83.6	0.095
SC-07	SB-12	Foundation Soils	29.9	3.7	124	1.8	1.4	93.3	0.513	0.9	15	33.4	93.3	1.0	-0.6	0.1	0.9	0.129	1.016	0.128	0.151	0.848	23.7	83.6	0.095
SC-07	SB-12	Foundation Soils	30.0	3.7	124	1.8	1.4	90.4	0.520	0.9	15	16.0	90.4	1.0	-0.6	0.1	0.9	0.126	1.015	0.124	0.151	0.827	14.9	89.3	0.103
SC-07	SB-12	Foundation Soils	30.1	3.6	124	1.8	1.4	83.7	0.537	0.9	15	2.7	83.7	1.0	-0.6	0.1	0.9	0.119	1.013	0.118	0.151	0.781	11.0	92.0	0.107
SC-07	SB-12	Foundation Soils	30.2	3.5	124	1.8	1.4	85.0	0.533	0.9	15	1.4	85.0	1.0	-0.6	0.1	0.9	0.121	1.013	0.119	0.151	0.789	10.4	94.0	0.110
SC-07	SB-12	Foundation Soils	30.3	3.4	124	1.8	1.4	87.4	0.528	0.9	15	7.6	87.4	1.0	-0.6	0.1	0.9	0.123	1.014	0.121	0.151	0.804	12.5	92.3	0.108

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-07	SB-12	Foundation Soils	30.3	3.3	124	1.8	1.4	91.8	0.517	0.9	15	14.6	91.8	1.0	-0.6	0.1	0.9	0.127	1.015	0.126	0.151	0.834	14.5	91.7	0.107
SC-07	SB-12	Foundation Soils	30.4	3.2	124	1.8	1.4	94.1	0.512	0.9	15	18.3	94.1	1.0	-0.6	0.1	0.9	0.130	1.016	0.128	0.151	0.850	15.5	91.4	0.106
SC-07	SB-12	Foundation Soils	30.5	3.2	124	1.8	1.4	91.8	0.517	0.9	15	15.6	91.8	1.0	-0.6	0.1	0.9	0.128	1.015	0.126	0.151	0.833	14.8	90.9	0.105
SC-07	SB-12	Foundation Soils	30.6	3.1	124	1.8	1.4	96.7	0.506	0.9	15	20.7	96.7	1.0	-0.6	0.1	0.9	0.133	1.017	0.131	0.151	0.869	16.3	92.3	0.108
SC-07	SB-12	Foundation Soils	30.7	3.0	124	1.8	1.4	103.1	0.491	0.9	15	30.3	103.1	1.0	-0.6	0.1	0.9	0.141	1.019	0.140	0.151	0.923	20.4	93.2	0.109
SC-07	SB-12	Foundation Soils	30.8	2.9	121	1.8	1.4	103.9	0.490	0.9	15	37.3	103.9	1.0	-0.6	0.1	0.9	0.143	1.019	0.141	0.151	0.930	26.8	93.4	0.109
SC-07	SB-12	Foundation Soils	30.8	2.8	121	1.8	1.4	97.8	0.503	0.9	15	38.2	97.8	1.0	-0.6	0.1	0.9	0.134	1.017	0.133	0.151	0.876	29.7	89.3	0.103
SC-07	SB-12	Foundation Soils	30.9	2.7	121	1.8	1.4	95.2	0.509	0.9	15	38.2	95.2	1.0	-0.6	0.1	0.9	0.131	1.016	0.130	0.152	0.855	30.5	87.5	0.101
SC-07	SB-12	Foundation Soils	31.0	2.7	121	1.9	1.4	93.1	0.514	0.9	15	38.0	93.1	1.0	-0.6	0.1	0.9	0.129	1.016	0.127	0.152	0.839	30.8	85.9	0.098
SC-07	SB-12	Foundation Soils	31.1	2.6	121	1.9	1.4	91.5	0.518	0.9	15	37.8	91.5	1.0	-0.6	0.1	0.9	0.127	1.015	0.125	0.152	0.827	30.7	84.5	0.096
SC-07	SB-12	Foundation Soils	31.2	2.5	121	1.9	1.4	92.2	0.516	0.9	15	37.5	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.126	0.152	0.831	29.8	84.6	0.096
SC-07	SB-12	Foundation Soils	31.2	2.4	121	1.9	1.4	91.4	0.518	0.9	15	36.9	91.4	1.0	-0.6	0.1	0.9	0.127	1.015	0.125	0.152	0.825	29.0	83.5	0.095
SC-07	SB-12	Foundation Soils	31.3	2.3	121	1.9	1.4	85.6	0.532	0.9	15	37.6	85.6	1.0	-0.6	0.1	0.9	0.121	1.013	0.119	0.152	0.785	32.6	80.6	0.091
SC-07	SB-12	Foundation Soils	31.4	2.3	121	1.9	1.4	81.7	0.542	0.9	15	38.5	81.7	1.0	-0.6	0.1	0.9	0.117	1.012	0.116	0.152	0.760	37.8	81.0	0.092
SC-07	SB-12	Foundation Soils	31.5	2.2	121	1.9	1.4	79.7	0.547	0.8	15	39.0	79.7	1.0	-0.6	0.1	0.9	0.116	1.012	0.114	0.152	0.748	42.7	83.4	0.095
SC-07	SB-12	Foundation Soils	31.6	2.1	115	1.9	1.4	73.7	0.563	0.8	15	38.7	73.7	1.0	-0.6	0.1	0.9	0.110	1.011	0.109	0.152	0.713	47.4	82.4	0.093
SC-07	SB-12	Foundation Soils	31.7	2.0	115	1.9	1.4	70.8	0.571	0.8	15	38.4	70.8	1.0	-0.6	0.1	0.9	0.108	1.010	0.106	0.152	0.698	49.5	81.9	0.093
SC-07	SB-12	Foundation Soils	31.7	1.9	121	1.9	1.4	75.4	0.558	0.8	15	38.5	75.4	1.0	-0.7	0.1	0.9	0.112	1.011	0.110	0.152	0.722	43.6	80.6	0.091
SC-07	SB-12	Foundation Soils	31.8	1.8	121	1.9	1.4	85.4	0.533	0.8	15	37.6	85.4	1.0	-0.7	0.1	0.9	0.121	1.013	0.119	0.152	0.780	32.5	80.3	0.091
SC-07	SB-12	Foundation Soils	31.9	1.8	121	1.9	1.4	86.8	0.529	0.8	15	36.6	86.8	1.0	-0.7	0.1	0.9	0.122	1.014	0.120	0.152	0.789	29.5	79.8	0.090
SC-07	SB-12	Foundation Soils	32.0	1.7	121	1.9	1.4	86.0	0.531	0.8	15	35.8	86.0	1.0	-0.7	0.1	0.9	0.122	1.014	0.120	0.153	0.783	28.2	78.5	0.088
SC-07	SB-12	Foundation Soils	32.1	1.6	121	1.9	1.4	85.8	0.531	0.8	15	35.3	85.8	1.0	-0.7	0.1	0.9	0.121	1.013	0.119	0.153	0.781	27.5	78.0	0.087
SC-07	SB-12	Foundation Soils	32.2	1.5	121	1.9	1.4	87.3	0.528	0.8	15	36.0	87.3	1.0	-0.7	0.1	0.9	0.123	1.014	0.121	0.153	0.790	28.2	79.6	0.090
SC-07	SB-12	Foundation Soils	32.2	1.4	121	1.9	1.5	87.6	0.527	0.8	15	36.6	87.6	1.0	-0.7	0.1	0.9	0.123	1.014	0.121	0.153	0.792	29.5	80.4	0.091
SC-07	SB-12	Foundation Soils	32.3	1.4	121	1.9	1.5	92.9	0.514	0.9	15	35.0	92.9	1.0	-0.7	0.1	0.9	0.129	1.015	0.127	0.153	0.828	25.6	83.5	0.095
SC-07	SB-12	Foundation Soils	32.4	1.3	121	1.9	1.5	94.2	0.511	0.9	15	34.3	94.2	1.0	-0.7	0.1	0.9	0.130	1.016	0.128	0.153	0.837	24.6	84.5	0.096
SC-07	SB-12	Foundation Soils	32.5	1.2	124	1.9	1.5	88.4	0.525	0.8	15	26.1	88.4	1.0	-0.7	0.1	0.9	0.124	1.014	0.122	0.153	0.796	18.9	81.2	0.092
SC-07	SB-12	Foundation Soils	32.6	1.1	124	1.9	1.5	86.0	0.531	0.8	15	23.3	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.119	0.153	0.780	17.6	80.4	0.091
SC-07	SB-12	Foundation Soils	32.6	1.0	124	2.0	1.5	86.6	0.529	0.8	15	22.5	86.6	1.0	-0.7	0.1	0.9	0.122	1.014	0.120	0.153	0.783	17.3	81.4	0.092
SC-07	SB-12	Foundation Soils	32.7	0.9	124	2.0	1.5	92.6	0.515	0.8	15	26.6	92.6	1.0	-0.7	0.1	0.9	0.128	1.015	0.126	0.153	0.823	18.9	84.9	0.097
SC-07	SB-12	Foundation Soils	32.8	0.9	124	2.0	1.5	93.9	0.512	0.8	15	33.1	93.9	1.0	-0.7	0.1	0.9	0.130	1.016	0.128	0.153	0.832	23.4	84.2	0.096
SC-07	SB-12	Foundation Soils	32.9	0.8	121	2.0	1.5	92.8	0.514	0.8	15	34.2	92.8	1.0	-0.7	0.1	0.9	0.129	1.015	0.126	0.153	0.824	24.7	83.3	0.095
SC-07	SB-12	Foundation Soils	33.0	0.7	124	2.0	1.5	90.2	0.521	0.8	15	32.8	90.2	1.0	-0.7	0.1	0.9	0.126	1.015	0.123	0.153	0.805	23.5	80.9	0.091
SC-07	SB-12	Foundation Soils	33.1	0.6	121	2.0	1.5	92.0	0.516	0.8	15	35.0	92.0	1.0	-0.7	0.1	0.9	0.128	1.015	0.125	0.153	0.817	25.8	82.8	0.094
SC-07	SB-12	Foundation Soils	33.1	0.5	121	2.0	1.5	90.1	0.521	0.8	15	36.4	90.1	1.0	-0.7	0.1	0.9	0.126	1.015	0.123	0.154	0.803	28.3	82.0	0.093
SC-07	SB-12	Foundation Soils	33.2	0.5	121	2.0	1.5	89.1	0.523	0.8	15	37.1	89.1	1.0	-0.7	0.1	0.9	0.125	1.014	0.122	0.154	0.796	30.1	82.0	0.093
SC-07	SB-12	Foundation Soils	33.3	0.4	121	2.0	1.5	88.4	0.525	0.8	15	38.1	88.4	1.0	-0.7	0.1	0.9	0.124	1.014	0.122	0.154	0.791	32.8	83.1	0.094
SC-07	SB-12	Foundation Soils	33.4	0.3	121	2.0	1.5	84.1	0.536	0.8	15	38.4	84.1	1.0	-0.7	0.1	0.9	0.120	1.013	0.117	0.154	0.763	36.0	81.7	0.092
SC-07	SB-12	Foundation Soils	33.5	0.2	121	2.0	1.5	83.1	0.538	0.8	15	38.1	83.1	1.0	-0.7	0.1	0.9	0.119	1.013	0.116	0.154	0.757	35.3	80.3	0.091
SC-07	SB-12	Foundation Soils	33.5	0.1	121	2.0	1.5	84.3	0.535	0.8	15	36.9	84.3	1.0	-0.7	0.1	0.9	0.120	1.013	0.117	0.154	0.763	31.0	78.4	0.088
SC-07	SB-12	Foundation Soils	33.6	0.0	124	2.0	1.5	85.4	0.532	0.8	15	32.6	85.4	1.0	-0.7	0.1	0.9	0.121	1.013	0.119	0.154	0.770	23.9	76.8	0.086
SC-07	SB-12	Foundation Soils	33.7	-0.0	124	2.0	1.5	77.2	0.554	0.8	15	19.5	77.2	1.0	-0.7	0.1	0.9	0.113	1.011	0.111	0.154	0.721	16.4	74.1	0.082
SC-07	SB-12	Foundation Soils	33.8	-0.1	124	2.0	1.5	68.2	0.579	0.8	15	1.7	68.2	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.154	0.674	10.6	77.0	0.086
SC-07	SB-12	Foundation Soils	33.9	-0.2	124	2.0	1.5	72.3	0.567	0.8	15	0.0	72.3	1.0	-0.7	0.1	0.9	0.109	1.011	0.107	0.154	0.694	6.0	78.3	0.088
SC-07	SB-12	Foundation Soils	34.0	-0.3	124	2.0	1.5	74.7	0.560	0.8	15	0.0	74.7	1.0	-0.7	0.1	0.9	0.111	1.011	0.109	0.154	0.707	6.0	80.7	0.091
SC-07	SB-12	Foundation Soils	34.0	-0.4	124	2.0	1.5	75.2	0.559	0.8	15	0.0	75.2	1.0	-0.7	0.1	0.9	0.112	1.011	0.109	0.154	0.709	6.0	81.2	0.092
SC-07	SB-12	Foundation Soils	34.1	-0.4	124	2.0	1.5	76.7	0.555	0.8	15	0.0	76.7	1.0	-0.7	0.1	0.9	0.113	1.011	0.111	0.154	0.717	6.0	82.6	0.094
SC-07	SB-12	Foundation Soils	34.2	-0.5	124	2.0	1.5	78.3	0.551	0.8	15	0.0	78.3	1.0	-0.7	0.1	0.9	0.114	1.012	0.112	0.154	0.725	6.0	84.3	0.096
SC-07	SB-12	Foundation Soils	34.3	-0.6	124	2.1	1.5	81.7	0.542	0.8	15	0.0	81.7	1.0	-0.7	0.1	0.9	0.117	1.012	0.115	0.154	0.744	6.0	87.7	0.101
SC-07	SB-12	Foundation Soils	34.4	-0.7	124	2.1	1.5	84.4	0.535	0.8	15	0.0	84.4	1.0	-0.7	0.1	0.9	0.120	1.013	0.117	0.154	0.760	6.0	90.4	0.105
SC-07	SB-12	Foundation Soils	34.4	-0.8	124	2.1	1.5	82.9	0.539	0.8	15	0.0	82.9	1.0	-0.7	0.1	0.9	0.118	1.013	0.116	0.154	0.751	6.0	88.9	0.103
SC-07	SB-12	Foundation Soils	34.5	-0.9	124	2.1	1.5	71.2	0.570	0.8	15	1.0	71.2	1.0	-0.7	0.1	0.9	0.108	1.010	0.106	0.155	0.686	10.1	80.3	0.091
SC-07	SB-12	Foundation Soils	34.6	-0.9	124	2.1	1.5	91.7	0.517	0.8	15	28.7	91.7	1.0	-0.7	0.1	0.9	0.127	1.015	0.125	0.155	0.806	20.2	83.2	0.094
SC-07	SB-12	Foundation Soils	34.7	-1.0	121	2.1	1.5	87.5	0.527	0.8	15	34.4	87.5	1.0	-0.7	0.1	0.9	0.123	1.014	0.120	0.155	0.778	25.8	78.9	0.089
SC-07	SB-12	Foundation Soils	34.8	-1.1	121	2.1	1.5	85.5	0.532	0.8	15	36.7	85.5	1.0	-0.7	0.1	0.9	0.121	1.013	0.118	0.155	0.765	30.1	79.0	0.089
SC-07	SB-12	Foundation Soils	34.9	-1.2	121	2.1	1.5	86.0	0.531	0.8	15	36.8	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.119	0.155	0.768	30.3	79.5	0.090
SC-07	SB-12	Foundation Soils	34.9	-1.3	121	2.1	1.5	88.3	0.525	0.8	15	36.0	88.3	1.0	-0.7	0.1	0.9	0.124	1.014	0.121	0.155	0.782	28.0	80.3	0.091
SC-07	SB-12	Foundation Soils	35.0	-1.4	121	2.1	1.5	88.9	0.524	0.8	15	37.1	88.9	1.0	-0.7	0.1	0.9	0.124	1.014	0.122	0.155	0.786	30.0	81.8	0.093
SC-07	SB-12	Foundation Soils	35.1	-1.4	121	2.1	1.5	89.3	0.523	0.8	15	37.1	89.3	1.0	-0.7	0.1	0.9	0.125	1.014	0.122	0.155	0.788	30.0	82.2	0.093
SC-07	SB-12	Foundation Soils	35.2	-1.5	121	2.1	1.5	90.1	0.521	0.8	15	34.9	90.1	1.0	-0.7	0.1	0.9	0.126	1.015	0.123	0.155	0.793	26.0	81.2	0.092
SC-07	SB-12	Foundation Soils	35.3	-1.6	124	2.1	1.5	80.8	0.544	0.8	15	23.0	80.8	1.0	-0.8	0.1	0.9	0.116	1.012	0.114	0.155	0.735	17.8	75.5	0.084
SC-07	SB-12	Foundation Soils	35.4	-1.7	124	2.1	1.5	60.6	0.602	0.8	15	0.1	60.6	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.155	0.631	9.1	69.6	0.077
SC-07	SB-12	Foundation Soils	35.4	-1.8	124	2.1	1.5	65.2	0.588	0.8	15	0.0	65.2	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.155	0.653	6.8	72.1	0.080
SC-07	SB-12	Foundation Soils	35.5	-1.8	124	2.1	1.6	71.1	0.571	0.8	15	0.0	71.1	1.0	-0.8	0.1	0.9	0.108	1.010	0.106	0.155	0.681	6.0	77.1	0.086
SC-07	SB-12	Foundation Soils	35.6	-1.9	124	2.1	1.6	63.2	0.594	0.8	15	0.0	63.2	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.155	0.642	6.0	69.1	0.076
SC-07	SB-12	Foundation Soils	35.7	-2.0	124	2.1	1.6	61.3	0.600	0.8	15	0.0	61.3	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.155	0.633	6.0	67.3	0.074
SC-07	SB-12	Foundation Soils	35.8	-2.1	124	2.1	1.6	63.7	0.592	0.8	15	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.155	0.644	6.1	69.8	0.077
SC-07	SB-12	Foundation Soils	35.8	-2.2	124	2.1	1.6	61.3	0.600	0.8	15	0.0	61.3	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.155	0.633	8.4	69.7	0.077
SC-07	SB-12	Foundation Soils	35.9	-2.3	124	2.2	1.6	70.5	0.572	0.8	15	5.0	70.5	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.155	0.677	11.9	77.3	0.087
SC-07	SB-12	Foundation Soils	36.0	-2.3	121	2.2	1.6	98.8	0.501	0.8	15	39.2	98.8	1.0	-0.8	0.1	0.9	0.136	1.017	0.132	0.155	0.852	31.7	91.3	0.106

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-08	SB-12 & SB-13	Foundation Soils	15.0	16.8	115	0.9	0.9	42.6	0.668	1.1	15	34.9	42.6	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.125	0.711	72.5	80.2	0.090
SC-08	SB-12 & SB-13	Foundation Soils	15.1	16.8	121	0.9	0.9	51.1	0.634	1.1	15	35.0	51.1	1.0	-0.2	0.0	1.0	0.093	1.008	0.095	0.125	0.759	45.7	61.9	0.067
SC-08	SB-12 & SB-13	Foundation Soils	15.2	16.7	121	0.9	0.9	60.9	0.601	1.1	15	32.9	60.9	1.0	-0.2	0.0	1.0	0.100	1.009	0.102	0.126	0.816	29.6	57.6	0.062
SC-08	SB-12 & SB-13	Foundation Soils	15.3	16.6	124	0.9	0.9	66.0	0.585	1.1	15	27.5	66.0	1.0	-0.2	0.0	1.0	0.104	1.009	0.107	0.126	0.847	21.4	59.9	0.065
SC-08	SB-12 & SB-13	Foundation Soils	15.3	16.5	124	0.9	0.9	67.9	0.580	1.1	15	30.4	67.9	1.0	-0.2	0.0	1.0	0.106	1.010	0.108	0.126	0.857	24.0	61.5	0.067
SC-08	SB-12 & SB-13	Foundation Soils	15.4	16.4	121	0.9	0.9	67.9	0.580	1.1	15	32.8	67.9	1.0	-0.2	0.0	1.0	0.106	1.010	0.108	0.126	0.854	27.3	62.4	0.068
SC-08	SB-12 & SB-13	Foundation Soils	15.5	16.3	121	0.9	0.9	66.6	0.584	1.1	15	34.1	66.6	1.0	-0.2	0.0	1.0	0.105	1.010	0.107	0.127	0.843	30.5	62.9	0.068
SC-08	SB-12 & SB-13	Foundation Soils	15.6	16.3	121	0.9	0.9	65.5	0.587	1.1	15	35.0	65.5	1.0	-0.2	0.0	1.0	0.104	1.009	0.106	0.127	0.834	33.4	63.9	0.070
SC-08	SB-12 & SB-13	Foundation Soils	15.7	16.2	121	0.9	0.9	64.4	0.590	1.1	15	34.8	64.4	1.0	-0.3	0.0	1.0	0.103	1.009	0.105	0.127	0.825	33.2	62.8	0.068
SC-08	SB-12 & SB-13	Foundation Soils	15.7	16.1	121	0.9	0.9	63.8	0.592	1.1	15	34.3	63.8	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.128	0.819	32.1	61.5	0.067
SC-08	SB-12 & SB-13	Foundation Soils	15.8	16.0	121	0.9	0.9	61.6	0.599	1.1	15	35.5	61.6	1.0	-0.3	0.0	1.0	0.101	1.009	0.103	0.128	0.803	37.8	63.9	0.070
SC-08	SB-12 & SB-13	Foundation Soils	15.9	15.9	121	0.9	0.9	59.7	0.605	1.1	15	36.1	59.7	1.0	-0.3	0.0	1.0	0.099	1.009	0.101	0.128	0.790	43.9	67.5	0.074
SC-08	SB-12 & SB-13	Foundation Soils	16.0	15.9	115	0.9	0.9	54.7	0.622	1.1	15	36.2	54.7	1.0	-0.3	0.0	1.0	0.096	1.008	0.097	0.129	0.758	55.1	73.5	0.082
SC-08	SB-12 & SB-13	Foundation Soils	16.1	15.8	115	1.0	0.9	50.6	0.637	1.1	15	36.0	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.129	0.732	65.0	79.6	0.090
SC-08	SB-12 & SB-13	Foundation Soils	16.2	15.7	115	1.0	0.9	47.8	0.647	1.1	15	35.7	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.129	0.715	70.7	82.8	0.094
SC-08	SB-12 & SB-13	Foundation Soils	16.2	15.6	111	1.0	0.9	43.9	0.662	1.1	15	35.2	43.9	1.0	-0.3	0.0	1.0	0.088	1.007	0.090	0.129	0.692	75.4	84.1	0.096
SC-08	SB-12 & SB-13	Foundation Soils	16.3	15.5	111	1.0	0.9	41.2	0.674	1.1	15	34.8	41.2	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.130	0.675	75.4	81.8	0.093
SC-08	SB-12 & SB-13	Foundation Soils	16.4	15.4	111	1.0	0.9	39.9	0.679	1.1	15	34.6	39.9	1.0	-0.3	0.0	1.0	0.085	1.007	0.087	0.130	0.666	75.4	80.7	0.091
SC-08	SB-12 & SB-13	Foundation Soils	16.5	15.4	111	1.0	0.9	39.1	0.682	1.1	15	34.4	39.1	1.0	-0.3	0.0	1.0	0.085	1.007	0.086	0.130	0.661	75.4	80.1	0.090
SC-08	SB-12 & SB-13	Foundation Soils	16.6	15.3	111	1.0	0.9	39.0	0.683	1.1	15	34.4	39.0	1.0	-0.3	0.0	1.0	0.085	1.007	0.086	0.131	0.659	75.4	80.0	0.090
SC-08	SB-12 & SB-13	Foundation Soils	16.7	15.2	111	1.0	0.9	38.6	0.685	1.1	15	34.3	38.6	1.0	-0.3	0.0	1.0	0.084	1.007	0.086	0.131	0.655	75.4	79.7	0.090
SC-08	SB-12 & SB-13	Foundation Soils	16.7	15.1	111	1.0	0.9	38.1	0.687	1.1	15	34.3	38.1	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.131	0.651	75.4	79.2	0.089
SC-08	SB-12 & SB-13	Foundation Soils	16.8	15.0	111	1.0	0.9	37.9	0.688	1.1	15	34.2	37.9	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.131	0.648	75.4	79.0	0.089
SC-08	SB-12 & SB-13	Foundation Soils	16.9	15.0	111	1.0	0.9	37.6	0.689	1.1	15	34.2	37.6	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.132	0.645	75.4	78.8	0.089
SC-08	SB-12 & SB-13	Foundation Soils	17.0	14.9	111	1.0	0.9	37.5	0.690	1.1	15	34.2	37.5	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.132	0.643	75.4	78.7	0.088
SC-08	SB-12 & SB-13	Foundation Soils	17.1	14.8	111	1.0	0.9	38.4	0.686	1.1	15	34.3	38.4	1.0	-0.3	0.0	1.0	0.084	1.007	0.086	0.132	0.647	75.4	79.5	0.089
SC-08	SB-12 & SB-13	Foundation Soils	17.1	14.7	111	1.0	0.9	38.8	0.684	1.1	15	34.4	38.8	1.0	-0.3	0.0	1.0	0.085	1.007	0.086	0.133	0.647	75.4	79.8	0.090
SC-08	SB-12 & SB-13	Foundation Soils	17.2	14.6	111	1.0	0.9	38.3	0.686	1.1	15	34.3	38.3	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.133	0.643	75.4	79.4	0.089
SC-08	SB-12 & SB-13	Foundation Soils	17.3	14.5	111	1.0	0.9	37.6	0.689	1.1	15	34.2	37.6	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.133	0.638	75.4	78.8	0.089
SC-08	SB-12 & SB-13	Foundation Soils	17.4	14.5	111	1.0	1.0	37.8	0.688	1.1	15	34.2	37.8	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.133	0.638	75.4	79.0	0.089
SC-08	SB-12 & SB-13	Foundation Soils	17.5	14.4	111	1.0	1.0	39.9	0.679	1.1	15	34.6	39.9	1.0	-0.3	0.0	1.0	0.085	1.007	0.087	0.134	0.647	75.4	80.7	0.091
SC-08	SB-12 & SB-13	Foundation Soils	17.6	14.3	115	1.0	1.0	44.9	0.658	1.1	15	35.0	44.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.134	0.672	62.6	72.5	0.080
SC-08	SB-12 & SB-13	Foundation Soils	17.6	14.2	121	1.0	1.0	49.9	0.639	1.1	15	34.8	49.9	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.134	0.698	46.4	61.4	0.067
SC-08	SB-12 & SB-13	Foundation Soils	17.7	14.1	121	1.0	1.0	51.0	0.635	1.1	15	34.7	51.0	1.0	-0.3	0.0	0.9	0.093	1.008	0.094	0.134	0.702	43.5	59.8	0.065
SC-08	SB-12 & SB-13	Foundation Soils	17.8	14.0	121	1.0	1.0	51.4	0.633	1.1	15	34.5	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.135	0.703	41.7	58.5	0.063
SC-08	SB-12 & SB-13	Foundation Soils	17.9	14.0	121	1.1	1.0	51.3	0.634	1.1	15	34.6	51.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.135	0.701	42.3	59.0	0.064
SC-08	SB-12 & SB-13	Foundation Soils	18.0	13.9	121	1.1	1.0	50.9	0.635	1.1	15	34.7	50.9	1.0	-0.3	0.0	0.9	0.093	1.008	0.094	0.135	0.697	43.3	59.5	0.064
SC-08	SB-12 & SB-13	Foundation Soils	18.0	13.8	121	1.1	1.0	50.2	0.638	1.1	15	34.8	50.2	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.135	0.692	45.7	61.1	0.066
SC-08	SB-12 & SB-13	Foundation Soils	18.1	13.7	121	1.1	1.0	49.3	0.641	1.1	15	35.0	49.3	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.136	0.686	48.8	63.2	0.069
SC-08	SB-12 & SB-13	Foundation Soils	18.2	13.6	121	1.1	1.0	48.5	0.644	1.1	15	35.2	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.092	0.136	0.680	53.2	66.6	0.073
SC-08	SB-12 & SB-13	Foundation Soils	18.3	13.6	115	1.1	1.0	47.0	0.650	1.1	15	35.3	47.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.136	0.671	61.7	73.4	0.081
SC-08	SB-12 & SB-13	Foundation Soils	18.4	13.5	115	1.1	1.0	46.2	0.653	1.1	15	35.4	46.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.136	0.666	68.5	79.3	0.089
SC-08	SB-12 & SB-13	Foundation Soils	18.5	13.4	115	1.1	1.0	45.2	0.657	1.1	15	35.4	45.2	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.137	0.659	72.7	82.6	0.094
SC-08	SB-12 & SB-13	Foundation Soils	18.5	13.3	111	1.1	1.0	44.1	0.661	1.1	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.089	0.137	0.652	75.4	84.3	0.096
SC-08	SB-12 & SB-13	Foundation Soils	18.6	13.2	111	1.1	1.0	43.6	0.663	1.1	15	35.2	43.6	1.0	-0.3	0.0	0.9	0.088	1.007	0.089	0.137	0.648	75.4	83.8	0.095
SC-08	SB-12 & SB-13	Foundation Soils	18.7	13.1	111	1.1	1.0	43.4	0.664	1.0	15	35.1	43.4	1.0	-0.3	0.0	0.9	0.088	1.007	0.089	0.137	0.646	75.4	83.7	0.095
SC-08	SB-12 & SB-13	Foundation Soils	18.8	13.1	115	1.1	1.0	45.1	0.658	1.0	15	35.3	45.1	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.138	0.653	69.5	79.3	0.089
SC-08	SB-12 & SB-13	Foundation Soils	18.9	13.0	115	1.1	1.0	46.7	0.651	1.0	15	35.4	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.138	0.661	64.7	76.0	0.085
SC-08	SB-12 & SB-13	Foundation Soils	18.9	12.9	121	1.1	1.0	50.8	0.636	1.0	15	35.5	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.094	0.138	0.681	52.4	67.7	0.074
SC-08	SB-12 & SB-13	Foundation Soils	19.0	12.8	121	1.1	1.0	53.6	0.626	1.0	15	35.3	53.6	1.0	-0.3	0.0	0.9	0.095	1.008	0.096	0.138	0.694	45.5	63.7	0.069
SC-08	SB-12 & SB-13	Foundation Soils	19.1	12.7	121	1.1	1.0	55.2	0.620	1.0	15	35.3	55.2	1.0	-0.3	0.0	0.9	0.096	1.008	0.097	0.139	0.702	43.0	62.9	0.068
SC-08	SB-12 & SB-13	Foundation Soils	19.2	12.7	121	1.1	1.0	56.1	0.617	1.0	15	35.4	56.1	1.0	-0.3	0.0	0.9	0.097	1.008	0.098	0.139	0.705	42.8	63.5	0.069
SC-08	SB-12 & SB-13	Foundation Soils	19.3	12.6	121	1.1	1.0	56.1	0.617	1.0	15	35.9	56.1	1.0	-0.3	0.0	0.9	0.097	1.008	0.098	0.139	0.704	47.5	67.7	0.074
SC-08	SB-12 & SB-13	Foundation Soils	19.4	12.5	115	1.1	1.0	55.2	0.620	1.0	15	36.2	55.2	1.0	-0.3	0.0	0.9	0.096	1.008	0.097	0.139	0.698	53.1	72.2	0.080
SC-08	SB-12 & SB-13	Foundation Soils	19.4	12.4	115	1.1	1.0	52.1	0.631	1.0	15	36.0	52.1	1.0	-0.3	0.0	0.9	0.094	1.008	0.095	0.139	0.680	57.8	73.9	0.082
SC-08	SB-12 & SB-13	Foundation Soils	19.5	12.3	115	1.2	1.0	50.1	0.638	1.0	15	35.9	50.1	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.140	0.668	64.0	78.2	0.088
SC-08	SB-12 & SB-13	Foundation Soils	19.6	12.2	115	1.2	1.0	48.4	0.645	1.0	15	35.8	48.4	1.0	-0.3	0.0	0.9	0.091	1.007	0.092	0.140	0.659	69.0	81.6	0.092
SC-08	SB-12 & SB-13	Foundation Soils	19.7	12.2	111	1.2	1.0	47.0	0.650	1.0	15	35.7	47.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.140	0.650	75.4	86.7	0.099
SC-08	SB-12 & SB-13	Foundation Soils	19.8	12.1	111	1.2	1.0	47.7	0.647	1.0	15	35.8	47.7	1.0	-0.3	0.0	0.9	0.091	1.007	0.092	0.140	0.653	75.4	87.2	0.100
SC-08	SB-12 & SB-13	Foundation Soils	19.8	12.0	111	1.2	1.0	47.9	0.647	1.0	15	35.8	47.9	1.0	-0.3	0.0	0.9	0.091	1.007	0.092	0.141	0.653	74.2	86.3	0.099
SC-08	SB-12 & SB-13	Foundation Soils	19.9	11.9	111	1.2	1.0	47.1	0.650	1.0	15	35.7	47.1	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.141	0.647	75.0	86.3	0.099
SC-08	SB-12 & SB-13	Foundation Soils	20.0	11.8	111	1.2	1.0	45.4	0.656	1.0	15	35.4	45.4	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.141	0.638	75.4	85.3	0.097
SC-08	SB-12 & SB-13	Foundation Soils	20.1	11.8	115	1.2	1.0	46.7	0.651	1.0	15	35.5	46.7	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.141	0.643	70.4	81.6	0.092
SC-08	SB-12 & SB-13	Foundation Soils	20.2	11.7	121	1.2	1.0	52.3	0.630	1.0	15	35.6	52.3	1.0	-0.4	0.0	0.9	0.094	1.008	0.095	0.141	0.671	51.4	68.1	0.075
SC-08	SB-12 & SB-13	Foundation Soils	20.3	11.6	121	1.2	1.0	55.0	0.621	1.0	15	35.5	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.097	0.142	0.684	45.0	64.5	0.070
SC-08	SB-12 & SB-13	Foundation Soils	20.3	11.5	121	1.2	1.0	56.0	0.617	1.0	15	35.3	56.0	1.0	-0.4	0.0	0.9	0.097	1.008	0.098	0.142	0.688	42.0	62.7	0.068
SC-08	SB-12 & SB-13	Foundation Soils	20.4	11.4	121	1.2	1.0	54.7	0.622	1.0	15	35.3	54.7	1.0	-0.4	0.0	0.9	0.096	1.008	0.097	0.142	0.680	43.9	63.3	0.069
SC-08	SB-12 & SB-13	Foundation Soils	20.5	11.3	121	1.2	1.0	54.3	0.623	1.0	15	35.4	54.3	1.0	-0.4	0.0	0.9	0.095	1.008	0.096	0.142	0.677	45.3	64.1	0.070
SC-08	SB-12 & SB-13	Foundation Soils	20.6	11.3	121	1.2	1.0	55.0	0.621	1.0	15	35.5	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.097	0.142	0.680	44.9	64.4	0.070

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-08	SB-12 & SB-13	Foundation Soils	20.7	11.2	121	1.2	1.0	55.7	0.618	1.0	15	35.6	55.7	1.0	-0.4	0.0	0.9	0.096	1.008	0.097	0.143	0.682	44.8	64.9	0.071
SC-08	SB-12 & SB-13	Foundation Soils	20.8	11.1	121	1.2	1.0	56.5	0.616	1.0	15	35.6	56.5	1.0	-0.4	0.0	0.9	0.097	1.008	0.098	0.143	0.685	44.0	64.9	0.071
SC-08	SB-12 & SB-13	Foundation Soils	20.8	11.0	121	1.2	1.0	57.8	0.611	1.0	15	35.7	57.8	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.143	0.691	42.9	65.0	0.071
SC-08	SB-12 & SB-13	Foundation Soils	20.9	10.9	121	1.2	1.0	56.8	0.615	1.0	15	36.0	56.8	1.0	-0.4	0.0	0.9	0.097	1.008	0.098	0.143	0.685	46.8	67.7	0.074
SC-08	SB-12 & SB-13	Foundation Soils	21.0	10.9	115	1.2	1.0	54.6	0.622	1.0	15	36.1	54.6	1.0	-0.4	0.0	0.9	0.096	1.008	0.096	0.143	0.672	53.7	72.1	0.080
SC-08	SB-12 & SB-13	Foundation Soils	21.1	10.8	115	1.2	1.1	51.5	0.633	1.0	15	36.1	51.5	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.144	0.655	62.6	78.0	0.087
SC-08	SB-12 & SB-13	Foundation Soils	21.2	10.7	115	1.2	1.1	49.2	0.642	1.0	15	35.9	49.2	1.0	-0.4	0.0	0.9	0.092	1.007	0.092	0.144	0.643	67.8	81.1	0.092
SC-08	SB-12 & SB-13	Foundation Soils	21.2	10.6	111	1.3	1.1	47.2	0.649	1.0	15	35.7	47.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.144	0.632	72.6	84.1	0.096
SC-08	SB-12 & SB-13	Foundation Soils	21.3	10.5	111	1.3	1.1	45.2	0.657	1.0	15	35.4	45.2	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.144	0.621	75.4	85.2	0.097
SC-08	SB-12 & SB-13	Foundation Soils	21.4	10.4	111	1.3	1.1	44.2	0.661	1.0	15	35.2	44.2	1.0	-0.4	0.0	0.9	0.088	1.007	0.089	0.144	0.615	75.4	84.3	0.096
SC-08	SB-12 & SB-13	Foundation Soils	21.5	10.4	111	1.3	1.1	41.9	0.670	1.0	15	34.9	41.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.087	0.145	0.604	75.4	82.4	0.093
SC-08	SB-12 & SB-13	Foundation Soils	21.6	10.3	111	1.3	1.1	40.7	0.676	1.0	15	34.7	40.7	1.0	-0.4	0.0	0.9	0.086	1.007	0.086	0.145	0.597	75.4	81.4	0.092
SC-08	SB-12 & SB-13	Foundation Soils	21.7	10.2	111	1.3	1.1	40.7	0.675	1.0	15	34.7	40.7	1.0	-0.4	0.0	0.9	0.086	1.007	0.086	0.145	0.596	75.4	81.4	0.092
SC-08	SB-12 & SB-13	Foundation Soils	21.7	10.1	111	1.3	1.1	40.9	0.675	1.0	15	34.7	40.9	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.145	0.596	75.4	81.5	0.092
SC-08	SB-12 & SB-13	Foundation Soils	21.8	10.0	111	1.3	1.1	40.6	0.676	1.0	15	34.7	40.6	1.0	-0.4	0.0	0.9	0.086	1.007	0.086	0.145	0.594	75.4	81.4	0.092
SC-08	SB-12 & SB-13	Foundation Soils	21.9	9.9	111	1.3	1.1	40.6	0.676	1.0	15	34.7	40.6	1.0	-0.4	0.0	0.9	0.086	1.007	0.086	0.146	0.593	75.4	81.3	0.092
SC-08	SB-12 & SB-13	Foundation Soils	22.0	9.9	111	1.3	1.1	40.8	0.675	1.0	15	34.7	40.8	1.0	-0.4	0.0	0.9	0.086	1.007	0.086	0.146	0.593	75.4	81.5	0.092
SC-08	SB-12 & SB-13	Foundation Soils	22.1	9.8	111	1.3	1.1	42.3	0.669	1.0	15	34.9	42.3	1.0	-0.4	0.0	0.9	0.087	1.007	0.087	0.146	0.599	75.4	82.7	0.094
SC-08	SB-12 & SB-13	Foundation Soils	22.1	9.7	111	1.3	1.1	43.0	0.666	1.0	15	35.1	43.0	1.0	-0.4	0.0	0.9	0.087	1.007	0.088	0.146	0.602	75.4	83.3	0.095
SC-08	SB-12 & SB-13	Foundation Soils	22.2	9.6	111	1.3	1.1	42.5	0.668	1.0	15	35.0	42.5	1.0	-0.4	0.0	0.9	0.087	1.007	0.088	0.146	0.599	75.4	82.9	0.094
SC-08	SB-12 & SB-13	Foundation Soils	22.3	9.5	111	1.3	1.1	43.1	0.666	1.0	15	35.1	43.1	1.0	-0.4	0.0	0.9	0.087	1.007	0.088	0.147	0.600	75.4	83.4	0.095
SC-08	SB-12 & SB-13	Foundation Soils	22.4	9.5	111	1.3	1.1	44.8	0.659	1.0	15	35.3	44.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.089	0.147	0.608	75.4	84.8	0.097
SC-08	SB-12 & SB-13	Foundation Soils	22.5	9.4	111	1.3	1.1	44.9	0.658	1.0	15	35.4	44.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.089	0.147	0.607	75.4	84.9	0.097
SC-08	SB-12 & SB-13	Foundation Soils	22.6	9.3	115	1.3	1.1	45.4	0.656	1.0	15	35.4	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.147	0.609	73.5	83.5	0.095
SC-08	SB-12 & SB-13	Foundation Soils	22.6	9.2	115	1.3	1.1	45.3	0.657	1.0	15	35.4	45.3	1.0	-0.4	0.0	0.9	0.089	1.007	0.089	0.147	0.608	73.3	83.2	0.094
SC-08	SB-12 & SB-13	Foundation Soils	22.7	9.1	111	1.3	1.1	45.4	0.656	1.0	15	35.5	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.147	0.608	75.4	85.4	0.098
SC-08	SB-12 & SB-13	Foundation Soils	22.8	9.0	111	1.3	1.1	45.5	0.656	1.0	15	35.5	45.5	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.148	0.607	75.4	85.4	0.098
SC-08	SB-12 & SB-13	Foundation Soils	22.9	9.0	115	1.3	1.1	46.5	0.652	1.0	15	35.5	46.5	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.148	0.611	71.5	82.5	0.094
SC-08	SB-12 & SB-13	Foundation Soils	23.0	8.9	115	1.3	1.1	47.8	0.647	1.0	15	35.7	47.8	1.0	-0.4	0.0	0.9	0.091	1.007	0.091	0.148	0.616	69.9	82.0	0.093
SC-08	SB-12 & SB-13	Foundation Soils	23.0	8.8	115	1.4	1.1	52.6	0.629	1.0	15	36.2	52.6	1.0	-0.4	0.0	0.9	0.094	1.008	0.095	0.148	0.639	60.1	76.5	0.086
SC-08	SB-12 & SB-13	Foundation Soils	23.1	8.7	115	1.4	1.1	54.0	0.624	1.0	15	36.5	54.0	1.0	-0.4	0.0	0.9	0.095	1.008	0.096	0.148	0.645	62.0	79.6	0.090
SC-08	SB-12 & SB-13	Foundation Soils	23.2	8.6	115	1.4	1.1	56.3	0.616	1.0	15	36.7	56.3	1.0	-0.4	0.0	0.9	0.097	1.008	0.097	0.148	0.655	58.2	77.8	0.087
SC-08	SB-12 & SB-13	Foundation Soils	23.3	8.6	115	1.4	1.1	55.4	0.619	1.0	15	36.7	55.4	1.0	-0.4	0.0	0.9	0.096	1.008	0.097	0.149	0.650	62.5	81.2	0.092
SC-08	SB-12 & SB-13	Foundation Soils	23.4	8.5	115	1.4	1.1	55.3	0.620	1.0	15	36.7	55.3	1.0	-0.4	0.0	0.9	0.096	1.008	0.097	0.149	0.649	62.6	81.2	0.092
SC-08	SB-12 & SB-13	Foundation Soils	23.5	8.4	115	1.4	1.1	56.1	0.617	1.0	15	36.7	56.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.097	0.149	0.652	59.3	78.7	0.088
SC-08	SB-12 & SB-13	Foundation Soils	23.5	8.3	115	1.4	1.1	57.0	0.614	1.0	15	36.6	57.0	1.0	-0.4	0.0	0.9	0.097	1.008	0.098	0.149	0.656	55.4	75.8	0.085
SC-08	SB-12 & SB-13	Foundation Soils	23.6	8.2	121	1.4	1.1	62.0	0.598	1.0	15	36.4	62.0	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.149	0.680	43.3	68.9	0.076
SC-08	SB-12 & SB-13	Foundation Soils	23.7	8.1	121	1.4	1.1	65.4	0.587	1.0	15	36.4	65.4	1.0	-0.4	0.0	0.9	0.104	1.009	0.104	0.149	0.697	39.6	68.6	0.075
SC-08	SB-12 & SB-13	Foundation Soils	23.8	8.1	121	1.4	1.1	64.8	0.589	1.0	15	36.5	64.8	1.0	-0.4	0.0	0.9	0.103	1.009	0.104	0.150	0.693	40.9	69.2	0.076
SC-08	SB-12 & SB-13	Foundation Soils	23.9	8.0	121	1.4	1.1	62.5	0.596	1.0	15	36.6	62.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.102	0.150	0.680	44.3	70.2	0.077
SC-08	SB-12 & SB-13	Foundation Soils	23.9	7.9	121	1.4	1.1	60.4	0.603	1.0	15	36.4	60.4	1.0	-0.4	0.1	0.9	0.100	1.009	0.100	0.150	0.669	45.5	69.5	0.077
SC-08	SB-12 & SB-13	Foundation Soils	24.0	7.8	121	1.4	1.1	59.0	0.608	1.0	15	36.6	59.0	1.0	-0.4	0.1	0.9	0.099	1.008	0.099	0.150	0.661	50.7	73.1	0.081
SC-08	SB-12 & SB-13	Foundation Soils	24.1	7.7	115	1.4	1.1	54.2	0.624	1.0	15	36.5	54.2	1.0	-0.4	0.1	0.9	0.095	1.008	0.096	0.150	0.636	63.1	80.8	0.091
SC-08	SB-12 & SB-13	Foundation Soils	24.2	7.7	115	1.4	1.1	52.0	0.631	1.0	15	36.3	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.150	0.625	66.9	82.6	0.094
SC-08	SB-12 & SB-13	Foundation Soils	24.3	7.6	115	1.4	1.1	55.1	0.620	1.0	15	36.6	55.1	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.150	0.639	61.9	80.4	0.091
SC-08	SB-12 & SB-13	Foundation Soils	24.4	7.5	115	1.4	1.1	60.5	0.602	1.0	15	36.9	60.5	1.0	-0.5	0.1	0.9	0.100	1.009	0.100	0.151	0.665	51.4	75.0	0.084
SC-08	SB-12 & SB-13	Foundation Soils	24.4	7.4	115	1.4	1.1	61.1	0.600	1.0	15	37.0	61.1	1.0	-0.5	0.1	0.9	0.100	1.009	0.101	0.151	0.668	50.7	74.8	0.083
SC-08	SB-12 & SB-13	Foundation Soils	24.5	7.3	115	1.4	1.1	60.8	0.602	1.0	15	37.1	60.8	1.0	-0.5	0.1	0.9	0.100	1.009	0.100	0.151	0.665	53.1	76.9	0.086
SC-08	SB-12 & SB-13	Foundation Soils	24.6	7.2	115	1.4	1.1	56.5	0.616	1.0	15	36.8	56.5	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.151	0.643	60.3	80.1	0.090
SC-08	SB-12 & SB-13	Foundation Soils	24.7	7.2	115	1.4	1.1	53.9	0.625	1.0	15	36.4	53.9	1.0	-0.5	0.1	0.9	0.095	1.008	0.095	0.151	0.630	62.3	79.7	0.090
SC-08	SB-12 & SB-13	Foundation Soils	24.8	7.1	115	1.5	1.1	53.9	0.625	1.0	15	36.4	53.9	1.0	-0.5	0.1	0.9	0.095	1.008	0.095	0.151	0.629	62.0	79.5	0.089
SC-08	SB-12 & SB-13	Foundation Soils	24.9	7.0	115	1.5	1.1	58.2	0.610	1.0	15	36.9	58.2	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.152	0.649	57.3	78.5	0.088
SC-08	SB-12 & SB-13	Foundation Soils	24.9	6.9	115	1.5	1.2	58.8	0.608	1.0	15	37.0	58.8	1.0	-0.5	0.1	0.9	0.099	1.008	0.099	0.152	0.652	57.8	79.6	0.090
SC-08	SB-12 & SB-13	Foundation Soils	25.0	6.8	115	1.5	1.2	56.8	0.615	0.9	15	36.9	56.8	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.152	0.641	60.7	80.7	0.091
SC-08	SB-12 & SB-13	Foundation Soils	25.1	6.7	115	1.5	1.2	55.0	0.621	0.9	15	36.8	55.0	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.152	0.632	66.3	84.5	0.096
SC-08	SB-12 & SB-13	Foundation Soils	25.2	6.7	115	1.5	1.2	53.8	0.625	0.9	15	36.6	53.8	1.0	-0.5	0.1	0.9	0.095	1.008	0.095	0.152	0.625	67.7	84.9	0.097
SC-08	SB-12 & SB-13	Foundation Soils	25.3	6.6	115	1.5	1.2	52.6	0.629	0.9	15	36.5	52.6	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.152	0.619	69.6	85.7	0.098
SC-08	SB-12 & SB-13	Foundation Soils	25.3	6.5	115	1.5	1.2	52.9	0.628	0.9	15	36.5	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.152	0.620	68.5	84.9	0.097
SC-08	SB-12 & SB-13	Foundation Soils	25.4	6.4	111	1.5	1.2	51.4	0.633	0.9	15	36.3	51.4	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.153	0.612	70.8	85.9	0.098
SC-08	SB-12 & SB-13	Foundation Soils	25.5	6.3	111	1.5	1.2	51.3	0.634	0.9	15	36.3	51.3	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.153	0.611	70.7	85.7	0.098
SC-08	SB-12 & SB-13	Foundation Soils	25.6	6.3	111	1.5	1.2	51.1	0.635	0.9	15	36.3	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.153	0.609	70.9	85.8	0.098
SC-08	SB-12 & SB-13	Foundation Soils	25.7	6.2	111	1.5	1.2	51.7	0.632	0.9	15	36.4	51.7	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.153	0.612	70.5	85.9	0.098
SC-08	SB-12 & SB-13	Foundation Soils	25.8	6.1	111	1.5	1.2	52.2	0.631	0.9	15	36.4	52.2	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.153	0.613	70.2	85.9	0.098
SC-08	SB-12 & SB-13	Foundation Soils	25.8	6.0	115	1.5	1.2	54.2	0.624	0.9	15	36.6	54.2	1.0	-0.5	0.1	0.9	0.095	1.008	0.095	0.153	0.622	65.5	83.1	0.094
SC-08	SB-12 & SB-13	Foundation Soils	25.9	5.9	115	1.5	1.2	56.6	0.615	0.9	15	36.9	56.6	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.153	0.633	62.7	82.4	0.093
SC-08	SB-12 & SB-13	Foundation Soils	26.0	5.8	115	1.5	1.2	57.2	0.613	0.9	15	37.0	57.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.098	0.154	0.635	62.5	82.8	0.094
SC-08	SB-12 & SB-13	Foundation Soils	26.1	5.8	115	1.5	1.2	59.7	0.605	0.9	15	37.1	59.7	1.0	-0.5	0.1	0.9	0.099	1.009	0.099	0.154	0.647	55.6	78.3	0.088
SC-08	SB-12 & SB-13	Foundation Soils	26.2	5.7	121	1.5	1.2	64.8	0.589	0.9	15	37.0	64.8	1.0	-0.5	0.1	0.9	0.103	1.009	0.103	0.154	0.671	45.0	72.7	0.081
SC-08	SB-12 & SB-13	Foundation Soils	26.2	5.6	121	1.5	1.2	70.2	0.573	0.9	15	36.8	70.2	1.0	-0.5	0.1	0.9	0.107	1.010	0.107	0.154	0.698	38.2	71.5	0.079
SC-08	SB-12 & SB-13	Foundation Soils	26.3	5.5	121	1.5	1.2	73.7	0.563	0.9	15	36.0	73.7	1.0	-0.5	0.1	0.9	0.110	1.011	0.110	0.154	0.717	32.9	70.5	0.078
SC-08	SB-12 & SB-13	Foundation Soils	26.4	5.4	121	1.5	1.2	69.4	0.575	0.9	15	36.9	69.4	1.0	-0.5	0.1	0.9	0.107	1.010	0.107	0.154	0.693	39.0	71.6	0.079

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-08	SB-12 & SB-13	Foundation Soils	26.5	5.4	121	1.6	1.2	63.6	0.593	0.9	15	36.8	63.6	1.0	-0.5	0.1	0.9	0.102	1.009	0.102	0.154	0.662	44.8	71.6	0.079
SC-08	SB-12 & SB-13	Foundation Soils	26.6	5.3	121	1.6	1.2	60.1	0.604	0.9	15	36.7	60.1	1.0	-0.5	0.1	0.9	0.100	1.009	0.100	0.154	0.645	49.4	72.8	0.081
SC-08	SB-12 & SB-13	Foundation Soils	26.7	5.2	115	1.6	1.2	56.8	0.615	0.9	15	36.7	56.8	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.154	0.628	56.9	77.0	0.086
SC-08	SB-12 & SB-13	Foundation Soils	26.7	5.1	115	1.6	1.2	53.8	0.625	0.9	15	36.4	53.8	1.0	-0.5	0.1	0.9	0.095	1.008	0.095	0.155	0.614	61.6	79.0	0.089
SC-08	SB-12 & SB-13	Foundation Soils	26.8	5.0	115	1.6	1.2	51.1	0.634	0.9	15	36.1	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.155	0.601	64.6	79.6	0.090
SC-08	SB-12 & SB-13	Foundation Soils	26.9	4.9	115	1.6	1.2	49.5	0.640	0.9	15	35.9	49.5	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.155	0.593	67.1	80.7	0.091
SC-08	SB-12 & SB-13	Foundation Soils	27.0	4.9	115	1.6	1.2	49.4	0.641	0.9	15	36.0	49.4	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.155	0.592	69.3	82.7	0.094
SC-08	SB-12 & SB-13	Foundation Soils	27.1	4.8	115	1.6	1.2	51.8	0.632	0.9	15	36.2	51.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.155	0.602	65.6	81.1	0.092
SC-08	SB-12 & SB-13	Foundation Soils	27.1	4.7	115	1.6	1.2	55.0	0.621	0.9	15	36.5	55.0	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.155	0.617	59.8	78.3	0.088
SC-08	SB-12 & SB-13	Foundation Soils	27.2	4.6	115	1.6	1.2	53.3	0.627	0.9	15	36.4	53.3	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.155	0.608	63.7	80.6	0.091
SC-08	SB-12 & SB-13	Foundation Soils	27.3	4.5	115	1.6	1.2	51.8	0.632	0.9	15	36.3	51.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.155	0.600	67.3	82.9	0.094
SC-08	SB-12 & SB-13	Foundation Soils	27.4	4.5	111	1.6	1.2	50.6	0.637	0.9	15	36.2	50.6	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.156	0.594	71.3	85.6	0.098
SC-08	SB-12 & SB-13	Foundation Soils	27.5	4.4	115	1.6	1.2	50.1	0.638	0.9	15	36.1	50.1	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.156	0.591	70.6	84.5	0.096
SC-08	SB-12 & SB-13	Foundation Soils	27.6	4.3	115	1.6	1.2	50.9	0.635	0.9	15	36.2	50.9	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.156	0.595	68.0	82.8	0.094
SC-08	SB-12 & SB-13	Foundation Soils	27.6	4.2	115	1.6	1.2	53.0	0.628	0.9	15	36.3	53.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.156	0.604	63.4	80.0	0.090
SC-08	SB-12 & SB-13	Foundation Soils	27.7	4.1	115	1.6	1.2	52.8	0.628	0.9	15	36.4	52.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.156	0.603	64.4	80.9	0.091
SC-08	SB-12 & SB-13	Foundation Soils	27.8	4.0	115	1.6	1.2	54.8	0.621	0.9	15	36.5	54.8	1.0	-0.5	0.1	0.9	0.096	1.008	0.095	0.156	0.611	60.9	79.1	0.089
SC-08	SB-12 & SB-13	Foundation Soils	27.9	4.0	115	1.6	1.2	54.8	0.622	0.9	15	36.5	54.8	1.0	-0.5	0.1	0.9	0.096	1.008	0.095	0.156	0.610	60.8	79.1	0.089
SC-08	SB-12 & SB-13	Foundation Soils	28.0	3.9	115	1.6	1.2	53.2	0.627	0.9	15	36.3	53.2	1.0	-0.5	0.1	0.9	0.095	1.008	0.094	0.156	0.603	61.8	78.6	0.088
SC-08	SB-12 & SB-13	Foundation Soils	28.1	3.8	115	1.6	1.2	51.5	0.633	0.9	15	36.1	51.5	1.0	-0.6	0.1	0.9	0.093	1.008	0.093	0.157	0.594	64.7	80.1	0.090
SC-08	SB-12 & SB-13	Foundation Soils	28.1	3.7	115	1.6	1.2	49.6	0.640	0.9	15	36.0	49.6	1.0	-0.6	0.1	0.9	0.092	1.008	0.092	0.157	0.585	70.9	84.5	0.096
SC-08	SB-12 & SB-13	Foundation Soils	28.2	3.6	111	1.7	1.2	48.6	0.644	0.9	15	35.9	48.6	1.0	-0.6	0.1	0.9	0.091	1.007	0.091	0.157	0.581	72.8	85.6	0.098
SC-08	SB-12 & SB-13	Foundation Soils	28.3	3.6	115	1.7	1.2	49.6	0.640	0.9	15	36.0	49.6	1.0	-0.6	0.1	0.9	0.092	1.008	0.092	0.157	0.584	69.8	83.4	0.095
SC-08	SB-12 & SB-13	Foundation Soils	28.4	3.5	115	1.7	1.2	50.6	0.636	0.9	15	36.1	50.6	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.157	0.588	66.4	81.0	0.091
SC-08	SB-12 & SB-13	Foundation Soils	28.5	3.4	115	1.7	1.2	50.6	0.636	0.9	15	36.1	50.6	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.157	0.588	66.7	81.2	0.092
SC-08	SB-12 & SB-13	Foundation Soils	28.5	3.3	115	1.7	1.2	53.0	0.628	0.9	15	36.3	53.0	1.0	-0.6	0.1	0.9	0.094	1.008	0.094	0.157	0.598	63.2	79.8	0.090
SC-08	SB-12 & SB-13	Foundation Soils	28.6	3.2	115	1.7	1.2	55.8	0.618	0.9	15	36.6	55.8	1.0	-0.6	0.1	0.9	0.096	1.008	0.096	0.157	0.611	58.7	78.0	0.087
SC-08	SB-12 & SB-13	Foundation Soils	28.7	3.1	115	1.7	1.3	55.7	0.618	0.9	15	36.6	55.7	1.0	-0.6	0.1	0.9	0.096	1.008	0.096	0.157	0.609	58.3	77.4	0.087
SC-08	SB-12 & SB-13	Foundation Soils	28.8	3.1	115	1.7	1.3	51.4	0.633	0.9	15	36.2	51.4	1.0	-0.6	0.1	0.9	0.093	1.008	0.093	0.157	0.590	65.7	81.0	0.091
SC-08	SB-12 & SB-13	Foundation Soils	28.9	3.0	115	1.7	1.3	49.9	0.639	0.9	15	36.0	49.9	1.0	-0.6	0.1	0.9	0.092	1.008	0.092	0.158	0.582	67.8	81.6	0.092
SC-08	SB-12 & SB-13	Foundation Soils	29.0	2.9	111	1.7	1.3	47.8	0.647	0.9	15	35.8	47.8	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.158	0.573	72.8	84.8	0.097
SC-08	SB-12 & SB-13	Foundation Soils	29.0	2.8	115	1.7	1.3	47.6	0.647	0.9	15	35.7	47.6	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.158	0.572	72.0	83.9	0.096
SC-08	SB-12 & SB-13	Foundation Soils	29.1	2.7	115	1.7	1.3	46.9	0.650	0.9	15	35.6	46.9	1.0	-0.6	0.1	0.9	0.090	1.007	0.090	0.158	0.568	71.3	82.6	0.094
SC-08	SB-12 & SB-13	Foundation Soils	29.2	2.6	115	1.7	1.3	46.9	0.650	0.9	15	35.5	46.9	1.0	-0.6	0.1	0.9	0.090	1.007	0.090	0.158	0.568	68.2	79.6	0.090
SC-08	SB-12 & SB-13	Foundation Soils	29.3	2.6	115	1.7	1.3	46.8	0.651	0.9	15	35.6	46.8	1.0	-0.6	0.1	0.9	0.090	1.007	0.090	0.158	0.567	71.6	82.8	0.094
SC-08	SB-12 & SB-13	Foundation Soils	29.4	2.5	111	1.7	1.3	46.8	0.651	0.9	15	35.7	46.8	1.0	-0.6	0.1	0.9	0.090	1.007	0.090	0.158	0.566	75.4	86.5	0.099
SC-08	SB-12 & SB-13	Foundation Soils	29.4	2.4	115	1.7	1.3	51.4	0.633	0.9	15	36.2	51.4	1.0	-0.6	0.1	0.9	0.093	1.008	0.093	0.158	0.586	66.9	82.1	0.093
SC-08	SB-12 & SB-13	Foundation Soils	29.5	2.3	115	1.7	1.3	57.4	0.613	0.9	15	36.8	57.4	1.0	-0.6	0.1	0.9	0.098	1.008	0.097	0.158	0.613	57.4	78.0	0.087
SC-08	SB-12 & SB-13	Foundation Soils	29.6	2.2	115	1.7	1.3	60.0	0.604	0.9	15	36.9	60.0	1.0	-0.6	0.1	0.9	0.099	1.009	0.099	0.158	0.624	51.9	74.9	0.083
SC-08	SB-12 & SB-13	Foundation Soils	29.7	2.2	115	1.7	1.3	55.1	0.620	0.9	15	36.7	55.1	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.159	0.601	64.1	82.5	0.094
SC-08	SB-12 & SB-13	Foundation Soils	29.8	2.1	115	1.7	1.3	53.7	0.625	0.9	15	36.6	53.7	1.0	-0.6	0.1	0.9	0.095	1.008	0.094	0.159	0.595	67.7	84.9	0.097
SC-08	SB-12 & SB-13	Foundation Soils	29.9	2.0	115	1.7	1.3	57.3	0.613	0.9	15	37.0	57.3	1.0	-0.6	0.1	0.9	0.098	1.008	0.097	0.159	0.611	61.9	82.2	0.093
SC-08	SB-12 & SB-13	Foundation Soils	29.9	1.9	121	1.7	1.3	63.5	0.593	0.9	15	37.1	63.5	1.0	-0.6	0.1	0.9	0.102	1.009	0.102	0.159	0.639	47.3	73.8	0.082
SC-08	SB-12 & SB-13	Foundation Soils	30.0	1.8	121	1.8	1.3	68.6	0.578	0.9	15	36.5	68.6	1.0	-0.6	0.1	0.9	0.106	1.010	0.106	0.159	0.664	37.8	69.9	0.077
SC-08	SB-12 & SB-13	Foundation Soils	30.1	1.7	121	1.8	1.3	71.2	0.570	0.9	15	35.3	71.2	1.0	-0.6	0.1	0.9	0.108	1.010	0.108	0.159	0.676	31.9	67.7	0.074
SC-08	SB-12 & SB-13	Foundation Soils	30.2	1.7	121	1.8	1.3	74.0	0.562	0.9	15	34.0	74.0	1.0	-0.6	0.1	0.9	0.111	1.011	0.110	0.159	0.690	28.1	68.0	0.075
SC-08	SB-12 & SB-13	Foundation Soils	30.3	1.6	121	1.8	1.3	74.8	0.560	0.9	15	32.9	74.8	1.0	-0.6	0.1	0.9	0.111	1.011	0.110	0.159	0.694	26.0	67.9	0.075
SC-08	SB-12 & SB-13	Foundation Soils	30.3	1.5	121	1.8	1.3	75.7	0.558	0.9	15	33.0	75.7	1.0	-0.6	0.1	0.9	0.112	1.011	0.111	0.159	0.699	26.0	68.7	0.076
SC-08	SB-12 & SB-13	Foundation Soils	30.4	1.4	121	1.8	1.3	74.4	0.561	0.9	15	35.1	74.4	1.0	-0.6	0.1	0.9	0.111	1.011	0.110	0.159	0.691	30.2	69.5	0.077
SC-08	SB-12 & SB-13	Foundation Soils	30.5	1.3	121	1.8	1.3	73.5	0.564	0.9	15	36.1	73.5	1.0	-0.6	0.1	0.9	0.110	1.011	0.109	0.159	0.686	33.3	70.7	0.078
SC-08	SB-12 & SB-13	Foundation Soils	30.6	1.3	121	1.8	1.3	71.8	0.568	0.9	15	36.2	71.8	1.0	-0.6	0.1	0.9	0.109	1.010	0.108	0.160	0.677	34.5	70.1	0.077
SC-08	SB-12 & SB-13	Foundation Soils	30.7	1.2	121	1.8	1.3	73.1	0.565	0.9	15	36.5	73.1	1.0	-0.6	0.1	0.9	0.110	1.011	0.109	0.160	0.683	34.8	71.4	0.079
SC-08	SB-12 & SB-13	Foundation Soils	30.8	1.1	121	1.8	1.3	75.6	0.558	0.9	15	36.3	75.6	1.0	-0.6	0.1	0.9	0.112	1.011	0.111	0.160	0.696	33.0	72.3	0.080
SC-08	SB-12 & SB-13	Foundation Soils	30.8	1.0	121	1.8	1.3	75.3	0.559	0.9	15	35.2	75.3	1.0	-0.6	0.1	0.9	0.112	1.011	0.111	0.160	0.694	30.1	70.2	0.077
SC-08	SB-12 & SB-13	Foundation Soils	30.9	0.9	121	1.8	1.3	74.8	0.560	0.9	15	35.5	74.8	1.0	-0.6	0.1	0.9	0.111	1.011	0.110	0.160	0.691	31.1	70.4	0.078
SC-08	SB-12 & SB-13	Foundation Soils	31.0	0.8	121	1.8	1.3	76.6	0.555	0.9	15	35.8	76.6	1.0	-0.6	0.1	0.9	0.113	1.011	0.112	0.160	0.699	31.1	71.9	0.080
SC-08	SB-12 & SB-13	Foundation Soils	31.1	0.8	121	1.8	1.3	79.8	0.547	0.9	15	37.3	79.8	1.0	-0.6	0.1	0.9	0.116	1.012	0.115	0.160	0.717	34.0	76.6	0.086
SC-08	SB-12 & SB-13	Foundation Soils	31.2	0.7	121	1.8	1.3	79.0	0.549	0.9	15	38.1	79.0	1.0	-0.6	0.1	0.9	0.115	1.012	0.114	0.160	0.712	37.8	78.7	0.088
SC-08	SB-12 & SB-13	Foundation Soils	31.2	0.6	121	1.8	1.3	78.6	0.550	0.9	15	38.5	78.6	1.0	-0.6	0.1	0.9	0.115	1.012	0.114	0.160	0.709	40.1	80.2	0.090
SC-08	SB-12 & SB-13	Foundation Soils	31.3	0.5	121	1.8	1.3	78.5	0.550	0.9	15	38.1	78.5	1.0	-0.6	0.1	0.9	0.114	1.012	0.114	0.160	0.709	38.3	78.8	0.089
SC-08	SB-12 & SB-13	Foundation Soils	31.4	0.4	121	1.8	1.3	90.2	0.521	0.9	15	35.9	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.125	0.160	0.779	27.5	81.8	0.093
SC-08	SB-12 & SB-13	Foundation Soils	31.5	0.4	124	1.8	1.3	91.1	0.519	0.9	15	28.7	91.1	1.0	-0.6	0.1	0.9	0.127	1.015	0.126	0.160	0.784	20.2	82.6	0.094
SC-08	SB-12 & SB-13	Foundation Soils	31.6	0.3	124	1.8	1.3	80.0	0.546	0.9	15	12.6	80.0	1.0	-0.6	0.1	0.9	0.116	1.012	0.115	0.160	0.716	14.0	81.5	0.092
SC-08	SB-12 & SB-13	Foundation Soils	31.7	0.2	124	1.9	1.3	73.6	0.563	0.9	15	0.3	73.6	1.0	-0.6	0.1	0.9	0.110	1.011	0.109	0.160	0.681	9.5	82.8	0.094
SC-08	SB-12 & SB-13	Foundation Soils	31.7	0.1	124	1.9	1.3	75.3	0.559	0.9	15	0.0	75.3	1.0	-0.7	0.1	0.9	0.112	1.011	0.111	0.161	0.689	6.0	81.3	0.092
SC-08	SB-12 & SB-13	Foundation Soils	31.8	0.0	124	1.9	1.3	70.9	0.571	0.9	15	0.0	70.9	1.0	-0.7	0.1	0.9	0.108	1.010	0.107	0.161	0.666	6.0	76.9	0.086
SC-08	SB-12 & SB-13	Foundation Soils	31.9	-0.1	124	1.9	1.3	70.2	0.573	0.9	15	0.0	70.2	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.161	0.662	6.0	76.2	0.085
SC-08	SB-12 & SB-13	Foundation Soils	32.0	-0.1	124	1.9	1.3	69.8	0.574	0.9	15	0.0	69.8	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.161	0.660	6.7	76.6	0.086
SC-08	SB-12 & SB-13	Foundation Soils	32.1	-0.2	124	1.9	1.3	76.1	0.557	0.9	15	7.0	76.1	1.0	-0.7	0.1	0.9	0.112	1.011	0.111	0.161	0.692	12.5	81.5	0.092
SC-08	SB-12 & SB-13	Foundation Soils	32.2	-0.3	124	1.9	1.3	90.7	0.520	0.9	15	22.6	90.7	1.0	-0.7	0.1	0.9	0.126	1.015	0.125	0.161	0.778	17.2	85.3	0.097
SC-08	SB-12 & SB-13	Foundation Soils	32.2	-0.4	124	1.9	1.4	89.6	0.522	0.9	15	14.9	89.6	1.0	-0.7	0.1	0.9	0.125	1.015	0.124	0.161	0.770	14.6	89.3	0.103

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-08	SB-12 & SB-13	Foundation Soils	32.3	-0.5	124	1.9	1.4	81.2	0.543	0.9	15	0.4	81.2	1.0	-0.7	0.1	0.9	0.117	1.012	0.116	0.161	0.718	9.6	90.4	0.105
SC-08	SB-12 & SB-13	Foundation Soils	32.4	-0.6	124	1.9	1.4	95.0	0.509	0.9	15	0.0	95.0	1.0	-0.7	0.1	0.9	0.131	1.016	0.130	0.161	0.807	6.0	101.0	0.121
SC-08	SB-12 & SB-13	Foundation Soils	32.5	-0.6	124	1.9	1.4	97.2	0.504	0.9	15	0.0	97.2	1.0	-0.7	0.1	0.9	0.134	1.017	0.133	0.161	0.823	6.0	103.2	0.125
SC-08	SB-12 & SB-13	Foundation Soils	32.6	-0.7	124	1.9	1.4	104.0	0.489	0.9	15	0.0	104.0	1.0	-0.7	0.1	0.9	0.143	1.019	0.141	0.161	0.878	6.0	110.0	0.136
SC-08	SB-12 & SB-13	Foundation Soils	32.6	-0.8	124	1.9	1.4	97.2	0.504	0.9	15	0.0	97.2	1.0	-0.7	0.1	0.9	0.134	1.017	0.132	0.161	0.822	6.0	103.2	0.125
SC-08	SB-12 & SB-13	Foundation Soils	32.7	-0.9	124	1.9	1.4	96.2	0.507	0.9	15	0.0	96.2	1.0	-0.7	0.1	0.9	0.133	1.016	0.131	0.161	0.814	6.0	102.2	0.123
SC-08	SB-12 & SB-13	Foundation Soils	32.8	-1.0	124	1.9	1.4	102.1	0.494	0.9	15	0.0	102.1	1.0	-0.7	0.1	0.9	0.140	1.019	0.139	0.161	0.860	6.0	108.1	0.133
SC-08	SB-12 & SB-13	Foundation Soils	32.9	-1.0	124	1.9	1.4	98.9	0.501	0.9	15	0.0	98.9	1.0	-0.7	0.1	0.9	0.136	1.017	0.134	0.161	0.833	6.0	104.9	0.127
SC-08	SB-12 & SB-13	Foundation Soils	33.0	-1.1	124	1.9	1.4	108.5	0.480	0.9	15	0.0	108.5	1.0	-0.7	0.1	0.9	0.150	1.021	0.148	0.161	0.918	6.0	114.5	0.145
SC-08	SB-12 & SB-13	Foundation Soils	33.1	-1.2	124	1.9	1.4	119.1	0.459	0.9	15	0.0	119.1	1.0	-0.7	0.1	0.9	0.169	1.026	0.168	0.162	1.040	6.0	125.1	
SC-08	SB-12 & SB-13	Foundation Soils	33.1	-1.3	124	1.9	1.4	123.3	0.450	0.9	15	0.0	123.3	1.0	-0.7	0.1	0.9	0.179	1.028	0.178	0.162	1.100	6.0	129.3	
SC-08	SB-12 & SB-13	Foundation Soils	33.2	-1.4	124	2.0	1.4	125.4	0.446	0.9	15	0.0	125.4	1.0	-0.7	0.1	0.9	0.184	1.029	0.183	0.162	1.133	6.0	131.4	
SC-08	SB-12 & SB-13	Foundation Soils	33.3	-1.5	124	2.0	1.4	112.9	0.471	0.9	15	0.0	112.9	1.0	-0.7	0.1	0.9	0.157	1.023	0.156	0.162	0.963	6.0	118.9	0.154
SC-08	SB-12 & SB-13	Foundation Soils	33.4	-1.5	124	2.0	1.4	106.7	0.484	0.9	15	0.0	106.7	1.0	-0.7	0.1	0.9	0.147	1.020	0.145	0.162	0.898	6.0	112.7	0.142
SC-08	SB-12 & SB-13	Foundation Soils	33.5	-1.6	124	2.0	1.4	95.5	0.508	0.9	15	0.0	95.5	1.0	-0.7	0.1	0.9	0.132	1.016	0.130	0.162	0.805	6.0	101.5	0.122
SC-08	SB-12 & SB-13	Foundation Soils	33.5	-1.7	124	2.0	1.4	90.8	0.519	0.9	15	0.0	90.8	1.0	-0.7	0.1	0.9	0.126	1.015	0.125	0.162	0.771	6.0	96.8	0.114
SC-08	SB-12 & SB-13	Foundation Soils	33.6	-1.8	124	2.0	1.4	86.1	0.531	0.9	15	0.0	86.1	1.0	-0.7	0.1	0.9	0.122	1.014	0.120	0.162	0.742	6.0	92.1	0.107
SC-08	SB-12 & SB-13	Foundation Soils	33.7	-1.9	124	2.0	1.4	86.7	0.529	0.9	15	0.0	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.121	0.162	0.745	6.0	92.7	0.108
SC-08	SB-12 & SB-13	Foundation Soils	33.8	-1.9	124	2.0	1.4	89.7	0.522	0.9	15	0.0	89.7	1.0	-0.7	0.1	0.9	0.125	1.015	0.124	0.162	0.763	6.0	95.7	0.113
SC-08	SB-12 & SB-13	Foundation Soils	33.9	-2.0	124	2.0	1.4	93.0	0.514	0.9	15	0.0	93.0	1.0	-0.7	0.1	0.9	0.129	1.015	0.127	0.162	0.785	6.0	99.0	0.118
SC-08	SB-12 & SB-13	Foundation Soils	34.0	-2.1	124	2.0	1.4	96.7	0.506	0.9	15	0.0	96.7	1.0	-0.7	0.1	0.9	0.133	1.017	0.131	0.162	0.811	6.0	102.7	0.124
SC-08	SB-12 & SB-13	Foundation Soils	34.0	-2.2	124	2.0	1.4	97.2	0.504	0.9	15	0.0	97.2	1.0	-0.7	0.1	0.9	0.134	1.017	0.132	0.162	0.814	6.0	103.2	0.125
SC-08	SB-12 & SB-13	Foundation Soils	34.1	-2.3	124	2.0	1.4	96.3	0.507	0.9	15	0.0	96.3	1.0	-0.7	0.1	0.9	0.133	1.017	0.131	0.162	0.807	6.0	102.3	0.123
SC-08	SB-12 & SB-13	Foundation Soils	34.2	-2.4	124	2.0	1.4	120.3	0.456	0.9	15	22.4	120.3	1.0	-0.7	0.1	0.9	0.172	1.026	0.170	0.162	1.049	16.3	114.1	
SC-09	SB-13 & SB-08A	Foundation Soils	12.1	14.8	111	0.7	0.7	45.3	0.656	1.3	20	39.5	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.127	0.728	75.4	81.3	0.092
SC-09	SB-13 & SB-08A	Foundation Soils	12.1	14.7	111	0.7	0.7	44.9	0.658	1.3	20	39.4	44.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.127	0.723	75.4	80.9	0.091
SC-09	SB-13 & SB-08A	Foundation Soils	12.2	14.6	111	0.7	0.7	45.1	0.658	1.3	20	39.4	45.1	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.127	0.721	75.4	81.0	0.092
SC-09	SB-13 & SB-08A	Foundation Soils	12.3	14.5	111	0.7	0.7	45.4	0.656	1.3	20	39.5	45.4	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.128	0.721	75.4	81.3	0.092
SC-09	SB-13 & SB-08A	Foundation Soils	12.4	14.4	115	0.7	0.7	52.7	0.629	1.3	20	40.3	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.098	0.128	0.762	59.5	71.9	0.080
SC-09	SB-13 & SB-08A	Foundation Soils	12.5	14.4	121	0.7	0.7	54.9	0.621	1.3	20	40.3	54.9	1.0	-0.2	0.0	1.0	0.096	1.008	0.099	0.129	0.772	53.2	67.8	0.074
SC-09	SB-13 & SB-08A	Foundation Soils	12.5	14.3	121	0.7	0.7	52.4	0.630	1.3	20	39.9	52.4	1.0	-0.2	0.0	1.0	0.094	1.008	0.097	0.129	0.755	54.6	67.0	0.073
SC-09	SB-13 & SB-08A	Foundation Soils	12.6	14.2	115	0.7	0.7	49.7	0.640	1.3	20	39.7	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.095	0.129	0.736	58.6	68.7	0.075
SC-09	SB-13 & SB-08A	Foundation Soils	12.7	14.1	115	0.7	0.7	47.5	0.648	1.3	20	39.7	47.5	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.130	0.721	68.7	76.5	0.085
SC-09	SB-13 & SB-08A	Foundation Soils	12.8	14.0	115	0.8	0.7	46.8	0.651	1.3	20	39.6	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.130	0.715	71.8	78.9	0.089
SC-09	SB-13 & SB-08A	Foundation Soils	12.9	13.9	115	0.8	0.7	46.4	0.652	1.3	20	39.7	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.131	0.710	75.3	82.1	0.093
SC-09	SB-13 & SB-08A	Foundation Soils	13.0	13.9	111	0.8	0.7	46.0	0.654	1.3	20	39.6	46.0	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.131	0.706	75.4	81.8	0.093
SC-09	SB-13 & SB-08A	Foundation Soils	13.0	13.8	111	0.8	0.7	45.9	0.654	1.3	20	39.6	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.131	0.703	75.4	81.7	0.092
SC-09	SB-13 & SB-08A	Foundation Soils	13.1	13.7	111	0.8	0.7	46.6	0.651	1.3	20	39.7	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.132	0.705	75.4	82.3	0.093
SC-09	SB-13 & SB-08A	Foundation Soils	13.2	13.6	111	0.8	0.7	47.2	0.649	1.3	20	39.8	47.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.132	0.706	75.4	82.8	0.094
SC-09	SB-13 & SB-08A	Foundation Soils	13.3	13.5	115	0.8	0.7	27.9	0.738	1.3	5	15.7	27.9	1.0	-0.2	0.0	1.0	0.077	1.006	0.080	0.133	0.600	61.2	73.5	0.082
SC-09	SB-13 & SB-08A	Foundation Soils	13.4	13.5	121	0.8	0.7	37.6	0.689	1.3	5	15.8	37.6	1.0	-0.2	0.0	1.0	0.084	1.007	0.086	0.133	0.649	43.1	64.9	0.071
SC-09	SB-13 & SB-08A	Foundation Soils	13.5	13.4	121	0.8	0.7	42.5	0.668	1.3	5	15.4	42.5	1.0	-0.2	0.0	1.0	0.087	1.007	0.090	0.133	0.674	34.9	62.0	0.067
SC-09	SB-13 & SB-08A	Foundation Soils	13.5	13.3	121	0.8	0.7	44.1	0.661	1.3	5	15.2	44.1	1.0	-0.2	0.0	1.0	0.088	1.007	0.091	0.134	0.680	32.3	61.2	0.066
SC-09	SB-13 & SB-08A	Foundation Soils	13.6	13.2	121	0.8	0.7	46.0	0.654	1.3	5	15.0	46.0	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.134	0.689	30.3	61.3	0.066
SC-09	SB-13 & SB-08A	Foundation Soils	13.7	13.1	121	0.8	0.8	45.7	0.655	1.3	5	15.3	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.134	0.685	32.5	62.8	0.068
SC-09	SB-13 & SB-08A	Foundation Soils	13.8	13.0	121	0.8	0.8	42.9	0.666	1.3	5	15.7	42.9	1.0	-0.2	0.0	1.0	0.087	1.007	0.090	0.135	0.668	37.4	64.6	0.070
SC-09	SB-13 & SB-08A	Foundation Soils	13.9	13.0	121	0.8	0.8	41.7	0.671	1.3	5	15.8	41.7	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.135	0.660	39.6	65.4	0.071
SC-09	SB-13 & SB-08A	Foundation Soils	13.9	12.9	121	0.8	0.8	42.8	0.667	1.2	5	15.9	42.8	1.0	-0.2	0.0	1.0	0.087	1.007	0.090	0.135	0.664	39.0	66.0	0.072
SC-09	SB-13 & SB-08A	Foundation Soils	14.0	12.8	121	0.8	0.8	44.2	0.661	1.2	5	15.8	44.2	1.0	-0.2	0.0	1.0	0.088	1.007	0.091	0.136	0.669	37.0	65.4	0.071
SC-09	SB-13 & SB-08A	Foundation Soils	14.1	12.7	121	0.8	0.8	42.2	0.669	1.2	5	15.8	42.2	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.136	0.657	39.0	65.4	0.071
SC-09	SB-13 & SB-08A	Foundation Soils	14.2	12.6	121	0.8	0.8	40.5	0.676	1.2	5	15.8	40.5	1.0	-0.2	0.0	1.0	0.086	1.007	0.088	0.136	0.646	39.9	64.6	0.070
SC-09	SB-13 & SB-08A	Foundation Soils	14.3	12.5	121	0.8	0.8	37.3	0.690	1.2	5	15.8	37.3	1.0	-0.2	0.0	1.0	0.084	1.007	0.086	0.137	0.628	43.6	65.2	0.071
SC-09	SB-13 & SB-08A	Foundation Soils	14.4	12.5	121	0.8	0.8	35.3	0.700	1.3	5	15.8	35.3	1.0	-0.2	0.0	1.0	0.082	1.007	0.084	0.137	0.616	47.2	66.7	0.073
SC-09	SB-13 & SB-08A	Foundation Soils	14.4	12.4	121	0.8	0.8	31.9	0.717	1.3	5	15.8	31.9	1.0	-0.2	0.0	1.0	0.080	1.006	0.082	0.137	0.597	54.0	70.1	0.077
SC-09	SB-13 & SB-08A	Foundation Soils	14.5	12.3	115	0.9	0.8	51.7	0.632	1.2	20	40.2	51.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.138	0.699	61.5	73.1	0.081
SC-09	SB-13 & SB-08A	Foundation Soils	14.6	12.2	115	0.9	0.8	48.1	0.646	1.2	20	39.9	48.1	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.138	0.678	72.2	80.4	0.091
SC-09	SB-13 & SB-08A	Foundation Soils	14.7	12.1	111	0.9	0.8	46.1	0.654	1.2	20	39.6	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.138	0.665	75.4	81.9	0.093
SC-09	SB-13 & SB-08A	Foundation Soils	14.8	12.1	111	0.9	0.8	43.8	0.663	1.2	20	39.2	43.8	1.0	-0.2	0.0	1.0	0.088	1.007	0.090	0.139	0.652	75.4	80.0	0.090
SC-09	SB-13 & SB-08A	Foundation Soils	14.8	12.0	111	0.9	0.8	41.8	0.671	1.2	20	38.8	41.8	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.139	0.639	75.4	78.3	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	14.9	11.9	80	0.9	0.8	41.2	0.673	1.2	20	38.7	41.2	1.0	-0.2	0.0	1.0	0.086	1.007	0.089	0.139	0.635	75.4	77.9	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	15.0	11.8	80	0.9	0.8	41.1	0.674	1.2	20	38.7	41.1	1.0	-0.2	0.0	1.0	0.086	1.007	0.088	0.140	0.633	75.4	77.8	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	15.1	11.7	80	0.9	0.8	40.9	0.675	1.2	20	38.7	40.9	1.0	-0.2	0.0	1.0	0.086	1.007	0.088	0.140	0.630	75.4	77.6	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	15.2	11.6	111	0.9	0.8	41.0	0.674	1.2	20	38.7	41.0	1.0	-0.2	0.0	1.0	0.086	1.007	0.088	0.140	0.629	75.4	77.7	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	15.3	11.6	111	0.9	0.8	41.1	0.674	1.2	20	38.7	41.1	1.0	-0.2	0.0	1.0	0.086	1.007	0.088	0.141	0.628	75.4	77.8	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	15.3	11.5	111	0.9	0.8	42.1	0.670	1.2	20	38.9	42.1	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.141	0.631	75.4	78.6	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	15.4	11.4	111	0.9	0.8	42.3	0.669	1.2	20	38.9	42.3	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.141	0.631	75.4	78.8	0.089
SC-09	SB-13 & SB-08A	Foundation Soils	15.5	11.3	111	0.9	0.8	41.6	0.672	1.2	20	38.8	41.6	1.0	-0.2	0.0	1.0	0.086	1.007	0.089	0.142	0.626	75.4	78.2	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	15.6	11.2	111	0.9	0.8	41.2	0.674	1.2	20	38.7	41.2	1.0	-0.2	0.0	1.0	0.086	1.007	0.088	0.142	0.622	75.4	77.8	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	15.7	11.2	80	0.9	0.8	40.8	0.675	1.2	20	38.6	40.8	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.142	0.619	75.4	77.5	0.087

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-09	SB-13 & SB-08A	Foundation Soils	15.7	11.1	80	0.9	0.8	40.7	0.676	1.2	20	38.6	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.143	0.617	75.4	77.4	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	15.8	11.0	111	0.9	0.8	41.5	0.672	1.2	20	38.8	41.5	1.0	-0.3	0.0	1.0	0.086	1.007	0.089	0.143	0.620	75.4	78.1	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	15.9	10.9	111	0.9	0.8	42.0	0.670	1.2	20	38.9	42.0	1.0	-0.3	0.0	1.0	0.087	1.007	0.089	0.143	0.621	75.4	78.5	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	16.0	10.8	111	0.9	0.8	42.2	0.669	1.2	20	38.9	42.2	1.0	-0.3	0.0	1.0	0.087	1.007	0.089	0.144	0.620	75.4	78.7	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	16.1	10.7	111	0.9	0.8	41.9	0.670	1.2	20	38.8	41.9	1.0	-0.3	0.0	1.0	0.087	1.007	0.089	0.144	0.618	75.4	78.5	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	16.2	10.7	80	0.9	0.8	41.8	0.671	1.2	20	38.8	41.8	1.0	-0.3	0.0	1.0	0.087	1.007	0.089	0.144	0.616	75.4	78.4	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	16.2	10.6	80	0.9	0.8	41.8	0.671	1.2	20	38.8	41.8	1.0	-0.3	0.0	1.0	0.087	1.007	0.089	0.145	0.614	75.4	78.3	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	16.3	10.5	80	0.9	0.8	41.7	0.671	1.2	20	38.8	41.7	1.0	-0.3	0.0	1.0	0.087	1.007	0.089	0.145	0.612	75.4	78.2	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	16.4	10.4	80	0.9	0.8	41.4	0.673	1.2	20	38.8	41.4	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.145	0.609	75.4	78.0	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	16.5	10.3	111	1.0	0.8	42.1	0.670	1.2	20	38.9	42.1	1.0	-0.3	0.0	1.0	0.087	1.007	0.089	0.146	0.611	75.4	78.6	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	16.6	10.3	111	1.0	0.8	41.9	0.671	1.2	20	38.8	41.9	1.0	-0.3	0.0	1.0	0.087	1.007	0.089	0.146	0.609	75.4	78.4	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	16.7	10.2	80	1.0	0.8	41.5	0.672	1.2	20	38.8	41.5	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.146	0.606	75.4	78.1	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	16.7	10.1	80	1.0	0.8	41.1	0.674	1.2	20	38.7	41.1	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.146	0.602	75.4	77.8	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	16.8	10.0	80	1.0	0.8	40.8	0.675	1.2	20	38.6	40.8	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.147	0.600	75.4	77.6	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	16.9	9.9	80	1.0	0.8	40.7	0.676	1.2	20	38.6	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.147	0.598	75.4	77.5	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	17.0	9.8	119	1.0	0.8	40.6	0.676	1.2	20	38.6	40.6	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.147	0.596	75.4	77.3	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	17.1	9.8	80	1.0	0.8	40.7	0.676	1.2	20	38.6	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.148	0.595	75.4	77.5	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	17.1	9.7	80	1.0	0.8	40.7	0.676	1.2	20	38.6	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.148	0.594	75.4	77.4	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	17.2	9.6	80	1.0	0.8	40.7	0.676	1.2	20	38.6	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.148	0.593	75.4	77.4	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	17.3	9.5	119	1.0	0.8	40.5	0.677	1.2	20	38.6	40.5	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.149	0.590	75.4	77.3	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	17.4	9.4	119	1.0	0.8	40.4	0.677	1.2	20	38.6	40.4	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.149	0.589	75.4	77.2	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	17.5	9.3	119	1.0	0.8	40.3	0.677	1.2	20	38.6	40.3	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.149	0.587	75.4	77.2	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	17.6	9.3	119	1.0	0.8	40.3	0.677	1.2	20	38.6	40.3	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.149	0.586	75.4	77.2	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	17.6	9.2	119	1.0	0.8	40.4	0.677	1.2	20	38.6	40.4	1.0	-0.3	0.0	1.0	0.086	1.007	0.088	0.150	0.585	75.4	77.2	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	17.7	9.1	119	1.0	0.8	40.3	0.677	1.2	20	38.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.150	0.584	75.4	77.2	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	17.8	9.0	119	1.0	0.8	40.3	0.678	1.2	20	38.5	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.150	0.583	75.4	77.1	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	17.9	8.9	119	1.0	0.8	40.2	0.678	1.2	20	38.5	40.2	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.150	0.581	75.4	77.0	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.0	8.9	119	1.0	0.8	40.1	0.678	1.2	20	38.5	40.1	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.151	0.580	75.4	77.0	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.0	8.8	119	1.0	0.8	40.1	0.678	1.2	20	38.5	40.1	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.151	0.579	75.4	77.0	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.1	8.7	119	1.0	0.8	40.0	0.679	1.2	20	38.5	40.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.151	0.577	75.4	76.9	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.2	8.6	119	1.0	0.8	39.9	0.679	1.2	20	38.5	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.151	0.576	75.4	76.8	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.3	8.5	119	1.0	0.9	39.9	0.679	1.2	20	38.5	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.152	0.575	75.4	76.8	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.4	8.4	119	1.1	0.9	39.8	0.679	1.2	20	38.5	39.8	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.152	0.573	75.4	76.8	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.5	8.4	119	1.1	0.9	39.8	0.679	1.2	20	38.5	39.8	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.152	0.572	75.4	76.8	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.5	8.3	119	1.1	0.9	39.8	0.679	1.2	20	38.5	39.8	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.152	0.571	75.4	76.8	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.6	8.2	119	1.1	0.9	39.8	0.679	1.2	20	38.5	39.8	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.153	0.571	75.4	76.8	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.7	8.1	119	1.1	0.9	39.9	0.679	1.2	20	38.5	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.153	0.570	75.4	76.8	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.8	8.0	119	1.1	0.9	39.9	0.679	1.1	20	38.5	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.153	0.569	75.4	76.8	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.9	8.0	119	1.1	0.9	39.9	0.679	1.1	20	38.5	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.153	0.568	75.4	76.8	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	18.9	7.9	119	1.1	0.9	39.9	0.679	1.1	20	38.5	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.153	0.567	75.4	76.8	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	19.0	7.8	119	1.1	0.9	40.0	0.679	1.1	20	38.5	40.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.154	0.567	75.4	76.9	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	19.1	7.7	119	1.1	0.9	40.1	0.678	1.1	20	38.5	40.1	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.154	0.566	75.4	76.9	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	19.2	7.6	119	1.1	0.9	40.1	0.678	1.1	20	38.5	40.1	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.154	0.565	75.4	77.0	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	19.3	7.5	119	1.1	0.9	40.2	0.678	1.1	20	38.5	40.2	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.154	0.565	75.4	77.1	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	19.4	7.5	119	1.1	0.9	40.3	0.677	1.1	20	38.5	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.155	0.564	75.4	77.1	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	19.4	7.4	119	1.1	0.9	40.5	0.676	1.1	20	38.6	40.5	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.155	0.564	75.4	77.3	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	19.5	7.3	119	1.1	0.9	40.6	0.676	1.1	20	38.6	40.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.155	0.564	75.4	77.4	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	19.6	7.2	119	1.1	0.9	40.7	0.676	1.1	20	38.6	40.7	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.155	0.563	75.4	77.5	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	19.7	7.1	80	1.1	0.9	41.0	0.674	1.1	20	38.7	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.155	0.564	75.4	77.7	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	19.8	7.1	80	1.1	0.9	40.9	0.675	1.1	20	38.7	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.156	0.562	75.4	77.6	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	19.8	7.0	80	1.1	0.9	41.7	0.671	1.1	20	38.8	41.7	1.0	-0.3	0.0	0.9	0.087	1.007	0.088	0.156	0.565	75.4	78.3	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	19.9	6.9	111	1.1	0.9	43.7	0.663	1.1	20	39.2	43.7	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.156	0.573	75.4	79.9	0.090
SC-09	SB-13 & SB-08A	Foundation Soils	20.0	6.8	111	1.1	0.9	46.5	0.652	1.1	20	39.7	46.5	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.156	0.585	75.4	82.3	0.093
SC-09	SB-13 & SB-08A	Foundation Soils	20.1	6.7	111	1.1	0.9	46.9	0.650	1.1	20	39.7	46.9	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.157	0.586	75.4	82.5	0.094
SC-09	SB-13 & SB-08A	Foundation Soils	20.2	6.6	111	1.2	0.9	47.0	0.650	1.1	20	39.7	47.0	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.157	0.585	75.4	82.6	0.094
SC-09	SB-13 & SB-08A	Foundation Soils	20.3	6.6	115	1.2	0.9	48.4	0.645	1.1	20	39.9	48.4	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.157	0.591	70.4	78.9	0.089
SC-09	SB-13 & SB-08A	Foundation Soils	20.3	6.5	115	1.2	0.9	53.2	0.627	1.1	20	40.2	53.2	1.0	-0.4	0.0	0.9	0.095	1.008	0.096	0.157	0.613	56.0	69.0	0.076
SC-09	SB-13 & SB-08A	Foundation Soils	20.4	6.4	121	1.2	0.9	56.2	0.617	1.1	20	40.2	56.2	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.158	0.627	48.5	64.6	0.070
SC-09	SB-13 & SB-08A	Foundation Soils	20.5	6.3	121	1.2	0.9	60.5	0.602	1.1	20	40.6	60.5	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.158	0.647	45.4	65.4	0.071
SC-09	SB-13 & SB-08A	Foundation Soils	20.6	6.2	121	1.2	0.9	62.2	0.597	1.1	20	40.8	62.2	1.0	-0.4	0.0	0.9	0.101	1.009	0.103	0.158	0.654	44.7	66.1	0.072
SC-09	SB-13 & SB-08A	Foundation Soils	20.7	6.2	121	1.2	0.9	61.7	0.599	1.1	20	41.0	61.7	1.0	-0.4	0.0	0.9	0.101	1.009	0.103	0.158	0.651	47.0	67.8	0.074
SC-09	SB-13 & SB-08A	Foundation Soils	20.8	6.1	121	1.2	0.9	60.9	0.601	1.1	20	41.3	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.158	0.646	52.1	71.7	0.079
SC-09	SB-13 & SB-08A	Foundation Soils	20.8	6.0	121	1.2	0.9	61.3	0.600	1.1	20	41.2	61.3	1.0	-0.4	0.0	0.9	0.101	1.009	0.103	0.158	0.647	50.9	71.0	0.078
SC-09	SB-13 & SB-08A	Foundation Soils	20.9	5.9	121	1.2	0.9	60.7	0.602	1.1	20	41.2	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.159	0.643	51.3	70.8	0.078
SC-09	SB-13 & SB-08A	Foundation Soils	21.0	5.8	121	1.2	0.9	60.3	0.603	1.1	20	41.0	60.3	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.159	0.640	49.9	69.2	0.076
SC-09	SB-13 & SB-08A	Foundation Soils	21.1	5.7	121	1.2	0.9	60.5	0.602	1.1	20	41.0	60.5	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.159	0.641	49.8	69.4	0.076
SC-09	SB-13 & SB-08A	Foundation Soils	21.2	5.7	121	1.2	0.9	62.2	0.597	1.1	20	41.2	62.2	1.0	-0.4	0.0	0.9	0.101	1.009	0.103	0.159	0.648	48.6	69.6	0.077
SC-09	SB-13 & SB-08A	Foundation Soils	21.2	5.6	121	1.2	0.9	62.6	0.596	1.1	20	41.0	62.6	1.0	-0.4	0.0	0.9	0.101	1.009	0.103	0.159	0.649	46.0	67.6	0.074
SC-09	SB-13 & SB-08A	Foundation Soils	21.3	5.5	121	1.2	0.9	61.3	0.600	1.1	20	41.0	61.3	1.0	-0.4	0.0	0.9	0.101	1.009	0.102	0.160	0.642	48.1	68.4	0.075
SC-09	SB-13 & SB-08A	Foundation Soils	21.4	5.4	121	1.2	0.9	61.0	0.601	1.1	20	41.1	61.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.160	0.639	49.4	69.4	0.076
SC-09	SB-13 & SB-08A	Foundation Soils	21.5	5.3	121	1.2	0.9	61.5	0.599	1.1	20	41.1	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.103	0.160	0.641	48.6	69.0	0.076

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-09	SB-13 & SB-08A	Foundation Soils	21.6	5.2	121	1.2	0.9	61.7	0.599	1.1	20	41.1	61.7	1.0	-0.4	0.0	0.9	0.101	1.009	0.103	0.160	0.642	48.7	69.3	0.076
SC-09	SB-13 & SB-08A	Foundation Soils	21.7	5.2	121	1.2	0.9	63.2	0.594	1.1	20	41.6	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.160	0.648	51.1	72.7	0.081
SC-09	SB-13 & SB-08A	Foundation Soils	21.7	5.1	121	1.2	0.9	64.8	0.589	1.1	20	41.8	64.8	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.160	0.655	50.3	73.3	0.081
SC-09	SB-13 & SB-08A	Foundation Soils	21.8	5.0	115	1.3	0.9	62.4	0.597	1.1	20	41.9	62.4	1.0	-0.4	0.0	0.9	0.101	1.009	0.103	0.161	0.642	57.6	78.1	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	21.9	4.9	115	1.3	0.9	64.8	0.589	1.1	20	42.1	64.8	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.161	0.653	54.6	77.2	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	22.0	4.8	121	1.3	0.9	71.6	0.569	1.1	20	42.6	71.6	1.0	-0.4	0.0	0.9	0.109	1.010	0.111	0.161	0.688	46.6	75.6	0.084
SC-09	SB-13 & SB-08A	Foundation Soils	22.1	4.8	121	1.3	1.0	69.8	0.574	1.1	20	42.6	69.8	1.0	-0.4	0.0	0.9	0.107	1.010	0.109	0.161	0.677	49.5	76.7	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	22.1	4.7	121	1.3	1.0	88.2	0.525	1.1	20	42.7	88.2	1.0	-0.4	0.0	0.9	0.124	1.014	0.127	0.161	0.786	33.2	78.8	0.089
SC-09	SB-13 & SB-08A	Foundation Soils	22.2	4.6	124	1.3	1.0	91.8	0.517	1.1	20	38.8	91.8	1.0	-0.4	0.0	0.9	0.128	1.015	0.131	0.161	0.810	25.5	78.4	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	22.3	4.5	124	1.3	1.0	89.0	0.524	1.1	20	23.7	89.0	1.0	-0.4	0.0	0.9	0.125	1.014	0.128	0.162	0.789	16.6	82.0	0.093
SC-09	SB-13 & SB-08A	Foundation Soils	22.4	4.4	124	1.3	1.0	83.9	0.536	1.1	20	17.3	83.9	1.0	-0.4	0.0	0.9	0.119	1.013	0.122	0.162	0.755	14.8	81.4	0.092
SC-09	SB-13 & SB-08A	Foundation Soils	22.5	4.3	124	1.3	1.0	71.8	0.569	1.1	20	3.5	71.8	1.0	-0.4	0.0	0.9	0.109	1.010	0.111	0.162	0.684	11.2	79.5	0.089
SC-09	SB-13 & SB-08A	Foundation Soils	22.6	4.3	124	1.3	1.0	73.2	0.565	1.1	20	5.0	73.2	1.0	-0.4	0.0	0.9	0.110	1.011	0.112	0.162	0.691	11.7	79.8	0.090
SC-09	SB-13 & SB-08A	Foundation Soils	22.6	4.2	124	1.3	1.0	81.1	0.543	1.0	20	17.3	81.1	1.0	-0.4	0.0	0.9	0.117	1.012	0.119	0.162	0.735	14.9	78.7	0.088
SC-09	SB-13 & SB-08A	Foundation Soils	22.7	4.1	124	1.3	1.0	69.2	0.576	1.1	20	5.5	69.2	1.0	-0.4	0.0	0.9	0.107	1.010	0.108	0.162	0.668	11.8	75.5	0.084
SC-09	SB-13 & SB-08A	Foundation Soils	22.8	4.0	124	1.3	1.0	77.3	0.553	1.0	20	19.8	77.3	1.0	-0.4	0.0	0.9	0.113	1.011	0.116	0.162	0.711	15.7	73.2	0.081
SC-09	SB-13 & SB-08A	Foundation Soils	22.9	3.9	124	1.3	1.0	78.4	0.550	1.0	20	22.3	78.4	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.163	0.717	16.5	72.6	0.080
SC-09	SB-13 & SB-08A	Foundation Soils	23.0	3.9	124	1.3	1.0	78.5	0.550	1.0	20	21.2	78.5	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.163	0.716	16.1	73.4	0.082
SC-09	SB-13 & SB-08A	Foundation Soils	23.0	3.8	124	1.3	1.0	87.2	0.528	1.0	20	38.0	87.2	1.0	-0.4	0.0	0.9	0.123	1.014	0.125	0.163	0.769	25.3	74.5	0.083
SC-09	SB-13 & SB-08A	Foundation Soils	23.1	3.7	121	1.3	1.0	94.4	0.511	1.0	20	39.8	94.4	1.0	-0.4	0.0	0.9	0.130	1.016	0.134	0.163	0.819	26.1	80.8	0.091
SC-09	SB-13 & SB-08A	Foundation Soils	23.2	3.6	124	1.3	1.0	97.1	0.505	1.0	20	37.8	97.1	1.0	-0.4	0.0	0.9	0.134	1.017	0.137	0.163	0.839	23.6	83.0	0.094
SC-09	SB-13 & SB-08A	Foundation Soils	23.3	3.5	124	1.3	1.0	86.9	0.529	1.0	20	36.2	86.9	1.0	-0.4	0.0	0.9	0.122	1.014	0.125	0.163	0.765	23.5	74.2	0.083
SC-09	SB-13 & SB-08A	Foundation Soils	23.4	3.4	124	1.3	1.0	87.1	0.528	1.0	20	32.9	87.1	1.0	-0.4	0.0	0.9	0.123	1.014	0.125	0.163	0.765	21.0	75.1	0.084
SC-09	SB-13 & SB-08A	Foundation Soils	23.5	3.4	124	1.4	1.0	80.5	0.545	1.0	20	0.0	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.118	0.164	0.724	8.6	89.1	0.103
SC-09	SB-13 & SB-08A	Foundation Soils	23.5	3.3	124	1.4	1.0	111.5	0.474	1.0	20	0.0	111.5	1.0	-0.4	0.0	0.9	0.155	1.022	0.159	0.164	0.972	6.0	117.5	0.151
SC-09	SB-13 & SB-08A	Foundation Soils	23.6	3.2	124	1.4	1.0	123.4	0.450	1.0	20	0.0	123.4	1.0	-0.4	0.0	0.9	0.179	1.028	0.185	0.164	1.132	6.0	129.4	
SC-09	SB-13 & SB-08A	Foundation Soils	23.7	3.1	124	1.4	1.0	125.2	0.447	1.0	20	0.0	125.2	1.0	-0.4	0.0	0.9	0.184	1.029	0.191	0.164	1.161	6.0	131.2	
SC-09	SB-13 & SB-08A	Foundation Soils	23.8	3.0	124	1.4	1.0	125.2	0.447	1.0	20	0.0	125.2	1.0	-0.4	0.0	0.9	0.184	1.029	0.190	0.164	1.159	6.0	131.1	
SC-09	SB-13 & SB-08A	Foundation Soils	23.9	3.0	124	1.4	1.0	119.6	0.458	1.0	20	0.0	119.6	1.0	-0.4	0.0	0.9	0.170	1.026	0.176	0.164	1.070	6.0	125.6	
SC-09	SB-13 & SB-08A	Foundation Soils	23.9	2.9	124	1.4	1.0	107.3	0.482	1.0	20	0.0	107.3	1.0	-0.4	0.1	0.9	0.148	1.020	0.151	0.164	0.921	6.0	113.3	0.143
SC-09	SB-13 & SB-08A	Foundation Soils	24.0	2.8	124	1.4	1.0	98.3	0.502	1.0	20	0.0	98.3	1.0	-0.4	0.1	0.9	0.135	1.017	0.138	0.165	0.839	6.0	104.3	0.126
SC-09	SB-13 & SB-08A	Foundation Soils	24.1	2.7	124	1.4	1.0	91.6	0.518	1.0	20	0.0	91.6	1.0	-0.4	0.1	0.9	0.127	1.015	0.130	0.165	0.788	6.0	97.5	0.115
SC-09	SB-13 & SB-08A	Foundation Soils	24.2	2.6	124	1.4	1.0	88.1	0.526	1.0	20	0.0	88.1	1.0	-0.5	0.1	0.9	0.124	1.014	0.126	0.165	0.764	6.0	94.1	0.110
SC-09	SB-13 & SB-08A	Foundation Soils	24.3	2.5	124	1.4	1.0	85.5	0.532	1.0	20	0.0	85.5	1.0	-0.5	0.1	0.9	0.121	1.013	0.123	0.165	0.746	6.0	91.5	0.106
SC-09	SB-13 & SB-08A	Foundation Soils	24.4	2.5	124	1.4	1.0	84.4	0.535	1.0	20	0.0	84.4	1.0	-0.5	0.1	0.9	0.120	1.013	0.122	0.165	0.739	6.0	90.4	0.105
SC-09	SB-13 & SB-08A	Foundation Soils	24.4	2.4	124	1.4	1.0	84.3	0.535	1.0	20	0.0	84.3	1.0	-0.5	0.1	0.9	0.120	1.013	0.122	0.165	0.737	6.0	90.3	0.105
SC-09	SB-13 & SB-08A	Foundation Soils	24.5	2.3	124	1.4	1.0	83.8	0.536	1.0	20	0.0	83.8	1.0	-0.5	0.1	0.9	0.119	1.013	0.121	0.165	0.734	6.0	89.8	0.104
SC-09	SB-13 & SB-08A	Foundation Soils	24.6	2.2	124	1.4	1.0	81.1	0.543	1.0	20	0.0	81.1	1.0	-0.5	0.1	0.9	0.117	1.012	0.119	0.165	0.717	6.0	87.1	0.100
SC-09	SB-13 & SB-08A	Foundation Soils	24.7	2.1	124	1.4	1.0	78.2	0.551	1.0	20	0.0	78.2	1.0	-0.5	0.1	0.9	0.114	1.012	0.116	0.166	0.700	6.0	84.2	0.096
SC-09	SB-13 & SB-08A	Foundation Soils	24.8	2.1	124	1.4	1.0	82.1	0.541	1.0	20	0.0	82.1	1.0	-0.5	0.1	0.9	0.118	1.013	0.119	0.166	0.721	6.0	88.1	0.101
SC-09	SB-13 & SB-08A	Foundation Soils	24.9	2.0	124	1.4	1.0	83.9	0.536	1.0	20	0.0	83.9	1.0	-0.5	0.1	0.9	0.119	1.013	0.121	0.166	0.731	6.0	89.8	0.104
SC-09	SB-13 & SB-08A	Foundation Soils	24.9	1.9	124	1.4	1.0	87.2	0.528	1.0	20	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.125	0.166	0.751	6.0	93.2	0.109
SC-09	SB-13 & SB-08A	Foundation Soils	25.0	1.8	124	1.4	1.0	84.1	0.536	1.0	20	0.0	84.1	1.0	-0.5	0.1	0.9	0.120	1.013	0.121	0.166	0.731	6.0	90.1	0.104
SC-09	SB-13 & SB-08A	Foundation Soils	25.1	1.7	124	1.5	1.0	81.0	0.544	1.0	20	0.0	81.0	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.166	0.712	6.0	87.0	0.100
SC-09	SB-13 & SB-08A	Foundation Soils	25.2	1.6	124	1.5	1.0	78.1	0.551	1.0	20	0.0	78.1	1.0	-0.5	0.1	0.9	0.114	1.012	0.116	0.166	0.695	6.0	84.1	0.096
SC-09	SB-13 & SB-08A	Foundation Soils	25.3	1.6	124	1.5	1.1	74.9	0.560	1.0	20	0.0	74.9	1.0	-0.5	0.1	0.9	0.111	1.011	0.113	0.166	0.677	6.0	80.9	0.091
SC-09	SB-13 & SB-08A	Foundation Soils	25.3	1.5	124	1.5	1.1	78.5	0.550	1.0	20	0.0	78.5	1.0	-0.5	0.1	0.9	0.114	1.012	0.116	0.166	0.696	7.0	85.5	0.098
SC-09	SB-13 & SB-08A	Foundation Soils	25.4	1.4	124	1.5	1.1	81.5	0.542	1.0	20	0.0	81.5	1.0	-0.5	0.1	0.9	0.117	1.012	0.119	0.167	0.713	6.0	87.5	0.101
SC-09	SB-13 & SB-08A	Foundation Soils	25.5	1.3	124	1.5	1.1	88.3	0.525	1.0	20	0.0	88.3	1.0	-0.5	0.1	0.9	0.124	1.014	0.126	0.167	0.753	6.0	94.3	0.110
SC-09	SB-13 & SB-08A	Foundation Soils	25.6	1.2	124	1.5	1.1	88.6	0.524	1.0	20	0.0	88.6	1.0	-0.5	0.1	0.9	0.124	1.014	0.126	0.167	0.755	6.0	94.6	0.111
SC-09	SB-13 & SB-08A	Foundation Soils	25.7	1.1	124	1.5	1.1	86.0	0.531	1.0	20	0.0	86.0	1.0	-0.5	0.1	0.9	0.121	1.014	0.123	0.167	0.738	6.0	92.0	0.107
SC-09	SB-13 & SB-08A	Foundation Soils	25.8	1.1	124	1.5	1.1	84.3	0.535	1.0	20	0.0	84.3	1.0	-0.5	0.1	0.9	0.120	1.013	0.121	0.167	0.727	6.0	90.3	0.105
SC-09	SB-13 & SB-08A	Foundation Soils	25.8	1.0	124	1.5	1.1	76.8	0.555	1.0	20	0.0	76.8	1.0	-0.5	0.1	0.9	0.113	1.011	0.114	0.167	0.683	6.7	83.5	0.095
SC-09	SB-13 & SB-08A	Foundation Soils	25.9	0.9	124	1.5	1.1	74.8	0.560	1.0	20	0.0	74.8	1.0	-0.5	0.1	0.9	0.111	1.011	0.112	0.167	0.672	6.2	81.0	0.092
SC-09	SB-13 & SB-08A	Foundation Soils	26.0	0.8	124	1.5	1.1	71.4	0.569	1.0	20	0.0	71.4	1.0	-0.5	0.1	0.9	0.108	1.010	0.109	0.167	0.654	6.0	77.4	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	26.1	0.7	124	1.5	1.1	69.3	0.576	1.0	20	0.0	69.3	1.0	-0.5	0.1	0.9	0.107	1.010	0.108	0.167	0.643	6.0	75.3	0.084
SC-09	SB-13 & SB-08A	Foundation Soils	26.2	0.7	124	1.5	1.1	69.3	0.576	1.0	20	0.0	69.3	1.0	-0.5	0.1	0.9	0.107	1.010	0.108	0.167	0.642	6.9	76.2	0.085
SC-09	SB-13 & SB-08A	Foundation Soils	26.2	0.6	124	1.5	1.1	69.3	0.576	1.0	20	7.8	69.3	1.0	-0.5	0.1	0.9	0.107	1.010	0.108	0.168	0.642	12.5	74.0	0.082
SC-09	SB-13 & SB-08A	Foundation Soils	26.3	0.5	124	1.5	1.1	75.0	0.559	1.0	20	19.3	75.0	1.0	-0.5	0.1	0.9	0.111	1.011	0.112	0.168	0.671	15.6	71.3	0.079
SC-09	SB-13 & SB-08A	Foundation Soils	26.4	0.4	124	1.5	1.1	78.0	0.551	1.0	20	16.8	78.0	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.168	0.686	14.8	76.0	0.085
SC-09	SB-13 & SB-08A	Foundation Soils	26.5	0.3	124	1.5	1.1	74.9	0.560	1.0	20	12.3	74.9	1.0	-0.5	0.1	0.9	0.111	1.011	0.112	0.168	0.669	13.6	76.2	0.085
SC-09	SB-13 & SB-08A	Foundation Soils	26.6	0.2	124	1.5	1.1	83.7	0.537	1.0	20	19.2	83.7	1.0	-0.5	0.1	0.9	0.119	1.013	0.120	0.168	0.717	15.4	79.8	0.090
SC-09	SB-13 & SB-08A	Foundation Soils	26.7	0.2	124	1.6	1.1	75.5	0.558	1.0	20	11.5	75.5	1.0	-0.5	0.1	0.9	0.112	1.011	0.113	0.168	0.671	13.4	77.4	0.087
SC-09	SB-13 & SB-08A	Foundation Soils	26.7	0.1	124	1.6	1.1	67.7	0.580	1.0	20	0.1	67.7	1.0	-0.5	0.1	0.9	0.105	1.010	0.106	0.168	0.631	9.0	76.6	0.086
SC-09	SB-13 & SB-08A	Foundation Soils	26.8	-0.0	124	1.6	1.1	77.7	0.552	1.0	20	6.4	77.7	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.168	0.682	12.0	83.3	0.095
SC-09	SB-13 & SB-08A	Foundation Soils	26.9	-0.1	124	1.6	1.1	78.6	0.550	1.0	20	0.0	78.6	1.0	-0.5	0.1	0.9	0.115	1.012	0.115	0.168	0.686	7.9	86.5	0.099
SC-09	SB-13 & SB-08A	Foundation Soils	27.0	-0.2	124	1.6	1.1	78.2	0.551	1.0	20	0.2	78.2	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.168	0.683	9.3	87.2	0.100
SC-09	SB-13 & SB-08A	Foundation Soils	27.1	-0.2	124	1.6	1.1	80.6	0.545	1.0	20	0.1	80.6	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.169	0.696	8.7	89.3	0.103
SC-09	SB-13 & SB-08A	Foundation Soils	27.1	-0.3	124	1.6	1.1	87.7	0.527	1.0	20	0.0	87.7	1.0	-0.5	0.1	0.9	0.123	1.014	0.124	0.169	0.738	6.0	93.7	0.110
SC-09	SB-13 & SB-08A	Foundation Soils	27.2	-0.4	124	1.6	1.1	106.9	0.483	1.0	20	0.0	106.9	1.0	-0.5	0.1	0.9	0.147	1.020	0.149	0.169	0.884	6.0	112.9	0.142
SC-09	SB-13 & SB-08A	Foundation Soils	27.3	-0.5	124	1.6	1.1	121.8	0.453	1.0	20	0.0	121.8	1.0	-0.5	0.1	0.9	0.175	1.027	0.179	0.169	1.061	6.0	127.8	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-09	SB-13 & SB-08A	Foundation Soils	27.4	-0.6	124	1.6	1.1	139.1	0.422	1.0	20	0.0	139.1	1.0	-0.5	0.1	0.9	0.230	1.037	0.237	0.169	1.404	6.0	145.1	
SC-09	SB-13 & SB-08A	Foundation Soils	27.5	-0.7	124	1.6	1.1	142.7	0.415	1.0	20	0.0	142.7	1.0	-0.5	0.1	0.9	0.247	1.040	0.255	0.169	1.508	6.0	148.7	
SC-09	SB-13 & SB-08A	Foundation Soils	27.6	-0.7	124	1.6	1.1	148.1	0.406	1.0	20	0.0	148.1	1.0	-0.5	0.1	0.9	0.276	1.044	0.286	0.169	1.692	6.0	154.1	
SC-09	SB-13 & SB-08A	Foundation Soils	27.6	-0.8	124	1.6	1.1	151.4	0.401	1.0	20	0.0	151.4	1.0	-0.5	0.1	0.9	0.298	1.047	0.309	0.169	1.828	6.0	157.4	
SC-09	SB-13 & SB-08A	Foundation Soils	27.7	-0.9	124	1.6	1.1	148.0	0.407	1.0	20	0.0	148.0	1.0	-0.5	0.1	0.9	0.276	1.044	0.285	0.169	1.686	6.0	154.0	
SC-09	SB-13 & SB-08A	Foundation Soils	27.8	-1.0	124	1.6	1.1	141.9	0.417	1.0	20	0.0	141.9	1.0	-0.5	0.1	0.9	0.243	1.039	0.250	0.169	1.478	6.0	147.9	
SC-09	SB-13 & SB-08A	Foundation Soils	27.9	-1.1	124	1.6	1.1	140.7	0.419	1.0	20	0.0	140.7	1.0	-0.5	0.1	0.9	0.238	1.039	0.244	0.169	1.443	6.0	146.7	
SC-09	SB-13 & SB-08A	Foundation Soils	28.0	-1.1	124	1.6	1.1	129.0	0.440	1.0	20	0.0	129.0	1.0	-0.5	0.1	0.9	0.194	1.031	0.199	0.169	1.172	6.0	135.0	
SC-09	SB-13 & SB-08A	Foundation Soils	28.1	-1.2	124	1.6	1.1	116.1	0.464	1.0	20	0.0	116.1	1.0	-0.6	0.1	0.9	0.163	1.024	0.166	0.170	0.977	6.0	122.1	0.161
SC-09	SB-13 & SB-08A	Foundation Soils	28.1	-1.3	124	1.6	1.1	111.7	0.473	1.0	20	0.0	111.7	1.0	-0.6	0.1	0.9	0.155	1.022	0.157	0.170	0.926	6.0	117.7	0.152
SC-09	SB-13 & SB-08A	Foundation Soils	28.2	-1.4	124	1.6	1.1	111.1	0.474	1.0	20	0.0	111.1	1.0	-0.6	0.1	0.9	0.154	1.022	0.156	0.170	0.919	6.0	117.1	0.150
SC-09	SB-13 & SB-08A	Foundation Soils	28.3	-1.5	124	1.7	1.1	106.3	0.484	1.0	20	0.0	106.3	1.0	-0.6	0.1	0.9	0.146	1.020	0.148	0.170	0.871	6.0	112.3	0.141
SC-09	SB-13 & SB-08A	Foundation Soils	28.4	-1.6	124	1.7	1.1	106.4	0.484	1.0	20	0.0	106.4	1.0	-0.6	0.1	0.9	0.146	1.020	0.148	0.170	0.871	6.0	112.4	0.141
SC-09	SB-13 & SB-08A	Foundation Soils	28.5	-1.6	124	1.7	1.1	108.4	0.480	1.0	20	0.0	108.4	1.0	-0.6	0.1	0.9	0.149	1.021	0.151	0.170	0.890	6.0	114.4	0.145
SC-09	SB-13 & SB-08A	Foundation Soils	28.5	-1.7	124	1.7	1.2	110.4	0.476	1.0	20	0.0	110.4	1.0	-0.6	0.1	0.9	0.153	1.022	0.155	0.170	0.909	6.0	116.4	0.149
SC-09	SB-13 & SB-08A	Foundation Soils	28.6	-1.8	124	1.7	1.2	108.0	0.481	1.0	20	0.4	108.0	1.0	-0.6	0.1	0.9	0.149	1.021	0.150	0.170	0.885	9.5	117.1	0.150
SC-09	SB-13 & SB-08A	Foundation Soils	28.7	-1.9	124	1.7	1.2	137.3	0.425	1.0	20	29.8	137.3	1.0	-0.6	0.1	0.9	0.223	1.036	0.228	0.170	1.341	17.2	124.6	
SC-10	SB-08A & SB-09	Foundation Soils	6.1	15.7	121	0.4	0.4	69.9	0.574	1.7	30	47.5	69.9	1.1	-0.1	0.0	1.0	0.107	1.010	0.118	0.130	0.912	47.9	70.3	0.078
SC-10	SB-08A & SB-09	Foundation Soils	6.2	15.7	121	0.4	0.4	68.7	0.577	1.7	30	47.7	68.7	1.1	-0.1	0.0	1.0	0.106	1.010	0.117	0.130	0.896	51.8	72.8	0.081
SC-10	SB-08A & SB-09	Foundation Soils	6.2	15.6	115	0.4	0.4	64.9	0.589	1.7	30	47.1	64.9	1.1	-0.1	0.0	1.0	0.103	1.009	0.113	0.131	0.862	54.0	71.8	0.079
SC-10	SB-08A & SB-09	Foundation Soils	6.3	15.5	115	0.4	0.4	63.2	0.594	1.7	30	47.0	63.2	1.1	-0.1	0.0	1.0	0.102	1.009	0.112	0.132	0.844	57.5	73.7	0.082
SC-10	SB-08A & SB-09	Foundation Soils	6.4	15.4	115	0.4	0.4	62.9	0.595	1.7	30	46.9	62.9	1.1	-0.1	0.0	1.0	0.102	1.009	0.111	0.133	0.836	57.6	73.5	0.082
SC-10	SB-08A & SB-09	Foundation Soils	6.5	15.3	121	0.4	0.4	69.8	0.574	1.7	30	48.0	69.8	1.1	-0.1	0.0	1.0	0.107	1.010	0.118	0.134	0.879	53.7	75.4	0.084
SC-10	SB-08A & SB-09	Foundation Soils	6.6	15.3	121	0.4	0.4	78.3	0.551	1.7	30	47.9	78.3	1.1	-0.1	0.0	1.0	0.114	1.012	0.126	0.135	0.939	39.9	70.3	0.077
SC-10	SB-08A & SB-09	Foundation Soils	6.6	15.2	124	0.4	0.4	86.1	0.531	1.7	30	36.8	86.1	1.1	-0.1	0.0	1.0	0.122	1.014	0.135	0.135	1.000	20.9	70.2	0.077
SC-10	SB-08A & SB-09	Foundation Soils	6.7	15.1	124	0.4	0.4	70.7	0.572	1.7	30	15.0	70.7	1.1	-0.1	0.0	1.0	0.108	1.010	0.118	0.136	0.869	13.9	69.6	0.077
SC-10	SB-08A & SB-09	Foundation Soils	6.8	15.0	124	0.4	0.4	60.6	0.602	1.7	30	0.0	60.6	1.1	-0.1	0.0	1.0	0.100	1.009	0.109	0.137	0.795	8.6	69.1	0.076
SC-10	SB-08A & SB-09	Foundation Soils	6.9	14.9	124	0.4	0.4	62.9	0.595	1.7	30	0.0	62.9	1.1	-0.1	0.0	1.0	0.102	1.009	0.111	0.138	0.805	6.0	68.9	0.076
SC-10	SB-08A & SB-09	Foundation Soils	7.0	14.8	124	0.4	0.4	62.9	0.595	1.7	30	0.0	62.9	1.1	-0.1	0.0	1.0	0.102	1.009	0.111	0.139	0.800	6.5	69.4	0.076
SC-10	SB-08A & SB-09	Foundation Soils	7.1	14.8	124	0.4	0.4	62.5	0.596	1.7	30	0.0	62.5	1.1	-0.1	0.0	1.0	0.101	1.009	0.110	0.139	0.793	6.9	69.4	0.076
SC-10	SB-08A & SB-09	Foundation Soils	7.1	14.7	124	0.4	0.4	61.9	0.598	1.7	30	0.0	61.9	1.1	-0.1	0.0	1.0	0.101	1.009	0.110	0.140	0.785	7.9	69.9	0.077
SC-10	SB-08A & SB-09	Foundation Soils	7.2	14.6	124	0.4	0.4	61.6	0.599	1.7	30	0.4	61.6	1.1	-0.1	0.0	1.0	0.101	1.009	0.110	0.141	0.778	9.5	70.7	0.078
SC-10	SB-08A & SB-09	Foundation Soils	7.3	14.5	124	0.4	0.4	62.7	0.595	1.7	30	2.5	62.7	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.141	0.781	10.7	70.9	0.078
SC-10	SB-08A & SB-09	Foundation Soils	7.4	14.4	124	0.4	0.4	72.3	0.567	1.7	30	14.5	72.3	1.1	-0.1	0.0	1.0	0.109	1.011	0.120	0.142	0.841	13.8	71.6	0.079
SC-10	SB-08A & SB-09	Foundation Soils	7.5	14.4	124	0.4	0.4	82.9	0.539	1.7	30	28.9	82.9	1.1	-0.1	0.0	1.0	0.118	1.013	0.131	0.143	0.916	17.5	71.5	0.079
SC-10	SB-08A & SB-09	Foundation Soils	7.5	14.3	124	0.5	0.4	87.7	0.527	1.7	30	39.5	87.7	1.1	-0.1	0.0	1.0	0.123	1.014	0.137	0.144	0.951	22.5	70.7	0.078
SC-10	SB-08A & SB-09	Foundation Soils	7.6	14.2	124	0.5	0.4	87.2	0.528	1.7	30	42.7	87.2	1.1	-0.1	0.0	1.0	0.123	1.014	0.136	0.144	0.942	25.3	69.8	0.077
SC-10	SB-08A & SB-09	Foundation Soils	7.7	14.1	121	0.5	0.4	83.1	0.538	1.7	30	46.7	83.1	1.1	-0.1	0.0	1.0	0.119	1.013	0.131	0.145	0.903	32.7	69.1	0.076
SC-10	SB-08A & SB-09	Foundation Soils	7.8	14.0	121	0.5	0.4	78.9	0.549	1.7	30	48.0	78.9	1.1	-0.1	0.0	1.0	0.115	1.012	0.126	0.146	0.866	40.0	70.9	0.078
SC-10	SB-08A & SB-09	Foundation Soils	7.9	13.9	121	0.5	0.4	74.8	0.560	1.7	30	48.2	74.8	1.1	-0.1	0.0	1.0	0.111	1.011	0.122	0.146	0.832	45.4	72.1	0.080
SC-10	SB-08A & SB-09	Foundation Soils	8.0	13.9	121	0.5	0.4	70.6	0.572	1.7	30	47.9	70.6	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.147	0.800	49.9	72.6	0.080
SC-10	SB-08A & SB-09	Foundation Soils	8.0	13.8	121	0.5	0.4	65.7	0.586	1.7	30	47.2	65.7	1.1	-0.1	0.0	1.0	0.104	1.009	0.113	0.148	0.765	52.9	71.4	0.079
SC-10	SB-08A & SB-09	Foundation Soils	8.1	13.7	121	0.5	0.4	62.5	0.596	1.7	30	46.5	62.5	1.1	-0.1	0.0	1.0	0.101	1.009	0.110	0.148	0.741	52.9	68.8	0.076
SC-10	SB-08A & SB-09	Foundation Soils	8.2	13.6	115	0.5	0.4	60.2	0.604	1.7	30	46.5	60.2	1.1	-0.1	0.0	1.0	0.100	1.009	0.108	0.149	0.724	59.1	72.8	0.081
SC-10	SB-08A & SB-09	Foundation Soils	8.3	13.5	115	0.5	0.4	58.8	0.608	1.7	30	46.2	58.8	1.1	-0.1	0.0	1.0	0.099	1.008	0.106	0.149	0.712	59.6	72.2	0.080
SC-10	SB-08A & SB-09	Foundation Soils	8.4	13.5	111	0.5	0.4	56.9	0.614	1.7	30	46.3	56.9	1.1	-0.1	0.0	1.0	0.097	1.008	0.105	0.150	0.698	69.8	80.4	0.091
SC-10	SB-08A & SB-09	Foundation Soils	8.4	13.4	111	0.5	0.4	56.1	0.617	1.7	30	46.3	56.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.151	0.691	74.2	84.1	0.096
SC-10	SB-08A & SB-09	Foundation Soils	8.5	13.3	111	0.5	0.4	56.2	0.617	1.7	30	46.3	56.2	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.151	0.688	75.4	85.3	0.097
SC-10	SB-08A & SB-09	Foundation Soils	8.6	13.2	111	0.5	0.4	56.5	0.616	1.7	30	46.4	56.5	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.152	0.687	75.4	85.5	0.098
SC-10	SB-08A & SB-09	Foundation Soils	8.7	13.1	111	0.5	0.4	55.7	0.618	1.7	30	46.2	55.7	1.1	-0.1	0.0	1.0	0.096	1.008	0.104	0.152	0.680	75.4	84.9	0.097
SC-10	SB-08A & SB-09	Foundation Soils	8.8	13.0	111	0.5	0.4	54.1	0.624	1.7	30	45.9	54.1	1.1	-0.1	0.0	1.0	0.095	1.008	0.102	0.153	0.668	75.4	83.6	0.095
SC-10	SB-08A & SB-09	Foundation Soils	8.9	13.0	111	0.5	0.4	52.3	0.630	1.7	30	45.5	52.3	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.154	0.655	75.4	82.2	0.093
SC-10	SB-08A & SB-09	Foundation Soils	8.9	12.9	111	0.5	0.4	51.8	0.632	1.7	30	45.4	51.8	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.154	0.650	75.4	81.8	0.093
SC-10	SB-08A & SB-09	Foundation Soils	9.0	12.8	111	0.5	0.4	40.6	0.676	1.7	15	34.7	40.6	1.1	-0.1	0.0	1.0	0.086	1.007	0.091	0.155	0.590	75.4	81.3	0.092
SC-10	SB-08A & SB-09	Foundation Soils	9.1	12.7	111	0.5	0.4	41.1	0.674	1.7	15	34.8	41.1	1.1	-0.1	0.0	1.0	0.086	1.007	0.092	0.155	0.590	75.4	81.8	0.093
SC-10	SB-08A & SB-09	Foundation Soils	9.2	12.6	111	0.5	0.4	41.5	0.672	1.7	15	34.8	41.5	1.1	-0.1	0.0	1.0	0.086	1.007	0.092	0.156	0.590	75.4	82.1	0.093
SC-10	SB-08A & SB-09	Foundation Soils	9.3	12.5	111	0.6	0.4	42.0	0.670	1.7	15	34.9	42.0	1.1	-0.1	0.0	1.0	0.087	1.007	0.092	0.156	0.590	75.4	82.5	0.094
SC-10	SB-08A & SB-09	Foundation Soils	9.4	12.5	111	0.6	0.5	42.7	0.667	1.7	15	35.0	42.7	1.1	-0.1	0.0	1.0	0.087	1.007	0.093	0.157	0.591	75.4	83.1	0.094
SC-10	SB-08A & SB-09	Foundation Soils	9.4	12.4	111	0.6	0.5	42.1	0.670	1.7	15	34.9	42.1	1.1	-0.1	0.0	1.0	0.087	1.007	0.092	0.158	0.586	75.4	82.5	0.094
SC-10	SB-08A & SB-09	Foundation Soils	9.5	12.3	111	0.6	0.5	40.8	0.675	1.7	15	34.7	40.8	1.1	-0.1	0.0	1.0	0.086	1.007	0.091	0.158	0.577	75.4	81.5	0.092
SC-10	SB-08A & SB-09	Foundation Soils	9.6	12.2	111	0.6	0.5	39.1	0.683	1.7	15	34.4	39.1	1.1	-0.1	0.0	1.0	0.085	1.007	0.090	0.159	0.567	75.4	80.0	0.090
SC-10	SB-08A & SB-09	Foundation Soils	9.7	12.1	111	0.6	0.5	37.5	0.690	1.7	15	34.2	37.5	1.1	-0.1	0.0	1.0	0.084	1.007	0.089	0.159	0.558	75.4	78.7	0.088
SC-10	SB-08A & SB-09	Foundation Soils	9.8	12.1	80	0.6	0.5	36.2	0.696	1.7	15	34.0	36.2	1.1	-0.1	0.0	1.0	0.083	1.007	0.088	0.160	0.549	75.4	77.6	0.087
SC-10	SB-08A & SB-09	Foundation Soils	9.8	12.0	119	0.6	0.5	35.4	0.700	1.7	15	33.8	35.4	1.1	-0.1	0.0	1.0	0.082	1.007	0.087	0.160	0.544	75.4	76.9	0.086
SC-10	SB-08A & SB-09	Foundation Soils	9.9	11.9	111	0.6	0.5	36.8	0.693	1.7	15	34.1	36.8	1.1	-0.1	0.0	1.0	0.083	1.007	0.088	0.161	0.548	75.4	78.2	0.088
SC-10	SB-08A & SB-09	Foundation Soils	10.0	11.8	80	0.6	0.5	36.2	0.696	1.7	15	33.9	36.2	1.1	-0.1	0.0	1.0	0.083	1.007	0.088	0.161	0.543	75.4	77.6	0.087
SC-10	SB-08A & SB-09	Foundation Soils	10.1	11.7	80	0.6	0.5	35.8	0.698	1.7	15	33.9	35.8	1.1	-0.1	0.0	1.0	0.083	1.007	0.087	0.162	0.539	75.4	77.3	0.087
SC-10	SB-08A & SB-09	Foundation Soils	10.2	11.6	119	0.6	0.5	35.6	0.699	1.7	15	33.9	35.6	1.1	-0.1	0.0	1.0	0.082	1.007	0.087	0.163	0.536	75.4	77.1	0.086
SC-10	SB-08A & SB-09	Foundation Soils	10.3	11.6	80	0.6	0.5	35.7	0.698	1.7	15	33.9	35.7	1.1	-0.1	0.0	1.0	0.083	1.007	0.087	0.163	0.535	75.4	77.2	0.086
SC-10	SB-08A & SB-09	Foundation Soils	10.3	11.5	111	0.6	0.5	35.9	0.697	1.7	15	33.9	35.9	1.1	-0.1	0.0	1.0	0.083	1.007	0.087	0.164	0.534	75.4	77.4	0.087

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-10	SB-08A & SB-09	Foundation Soils	10.4	11.4	111	0.6	0.5	36.3	0.695	1.7	15	34.0	36.3	1.1	-0.1	0.0	1.0	0.083	1.007	0.088	0.164	0.534	75.4	77.7	0.087
SC-10	SB-08A & SB-09	Foundation Soils	10.5	11.3	111	0.6	0.5	36.4	0.695	1.7	15	34.0	36.4	1.1	-0.1	0.0	1.0	0.083	1.007	0.088	0.165	0.533	75.4	77.8	0.087
SC-10	SB-08A & SB-09	Foundation Soils	10.6	11.2	111	0.6	0.5	36.2	0.696	1.7	15	34.0	36.2	1.1	-0.1	0.0	1.0	0.083	1.007	0.088	0.165	0.531	75.4	77.7	0.087
SC-10	SB-08A & SB-09	Foundation Soils	10.7	11.2	111	0.6	0.5	36.1	0.696	1.7	15	33.9	36.1	1.0	-0.1	0.0	1.0	0.083	1.007	0.087	0.166	0.528	75.4	77.5	0.087
SC-10	SB-08A & SB-09	Foundation Soils	10.7	11.1	111	0.6	0.5	36.0	0.697	1.7	15	33.9	36.0	1.0	-0.2	0.0	1.0	0.083	1.007	0.087	0.166	0.526	75.4	77.5	0.087
SC-10	SB-08A & SB-09	Foundation Soils	10.8	11.0	111	0.6	0.5	36.3	0.695	1.7	15	34.0	36.3	1.0	-0.2	0.0	1.0	0.083	1.007	0.088	0.166	0.526	75.4	77.7	0.087
SC-10	SB-08A & SB-09	Foundation Soils	10.9	10.9	111	0.6	0.5	36.8	0.693	1.7	15	34.1	36.8	1.0	-0.2	0.0	1.0	0.083	1.007	0.088	0.167	0.527	75.4	78.1	0.088
SC-10	SB-08A & SB-09	Foundation Soils	11.0	10.8	111	0.6	0.5	36.9	0.693	1.7	15	34.1	36.9	1.0	-0.2	0.0	1.0	0.083	1.007	0.088	0.167	0.526	75.4	78.2	0.088
SC-10	SB-08A & SB-09	Foundation Soils	11.1	10.7	111	0.6	0.5	36.5	0.694	1.7	15	34.0	36.5	1.0	-0.2	0.0	1.0	0.083	1.007	0.088	0.168	0.523	75.4	77.9	0.087
SC-10	SB-08A & SB-09	Foundation Soils	11.2	10.7	111	0.7	0.5	36.3	0.695	1.7	15	34.0	36.3	1.0	-0.2	0.0	1.0	0.083	1.007	0.088	0.168	0.520	75.4	77.7	0.087
SC-10	SB-08A & SB-09	Foundation Soils	11.2	10.6	111	0.7	0.5	35.9	0.697	1.7	15	33.9	35.9	1.0	-0.2	0.0	1.0	0.083	1.007	0.087	0.169	0.517	75.4	77.4	0.087
SC-10	SB-08A & SB-09	Foundation Soils	11.3	10.5	119	0.7	0.5	35.7	0.698	1.7	15	33.9	35.7	1.0	-0.2	0.0	1.0	0.083	1.007	0.087	0.169	0.515	75.4	77.2	0.086
SC-10	SB-08A & SB-09	Foundation Soils	11.4	10.4	119	0.7	0.5	35.6	0.698	1.7	15	33.9	35.6	1.0	-0.2	0.0	1.0	0.082	1.007	0.087	0.170	0.513	75.4	77.2	0.086
SC-10	SB-08A & SB-09	Foundation Soils	11.5	10.3	119	0.7	0.5	35.6	0.698	1.7	15	33.9	35.6	1.0	-0.2	0.0	1.0	0.082	1.007	0.087	0.170	0.511	75.4	77.2	0.086
SC-10	SB-08A & SB-09	Foundation Soils	11.6	10.3	119	0.7	0.5	35.6	0.698	1.7	15	33.9	35.6	1.0	-0.2	0.0	1.0	0.082	1.007	0.087	0.170	0.510	75.4	77.1	0.086
SC-10	SB-08A & SB-09	Foundation Soils	11.6	10.2	119	0.7	0.5	35.6	0.698	1.7	15	33.9	35.6	1.0	-0.2	0.0	1.0	0.082	1.007	0.087	0.171	0.509	75.4	77.1	0.086
SC-10	SB-08A & SB-09	Foundation Soils	11.7	10.1	119	0.7	0.5	35.6	0.698	1.7	15	33.9	35.6	1.0	-0.2	0.0	1.0	0.082	1.007	0.087	0.171	0.508	75.4	77.2	0.086
SC-10	SB-08A & SB-09	Foundation Soils	11.8	10.0	119	0.7	0.5	35.7	0.698	1.7	15	33.9	35.7	1.0	-0.2	0.0	1.0	0.082	1.007	0.087	0.171	0.506	75.4	77.2	0.086
SC-10	SB-08A & SB-09	Foundation Soils	11.9	9.9	119	0.7	0.5	35.6	0.698	1.7	15	33.9	35.6	1.0	-0.2	0.0	1.0	0.082	1.007	0.087	0.172	0.505	75.4	77.2	0.086
SC-10	SB-08A & SB-09	Foundation Soils	12.0	9.8	119	0.7	0.5	35.6	0.698	1.7	15	33.9	35.6	1.0	-0.2	0.0	1.0	0.082	1.007	0.087	0.172	0.504	75.4	77.1	0.086
SC-10	SB-08A & SB-09	Foundation Soils	12.1	9.8	119	0.7	0.5	35.6	0.699	1.7	15	33.9	35.6	1.0	-0.2	0.0	1.0	0.082	1.007	0.087	0.173	0.502	75.4	77.1	0.086
SC-10	SB-08A & SB-09	Foundation Soils	12.1	9.7	111	0.7	0.5	38.4	0.686	1.6	15	34.3	38.4	1.0	-0.2	0.0	1.0	0.084	1.007	0.089	0.173	0.513	75.4	79.5	0.090
SC-10	SB-08A & SB-09	Foundation Soils	12.2	9.6	121	0.7	0.5	44.4	0.660	1.6	15	34.5	44.4	1.0	-0.2	0.0	1.0	0.088	1.007	0.093	0.173	0.538	53.1	63.0	0.068
SC-10	SB-08A & SB-09	Foundation Soils	12.3	9.5	121	0.7	0.5	55.0	0.621	1.6	15	33.0	55.0	1.1	-0.2	0.0	1.0	0.096	1.008	0.102	0.174	0.585	31.8	53.8	0.058
SC-10	SB-08A & SB-09	Foundation Soils	12.4	9.4	121	0.7	0.5	62.8	0.595	1.5	15	33.4	62.8	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.174	0.622	30.0	59.4	0.064
SC-10	SB-08A & SB-09	Foundation Soils	12.5	9.3	121	0.7	0.5	64.9	0.589	1.5	15	34.6	64.9	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.174	0.631	32.6	62.8	0.068
SC-10	SB-08A & SB-09	Foundation Soils	12.5	9.3	121	0.7	0.5	62.3	0.597	1.5	15	35.9	62.3	1.1	-0.2	0.0	1.0	0.101	1.009	0.108	0.175	0.617	39.5	65.9	0.072
SC-10	SB-08A & SB-09	Foundation Soils	12.6	9.2	124	0.7	0.5	63.0	0.595	1.5	15	31.1	63.0	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.175	0.619	25.7	57.6	0.062
SC-10	SB-08A & SB-09	Foundation Soils	12.7	9.1	124	0.7	0.5	62.2	0.597	1.5	15	22.9	62.2	1.1	-0.2	0.0	1.0	0.101	1.009	0.108	0.175	0.613	18.6	57.9	0.062
SC-10	SB-08A & SB-09	Foundation Soils	12.8	9.0	124	0.7	0.5	57.2	0.613	1.5	15	12.5	57.2	1.1	-0.2	0.0	1.0	0.097	1.008	0.103	0.176	0.588	14.4	59.1	0.064
SC-10	SB-08A & SB-09	Foundation Soils	12.9	8.9	124	0.8	0.5	55.0	0.621	1.5	15	6.5	55.0	1.1	-0.2	0.0	1.0	0.096	1.008	0.101	0.176	0.577	12.5	61.0	0.066
SC-10	SB-08A & SB-09	Foundation Soils	13.0	8.9	124	0.8	0.5	53.4	0.626	1.5	15	4.8	53.4	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.176	0.568	11.9	60.5	0.066
SC-10	SB-08A & SB-09	Foundation Soils	13.0	8.8	119	0.8	0.5	56.4	0.616	1.5	15	6.3	56.4	1.1	-0.2	0.0	1.0	0.097	1.008	0.103	0.177	0.581	12.4	62.5	0.068
SC-10	SB-08A & SB-09	Foundation Soils	13.1	8.7	119	0.8	0.5	57.2	0.613	1.5	20	7.2	57.2	1.1	-0.2	0.0	1.0	0.097	1.008	0.103	0.177	0.583	12.4	62.4	0.068
SC-10	SB-08A & SB-09	Foundation Soils	13.2	8.6	119	0.8	0.5	56.8	0.615	1.5	20	5.1	56.8	1.0	-0.2	0.0	1.0	0.097	1.008	0.103	0.177	0.580	11.8	63.5	0.069
SC-10	SB-08A & SB-09	Foundation Soils	13.3	8.5	119	0.8	0.6	56.7	0.615	1.5	20	4.1	56.7	1.0	-0.2	0.0	1.0	0.097	1.008	0.103	0.178	0.578	11.5	64.1	0.070
SC-10	SB-08A & SB-09	Foundation Soils	13.4	8.4	124	0.8	0.6	54.8	0.621	1.5	20	0.1	54.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.178	0.569	8.8	63.5	0.069
SC-10	SB-08A & SB-09	Foundation Soils	13.5	8.4	124	0.8	0.6	57.9	0.611	1.5	20	3.4	57.9	1.0	-0.2	0.0	1.0	0.098	1.008	0.104	0.178	0.582	11.2	65.7	0.072
SC-10	SB-08A & SB-09	Foundation Soils	13.5	8.3	124	0.8	0.6	67.8	0.580	1.5	20	18.0	67.8	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.178	0.628	15.4	65.1	0.071
SC-10	SB-08A & SB-09	Foundation Soils	13.6	8.2	124	0.8	0.6	78.7	0.550	1.4	20	32.4	78.7	1.1	-0.2	0.0	1.0	0.115	1.012	0.123	0.179	0.686	21.3	67.7	0.074
SC-10	SB-08A & SB-09	Foundation Soils	13.7	8.1	124	0.8	0.6	80.9	0.544	1.4	20	36.5	80.9	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.179	0.697	24.6	69.0	0.076
SC-10	SB-08A & SB-09	Foundation Soils	13.8	8.0	124	0.8	0.6	81.2	0.543	1.4	20	36.2	81.2	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.179	0.698	24.2	69.3	0.076
SC-10	SB-08A & SB-09	Foundation Soils	13.9	8.0	124	0.8	0.6	79.1	0.549	1.4	20	34.3	79.1	1.1	-0.2	0.0	1.0	0.115	1.012	0.123	0.180	0.684	22.8	67.6	0.074
SC-10	SB-08A & SB-09	Foundation Soils	13.9	7.9	124	0.8	0.6	80.2	0.546	1.4	20	31.9	80.2	1.1	-0.2	0.0	1.0	0.116	1.012	0.124	0.180	0.690	20.9	69.2	0.076
SC-10	SB-08A & SB-09	Foundation Soils	14.0	7.8	124	0.8	0.6	85.0	0.533	1.4	20	33.9	85.0	1.1	-0.2	0.0	1.0	0.121	1.013	0.129	0.180	0.717	21.8	73.0	0.081
SC-10	SB-08A & SB-09	Foundation Soils	14.1	7.7	124	0.8	0.6	84.9	0.534	1.4	20	34.0	84.9	1.1	-0.2	0.0	1.0	0.120	1.013	0.129	0.180	0.716	21.9	72.9	0.081
SC-10	SB-08A & SB-09	Foundation Soils	14.2	7.6	124	0.8	0.6	87.5	0.527	1.4	20	37.4	87.5	1.1	-0.2	0.0	1.0	0.123	1.014	0.132	0.181	0.731	24.6	74.7	0.083
SC-10	SB-08A & SB-09	Foundation Soils	14.3	7.5	121	0.8	0.6	89.1	0.523	1.4	20	41.3	89.1	1.1	-0.2	0.0	1.0	0.125	1.014	0.134	0.181	0.740	29.7	77.5	0.087
SC-10	SB-08A & SB-09	Foundation Soils	14.4	7.5	121	0.8	0.6	88.8	0.524	1.4	20	43.2	88.8	1.1	-0.2	0.0	1.0	0.124	1.014	0.133	0.181	0.737	34.6	80.1	0.090
SC-10	SB-08A & SB-09	Foundation Soils	14.4	7.4	121	0.8	0.6	86.9	0.529	1.4	20	43.8	86.9	1.1	-0.2	0.0	1.0	0.122	1.014	0.131	0.181	0.723	37.9	81.0	0.091
SC-10	SB-08A & SB-09	Foundation Soils	14.5	7.3	121	0.9	0.6	85.1	0.533	1.4	20	43.5	85.1	1.1	-0.2	0.0	1.0	0.121	1.013	0.129	0.182	0.710	38.0	79.6	0.090
SC-10	SB-08A & SB-09	Foundation Soils	14.6	7.2	121	0.9	0.6	85.2	0.533	1.4	20	43.7	85.2	1.1	-0.2	0.0	1.0	0.121	1.013	0.129	0.182	0.709	38.5	80.0	0.090
SC-10	SB-08A & SB-09	Foundation Soils	14.7	7.1	121	0.9	0.6	87.5	0.527	1.4	20	43.2	87.5	1.1	-0.2	0.0	1.0	0.123	1.014	0.132	0.182	0.723	35.2	79.5	0.090
SC-10	SB-08A & SB-09	Foundation Soils	14.8	7.1	121	0.9	0.6	88.6	0.525	1.4	20	41.2	88.6	1.1	-0.2	0.0	1.0	0.124	1.014	0.133	0.182	0.729	29.6	77.1	0.086
SC-10	SB-08A & SB-09	Foundation Soils	14.8	7.0	121	0.9	0.6	90.4	0.520	1.3	20	40.9	90.4	1.1	-0.2	0.0	1.0	0.126	1.015	0.135	0.183	0.740	28.7	78.2	0.088
SC-10	SB-08A & SB-09	Foundation Soils	14.9	6.9	121	0.9	0.6	87.8	0.527	1.3	20	41.8	87.8	1.1	-0.2	0.0	1.0	0.123	1.014	0.132	0.183	0.721	31.2	77.2	0.086
SC-10	SB-08A & SB-09	Foundation Soils	15.0	6.8	121	0.9	0.6	85.5	0.532	1.4	20	42.1	85.5	1.1	-0.2	0.0	1.0	0.121	1.013	0.129	0.183	0.706	32.8	76.3	0.085
SC-10	SB-08A & SB-09	Foundation Soils	15.1	6.7	121	0.9	0.6	80.5	0.545	1.4	20	42.7	80.5	1.1	-0.2	0.0	1.0	0.116	1.012	0.124	0.183	0.674	37.7	75.5	0.084
SC-10	SB-08A & SB-09	Foundation Soils	15.2	6.6	121	0.9	0.6	79.2	0.548	1.4	20	43.2	79.2	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.184	0.666	41.0	77.1	0.086
SC-10	SB-08A & SB-09	Foundation Soils	15.3	6.6	121	0.9	0.6	77.6	0.552	1.4	20	42.9	77.6	1.0	-0.2	0.0	1.0	0.114	1.012	0.121	0.184	0.656	41.1	75.8	0.085
SC-10	SB-08A & SB-09	Foundation Soils	15.3	6.5	121	0.9	0.6	76.4	0.556	1.4	20	42.6	76.4	1.0	-0.2	0.0	1.0	0.113	1.011	0.119	0.184	0.649	40.8	74.6	0.083
SC-10	SB-08A & SB-09	Foundation Soils	15.4	6.4	121	0.9	0.6	74.5	0.561	1.4	20	41.8	74.5	1.0	-0.2	0.0	1.0	0.111	1.011	0.117	0.184	0.638	38.4	71.1	0.079
SC-10	SB-08A & SB-09	Foundation Soils	15.5	6.3	121	0.9	0.6	76.6	0.555	1.4	20	42.0	76.6	1.0	-0.2	0.0	1.0	0.113	1.011	0.119	0.185	0.648	37.4	72.0	0.080
SC-10	SB-08A & SB-09	Foundation Soils	15.6	6.2	121	0.9	0.6	78.4	0.550	1.3	20	41.5	78.4	1.0	-0.2	0.0	1.0	0.114	1.012	0.121	0.185	0.656	34.6	71.5	0.079
SC-10	SB-08A & SB-09	Foundation Soils	15.7	6.2	121	0.9	0.6	76.9	0.554	1.3	20	41.4	76.9	1.0	-0.3	0.0	1.0	0.113	1.011	0.120	0.185	0.647	34.9	70.4	0.078
SC-10	SB-08A & SB-09	Foundation Soils	15.7	6.1	121	0.9	0.6	76.4	0.556	1.3	20	41.7	76.4	1.0	-0.3	0.0	1.0	0.113	1.011	0.119	0.185	0.644	36.5	71.2	0.079
SC-10	SB-08A & SB-09	Foundation Soils	15.8	6.0	121	0.9	0.6	77.0	0.554	1.3	20	42.4	77.0	1.0	-0.3	0.0	1.0	0.113	1.011	0.120	0.185	0.646	38.8	73.5	0.082
SC-10	SB-08A & SB-09	Foundation Soils	15.9	5.9	121	0.9	0.6	77.2	0.554	1.3	20	42.6	77.2	1.0	-0.3	0.0	1.0	0.113	1.011	0.120	0.186	0.646	39.7	74.3	0.083
SC-10	SB-08A & SB-09	Foundation Soils	16.0	5.8	121	0.9	0.6	75.4	0.558	1.3	20	42.1	75.4	1.0	-0.3	0.0	1.0	0.112	1.011	0.118	0.186	0.636	38.8	72.1	0.080
SC-10	SB-08A & SB-09	Foundation Soils	16.1	5.7	121	0.9	0.6	74.8	0.560	1.3	20	41.7	74.8	1.0	-0.3	0.0	1.0	0.111	1.011	0.117	0.186	0.632	37.7	70.8	0.078
SC-10	SB-08A & SB-09	Foundation Soils	16.2	5.7	121	1.0	0.6	74.9	0.560	1.3	20	41.3	74.9	1.0	-0.3	0.0	1.0	0.111	1.011	0.118	0.186	0.631	35.9	69.5	0.077

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-10	SB-08A & SB-09	Foundation Soils	16.2	5.6	121	1.0	0.6	82.0	0.541	1.3	20	41.4	82.0	1.0	-0.3	0.0	1.0	0.118	1.013	0.125	0.186	0.669	32.5	73.1	0.081
SC-10	SB-08A & SB-09	Foundation Soils	16.3	5.5	121	1.0	0.6	84.3	0.535	1.3	20	41.5	84.3	1.0	-0.3	0.0	1.0	0.120	1.013	0.127	0.187	0.681	31.9	74.7	0.083
SC-10	SB-08A & SB-09	Foundation Soils	16.4	5.4	121	1.0	0.6	86.1	0.531	1.3	20	42.7	86.1	1.0	-0.3	0.0	1.0	0.122	1.014	0.129	0.187	0.691	34.2	77.6	0.087
SC-10	SB-08A & SB-09	Foundation Soils	16.5	5.3	121	1.0	0.6	82.6	0.540	1.3	20	44.0	82.6	1.0	-0.3	0.0	1.0	0.118	1.013	0.125	0.187	0.669	42.5	81.1	0.092
SC-10	SB-08A & SB-09	Foundation Soils	16.6	5.2	121	1.0	0.6	81.5	0.542	1.3	20	44.1	81.5	1.0	-0.3	0.0	1.0	0.117	1.012	0.124	0.187	0.662	44.9	82.3	0.093
SC-10	SB-08A & SB-09	Foundation Soils	16.7	5.2	121	1.0	0.7	80.3	0.546	1.3	20	43.9	80.3	1.0	-0.3	0.0	1.0	0.116	1.012	0.123	0.187	0.655	44.9	81.2	0.092
SC-10	SB-08A & SB-09	Foundation Soils	16.7	5.1	121	1.0	0.7	80.9	0.544	1.3	20	44.0	80.9	1.0	-0.3	0.0	1.0	0.117	1.012	0.123	0.188	0.657	44.6	81.5	0.092
SC-10	SB-08A & SB-09	Foundation Soils	16.8	5.0	121	1.0	0.7	89.5	0.522	1.3	20	44.5	89.5	1.0	-0.3	0.0	1.0	0.125	1.014	0.133	0.188	0.707	38.7	83.8	0.095
SC-10	SB-08A & SB-09	Foundation Soils	16.9	4.9	124	1.0	0.7	100.3	0.497	1.3	20	39.4	100.3	1.1	-0.3	0.0	1.0	0.138	1.018	0.147	0.188	0.784	24.8	85.7	0.098
SC-10	SB-08A & SB-09	Foundation Soils	17.0	4.8	124	1.0	0.7	98.1	0.502	1.3	20	31.1	98.1	1.0	-0.3	0.0	1.0	0.135	1.017	0.144	0.188	0.766	19.2	86.3	0.099
SC-10	SB-08A & SB-09	Foundation Soils	17.1	4.8	124	1.0	0.7	105.1	0.487	1.3	20	32.1	105.1	1.1	-0.3	0.0	1.0	0.144	1.020	0.155	0.188	0.822	19.3	92.3	0.108
SC-10	SB-08A & SB-09	Foundation Soils	17.1	4.7	124	1.0	0.7	106.7	0.484	1.3	20	40.6	106.7	1.1	-0.3	0.0	1.0	0.147	1.020	0.158	0.188	0.836	25.0	91.1	0.106
SC-10	SB-08A & SB-09	Foundation Soils	17.2	4.6	124	1.0	0.7	109.9	0.477	1.2	20	41.9	109.9	1.1	-0.3	0.0	1.0	0.152	1.022	0.163	0.189	0.865	25.9	93.9	0.110
SC-10	SB-08A & SB-09	Foundation Soils	17.3	4.5	121	1.0	0.7	109.2	0.478	1.2	20	44.0	109.2	1.1	-0.3	0.0	1.0	0.151	1.021	0.162	0.189	0.857	29.0	94.1	0.110
SC-10	SB-08A & SB-09	Foundation Soils	17.4	4.4	124	1.0	0.7	108.3	0.480	1.2	20	40.1	108.3	1.1	-0.3	0.0	1.0	0.149	1.021	0.160	0.189	0.848	24.3	92.5	0.108
SC-10	SB-08A & SB-09	Foundation Soils	17.5	4.3	124	1.0	0.7	107.0	0.483	1.2	20	38.9	107.0	1.1	-0.3	0.0	1.0	0.147	1.020	0.158	0.189	0.835	23.4	91.6	0.106
SC-10	SB-08A & SB-09	Foundation Soils	17.6	4.3	124	1.0	0.7	109.4	0.478	1.2	20	29.1	109.4	1.1	-0.3	0.0	1.0	0.151	1.021	0.162	0.189	0.856	17.9	98.2	0.116
SC-10	SB-08A & SB-09	Foundation Soils	17.6	4.2	124	1.0	0.7	94.3	0.511	1.3	20	0.1	94.3	1.0	-0.3	0.0	1.0	0.130	1.016	0.138	0.189	0.730	8.8	103.1	0.124
SC-10	SB-08A & SB-09	Foundation Soils	17.7	4.1	124	1.0	0.7	98.8	0.501	1.2	20	0.0	98.8	1.0	-0.3	0.0	0.9	0.136	1.017	0.144	0.190	0.762	6.0	104.8	0.127
SC-10	SB-08A & SB-09	Foundation Soils	17.8	4.0	124	1.1	0.7	94.7	0.510	1.2	20	0.0	94.7	1.0	-0.3	0.0	0.9	0.131	1.016	0.139	0.190	0.731	6.5	101.2	0.121
SC-10	SB-08A & SB-09	Foundation Soils	17.9	3.9	124	1.1	0.7	115.1	0.466	1.2	20	25.3	115.1	1.1	-0.3	0.0	0.9	0.161	1.024	0.174	0.190	0.914	16.4	106.3	0.130
SC-10	SB-08A & SB-09	Foundation Soils	18.0	3.9	124	1.1	0.7	115.6	0.465	1.2	20	24.9	115.6	1.1	-0.3	0.0	0.9	0.162	1.024	0.175	0.190	0.918	16.3	107.0	0.131
SC-10	SB-08A & SB-09	Foundation Soils	18.0	3.8	124	1.1	0.7	110.1	0.477	1.2	20	16.0	110.1	1.0	-0.3	0.0	0.9	0.152	1.022	0.163	0.190	0.857	14.1	108.1	0.133
SC-10	SB-08A & SB-09	Foundation Soils	18.1	3.7	124	1.1	0.7	108.1	0.481	1.2	20	17.5	108.1	1.0	-0.3	0.0	0.9	0.149	1.021	0.159	0.190	0.837	14.4	105.1	0.128
SC-10	SB-08A & SB-09	Foundation Soils	18.2	3.6	124	1.1	0.7	108.8	0.479	1.2	20	0.0	108.8	1.0	-0.3	0.0	0.9	0.150	1.021	0.161	0.190	0.843	6.3	115.1	0.146
SC-10	SB-08A & SB-09	Foundation Soils	18.3	3.5	124	1.1	0.7	128.6	0.441	1.2	20	0.0	128.6	1.1	-0.3	0.0	0.9	0.193	1.031	0.210	0.191	1.102	6.0	134.6	
SC-10	SB-08A & SB-09	Foundation Soils	18.4	3.4	124	1.1	0.7	140.0	0.420	1.2	20	0.0	140.0	1.1	-0.3	0.0	0.9	0.234	1.038	0.258	0.191	1.353	6.0	146.0	
SC-10	SB-08A & SB-09	Foundation Soils	18.5	3.4	124	1.1	0.7	141.3	0.418	1.2	20	0.0	141.3	1.1	-0.3	0.0	0.9	0.240	1.039	0.265	0.191	1.387	6.0	147.3	
SC-10	SB-08A & SB-09	Foundation Soils	18.5	3.3	124	1.1	0.7	141.5	0.418	1.2	20	0.0	141.5	1.1	-0.3	0.0	0.9	0.241	1.039	0.266	0.191	1.391	6.0	147.5	
SC-10	SB-08A & SB-09	Foundation Soils	18.6	3.2	124	1.1	0.7	140.3	0.420	1.2	20	0.0	140.3	1.1	-0.3	0.0	0.9	0.236	1.038	0.259	0.191	1.355	6.0	146.3	
SC-10	SB-08A & SB-09	Foundation Soils	18.7	3.1	124	1.1	0.7	138.0	0.424	1.2	20	0.0	138.0	1.1	-0.3	0.0	0.9	0.226	1.037	0.247	0.191	1.293	6.0	144.0	
SC-10	SB-08A & SB-09	Foundation Soils	18.8	3.0	124	1.1	0.7	132.8	0.433	1.2	20	0.0	132.8	1.1	-0.3	0.0	0.9	0.206	1.033	0.225	0.191	1.175	6.0	138.8	
SC-10	SB-08A & SB-09	Foundation Soils	18.9	3.0	124	1.1	0.7	126.3	0.445	1.2	20	0.0	126.3	1.1	-0.3	0.0	0.9	0.187	1.030	0.202	0.192	1.054	6.0	132.3	
SC-10	SB-08A & SB-09	Foundation Soils	18.9	2.9	124	1.1	0.7	115.3	0.466	1.2	20	0.0	115.3	1.0	-0.3	0.0	0.9	0.162	1.024	0.173	0.192	0.903	6.0	121.3	0.160
SC-10	SB-08A & SB-09	Foundation Soils	19.0	2.8	124	1.1	0.7	106.9	0.483	1.2	20	0.0	106.9	1.0	-0.3	0.0	0.9	0.147	1.020	0.156	0.192	0.816	6.0	112.9	0.142
SC-10	SB-08A & SB-09	Foundation Soils	19.1	2.7	124	1.1	0.7	98.7	0.501	1.2	20	0.0	98.7	1.0	-0.3	0.0	0.9	0.136	1.017	0.143	0.192	0.747	6.0	104.6	0.127
SC-10	SB-08A & SB-09	Foundation Soils	19.2	2.6	124	1.1	0.7	91.2	0.518	1.2	20	0.0	91.2	1.0	-0.3	0.0	0.9	0.127	1.015	0.134	0.192	0.696	6.0	97.2	0.115
SC-10	SB-08A & SB-09	Foundation Soils	19.3	2.5	124	1.1	0.7	88.6	0.525	1.2	20	0.0	88.6	1.0	-0.3	0.0	0.9	0.124	1.014	0.130	0.192	0.678	6.0	94.5	0.111
SC-10	SB-08A & SB-09	Foundation Soils	19.4	2.5	124	1.2	0.7	88.3	0.525	1.2	20	0.0	88.3	1.0	-0.3	0.0	0.9	0.124	1.014	0.130	0.192	0.676	6.0	94.3	0.111
SC-10	SB-08A & SB-09	Foundation Soils	19.4	2.4	124	1.2	0.7	90.1	0.521	1.2	20	0.0	90.1	1.0	-0.3	0.0	0.9	0.126	1.015	0.132	0.192	0.687	6.0	96.1	0.113
SC-10	SB-08A & SB-09	Foundation Soils	19.5	2.3	124	1.2	0.7	95.0	0.509	1.2	20	0.0	95.0	1.0	-0.3	0.0	0.9	0.131	1.016	0.138	0.193	0.718	6.0	101.0	0.121
SC-10	SB-08A & SB-09	Foundation Soils	19.6	2.2	124	1.2	0.7	96.0	0.507	1.2	20	0.0	96.0	1.0	-0.3	0.0	0.9	0.132	1.016	0.139	0.193	0.724	6.0	102.0	0.123
SC-10	SB-08A & SB-09	Foundation Soils	19.7	2.1	124	1.2	0.7	93.6	0.513	1.2	20	0.0	93.6	1.0	-0.3	0.0	0.9	0.130	1.016	0.136	0.193	0.707	6.0	99.6	0.119
SC-10	SB-08A & SB-09	Foundation Soils	19.8	2.0	124	1.2	0.7	89.3	0.523	1.2	20	0.0	89.3	1.0	-0.3	0.0	0.9	0.125	1.014	0.131	0.193	0.679	6.0	95.3	0.112
SC-10	SB-08A & SB-09	Foundation Soils	19.8	2.0	124	1.2	0.7	83.5	0.537	1.2	20	0.0	83.5	1.0	-0.3	0.0	0.9	0.119	1.013	0.125	0.193	0.645	6.0	89.5	0.103
SC-10	SB-08A & SB-09	Foundation Soils	19.9	1.9	124	1.2	0.8	80.7	0.544	1.2	20	0.0	80.7	1.0	-0.3	0.0	0.9	0.116	1.012	0.122	0.193	0.629	6.0	86.7	0.099
SC-10	SB-08A & SB-09	Foundation Soils	20.0	1.8	124	1.2	0.8	83.1	0.538	1.2	20	0.0	83.1	1.0	-0.3	0.0	0.9	0.119	1.013	0.124	0.193	0.642	6.0	89.1	0.103
SC-10	SB-08A & SB-09	Foundation Soils	20.1	1.7	124	1.2	0.8	84.3	0.535	1.2	20	0.0	84.3	1.0	-0.4	0.0	0.9	0.120	1.013	0.125	0.193	0.648	6.0	90.2	0.104
SC-10	SB-08A & SB-09	Foundation Soils	20.2	1.6	124	1.2	0.8	81.9	0.541	1.2	20	0.0	81.9	1.0	-0.4	0.0	0.9	0.118	1.013	0.123	0.193	0.634	6.0	87.9	0.101
SC-10	SB-08A & SB-09	Foundation Soils	20.3	1.6	124	1.2	0.8	76.4	0.556	1.2	20	0.6	76.4	1.0	-0.4	0.0	0.9	0.113	1.011	0.117	0.194	0.605	9.7	85.5	0.098
SC-10	SB-08A & SB-09	Foundation Soils	20.3	1.5	124	1.2	0.8	85.8	0.532	1.2	20	0.0	85.8	1.0	-0.4	0.0	0.9	0.121	1.013	0.127	0.194	0.654	6.0	91.8	0.107
SC-10	SB-08A & SB-09	Foundation Soils	20.4	1.4	124	1.2	0.8	97.9	0.503	1.2	20	0.0	97.9	1.0	-0.4	0.0	0.9	0.135	1.017	0.142	0.194	0.731	6.0	103.9	0.126
SC-10	SB-08A & SB-09	Foundation Soils	20.5	1.3	124	1.2	0.8	95.6	0.508	1.2	20	0.0	95.6	1.0	-0.4	0.0	0.9	0.132	1.016	0.138	0.194	0.714	6.0	101.6	0.122
SC-10	SB-08A & SB-09	Foundation Soils	20.6	1.2	124	1.2	0.8	101.3	0.495	1.2	20	0.0	101.3	1.0	-0.4	0.0	0.9	0.139	1.018	0.146	0.194	0.755	6.0	107.3	0.132
SC-10	SB-08A & SB-09	Foundation Soils	20.7	1.1	124	1.2	0.8	106.8	0.483	1.2	20	0.0	106.8	1.0	-0.4	0.0	0.9	0.147	1.020	0.155	0.194	0.799	6.0	112.8	0.142
SC-10	SB-08A & SB-09	Foundation Soils	20.8	1.1	124	1.2	0.8	107.9	0.481	1.2	20	0.0	107.9	1.0	-0.4	0.0	0.9	0.149	1.021	0.157	0.194	0.809	6.0	113.9	0.144
SC-10	SB-08A & SB-09	Foundation Soils	20.8	1.0	124	1.2	0.8	106.8	0.484	1.2	20	0.0	106.8	1.0	-0.4	0.0	0.9	0.147	1.020	0.155	0.194	0.798	6.0	112.8	0.142
SC-10	SB-08A & SB-09	Foundation Soils	20.9	0.9	124	1.2	0.8	109.8	0.477	1.2	20	0.0	109.8	1.0	-0.4	0.0	0.9	0.152	1.022	0.160	0.194	0.825	6.0	115.8	0.148
SC-10	SB-08A & SB-09	Foundation Soils	21.0	0.8	124	1.3	0.8	112.4	0.472	1.2	20	0.0	112.4	1.0	-0.4	0.0	0.9	0.156	1.023	0.165	0.194	0.850	6.0	118.4	0.153
SC-10	SB-08A & SB-09	Foundation Soils	21.1	0.7	124	1.3	0.8	110.1	0.477	1.2	20	0.0	110.1	1.0	-0.4	0.0	0.9	0.152	1.022	0.161	0.194	0.827	6.0	116.1	0.148
SC-10	SB-08A & SB-09	Foundation Soils	21.2	0.7	124	1.3	0.8	113.1	0.470	1.1	20	0.0	113.1	1.0	-0.4	0.0	0.9	0.157	1.023	0.167	0.195	0.856	6.0	119.1	0.155
SC-10	SB-08A & SB-09	Foundation Soils	21.2	0.6	124	1.3	0.8	117.2	0.462	1.1	20	0.0	117.2	1.0	-0.4	0.0	0.9	0.165	1.025	0.175	0.195	0.901	6.0	123.2	0.164
SC-10	SB-08A & SB-09	Foundation Soils	21.3	0.5	124	1.3	0.8	124.4	0.448	1.1	20	0.0	124.4	1.0	-0.4	0.0	0.9	0.182	1.029	0.194	0.195	0.995	6.0	130.4	0.182
SC-10	SB-08A & SB-09	Foundation Soils	21.4	0.4	124	1.3	0.8	121.5	0.454	1.1	20	0.0	121.5	1.0	-0.4	0.0	0.9	0.175	1.027	0.186	0.195	0.953	6.0	127.5	0.174
SC-10	SB-08A & SB-09	Foundation Soils	21.5	0.3	124	1.3	0.8	123.8	0.449	1.1	20	0.0	123.8	1.0	-0.4	0.0	0.9	0.180	1.028	0.192	0.195	0.985	6.0	129.8	0.181
SC-10	SB-08A & SB-09	Foundation Soils	21.6	0.2	124	1.3	0.8	126.2	0.445	1.1	20	0.0	126.2	1.0	-0.4	0.0	0.9	0.186	1.029	0.199	0.195	1.020	6.0	132.2	
SC-10	SB-08A & SB-09	Foundation Soils	21.7	0.2	124	1.3	0.8	119.7	0.457	1.1	20	0.0	119.7	1.0	-0.4	0.0	0.9	0.171	1.026	0.181	0.195	0.928	6.0	125.7	0.170
SC-10	SB-08A & SB-09	Foundation Soils	21.7	0.1	124	1.3	0.8	117.8	0.461	1.1	20	0.0	117.8	1.0	-0.4	0.0	0.9	0.166	1.025	0.176	0.195	0.904	6.0	123.8	0.165
SC-10	SB-08A & SB-09	Foundation Soils	21.8	-0.0	124	1.3	0.8	117.9	0.461	1.1	20	0.0	117.9	1.0	-0.4	0.0	0.9	0.167	1.025	0.176	0.195	0.904	6.0	123.9	0.165
SC-10	SB-08A & SB-09	Foundation Soils	21.9	-0.1	124	1.3	0.8	116.3	0.464	1.1	20	0.0	116.3	1.0	-0.4	0.0	0.9	0.164	1.024	0.173	0.195	0.885	6.0	122.3	0.162
SC-10	SB-08A & SB-09	Foundation Soils	22.0	-0.2	124	1.3	0.8	115.6	0.465	1.1	20	0.0	115.6	1.0	-0.4	0.0	0.9	0.162	1.024	0.171	0.195	0.876	6.0	121.6	0.160

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-10	SB-08A & SB-09	Foundation Soils	22.1	-0.2	124	1.3	0.8	117.6	0.461	1.1	20	0.0	117.6	1.0	-0.4	0.0	0.9	0.166	1.025	0.176	0.195	0.899	6.0	123.6	0.165
SC-10	SB-08A & SB-09	Foundation Soils	22.1	-0.3	124	1.3	0.8	119.7	0.457	1.1	20	0.0	119.7	1.0	-0.4	0.0	0.9	0.170	1.026	0.180	0.196	0.923	6.0	125.6	0.170
SC-10	SB-08A & SB-09	Foundation Soils	22.2	-0.4	124	1.3	0.8	123.3	0.450	1.1	20	0.0	123.3	1.0	-0.4	0.0	0.9	0.179	1.028	0.190	0.196	0.970	6.0	129.3	0.179
SC-10	SB-08A & SB-09	Foundation Soils	22.3	-0.5	124	1.3	0.8	125.2	0.447	1.1	20	0.0	125.2	1.0	-0.4	0.0	0.9	0.184	1.029	0.195	0.196	0.998	6.0	131.2	0.184
SC-10	SB-08A & SB-09	Foundation Soils	22.4	-0.6	124	1.3	0.8	121.7	0.453	1.1	20	0.0	121.7	1.0	-0.4	0.0	0.9	0.175	1.027	0.186	0.196	0.948	6.0	127.7	0.175
SC-10	SB-08A & SB-09	Foundation Soils	22.5	-0.7	124	1.3	0.8	110.7	0.475	1.1	20	0.0	110.7	1.0	-0.4	0.0	0.9	0.153	1.022	0.161	0.196	0.822	6.0	116.7	0.150
SC-10	SB-08A & SB-09	Foundation Soils	22.6	-0.7	124	1.3	0.8	92.4	0.516	1.1	20	0.0	92.4	1.0	-0.4	0.0	0.9	0.128	1.015	0.133	0.196	0.680	6.0	98.4	0.117
SC-10	SB-08A & SB-09	Foundation Soils	22.6	-0.8	124	1.4	0.8	74.4	0.561	1.1	20	0.0	74.4	1.0	-0.4	0.0	0.9	0.111	1.011	0.114	0.196	0.584	6.0	80.4	0.091
SC-10	SB-08A & SB-09	Foundation Soils	22.7	-0.9	124	1.4	0.8	64.1	0.591	1.1	20	0.0	64.1	1.0	-0.4	0.0	0.9	0.103	1.009	0.106	0.196	0.538	7.0	71.0	0.078
SC-10	SB-08A & SB-09	Foundation Soils	22.8	-1.0	124	1.4	0.8	66.0	0.585	1.1	20	7.0	66.0	1.0	-0.4	0.0	0.9	0.104	1.009	0.107	0.196	0.546	12.3	71.3	0.079
SC-10	SB-08A & SB-09	Foundation Soils	22.9	-1.1	124	1.4	0.8	74.1	0.562	1.1	20	18.7	74.1	1.0	-0.4	0.0	0.9	0.111	1.011	0.114	0.196	0.582	15.4	70.8	0.078
SC-10	SB-08A & SB-09	Foundation Soils	23.0	-1.1	124	1.4	0.8	77.9	0.552	1.1	20	26.2	77.9	1.0	-0.4	0.0	0.9	0.114	1.012	0.118	0.196	0.599	18.0	69.7	0.077
SC-10	SB-08A & SB-09	Foundation Soils	23.0	-1.2	124	1.4	0.8	78.1	0.551	1.1	20	26.1	78.1	1.0	-0.4	0.0	0.9	0.114	1.012	0.118	0.196	0.600	18.0	70.0	0.077
SC-10	SB-08A & SB-09	Foundation Soils	23.1	-1.3	124	1.4	0.9	84.4	0.535	1.1	20	37.1	84.4	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.196	0.632	24.8	72.1	0.080
SC-10	SB-08A & SB-09	Foundation Soils	23.2	-1.4	115	1.4	0.9	91.5	0.518	1.1	20	46.8	91.5	1.0	-0.4	0.0	0.9	0.127	1.015	0.132	0.196	0.671	53.9	98.6	0.117
SC-10	SB-08A & SB-09	Foundation Soils	23.3	-1.5	115	1.4	0.9	89.1	0.523	1.1	20	46.5	89.1	1.0	-0.4	0.0	0.9	0.125	1.014	0.129	0.197	0.657	55.0	97.7	0.116
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SC-11	SB-09 & SB-14	Foundation Soils	8.0	13.8	124	0.5	0.5	185.9	0.349	1.3	15	0.0	185.9	1.1	-0.1	0.0	1.0	0.930	1.081	1.105	0.128	8.612	6.0	191.9	
SC-11	SB-09 & SB-14	Foundation Soils	8.1	13.8	124	0.5	0.5	200.2	0.329	1.3	15	0.0	200.2	1.1	-0.1	0.0	1.0	1.910	1.082	2.272	0.129	17.616	6.0	206.2	
SC-11	SB-09 & SB-14	Foundation Soils	8.2	13.7	124	0.5	0.5	216.4	0.308	1.3	15	0.0	216.4	1.1	-0.1	0.0	1.0	5.453	1.082	6.487	0.130	50.057	6.0	222.4	
SC-11	SB-09 & SB-14	Foundation Soils	8.3	13.6	124	0.5	0.5	225.4	0.297	1.3	15	0.0	225.4	1.1	-0.1	0.0	1.0	10.990	1.082	13.075	0.130	100.407	6.0	231.4	
SC-11	SB-09 & SB-14	Foundation Soils	8.4	13.5	124	0.5	0.5	223.1	0.300	1.3	15	0.0	223.1	1.1	-0.1	0.0	1.0	9.148	1.082	10.883	0.131	83.185	6.0	229.1	
SC-11	SB-09 & SB-14	Foundation Soils	8.4	13.4	124	0.5	0.5	217.7	0.307	1.3	15	0.0	217.7	1.1	-0.1	0.0	1.0	5.996	1.082	7.133	0.131	54.266	6.0	223.7	
SC-11	SB-09 & SB-14	Foundation Soils	8.5	13.3	124	0.5	0.5	208.6	0.318	1.3	15	0.0	208.6	1.1	-0.1	0.0	1.0	3.174	1.082	3.776	0.132	28.596	6.0	214.6	
SC-11	SB-09 & SB-14	Foundation Soils	8.6	13.3	124	0.5	0.5	202.2	0.327	1.3	15	0.0	202.2	1.1	-0.1	0.0	1.0	2.150	1.082	2.558	0.133	19.283	6.0	208.2	
SC-11	SB-09 & SB-14	Foundation Soils	8.7	13.2	124	0.5	0.5	201.9	0.327	1.3	15	0.0	201.9	1.1	-0.1	0.0	1.0	2.109	1.082	2.509	0.133	18.832	6.0	207.9	
SC-11	SB-09 & SB-14	Foundation Soils	8.8	13.1	124	0.5	0.5	203.8	0.325	1.3	15	0.0	203.8	1.1	-0.1	0.0	1.0	2.350	1.082	2.796	0.134	20.899	6.0	209.7	
SC-11	SB-09 & SB-14	Foundation Soils	8.9	13.0	124	0.5	0.5	207.0	0.320	1.3	15	0.0	207.0	1.1	-0.1	0.0	1.0	2.868	1.082	3.412	0.134	25.389	6.0	213.0	
SC-11	SB-09 & SB-14	Foundation Soils	8.9	12.9	124	0.5	0.5	209.2	0.318	1.3	15	0.0	209.2	1.1	-0.1	0.0	1.0	3.296	1.082	3.921	0.135	29.055	6.0	215.1	
SC-11	SB-09 & SB-14	Foundation Soils	9.0	12.8	124	0.5	0.5	208.2	0.319	1.3	15	0.0	208.2	1.1	-0.1	0.0	1.0	3.106	1.082	3.695	0.135	27.268	6.0	214.2	
SC-11	SB-09 & SB-14	Foundation Soils	9.1	12.8	124	0.6	0.5	202.8	0.326	1.3	15	0.0	202.8	1.1	-0.1	0.0	1.0	2.219	1.082	2.640	0.136	19.401	6.0	208.8	
SC-11	SB-09 & SB-14	Foundation Soils	9.2	12.7	124	0.6	0.5	197.1	0.333	1.3	15	0.0	197.1	1.1	-0.1	0.0	1.0	1.609	1.082	1.914	0.137	14.013	6.0	203.1	
SC-11	SB-09 & SB-14	Foundation Soils	9.3	12.6	124	0.6	0.5	193.0	0.339	1.3	15	0.0	193.0	1.1	-0.1	0.0	1.0	1.303	1.082	1.550	0.137	11.304	6.0	199.0	
SC-11	SB-09 & SB-14	Foundation Soils	9.4	12.5	124	0.6	0.5	190.5	0.342	1.3	15	0.0	190.5	1.1	-0.1	0.0	1.0	1.153	1.082	1.372	0.138	9.962	6.0	196.5	
SC-11	SB-09 & SB-14	Foundation Soils	9.4	12.4	124	0.6	0.5	192.1	0.340	1.3	15	0.0	192.1	1.1	-0.1	0.0	1.0	1.243	1.082	1.478	0.138	10.696	6.0	198.1	
SC-11	SB-09 & SB-14	Foundation Soils	9.5	12.4	127	0.6	0.5	192.8	0.339	1.3	15	0.0	192.8	1.1	-0.1	0.0	1.0	1.289	1.082	1.533	0.139	11.053	6.0	198.8	
SC-11	SB-09 & SB-14	Foundation Soils	9.6	12.3	127	0.6	0.5	192.4	0.340	1.3	15	0.0	192.4	1.1	-0.1	0.0	1.0	1.267	1.082	1.507	0.139	10.822	6.0	198.4	
SC-11	SB-09 & SB-14	Foundation Soils	9.7	12.2	127	0.6	0.5	192.3	0.340	1.3	15	0.0	192.3	1.1	-0.1	0.0	1.0	1.260	1.082	1.499	0.140	10.723	6.0	198.3	
SC-11	SB-09 & SB-14	Foundation Soils	9.8	12.1	124	0.6	0.5	193.3	0.338	1.3	15	0.0	193.3	1.1	-0.1	0.0	1.0	1.324	1.082	1.576	0.140	11.233	6.0	199.3	
SC-11	SB-09 & SB-14	Foundation Soils	9.8	12.0	124	0.6	0.5	181.8	0.355	1.3	15	0.0	181.8	1.1	-0.1	0.0	1.0	0.781	1.076	0.924	0.141	6.564	6.0	187.8	
SC-11	SB-09 & SB-14	Foundation Soils	9.9	11.9	124	0.6	0.5	195.6	0.335	1.3	15	0.0	195.6	1.1	-0.1	0.0	1.0	1.491	1.082	1.774	0.141	12.556	6.0	201.6	
SC-11	SB-09 & SB-14	Foundation Soils	10.0	11.9	124	0.6	0.5	199.5	0.330	1.2	15	0.0	199.5	1.1	-0.1	0.0	1.0	1.840	1.082	2.189	0.142	15.441	6.0	205.5	
SC-11	SB-09 & SB-14	Foundation Soils	10.1	11.8	124	0.6	0.5	204.1	0.324	1.2	15	0.0	204.1	1.1	-0.1	0.0	1.0	2.393	1.082	2.846	0.142	20.011	6.0	210.0	
SC-11	SB-09 & SB-14	Foundation Soils	10.2	11.7	124	0.6	0.6	204.3	0.324	1.2	15	0.0	204.3	1.1	-0.1	0.0	1.0	2.424	1.082	2.884	0.143	20.208	6.0	210.3	
SC-11	SB-09 & SB-14	Foundation Soils	10.3	11.6	124	0.6	0.6	206.5	0.321	1.2	15	0.0	206.5	1.1	-0.1	0.0	1.0	2.789	1.082	3.318	0.143	23.172	6.0	212.5	
SC-11	SB-09 & SB-14	Foundation Soils	10.3	11.5	124	0.6	0.6	207.7	0.319	1.2	15	0.0	207.7	1.1	-0.1	0.0	1.0	3.005	1.082	3.575	0.144	24.884	6.0	213.7	
SC-11	SB-09 & SB-14	Foundation Soils	10.4	11.5	124	0.6	0.6	209.3	0.317	1.2	15	0.0	209.3	1.1	-0.1	0.0	1.0	3.337	1.082	3.970	0.144	27.542	6.0	215.3	
SC-11	SB-09 & SB-14	Foundation Soils	10.5	11.4	124	0.6	0.6	213.7	0.312	1.2	15	0.0	213.7	1.1	-0.1	0.0	1.0	4.481	1.082	5.331	0.145	36.870	6.0	219.7	
SC-11	SB-09 & SB-14	Foundation Soils	10.6	11.3	124	0.6	0.6	218.8	0.305	1.2	15	0.0	218.8	1.1	-0.1	0.0	1.0	6.498	1.082	7.731	0.145	53.300	6.0	224.8	
SC-11	SB-09 & SB-14	Foundation Soils	10.7	11.2	124	0.7	0.6	221.2	0.302	1.2	15	0.0	221.2	1.1	-0.1	0.0	1.0	7.834	1.082	9.319	0.145	64.053	6.0	227.2	
SC-11	SB-09 & SB-14	Foundation Soils	10.7	11.1	124	0.7	0.6	223.3	0.300	1.2	15	0.0	223.3	1.1	-0.2	0.0	1.0	9.267	1.082	11.025	0.146	75.544	6.0	229.3	
SC-11	SB-09 & SB-14	Foundation Soils	10.8	11.0	124	0.7	0.6	224.7	0.298	1.2	15	0.0	224.7	1.1	-0.2	0.0	1.0	10.360	1.082	12.325	0.146	84.200	6.0	230.7	
SC-11	SB-09 & SB-14	Foundation Soils	10.9	11.0	124	0.7	0.6	225.3	0.297	1.2	15	0.0	225.3	1.1	-0.2	0.0	1.0	10.901	1.082	12.968	0.147	88.328	6.0	231.3	
SC-11	SB-09 & SB-14	Foundation Soils	11.0	10.9	124	0.7	0.6	224.9	0.298	1.2	15	0.0	224.9	1.1	-0.2	0.0	1.0	10.530	1.082	12.527	0.147	85.070	6.0	230.9	
SC-11	SB-09 & SB-14	Foundation Soils	11.1	10.8	124	0.7	0.6	225.1	0.298	1.2	15	0.0	225.1	1.1	-0.2	0.0	1.0	10.728	1.082	12.763	0.148	86.425	6.0	231.1	
SC-11	SB-09 & SB-14	Foundation Soils	11.2	10.7	124	0.7	0.6	224.7	0.298	1.2	15	0.0	224.7	1.1	-0.2	0.0	1.0	10.349	1.082	12.312	0.148	83.131	6.0	230.6	
SC-11	SB-09 & SB-14	Foundation Soils	11.2	10.6	124	0.7	0.6	222.6	0.301	1.2	15	0.0	222.6	1.1	-0.2	0.0	1.0	8.762	1.082	10.423	0.149	70.181	6.0	228.6	
SC-11	SB-09 & SB-14	Foundation Soils	11.3	10.6	124	0.7	0.6	220.0	0.304	1.2	15	0.0	220.0	1.1	-0.2	0.0	1.0	7.160	1.082	8.518	0.149	57.192	6.0	226.0	
SC-11	SB-09 & SB-14	Foundation Soils	11.4	10.5	124	0.7	0.6	216.1	0.309	1.2	15	0.0	216.1	1.1	-0.2	0.0	1.0	5.325	1.082	6.335	0.149	42.417	6.0	222.1	
SC-11	SB-09 & SB-14	Foundation Soils	11.5	10.4	124	0.7	0.6	210.2	0.316	1.2	15	0.0	210.2	1.1	-0.2	0.0	1.0	3.542	1.082	4.214	0.150	28.138	6.0	216.2	
SC-11	SB-09 & SB-14	Foundation Soils	11.6	10.3	124	0.7	0.6	204.5	0.324	1.2	15	0.0	204.5	1.1	-0.2	0.0	1.0	2.456	1.082	2.922	0.150	19.457	6.0	210.5	
SC-11	SB-09 & SB-14	Foundation Soils	11.6	10.2	124	0.7	0.6	198.0	0.332	1.2	15	0.0	198.0	1.1	-0.2	0.0	1.0	1.693	1.082	2.014	0.151	13.378	6.0	204.0	
SC-11	SB-09 & SB-14	Foundation Soils	11.7	10.1	124	0.7	0.6	191.6	0.341	1.2	15	0.0	191.6	1.1	-0.2	0.0	1.0	1.216	1.082	1.447	0.151	9.588	6.0	197.6	
SC-11	SB-09 & SB-14	Foundation Soils	11.8	10.1	124	0.7	0.6	185.1	0.350	1.2	15	0.0	185.1	1.1	-0.2	0.0	1.0	0.899	1.080	1.068	0.151	7.055	6.0	191.1	
SC-11	SB-09 & SB-14	Foundation Soils	11.9	10.0	124	0.7	0.6	176.7	0.362	1.2	15	0.0	176.7	1.1	-0.2	0.0	1.0	0.639	1.070	0.753	0.152	4.961	6.0	182.7	
SC-11	SB-09 & SB-14	Foundation Soils	12.0	9.9	124	0.7	0.6	167.0	0.376	1.2	15	0.0	167.0	1.1	-0.2	0.0	1.0	0.457	1.060	0.534	0.152	3.508	6.0	173.0	
SC-11	SB-09 & SB-14	Foundation Soils	12.1	9.8	124	0.7	0.6	158.5	0.390	1.2	15	0.0	158.5	1.1	-0.2	0.0	1.0	0.357	1.053	0.411	0.152	2.696	6.0	164.5	
SC-11	SB-09 & SB-14	Foundation Soils	12.1	9.7	124	0.7	0.6	138.9	0.422	1.3	15	0.0	138.9	1.1	-0.2	0.0	1.0	0.229	1.037	0.257	0.153	1.681	6.0	144.9	
SC-11	SB-09 & SB-14	Foundation Soils	12.2	9.7	124	0.7	0.6	117.4	0.462	1.3	15	0.0	117.4	1.1	-0.2	0.0	1.0	0.166	1.025	0.181	0.153	1.181	6.5	123.8	
SC-11	SB-09 & SB-14	Foundation Soils	12.3	9.6	124	0.8	0.6	107.0	0.483	1.3	15	10.6	107.0	1.1	-0.2	0.0	1.0	0.147	1.020	0.159	0.154	1.038	13.2	109.6	
SC-11	SB-09 & SB-14	Foundation Soils	12.4	9.5	124	0.8	0.6	110.1	0.477	1.3	15	29.6	110.1	1.1	-0.2	0.0	1.0	0.152	1.022	0.165	0.154	1.072	19.6	100.1	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-11	SB-09 & SB-14	Foundation Soils	12.5	9.4	121	0.8	0.6	95.7	0.508	1.3	15	38.8	95.7	1.1	-0.2	0.0	1.0	0.132	1.016	0.141	0.154	0.916	31.7	88.6	0.102
SC-11	SB-09 & SB-14	Foundation Soils	12.5	9.3	121	0.8	0.6	81.7	0.542	1.3	15	39.2	81.7	1.0	-0.2	0.0	1.0	0.117	1.012	0.125	0.155	0.806	41.8	84.3	0.096
SC-11	SB-09 & SB-14	Foundation Soils	12.6	9.2	121	0.8	0.6	69.4	0.576	1.4	15	38.3	69.4	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.155	0.726	51.7	82.7	0.094
SC-11	SB-09 & SB-14	Foundation Soils	12.7	9.2	115	0.8	0.6	63.8	0.592	1.4	15	37.6	63.8	1.0	-0.2	0.0	1.0	0.102	1.009	0.108	0.155	0.693	54.4	80.6	0.091
SC-11	SB-09 & SB-14	Foundation Soils	12.8	9.1	121	0.8	0.6	67.8	0.580	1.3	15	38.0	67.8	1.0	-0.2	0.0	1.0	0.105	1.010	0.111	0.156	0.713	50.2	80.0	0.090
SC-11	SB-09 & SB-14	Foundation Soils	12.9	9.0	121	0.8	0.6	66.9	0.583	1.3	15	36.9	66.9	1.0	-0.2	0.0	1.0	0.105	1.010	0.110	0.156	0.707	41.7	71.7	0.079
SC-11	SB-09 & SB-14	Foundation Soils	13.0	8.9	121	0.8	0.6	65.7	0.586	1.3	15	36.3	65.7	1.0	-0.2	0.0	1.0	0.104	1.009	0.109	0.156	0.698	39.2	68.6	0.075
SC-11	SB-09 & SB-14	Foundation Soils	13.0	8.8	121	0.8	0.6	67.0	0.583	1.3	15	36.0	67.0	1.0	-0.2	0.0	1.0	0.105	1.010	0.110	0.157	0.703	36.4	67.4	0.074
SC-11	SB-09 & SB-14	Foundation Soils	13.1	8.7	121	0.8	0.6	68.3	0.579	1.3	15	34.3	68.3	1.0	-0.2	0.0	1.0	0.106	1.010	0.111	0.157	0.709	30.4	64.3	0.070
SC-11	SB-09 & SB-14	Foundation Soils	13.2	8.7	124	0.8	0.6	65.9	0.586	1.3	15	32.5	65.9	1.0	-0.2	0.0	1.0	0.104	1.009	0.109	0.157	0.694	27.3	60.7	0.066
SC-11	SB-09 & SB-14	Foundation Soils	13.3	8.6	121	0.8	0.6	67.6	0.581	1.3	15	33.5	67.6	1.0	-0.2	0.0	1.0	0.105	1.010	0.111	0.158	0.701	28.7	62.8	0.068
SC-11	SB-09 & SB-14	Foundation Soils	13.4	8.5	121	0.8	0.6	67.6	0.581	1.3	15	34.0	67.6	1.0	-0.2	0.0	1.0	0.105	1.010	0.111	0.158	0.700	29.9	63.4	0.069
SC-11	SB-09 & SB-14	Foundation Soils	13.5	8.4	121	0.8	0.7	68.3	0.579	1.3	15	35.0	68.3	1.0	-0.2	0.0	1.0	0.106	1.010	0.111	0.158	0.702	32.2	65.5	0.072
SC-11	SB-09 & SB-14	Foundation Soils	13.5	8.3	121	0.8	0.7	68.1	0.579	1.3	15	34.9	68.1	1.0	-0.2	0.0	1.0	0.106	1.010	0.111	0.159	0.699	31.9	65.1	0.071
SC-11	SB-09 & SB-14	Foundation Soils	13.6	8.3	121	0.8	0.7	67.1	0.582	1.3	15	35.0	67.1	1.0	-0.2	0.0	1.0	0.105	1.010	0.110	0.159	0.692	32.8	64.8	0.071
SC-11	SB-09 & SB-14	Foundation Soils	13.7	8.2	121	0.8	0.7	66.8	0.583	1.3	15	36.1	66.8	1.0	-0.2	0.0	1.0	0.105	1.010	0.110	0.159	0.689	37.1	67.9	0.074
SC-11	SB-09 & SB-14	Foundation Soils	13.8	8.1	121	0.8	0.7	62.9	0.595	1.3	15	36.2	62.9	1.0	-0.2	0.0	1.0	0.102	1.009	0.106	0.160	0.667	41.1	67.8	0.074
SC-11	SB-09 & SB-14	Foundation Soils	13.9	8.0	121	0.8	0.7	61.3	0.600	1.3	15	36.4	61.3	1.0	-0.2	0.0	1.0	0.101	1.009	0.105	0.160	0.657	44.4	69.3	0.076
SC-11	SB-09 & SB-14	Foundation Soils	13.9	7.9	121	0.9	0.7	59.8	0.605	1.3	15	36.1	59.8	1.0	-0.2	0.0	1.0	0.099	1.009	0.104	0.160	0.647	43.5	67.2	0.074
SC-11	SB-09 & SB-14	Foundation Soils	14.0	7.8	121	0.9	0.7	62.9	0.595	1.3	15	35.5	62.9	1.0	-0.2	0.0	1.0	0.102	1.009	0.106	0.161	0.662	37.0	64.4	0.070
SC-11	SB-09 & SB-14	Foundation Soils	14.1	7.8	121	0.9	0.7	62.8	0.595	1.3	15	35.7	62.8	1.0	-0.2	0.0	1.0	0.102	1.009	0.106	0.161	0.660	38.2	65.3	0.071
SC-11	SB-09 & SB-14	Foundation Soils	14.2	7.7	121	0.9	0.7	65.0	0.589	1.3	15	35.1	65.0	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.161	0.670	34.0	63.9	0.070
SC-11	SB-09 & SB-14	Foundation Soils	14.3	7.6	121	0.9	0.7	68.9	0.577	1.3	15	35.4	68.9	1.0	-0.2	0.0	1.0	0.106	1.010	0.111	0.162	0.690	33.2	66.7	0.073
SC-11	SB-09 & SB-14	Foundation Soils	14.4	7.5	121	0.9	0.7	68.8	0.577	1.3	15	35.0	68.8	1.0	-0.2	0.0	1.0	0.106	1.010	0.111	0.162	0.688	32.0	65.8	0.072
SC-11	SB-09 & SB-14	Foundation Soils	14.4	7.4	121	0.9	0.7	70.0	0.574	1.3	15	35.7	70.0	1.0	-0.2	0.0	1.0	0.107	1.010	0.112	0.162	0.693	33.8	68.0	0.075
SC-11	SB-09 & SB-14	Foundation Soils	14.5	7.4	121	0.9	0.7	73.9	0.563	1.3	15	35.8	73.9	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.162	0.714	32.2	70.3	0.078
SC-11	SB-09 & SB-14	Foundation Soils	14.6	7.3	121	0.9	0.7	75.7	0.558	1.3	15	36.7	75.7	1.0	-0.2	0.0	1.0	0.112	1.011	0.118	0.163	0.723	34.0	73.1	0.081
SC-11	SB-09 & SB-14	Foundation Soils	14.7	7.2	121	0.9	0.7	74.4	0.561	1.3	15	36.9	74.4	1.0	-0.2	0.0	1.0	0.111	1.011	0.116	0.163	0.714	35.6	73.1	0.081
SC-11	SB-09 & SB-14	Foundation Soils	14.8	7.1	121	0.9	0.7	72.6	0.566	1.3	15	37.1	72.6	1.0	-0.2	0.0	1.0	0.109	1.011	0.115	0.163	0.702	37.7	73.2	0.081
SC-11	SB-09 & SB-14	Foundation Soils	14.8	7.0	121	0.9	0.7	69.8	0.574	1.3	15	36.8	69.8	1.0	-0.2	0.0	1.0	0.107	1.010	0.112	0.164	0.685	38.3	71.3	0.079
SC-11	SB-09 & SB-14	Foundation Soils	14.9	6.9	121	0.9	0.7	70.5	0.572	1.3	15	36.4	70.5	1.0	-0.2	0.0	1.0	0.108	1.010	0.113	0.164	0.688	36.0	70.1	0.077
SC-11	SB-09 & SB-14	Foundation Soils	15.0	6.9	121	0.9	0.7	71.9	0.568	1.3	15	36.0	71.9	1.0	-0.2	0.0	1.0	0.109	1.010	0.114	0.164	0.694	33.5	69.5	0.077
SC-11	SB-09 & SB-14	Foundation Soils	15.1	6.8	121	0.9	0.7	73.2	0.565	1.3	15	34.1	73.2	1.0	-0.2	0.0	1.0	0.110	1.011	0.115	0.164	0.700	28.4	67.5	0.074
SC-11	SB-09 & SB-14	Foundation Soils	15.2	6.7	121	0.9	0.7	72.3	0.567	1.3	15	34.1	72.3	1.0	-0.2	0.0	1.0	0.109	1.011	0.114	0.165	0.694	28.7	66.9	0.073
SC-11	SB-09 & SB-14	Foundation Soils	15.3	6.6	121	0.9	0.7	72.5	0.567	1.3	15	34.3	72.5	1.0	-0.2	0.0	1.0	0.109	1.011	0.114	0.165	0.693	28.9	67.2	0.074
SC-11	SB-09 & SB-14	Foundation Soils	15.3	6.5	121	0.9	0.7	71.7	0.569	1.3	15	35.9	71.7	1.0	-0.2	0.0	1.0	0.109	1.010	0.114	0.165	0.688	33.5	69.3	0.076
SC-11	SB-09 & SB-14	Foundation Soils	15.4	6.5	121	0.9	0.7	70.8	0.571	1.3	15	36.3	70.8	1.0	-0.2	0.0	1.0	0.108	1.010	0.113	0.165	0.681	35.5	70.0	0.077
SC-11	SB-09 & SB-14	Foundation Soils	15.5	6.4	121	0.9	0.7	69.0	0.576	1.3	15	36.4	69.0	1.0	-0.2	0.0	1.0	0.106	1.010	0.111	0.166	0.671	36.9	69.5	0.077
SC-11	SB-09 & SB-14	Foundation Soils	15.6	6.3	121	1.0	0.7	66.9	0.583	1.3	15	36.4	66.9	1.0	-0.2	0.0	1.0	0.105	1.010	0.109	0.166	0.659	38.5	69.1	0.076
SC-11	SB-09 & SB-14	Foundation Soils	15.7	6.2	121	1.0	0.7	66.2	0.585	1.3	15	37.0	66.2	1.0	-0.3	0.0	1.0	0.104	1.009	0.109	0.166	0.654	43.2	72.4	0.080
SC-11	SB-09 & SB-14	Foundation Soils	15.7	6.1	121	1.0	0.7	65.9	0.586	1.3	15	37.1	65.9	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.166	0.651	44.4	73.2	0.081
SC-11	SB-09 & SB-14	Foundation Soils	15.8	6.0	121	1.0	0.7	63.8	0.592	1.3	15	36.8	63.8	1.0	-0.3	0.0	1.0	0.102	1.009	0.107	0.167	0.639	44.6	71.6	0.079
SC-11	SB-09 & SB-14	Foundation Soils	15.9	6.0	121	1.0	0.7	61.7	0.599	1.3	15	37.0	61.7	1.0	-0.3	0.0	1.0	0.101	1.009	0.105	0.167	0.628	50.1	74.8	0.083
SC-11	SB-09 & SB-14	Foundation Soils	16.0	5.9	121	1.0	0.7	70.9	0.571	1.2	15	37.4	70.9	1.0	-0.3	0.0	1.0	0.108	1.010	0.113	0.167	0.674	40.7	74.3	0.083
SC-11	SB-09 & SB-14	Foundation Soils	16.1	5.8	121	1.0	0.7	76.8	0.555	1.2	15	37.8	76.8	1.0	-0.3	0.0	1.0	0.113	1.011	0.118	0.167	0.705	38.1	77.0	0.086
SC-11	SB-09 & SB-14	Foundation Soils	16.2	5.7	121	1.0	0.7	67.4	0.581	1.2	15	37.8	67.4	1.0	-0.3	0.0	1.0	0.105	1.010	0.109	0.168	0.653	49.0	78.6	0.088
SC-11	SB-09 & SB-14	Foundation Soils	16.2	5.6	121	1.0	0.7	66.2	0.585	1.2	15	37.8	66.2	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.168	0.646	51.2	79.5	0.090
SC-11	SB-09 & SB-14	Foundation Soils	16.3	5.5	121	1.0	0.7	67.2	0.582	1.2	15	37.7	67.2	1.0	-0.3	0.0	1.0	0.105	1.010	0.109	0.168	0.650	47.9	77.4	0.087
SC-11	SB-09 & SB-14	Foundation Soils	16.4	5.5	121	1.0	0.7	69.4	0.575	1.2	15	37.3	69.4	1.0	-0.3	0.0	1.0	0.107	1.010	0.111	0.168	0.660	41.5	73.6	0.082
SC-11	SB-09 & SB-14	Foundation Soils	16.5	5.4	121	1.0	0.7	72.8	0.566	1.2	15	36.9	72.8	1.0	-0.3	0.0	1.0	0.110	1.011	0.114	0.169	0.677	36.4	72.4	0.080
SC-11	SB-09 & SB-14	Foundation Soils	16.6	5.3	121	1.0	0.7	75.2	0.559	1.2	15	37.4	75.2	1.0	-0.3	0.0	1.0	0.112	1.011	0.116	0.169	0.689	37.5	75.2	0.084
SC-11	SB-09 & SB-14	Foundation Soils	16.7	5.2	121	1.0	0.7	76.4	0.556	1.2	15	37.0	76.4	1.0	-0.3	0.0	1.0	0.113	1.011	0.117	0.169	0.695	34.9	74.3	0.083
SC-11	SB-09 & SB-14	Foundation Soils	16.7	5.1	121	1.0	0.7	72.0	0.568	1.2	15	37.9	72.0	1.0	-0.3	0.0	1.0	0.109	1.010	0.113	0.169	0.670	43.4	77.5	0.087
SC-11	SB-09 & SB-14	Foundation Soils	16.8	5.1	121	1.0	0.8	72.8	0.566	1.2	15	38.3	72.8	1.0	-0.3	0.0	1.0	0.110	1.011	0.114	0.169	0.673	45.4	79.9	0.090
SC-11	SB-09 & SB-14	Foundation Soils	16.9	5.0	121	1.0	0.8	81.9	0.541	1.2	15	39.0	81.9	1.0	-0.3	0.0	1.0	0.118	1.013	0.123	0.170	0.724	40.1	83.0	0.094
SC-11	SB-09 & SB-14	Foundation Soils	17.0	4.9	121	1.0	0.8	82.3	0.540	1.2	15	39.2	82.3	1.0	-0.3	0.0	1.0	0.118	1.013	0.123	0.170	0.725	41.0	84.1	0.096
SC-11	SB-09 & SB-14	Foundation Soils	17.1	4.8	121	1.0	0.8	87.1	0.528	1.2	15	38.5	87.1	1.0	-0.3	0.0	1.0	0.123	1.014	0.128	0.170	0.754	34.6	83.2	0.094
SC-11	SB-09 & SB-14	Foundation Soils	17.1	4.7	124	1.0	0.8	90.6	0.520	1.2	15	30.2	90.6	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.170	0.777	21.3	81.7	0.093
SC-11	SB-09 & SB-14	Foundation Soils	17.2	4.6	124	1.1	0.8	80.9	0.544	1.2	15	0.5	80.9	1.0	-0.3	0.0	1.0	0.117	1.012	0.122	0.171	0.713	9.7	90.1	0.104
SC-11	SB-09 & SB-14	Foundation Soils	17.3	4.6	124	1.1	0.8	99.6	0.499	1.2	15	0.0	99.6	1.0	-0.3	0.0	1.0	0.137	1.018	0.144	0.171	0.844	6.0	105.6	0.129
SC-11	SB-09 & SB-14	Foundation Soils	17.4	4.5	124	1.1	0.8	104.4	0.489	1.2	15	0.0	104.4	1.0	-0.3	0.0	1.0	0.143	1.019	0.151	0.171	0.885	6.0	110.4	0.137
SC-11	SB-09 & SB-14	Foundation Soils	17.5	4.4	124	1.1	0.8	99.9	0.498	1.2	15	0.0	99.9	1.0	-0.3	0.0	1.0	0.137	1.018	0.144	0.171	0.844	6.0	105.9	0.129
SC-11	SB-09 & SB-14	Foundation Soils	17.6	4.3	124	1.1	0.8	96.8	0.505	1.2	15	0.0	96.8	1.0	-0.3	0.0	1.0	0.133	1.017	0.140	0.171	0.817	6.0	102.8	0.124
SC-11	SB-09 & SB-14	Foundation Soils	17.6	4.2	124	1.1	0.8	93.9	0.512	1.2	15	0.0	93.9	1.0	-0.3	0.0	1.0	0.130	1.016	0.136	0.171	0.794	6.0	99.9	0.119
SC-11	SB-09 & SB-14	Foundation Soils	17.7	4.2	124	1.1	0.8	96.7	0.506	1.2	15	0.0	96.7	1.0	-0.3	0.0	0.9	0.133	1.017	0.140	0.172	0.814	6.0	102.7	0.124
SC-11	SB-09 & SB-14	Foundation Soils	17.8	4.1	124	1.1	0.8	88.1	0.526	1.2	15	0.0	88.1	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.172	0.751	6.0	94.1	0.110
SC-11	SB-09 & SB-14	Foundation Soils	17.9	4.0	124	1.1	0.8	86.7	0.529	1.2	15	0.0	86.7	1.0	-0.3	0.0	0.9	0.122	1.014	0.127	0.172	0.741	6.0	92.7	0.108
SC-11	SB-09 & SB-14	Foundation Soils	18.0	3.9	124	1.1	0.8	98.7	0.501	1.2	15	0.0	98.7	1.0	-0.3	0.0	0.9	0.136	1.017	0.142	0.172	0.826	6.0	104.6	0.127
SC-11	SB-09 & SB-14	Foundation Soils	18.0	3.8	124	1.1	0.8	102.1	0.493	1.2	15	0.0	102.1	1.0	-0.3	0.0	0.9	0.140	1.019	0.147	0.172	0.854	6.0	108.1	0.133
SC-11	SB-09 & SB-14	Foundation Soils	18.1	3.7	124	1.1	0.8	111.7	0.473	1.1	15	0.0	111.7	1.0	-0.3	0.0	0.9	0.155	1.022	0.164	0.173	0.949	6.0	117.7	0.152
SC-11	SB-09 & SB-14	Foundation Soils	18.2	3.7	124	1.1	0.8	122.4	0.452	1.1	15	0.0	122.4	1.0	-0.3	0.0	0.9	0.177	1.027	0.188	0.173	1.090	6.0	128.4	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-11	SB-09 & SB-14	Foundation Soils	18.3	3.6	124	1.1	0.8	130.7	0.437	1.1	15	0.0	130.7	1.0	-0.3	0.0	0.9	0.200	1.032	0.214	0.173	1.238	6.0	136.7	
SC-11	SB-09 & SB-14	Foundation Soils	18.4	3.5	124	1.1	0.8	128.6	0.441	1.1	15	0.0	128.6	1.0	-0.3	0.0	0.9	0.193	1.031	0.207	0.173	1.194	6.0	134.6	
SC-11	SB-09 & SB-14	Foundation Soils	18.5	3.4	124	1.1	0.8	117.9	0.461	1.1	15	0.0	117.9	1.0	-0.3	0.0	0.9	0.167	1.025	0.177	0.173	1.020	6.0	123.9	
SC-11	SB-09 & SB-14	Foundation Soils	18.5	3.3	124	1.1	0.8	113.9	0.469	1.1	15	0.0	113.9	1.0	-0.3	0.0	0.9	0.159	1.023	0.168	0.173	0.968	6.0	119.9	0.156
SC-11	SB-09 & SB-14	Foundation Soils	18.6	3.3	124	1.1	0.8	115.6	0.465	1.1	15	0.0	115.6	1.0	-0.3	0.0	0.9	0.162	1.024	0.171	0.174	0.987	6.0	121.6	0.160
SC-11	SB-09 & SB-14	Foundation Soils	18.7	3.2	124	1.1	0.8	117.3	0.462	1.1	15	0.0	117.3	1.0	-0.3	0.0	0.9	0.166	1.025	0.175	0.174	1.008	6.0	123.3	
SC-11	SB-09 & SB-14	Foundation Soils	18.8	3.1	124	1.1	0.8	114.0	0.469	1.1	15	0.0	114.0	1.0	-0.3	0.0	0.9	0.159	1.023	0.168	0.174	0.965	6.0	120.0	0.157
SC-11	SB-09 & SB-14	Foundation Soils	18.9	3.0	124	1.2	0.8	109.2	0.478	1.1	15	0.0	109.2	1.0	-0.3	0.0	0.9	0.151	1.021	0.159	0.174	0.910	6.0	115.2	0.147
SC-11	SB-09 & SB-14	Foundation Soils	18.9	2.9	124	1.2	0.8	102.3	0.493	1.1	15	0.0	102.3	1.0	-0.3	0.0	0.9	0.140	1.019	0.147	0.174	0.844	6.0	108.3	0.133
SC-11	SB-09 & SB-14	Foundation Soils	19.0	2.8	124	1.2	0.8	96.5	0.506	1.1	15	0.0	96.5	1.0	-0.3	0.0	0.9	0.133	1.017	0.139	0.174	0.795	6.0	102.5	0.123
SC-11	SB-09 & SB-14	Foundation Soils	19.1	2.8	124	1.2	0.8	93.7	0.512	1.1	15	0.0	93.7	1.0	-0.3	0.0	0.9	0.130	1.016	0.135	0.175	0.774	6.0	99.7	0.119
SC-11	SB-09 & SB-14	Foundation Soils	19.2	2.7	124	1.2	0.8	91.2	0.518	1.1	15	0.0	91.2	1.0	-0.3	0.0	0.9	0.127	1.015	0.132	0.175	0.755	6.0	97.2	0.115
SC-11	SB-09 & SB-14	Foundation Soils	19.3	2.6	124	1.2	0.8	88.9	0.524	1.1	15	0.0	88.9	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.175	0.739	6.0	94.9	0.111
SC-11	SB-09 & SB-14	Foundation Soils	19.4	2.5	124	1.2	0.8	84.8	0.534	1.1	15	0.0	84.8	1.0	-0.3	0.0	0.9	0.120	1.013	0.125	0.175	0.712	6.0	90.8	0.105
SC-11	SB-09 & SB-14	Foundation Soils	19.4	2.4	119	1.2	0.8	84.9	0.534	1.1	15	0.0	84.9	1.0	-0.3	0.0	0.9	0.120	1.013	0.125	0.175	0.712	6.0	90.9	0.105
SC-11	SB-09 & SB-14	Foundation Soils	19.5	2.4	119	1.2	0.8	85.6	0.532	1.1	15	0.0	85.6	1.0	-0.3	0.0	0.9	0.121	1.013	0.126	0.175	0.715	6.0	91.6	0.106
SC-11	SB-09 & SB-14	Foundation Soils	19.6	2.3	124	1.2	0.8	82.1	0.541	1.1	15	0.0	82.1	1.0	-0.3	0.0	0.9	0.118	1.013	0.122	0.176	0.694	6.0	88.1	0.101
SC-11	SB-09 & SB-14	Foundation Soils	19.7	2.2	124	1.2	0.8	78.2	0.551	1.1	15	0.0	78.2	1.0	-0.3	0.0	0.9	0.114	1.012	0.118	0.176	0.671	6.0	84.2	0.096
SC-11	SB-09 & SB-14	Foundation Soils	19.8	2.1	124	1.2	0.8	77.7	0.552	1.1	15	0.0	77.7	1.0	-0.3	0.0	0.9	0.114	1.012	0.117	0.176	0.668	6.0	83.7	0.095
SC-11	SB-09 & SB-14	Foundation Soils	19.8	2.0	124	1.2	0.8	77.0	0.554	1.1	15	0.0	77.0	1.0	-0.3	0.0	0.9	0.113	1.011	0.117	0.176	0.663	6.0	83.0	0.094
SC-11	SB-09 & SB-14	Foundation Soils	19.9	1.9	124	1.2	0.8	78.8	0.549	1.1	15	0.0	78.8	1.0	-0.3	0.0	0.9	0.115	1.012	0.118	0.176	0.672	6.0	84.8	0.097
SC-11	SB-09 & SB-14	Foundation Soils	20.0	1.9	119	1.2	0.8	82.5	0.540	1.1	15	0.0	82.5	1.0	-0.3	0.0	0.9	0.118	1.013	0.122	0.176	0.692	6.0	88.5	0.102
SC-11	SB-09 & SB-14	Foundation Soils	20.1	1.8	124	1.2	0.9	76.9	0.554	1.1	15	0.0	76.9	1.0	-0.4	0.0	0.9	0.113	1.011	0.117	0.177	0.661	6.0	82.9	0.094
SC-11	SB-09 & SB-14	Foundation Soils	20.2	1.7	124	1.2	0.9	77.8	0.552	1.1	15	0.0	77.8	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.177	0.665	6.0	83.8	0.095
SC-11	SB-09 & SB-14	Foundation Soils	20.3	1.6	119	1.2	0.9	73.1	0.565	1.1	15	0.0	73.1	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.177	0.639	6.0	79.1	0.089
SC-11	SB-09 & SB-14	Foundation Soils	20.3	1.5	124	1.2	0.9	70.7	0.572	1.1	15	0.0	70.7	1.0	-0.4	0.0	0.9	0.108	1.010	0.111	0.177	0.626	6.0	76.7	0.086
SC-11	SB-09 & SB-14	Foundation Soils	20.4	1.4	124	1.2	0.9	75.7	0.558	1.1	15	0.0	75.7	1.0	-0.4	0.0	0.9	0.112	1.011	0.115	0.177	0.651	6.0	81.7	0.092
SC-11	SB-09 & SB-14	Foundation Soils	20.5	1.4	124	1.3	0.9	79.2	0.548	1.1	15	0.0	79.2	1.0	-0.4	0.0	0.9	0.115	1.012	0.119	0.177	0.669	6.0	85.2	0.097
SC-11	SB-09 & SB-14	Foundation Soils	20.6	1.3	124	1.3	0.9	79.3	0.548	1.1	15	0.0	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.119	0.177	0.669	6.0	85.3	0.097
SC-11	SB-09 & SB-14	Foundation Soils	20.7	1.2	124	1.3	0.9	77.4	0.553	1.1	15	0.0	77.4	1.0	-0.4	0.0	0.9	0.113	1.012	0.117	0.177	0.658	6.0	83.4	0.095
SC-11	SB-09 & SB-14	Foundation Soils	20.8	1.1	124	1.3	0.9	70.2	0.573	1.1	15	0.0	70.2	1.0	-0.4	0.0	0.9	0.107	1.010	0.110	0.178	0.621	7.9	78.2	0.088
SC-11	SB-09 & SB-14	Foundation Soils	20.8	1.0	124	1.3	0.9	68.3	0.578	1.1	15	0.7	68.3	1.0	-0.4	0.0	0.9	0.106	1.010	0.109	0.178	0.611	9.9	77.6	0.087
SC-11	SB-09 & SB-14	Foundation Soils	20.9	1.0	124	1.3	0.9	68.0	0.579	1.1	15	0.6	68.0	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.178	0.609	9.8	77.3	0.087
SC-11	SB-09 & SB-14	Foundation Soils	21.0	0.9	124	1.3	0.9	78.1	0.551	1.1	15	9.5	78.1	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.178	0.659	13.2	81.7	0.093
SC-11	SB-09 & SB-14	Foundation Soils	21.1	0.8	124	1.3	0.9	90.8	0.519	1.1	15	28.8	90.8	1.0	-0.4	0.0	0.9	0.126	1.015	0.131	0.178	0.734	20.3	82.3	0.093
SC-11	SB-09 & SB-14	Foundation Soils	21.2	0.7	124	1.3	0.9	89.7	0.522	1.1	15	32.6	89.7	1.0	-0.4	0.0	0.9	0.125	1.015	0.129	0.178	0.726	23.4	80.5	0.091
SC-11	SB-09 & SB-14	Foundation Soils	21.2	0.6	124	1.3	0.9	87.0	0.529	1.1	15	31.4	87.0	1.0	-0.4	0.0	0.9	0.122	1.014	0.126	0.178	0.708	22.6	78.2	0.088
SC-11	SB-09 & SB-14	Foundation Soils	21.3	0.5	124	1.3	0.9	87.1	0.528	1.1	15	32.7	87.1	1.0	-0.4	0.0	0.9	0.123	1.014	0.126	0.179	0.708	23.8	78.2	0.088
SC-11	SB-09 & SB-14	Foundation Soils	21.4	0.5	124	1.3	0.9	77.2	0.554	1.1	15	22.3	77.2	1.0	-0.4	0.0	0.9	0.113	1.011	0.116	0.179	0.651	17.6	72.4	0.080
SC-11	SB-09 & SB-14	Foundation Soils	21.5	0.4	124	1.3	0.9	77.7	0.552	1.1	15	31.0	77.7	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.179	0.654	23.3	70.0	0.077
SC-11	SB-09 & SB-14	Foundation Soils	21.6	0.3	124	1.3	0.9	81.1	0.543	1.1	15	20.8	81.1	1.0	-0.4	0.0	0.9	0.117	1.012	0.120	0.179	0.671	16.8	77.2	0.086
SC-11	SB-09 & SB-14	Foundation Soils	21.7	0.2	124	1.3	0.9	78.5	0.550	1.1	15	12.2	78.5	1.0	-0.4	0.0	0.9	0.114	1.012	0.118	0.179	0.657	13.9	80.3	0.091
SC-11	SB-09 & SB-14	Foundation Soils	21.7	0.1	124	1.3	0.9	79.2	0.548	1.1	15	0.1	79.2	1.0	-0.4	0.0	0.9	0.115	1.012	0.118	0.179	0.660	9.0	88.1	0.101
SC-11	SB-09 & SB-14	Foundation Soils	21.8	0.1	124	1.3	0.9	97.0	0.505	1.1	15	0.0	97.0	1.0	-0.4	0.0	0.9	0.134	1.017	0.138	0.179	0.770	6.0	103.0	0.124
SC-11	SB-09 & SB-14	Foundation Soils	21.9	-0.0	124	1.3	0.9	115.5	0.466	1.1	15	0.0	115.5	1.0	-0.4	0.0	0.9	0.162	1.024	0.169	0.179	0.942	6.0	121.5	0.160
SC-11	SB-09 & SB-14	Foundation Soils	22.0	-0.1	124	1.3	0.9	117.8	0.461	1.1	15	0.0	117.8	1.0	-0.4	0.0	0.9	0.167	1.025	0.174	0.179	0.970	6.0	123.8	0.165
SC-11	SB-09 & SB-14	Foundation Soils	22.1	-0.2	124	1.3	0.9	113.0	0.471	1.1	15	0.0	113.0	1.0	-0.4	0.0	0.9	0.157	1.023	0.164	0.180	0.911	6.0	119.0	0.154
SC-11	SB-09 & SB-14	Foundation Soils	22.1	-0.3	124	1.4	0.9	111.3	0.474	1.1	15	0.0	111.3	1.0	-0.4	0.0	0.9	0.154	1.022	0.160	0.180	0.893	6.0	117.3	0.151
SC-11	SB-09 & SB-14	Foundation Soils	22.2	-0.4	124	1.4	0.9	112.0	0.473	1.1	15	0.0	112.0	1.0	-0.4	0.0	0.9	0.155	1.022	0.162	0.180	0.899	6.0	118.0	0.152
SC-11	SB-09 & SB-14	Foundation Soils	22.3	-0.4	124	1.4	0.9	115.1	0.466	1.1	15	0.0	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.168	0.180	0.933	6.0	121.1	0.159
SC-11	SB-09 & SB-14	Foundation Soils	22.4	-0.5	124	1.4	0.9	117.7	0.461	1.1	15	0.0	117.7	1.0	-0.4	0.0	0.9	0.166	1.025	0.173	0.180	0.963	6.0	123.7	0.165
SC-11	SB-09 & SB-14	Foundation Soils	22.5	-0.6	124	1.4	0.9	114.6	0.467	1.1	15	0.0	114.6	1.0	-0.4	0.0	0.9	0.160	1.024	0.167	0.180	0.925	6.0	120.6	0.158
SC-11	SB-09 & SB-14	Foundation Soils	22.6	-0.7	124	1.4	0.9	116.8	0.463	1.1	15	0.0	116.8	1.0	-0.4	0.0	0.9	0.165	1.025	0.171	0.180	0.951	6.0	122.8	0.163
SC-11	SB-09 & SB-14	Foundation Soils	22.6	-0.8	124	1.4	0.9	120.2	0.456	1.1	15	0.0	120.2	1.0	-0.4	0.0	0.9	0.172	1.026	0.179	0.180	0.994	6.0	126.2	0.171
SC-11	SB-09 & SB-14	Foundation Soils	22.7	-0.8	124	1.4	0.9	123.3	0.450	1.1	15	0.0	123.3	1.0	-0.4	0.0	0.9	0.179	1.028	0.187	0.180	1.037	6.0	129.3	
SC-11	SB-09 & SB-14	Foundation Soils	22.8	-0.9	124	1.4	0.9	126.1	0.445	1.1	15	0.0	126.1	1.0	-0.4	0.0	0.9	0.186	1.029	0.195	0.180	1.080	6.0	132.1	
SC-11	SB-09 & SB-14	Foundation Soils	22.9	-1.0	124	1.4	0.9	133.5	0.432	1.1	15	0.0	133.5	1.0	-0.4	0.0	0.9	0.209	1.034	0.220	0.181	1.216	6.0	139.5	
SC-11	SB-09 & SB-14	Foundation Soils	23.0	-1.1	124	1.4	0.9	136.1	0.427	1.1	15	0.0	136.1	1.0	-0.4	0.0	0.9	0.218	1.035	0.230	0.181	1.273	6.0	142.1	
SC-11	SB-09 & SB-14	Foundation Soils	23.0	-1.2	124	1.4	0.9	132.9	0.433	1.1	15	0.0	132.9	1.0	-0.4	0.0	0.9	0.207	1.033	0.217	0.181	1.202	6.0	138.9	
SC-11	SB-09 & SB-14	Foundation Soils	23.1	-1.3	124	1.4	0.9	130.4	0.437	1.1	15	0.0	130.4	1.0	-0.4	0.0	0.9	0.199	1.032	0.208	0.181	1.152	6.0	136.4	
SC-11	SB-09 & SB-14	Foundation Soils	23.2	-1.3	124	1.4	0.9	127.5	0.443	1.1	15	0.0	127.5	1.0	-0.4	0.0	0.9	0.190	1.030	0.199	0.181	1.098	6.0	133.5	
SC-11	SB-09 & SB-14	Foundation Soils	23.3	-1.4	124	1.4	0.9	124.3	0.448	1.1	15	0.0	124.3	1.0	-0.4	0.0	0.9	0.182	1.028	0.189	0.181	1.046	6.0	130.3	
SC-11	SB-09 & SB-14	Foundation Soils	23.4	-1.5	124	1.4	1.0	132.3	0.434	1.0	15	2.2	132.3	1.0	-0.4	0.0	0.9	0.205	1.033	0.215	0.181	1.186	10.6	140.8	
SC-12	SB-17 & SB-18	Foundation Soils	8.0	16.9	124	0.5	0.5	74.3	0.562	1.6	5	0.0	74.3	1.1	-0.1	0.0	1.0	0.111	1.011	0.120	0.128	0.934	6.0	80.3	0.091
SC-12	SB-17 & SB-18	Foundation Soils	8.1	16.8	124	0.5	0.5	78.3	0.551	1.6	5	0.0	78.3	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.129	0.961	6.0	84.3	0.096
SC-12	SB-17 & SB-18	Foundation Soils	8.2	16.7	124	0.5	0.5	79.7	0.547	1.5	5	0.0	79.7	1.1	-0.1	0.0	1.0	0.115	1.012	0.125	0.130	0.966	6.0	85.7	0.098
SC-12	SB-17 & SB-18	Foundation Soils	8.3	16.6	124	0.5	0.5	76.1	0.557	1.5	5	0.0	76.1	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.130	0.933	7.7	83.9	0.095
SC-12	SB-17 & SB-18	Foundation Soils	8.4	16.5	124	0.5	0.5	73.7	0.563	1.6	5	0.6	73.7	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.131	0.909	10.4	83.5	0.095
SC-12	SB-17 & SB-18	Foundation Soils	8.4	16.5	124	0.5	0.5	73.4	0.564	1.5	5	4.4	73.4	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.132	0.902	13.3	82.3	0.093
SC-12	SB-17 & SB-18	Foundation Soils	8.5	16.4	124	0.5	0.5	72.7	0.566	1.5	5	7.7	72.7	1.1	-0.1	0.0	1.0	0.110	1.011	0.118	0.132	0.893	15.5	80.6	0.091

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-12	SB-17 & SB-18	Foundation Soils	8.6	16.3	124	0.5	0.5	72.0	0.568	1.5	5	11.8	72.1	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.133	0.884	19.3	79.6	0.090
SC-12	SB-17 & SB-18	Foundation Soils	8.7	16.2	124	0.5	0.5	66.3	0.584	1.6	5	15.6	66.4	1.1	-0.1	0.0	1.0	0.104	1.010	0.112	0.133	0.839	27.5	78.2	0.088
SC-12	SB-17 & SB-18	Foundation Soils	8.8	16.1	121	0.5	0.5	56.9	0.614	1.6	5	16.8	56.9	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.134	0.774	37.8	77.9	0.087
SC-12	SB-17 & SB-18	Foundation Soils	8.9	16.0	121	0.5	0.5	82.7	0.539	1.5	32	50.3	82.7	1.1	-0.1	0.0	1.0	0.118	1.013	0.128	0.135	0.953	44.8	77.2	0.086
SC-12	SB-17 & SB-18	Foundation Soils	8.9	16.0	115	0.5	0.5	73.1	0.565	1.5	32	49.4	73.1	1.1	-0.1	0.0	1.0	0.110	1.011	0.118	0.135	0.874	53.1	76.9	0.086
SC-12	SB-17 & SB-18	Foundation Soils	9.0	15.9	115	0.5	0.5	66.4	0.584	1.5	32	48.3	66.4	1.1	-0.1	0.0	1.0	0.104	1.010	0.112	0.136	0.824	57.8	75.9	0.085
SC-12	SB-17 & SB-18	Foundation Soils	9.1	15.8	115	0.5	0.5	64.2	0.591	1.5	32	47.9	64.2	1.1	-0.1	0.0	1.0	0.103	1.009	0.110	0.136	0.806	57.3	73.6	0.082
SC-12	SB-17 & SB-18	Foundation Soils	9.2	15.7	121	0.5	0.5	71.0	0.571	1.5	32	48.3	71.0	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.137	0.847	46.9	69.5	0.077
SC-12	SB-17 & SB-18	Foundation Soils	9.3	15.6	121	0.6	0.5	78.6	0.550	1.5	32	45.0	78.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.123	0.137	0.899	29.4	63.1	0.069
SC-12	SB-17 & SB-18	Foundation Soils	9.4	15.6	124	0.6	0.5	81.4	0.542	1.5	32	41.5	81.4	1.1	-0.1	0.0	1.0	0.117	1.012	0.126	0.138	0.917	24.5	64.3	0.070
SC-12	SB-17 & SB-18	Foundation Soils	9.4	15.5	124	0.6	0.5	81.9	0.541	1.5	32	34.3	81.9	1.1	-0.1	0.0	1.0	0.118	1.013	0.127	0.138	0.917	19.6	67.2	0.074
SC-12	SB-17 & SB-18	Foundation Soils	9.5	15.4	124	0.6	0.5	81.0	0.544	1.5	32	29.2	81.0	1.1	-0.1	0.0	1.0	0.117	1.012	0.126	0.139	0.906	17.6	69.4	0.076
SC-12	SB-17 & SB-18	Foundation Soils	9.6	15.3	124	0.6	0.5	80.7	0.544	1.5	32	26.2	80.7	1.1	-0.1	0.0	1.0	0.116	1.012	0.126	0.140	0.899	16.6	71.1	0.079
SC-12	SB-17 & SB-18	Foundation Soils	9.7	15.2	124	0.6	0.5	84.2	0.535	1.5	32	30.9	84.2	1.1	-0.1	0.0	1.0	0.120	1.013	0.129	0.140	0.923	18.0	71.4	0.079
SC-12	SB-17 & SB-18	Foundation Soils	9.8	15.1	124	0.6	0.5	87.7	0.527	1.4	32	37.0	87.7	1.1	-0.1	0.0	1.0	0.123	1.014	0.133	0.141	0.949	20.6	71.3	0.079
SC-12	SB-17 & SB-18	Foundation Soils	9.8	15.1	124	0.6	0.5	91.1	0.519	1.4	32	45.3	91.1	1.1	-0.1	0.0	1.0	0.127	1.015	0.137	0.141	0.974	26.7	72.5	0.080
SC-12	SB-17 & SB-18	Foundation Soils	9.9	15.0	121	0.6	0.5	88.6	0.525	1.4	32	48.9	88.6	1.1	-0.1	0.0	1.0	0.124	1.014	0.134	0.142	0.948	33.9	73.6	0.082
SC-12	SB-17 & SB-18	Foundation Soils	10.0	14.9	121	0.6	0.5	86.1	0.531	1.4	32	50.2	86.1	1.1	-0.1	0.0	1.0	0.122	1.014	0.131	0.142	0.924	40.2	76.1	0.085
SC-12	SB-17 & SB-18	Foundation Soils	10.1	14.8	121	0.6	0.5	85.0	0.533	1.4	32	50.4	85.0	1.1	-0.1	0.0	1.0	0.120	1.013	0.130	0.143	0.911	42.5	77.1	0.086
SC-12	SB-17 & SB-18	Foundation Soils	10.2	14.7	121	0.6	0.5	83.7	0.537	1.4	32	50.2	83.7	1.1	-0.1	0.0	1.0	0.119	1.013	0.128	0.143	0.897	42.7	76.2	0.085
SC-12	SB-17 & SB-18	Foundation Soils	10.3	14.6	121	0.6	0.5	53.3	0.627	1.5	5	16.9	53.3	1.0	-0.1	0.0	1.0	0.095	1.008	0.100	0.144	0.697	42.2	78.6	0.088
SC-12	SB-17 & SB-18	Foundation Soils	10.3	14.6	121	0.6	0.5	54.7	0.622	1.5	5	16.7	54.7	1.0	-0.1	0.0	1.0	0.096	1.008	0.101	0.144	0.702	38.2	76.2	0.085
SC-12	SB-17 & SB-18	Foundation Soils	10.4	14.5	121	0.6	0.5	53.7	0.625	1.5	5	16.6	53.7	1.0	-0.1	0.0	1.0	0.095	1.008	0.100	0.145	0.694	38.2	75.3	0.084
SC-12	SB-17 & SB-18	Foundation Soils	10.5	14.4	121	0.6	0.5	53.6	0.626	1.5	5	16.4	53.6	1.0	-0.1	0.0	1.0	0.095	1.008	0.100	0.145	0.691	36.8	73.9	0.082
SC-12	SB-17 & SB-18	Foundation Soils	10.6	14.3	121	0.6	0.6	53.6	0.625	1.5	5	16.7	53.6	1.0	-0.1	0.0	1.0	0.095	1.008	0.100	0.146	0.689	39.7	76.6	0.086
SC-12	SB-17 & SB-18	Foundation Soils	10.7	14.2	121	0.6	0.6	51.2	0.634	1.5	5	16.8	51.2	1.0	-0.1	0.0	1.0	0.093	1.008	0.098	0.146	0.673	42.6	77.1	0.086
SC-12	SB-17 & SB-18	Foundation Soils	10.7	14.2	121	0.6	0.6	50.0	0.639	1.5	5	16.6	50.0	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.146	0.664	41.6	75.0	0.084
SC-12	SB-17 & SB-18	Foundation Soils	10.8	14.1	121	0.6	0.6	51.6	0.633	1.5	5	16.4	51.6	1.0	-0.2	0.0	1.0	0.093	1.008	0.099	0.147	0.671	38.0	73.2	0.081
SC-12	SB-17 & SB-18	Foundation Soils	10.9	14.0	121	0.7	0.6	57.6	0.612	1.5	5	16.0	57.6	1.0	-0.2	0.0	1.0	0.098	1.008	0.103	0.147	0.701	31.5	73.1	0.081
SC-12	SB-17 & SB-18	Foundation Soils	11.0	13.9	124	0.7	0.6	88.7	0.524	1.4	32	29.6	88.7	1.1	-0.2	0.0	1.0	0.124	1.014	0.134	0.148	0.905	17.4	76.5	0.086
SC-12	SB-17 & SB-18	Foundation Soils	11.1	13.8	124	0.7	0.6	82.2	0.541	1.4	32	0.0	82.2	1.1	-0.2	0.0	1.0	0.118	1.013	0.126	0.148	0.852	6.5	88.7	0.102
SC-12	SB-17 & SB-18	Foundation Soils	11.2	13.7	124	0.7	0.6	87.9	0.526	1.4	32	0.0	87.9	1.1	-0.2	0.0	1.0	0.123	1.014	0.133	0.149	0.893	6.0	93.9	0.110
SC-12	SB-17 & SB-18	Foundation Soils	11.2	13.7	124	0.7	0.6	86.3	0.530	1.4	32	0.0	86.3	1.1	-0.2	0.0	1.0	0.122	1.014	0.131	0.149	0.877	6.8	93.1	0.109
SC-12	SB-17 & SB-18	Foundation Soils	11.3	13.6	124	0.7	0.6	83.6	0.537	1.4	32	2.3	83.6	1.1	-0.2	0.0	1.0	0.119	1.013	0.128	0.150	0.854	10.6	91.8	0.107
SC-12	SB-17 & SB-18	Foundation Soils	11.4	13.5	124	0.7	0.6	103.1	0.491	1.4	32	33.1	103.1	1.1	-0.2	0.0	1.0	0.141	1.019	0.154	0.150	1.026	18.0	88.1	
SC-12	SB-17 & SB-18	Foundation Soils	11.5	13.4	124	0.7	0.6	106.2	0.485	1.3	32	45.4	106.2	1.1	-0.2	0.0	1.0	0.146	1.020	0.159	0.150	1.058	24.3	85.1	
SC-12	SB-17 & SB-18	Foundation Soils	11.6	13.3	121	0.7	0.6	100.5	0.497	1.3	32	49.4	100.5	1.1	-0.2	0.0	1.0	0.138	1.018	0.149	0.151	0.991	30.4	81.5	0.092
SC-12	SB-17 & SB-18	Foundation Soils	11.6	13.3	121	0.7	0.6	95.1	0.509	1.4	32	50.0	95.1	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.151	0.936	33.6	78.8	0.089
SC-12	SB-17 & SB-18	Foundation Soils	11.7	13.2	121	0.7	0.6	92.7	0.515	1.4	32	49.8	92.7	1.1	-0.2	0.0	1.0	0.129	1.015	0.138	0.152	0.912	34.4	77.3	0.087
SC-12	SB-17 & SB-18	Foundation Soils	11.8	13.1	121	0.7	0.6	96.8	0.505	1.3	32	47.8	96.8	1.1	-0.2	0.0	1.0	0.133	1.017	0.144	0.152	0.946	28.7	77.8	0.087
SC-12	SB-17 & SB-18	Foundation Soils	11.9	13.0	124	0.7	0.6	98.8	0.501	1.3	32	41.7	98.8	1.1	-0.2	0.0	1.0	0.136	1.017	0.147	0.152	0.962	22.4	79.5	0.089
SC-12	SB-17 & SB-18	Foundation Soils	12.0	12.9	124	0.7	0.6	95.3	0.509	1.3	32	29.0	95.3	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.153	0.927	17.0	83.3	0.095
SC-12	SB-17 & SB-18	Foundation Soils	12.1	12.8	124	0.7	0.6	89.1	0.523	1.4	32	14.3	89.1	1.1	-0.2	0.0	1.0	0.125	1.014	0.133	0.153	0.872	13.4	88.2	0.102
SC-12	SB-17 & SB-18	Foundation Soils	12.1	12.8	124	0.7	0.6	86.0	0.531	1.4	32	9.2	86.0	1.1	-0.2	0.0	1.0	0.122	1.014	0.130	0.154	0.846	12.4	89.2	0.103
SC-12	SB-17 & SB-18	Foundation Soils	12.2	12.7	124	0.7	0.6	88.4	0.525	1.3	32	14.8	88.4	1.1	-0.2	0.0	1.0	0.124	1.014	0.133	0.154	0.861	13.6	87.2	0.100
SC-12	SB-17 & SB-18	Foundation Soils	12.3	12.6	124	0.7	0.6	93.8	0.512	1.3	32	29.1	93.8	1.1	-0.2	0.0	1.0	0.130	1.016	0.139	0.154	0.903	17.0	81.7	0.093
SC-12	SB-17 & SB-18	Foundation Soils	12.4	12.5	124	0.7	0.6	94.7	0.510	1.3	32	38.2	94.7	1.1	-0.2	0.0	1.0	0.131	1.016	0.140	0.155	0.908	20.7	77.1	0.086
SC-12	SB-17 & SB-18	Foundation Soils	12.5	12.4	124	0.7	0.6	91.9	0.517	1.3	32	45.7	91.9	1.1	-0.2	0.0	1.0	0.128	1.015	0.137	0.155	0.883	27.1	73.3	0.081
SC-12	SB-17 & SB-18	Foundation Soils	12.5	12.4	121	0.8	0.6	85.7	0.532	1.3	32	49.1	85.7	1.1	-0.2	0.0	1.0	0.121	1.013	0.129	0.155	0.832	36.3	72.9	0.081
SC-12	SB-17 & SB-18	Foundation Soils	12.6	12.3	121	0.8	0.6	81.2	0.543	1.3	32	49.6	81.2	1.1	-0.2	0.0	1.0	0.117	1.012	0.124	0.156	0.798	42.0	73.6	0.082
SC-12	SB-17 & SB-18	Foundation Soils	12.7	12.2	121	0.8	0.6	76.3	0.556	1.4	32	49.5	76.3	1.0	-0.2	0.0	1.0	0.113	1.011	0.119	0.156	0.764	47.9	74.7	0.083
SC-12	SB-17 & SB-18	Foundation Soils	12.8	12.1	121	0.8	0.6	73.0	0.565	1.4	32	49.2	73.0	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.156	0.742	51.5	75.4	0.084
SC-12	SB-17 & SB-18	Foundation Soils	12.9	12.0	121	0.8	0.6	71.0	0.571	1.4	32	48.5	71.0	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.157	0.728	48.8	71.2	0.079
SC-12	SB-17 & SB-18	Foundation Soils	13.0	11.9	121	0.8	0.6	73.2	0.565	1.4	32	48.2	73.2	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.157	0.739	43.0	68.0	0.075
SC-12	SB-17 & SB-18	Foundation Soils	13.0	11.9	121	0.8	0.6	72.8	0.566	1.3	32	48.1	72.8	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.158	0.735	42.8	67.5	0.074
SC-12	SB-17 & SB-18	Foundation Soils	13.1	11.8	121	0.8	0.6	72.0	0.568	1.3	32	48.2	72.0	1.0	-0.2	0.0	1.0	0.109	1.010	0.115	0.158	0.728	44.6	68.4	0.075
SC-12	SB-17 & SB-18	Foundation Soils	13.2	11.7	121	0.8	0.6	71.7	0.569	1.3	32	48.1	71.7	1.0	-0.2	0.0	1.0	0.109	1.010	0.115	0.158	0.724	44.3	67.9	0.074
SC-12	SB-17 & SB-18	Foundation Soils	13.3	11.6	121	0.8	0.6	68.9	0.577	1.3	32	47.9	68.9	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.159	0.707	47.3	68.2	0.075
SC-12	SB-17 & SB-18	Foundation Soils	13.4	11.5	121	0.8	0.6	67.9	0.580	1.3	32	47.7	67.9	1.0	-0.2	0.0	1.0	0.106	1.010	0.111	0.159	0.700	46.5	66.8	0.073
SC-12	SB-17 & SB-18	Foundation Soils	13.5	11.4	121	0.8	0.6	67.7	0.580	1.3	32	47.6	67.7	1.0	-0.2	0.0	1.0	0.105	1.010	0.111	0.159	0.697	46.6	66.7	0.073
SC-12	SB-17 & SB-18	Foundation Soils	13.5	11.4	121	0.8	0.6	68.9	0.577	1.3	32	48.1	68.9	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.160	0.702	48.7	69.5	0.077
SC-12	SB-17 & SB-18	Foundation Soils	13.6	11.3	121	0.8	0.6	70.1	0.573	1.3	32	48.5	70.1	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.160	0.707	50.2	71.9	0.080
SC-12	SB-17 & SB-18	Foundation Soils	13.7	11.2	121	0.8	0.6	67.9	0.580	1.3	32	48.3	67.9	1.0	-0.2	0.0	1.0	0.106	1.010	0.111	0.160	0.693	52.8	72.5	0.080
SC-12	SB-17 & SB-18	Foundation Soils	13.8	11.1	115	0.8	0.6	66.4	0.584	1.3	32	48.1	66.4	1.0	-0.2	0.0	1.0	0.104	1.010	0.110	0.161	0.683	54.1	72.4	0.080
SC-12	SB-17 & SB-18	Foundation Soils	13.9	11.0	115	0.8	0.6	65.0	0.588	1.3	32	47.9	65.0	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.161	0.674	55.7	72.9	0.081
SC-12	SB-17 & SB-18	Foundation Soils	13.9	11.0	115	0.8	0.7	62.4	0.596	1.3	32	47.6	62.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.161	0.659	59.1	73.9	0.082
SC-12	SB-17 & SB-18	Foundation Soils	14.0	10.9	115	0.8	0.7	60.8	0.602	1.3	32	47.4	60.8	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.161	0.649	61.4	74.7	0.083
SC-12	SB-17 & SB-18	Foundation Soils	14.1	10.8	121	0.8	0.7	69.0	0.577	1.3	32	48.1	69.0	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.162	0.691	48.7	69.5	0.077
SC-12	SB-17 & SB-18	Foundation Soils	14.2	10.7	121	0.9	0.7	76.0	0.557	1.3	32	48.4	76.0	1.0	-0.2	0.0	1.0	0.112	1.011	0.118	0.162	0.730	41.2	68.8	0.076
SC-12	SB-17 & SB-18	Foundation Soils	14.3	10.6	121	0.9	0.7	75.0	0.560	1.3	32	48.8	75.0	1.0	-0.2	0.0	1.0	0.111	1.011	0.117	0.162	0.722	44.9	71.0	0.078
SC-12	SB-17 & SB-18	Foundation Soils	14.4	10.5	121	0.9	0.7	72.3	0.567	1.3	32	48.9	72.3	1.0	-0.2	0.0	1.0	0.109	1.011	0.115	0.163	0.705	50.2	73.6	0.082

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-12	SB-17 & SB-18	Foundation Soils	14.4	10.5	121	0.9	0.7	72.0	0.568	1.3	32	49.1	72.0	1.0	-0.2	0.0	1.0	0.109	1.010	0.114	0.163	0.702	52.7	75.6	0.084
SC-12	SB-17 & SB-18	Foundation Soils	14.5	10.4	115	0.9	0.7	68.9	0.577	1.3	32	48.7	68.9	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.163	0.683	55.6	75.8	0.085
SC-12	SB-17 & SB-18	Foundation Soils	14.6	10.3	115	0.9	0.7	35.5	0.699	1.4	5	16.2	35.5	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.164	0.521	57.4	76.7	0.086
SC-12	SB-17 & SB-18	Foundation Soils	14.7	10.2	115	0.9	0.7	35.1	0.701	1.4	5	16.1	35.1	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.164	0.519	55.6	74.6	0.083
SC-12	SB-17 & SB-18	Foundation Soils	14.8	10.1	121	0.9	0.7	37.2	0.691	1.4	5	16.2	37.2	1.0	-0.2	0.0	1.0	0.084	1.007	0.086	0.164	0.527	52.6	73.6	0.082
SC-12	SB-17 & SB-18	Foundation Soils	14.8	10.1	121	0.9	0.7	38.5	0.685	1.4	5	16.2	38.5	1.0	-0.2	0.0	1.0	0.084	1.007	0.087	0.164	0.532	49.5	71.8	0.079
SC-12	SB-17 & SB-18	Foundation Soils	14.9	10.0	121	0.9	0.7	39.5	0.681	1.4	5	16.0	39.5	1.0	-0.2	0.0	1.0	0.085	1.007	0.088	0.165	0.535	44.4	67.9	0.075
SC-12	SB-17 & SB-18	Foundation Soils	15.0	9.9	121	0.9	0.7	40.2	0.678	1.4	5	15.7	40.2	1.0	-0.2	0.0	1.0	0.086	1.007	0.089	0.165	0.537	39.6	64.0	0.070
SC-12	SB-17 & SB-18	Foundation Soils	15.1	9.8	121	0.9	0.7	40.2	0.678	1.3	5	15.4	40.2	1.0	-0.2	0.0	1.0	0.086	1.007	0.089	0.165	0.536	36.4	61.2	0.066
SC-12	SB-17 & SB-18	Foundation Soils	15.2	9.7	121	0.9	0.7	40.0	0.678	1.3	5	15.7	40.0	1.0	-0.2	0.0	1.0	0.085	1.007	0.088	0.166	0.534	38.9	63.3	0.069
SC-12	SB-17 & SB-18	Foundation Soils	15.3	9.6	121	0.9	0.7	40.2	0.678	1.3	5	15.9	40.2	1.0	-0.2	0.0	1.0	0.086	1.007	0.089	0.166	0.534	42.3	66.6	0.073
SC-12	SB-17 & SB-18	Foundation Soils	15.3	9.6	121	0.9	0.7	39.5	0.681	1.3	5	16.2	39.5	1.0	-0.2	0.0	1.0	0.085	1.007	0.088	0.166	0.530	47.3	70.7	0.078
SC-12	SB-17 & SB-18	Foundation Soils	15.4	9.5	115	0.9	0.7	36.0	0.697	1.3	5	16.1	36.0	1.0	-0.2	0.0	1.0	0.083	1.007	0.085	0.166	0.514	54.5	74.4	0.083
SC-12	SB-17 & SB-18	Foundation Soils	15.5	9.4	115	0.9	0.7	34.3	0.705	1.3	5	16.1	34.3	1.0	-0.2	0.0	1.0	0.082	1.007	0.084	0.167	0.506	57.5	75.7	0.085
SC-12	SB-17 & SB-18	Foundation Soils	15.6	9.3	115	0.9	0.7	35.1	0.701	1.3	5	16.1	35.1	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.167	0.508	56.9	75.8	0.085
SC-12	SB-17 & SB-18	Foundation Soils	15.7	9.2	115	0.9	0.7	35.1	0.701	1.3	5	16.1	35.1	1.0	-0.3	0.0	1.0	0.082	1.007	0.085	0.167	0.507	56.3	75.3	0.084
SC-12	SB-17 & SB-18	Foundation Soils	15.7	9.2	121	0.9	0.7	36.9	0.692	1.3	5	16.2	36.9	1.0	-0.3	0.0	1.0	0.083	1.007	0.086	0.167	0.514	52.9	73.6	0.082
SC-12	SB-17 & SB-18	Foundation Soils	15.8	9.1	121	0.9	0.7	38.0	0.687	1.3	5	16.1	38.0	1.0	-0.3	0.0	1.0	0.084	1.007	0.087	0.168	0.518	49.3	71.2	0.079
SC-12	SB-17 & SB-18	Foundation Soils	15.9	9.0	121	1.0	0.7	40.8	0.675	1.3	5	16.0	40.8	1.0	-0.3	0.0	1.0	0.086	1.007	0.089	0.168	0.529	43.4	68.2	0.075
SC-12	SB-17 & SB-18	Foundation Soils	16.0	8.9	121	1.0	0.7	41.5	0.672	1.3	5	16.0	41.5	1.0	-0.3	0.0	1.0	0.086	1.007	0.089	0.168	0.531	41.8	67.2	0.074
SC-12	SB-17 & SB-18	Foundation Soils	16.1	8.8	121	1.0	0.7	41.8	0.671	1.3	5	16.1	41.8	1.0	-0.3	0.0	1.0	0.087	1.007	0.090	0.168	0.532	43.0	68.8	0.076
SC-12	SB-17 & SB-18	Foundation Soils	16.2	8.7	121	1.0	0.7	40.6	0.676	1.3	5	16.2	40.6	1.0	-0.3	0.0	1.0	0.086	1.007	0.089	0.169	0.525	45.7	70.1	0.077
SC-12	SB-17 & SB-18	Foundation Soils	16.2	8.7	121	1.0	0.7	36.9	0.692	1.3	5	16.2	36.9	1.0	-0.3	0.0	1.0	0.083	1.007	0.086	0.169	0.509	53.3	74.0	0.082
SC-12	SB-17 & SB-18	Foundation Soils	16.3	8.6	115	1.0	0.7	35.3	0.700	1.3	5	16.1	35.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.085	0.169	0.501	53.8	73.0	0.081
SC-12	SB-17 & SB-18	Foundation Soils	16.4	8.5	115	1.0	0.7	33.9	0.707	1.3	5	16.0	33.9	1.0	-0.3	0.0	1.0	0.081	1.007	0.084	0.169	0.494	56.8	74.7	0.083
SC-12	SB-17 & SB-18	Foundation Soils	16.5	8.4	115	1.0	0.7	67.0	0.582	1.3	34	48.9	67.0	1.0	-0.3	0.0	1.0	0.105	1.010	0.109	0.170	0.644	55.5	73.6	0.082
SC-12	SB-17 & SB-18	Foundation Soils	16.6	8.3	121	1.0	0.7	70.6	0.572	1.2	34	49.0	70.6	1.0	-0.3	0.0	1.0	0.108	1.010	0.112	0.170	0.661	48.4	70.0	0.077
SC-12	SB-17 & SB-18	Foundation Soils	16.7	8.3	121	1.0	0.7	72.7	0.566	1.2	34	49.0	72.7	1.0	-0.3	0.0	1.0	0.109	1.011	0.114	0.170	0.671	45.0	68.7	0.076
SC-12	SB-17 & SB-18	Foundation Soils	16.7	8.2	121	1.0	0.7	70.4	0.572	1.2	34	49.2	70.4	1.0	-0.3	0.0	1.0	0.108	1.010	0.112	0.170	0.658	51.0	72.1	0.080
SC-12	SB-17 & SB-18	Foundation Soils	16.8	8.1	115	1.0	0.7	66.1	0.585	1.2	34	48.8	66.1	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.171	0.635	56.6	73.9	0.082
SC-12	SB-17 & SB-18	Foundation Soils	16.9	8.0	115	1.0	0.7	61.5	0.599	1.2	34	48.4	61.5	1.0	-0.3	0.0	1.0	0.101	1.009	0.104	0.171	0.611	66.5	79.7	0.090
SC-12	SB-17 & SB-18	Foundation Soils	17.0	7.9	111	1.0	0.7	59.5	0.606	1.2	34	48.1	59.5	1.0	-0.3	0.0	1.0	0.099	1.009	0.103	0.171	0.601	71.8	83.2	0.095
SC-12	SB-17 & SB-18	Foundation Soils	17.1	7.8	111	1.0	0.7	57.0	0.614	1.2	34	47.7	57.0	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.171	0.588	75.4	84.6	0.097
SC-12	SB-17 & SB-18	Foundation Soils	17.1	7.8	111	1.0	0.7	54.7	0.622	1.3	34	47.2	54.7	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.172	0.577	75.4	82.8	0.094
SC-12	SB-17 & SB-18	Foundation Soils	17.2	7.7	111	1.0	0.7	54.6	0.622	1.2	34	47.2	54.6	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.172	0.575	75.4	82.7	0.094
SC-12	SB-17 & SB-18	Foundation Soils	17.3	7.6	115	1.0	0.7	54.6	0.622	1.2	34	47.2	54.6	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.172	0.575	74.1	81.5	0.092
SC-12	SB-17 & SB-18	Foundation Soils	17.4	7.5	115	1.0	0.7	54.1	0.624	1.2	34	47.1	54.1	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.172	0.571	74.6	81.6	0.092
SC-12	SB-17 & SB-18	Foundation Soils	17.5	7.4	115	1.0	0.7	53.8	0.625	1.2	34	47.0	53.8	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.172	0.569	74.6	81.3	0.092
SC-12	SB-17 & SB-18	Foundation Soils	17.6	7.3	111	1.0	0.7	53.1	0.627	1.2	34	46.9	53.1	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.173	0.565	75.4	81.6	0.092
SC-12	SB-17 & SB-18	Foundation Soils	17.6	7.3	111	1.1	0.8	52.8	0.629	1.2	34	46.9	52.8	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.173	0.563	75.4	81.3	0.092
SC-12	SB-17 & SB-18	Foundation Soils	17.7	7.2	111	1.1	0.8	52.8	0.629	1.2	34	46.8	52.8	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.173	0.562	75.4	81.3	0.092
SC-12	SB-17 & SB-18	Foundation Soils	17.8	7.1	111	1.1	0.8	52.9	0.628	1.2	34	46.9	52.9	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.173	0.562	75.4	81.4	0.092
SC-12	SB-17 & SB-18	Foundation Soils	17.9	7.0	111	1.1	0.8	53.1	0.628	1.2	34	46.9	53.1	1.0	-0.3	0.0	0.9	0.094	1.008	0.098	0.174	0.562	75.4	81.5	0.092
SC-12	SB-17 & SB-18	Foundation Soils	18.0	6.9	111	1.1	0.8	52.9	0.628	1.2	34	46.9	52.9	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.174	0.560	75.4	81.4	0.092
SC-12	SB-17 & SB-18	Foundation Soils	18.0	6.9	111	1.1	0.8	53.1	0.627	1.2	34	46.9	53.1	1.0	-0.3	0.0	0.9	0.094	1.008	0.098	0.174	0.560	75.4	81.6	0.092
SC-12	SB-17 & SB-18	Foundation Soils	18.1	6.8	111	1.1	0.8	53.5	0.626	1.2	34	47.0	53.5	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.174	0.561	75.4	81.9	0.093
SC-12	SB-17 & SB-18	Foundation Soils	18.2	6.7	111	1.1	0.8	54.4	0.623	1.2	34	47.2	54.4	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.175	0.564	75.4	82.6	0.094
SC-12	SB-17 & SB-18	Foundation Soils	18.3	6.6	115	1.1	0.8	56.3	0.616	1.2	34	47.5	56.3	1.0	-0.3	0.0	0.9	0.097	1.008	0.100	0.175	0.572	71.9	80.7	0.091
SC-12	SB-17 & SB-18	Foundation Soils	18.4	6.5	115	1.1	0.8	57.0	0.614	1.2	34	47.6	57.0	1.0	-0.3	0.0	0.9	0.097	1.008	0.100	0.175	0.574	70.2	79.6	0.090
SC-12	SB-17 & SB-18	Foundation Soils	18.5	6.4	115	1.1	0.8	56.6	0.615	1.2	34	47.6	56.6	1.0	-0.3	0.0	0.9	0.097	1.008	0.100	0.175	0.572	73.4	82.4	0.093
SC-12	SB-17 & SB-18	Foundation Soils	18.5	6.4	115	1.1	0.8	58.2	0.610	1.2	34	47.8	58.2	1.0	-0.3	0.0	0.9	0.098	1.008	0.101	0.175	0.578	68.5	78.9	0.089
SC-12	SB-17 & SB-18	Foundation Soils	18.6	6.3	115	1.1	0.8	59.3	0.607	1.2	34	47.9	59.3	1.0	-0.3	0.0	0.9	0.099	1.009	0.102	0.176	0.582	67.3	78.6	0.088
SC-12	SB-17 & SB-18	Foundation Soils	18.7	6.2	115	1.1	0.8	60.9	0.601	1.2	34	48.1	60.9	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.176	0.589	63.7	76.5	0.085
SC-12	SB-17 & SB-18	Foundation Soils	18.8	6.1	115	1.1	0.8	61.3	0.600	1.2	34	48.2	61.3	1.0	-0.3	0.0	0.9	0.100	1.009	0.104	0.176	0.590	63.5	76.6	0.086
SC-12	SB-17 & SB-18	Foundation Soils	18.9	6.0	115	1.1	0.8	60.9	0.601	1.2	34	48.2	60.9	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.176	0.587	65.5	78.1	0.088
SC-12	SB-17 & SB-18	Foundation Soils	18.9	6.0	115	1.1	0.8	60.4	0.603	1.2	34	48.1	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.176	0.584	65.4	77.7	0.087
SC-12	SB-17 & SB-18	Foundation Soils	19.0	5.9	115	1.1	0.8	61.2	0.600	1.2	34	48.3	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.104	0.177	0.587	67.2	80.0	0.090
SC-12	SB-17 & SB-18	Foundation Soils	19.1	5.8	115	1.1	0.8	63.2	0.594	1.2	34	48.6	63.2	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.177	0.596	63.1	77.7	0.087
SC-12	SB-17 & SB-18	Foundation Soils	19.2	5.7	115	1.1	0.8	65.5	0.587	1.2	34	48.6	65.5	1.0	-0.3	0.0	0.9	0.104	1.009	0.107	0.177	0.606	55.3	72.2	0.080
SC-12	SB-17 & SB-18	Foundation Soils	19.3	5.6	115	1.1	0.8	65.2	0.588	1.2	34	48.6	65.2	1.0	-0.3	0.0	0.9	0.103	1.009	0.107	0.177	0.604	56.7	73.2	0.081
SC-12	SB-17 & SB-18	Foundation Soils	19.4	5.5	115	1.2	0.8	63.9	0.592	1.2	34	48.7	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.106	0.177	0.597	62.6	77.7	0.087
SC-12	SB-17 & SB-18	Foundation Soils	19.4	5.5	111	1.2	0.8	62.5	0.596	1.2	34	48.7	62.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.177	0.590	70.1	83.9	0.095
SC-12	SB-17 & SB-18	Foundation Soils	19.5	5.4	111	1.2	0.8	62.0	0.598	1.2	34	48.6	62.0	1.0	-0.3	0.0	0.9	0.101	1.009	0.104	0.178	0.586	71.4	84.8	0.097
SC-12	SB-17 & SB-18	Foundation Soils	19.6	5.3	111	1.2	0.8	61.1	0.600	1.2	34	48.5	61.1	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.178	0.582	72.2	84.9	0.097
SC-12	SB-17 & SB-18	Foundation Soils	19.7	5.2	115	1.2	0.8	62.3	0.597	1.2	34	48.6	62.3	1.0	-0.3	0.0	0.9	0.101	1.009	0.104	0.178	0.586	67.9	81.6	0.092
SC-12	SB-17 & SB-18	Foundation Soils	19.8	5.1	115	1.2	0.8	66.7	0.583	1.2	34	49.0	66.7	1.0	-0.3	0.0	0.9	0.105	1.010	0.108	0.178	0.606	58.4	76.0	0.085
SC-12	SB-17 & SB-18	Foundation Soils	19.8	5.1	115	1.2	0.8	65.7	0.586	1.2	34	48.8	65.7	1.0	-0.3	0.0	0.9	0.104	1.009	0.107	0.178	0.601	57.0	73.9	0.082
SC-12	SB-17 & SB-18	Foundation Soils	19.9	5.0	115	1.2	0.8	66.5	0.584	1.2	34	48.8	66.5	1.0	-0.3	0.0	0.9	0.104	1.010	0.108	0.179	0.604	54.8	72.6	0.080
SC-12	SB-17 & SB-18	Foundation Soils	20.0	4.9	115	1.2	0.8	66.9	0.583	1.2	34	48.9	66.9	1.0	-0.3	0.0	0.9	0.105	1.010	0.108	0.179	0.605	55.8	73.7	0.082
SC-12	SB-17 & SB-18	Foundation Soils	20.1	4.8	115	1.2	0.8	66.5	0.584	1.2	34	49.0	66.5	1.0	-0.4	0.0	0.9	0.105	1.010	0.108	0.179	0.603	58.5	76.1	0.085
SC-12	SB-17 & SB-18	Foundation Soils	20.2	4.7	115	1.2	0.8	64.3	0.590	1.2	34	48.8	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.106	0.179	0.592	63.6	79.2	0.089

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-12	SB-17 & SB-18	Foundation Soils	20.3	4.6	115	1.2	0.8	62.2	0.597	1.2	34	48.6	62.2	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.179	0.581	68.3	81.9	0.093
SC-12	SB-17 & SB-18	Foundation Soils	20.3	4.6	111	1.2	0.8	60.9	0.601	1.2	34	48.4	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.179	0.575	71.1	83.6	0.095
SC-12	SB-17 & SB-18	Foundation Soils	20.4	4.5	115	1.2	0.8	60.9	0.601	1.2	34	48.4	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.180	0.574	70.3	82.8	0.094
SC-12	SB-17 & SB-18	Foundation Soils	20.5	4.4	115	1.2	0.8	61.0	0.601	1.2	34	48.3	61.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.180	0.574	67.7	80.4	0.091
SC-12	SB-17 & SB-18	Foundation Soils	20.6	4.3	115	1.2	0.8	60.9	0.601	1.2	34	48.2	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.180	0.573	65.6	78.3	0.088
SC-12	SB-17 & SB-18	Foundation Soils	20.7	4.2	115	1.2	0.8	60.6	0.602	1.2	34	48.1	60.6	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.180	0.571	65.4	77.9	0.087
SC-12	SB-17 & SB-18	Foundation Soils	20.8	4.1	115	1.2	0.8	59.6	0.605	1.2	34	48.1	59.6	1.0	-0.4	0.0	0.9	0.099	1.009	0.102	0.180	0.566	68.4	80.0	0.090
SC-12	SB-17 & SB-18	Foundation Soils	20.8	4.1	115	1.2	0.8	58.2	0.610	1.2	34	47.8	58.2	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.180	0.559	70.8	81.1	0.092
SC-12	SB-17 & SB-18	Foundation Soils	20.9	4.0	115	1.2	0.8	57.9	0.611	1.2	34	47.8	57.9	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.181	0.557	71.6	81.7	0.093
SC-12	SB-17 & SB-18	Foundation Soils	21.0	3.9	115	1.2	0.8	58.3	0.610	1.2	34	47.8	58.3	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.181	0.558	68.3	78.8	0.089
SC-12	SB-17 & SB-18	Foundation Soils	21.1	3.8	115	1.2	0.8	59.5	0.606	1.2	34	47.8	59.5	1.0	-0.4	0.0	0.9	0.099	1.009	0.102	0.181	0.563	63.9	75.5	0.084
SC-12	SB-17 & SB-18	Foundation Soils	21.2	3.7	115	1.3	0.8	61.7	0.599	1.1	34	48.3	61.7	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.181	0.572	63.6	77.0	0.086
SC-12	SB-17 & SB-18	Foundation Soils	21.2	3.7	115	1.3	0.8	65.0	0.588	1.1	34	48.7	65.0	1.0	-0.4	0.0	0.9	0.103	1.009	0.106	0.181	0.586	58.9	75.1	0.084
SC-12	SB-17 & SB-18	Foundation Soils	21.3	3.6	115	1.3	0.8	65.2	0.588	1.1	34	48.8	65.2	1.0	-0.4	0.0	0.9	0.103	1.009	0.106	0.181	0.586	59.3	75.7	0.084
SC-12	SB-17 & SB-18	Foundation Soils	21.4	3.5	115	1.3	0.8	62.5	0.596	1.1	34	48.6	62.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.181	0.574	66.6	80.6	0.091
SC-12	SB-17 & SB-18	Foundation Soils	21.5	3.4	115	1.3	0.9	61.3	0.600	1.1	34	48.4	61.3	1.0	-0.4	0.0	0.9	0.101	1.009	0.103	0.182	0.568	68.6	81.5	0.092
SC-12	SB-17 & SB-18	Foundation Soils	21.6	3.3	115	1.3	0.9	60.8	0.602	1.1	34	48.3	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.182	0.565	69.3	81.8	0.093
SC-12	SB-17 & SB-18	Foundation Soils	21.7	3.2	115	1.3	0.9	60.3	0.603	1.1	34	48.2	60.3	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.182	0.563	68.8	80.9	0.091
SC-12	SB-17 & SB-18	Foundation Soils	21.7	3.2	115	1.3	0.9	60.0	0.604	1.1	34	48.1	60.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.182	0.561	66.7	78.6	0.088
SC-12	SB-17 & SB-18	Foundation Soils	21.8	3.1	115	1.3	0.9	60.2	0.603	1.1	34	48.1	60.2	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.182	0.561	67.6	79.7	0.090
SC-12	SB-17 & SB-18	Foundation Soils	21.9	3.0	115	1.3	0.9	60.6	0.602	1.1	34	48.2	60.6	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.182	0.562	66.4	78.8	0.089
SC-12	SB-17 & SB-18	Foundation Soils	22.0	2.9	115	1.3	0.9	62.5	0.596	1.1	34	48.4	62.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.182	0.570	62.1	76.2	0.085
SC-12	SB-17 & SB-18	Foundation Soils	22.1	2.8	115	1.3	0.9	64.2	0.591	1.1	34	48.4	64.2	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.183	0.577	56.0	71.8	0.079
SC-12	SB-17 & SB-18	Foundation Soils	22.1	2.8	121	1.3	0.9	64.5	0.590	1.1	34	48.3	64.5	1.0	-0.4	0.0	0.9	0.103	1.009	0.106	0.183	0.578	53.5	69.8	0.077
SC-12	SB-17 & SB-18	Foundation Soils	22.2	2.7	121	1.3	0.9	64.5	0.590	1.1	34	48.3	64.5	1.0	-0.4	0.0	0.9	0.103	1.009	0.106	0.183	0.577	53.6	69.8	0.077
SC-12	SB-17 & SB-18	Foundation Soils	22.3	2.6	115	1.3	0.9	63.5	0.593	1.1	34	48.3	63.5	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.183	0.572	57.0	72.2	0.080
SC-12	SB-17 & SB-18	Foundation Soils	22.4	2.5	115	1.3	0.9	62.2	0.597	1.1	34	48.3	62.2	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.183	0.566	62.5	76.4	0.085
SC-12	SB-17 & SB-18	Foundation Soils	22.5	2.4	115	1.3	0.9	62.1	0.597	1.1	34	48.5	62.1	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.183	0.565	67.0	80.6	0.091
SC-12	SB-17 & SB-18	Foundation Soils	22.6	2.3	115	1.3	0.9	64.9	0.589	1.1	34	48.8	64.9	1.0	-0.4	0.0	0.9	0.103	1.009	0.106	0.183	0.577	60.8	76.9	0.086
SC-12	SB-17 & SB-18	Foundation Soils	22.6	2.3	115	1.3	0.9	66.6	0.584	1.1	34	49.0	66.6	1.0	-0.4	0.0	0.9	0.105	1.010	0.107	0.183	0.584	57.9	75.5	0.084
SC-12	SB-17 & SB-18	Foundation Soils	22.7	2.2	115	1.3	0.9	64.7	0.589	1.1	34	48.9	64.7	1.0	-0.4	0.0	0.9	0.103	1.009	0.106	0.184	0.575	63.6	79.4	0.089
SC-12	SB-17 & SB-18	Foundation Soils	22.8	2.1	115	1.3	0.9	63.7	0.592	1.1	34	48.8	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.184	0.570	66.6	81.5	0.092
SC-12	SB-17 & SB-18	Foundation Soils	22.9	2.0	115	1.4	0.9	68.1	0.579	1.1	34	49.4	68.1	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.184	0.589	59.4	78.1	0.088
SC-12	SB-17 & SB-18	Foundation Soils	23.0	1.9	121	1.4	0.9	73.4	0.564	1.1	34	49.9	73.4	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.184	0.614	51.8	75.3	0.084
SC-12	SB-17 & SB-18	Foundation Soils	23.0	1.9	121	1.4	0.9	79.1	0.549	1.1	34	50.3	79.1	1.0	-0.4	0.0	0.9	0.115	1.012	0.118	0.184	0.642	44.9	73.7	0.082
SC-12	SB-17 & SB-18	Foundation Soils	23.1	1.8	121	1.4	0.9	78.3	0.551	1.1	34	50.6	78.3	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.184	0.637	48.4	76.1	0.085
SC-12	SB-17 & SB-18	Foundation Soils	23.2	1.7	121	1.4	0.9	79.3	0.548	1.1	34	50.6	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.118	0.184	0.642	47.3	76.0	0.085
SC-12	SB-17 & SB-18	Foundation Soils	23.3	1.6	121	1.4	0.9	78.5	0.550	1.1	34	50.7	78.5	1.0	-0.4	0.0	0.9	0.114	1.012	0.118	0.184	0.637	49.5	77.3	0.087
SC-12	SB-17 & SB-18	Foundation Soils	23.4	1.5	115	1.4	0.9	75.5	0.558	1.1	34	50.4	75.5	1.0	-0.4	0.0	0.9	0.112	1.011	0.115	0.184	0.622	51.9	77.0	0.086
SC-12	SB-17 & SB-18	Foundation Soils	23.5	1.4	115	1.4	0.9	70.6	0.572	1.1	34	49.9	70.6	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.185	0.598	60.1	80.7	0.091
SC-12	SB-17 & SB-18	Foundation Soils	23.5	1.4	115	1.4	0.9	69.9	0.574	1.1	34	50.0	69.9	1.0	-0.4	0.0	0.9	0.107	1.010	0.110	0.185	0.594	64.7	84.6	0.096
SC-12	SB-17 & SB-18	Foundation Soils	23.6	1.3	115	1.4	0.9	72.0	0.568	1.1	34	50.3	72.0	1.0	-0.4	0.0	0.9	0.109	1.010	0.111	0.185	0.603	60.7	82.5	0.094
SC-12	SB-17 & SB-18	Foundation Soils	23.7	1.2	115	1.4	0.9	71.7	0.569	1.1	34	50.1	71.7	1.0	-0.4	0.0	0.9	0.109	1.010	0.111	0.185	0.601	59.6	81.1	0.092
SC-12	SB-17 & SB-18	Foundation Soils	23.8	1.1	115	1.4	0.9	67.0	0.582	1.1	34	49.5	67.0	1.0	-0.4	0.0	0.9	0.105	1.010	0.107	0.185	0.579	65.2	82.8	0.094
SC-12	SB-17 & SB-18	Foundation Soils	23.9	1.0	115	1.4	0.9	64.9	0.589	1.1	34	49.2	64.9	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.185	0.569	68.6	84.3	0.096
SC-12	SB-17 & SB-18	Foundation Soils	23.9	1.0	115	1.4	0.9	68.0	0.579	1.1	34	49.5	68.0	1.0	-0.4	0.1	0.9	0.106	1.010	0.108	0.185	0.583	60.9	79.5	0.089
SC-12	SB-17 & SB-18	Foundation Soils	24.0	0.9	115	1.4	0.9	71.6	0.569	1.1	34	49.8	71.6	1.0	-0.4	0.1	0.9	0.109	1.010	0.111	0.185	0.599	54.6	76.4	0.085
SC-12	SB-17 & SB-18	Foundation Soils	24.1	0.8	121	1.4	0.9	72.7	0.566	1.1	34	49.4	72.7	1.0	-0.4	0.1	0.9	0.109	1.011	0.112	0.185	0.603	48.1	71.3	0.079
SC-12	SB-17 & SB-18	Foundation Soils	24.2	0.7	115	1.4	0.9	69.5	0.575	1.1	34	49.3	69.5	1.0	-0.5	0.1	0.9	0.107	1.010	0.109	0.186	0.588	53.3	73.5	0.082
SC-12	SB-17 & SB-18	Foundation Soils	24.3	0.6	115	1.4	0.9	66.4	0.584	1.1	34	49.2	66.4	1.0	-0.5	0.1	0.9	0.104	1.010	0.107	0.186	0.574	61.8	79.0	0.089
SC-12	SB-17 & SB-18	Foundation Soils	24.4	0.5	115	1.4	0.9	64.7	0.589	1.1	34	49.0	64.7	1.0	-0.5	0.1	0.9	0.103	1.009	0.105	0.186	0.566	64.9	80.6	0.091
SC-12	SB-17 & SB-18	Foundation Soils	24.4	0.5	115	1.4	0.9	64.3	0.591	1.1	34	48.9	64.3	1.0	-0.5	0.1	0.9	0.103	1.009	0.105	0.186	0.564	65.4	80.8	0.091
SC-12	SB-17 & SB-18	Foundation Soils	24.5	0.4	115	1.4	0.9	63.7	0.592	1.1	34	48.6	63.7	1.0	-0.5	0.1	0.9	0.102	1.009	0.104	0.186	0.561	61.1	76.2	0.085
SC-12	SB-17 & SB-18	Foundation Soils	24.6	0.3	115	1.5	0.9	65.6	0.587	1.1	34	48.9	65.6	1.0	-0.5	0.1	0.9	0.104	1.009	0.106	0.186	0.569	60.3	77.0	0.086
SC-12	SB-17 & SB-18	Foundation Soils	24.7	0.2	115	1.5	0.9	68.9	0.577	1.1	34	49.2	68.9	1.0	-0.5	0.1	0.9	0.106	1.010	0.109	0.186	0.583	53.9	73.6	0.082
SC-12	SB-17 & SB-18	Foundation Soils	24.8	0.1	115	1.5	0.9	69.8	0.574	1.1	34	49.3	69.8	1.0	-0.5	0.1	0.9	0.107	1.010	0.109	0.186	0.587	53.0	73.5	0.082
SC-12	SB-17 & SB-18	Foundation Soils	24.9	0.0	121	1.5	0.9	70.4	0.573	1.1	34	49.3	70.4	1.0	-0.5	0.1	0.9	0.108	1.010	0.110	0.186	0.589	51.6	72.7	0.081
SC-12	SB-17 & SB-18	Foundation Soils	24.9	-0.0	115	1.5	0.9	71.5	0.569	1.1	34	49.5	71.5	1.0	-0.5	0.1	0.9	0.108	1.010	0.111	0.186	0.593	51.9	73.8	0.082
SC-12	SB-17 & SB-18	Foundation Soils	25.0	-0.1	121	1.5	0.9	73.2	0.565	1.1	34	49.7	73.2	1.0	-0.5	0.1	0.9	0.110	1.011	0.112	0.187	0.601	49.6	73.1	0.081
SC-12	SB-17 & SB-18	Foundation Soils	25.1	-0.2	121	1.5	0.9	73.6	0.563	1.1	34	49.8	73.6	1.0	-0.5	0.1	0.9	0.110	1.011	0.113	0.187	0.603	49.9	73.7	0.082
SC-12	SB-17 & SB-18	Foundation Soils	25.2	-0.3	121	1.5	1.0	73.3	0.564	1.1	34	49.9	73.3	1.0	-0.5	0.1	0.9	0.110	1.011	0.112	0.187	0.601	51.4	74.9	0.083
SC-12	SB-17 & SB-18	Foundation Soils	25.3	-0.4	121	1.5	1.0	77.0	0.554	1.1	34	50.1	77.0	1.0	-0.5	0.1	0.9	0.113	1.011	0.116	0.187	0.618	46.6	73.5	0.082
SC-12	SB-17 & SB-18	Foundation Soils	25.3	-0.4	121	1.5	1.0	84.3	0.535	1.1	34	50.3	84.3	1.0	-0.5	0.1	0.9	0.120	1.013	0.123	0.187	0.656	39.2	73.3	0.081
SC-12	SB-17 & SB-18	Foundation Soils	25.4	-0.5	121	1.5	1.0	73.8	0.563	1.1	15	36.3	73.8	1.0	-0.5	0.1	0.9	0.110	1.011	0.113	0.187	0.602	33.8	71.3	0.079
SC-12	SB-17 & SB-18	Foundation Soils	25.5	-0.6	121	1.5	1.0	76.3	0.556	1.1	15	34.7	76.3	1.0	-0.5	0.1	0.9	0.113	1.011	0.115	0.187	0.614	28.8	70.4	0.078
SC-12	SB-17 & SB-18	Foundation Soils	25.6	-0.7	124	1.5	1.0	78.7	0.550	1.1	15	30.2	78.7	1.0	-0.5	0.1	0.9	0.115	1.012	0.117	0.187	0.625	22.4	70.9	0.078
SC-12	SB-17 & SB-18	Foundation Soils	25.7	-0.8	124	1.5	1.0	76.0	0.557	1.1	15	26.5	76.0	1.0	-0.5	0.1	0.9	0.112	1.011	0.114	0.187	0.612	19.8	69.4	0.076
SC-12	SB-17 & SB-18	Foundation Soils	25.8	-0.9	124	1.5	1.0	75.5	0.558	1.1	15	26.4	75.5	1.0	-0.5	0.1	0.9	0.112	1.011	0.114	0.187	0.609	19.8	68.9	0.076
SC-12	SB-17 & SB-18	Foundation Soils	25.8	-0.9	124	1.5	1.0	74.7	0.560	1.1	15	30.7	74.7	1.0	-0.5	0.1	0.9	0.111	1.011	0.113	0.187	0.605	23.4	67.4	0.074
SC-12	SB-17 & SB-18	Foundation Soils	25.9	-1.0	124	1.5	1.0	73.2	0.564	1.0	15	32.6	73.2	1.0	-0.5	0.1	0.9	0.110	1.011	0.112	0.187	0.597	25.8	66.5	0.073
SC-12	SB-17 & SB-18	Foundation Soils	26.0	-1.1	121	1.5	1.0	72.2	0.567	1.0	15	33.0	72.2	1.0	-0.5	0.1	0.9	0.109	1.010	0.111	0.187	0.592	26.7	65.9	0.072

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-12	SB-17 & SB-18	Foundation Soils	26.1	-1.2	121	1.5	1.0	71.0	0.571	1.0	15	33.3	71.0	1.0	-0.5	0.1	0.9	0.108	1.010	0.110	0.187	0.587	27.6	65.3	0.071
SC-12	SB-17 & SB-18	Foundation Soils	26.2	-1.3	121	1.5	1.0	68.6	0.578	1.0	15	33.0	68.6	1.0	-0.5	0.1	0.9	0.106	1.010	0.108	0.188	0.575	27.6	63.2	0.069
SC-12	SB-17 & SB-18	Foundation Soils	26.2	-1.3	121	1.6	1.0	69.5	0.575	1.0	15	34.9	69.5	1.0	-0.5	0.1	0.9	0.107	1.010	0.109	0.188	0.579	31.4	66.0	0.072
SC-12	SB-17 & SB-18	Foundation Soils	26.3	-1.4	121	1.6	1.0	71.5	0.569	1.0	15	34.1	71.5	1.0	-0.5	0.1	0.9	0.109	1.010	0.110	0.188	0.588	28.8	66.2	0.072
SC-12	SB-17 & SB-18	Foundation Soils	26.4	-1.5	121	1.6	1.0	72.4	0.567	1.0	15	35.6	72.4	1.0	-0.5	0.1	0.9	0.109	1.011	0.111	0.188	0.591	32.2	69.0	0.076
SC-12	SB-17 & SB-18	Foundation Soils	26.5	-1.6	121	1.6	1.0	69.1	0.576	1.0	15	37.0	69.1	1.0	-0.5	0.1	0.9	0.107	1.010	0.108	0.188	0.576	40.3	72.3	0.080
SC-12	SB-17 & SB-18	Foundation Soils	26.6	-1.7	115	1.6	1.0	69.0	0.577	1.0	15	38.8	69.0	1.0	-0.5	0.1	0.9	0.106	1.010	0.108	0.188	0.575	61.0	91.2	0.106
SC-12	SB-17 & SB-18	Foundation Soils	26.7	-1.8	115	1.6	1.0	69.0	0.577	1.0	15	38.7	69.0	1.0	-0.5	0.1	0.9	0.106	1.010	0.108	0.188	0.575	59.2	89.4	0.103
SC-13	SB-18 & SB-19	Foundation Soils	7.1	16.0	115	0.4	0.4	69.2	0.576	1.7	45	52.1	69.2	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.129	0.899	58.4	75.6	0.084
SC-13	SB-18 & SB-19	Foundation Soils	7.1	15.9	115	0.4	0.4	67.0	0.582	1.7	45	51.8	67.0	1.1	-0.1	0.0	1.0	0.105	1.010	0.114	0.130	0.877	60.8	76.0	0.085
SC-13	SB-18 & SB-19	Foundation Soils	7.2	15.8	115	0.4	0.4	64.9	0.589	1.7	45	51.4	64.9	1.1	-0.1	0.0	1.0	0.103	1.009	0.112	0.130	0.857	63.2	76.7	0.086
SC-13	SB-18 & SB-19	Foundation Soils	7.3	15.7	115	0.4	0.4	63.4	0.593	1.7	45	51.1	63.4	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.131	0.842	63.9	76.2	0.085
SC-13	SB-18 & SB-19	Foundation Soils	7.4	15.7	115	0.4	0.4	63.1	0.594	1.7	45	51.2	63.1	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.132	0.835	66.0	78.0	0.087
SC-13	SB-18 & SB-19	Foundation Soils	7.5	15.6	115	0.5	0.4	63.9	0.592	1.7	45	51.3	63.9	1.1	-0.1	0.0	1.0	0.102	1.009	0.111	0.132	0.836	65.6	78.2	0.088
SC-13	SB-18 & SB-19	Foundation Soils	7.5	15.5	115	0.5	0.4	64.7	0.589	1.7	45	51.2	64.7	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.133	0.836	60.3	73.7	0.082
SC-13	SB-18 & SB-19	Foundation Soils	7.6	15.4	115	0.5	0.4	67.0	0.582	1.7	45	51.6	67.0	1.1	-0.1	0.0	1.0	0.105	1.010	0.113	0.134	0.848	58.2	73.6	0.082
SC-13	SB-18 & SB-19	Foundation Soils	7.7	15.3	115	0.5	0.4	72.1	0.568	1.6	45	52.4	72.1	1.1	-0.1	0.0	1.0	0.109	1.010	0.118	0.135	0.879	53.6	73.4	0.081
SC-13	SB-18 & SB-19	Foundation Soils	7.8	15.3	121	0.5	0.4	76.5	0.555	1.6	45	53.2	76.5	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.135	0.907	52.7	76.0	0.085
SC-13	SB-18 & SB-19	Foundation Soils	7.9	15.2	121	0.5	0.5	79.6	0.547	1.6	45	53.8	79.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.126	0.136	0.927	51.4	77.2	0.086
SC-13	SB-18 & SB-19	Foundation Soils	8.0	15.1	121	0.5	0.5	81.0	0.544	1.6	45	53.9	81.0	1.1	-0.1	0.0	1.0	0.117	1.012	0.127	0.136	0.933	49.8	77.0	0.086
SC-13	SB-18 & SB-19	Foundation Soils	8.0	15.0	115	0.5	0.5	78.2	0.551	1.6	45	53.6	78.2	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.137	0.906	53.0	77.5	0.087
SC-13	SB-18 & SB-19	Foundation Soils	8.1	14.9	115	0.5	0.5	73.5	0.564	1.6	45	53.0	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.138	0.867	57.6	78.2	0.088
SC-13	SB-18 & SB-19	Foundation Soils	8.2	14.8	121	0.5	0.5	78.4	0.551	1.6	45	53.7	78.4	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.138	0.898	53.3	78.0	0.087
SC-13	SB-18 & SB-19	Foundation Soils	8.3	14.8	121	0.5	0.5	87.5	0.527	1.5	45	54.4	87.5	1.1	-0.1	0.0	1.0	0.123	1.014	0.135	0.139	0.969	43.3	76.5	0.086
SC-13	SB-18 & SB-19	Foundation Soils	8.4	14.7	121	0.5	0.5	92.1	0.516	1.5	45	54.0	92.1	1.1	-0.1	0.0	1.0	0.128	1.015	0.141	0.140	1.007	37.4	75.5	
SC-13	SB-18 & SB-19	Foundation Soils	8.4	14.6	121	0.5	0.5	86.2	0.530	1.5	45	53.5	86.2	1.1	-0.1	0.0	1.0	0.122	1.014	0.133	0.140	0.948	40.5	73.1	0.081
SC-13	SB-18 & SB-19	Foundation Soils	8.5	14.5	121	0.5	0.5	83.0	0.539	1.6	45	53.6	83.0	1.1	-0.1	0.0	1.0	0.119	1.013	0.129	0.141	0.917	44.2	73.6	0.082
SC-13	SB-18 & SB-19	Foundation Soils	8.6	14.4	121	0.5	0.5	77.5	0.553	1.6	45	52.9	77.5	1.1	-0.1	0.0	1.0	0.114	1.012	0.123	0.141	0.871	47.8	72.3	0.080
SC-13	SB-18 & SB-19	Foundation Soils	8.7	14.3	121	0.5	0.5	70.8	0.571	1.6	45	52.2	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.142	0.820	54.4	73.0	0.081
SC-13	SB-18 & SB-19	Foundation Soils	8.8	14.3	115	0.5	0.5	67.7	0.580	1.6	45	51.6	67.7	1.1	-0.1	0.0	1.0	0.105	1.010	0.113	0.143	0.796	56.6	72.6	0.080
SC-13	SB-18 & SB-19	Foundation Soils	8.9	14.2	115	0.5	0.5	65.4	0.587	1.6	45	51.4	65.4	1.1	-0.1	0.0	1.0	0.104	1.009	0.111	0.143	0.778	59.8	73.9	0.082
SC-13	SB-18 & SB-19	Foundation Soils	8.9	14.1	115	0.5	0.5	64.1	0.591	1.6	45	51.3	64.1	1.1	-0.1	0.0	1.0	0.103	1.009	0.110	0.144	0.766	63.0	75.9	0.085
SC-13	SB-18 & SB-19	Foundation Soils	9.0	14.0	115	0.5	0.5	65.0	0.589	1.6	45	51.1	65.0	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.144	0.768	57.6	71.4	0.079
SC-13	SB-18 & SB-19	Foundation Soils	9.1	13.9	115	0.6	0.5	67.2	0.582	1.6	45	51.5	67.2	1.1	-0.1	0.0	1.0	0.105	1.010	0.113	0.145	0.779	55.2	70.9	0.078
SC-13	SB-18 & SB-19	Foundation Soils	9.2	13.9	121	0.6	0.5	70.0	0.574	1.6	45	51.9	70.0	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.145	0.794	52.8	70.9	0.078
SC-13	SB-18 & SB-19	Foundation Soils	9.3	13.8	121	0.6	0.5	69.2	0.576	1.6	45	51.7	69.2	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.146	0.786	52.8	70.3	0.078
SC-13	SB-18 & SB-19	Foundation Soils	9.4	13.7	121	0.6	0.5	68.7	0.578	1.6	45	51.2	68.7	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.146	0.779	49.3	66.7	0.073
SC-13	SB-18 & SB-19	Foundation Soils	9.4	13.6	121	0.6	0.5	66.5	0.584	1.6	45	50.8	66.5	1.1	-0.1	0.0	1.0	0.104	1.010	0.112	0.147	0.762	49.5	65.2	0.071
SC-13	SB-18 & SB-19	Foundation Soils	9.5	13.5	121	0.6	0.5	62.9	0.595	1.6	45	50.3	62.9	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.148	0.737	52.3	64.9	0.071
SC-13	SB-18 & SB-19	Foundation Soils	9.6	13.4	115	0.6	0.5	60.5	0.602	1.6	45	50.2	60.5	1.1	-0.1	0.0	1.0	0.100	1.009	0.107	0.148	0.721	57.9	68.2	0.075
SC-13	SB-18 & SB-19	Foundation Soils	9.7	13.4	115	0.6	0.5	59.0	0.607	1.6	45	49.7	59.0	1.1	-0.1	0.0	1.0	0.099	1.009	0.105	0.149	0.709	55.7	64.9	0.071
SC-13	SB-18 & SB-19	Foundation Soils	9.8	13.3	121	0.6	0.5	59.6	0.606	1.6	45	49.7	59.6	1.1	-0.1	0.0	1.0	0.099	1.009	0.106	0.149	0.710	54.0	63.9	0.070
SC-13	SB-18 & SB-19	Foundation Soils	9.8	13.2	121	0.6	0.5	60.9	0.601	1.6	45	50.0	60.9	1.1	-0.1	0.0	1.0	0.100	1.009	0.107	0.150	0.714	53.5	64.4	0.070
SC-13	SB-18 & SB-19	Foundation Soils	9.9	13.1	121	0.6	0.5	58.5	0.609	1.6	45	49.5	58.5	1.1	-0.1	0.0	1.0	0.098	1.008	0.105	0.150	0.698	53.5	62.5	0.068
SC-13	SB-18 & SB-19	Foundation Soils	10.0	13.0	111	0.6	0.5	56.3	0.616	1.6	45	49.2	56.3	1.1	-0.1	0.0	1.0	0.097	1.008	0.103	0.151	0.684	56.7	63.8	0.069
SC-13	SB-18 & SB-19	Foundation Soils	10.1	13.0	111	0.6	0.5	55.4	0.619	1.6	45	49.3	55.4	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.151	0.676	62.1	68.1	0.075
SC-13	SB-18 & SB-19	Foundation Soils	10.2	12.9	111	0.6	0.5	55.0	0.621	1.6	45	49.4	55.0	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.152	0.672	64.9	70.5	0.078
SC-13	SB-18 & SB-19	Foundation Soils	10.3	12.8	111	0.6	0.5	54.8	0.621	1.6	45	49.4	54.8	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.152	0.668	66.1	71.5	0.079
SC-13	SB-18 & SB-19	Foundation Soils	10.3	12.7	111	0.6	0.5	54.6	0.622	1.6	45	49.4	54.6	1.1	-0.1	0.0	1.0	0.096	1.008	0.101	0.153	0.665	67.9	73.1	0.081
SC-13	SB-18 & SB-19	Foundation Soils	10.4	12.6	111	0.6	0.5	54.9	0.621	1.6	45	49.4	54.9	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.153	0.664	65.8	71.3	0.079
SC-13	SB-18 & SB-19	Foundation Soils	10.5	12.5	111	0.6	0.5	56.0	0.617	1.5	45	49.3	56.0	1.1	-0.1	0.0	1.0	0.097	1.008	0.102	0.153	0.668	59.0	65.7	0.072
SC-13	SB-18 & SB-19	Foundation Soils	10.6	12.5	121	0.6	0.5	62.8	0.595	1.5	45	49.1	62.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.108	0.154	0.703	42.7	56.4	0.061
SC-13	SB-18 & SB-19	Foundation Soils	10.7	12.4	124	0.6	0.5	44.4	0.660	1.6	5	12.5	44.4	1.0	-0.1	0.0	1.0	0.088	1.007	0.093	0.154	0.604	22.7	54.6	0.059
SC-13	SB-18 & SB-19	Foundation Soils	10.7	12.3	124	0.6	0.5	51.5	0.633	1.6	5	1.3	51.5	1.0	-0.2	0.0	1.0	0.093	1.008	0.099	0.155	0.638	11.2	61.4	0.067
SC-13	SB-18 & SB-19	Foundation Soils	10.8	12.2	124	0.7	0.5	54.9	0.621	1.5	5	0.0	54.9	1.1	-0.2	0.0	1.0	0.096	1.008	0.102	0.155	0.654	9.0	63.8	0.070
SC-13	SB-18 & SB-19	Foundation Soils	10.9	12.1	124	0.7	0.5	57.5	0.612	1.5	5	0.0	57.5	1.1	-0.2	0.0	1.0	0.098	1.008	0.104	0.156	0.665	7.7	65.1	0.071
SC-13	SB-18 & SB-19	Foundation Soils	11.0	12.1	124	0.7	0.5	59.7	0.605	1.5	5	0.1	59.7	1.1	-0.2	0.0	1.0	0.099	1.009	0.105	0.156	0.675	9.3	68.9	0.076
SC-13	SB-18 & SB-19	Foundation Soils	11.1	12.0	124	0.7	0.5	61.8	0.598	1.5	5	0.0	61.8	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.157	0.684	8.7	70.5	0.078
SC-13	SB-18 & SB-19	Foundation Soils	11.2	11.9	124	0.7	0.5	59.9	0.604	1.5	5	0.6	59.9	1.1	-0.2	0.0	1.0	0.099	1.009	0.106	0.157	0.672	10.4	69.7	0.077
SC-13	SB-18 & SB-19	Foundation Soils	11.2	11.8	124	0.7	0.5	59.4	0.606	1.5	5	8.7	59.4	1.1	-0.2	0.0	1.0	0.099	1.009	0.105	0.157	0.668	16.7	67.4	0.074
SC-13	SB-18 & SB-19	Foundation Soils	11.3	11.7	121	0.7	0.5	55.9	0.618	1.5	5	16.1	55.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.158	0.647	33.1	72.9	0.081
SC-13	SB-18 & SB-19	Foundation Soils	11.4	11.6	121	0.7	0.5	77.1	0.554	1.4	36	51.0	77.1	1.1	-0.2	0.0	1.0	0.113	1.011	0.121	0.158	0.766	49.4	75.5	0.084
SC-13	SB-18 & SB-19	Foundation Soils	11.5	11.6	115	0.7	0.6	70.8	0.571	1.5	36	50.3	70.8	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.159	0.725	55.6	76.1	0.085
SC-13	SB-18 & SB-19	Foundation Soils	11.6	11.5	115	0.7	0.6	67.1	0.582	1.5	36	49.7	67.1	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.159	0.702	57.9	75.4	0.084
SC-13	SB-18 & SB-19	Foundation Soils	11.6	11.4	115	0.7	0.6	61.7	0.599	1.5	36	49.0	61.7	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.159	0.670	67.1	79.8	0.090
SC-13	SB-18 & SB-19	Foundation Soils	11.7	11.3	115	0.7	0.6	59.9	0.604	1.5	36	48.7	59.9	1.0	-0.2	0.0	1.0	0.099	1.009	0.105	0.160	0.659	69.2	80.5	0.091
SC-13	SB-18 & SB-19	Foundation Soils	11.8	11.2	115	0.7	0.6	59.3	0.606	1.5	36	48.4	59.3	1.0	-0.2	0.0	1.0	0.099	1.009	0.105	0.160	0.654	64.9	75.8	0.085
SC-13	SB-18 & SB-19	Foundation Soils	11.9	11.2	115	0.7	0.6	57.9	0.611	1.5	36	48.1	57.9	1.0	-0.2	0.0	1.0	0.098	1.008	0.104	0.161	0.645	65.5	75.2	0.084
SC-13	SB-18 & SB-19	Foundation Soils	12.0	11.1	115	0.7	0.6	56.0	0.617	1.5	36	47.5	56.0	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.161	0.633	60.8	69.3	0.076
SC-13	SB-18 & SB-19	Foundation Soils	12.1	11.0	115	0.7	0.6	55.6	0.619	1.5	36	47.3	55.6	1.0	-0.2	0.0	1.0	0.096	1.008	0.102	0.161	0.629	58.7	67.0	0.073

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-13	SB-18 & SB-19	Foundation Soils	12.1	10.9	115	0.7	0.6	55.8	0.618	1.5	36	47.6	55.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.102	0.162	0.629	63.1	71.4	0.079
SC-13	SB-18 & SB-19	Foundation Soils	12.2	10.8	115	0.7	0.6	55.9	0.618	1.5	36	47.8	55.9	1.0	-0.2	0.0	1.0	0.096	1.008	0.102	0.162	0.627	66.8	74.9	0.083
SC-13	SB-18 & SB-19	Foundation Soils	12.3	10.7	111	0.7	0.6	55.0	0.621	1.5	36	47.0	55.0	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.163	0.621	54.9	63.0	0.068
SC-13	SB-18 & SB-19	Foundation Soils	12.4	10.7	111	0.7	0.6	54.8	0.621	1.5	36	47.0	54.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.163	0.619	55.7	63.5	0.069
SC-13	SB-18 & SB-19	Foundation Soils	12.5	10.6	111	0.7	0.6	54.8	0.621	1.5	36	47.0	54.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.163	0.617	56.3	64.1	0.070
SC-13	SB-18 & SB-19	Foundation Soils	12.5	10.5	115	0.8	0.6	56.2	0.617	1.5	36	47.3	56.2	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.164	0.623	56.1	65.1	0.071
SC-13	SB-18 & SB-19	Foundation Soils	12.6	10.4	121	0.8	0.6	57.6	0.612	1.4	36	47.4	57.6	1.0	-0.2	0.0	1.0	0.098	1.008	0.103	0.164	0.628	54.2	64.3	0.070
SC-13	SB-18 & SB-19	Foundation Soils	12.7	10.3	121	0.8	0.6	57.5	0.612	1.4	36	47.4	57.5	1.0	-0.2	0.0	1.0	0.098	1.008	0.103	0.164	0.626	53.9	64.0	0.070
SC-13	SB-18 & SB-19	Foundation Soils	12.8	10.2	121	0.8	0.6	56.7	0.615	1.4	36	47.3	56.7	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.165	0.620	54.1	63.5	0.069
SC-13	SB-18 & SB-19	Foundation Soils	12.9	10.2	115	0.8	0.6	55.8	0.618	1.4	36	47.3	55.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.102	0.165	0.615	58.1	66.6	0.073
SC-13	SB-18 & SB-19	Foundation Soils	13.0	10.1	115	0.8	0.6	55.4	0.619	1.4	36	47.4	55.4	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.165	0.611	61.6	69.6	0.077
SC-13	SB-18 & SB-19	Foundation Soils	13.0	10.0	115	0.8	0.6	55.5	0.619	1.4	36	47.4	55.5	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.166	0.610	61.3	69.4	0.076
SC-13	SB-18 & SB-19	Foundation Soils	13.1	9.9	115	0.8	0.6	55.6	0.619	1.4	36	47.4	55.6	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.166	0.609	59.8	68.0	0.075
SC-13	SB-18 & SB-19	Foundation Soils	13.2	9.8	115	0.8	0.6	55.5	0.619	1.4	36	47.3	55.5	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.167	0.607	59.0	67.2	0.074
SC-13	SB-18 & SB-19	Foundation Soils	13.3	9.8	115	0.8	0.6	55.9	0.618	1.4	36	47.4	55.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.167	0.608	59.5	68.0	0.075
SC-13	SB-18 & SB-19	Foundation Soils	13.4	9.7	115	0.8	0.6	56.1	0.617	1.4	36	47.5	56.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.167	0.607	60.0	68.5	0.075
SC-13	SB-18 & SB-19	Foundation Soils	13.5	9.6	115	0.8	0.6	56.1	0.617	1.4	36	47.6	56.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.168	0.606	60.7	69.3	0.076
SC-13	SB-18 & SB-19	Foundation Soils	13.5	9.5	115	0.8	0.6	56.4	0.616	1.4	36	47.7	56.4	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.168	0.606	62.3	71.0	0.078
SC-13	SB-18 & SB-19	Foundation Soils	13.6	9.4	115	0.8	0.6	56.7	0.615	1.4	36	47.8	56.7	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.168	0.606	63.4	72.2	0.080
SC-13	SB-18 & SB-19	Foundation Soils	13.7	9.3	115	0.8	0.6	56.8	0.615	1.4	36	47.8	56.8	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.168	0.606	63.6	72.6	0.080
SC-13	SB-18 & SB-19	Foundation Soils	13.8	9.3	115	0.8	0.6	56.9	0.614	1.4	36	47.9	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.169	0.605	64.1	73.2	0.081
SC-13	SB-18 & SB-19	Foundation Soils	13.9	9.2	115	0.8	0.6	56.9	0.614	1.4	36	47.9	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.169	0.603	64.2	73.2	0.081
SC-13	SB-18 & SB-19	Foundation Soils	13.9	9.1	115	0.8	0.6	57.0	0.614	1.4	36	47.9	57.0	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.169	0.603	63.2	72.4	0.080
SC-13	SB-18 & SB-19	Foundation Soils	14.0	9.0	115	0.8	0.6	57.5	0.612	1.4	36	47.9	57.5	1.0	-0.2	0.0	1.0	0.098	1.008	0.102	0.170	0.604	61.5	71.1	0.079
SC-13	SB-18 & SB-19	Foundation Soils	14.1	8.9	115	0.8	0.6	57.3	0.613	1.4	36	47.9	57.3	1.0	-0.2	0.0	1.0	0.098	1.008	0.102	0.170	0.602	62.4	71.9	0.080
SC-13	SB-18 & SB-19	Foundation Soils	14.2	8.9	115	0.8	0.6	57.2	0.613	1.4	36	47.9	57.2	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.170	0.600	62.7	72.0	0.080
SC-13	SB-18 & SB-19	Foundation Soils	14.3	8.8	115	0.9	0.6	56.9	0.614	1.4	36	47.5	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.171	0.597	56.4	65.9	0.072
SC-13	SB-18 & SB-19	Foundation Soils	14.4	8.7	121	0.9	0.6	57.2	0.613	1.4	36	47.3	57.2	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.171	0.598	53.6	63.5	0.069
SC-13	SB-18 & SB-19	Foundation Soils	14.4	8.6	121	0.9	0.6	57.1	0.614	1.4	36	47.2	57.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.171	0.596	51.8	61.7	0.067
SC-13	SB-18 & SB-19	Foundation Soils	14.5	8.5	121	0.9	0.6	56.4	0.616	1.4	36	47.2	56.4	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.172	0.591	54.7	63.8	0.070
SC-13	SB-18 & SB-19	Foundation Soils	14.6	8.4	111	0.9	0.6	55.9	0.618	1.4	36	47.0	55.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.172	0.588	53.2	62.1	0.067
SC-13	SB-18 & SB-19	Foundation Soils	14.7	8.4	111	0.9	0.6	55.8	0.618	1.4	36	47.1	55.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.172	0.587	54.9	63.6	0.069
SC-13	SB-18 & SB-19	Foundation Soils	14.8	8.3	111	0.9	0.6	55.5	0.619	1.4	36	47.1	55.5	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.172	0.584	55.1	63.6	0.069
SC-13	SB-18 & SB-19	Foundation Soils	14.8	8.2	121	0.9	0.6	55.6	0.619	1.4	36	47.1	55.6	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.173	0.583	55.3	63.8	0.069
SC-13	SB-18 & SB-19	Foundation Soils	14.9	8.1	121	0.9	0.6	55.7	0.618	1.4	36	47.1	55.7	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.173	0.583	54.8	63.5	0.069
SC-13	SB-18 & SB-19	Foundation Soils	15.0	8.0	115	0.9	0.6	56.1	0.617	1.4	36	47.5	56.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.173	0.583	60.7	69.2	0.076
SC-13	SB-18 & SB-19	Foundation Soils	15.1	8.0	115	0.9	0.6	56.2	0.617	1.4	36	47.7	56.2	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.174	0.583	63.2	71.7	0.079
SC-13	SB-18 & SB-19	Foundation Soils	15.2	7.9	115	0.9	0.6	56.5	0.616	1.4	36	47.9	56.5	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.174	0.583	66.7	75.3	0.084
SC-13	SB-18 & SB-19	Foundation Soils	15.3	7.8	115	0.9	0.7	57.4	0.613	1.3	36	48.1	57.4	1.0	-0.2	0.0	1.0	0.098	1.008	0.102	0.174	0.586	67.9	77.1	0.086
SC-13	SB-18 & SB-19	Foundation Soils	15.3	7.7	115	0.9	0.7	59.5	0.606	1.3	36	48.4	59.5	1.0	-0.2	0.0	1.0	0.099	1.009	0.104	0.174	0.595	63.3	74.4	0.083
SC-13	SB-18 & SB-19	Foundation Soils	15.4	7.6	115	0.9	0.7	62.4	0.597	1.3	36	48.5	62.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.175	0.607	55.4	69.2	0.076
SC-13	SB-18 & SB-19	Foundation Soils	15.5	7.5	121	0.9	0.7	65.2	0.588	1.3	36	48.5	65.2	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.175	0.620	48.7	65.4	0.071
SC-13	SB-18 & SB-19	Foundation Soils	15.6	7.5	121	0.9	0.7	68.9	0.577	1.3	36	47.9	68.9	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.175	0.638	39.7	60.7	0.066
SC-13	SB-18 & SB-19	Foundation Soils	15.7	7.4	121	0.9	0.7	73.2	0.565	1.3	36	47.5	73.2	1.0	-0.3	0.0	1.0	0.110	1.011	0.116	0.175	0.659	35.0	60.7	0.066
SC-13	SB-18 & SB-19	Foundation Soils	15.7	7.3	121	0.9	0.7	77.8	0.552	1.3	36	47.9	77.8	1.0	-0.3	0.0	1.0	0.114	1.012	0.120	0.176	0.683	33.5	63.4	0.069
SC-13	SB-18 & SB-19	Foundation Soils	15.8	7.2	121	0.9	0.7	79.9	0.546	1.3	36	47.8	79.9	1.0	-0.3	0.0	1.0	0.116	1.012	0.122	0.176	0.694	32.3	64.5	0.070
SC-13	SB-18 & SB-19	Foundation Soils	15.9	7.1	121	0.9	0.7	80.1	0.546	1.3	36	48.5	80.1	1.0	-0.3	0.0	1.0	0.116	1.012	0.122	0.176	0.694	34.2	65.7	0.072
SC-13	SB-18 & SB-19	Foundation Soils	16.0	7.0	121	1.0	0.7	79.8	0.547	1.3	36	49.4	79.8	1.0	-0.3	0.0	1.0	0.116	1.012	0.122	0.176	0.691	37.0	67.5	0.074
SC-13	SB-18 & SB-19	Foundation Soils	16.1	7.0	121	1.0	0.7	79.4	0.548	1.3	36	49.8	79.4	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.177	0.688	38.8	68.4	0.075
SC-13	SB-18 & SB-19	Foundation Soils	16.2	6.9	121	1.0	0.7	80.5	0.545	1.3	36	50.0	80.5	1.0	-0.3	0.0	1.0	0.116	1.012	0.122	0.177	0.693	38.9	69.4	0.076
SC-13	SB-18 & SB-19	Foundation Soils	16.2	6.8	121	1.0	0.7	82.3	0.540	1.3	36	50.5	82.3	1.0	-0.3	0.0	1.0	0.118	1.013	0.124	0.177	0.702	39.5	71.3	0.079
SC-13	SB-18 & SB-19	Foundation Soils	16.3	6.7	121	1.0	0.7	84.8	0.534	1.3	36	50.1	84.8	1.0	-0.3	0.0	1.0	0.120	1.013	0.127	0.177	0.717	36.0	70.8	0.078
SC-13	SB-18 & SB-19	Foundation Soils	16.4	6.6	121	1.0	0.7	85.0	0.533	1.3	36	49.8	85.0	1.0	-0.3	0.0	1.0	0.121	1.013	0.127	0.177	0.717	35.0	70.3	0.077
SC-13	SB-18 & SB-19	Foundation Soils	16.5	6.6	121	1.0	0.7	84.6	0.534	1.3	36	46.9	84.6	1.0	-0.3	0.0	1.0	0.120	1.013	0.127	0.178	0.713	29.0	66.7	0.073
SC-13	SB-18 & SB-19	Foundation Soils	16.6	6.5	124	1.0	0.7	82.2	0.541	1.3	36	44.2	82.2	1.0	-0.3	0.0	1.0	0.118	1.013	0.124	0.178	0.698	26.0	64.0	0.070
SC-13	SB-18 & SB-19	Foundation Soils	16.7	6.4	124	1.0	0.7	80.8	0.544	1.3	36	44.2	80.8	1.0	-0.3	0.0	1.0	0.117	1.012	0.123	0.178	0.688	26.3	62.9	0.068
SC-13	SB-18 & SB-19	Foundation Soils	16.7	6.3	124	1.0	0.7	79.8	0.547	1.3	36	44.1	79.8	1.0	-0.3	0.0	1.0	0.116	1.012	0.121	0.178	0.682	26.4	62.0	0.067
SC-13	SB-18 & SB-19	Foundation Soils	16.8	6.2	124	1.0	0.7	77.7	0.552	1.3	36	40.2	77.7	1.0	-0.3	0.0	1.0	0.114	1.012	0.119	0.178	0.669	22.9	60.5	0.065
SC-13	SB-18 & SB-19	Foundation Soils	16.9	6.1	124	1.0	0.7	67.7	0.580	1.3	36	28.0	67.7	1.0	-0.3	0.0	1.0	0.105	1.010	0.110	0.179	0.616	17.4	57.1	0.061
SC-13	SB-18 & SB-19	Foundation Soils	17.0	6.1	124	1.0	0.7	63.5	0.593	1.3	36	21.1	63.5	1.0	-0.3	0.0	1.0	0.102	1.009	0.106	0.179	0.595	15.4	57.8	0.062
SC-13	SB-18 & SB-19	Foundation Soils	17.1	6.0	124	1.0	0.7	70.8	0.571	1.3	36	25.8	70.8	1.0	-0.3	0.0	1.0	0.108	1.010	0.113	0.179	0.630	16.6	61.6	0.067
SC-13	SB-18 & SB-19	Foundation Soils	17.1	5.9	124	1.0	0.7	88.2	0.525	1.2	36	43.6	88.2	1.0	-0.3	0.0	1.0	0.124	1.014	0.130	0.179	0.728	24.4	69.0	0.076
SC-13	SB-18 & SB-19	Foundation Soils	17.2	5.8	121	1.0	0.7	87.0	0.528	1.2	36	47.2	87.0	1.0	-0.3	0.0	1.0	0.122	1.014	0.129	0.179	0.719	28.7	68.6	0.075
SC-13	SB-18 & SB-19	Foundation Soils	17.3	5.7	121	1.0	0.7	86.1	0.531	1.2	36	48.5	86.1	1.0	-0.3	0.0	1.0	0.122	1.014	0.128	0.180	0.712	31.3	68.9	0.076
SC-13	SB-18 & SB-19	Foundation Soils	17.4	5.7	121	1.0	0.7	84.1	0.536	1.2	36	50.3	84.1	1.0	-0.3	0.0	1.0	0.120	1.013	0.126	0.180	0.699	37.2	71.0	0.078
SC-13	SB-18 & SB-19	Foundation Soils	17.5	5.6	121	1.0	0.7	79.8	0.547	1.2	36	50.6	79.8	1.0	-0.3	0.0	1.0	0.116	1.012	0.121	0.180	0.673	42.7	71.8	0.080
SC-13	SB-18 & SB-19	Foundation Soils	17.6	5.5	121	1.0	0.7	79.1	0.549	1.2	36	50.5	79.1	1.0	-0.3	0.0	1.0	0.115	1.012	0.120	0.180	0.668	42.7	71.3	0.079
SC-13	SB-18 & SB-19	Foundation Soils	17.6	5.4	121	1.1	0.7	78.7	0.550	1.2	36	49.5	78.7	1.0	-0.3	0.0	1.0	0.115	1.012	0.120	0.180	0.665	38.5	67.6	0.074
SC-13	SB-18 & SB-19	Foundation Soils	17.7	5.3	121	1.1	0.7	79.4	0.548	1.2	36	49.7	79.4	1.0	-0.3	0.0	0.9	0.115	1.012	0.121	0.181	0.668	38.6	68.3	0.075
SC-13	SB-18 & SB-19	Foundation Soils	17.8	5.2	121	1.1	0.7	79.3	0.548	1.2	36	49.4	79.3	1.0	-0.3	0.0	0.9	0.115	1.012	0.121	0.181	0.667	37.3	67.3	0.074
SC-13	SB-18 & SB-19	Foundation Soils	17.9	5.2	121	1.1	0.7	80.0	0.546	1.2	36	50.7	80.0	1.0	-0.3	0.0	0.9	0.116	1.012	0.121	0.181	0.670	42.6	71.9	0.080

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-13	SB-18 & SB-19	Foundation Soils	18.0	5.1	121	1.1	0.7	78.8	0.549	1.2	36	50.7	78.8	1.0	-0.3	0.0	0.9	0.115	1.012	0.120	0.181	0.663	44.3	72.4	0.080
SC-13	SB-18 & SB-19	Foundation Soils	18.0	5.0	121	1.1	0.7	78.7	0.550	1.2	36	51.0	78.7	1.0	-0.3	0.0	0.9	0.115	1.012	0.120	0.181	0.661	46.6	74.3	0.083
SC-13	SB-18 & SB-19	Foundation Soils	18.1	4.9	121	1.1	0.7	79.1	0.549	1.2	36	51.6	79.1	1.0	-0.3	0.0	0.9	0.115	1.012	0.120	0.181	0.662	51.5	79.0	0.089
SC-13	SB-18 & SB-19	Foundation Soils	18.2	4.8	121	1.1	0.7	86.6	0.529	1.2	36	52.1	86.6	1.0	-0.3	0.0	0.9	0.122	1.014	0.128	0.182	0.705	43.4	77.9	0.087
SC-13	SB-18 & SB-19	Foundation Soils	18.3	4.8	121	1.1	0.7	88.2	0.526	1.2	36	52.1	88.2	1.0	-0.3	0.0	0.9	0.124	1.014	0.130	0.182	0.714	41.5	77.6	0.087
SC-13	SB-18 & SB-19	Foundation Soils	18.4	4.7	121	1.1	0.7	96.0	0.507	1.2	36	50.8	96.0	1.0	-0.3	0.0	0.9	0.132	1.016	0.139	0.182	0.766	32.2	77.4	0.087
SC-13	SB-18 & SB-19	Foundation Soils	18.5	4.6	124	1.1	0.7	102.4	0.493	1.2	36	44.3	102.4	1.0	-0.3	0.0	0.9	0.140	1.019	0.149	0.182	0.815	23.1	81.1	0.092
SC-13	SB-18 & SB-19	Foundation Soils	18.5	4.5	124	1.1	0.7	99.7	0.499	1.2	36	38.7	99.7	1.0	-0.3	0.0	0.9	0.137	1.018	0.145	0.182	0.793	20.1	81.1	0.092
SC-13	SB-18 & SB-19	Foundation Soils	18.6	4.4	124	1.1	0.8	97.7	0.503	1.2	36	41.6	97.7	1.0	-0.3	0.0	0.9	0.134	1.017	0.142	0.182	0.776	21.8	77.9	0.087
SC-13	SB-18 & SB-19	Foundation Soils	18.7	4.3	124	1.1	0.8	88.5	0.525	1.2	36	25.4	88.5	1.0	-0.3	0.0	0.9	0.124	1.014	0.130	0.183	0.712	15.9	79.1	0.089
SC-13	SB-18 & SB-19	Foundation Soils	18.8	4.3	124	1.1	0.8	71.4	0.570	1.2	36	3.3	71.4	1.0	-0.3	0.0	0.9	0.108	1.010	0.113	0.183	0.617	10.9	79.0	0.089
SC-13	SB-18 & SB-19	Foundation Soils	18.9	4.2	124	1.1	0.8	66.8	0.583	1.2	36	0.3	66.8	1.0	-0.3	0.0	0.9	0.105	1.010	0.109	0.183	0.594	9.3	75.8	0.085
SC-13	SB-18 & SB-19	Foundation Soils	18.9	4.1	124	1.1	0.8	59.8	0.605	1.2	36	0.1	59.8	1.0	-0.3	0.0	0.9	0.099	1.009	0.103	0.183	0.561	8.8	68.5	0.075
SC-13	SB-18 & SB-19	Foundation Soils	19.0	4.0	124	1.1	0.8	56.5	0.616	1.2	36	0.0	56.5	1.0	-0.3	0.0	0.9	0.097	1.008	0.100	0.183	0.547	8.1	64.6	0.070
SC-13	SB-18 & SB-19	Foundation Soils	19.1	3.9	124	1.1	0.8	56.6	0.615	1.2	36	11.2	56.6	1.0	-0.3	0.0	0.9	0.097	1.008	0.100	0.183	0.547	13.0	58.5	0.063
SC-13	SB-18 & SB-19	Foundation Soils	19.2	3.9	124	1.1	0.8	65.2	0.588	1.2	36	29.2	65.2	1.0	-0.3	0.0	0.9	0.103	1.009	0.107	0.183	0.584	18.0	54.0	0.058
SC-13	SB-18 & SB-19	Foundation Soils	19.3	3.8	119	1.2	0.8	67.4	0.581	1.2	36	41.2	67.4	1.0	-0.3	0.0	0.9	0.105	1.010	0.109	0.184	0.594	25.5	51.7	0.055
SC-13	SB-18 & SB-19	Foundation Soils	19.4	3.7	121	1.2	0.8	64.4	0.590	1.2	36	44.9	64.4	1.0	-0.3	0.0	0.9	0.103	1.009	0.106	0.184	0.579	32.5	52.0	0.056
SC-13	SB-18 & SB-19	Foundation Soils	19.4	3.6	111	1.2	0.8	56.4	0.616	1.2	36	47.2	56.4	1.0	-0.3	0.0	0.9	0.097	1.008	0.100	0.184	0.543	53.8	63.0	0.068
SC-13	SB-18 & SB-19	Foundation Soils	19.5	3.5	115	1.2	0.8	55.9	0.618	1.2	36	47.9	55.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.100	0.184	0.541	71.1	79.1	0.089
SC-13	SB-18 & SB-19	Foundation Soils	19.6	3.4	111	1.2	0.8	54.9	0.621	1.2	36	47.8	54.9	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.184	0.536	75.4	82.4	0.093
SC-13	SB-18 & SB-19	Foundation Soils	19.7	3.4	111	1.2	0.8	54.7	0.622	1.2	36	47.8	54.7	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.184	0.535	75.4	82.3	0.093
SC-13	SB-18 & SB-19	Foundation Soils	19.8	3.3	115	1.2	0.8	61.3	0.600	1.2	36	48.6	61.3	1.0	-0.3	0.0	0.9	0.101	1.009	0.104	0.185	0.562	60.0	72.7	0.081
SC-13	SB-18 & SB-19	Foundation Soils	19.8	3.2	121	1.2	0.8	73.2	0.565	1.2	36	49.4	73.2	1.0	-0.3	0.0	0.9	0.110	1.011	0.114	0.185	0.616	42.9	66.8	0.073
SC-13	SB-18 & SB-19	Foundation Soils	19.9	3.1	124	1.2	0.8	86.8	0.529	1.2	36	39.9	86.8	1.0	-0.3	0.0	0.9	0.122	1.014	0.127	0.185	0.689	21.8	68.6	0.075
SC-13	SB-18 & SB-19	Foundation Soils	20.0	3.0	124	1.2	0.8	69.9	0.574	1.2	36	0.2	69.9	1.0	-0.3	0.0	0.9	0.107	1.010	0.111	0.185	0.600	9.2	78.9	0.089
SC-13	SB-18 & SB-19	Foundation Soils	20.1	2.9	124	1.2	0.8	85.8	0.531	1.2	36	0.0	85.8	1.0	-0.4	0.0	0.9	0.121	1.013	0.126	0.185	0.682	6.0	91.8	0.107
SC-13	SB-18 & SB-19	Foundation Soils	20.2	2.9	124	1.2	0.8	97.6	0.503	1.2	36	0.0	97.6	1.0	-0.4	0.0	0.9	0.134	1.017	0.141	0.185	0.759	6.0	103.6	0.125
SC-13	SB-18 & SB-19	Foundation Soils	20.3	2.8	124	1.2	0.8	105.4	0.486	1.1	36	0.0	105.4	1.0	-0.4	0.0	0.9	0.145	1.020	0.152	0.185	0.821	6.0	111.4	0.139
SC-13	SB-18 & SB-19	Foundation Soils	20.3	2.7	124	1.2	0.8	110.6	0.476	1.1	36	0.0	110.6	1.0	-0.4	0.0	0.9	0.153	1.022	0.161	0.186	0.869	6.0	116.6	0.149
SC-13	SB-18 & SB-19	Foundation Soils	20.4	2.6	124	1.2	0.8	107.1	0.483	1.1	36	0.0	107.1	1.0	-0.4	0.0	0.9	0.147	1.020	0.155	0.186	0.835	6.0	113.1	0.142
SC-13	SB-18 & SB-19	Foundation Soils	20.5	2.5	124	1.2	0.8	103.5	0.490	1.1	36	0.0	103.5	1.0	-0.4	0.0	0.9	0.142	1.019	0.149	0.186	0.803	6.0	109.5	0.136
SC-13	SB-18 & SB-19	Foundation Soils	20.6	2.5	124	1.2	0.8	98.7	0.501	1.1	36	0.0	98.7	1.0	-0.4	0.0	0.9	0.136	1.017	0.142	0.186	0.763	6.0	104.7	0.127
SC-13	SB-18 & SB-19	Foundation Soils	20.7	2.4	124	1.2	0.8	95.2	0.509	1.1	36	0.0	95.2	1.0	-0.4	0.0	0.9	0.131	1.016	0.137	0.186	0.737	6.0	101.2	0.121
SC-13	SB-18 & SB-19	Foundation Soils	20.8	2.3	124	1.2	0.8	95.5	0.508	1.1	36	0.0	95.5	1.0	-0.4	0.0	0.9	0.132	1.016	0.137	0.186	0.738	6.0	101.5	0.122
SC-13	SB-18 & SB-19	Foundation Soils	20.8	2.2	124	1.2	0.8	96.4	0.506	1.1	36	0.0	96.4	1.0	-0.4	0.0	0.9	0.133	1.017	0.139	0.186	0.744	6.0	102.4	0.123
SC-13	SB-18 & SB-19	Foundation Soils	20.9	2.1	119	1.3	0.8	93.5	0.513	1.1	36	0.0	93.5	1.0	-0.4	0.0	0.9	0.129	1.016	0.135	0.186	0.723	6.0	99.5	0.119
SC-13	SB-18 & SB-19	Foundation Soils	21.0	2.0	124	1.3	0.8	92.0	0.516	1.1	36	0.0	92.0	1.0	-0.4	0.0	0.9	0.128	1.015	0.133	0.187	0.713	6.0	98.0	0.116
SC-13	SB-18 & SB-19	Foundation Soils	21.1	2.0	124	1.3	0.8	92.4	0.515	1.1	36	0.0	92.4	1.0	-0.4	0.0	0.9	0.128	1.015	0.133	0.187	0.715	6.0	98.4	0.117
SC-13	SB-18 & SB-19	Foundation Soils	21.2	1.9	124	1.3	0.8	82.2	0.541	1.1	36	0.0	82.2	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.187	0.653	6.0	88.2	0.101
SC-13	SB-18 & SB-19	Foundation Soils	21.2	1.8	124	1.3	0.8	83.7	0.537	1.1	36	0.0	83.7	1.0	-0.4	0.0	0.9	0.119	1.013	0.124	0.187	0.661	6.0	89.7	0.104
SC-13	SB-18 & SB-19	Foundation Soils	21.3	1.7	124	1.3	0.8	83.9	0.536	1.1	36	0.0	83.9	1.0	-0.4	0.0	0.9	0.119	1.013	0.124	0.187	0.662	6.0	89.9	0.104
SC-13	SB-18 & SB-19	Foundation Soils	21.4	1.6	124	1.3	0.8	87.2	0.528	1.1	36	0.0	87.2	1.0	-0.4	0.0	0.9	0.123	1.014	0.127	0.187	0.680	6.0	93.2	0.109
SC-13	SB-18 & SB-19	Foundation Soils	21.5	1.6	124	1.3	0.8	86.0	0.531	1.1	36	0.0	86.0	1.0	-0.4	0.0	0.9	0.121	1.014	0.126	0.187	0.673	6.0	92.0	0.107
SC-13	SB-18 & SB-19	Foundation Soils	21.6	1.5	124	1.3	0.8	83.8	0.537	1.1	36	0.0	83.8	1.0	-0.4	0.0	0.9	0.119	1.013	0.123	0.187	0.659	6.0	89.7	0.104
SC-13	SB-18 & SB-19	Foundation Soils	21.7	1.4	124	1.3	0.8	82.7	0.539	1.1	36	0.0	82.7	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.187	0.653	6.0	88.6	0.102
SC-13	SB-18 & SB-19	Foundation Soils	21.7	1.3	124	1.3	0.8	82.8	0.539	1.1	36	0.0	82.8	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.187	0.653	6.0	88.8	0.102
SC-13	SB-18 & SB-19	Foundation Soils	21.8	1.2	124	1.3	0.8	83.0	0.538	1.1	36	0.0	83.0	1.0	-0.4	0.0	0.9	0.119	1.013	0.123	0.188	0.654	6.0	89.0	0.103
SC-13	SB-18 & SB-19	Foundation Soils	21.9	1.1	124	1.3	0.8	81.4	0.543	1.1	36	0.0	81.4	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.188	0.644	6.0	87.4	0.100
SC-13	SB-18 & SB-19	Foundation Soils	22.0	1.1	124	1.3	0.9	81.6	0.542	1.1	36	0.0	81.6	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.188	0.645	6.0	87.6	0.101
SC-13	SB-18 & SB-19	Foundation Soils	22.1	1.0	124	1.3	0.9	78.5	0.550	1.1	36	0.0	78.5	1.0	-0.4	0.0	0.9	0.114	1.012	0.118	0.188	0.628	8.1	86.5	0.099
SC-13	SB-18 & SB-19	Foundation Soils	22.1	0.9	124	1.3	0.9	77.0	0.554	1.1	36	0.0	77.0	1.0	-0.4	0.0	0.9	0.113	1.011	0.117	0.188	0.620	8.4	85.4	0.098
SC-13	SB-18 & SB-19	Foundation Soils	22.2	0.8	124	1.3	0.9	85.5	0.532	1.1	36	0.0	85.5	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.188	0.665	6.0	91.5	0.106
SC-13	SB-18 & SB-19	Foundation Soils	22.3	0.7	124	1.3	0.9	88.2	0.526	1.1	36	0.0	88.2	1.0	-0.4	0.0	0.9	0.124	1.014	0.128	0.188	0.680	6.0	94.2	0.110
SC-13	SB-18 & SB-19	Foundation Soils	22.4	0.7	124	1.3	0.9	91.9	0.517	1.1	36	0.0	91.9	1.0	-0.4	0.0	0.9	0.128	1.015	0.132	0.188	0.702	6.0	97.9	0.116
SC-13	SB-18 & SB-19	Foundation Soils	22.5	0.6	124	1.3	0.9	90.4	0.520	1.1	36	0.0	90.4	1.0	-0.4	0.0	0.9	0.126	1.015	0.130	0.188	0.692	6.0	96.4	0.114
SC-13	SB-18 & SB-19	Foundation Soils	22.6	0.5	124	1.4	0.9	92.5	0.515	1.1	36	0.0	92.5	1.0	-0.4	0.0	0.9	0.128	1.015	0.133	0.188	0.705	6.0	98.5	0.117
SC-13	SB-18 & SB-19	Foundation Soils	22.6	0.4	124	1.4	0.9	96.1	0.507	1.1	36	0.0	96.1	1.0	-0.4	0.0	0.9	0.132	1.016	0.137	0.188	0.728	6.0	102.1	0.123
SC-13	SB-18 & SB-19	Foundation Soils	22.7	0.3	124	1.4	0.9	105.4	0.486	1.1	36	0.0	105.4	1.0	-0.4	0.0	0.9	0.145	1.020	0.151	0.189	0.800	6.0	111.4	0.139
SC-13	SB-18 & SB-19	Foundation Soils	22.8	0.2	124	1.4	0.9	113.7	0.469	1.1	36	0.0	113.7	1.0	-0.4	0.0	0.9	0.158	1.023	0.166	0.189	0.879	6.0	119.7	0.156
SC-13	SB-18 & SB-19	Foundation Soils	22.9	0.2	124	1.4	0.9	113.1	0.471	1.1	36	0.0	113.1	1.0	-0.4	0.0	0.9	0.157	1.023	0.164	0.189	0.871	6.0	119.0	0.155
SC-13	SB-18 & SB-19	Foundation Soils	23.0	0.1	119	1.4	0.9	113.3	0.470	1.1	36	0.0	113.3	1.0	-0.4	0.0	0.9	0.158	1.023	0.165	0.189	0.873	6.0	119.3	0.155
SC-13	SB-18 & SB-19	Foundation Soils	23.0	-0.0	124	1.4	0.9	100.9	0.496	1.1	36	0.0	100.9	1.0	-0.4	0.0	0.9	0.138	1.018	0.144	0.189	0.761	6.0	106.9	0.131
SC-13	SB-18 & SB-19	Foundation Soils	23.1	-0.1	124	1.4	0.9	103.9	0.490	1.1	36	0.0	103.9	1.0	-0.4	0.0	0.9	0.143	1.019	0.148	0.189	0.784	6.0	109.9	0.136
SC-13	SB-18 & SB-19	Foundation Soils	23.2	-0.2	124	1.4	0.9	96.2	0.507	1.1	36	0.0	96.2	1.0	-0.4	0.0	0.9	0.133	1.016	0.137	0.189	0.725	6.0	102.2	0.123
SC-13	SB-18 & SB-19	Foundation Soils	23.3	-0.3	124	1.4	0.9	85.8	0.532	1.1	36	0.0	85.8	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.189	0.660	6.0	91.8	0.107
SC-13	SB-18 & SB-19	Foundation Soils	23.4	-0.3	124	1.4	0.9	81.0	0.544	1.1	36	0.0	81.0	1.0	-0.4	0.0	0.9	0.117	1.012	0.120	0.189	0.634	6.0	87.0	0.100
SC-13	SB-18 & SB-19	Foundation Soils	23.5	-0.4	119	1.4	0.9	77.7	0.552	1.1	36	0.0	77.7	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.189	0.617	6.0	83.7	0.095
SC-13	SB-18 & SB-19	Foundation Soils	23.5	-0.5	119	1.4	0.9	74.7	0.560	1.1	36	0.0	74.7	1.0	-0.4	0.0	0.9	0.111	1.011	0.114	0.189	0.602	6.0	80.7	0.091
SC-13	SB-18 & SB-19	Foundation Soils	23.6	-0.6	119	1.4	0.9	68.6	0.578	1.1	36	0.0	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.109	0.189	0.573	7.5	76.1	0.085
SC-13	SB-18 & SB-19	Foundation Soils	23.7	-0.7	119	1.4	0.9	59.6	0.605	1.1	36	0.9	59.6	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.190	0.534	9.9	68.6	0.075

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-13	SB-18 & SB-19	Foundation Soils	23.8	-0.7	119	1.4	0.9	60.0	0.604	1.1	36	11.5	60.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.190	0.536	13.1	61.6	0.067
SC-13	SB-18 & SB-19	Foundation Soils	23.9	-0.8	119	1.4	0.9	63.8	0.592	1.1	36	21.2	63.8	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.190	0.551	15.4	58.0	0.062
SC-13	SB-18 & SB-19	Foundation Soils	23.9	-0.9	119	1.4	0.9	66.4	0.584	1.1	36	28.9	66.4	1.0	-0.4	0.1	0.9	0.104	1.010	0.107	0.190	0.562	17.8	55.4	0.059
SC-13	SB-18 & SB-19	Foundation Soils	24.0	-1.0	119	1.4	0.9	67.8	0.580	1.1	36	35.7	67.8	1.0	-0.4	0.1	0.9	0.106	1.010	0.108	0.190	0.568	20.9	53.0	0.057
SC-13	SB-18 & SB-19	Foundation Soils	24.1	-1.1	119	1.4	0.9	67.2	0.582	1.1	36	41.0	67.2	1.0	-0.4	0.1	0.9	0.105	1.010	0.107	0.190	0.565	25.2	51.5	0.055
SC-13	SB-18 & SB-19	Foundation Soils	24.2	-1.2	119	1.5	0.9	66.3	0.585	1.1	36	42.8	66.3	1.0	-0.5	0.1	0.9	0.104	1.009	0.107	0.190	0.560	27.8	51.2	0.055
SC-13	SB-18 & SB-19	Foundation Soils	24.3	-1.2	121	1.5	0.9	63.4	0.593	1.1	36	45.3	63.4	1.0	-0.5	0.1	0.9	0.102	1.009	0.104	0.190	0.548	34.1	52.2	0.056
SC-13	SB-18 & SB-19	Foundation Soils	24.4	-1.3	121	1.5	0.9	60.0	0.604	1.1	36	47.3	60.0	1.0	-0.5	0.1	0.9	0.100	1.009	0.101	0.190	0.533	46.9	59.6	0.064
SC-13	SB-18 & SB-19	Foundation Soils	24.4	-1.4	111	1.5	0.9	62.3	0.597	1.1	36	49.4	62.3	1.0	-0.5	0.1	0.9	0.101	1.009	0.103	0.190	0.542	75.4	88.3	0.102
SC-13	SB-18 & SB-19	Foundation Soils	24.5	-1.5	111	1.5	0.9	64.4	0.590	1.1	36	49.8	64.4	1.0	-0.5	0.1	0.9	0.103	1.009	0.105	0.190	0.551	75.4	90.0	0.104
SC-14	SB-19 & SB-20	Foundation Soils	7.1	15.0	121	0.4	0.4	80.1	0.546	1.6	95	56.1	80.1	1.1	-0.1	0.0	1.0	0.116	1.012	0.127	0.129	0.984	37.5	61.5	0.067
SC-14	SB-19 & SB-20	Foundation Soils	7.1	14.9	121	0.4	0.4	80.9	0.544	1.6	95	56.3	80.9	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.130	0.985	37.6	62.2	0.068
SC-14	SB-19 & SB-20	Foundation Soils	7.2	14.8	121	0.4	0.4	80.6	0.545	1.6	95	56.4	80.6	1.1	-0.1	0.0	1.0	0.116	1.012	0.127	0.130	0.977	38.3	62.5	0.068
SC-14	SB-19 & SB-20	Foundation Soils	7.3	14.7	121	0.4	0.4	80.3	0.545	1.6	95	56.1	80.3	1.1	-0.1	0.0	1.0	0.116	1.012	0.127	0.131	0.968	37.6	61.7	0.067
SC-14	SB-19 & SB-20	Foundation Soils	7.4	14.7	121	0.5	0.4	78.4	0.550	1.6	95	55.8	78.4	1.1	-0.1	0.0	1.0	0.114	1.012	0.125	0.132	0.947	38.1	60.6	0.066
SC-14	SB-19 & SB-20	Foundation Soils	7.5	14.6	121	0.5	0.4	75.8	0.557	1.6	95	55.8	75.8	1.1	-0.1	0.0	1.0	0.112	1.011	0.122	0.132	0.921	40.3	60.2	0.065
SC-14	SB-19 & SB-20	Foundation Soils	7.5	14.5	121	0.5	0.4	73.4	0.564	1.6	95	56.2	73.4	1.1	-0.1	0.0	1.0	0.110	1.011	0.120	0.133	0.898	45.3	62.5	0.068
SC-14	SB-19 & SB-20	Foundation Soils	7.6	14.4	121	0.5	0.4	73.6	0.563	1.6	95	56.7	73.6	1.1	-0.1	0.0	1.0	0.110	1.011	0.120	0.134	0.895	48.2	65.2	0.071
SC-14	SB-19 & SB-20	Foundation Soils	7.7	14.3	121	0.5	0.5	73.8	0.563	1.6	95	57.2	73.8	1.1	-0.1	0.0	1.0	0.110	1.011	0.120	0.134	0.892	52.7	69.4	0.076
SC-14	SB-19 & SB-20	Foundation Soils	7.8	14.2	121	0.5	0.5	74.1	0.562	1.6	95	57.1	74.1	1.1	-0.1	0.0	1.0	0.111	1.011	0.120	0.135	0.889	51.1	68.0	0.075
SC-14	SB-19 & SB-20	Foundation Soils	7.9	14.2	121	0.5	0.5	74.8	0.560	1.6	95	57.5	74.8	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.136	0.890	53.4	70.8	0.078
SC-14	SB-19 & SB-20	Foundation Soils	8.0	14.1	121	0.5	0.5	75.2	0.559	1.6	95	57.5	75.2	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.136	0.888	52.1	69.8	0.077
SC-14	SB-19 & SB-20	Foundation Soils	8.0	14.0	115	0.5	0.5	71.2	0.570	1.6	56	54.0	71.2	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.137	0.855	56.7	73.9	0.082
SC-14	SB-19 & SB-20	Foundation Soils	8.1	13.9	115	0.5	0.5	71.0	0.571	1.6	56	54.1	71.0	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.138	0.849	58.8	75.6	0.084
SC-14	SB-19 & SB-20	Foundation Soils	8.2	13.8	115	0.5	0.5	70.8	0.571	1.6	56	53.9	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.138	0.844	56.0	73.0	0.081
SC-14	SB-19 & SB-20	Foundation Soils	8.3	13.7	115	0.5	0.5	71.6	0.569	1.6	56	54.1	71.6	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.139	0.845	55.8	73.3	0.081
SC-14	SB-19 & SB-20	Foundation Soils	8.4	13.7	115	0.5	0.5	71.2	0.570	1.6	56	54.0	71.2	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.139	0.838	56.5	73.7	0.082
SC-14	SB-19 & SB-20	Foundation Soils	8.4	13.6	115	0.5	0.5	70.3	0.573	1.6	56	53.9	70.3	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.140	0.828	57.0	73.4	0.082
SC-14	SB-19 & SB-20	Foundation Soils	8.5	13.5	115	0.5	0.5	68.8	0.577	1.6	56	53.6	68.8	1.1	-0.1	0.0	1.0	0.106	1.010	0.115	0.141	0.814	58.6	73.7	0.082
SC-14	SB-19 & SB-20	Foundation Soils	8.6	13.4	115	0.5	0.5	67.6	0.581	1.6	56	53.2	67.6	1.1	-0.1	0.0	1.0	0.105	1.010	0.113	0.141	0.803	56.1	70.5	0.078
SC-14	SB-19 & SB-20	Foundation Soils	8.7	13.3	115	0.5	0.5	68.1	0.579	1.6	56	53.4	68.1	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.142	0.802	57.5	72.1	0.080
SC-14	SB-19 & SB-20	Foundation Soils	8.8	13.3	115	0.5	0.5	71.0	0.571	1.6	56	54.0	71.0	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.142	0.818	56.7	73.8	0.082
SC-14	SB-19 & SB-20	Foundation Soils	8.9	13.2	121	0.5	0.5	76.2	0.556	1.5	56	54.8	76.2	1.1	-0.1	0.0	1.0	0.112	1.011	0.122	0.143	0.850	52.9	74.2	0.083
SC-14	SB-19 & SB-20	Foundation Soils	8.9	13.1	121	0.5	0.5	79.9	0.547	1.5	56	55.0	79.9	1.1	-0.1	0.0	1.0	0.116	1.012	0.125	0.144	0.873	47.0	71.9	0.080
SC-14	SB-19 & SB-20	Foundation Soils	9.0	13.0	121	0.6	0.5	79.5	0.548	1.5	56	54.1	79.5	1.1	-0.1	0.0	1.0	0.115	1.012	0.125	0.144	0.867	41.9	67.3	0.074
SC-14	SB-19 & SB-20	Foundation Soils	9.1	12.9	121	0.6	0.5	81.7	0.542	1.5	56	49.6	81.7	1.1	-0.1	0.0	1.0	0.117	1.012	0.127	0.145	0.880	28.7	60.8	0.066
SC-14	SB-19 & SB-20	Foundation Soils	9.2	12.8	124	0.6	0.5	65.3	0.587	1.6	56	15.1	65.3	1.1	-0.1	0.0	1.0	0.104	1.009	0.111	0.145	0.765	13.6	63.8	0.069
SC-14	SB-19 & SB-20	Foundation Soils	9.3	12.8	124	0.6	0.5	63.5	0.593	1.6	56	0.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.146	0.750	6.0	69.5	0.076
SC-14	SB-19 & SB-20	Foundation Soils	9.4	12.7	124	0.6	0.5	63.1	0.594	1.6	56	0.0	63.1	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.146	0.745	6.0	69.1	0.076
SC-14	SB-19 & SB-20	Foundation Soils	9.4	12.6	124	0.6	0.5	58.8	0.608	1.6	56	0.0	58.8	1.1	-0.1	0.0	1.0	0.099	1.008	0.105	0.147	0.717	7.1	65.9	0.072
SC-14	SB-19 & SB-20	Foundation Soils	9.5	12.5	124	0.6	0.5	56.8	0.615	1.6	56	8.7	56.8	1.1	-0.1	0.0	1.0	0.097	1.008	0.103	0.147	0.703	12.3	60.3	0.065
SC-14	SB-19 & SB-20	Foundation Soils	9.6	12.4	124	0.6	0.5	80.5	0.545	1.5	56	47.1	80.5	1.1	-0.1	0.0	1.0	0.116	1.012	0.126	0.148	0.850	25.8	59.3	0.064
SC-14	SB-19 & SB-20	Foundation Soils	9.7	12.4	121	0.6	0.5	76.6	0.555	1.5	56	50.6	76.6	1.1	-0.1	0.0	1.0	0.113	1.011	0.121	0.148	0.819	32.2	58.2	0.063
SC-14	SB-19 & SB-20	Foundation Soils	9.8	12.3	121	0.6	0.5	72.0	0.568	1.5	56	52.3	72.0	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.149	0.786	40.8	60.5	0.065
SC-14	SB-19 & SB-20	Foundation Soils	9.8	12.2	121	0.6	0.5	69.0	0.576	1.5	56	52.1	69.0	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.149	0.764	43.5	60.4	0.065
SC-14	SB-19 & SB-20	Foundation Soils	9.9	12.1	121	0.6	0.5	67.3	0.581	1.5	56	52.8	67.3	1.1	-0.1	0.0	1.0	0.105	1.010	0.112	0.150	0.751	52.4	66.9	0.073
SC-14	SB-19 & SB-20	Foundation Soils	10.0	12.0	121	0.6	0.5	66.2	0.585	1.5	56	52.8	66.2	1.1	-0.1	0.0	1.0	0.104	1.009	0.111	0.150	0.741	54.1	67.6	0.074
SC-14	SB-19 & SB-20	Foundation Soils	10.1	11.9	115	0.6	0.5	62.9	0.595	1.5	40	49.6	62.9	1.1	-0.1	0.0	1.0	0.102	1.009	0.108	0.151	0.719	55.5	68.8	0.076
SC-14	SB-19 & SB-20	Foundation Soils	10.2	11.9	115	0.6	0.5	63.5	0.593	1.5	40	49.7	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.151	0.720	55.5	69.3	0.076
SC-14	SB-19 & SB-20	Foundation Soils	10.3	11.8	121	0.6	0.5	64.1	0.591	1.5	40	49.8	64.1	1.1	-0.1	0.0	1.0	0.103	1.009	0.109	0.152	0.721	54.7	69.0	0.076
SC-14	SB-19 & SB-20	Foundation Soils	10.3	11.7	115	0.6	0.5	64.4	0.590	1.5	40	49.9	64.4	1.1	-0.1	0.0	1.0	0.103	1.009	0.110	0.152	0.720	55.6	70.0	0.077
SC-14	SB-19 & SB-20	Foundation Soils	10.4	11.6	115	0.6	0.5	64.8	0.589	1.5	40	50.0	64.8	1.1	-0.1	0.0	1.0	0.103	1.009	0.110	0.153	0.721	55.6	70.5	0.078
SC-14	SB-19 & SB-20	Foundation Soils	10.5	11.5	115	0.6	0.5	65.2	0.588	1.5	40	50.3	65.2	1.1	-0.1	0.0	1.0	0.103	1.009	0.110	0.153	0.720	58.6	73.5	0.082
SC-14	SB-19 & SB-20	Foundation Soils	10.6	11.5	115	0.6	0.5	65.9	0.586	1.5	40	50.4	65.9	1.1	-0.1	0.0	1.0	0.104	1.009	0.111	0.154	0.722	59.2	74.6	0.083
SC-14	SB-19 & SB-20	Foundation Soils	10.7	11.4	115	0.6	0.5	67.3	0.582	1.5	40	50.6	67.3	1.1	-0.1	0.0	1.0	0.105	1.010	0.112	0.154	0.728	57.5	74.2	0.082
SC-14	SB-19 & SB-20	Foundation Soils	10.7	11.3	121	0.7	0.5	67.7	0.580	1.5	40	50.4	67.7	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.154	0.728	52.8	70.1	0.077
SC-14	SB-19 & SB-20	Foundation Soils	10.8	11.2	121	0.7	0.5	66.2	0.585	1.5	40	50.0	66.2	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.155	0.717	52.6	68.8	0.076
SC-14	SB-19 & SB-20	Foundation Soils	10.9	11.1	115	0.7	0.5	62.5	0.596	1.5	40	49.6	62.5	1.1	-0.2	0.0	1.0	0.101	1.009	0.108	0.155	0.694	56.4	69.4	0.076
SC-14	SB-19 & SB-20	Foundation Soils	11.0	11.0	115	0.7	0.5	62.4	0.596	1.5	40	49.6	62.4	1.1	-0.2	0.0	1.0	0.101	1.009	0.108	0.156	0.691	57.2	70.0	0.077
SC-14	SB-19 & SB-20	Foundation Soils	11.1	11.0	121	0.7	0.5	66.6	0.583	1.5	40	49.9	66.6	1.1	-0.2	0.0	1.0	0.105	1.010	0.111	0.156	0.713	49.7	66.5	0.073
SC-14	SB-19 & SB-20	Foundation Soils	11.2	10.9	121	0.7	0.5	66.7	0.583	1.5	40	49.3	66.7	1.1	-0.2	0.0	1.0	0.105	1.010	0.111	0.157	0.711	45.2	62.6	0.068
SC-14	SB-19 & SB-20	Foundation Soils	11.2	10.8	121	0.7	0.6	64.8	0.589	1.5	40	48.9	64.8	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.157	0.698	44.5	60.4	0.065
SC-14	SB-19 & SB-20	Foundation Soils	11.3	10.7	121	0.7	0.6	62.3	0.597	1.5	40	48.8	62.3	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.157	0.682	47.8	61.4	0.067
SC-14	SB-19 & SB-20	Foundation Soils	11.4	10.6	121	0.7	0.6	61.4	0.600	1.5	40	48.9	61.4	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.158	0.675	51.5	63.9	0.070
SC-14	SB-19 & SB-20	Foundation Soils	11.5	10.5	121	0.7	0.6	59.5	0.606	1.5	40	48.7	59.5	1.0	-0.2	0.0	1.0	0.099	1.009	0.105	0.158	0.663	53.4	64.1	0.070
SC-14	SB-19 & SB-20	Foundation Soils	11.6	10.5	115	0.7	0.6	57.7	0.612	1.5	40	48.7	57.7	1.0	-0.2	0.0	1.0	0.098	1.008	0.103	0.159	0.652	58.1	67.2	0.074
SC-14	SB-19 & SB-20	Foundation Soils	11.6	10.4	115	0.7	0.6	57.4	0.613	1.5	40	48.9	57.4	1.0	-0.2	0.0	1.0	0.098	1.008	0.103	0.159	0.648	63.5	72.0	0.080
SC-14	SB-19 & SB-20	Foundation Soils	11.7	10.3	115	0.7	0.6	56.5	0.616	1.5	40	49.0	56.5	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.159	0.642	71.5	79.0	0.089
SC-14	SB-19 & SB-20	Foundation Soils	11.8	10.2	115	0.7	0.6	55.2	0.620	1.5	40	48.8	55.2	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.160	0.634	75.0	81.4	0.092
SC-14	SB-19 & SB-20	Foundation Soils	11.9	10.1	111	0.7	0.6	54.4	0.623	1.5	40	48.6	54.4	1.0	-0.2	0.0	1.0	0.095	1.008	0.101	0.160	0.628	75.4	81.1	0.092

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-14	SB-19 & SB-20	Foundation Soils	12.0	10.1	111	0.7	0.6	54.2	0.624	1.5	40	48.6	54.2	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.161	0.625	75.4	80.9	0.091
SC-14	SB-19 & SB-20	Foundation Soils	12.1	10.0	111	0.7	0.6	53.7	0.625	1.5	40	48.5	53.7	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.161	0.621	75.4	80.6	0.091
SC-14	SB-19 & SB-20	Foundation Soils	12.1	9.9	111	0.7	0.6	53.4	0.626	1.5	40	48.4	53.4	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.161	0.618	75.4	80.4	0.091
SC-14	SB-19 & SB-20	Foundation Soils	12.2	9.8	111	0.7	0.6	53.3	0.627	1.5	40	48.4	53.3	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.162	0.616	75.4	80.3	0.091
SC-14	SB-19 & SB-20	Foundation Soils	12.3	9.7	111	0.7	0.6	53.1	0.627	1.5	40	48.4	53.1	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.162	0.613	75.4	80.1	0.090
SC-14	SB-19 & SB-20	Foundation Soils	12.4	9.6	111	0.7	0.6	53.1	0.627	1.5	40	48.4	53.1	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.163	0.611	75.4	80.1	0.090
SC-14	SB-19 & SB-20	Foundation Soils	12.5	9.6	111	0.8	0.6	53.0	0.628	1.5	40	48.3	53.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.163	0.609	75.4	80.0	0.090
SC-14	SB-19 & SB-20	Foundation Soils	12.5	9.5	111	0.8	0.6	52.9	0.628	1.5	40	48.3	52.9	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.163	0.607	75.4	79.9	0.090
SC-14	SB-19 & SB-20	Foundation Soils	12.6	9.4	111	0.8	0.6	52.9	0.628	1.4	40	48.3	52.9	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.164	0.606	75.4	79.9	0.090
SC-14	SB-19 & SB-20	Foundation Soils	12.7	9.3	111	0.8	0.6	52.9	0.628	1.4	40	48.3	52.9	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.164	0.604	75.4	79.9	0.090
SC-14	SB-19 & SB-20	Foundation Soils	12.8	9.2	111	0.8	0.6	53.2	0.627	1.4	40	48.4	53.2	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.164	0.604	75.4	80.2	0.090
SC-14	SB-19 & SB-20	Foundation Soils	12.9	9.2	115	0.8	0.6	55.9	0.618	1.4	40	48.8	55.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.165	0.616	70.5	77.6	0.087
SC-14	SB-19 & SB-20	Foundation Soils	13.0	9.1	121	0.8	0.6	63.3	0.594	1.4	40	49.5	63.3	1.0	-0.2	0.0	1.0	0.102	1.009	0.108	0.165	0.652	52.7	66.6	0.073
SC-14	SB-19 & SB-20	Foundation Soils	13.0	9.0	121	0.8	0.6	54.9	0.621	1.4	15	35.7	54.9	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.165	0.608	46.7	66.0	0.072
SC-14	SB-19 & SB-20	Foundation Soils	13.1	8.9	121	0.8	0.6	58.7	0.608	1.4	15	35.4	58.7	1.0	-0.2	0.0	1.0	0.099	1.008	0.104	0.166	0.626	40.2	63.4	0.069
SC-14	SB-19 & SB-20	Foundation Soils	13.2	8.8	121	0.8	0.6	60.1	0.604	1.4	15	35.0	60.1	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.166	0.631	36.6	61.7	0.067
SC-14	SB-19 & SB-20	Foundation Soils	13.3	8.7	121	0.8	0.6	61.8	0.598	1.4	15	34.5	61.8	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.166	0.639	33.5	60.9	0.066
SC-14	SB-19 & SB-20	Foundation Soils	13.4	8.7	121	0.8	0.6	65.7	0.586	1.4	15	35.4	65.7	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.167	0.657	34.9	65.2	0.071
SC-14	SB-19 & SB-20	Foundation Soils	13.5	8.6	121	0.8	0.6	63.9	0.592	1.4	15	34.0	63.9	1.0	-0.2	0.0	1.0	0.102	1.009	0.108	0.167	0.646	31.2	61.1	0.066
SC-14	SB-19 & SB-20	Foundation Soils	13.5	8.5	124	0.8	0.6	60.3	0.603	1.4	15	29.4	60.3	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.167	0.627	23.9	54.8	0.059
SC-14	SB-19 & SB-20	Foundation Soils	13.6	8.4	124	0.8	0.6	60.0	0.604	1.4	15	26.4	60.0	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.168	0.624	21.1	54.6	0.059
SC-14	SB-19 & SB-20	Foundation Soils	13.7	8.3	124	0.8	0.6	60.8	0.602	1.4	15	23.0	60.8	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.168	0.626	18.7	56.4	0.061
SC-14	SB-19 & SB-20	Foundation Soils	13.8	8.3	124	0.8	0.6	59.0	0.607	1.4	15	25.0	59.0	1.0	-0.2	0.0	1.0	0.099	1.009	0.104	0.168	0.617	20.1	54.1	0.058
SC-14	SB-19 & SB-20	Foundation Soils	13.9	8.2	124	0.8	0.6	58.7	0.608	1.4	15	27.6	58.7	1.0	-0.2	0.0	1.0	0.099	1.008	0.103	0.169	0.614	22.2	53.3	0.057
SC-14	SB-19 & SB-20	Foundation Soils	13.9	8.1	121	0.8	0.6	57.1	0.614	1.4	15	30.3	57.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.169	0.605	25.6	52.4	0.056
SC-14	SB-19 & SB-20	Foundation Soils	14.0	8.0	121	0.8	0.6	56.4	0.616	1.4	15	30.9	56.4	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.169	0.600	26.8	52.3	0.056
SC-14	SB-19 & SB-20	Foundation Soils	14.1	7.9	121	0.9	0.6	54.8	0.621	1.4	15	32.1	54.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.100	0.169	0.592	29.5	52.3	0.056
SC-14	SB-19 & SB-20	Foundation Soils	14.2	7.8	121	0.9	0.6	53.4	0.626	1.4	15	32.8	53.4	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.170	0.584	32.0	52.6	0.056
SC-14	SB-19 & SB-20	Foundation Soils	14.3	7.8	121	0.9	0.6	50.7	0.636	1.4	15	33.6	50.7	1.0	-0.2	0.0	1.0	0.093	1.008	0.097	0.170	0.570	36.8	53.9	0.058
SC-14	SB-19 & SB-20	Foundation Soils	14.4	7.7	121	0.9	0.6	48.3	0.645	1.4	15	34.1	48.3	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.170	0.558	41.7	55.9	0.060
SC-14	SB-19 & SB-20	Foundation Soils	14.4	7.6	121	0.9	0.6	46.6	0.652	1.4	15	34.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.171	0.549	45.7	58.0	0.062
SC-14	SB-19 & SB-20	Foundation Soils	14.5	7.5	111	0.9	0.6	44.1	0.662	1.4	15	34.4	44.1	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.171	0.537	52.5	62.1	0.067
SC-14	SB-19 & SB-20	Foundation Soils	14.6	7.4	111	0.9	0.6	42.0	0.670	1.4	15	34.3	42.0	1.0	-0.2	0.0	1.0	0.087	1.007	0.090	0.171	0.527	57.3	65.0	0.071
SC-14	SB-19 & SB-20	Foundation Soils	14.7	7.4	111	0.9	0.6	39.9	0.679	1.4	15	34.4	39.9	1.0	-0.2	0.0	1.0	0.085	1.007	0.089	0.171	0.517	69.4	74.9	0.083
SC-14	SB-19 & SB-20	Foundation Soils	14.8	7.3	111	0.9	0.6	37.9	0.688	1.4	15	34.2	37.9	1.0	-0.2	0.0	1.0	0.084	1.007	0.087	0.172	0.508	75.4	79.1	0.089
SC-14	SB-19 & SB-20	Foundation Soils	14.8	7.2	111	0.9	0.6	36.8	0.693	1.4	15	34.1	36.8	1.0	-0.2	0.0	1.0	0.083	1.007	0.086	0.172	0.502	75.4	78.2	0.088
SC-14	SB-19 & SB-20	Foundation Soils	14.9	7.1	111	0.9	0.7	36.7	0.693	1.4	15	34.0	36.7	1.0	-0.2	0.0	1.0	0.083	1.007	0.086	0.172	0.501	75.4	78.1	0.088
SC-14	SB-19 & SB-20	Foundation Soils	15.0	7.0	111	0.9	0.7	37.2	0.691	1.4	15	34.1	37.2	1.0	-0.2	0.0	1.0	0.084	1.007	0.087	0.173	0.502	75.4	78.5	0.088
SC-14	SB-19 & SB-20	Foundation Soils	15.1	6.9	111	0.9	0.7	37.6	0.689	1.4	15	34.2	37.6	1.0	-0.2	0.0	1.0	0.084	1.007	0.087	0.173	0.503	75.4	78.8	0.089
SC-14	SB-19 & SB-20	Foundation Soils	15.2	6.9	111	0.9	0.7	37.2	0.691	1.4	15	34.1	37.2	1.0	-0.2	0.0	1.0	0.084	1.007	0.087	0.173	0.500	75.4	78.5	0.088
SC-14	SB-19 & SB-20	Foundation Soils	15.3	6.8	111	0.9	0.7	36.7	0.693	1.4	15	34.0	36.7	1.0	-0.2	0.0	1.0	0.083	1.007	0.086	0.173	0.497	75.4	78.0	0.088
SC-14	SB-19 & SB-20	Foundation Soils	15.3	6.7	119	0.9	0.7	35.8	0.698	1.4	15	33.9	35.8	1.0	-0.2	0.0	1.0	0.083	1.007	0.086	0.174	0.493	75.4	77.3	0.087
SC-14	SB-19 & SB-20	Foundation Soils	15.4	6.6	119	0.9	0.7	35.3	0.700	1.4	15	33.8	35.3	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.174	0.490	75.4	76.9	0.086
SC-14	SB-19 & SB-20	Foundation Soils	15.5	6.5	119	0.9	0.7	35.3	0.700	1.4	15	33.8	35.3	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.174	0.489	75.4	76.9	0.086
SC-14	SB-19 & SB-20	Foundation Soils	15.6	6.4	119	0.9	0.7	35.3	0.700	1.4	15	33.8	35.3	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.174	0.488	75.4	76.9	0.086
SC-14	SB-19 & SB-20	Foundation Soils	15.7	6.4	119	0.9	0.7	35.3	0.700	1.4	15	33.8	35.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.085	0.175	0.487	75.4	76.9	0.086
SC-14	SB-19 & SB-20	Foundation Soils	15.7	6.3	119	0.9	0.7	35.3	0.700	1.4	15	33.8	35.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.085	0.175	0.487	75.4	76.9	0.086
SC-14	SB-19 & SB-20	Foundation Soils	15.8	6.2	119	1.0	0.7	35.3	0.700	1.4	15	33.8	35.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.085	0.175	0.486	75.4	76.9	0.086
SC-14	SB-19 & SB-20	Foundation Soils	15.9	6.1	111	1.0	0.7	38.0	0.687	1.4	15	34.2	38.0	1.0	-0.3	0.0	1.0	0.084	1.007	0.087	0.175	0.496	75.4	79.1	0.089
SC-14	SB-19 & SB-20	Foundation Soils	16.0	6.0	121	1.0	0.7	48.9	0.643	1.3	15	35.0	48.9	1.0	-0.3	0.0	1.0	0.092	1.007	0.095	0.176	0.541	50.3	64.2	0.070
SC-14	SB-19 & SB-20	Foundation Soils	16.1	6.0	121	1.0	0.7	54.4	0.623	1.3	15	35.2	54.4	1.0	-0.3	0.0	1.0	0.095	1.008	0.099	0.176	0.564	42.9	62.1	0.067
SC-14	SB-19 & SB-20	Foundation Soils	16.2	5.9	121	1.0	0.7	56.6	0.615	1.3	15	35.4	56.6	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.176	0.573	42.3	63.5	0.069
SC-14	SB-19 & SB-20	Foundation Soils	16.2	5.8	121	1.0	0.7	59.0	0.607	1.3	15	35.3	59.0	1.0	-0.3	0.0	1.0	0.099	1.009	0.103	0.176	0.583	38.9	62.6	0.068
SC-14	SB-19 & SB-20	Foundation Soils	16.3	5.7	121	1.0	0.7	61.0	0.601	1.3	15	35.6	61.0	1.0	-0.3	0.0	1.0	0.100	1.009	0.105	0.177	0.592	39.1	64.5	0.070
SC-14	SB-19 & SB-20	Foundation Soils	16.4	5.6	121	1.0	0.7	62.2	0.597	1.3	15	35.4	62.2	1.0	-0.3	0.0	1.0	0.101	1.009	0.105	0.177	0.597	37.3	64.0	0.070
SC-14	SB-19 & SB-20	Foundation Soils	16.5	5.5	121	1.0	0.7	63.9	0.592	1.3	15	36.3	63.9	1.0	-0.3	0.0	1.0	0.102	1.009	0.107	0.177	0.604	40.5	68.2	0.075
SC-14	SB-19 & SB-20	Foundation Soils	16.6	5.5	121	1.0	0.7	59.6	0.605	1.3	15	36.5	59.6	1.0	-0.3	0.0	1.0	0.099	1.009	0.103	0.177	0.583	47.5	70.6	0.078
SC-14	SB-19 & SB-20	Foundation Soils	16.7	5.4	121	1.0	0.7	60.0	0.604	1.3	15	36.6	60.0	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.177	0.584	48.6	71.9	0.080
SC-14	SB-19 & SB-20	Foundation Soils	16.7	5.3	121	1.0	0.7	60.1	0.604	1.3	15	36.8	60.1	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.178	0.584	50.8	74.1	0.082
SC-14	SB-19 & SB-20	Foundation Soils	16.8	5.2	121	1.0	0.7	63.9	0.592	1.3	15	36.9	63.9	1.0	-0.3	0.0	1.0	0.102	1.009	0.107	0.178	0.600	45.5	72.5	0.080
SC-14	SB-19 & SB-20	Foundation Soils	16.9	5.1	121	1.0	0.7	64.6	0.590	1.3	15	36.7	64.6	1.0	-0.3	0.0	1.0	0.103	1.009	0.107	0.178	0.603	42.7	70.6	0.078
SC-14	SB-19 & SB-20	Foundation Soils	17.0	5.1	121	1.0	0.7	67.1	0.582	1.3	15	36.2	67.1	1.0	-0.3	0.0	1.0	0.105	1.010	0.109	0.178	0.614	37.4	68.3	0.075
SC-14	SB-19 & SB-20	Foundation Soils	17.1	5.0	121	1.0	0.7	70.3	0.573	1.3	15	37.5	70.3	1.0	-0.3	0.0	1.0	0.108	1.010	0.112	0.179	0.629	41.9	74.8	0.083
SC-14	SB-19 & SB-20	Foundation Soils	17.1	4.9	121	1.0	0.7	70.7	0.572	1.3	15	37.8	70.7	1.0	-0.3	0.0	1.0	0.108	1.010	0.113	0.179	0.630	44.1	76.9	0.086
SC-14	SB-19 & SB-20	Foundation Soils	17.2	4.8	121	1.0	0.7	73.4	0.564	1.2	15	38.1	73.4	1.0	-0.3	0.0	1.0	0.110	1.011	0.115	0.179	0.643	43.0	78.3	0.088
SC-14	SB-19 & SB-20	Foundation Soils	17.3	4.7	121	1.0	0.7	73.1	0.565	1.2	15	37.5	73.1	1.0	-0.3	0.0	1.0	0.110	1.011	0.115	0.179	0.640	39.6	75.2	0.084
SC-14	SB-19 & SB-20	Foundation Soils	17.4	4.6	124	1.0	0.7	79.9	0.547	1.2	15	33.5	79.9	1.0	-0.3	0.0	1.0	0.116	1.012	0.121	0.179	0.676	25.9	72.3	0.080
SC-14	SB-19 & SB-20	Foundation Soils	17.5	4.6	124	1.1	0.7	86.3	0.530	1.2	15	33.4	86.3	1.0	-0.3	0.0	1.0	0.122	1.014	0.128	0.179	0.713	24.7	77.6	0.087
SC-14	SB-19 & SB-20	Foundation Soils	17.6	4.5	124	1.1	0.7	87.9	0.526	1.2	15	27.3	87.9	1.0	-0.3	0.0	1.0	0.123	1.014	0.130	0.180	0.722	19.6	80.2	0.090
SC-14	SB-19 & SB-20	Foundation Soils	17.6	4.4	124	1.1	0.7	87.2	0.528	1.2	15	27.1	87.2	1.0	-0.3	0.0	1.0	0.123	1.014	0.129	0.180	0.716	19.5	79.6	0.090
SC-14	SB-19 & SB-20	Foundation Soils	17.7	4.3	124	1.1	0.7	93.8	0.512	1.2	15	26.9	93.8	1.0	-0.3	0.0	0.9	0.130	1.016	0.137	0.180	0.760	19.0	85.9	0.098

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-14	SB-19 & SB-20	Foundation Soils	17.8	4.2	124	1.1	0.7	94.0	0.512	1.2	15	21.4	94.0	1.0	-0.3	0.0	0.9	0.130	1.016	0.137	0.180	0.760	16.6	89.2	0.103
SC-14	SB-19 & SB-20	Foundation Soils	17.9	4.2	124	1.1	0.7	97.5	0.504	1.2	15	23.8	97.5	1.0	-0.3	0.0	0.9	0.134	1.017	0.142	0.180	0.785	17.4	91.2	0.106
SC-14	SB-19 & SB-20	Foundation Soils	18.0	4.1	124	1.1	0.7	98.4	0.502	1.2	15	32.3	98.4	1.0	-0.3	0.0	0.9	0.135	1.017	0.143	0.181	0.791	22.2	88.3	0.102
SC-14	SB-19 & SB-20	Foundation Soils	18.0	4.0	124	1.1	0.7	101.8	0.494	1.2	15	33.5	101.8	1.0	-0.3	0.0	0.9	0.140	1.018	0.148	0.181	0.817	22.8	91.1	0.106
SC-14	SB-19 & SB-20	Foundation Soils	18.1	3.9	124	1.1	0.7	103.2	0.491	1.2	15	32.4	103.2	1.0	-0.3	0.0	0.9	0.142	1.019	0.150	0.181	0.829	21.8	92.7	0.108
SC-14	SB-19 & SB-20	Foundation Soils	18.2	3.8	124	1.1	0.7	89.2	0.523	1.2	15	19.7	89.2	1.0	-0.3	0.0	0.9	0.125	1.014	0.131	0.181	0.723	16.1	85.7	0.098
SC-14	SB-19 & SB-20	Foundation Soils	18.3	3.7	124	1.1	0.7	93.8	0.512	1.2	15	16.2	93.8	1.0	-0.3	0.0	0.9	0.130	1.016	0.136	0.181	0.753	14.9	92.5	0.108
SC-14	SB-19 & SB-20	Foundation Soils	18.4	3.7	124	1.1	0.8	94.9	0.510	1.2	15	13.4	94.9	1.0	-0.3	0.0	0.9	0.131	1.016	0.138	0.181	0.760	14.1	95.5	0.112
SC-14	SB-19 & SB-20	Foundation Soils	18.5	3.6	124	1.1	0.8	104.8	0.488	1.2	15	0.0	104.8	1.0	-0.3	0.0	0.9	0.144	1.020	0.152	0.182	0.839	6.0	110.8	0.138
SC-14	SB-19 & SB-20	Foundation Soils	18.5	3.5	124	1.1	0.8	119.9	0.457	1.2	15	0.0	119.9	1.0	-0.3	0.0	0.9	0.171	1.026	0.183	0.182	1.006	6.0	125.8	
SC-14	SB-19 & SB-20	Foundation Soils	18.6	3.4	124	1.1	0.8	128.8	0.440	1.2	15	0.0	128.8	1.0	-0.3	0.0	0.9	0.194	1.031	0.209	0.182	1.148	6.0	134.8	
SC-14	SB-19 & SB-20	Foundation Soils	18.7	3.3	124	1.1	0.8	137.7	0.424	1.2	15	0.0	137.7	1.0	-0.3	0.0	0.9	0.224	1.037	0.244	0.182	1.340	6.0	143.7	
SC-14	SB-19 & SB-20	Foundation Soils	18.8	3.2	124	1.1	0.8	142.4	0.416	1.1	15	0.0	142.4	1.0	-0.3	0.0	0.9	0.245	1.040	0.268	0.182	1.469	6.0	148.4	
SC-14	SB-19 & SB-20	Foundation Soils	18.9	3.2	124	1.1	0.8	140.0	0.420	1.1	15	0.0	140.0	1.0	-0.3	0.0	0.9	0.234	1.038	0.255	0.182	1.398	6.0	146.0	
SC-14	SB-19 & SB-20	Foundation Soils	18.9	3.1	124	1.1	0.8	133.7	0.431	1.1	15	0.0	133.7	1.0	-0.3	0.0	0.9	0.210	1.034	0.226	0.182	1.241	6.0	139.7	
SC-14	SB-19 & SB-20	Foundation Soils	19.0	3.0	124	1.1	0.8	126.0	0.445	1.2	15	0.0	126.0	1.0	-0.3	0.0	0.9	0.186	1.029	0.199	0.183	1.091	6.0	131.9	
SC-14	SB-19 & SB-20	Foundation Soils	19.1	2.9	124	1.2	0.8	111.7	0.473	1.2	15	0.0	111.7	1.0	-0.3	0.0	0.9	0.155	1.022	0.164	0.183	0.899	6.0	117.7	0.152
SC-14	SB-19 & SB-20	Foundation Soils	19.2	2.8	124	1.2	0.8	105.3	0.487	1.2	15	0.0	105.3	1.0	-0.3	0.0	0.9	0.145	1.020	0.153	0.183	0.834	6.0	111.3	0.139
SC-14	SB-19 & SB-20	Foundation Soils	19.3	2.8	124	1.2	0.8	95.5	0.508	1.2	15	0.0	95.5	1.0	-0.3	0.0	0.9	0.132	1.016	0.138	0.183	0.755	6.0	101.5	0.122
SC-14	SB-19 & SB-20	Foundation Soils	19.4	2.7	124	1.2	0.8	87.7	0.527	1.2	15	0.0	87.7	1.0	-0.3	0.0	0.9	0.123	1.014	0.129	0.183	0.702	6.0	93.7	0.110
SC-14	SB-19 & SB-20	Foundation Soils	19.4	2.6	119	1.2	0.8	85.2	0.533	1.2	15	0.0	85.2	1.0	-0.3	0.0	0.9	0.121	1.013	0.126	0.183	0.686	6.0	91.2	0.106
SC-14	SB-19 & SB-20	Foundation Soils	19.5	2.5	119	1.2	0.8	84.9	0.534	1.2	15	0.0	84.9	1.0	-0.3	0.0	0.9	0.120	1.013	0.125	0.183	0.684	6.0	90.9	0.106
SC-14	SB-19 & SB-20	Foundation Soils	19.6	2.4	124	1.2	0.8	86.0	0.531	1.2	15	0.0	86.0	1.0	-0.3	0.0	0.9	0.121	1.014	0.127	0.184	0.690	6.0	92.0	0.107
SC-14	SB-19 & SB-20	Foundation Soils	19.7	2.3	124	1.2	0.8	83.1	0.538	1.2	15	0.0	83.1	1.0	-0.3	0.0	0.9	0.119	1.013	0.123	0.184	0.672	6.0	89.1	0.103
SC-14	SB-19 & SB-20	Foundation Soils	19.8	2.3	124	1.2	0.8	76.1	0.556	1.2	15	0.0	76.1	1.0	-0.3	0.0	0.9	0.112	1.011	0.117	0.184	0.634	6.0	82.1	0.093
SC-14	SB-19 & SB-20	Foundation Soils	19.8	2.2	119	1.2	0.8	72.4	0.567	1.2	15	0.0	72.4	1.0	-0.3	0.0	0.9	0.109	1.011	0.113	0.184	0.614	6.0	78.4	0.088
SC-14	SB-19 & SB-20	Foundation Soils	19.9	2.1	124	1.2	0.8	72.1	0.568	1.2	15	0.0	72.1	1.0	-0.3	0.0	0.9	0.109	1.010	0.113	0.184	0.612	6.0	78.1	0.088
SC-14	SB-19 & SB-20	Foundation Soils	20.0	2.0	124	1.2	0.8	74.4	0.561	1.2	15	0.0	74.4	1.0	-0.3	0.0	0.9	0.111	1.011	0.115	0.184	0.623	6.0	80.4	0.091
SC-14	SB-19 & SB-20	Foundation Soils	20.1	1.9	124	1.2	0.8	77.5	0.553	1.2	15	0.0	77.5	1.0	-0.4	0.0	0.9	0.114	1.012	0.118	0.184	0.638	6.0	83.5	0.095
SC-14	SB-19 & SB-20	Foundation Soils	20.2	1.9	119	1.2	0.8	77.3	0.553	1.2	15	0.0	77.3	1.0	-0.4	0.0	0.9	0.113	1.011	0.118	0.185	0.637	6.0	83.3	0.095
SC-14	SB-19 & SB-20	Foundation Soils	20.3	1.8	119	1.2	0.8	77.9	0.552	1.2	15	0.0	77.9	1.0	-0.4	0.0	0.9	0.114	1.012	0.118	0.185	0.639	6.0	83.9	0.095
SC-14	SB-19 & SB-20	Foundation Soils	20.3	1.7	124	1.2	0.8	79.4	0.548	1.2	15	0.0	79.4	1.0	-0.4	0.0	0.9	0.115	1.012	0.119	0.185	0.646	6.0	85.3	0.098
SC-14	SB-19 & SB-20	Foundation Soils	20.4	1.6	124	1.2	0.8	80.6	0.545	1.2	15	0.0	80.6	1.0	-0.4	0.0	0.9	0.116	1.012	0.121	0.185	0.652	6.0	86.6	0.099
SC-14	SB-19 & SB-20	Foundation Soils	20.5	1.5	124	1.2	0.8	82.4	0.540	1.2	15	0.0	82.4	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.185	0.661	6.0	88.4	0.102
SC-14	SB-19 & SB-20	Foundation Soils	20.6	1.4	124	1.2	0.8	84.2	0.535	1.1	15	0.0	84.2	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.185	0.671	6.0	90.2	0.104
SC-14	SB-19 & SB-20	Foundation Soils	20.7	1.4	124	1.2	0.8	83.2	0.538	1.1	15	0.0	83.2	1.0	-0.4	0.0	0.9	0.119	1.013	0.123	0.185	0.665	6.0	89.2	0.103
SC-14	SB-19 & SB-20	Foundation Soils	20.8	1.3	124	1.3	0.8	93.0	0.514	1.1	15	13.0	93.0	1.0	-0.4	0.0	0.9	0.129	1.015	0.134	0.185	0.724	14.0	94.0	0.110
SC-14	SB-19 & SB-20	Foundation Soils	20.8	1.2	124	1.3	0.8	89.7	0.522	1.1	15	13.5	89.7	1.0	-0.4	0.0	0.9	0.125	1.015	0.130	0.186	0.702	14.2	90.4	0.105
SC-14	SB-19 & SB-20	Foundation Soils	20.9	1.1	124	1.3	0.8	95.2	0.509	1.1	15	24.4	95.2	1.0	-0.4	0.0	0.9	0.131	1.016	0.137	0.186	0.738	17.8	88.6	0.102
SC-14	SB-19 & SB-20	Foundation Soils	21.0	1.0	124	1.3	0.8	103.1	0.491	1.1	15	34.1	103.1	1.0	-0.4	0.0	0.9	0.142	1.019	0.148	0.186	0.797	23.3	92.3	0.107
SC-14	SB-19 & SB-20	Foundation Soils	21.1	1.0	121	1.3	0.8	96.2	0.507	1.1	15	38.1	96.2	1.0	-0.4	0.0	0.9	0.133	1.016	0.138	0.186	0.743	30.0	88.1	0.101
SC-14	SB-19 & SB-20	Foundation Soils	21.2	0.9	124	1.3	0.8	102.1	0.494	1.1	15	35.4	102.1	1.0	-0.4	0.0	0.9	0.140	1.018	0.146	0.186	0.787	24.7	91.4	0.106
SC-14	SB-19 & SB-20	Foundation Soils	21.2	0.8	124	1.3	0.8	102.2	0.493	1.1	15	31.7	102.2	1.0	-0.4	0.0	0.9	0.140	1.019	0.146	0.186	0.787	21.4	91.9	0.107
SC-14	SB-19 & SB-20	Foundation Soils	21.3	0.7	124	1.3	0.8	95.4	0.509	1.1	15	12.5	95.4	1.0	-0.4	0.0	0.9	0.132	1.016	0.137	0.186	0.735	13.8	96.7	0.114
SC-14	SB-19 & SB-20	Foundation Soils	21.4	0.6	124	1.3	0.8	97.3	0.504	1.1	15	15.1	97.3	1.0	-0.4	0.0	0.9	0.134	1.017	0.139	0.186	0.748	14.5	96.7	0.114
SC-14	SB-19 & SB-20	Foundation Soils	21.5	0.5	124	1.3	0.8	89.9	0.521	1.1	15	7.6	89.9	1.0	-0.4	0.0	0.9	0.126	1.015	0.130	0.186	0.698	12.5	94.8	0.111
SC-14	SB-19 & SB-20	Foundation Soils	21.6	0.5	124	1.3	0.8	85.0	0.533	1.1	15	7.9	85.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.125	0.186	0.668	12.6	89.8	0.104
SC-14	SB-19 & SB-20	Foundation Soils	21.7	0.4	124	1.3	0.9	82.8	0.539	1.1	15	3.3	82.8	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.187	0.656	11.2	90.7	0.105
SC-14	SB-19 & SB-20	Foundation Soils	21.7	0.3	124	1.3	0.9	82.7	0.539	1.1	15	0.0	82.7	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.187	0.654	6.6	89.3	0.103
SC-14	SB-19 & SB-20	Foundation Soils	21.8	0.2	124	1.3	0.9	95.2	0.509	1.1	15	0.0	95.2	1.0	-0.4	0.0	0.9	0.131	1.016	0.136	0.187	0.730	6.0	101.2	0.121
SC-14	SB-19 & SB-20	Foundation Soils	21.9	0.1	124	1.3	0.9	102.4	0.493	1.1	15	0.0	102.4	1.0	-0.4	0.0	0.9	0.140	1.019	0.146	0.187	0.783	6.0	108.4	0.134
SC-14	SB-19 & SB-20	Foundation Soils	22.0	0.1	124	1.3	0.9	101.9	0.494	1.1	15	0.0	101.9	1.0	-0.4	0.0	0.9	0.140	1.018	0.146	0.187	0.778	6.0	107.9	0.133
SC-14	SB-19 & SB-20	Foundation Soils	22.1	-0.0	124	1.3	0.9	101.2	0.495	1.1	15	0.0	101.2	1.0	-0.4	0.0	0.9	0.139	1.018	0.145	0.187	0.773	6.0	107.2	0.132
SC-14	SB-19 & SB-20	Foundation Soils	22.1	-0.1	124	1.3	0.9	94.2	0.511	1.1	15	0.0	94.2	1.0	-0.4	0.0	0.9	0.130	1.016	0.135	0.187	0.721	6.0	100.2	0.120
SC-14	SB-19 & SB-20	Foundation Soils	22.2	-0.2	124	1.3	0.9	88.1	0.526	1.1	15	0.0	88.1	1.0	-0.4	0.0	0.9	0.124	1.014	0.128	0.187	0.682	6.0	94.1	0.110
SC-14	SB-19 & SB-20	Foundation Soils	22.3	-0.3	124	1.3	0.9	83.2	0.538	1.1	15	0.0	83.2	1.0	-0.4	0.0	0.9	0.119	1.013	0.123	0.187	0.654	6.0	89.2	0.103
SC-14	SB-19 & SB-20	Foundation Soils	22.4	-0.4	124	1.4	0.9	74.4	0.561	1.1	15	0.0	74.4	1.0	-0.4	0.0	0.9	0.111	1.011	0.114	0.187	0.608	6.0	80.4	0.091
SC-14	SB-19 & SB-20	Foundation Soils	22.5	-0.4	124	1.4	0.9	59.5	0.606	1.1	15	2.5	59.5	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.188	0.541	11.0	68.0	0.075
SC-14	SB-19 & SB-20	Foundation Soils	22.6	-0.5	124	1.4	0.9	58.5	0.609	1.1	15	5.8	58.5	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.188	0.536	12.2	64.9	0.071
SC-14	SB-19 & SB-20	Foundation Soils	22.6	-0.6	124	1.4	0.9	57.5	0.612	1.1	15	0.0	57.5	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.188	0.532	8.5	65.9	0.072
SC-14	SB-19 & SB-20	Foundation Soils	22.7	-0.7	124	1.4	0.9	65.6	0.587	1.1	15	0.0	65.6	1.0	-0.4	0.0	0.9	0.104	1.009	0.106	0.188	0.566	6.0	71.6	0.079
SC-14	SB-19 & SB-20	Foundation Soils	22.8	-0.8	124	1.4	0.9	81.2	0.543	1.1	15	0.0	81.2	1.0	-0.4	0.0	0.9	0.117	1.012	0.120	0.188	0.640	6.0	87.2	0.100
SC-14	SB-19 & SB-20	Foundation Soils	22.9	-0.9	124	1.4	0.9	92.2	0.516	1.1	15	0.0	92.2	1.0	-0.4	0.0	0.9	0.128	1.015	0.132	0.188	0.703	6.0	98.2	0.116
SC-14	SB-19 & SB-20	Foundation Soils	23.0	-0.9	119	1.4	0.9	101.9	0.494	1.1	15	0.0	101.9	1.0	-0.4	0.0	0.9	0.140	1.018	0.145	0.188	0.771	6.0	107.9	0.133
SC-14	SB-19 & SB-20	Foundation Soils	23.0	-1.0	124	1.4	0.9	97.2	0.504	1.1	15	0.0	97.2	1.0	-0.4	0.0	0.9	0.134	1.017	0.138	0.188	0.736	6.0	103.2	0.125
SC-14	SB-19 & SB-20	Foundation Soils	23.1	-1.1	124	1.4	0.9	92.6	0.515	1.1	15	0.0	92.6	1.0	-0.4	0.0	0.9	0.128	1.015	0.133	0.188	0.704	6.0	98.6	0.117
SC-14	SB-19 & SB-20	Foundation Soils	23.2	-1.2	124	1.4	0.9	88.8	0.524	1.1	15	0.0	88.8	1.0	-0.4	0.0	0.9	0.124	1.014	0.128	0.188	0.680	6.0	94.8	0.111
SC-14	SB-19 & SB-20	Foundation Soils	23.3	-1.3	124	1.4	0.9	83.7	0.537	1.1	15	0.0	83.7	1.0	-0.4	0.0	0.9	0.119	1.013	0.123	0.188	0.651	6.0	89.7	0.104
SC-14	SB-19 & SB-20	Foundation Soils	23.4	-1.3	124	1.4	0.9	80.2	0.546	1.1	15	0.0	80.2	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.188	0.632	6.0	86.2	0.099
SC-14	SB-19 & SB-20	Foundation Soils	23.5	-1.4	124	1.4	0.9	73.6	0.564	1.1	15	0.0	73.6	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.189	0.599	6.0	79.6	0.090
SC-14	SB-19 & SB-20	Foundation Soils	23.5	-1.5	124	1.4	0.9	66.3	0.585	1.1	15	0.0	66.3	1.0	-0.4	0.0	0.9	0.104	1.009	0.107	0.189	0.565	6.0	72.2	0.080

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-14	SB-19 & SB-20	Foundation Soils	23.6	-1.6	124	1.4	0.9	81.2	0.543	1.1	15	19.4	81.2	1.0	-0.4	0.0	0.9	0.117	1.012	0.120	0.189	0.636	16.2	78.0	0.088
SC-14	SB-19 & SB-20	Foundation Soils	23.7	-1.7	121	1.4	0.9	100.5	0.497	1.1	15	42.3	100.5	1.0	-0.4	0.0	0.9	0.138	1.018	0.143	0.189	0.756	43.0	101.2	0.121
SC-15	SB-20 & SB-21	Foundation Soils	5.0	15.8	124	0.3	0.3	162.1	0.384	1.6	56	0.0	162.1	1.1	-0.1	0.0	1.0	0.394	1.056	0.458	0.129	3.542	6.0	168.1	
SC-15	SB-20 & SB-21	Foundation Soils	5.1	15.7	124	0.3	0.3	193.7	0.338	1.5	56	0.0	193.7	1.1	-0.1	0.0	1.0	1.346	1.082	1.601	0.130	12.293	6.0	199.7	
SC-15	SB-20 & SB-21	Foundation Soils	5.2	15.7	124	0.3	0.3	207.8	0.319	1.5	56	0.0	207.8	1.1	-0.1	0.0	1.0	3.018	1.082	3.591	0.131	27.351	6.0	213.8	
SC-15	SB-20 & SB-21	Foundation Soils	5.2	15.6	124	0.3	0.3	212.7	0.313	1.5	56	0.0	212.7	1.1	-0.1	0.0	1.0	4.182	1.082	4.975	0.132	37.614	6.0	218.7	
SC-15	SB-20 & SB-21	Foundation Soils	5.3	15.5	124	0.3	0.3	214.9	0.310	1.5	56	0.0	214.9	1.1	-0.1	0.0	1.0	4.885	1.082	5.812	0.133	43.612	6.0	220.9	
SC-15	SB-20 & SB-21	Foundation Soils	5.4	15.4	124	0.3	0.3	213.6	0.312	1.5	56	0.0	213.6	1.1	-0.1	0.0	1.0	4.455	1.082	5.300	0.134	39.489	6.0	219.6	
SC-15	SB-20 & SB-21	Foundation Soils	5.5	15.3	124	0.3	0.3	212.1	0.314	1.5	56	0.0	212.1	1.1	-0.1	0.0	1.0	4.020	1.082	4.782	0.135	35.381	6.0	218.1	
SC-15	SB-20 & SB-21	Foundation Soils	5.6	15.2	124	0.3	0.3	211.4	0.315	1.4	56	0.0	211.4	1.1	-0.1	0.0	1.0	3.817	1.082	4.541	0.136	33.368	6.0	217.4	
SC-15	SB-20 & SB-21	Foundation Soils	5.7	15.2	124	0.3	0.3	210.4	0.316	1.4	56	0.0	210.4	1.1	-0.1	0.0	1.0	3.567	1.082	4.244	0.137	30.972	6.0	216.3	
SC-15	SB-20 & SB-21	Foundation Soils	5.7	15.1	124	0.4	0.3	209.6	0.317	1.4	56	0.0	209.6	1.1	-0.1	0.0	1.0	3.393	1.082	4.036	0.138	29.265	6.0	215.6	
SC-15	SB-20 & SB-21	Foundation Soils	5.8	15.0	124	0.4	0.3	210.2	0.316	1.4	56	0.0	210.2	1.1	-0.1	0.0	1.0	3.533	1.082	4.203	0.139	30.279	6.0	216.2	
SC-15	SB-20 & SB-21	Foundation Soils	5.9	14.9	124	0.4	0.3	214.4	0.311	1.4	56	0.0	214.4	1.1	-0.1	0.0	1.0	4.701	1.082	5.593	0.140	40.044	6.0	220.4	
SC-15	SB-20 & SB-21	Foundation Soils	6.0	14.8	124	0.4	0.3	215.5	0.309	1.4	56	0.0	215.5	1.1	-0.1	0.0	1.0	5.080	1.082	6.044	0.141	43.005	6.0	221.5	
SC-15	SB-20 & SB-21	Foundation Soils	6.1	14.8	124	0.4	0.3	211.4	0.315	1.4	56	0.0	211.4	1.1	-0.1	0.0	1.0	3.821	1.082	4.546	0.141	32.153	6.0	217.4	
SC-15	SB-20 & SB-21	Foundation Soils	6.2	14.7	124	0.4	0.3	212.2	0.314	1.4	56	0.0	212.2	1.1	-0.1	0.0	1.0	4.039	1.082	4.805	0.142	33.792	6.0	218.2	
SC-15	SB-20 & SB-21	Foundation Soils	6.2	14.6	124	0.4	0.3	216.9	0.308	1.4	56	0.0	216.9	1.1	-0.1	0.0	1.0	5.626	1.082	6.693	0.143	46.795	6.0	222.9	
SC-15	SB-20 & SB-21	Foundation Soils	6.3	14.5	124	0.4	0.3	220.7	0.303	1.4	56	0.0	220.7	1.1	-0.1	0.0	1.0	7.511	1.082	8.935	0.144	62.124	6.0	226.7	
SC-15	SB-20 & SB-21	Foundation Soils	6.4	14.4	124	0.4	0.4	220.6	0.303	1.4	56	0.0	220.6	1.1	-0.1	0.0	1.0	7.445	1.082	8.857	0.145	61.246	6.0	226.5	
SC-15	SB-20 & SB-21	Foundation Soils	6.5	14.3	124	0.4	0.4	220.3	0.303	1.4	56	0.0	220.3	1.1	-0.1	0.0	1.0	7.278	1.082	8.659	0.145	59.550	6.0	226.3	
SC-15	SB-20 & SB-21	Foundation Soils	6.6	14.3	124	0.4	0.4	220.7	0.303	1.4	56	0.0	220.7	1.1	-0.1	0.0	1.0	7.540	1.082	8.970	0.146	61.364	6.0	226.7	
SC-15	SB-20 & SB-21	Foundation Soils	6.6	14.2	124	0.4	0.4	189.2	0.344	1.5	56	0.0	189.2	1.1	-0.1	0.0	1.0	1.084	1.082	1.290	0.147	8.781	6.0	195.2	
SC-15	SB-20 & SB-21	Foundation Soils	6.7	14.1	124	0.4	0.4	215.9	0.309	1.4	56	0.0	215.9	1.1	-0.1	0.0	1.0	5.240	1.082	6.234	0.148	42.215	6.0	221.9	
SC-15	SB-20 & SB-21	Foundation Soils	6.8	14.0	124	0.4	0.4	214.8	0.310	1.4	56	0.0	214.8	1.1	-0.1	0.0	1.0	4.851	1.082	5.770	0.148	38.884	6.0	220.8	
SC-15	SB-20 & SB-21	Foundation Soils	6.9	13.9	124	0.4	0.4	213.0	0.313	1.4	56	0.0	213.0	1.1	-0.1	0.0	1.0	4.275	1.082	5.085	0.149	34.102	6.0	219.0	
SC-15	SB-20 & SB-21	Foundation Soils	7.0	13.9	124	0.4	0.4	211.3	0.315	1.4	56	0.0	211.3	1.1	-0.1	0.0	1.0	3.803	1.082	4.525	0.150	30.198	6.0	217.3	
SC-15	SB-20 & SB-21	Foundation Soils	7.1	13.8	124	0.4	0.4	208.0	0.319	1.4	56	0.0	208.0	1.1	-0.1	0.0	1.0	3.063	1.082	3.644	0.151	24.208	6.0	214.0	
SC-15	SB-20 & SB-21	Foundation Soils	7.1	13.7	124	0.4	0.4	202.7	0.326	1.4	56	0.0	202.7	1.1	-0.1	0.0	1.0	2.210	1.082	2.630	0.151	17.388	6.0	208.7	
SC-15	SB-20 & SB-21	Foundation Soils	7.2	13.6	124	0.4	0.4	197.1	0.333	1.4	56	0.0	197.1	1.1	-0.1	0.0	1.0	1.613	1.082	1.919	0.152	12.634	6.0	203.1	
SC-15	SB-20 & SB-21	Foundation Soils	7.3	13.5	124	0.5	0.4	190.3	0.343	1.4	56	0.0	190.3	1.1	-0.1	0.0	1.0	1.139	1.082	1.355	0.153	8.881	6.0	196.3	
SC-15	SB-20 & SB-21	Foundation Soils	7.4	13.4	124	0.5	0.4	175.8	0.363	1.4	56	0.0	175.8	1.1	-0.1	0.0	1.0	0.617	1.069	0.725	0.153	4.734	6.0	181.8	
SC-15	SB-20 & SB-21	Foundation Soils	7.5	13.4	124	0.5	0.4	162.1	0.384	1.5	56	0.1	162.1	1.1	-0.1	0.0	1.0	0.394	1.056	0.458	0.154	2.976	8.8	170.8	
SC-15	SB-20 & SB-21	Foundation Soils	7.5	13.3	124	0.5	0.4	164.3	0.381	1.5	56	25.2	164.3	1.1	-0.1	0.0	1.0	0.420	1.058	0.489	0.155	3.166	14.2	153.3	
SC-15	SB-20 & SB-21	Foundation Soils	7.6	13.2	124	0.5	0.4	163.2	0.382	1.5	56	43.3	163.2	1.1	-0.1	0.0	1.0	0.406	1.057	0.472	0.155	3.044	17.7	137.5	
SC-15	SB-20 & SB-21	Foundation Soils	7.7	13.1	124	0.5	0.4	166.1	0.378	1.5	56	52.8	166.1	1.1	-0.1	0.0	1.0	0.444	1.059	0.517	0.156	3.319	20.4	133.7	
SC-15	SB-20 & SB-21	Foundation Soils	7.8	13.0	124	0.5	0.4	166.1	0.378	1.5	56	47.8	166.1	1.1	-0.1	0.0	1.0	0.445	1.060	0.518	0.156	3.314	18.8	137.1	
SC-15	SB-20 & SB-21	Foundation Soils	7.9	12.9	124	0.5	0.4	155.5	0.394	1.5	56	0.3	155.5	1.1	-0.1	0.0	1.0	0.329	1.050	0.380	0.157	2.423	9.2	164.3	
SC-15	SB-20 & SB-21	Foundation Soils	8.0	12.9	124	0.5	0.4	178.6	0.359	1.4	56	0.0	178.6	1.1	-0.1	0.0	1.0	0.687	1.072	0.811	0.158	5.146	6.0	184.6	
SC-15	SB-20 & SB-21	Foundation Soils	8.0	12.8	124	0.5	0.4	187.7	0.346	1.4	56	0.0	187.7	1.1	-0.1	0.0	1.0	1.010	1.082	1.202	0.158	7.596	6.0	193.7	
SC-15	SB-20 & SB-21	Foundation Soils	8.1	12.7	124	0.5	0.4	190.6	0.342	1.4	56	0.0	190.6	1.1	-0.1	0.0	1.0	1.159	1.082	1.379	0.159	8.685	6.0	196.6	
SC-15	SB-20 & SB-21	Foundation Soils	8.2	12.6	124	0.5	0.4	193.4	0.338	1.4	56	0.0	193.4	1.1	-0.1	0.0	1.0	1.328	1.082	1.579	0.159	9.913	6.0	199.4	
SC-15	SB-20 & SB-21	Foundation Soils	8.3	12.5	124	0.5	0.4	196.3	0.335	1.4	56	0.0	196.3	1.1	-0.1	0.0	1.0	1.541	1.082	1.833	0.160	11.463	6.0	202.3	
SC-15	SB-20 & SB-21	Foundation Soils	8.4	12.5	124	0.5	0.4	200.6	0.329	1.4	56	0.0	200.6	1.1	-0.1	0.0	1.0	1.953	1.082	2.323	0.160	14.480	6.0	206.6	
SC-15	SB-20 & SB-21	Foundation Soils	8.4	12.4	124	0.5	0.4	201.6	0.327	1.4	56	0.0	201.6	1.1	-0.1	0.0	1.0	2.067	1.082	2.459	0.161	15.275	6.0	207.6	
SC-15	SB-20 & SB-21	Foundation Soils	8.5	12.3	124	0.5	0.4	200.6	0.329	1.4	56	0.0	200.6	1.1	-0.1	0.0	1.0	1.951	1.082	2.321	0.162	14.366	6.0	206.6	
SC-15	SB-20 & SB-21	Foundation Soils	8.6	12.2	124	0.5	0.4	199.2	0.331	1.4	56	0.0	199.2	1.1	-0.1	0.0	1.0	1.803	1.082	2.145	0.162	13.236	6.0	205.2	
SC-15	SB-20 & SB-21	Foundation Soils	8.7	12.1	124	0.5	0.4	195.9	0.335	1.4	56	0.0	195.9	1.1	-0.1	0.0	1.0	1.508	1.082	1.793	0.163	11.030	6.0	201.8	
SC-15	SB-20 & SB-21	Foundation Soils	8.8	12.0	124	0.5	0.4	190.1	0.343	1.4	56	0.0	190.1	1.1	-0.1	0.0	1.0	1.129	1.082	1.343	0.163	8.232	6.0	196.1	
SC-15	SB-20 & SB-21	Foundation Soils	8.9	12.0	124	0.5	0.4	181.9	0.354	1.4	56	0.0	181.9	1.1	-0.1	0.0	1.0	0.784	1.076	0.928	0.164	5.674	6.0	187.9	
SC-15	SB-20 & SB-21	Foundation Soils	8.9	11.9	124	0.6	0.4	178.1	0.360	1.4	56	0.0	178.1	1.1	-0.1	0.0	1.0	0.673	1.072	0.794	0.164	4.838	6.0	184.1	
SC-15	SB-20 & SB-21	Foundation Soils	9.0	11.8	124	0.6	0.4	177.5	0.361	1.4	56	0.0	177.5	1.1	-0.1	0.0	1.0	0.658	1.071	0.775	0.165	4.707	6.0	183.5	
SC-15	SB-20 & SB-21	Foundation Soils	9.1	11.7	124	0.6	0.4	179.7	0.358	1.4	56	0.0	179.7	1.1	-0.1	0.0	1.0	0.718	1.074	0.848	0.165	5.133	6.0	185.7	
SC-15	SB-20 & SB-21	Foundation Soils	9.2	11.6	124	0.6	0.4	186.1	0.349	1.4	56	0.0	186.1	1.1	-0.1	0.0	1.0	0.938	1.081	1.115	0.166	6.734	6.0	192.1	
SC-15	SB-20 & SB-21	Foundation Soils	9.3	11.6	124	0.6	0.4	191.5	0.341	1.3	56	0.0	191.5	1.1	-0.1	0.0	1.0	1.208	1.082	1.437	0.166	8.653	6.0	197.5	
SC-15	SB-20 & SB-21	Foundation Soils	9.4	11.5	124	0.6	0.4	203.6	0.325	1.3	56	0.0	203.6	1.1	-0.1	0.0	1.0	2.332	1.082	2.774	0.167	16.656	6.0	209.6	
SC-15	SB-20 & SB-21	Foundation Soils	9.4	11.4	124	0.6	0.4	220.2	0.304	1.3	56	0.0	220.2	1.1	-0.1	0.0	1.0	7.232	1.082	8.604	0.167	51.515	6.0	226.2	
SC-15	SB-20 & SB-21	Foundation Soils	9.5	11.3	124	0.6	0.4	233.7	0.287	1.3	56	0.0	233.7	1.1	-0.1	0.0	1.0	23.164	1.082	27.557	0.167	164.543	6.0	239.7	
SC-15	SB-20 & SB-21	Foundation Soils	9.7	11.1	127	0.6	0.5	254.3	0.264	1.3	26	0.0	254.3	1.1	-0.1	0.0	1.0	220.336	1.082	262.123	0.168	1556.965	6.0	260.3	
SC-15	SB-20 & SB-21	Foundation Soils	9.8	11.1	127	0.6	0.5	262.3	0.264	1.2	26	0.0	262.3	1.1	-0.1	0.0	1.0	629.772	1.082	749.211	0.169	4438.869	6.0	268.3	
SC-15	SB-20 & SB-21	Foundation Soils	9.8	11.0	127	0.6	0.5	268.1	0.264	1.2	26	0.0	268.1	1.1	-0.1	0.0	1.0	1457.802	1.082	1734.281	0.169	10249.450	6.0	274.1	
SC-15	SB-20 & SB-21	Foundation Soils	9.9	10.9	124	0.6	0.5	233.6	0.287	1.3	26	0.0	233.6	1.1	-0.1	0.0	1.0	22.868	1.082	27.205	0.170	160.380	6.0	239.6	
SC-15	SB-20 & SB-21	Foundation Soils	10.0	10.8	124	0.6	0.5	263.9	0.264	1.2	26	0.0	263.9	1.1	-0.1	0.0	1.0	788.916	1.082	938.538	0.170	5519.058	6.0	269.9	
SC-15	SB-20 & SB-21	Foundation Soils	10.1	10.7	127	0.6	0.5	272.0	0.264	1.2	26	0.0	272.0	1.1	-0.1	0.0	1.0	2673.220	1.082	3180.210	0.170	18655.971	6.0	278.0	
SC-15	SB-20 & SB-21	Foundation Soils	10.2	10.7	127	0.6	0.5	279.3	0.264	1.2	26	0.0	279.3	1.1	-0.1	0.0	1.0	8861.247	1.082	10541.827	0.171	61696.257	6.0	285.3	
SC-15	SB-20 & SB-21	Foundation Soils	10.3	10.6	127	0.6	0.5	280.7	0.264	1.2	26	0.0	280.7	1.1	-0.1	0.0	1.0	11150.674	1.082	13265.455	0.171	77457.255	6.0	286.7	
SC-15	SB-20 & SB-21	Foundation Soils	10.3	10.5	124	0.6	0.5	279.6	0.264	1.2	26	0.0	279.6	1.1	-0.1	0.0	1.0	9276.446	1.082	11035.770	0.172	64289.475	6.0	285.6	
SC-15	SB-20 & SB-21	Foundation Soils	10.4	10.4	124	0.6	0.5	278.8	0.264	1.2	26	0.0	278.8	1.1	-0.1	0.0	1.0	8049.631	1.082	9576.284	0.172	55658.488	6.0	284.8	
SC-15	SB-20 & SB-21	Foundation Soils	10.5	10.3	124	0.7	0.5	276.3	0.264	1.2	26	0.0	276.3	1.1	-0.1	0.0	1.0	5319.603	1.082	6328.492	0.172	36698.378	6.0	282.3	
SC-15	SB-20 & SB-21	Foundation Soils	10.6	10.2	127	0.7	0.5	274.5	0.264	1.2	26	0.0	274.5	1.1	-0.1	0.0	1.0	3971.526	1.082	4724.746	0.173	27338.061	6.0	280.5	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-15	SB-20 & SB-21	Foundation Soils	10.7	10.2	127	0.7	0.5	274.7	0.264	1.2	26	0.0	274.7	1.1	-0.1	0.0	1.0	4081.729	1.082	4855.849	0.173	28036.722	6.0	280.7	
SC-15	SB-20 & SB-21	Foundation Soils	10.7	10.1	127	0.7	0.5	277.5	0.264	1.2	26	0.0	277.5	1.1	-0.2	0.0	1.0	6527.106	1.082	7765.005	0.174	44739.476	6.0	283.5	
SC-15	SB-20 & SB-21	Foundation Soils	10.8	10.0	127	0.7	0.5	278.8	0.264	1.2	26	0.0	278.8	1.1	-0.2	0.0	1.0	8043.647	1.082	9569.165	0.174	55020.476	6.0	284.8	
SC-15	SB-20 & SB-21	Foundation Soils	10.9	9.9	127	0.7	0.5	275.7	0.264	1.2	26	0.0	275.7	1.1	-0.2	0.0	1.0	4787.727	1.082	5695.743	0.174	32682.523	6.0	281.7	
SC-15	SB-20 & SB-21	Foundation Soils	11.0	9.8	127	0.7	0.5	269.7	0.264	1.2	26	0.0	269.7	1.1	-0.2	0.0	1.0	1859.870	1.082	2212.603	0.175	12670.598	6.0	275.7	
SC-15	SB-20 & SB-21	Foundation Soils	11.1	9.8	124	0.7	0.5	263.0	0.264	1.2	26	0.0	263.0	1.1	-0.2	0.0	1.0	701.698	1.082	834.779	0.175	4770.794	6.0	269.0	
SC-15	SB-20 & SB-21	Foundation Soils	11.2	9.7	124	0.7	0.5	245.7	0.273	1.2	26	0.0	245.7	1.1	-0.2	0.0	1.0	79.018	1.082	94.004	0.175	536.155	6.0	251.7	
SC-15	SB-20 & SB-21	Foundation Soils	11.2	9.6	124	0.7	0.5	232.4	0.289	1.2	26	0.0	232.4	1.1	-0.2	0.0	1.0	20.341	1.082	24.199	0.176	137.743	6.0	238.3	
SC-15	SB-20 & SB-21	Foundation Soils	11.3	9.5	124	0.7	0.5	217.5	0.307	1.3	26	0.0	217.5	1.1	-0.2	0.0	1.0	5.901	1.082	7.021	0.176	39.884	6.0	223.5	
SC-15	SB-20 & SB-21	Foundation Soils	11.4	9.4	124	0.7	0.5	201.3	0.328	1.3	26	0.0	201.3	1.1	-0.2	0.0	1.0	2.035	1.082	2.420	0.176	13.724	6.0	207.3	
SC-15	SB-20 & SB-21	Foundation Soils	11.5	9.3	124	0.7	0.5	186.2	0.348	1.3	26	0.0	186.2	1.1	-0.2	0.0	1.0	0.944	1.081	1.123	0.177	6.353	6.0	192.2	
SC-15	SB-20 & SB-21	Foundation Soils	11.6	9.3	124	0.7	0.5	167.2	0.376	1.3	26	0.0	167.2	1.1	-0.2	0.0	1.0	0.460	1.061	0.537	0.177	3.031	6.0	173.2	
SC-15	SB-20 & SB-21	Foundation Soils	11.6	9.2	124	0.7	0.5	155.8	0.394	1.3	26	22.3	155.8	1.1	-0.2	0.0	1.0	0.332	1.050	0.383	0.177	2.161	14.5	147.9	
SC-15	SB-20 & SB-21	Foundation Soils	11.7	9.1	124	0.7	0.5	151.4	0.401	1.3	26	39.1	151.4	1.1	-0.2	0.0	1.0	0.298	1.047	0.343	0.178	1.933	18.7	131.1	
SC-15	SB-20 & SB-21	Foundation Soils	11.8	9.0	121	0.7	0.5	131.9	0.435	1.4	26	51.4	131.9	1.1	-0.2	0.0	1.0	0.203	1.033	0.230	0.178	1.295	28.8	109.3	
SC-15	SB-20 & SB-21	Foundation Soils	11.9	8.9	121	0.7	0.5	119.5	0.458	1.4	26	51.9	119.5	1.1	-0.2	0.0	1.0	0.170	1.026	0.190	0.178	1.064	33.8	101.4	
SC-15	SB-20 & SB-21	Foundation Soils	12.0	8.8	121	0.7	0.5	120.5	0.456	1.4	26	50.0	120.5	1.1	-0.2	0.0	1.0	0.172	1.026	0.192	0.179	1.077	29.7	100.2	
SC-15	SB-20 & SB-21	Foundation Soils	12.1	8.8	124	0.7	0.5	125.3	0.447	1.4	26	41.3	125.3	1.1	-0.2	0.0	1.0	0.184	1.029	0.207	0.179	1.154	21.2	105.2	
SC-15	SB-20 & SB-21	Foundation Soils	12.1	8.7	124	0.8	0.5	110.3	0.476	1.4	26	20.5	110.3	1.1	-0.2	0.0	1.0	0.152	1.022	0.168	0.179	0.938	14.7	104.5	0.127
SC-15	SB-20 & SB-21	Foundation Soils	12.2	8.6	124	0.8	0.5	94.0	0.512	1.4	26	1.9	94.0	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.180	0.786	10.4	102.5	0.123
SC-15	SB-20 & SB-21	Foundation Soils	12.3	8.5	124	0.8	0.5	91.6	0.517	1.4	26	0.0	91.6	1.1	-0.2	0.0	1.0	0.127	1.015	0.138	0.180	0.767	6.0	97.6	0.116
SC-15	SB-20 & SB-21	Foundation Soils	12.4	8.4	124	0.8	0.5	91.5	0.518	1.4	26	0.0	91.5	1.1	-0.2	0.0	1.0	0.127	1.015	0.138	0.180	0.765	6.0	97.5	0.115
SC-15	SB-20 & SB-21	Foundation Soils	12.5	8.4	124	0.8	0.5	88.3	0.525	1.4	26	0.0	88.3	1.1	-0.2	0.0	1.0	0.124	1.014	0.134	0.180	0.741	6.0	94.3	0.111
SC-15	SB-20 & SB-21	Foundation Soils	12.5	8.3	124	0.8	0.5	81.5	0.542	1.4	26	0.0	81.5	1.1	-0.2	0.0	1.0	0.117	1.012	0.126	0.181	0.696	6.0	87.5	0.100
SC-15	SB-20 & SB-21	Foundation Soils	12.6	8.2	124	0.8	0.5	74.7	0.560	1.5	26	0.0	74.7	1.1	-0.2	0.0	1.0	0.111	1.011	0.119	0.181	0.657	6.0	80.7	0.091
SC-15	SB-20 & SB-21	Foundation Soils	12.7	8.1	119	0.8	0.5	71.3	0.570	1.5	26	0.0	71.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.116	0.181	0.637	6.0	77.3	0.087
SC-15	SB-20 & SB-21	Foundation Soils	12.8	8.0	119	0.8	0.6	70.2	0.573	1.5	26	0.0	70.2	1.1	-0.2	0.0	1.0	0.107	1.010	0.114	0.182	0.630	6.0	76.1	0.085
SC-15	SB-20 & SB-21	Foundation Soils	12.9	7.9	119	0.8	0.6	69.8	0.574	1.5	26	0.0	69.8	1.1	-0.2	0.0	1.0	0.107	1.010	0.114	0.182	0.627	6.0	75.7	0.085
SC-15	SB-20 & SB-21	Foundation Soils	13.0	7.9	119	0.8	0.6	71.7	0.569	1.4	26	0.0	71.7	1.1	-0.2	0.0	1.0	0.109	1.010	0.116	0.182	0.636	6.0	77.7	0.087
SC-15	SB-20 & SB-21	Foundation Soils	13.0	7.8	119	0.8	0.6	73.2	0.565	1.4	26	0.0	73.2	1.1	-0.2	0.0	1.0	0.110	1.011	0.117	0.183	0.642	6.0	79.2	0.089
SC-15	SB-20 & SB-21	Foundation Soils	13.1	7.7	119	0.8	0.6	73.6	0.564	1.4	26	0.0	73.6	1.1	-0.2	0.0	1.0	0.110	1.011	0.118	0.183	0.643	6.0	79.6	0.090
SC-15	SB-20 & SB-21	Foundation Soils	13.2	7.6	119	0.8	0.6	72.0	0.568	1.4	26	0.0	72.0	1.1	-0.2	0.0	1.0	0.109	1.010	0.116	0.183	0.634	6.0	78.0	0.088
SC-15	SB-20 & SB-21	Foundation Soils	13.3	7.5	119	0.8	0.6	68.2	0.579	1.4	26	0.0	68.2	1.1	-0.2	0.0	1.0	0.106	1.010	0.112	0.183	0.613	6.4	74.7	0.083
SC-15	SB-20 & SB-21	Foundation Soils	13.4	7.5	124	0.8	0.6	65.4	0.587	1.4	26	0.0	65.4	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.184	0.598	6.0	71.4	0.079
SC-15	SB-20 & SB-21	Foundation Soils	13.5	7.4	124	0.8	0.6	62.9	0.595	1.4	26	0.0	62.9	1.0	-0.2	0.0	1.0	0.102	1.009	0.108	0.184	0.585	7.4	70.3	0.078
SC-15	SB-20 & SB-21	Foundation Soils	13.5	7.3	124	0.8	0.6	69.3	0.576	1.4	26	17.3	69.3	1.1	-0.2	0.0	1.0	0.107	1.010	0.113	0.184	0.616	14.7	66.7	0.073
SC-15	SB-20 & SB-21	Foundation Soils	13.6	7.2	124	0.8	0.6	76.6	0.555	1.4	26	29.3	76.6	1.1	-0.2	0.0	1.0	0.113	1.011	0.120	0.184	0.652	18.4	65.7	0.072
SC-15	SB-20 & SB-21	Foundation Soils	13.7	7.1	124	0.8	0.6	79.0	0.549	1.4	26	35.8	79.0	1.1	-0.2	0.0	1.0	0.115	1.012	0.123	0.185	0.664	21.7	65.0	0.071
SC-15	SB-20 & SB-21	Foundation Soils	13.8	7.0	124	0.9	0.6	79.7	0.547	1.4	26	41.0	79.7	1.1	-0.2	0.0	1.0	0.116	1.012	0.123	0.185	0.667	26.5	65.2	0.071
SC-15	SB-20 & SB-21	Foundation Soils	13.9	7.0	121	0.9	0.6	78.4	0.550	1.4	26	42.4	78.4	1.1	-0.2	0.0	1.0	0.114	1.012	0.122	0.185	0.659	28.9	64.9	0.071
SC-15	SB-20 & SB-21	Foundation Soils	13.9	6.9	121	0.9	0.6	75.1	0.559	1.4	26	42.8	75.1	1.1	-0.2	0.0	1.0	0.111	1.011	0.119	0.185	0.640	30.6	62.9	0.068
SC-15	SB-20 & SB-21	Foundation Soils	14.0	6.8	121	0.9	0.6	68.4	0.578	1.4	26	42.0	68.4	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.186	0.605	31.5	57.9	0.062
SC-15	SB-20 & SB-21	Foundation Soils	14.1	6.7	121	0.9	0.6	65.4	0.587	1.4	26	42.4	65.4	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.186	0.590	34.1	57.1	0.061
SC-15	SB-20 & SB-21	Foundation Soils	14.2	6.6	121	0.9	0.6	65.9	0.586	1.4	26	42.8	65.9	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.186	0.591	34.9	58.1	0.063
SC-15	SB-20 & SB-21	Foundation Soils	14.3	6.6	121	0.9	0.6	67.7	0.580	1.4	26	43.8	67.7	1.0	-0.2	0.0	1.0	0.105	1.010	0.112	0.186	0.599	37.6	61.5	0.067
SC-15	SB-20 & SB-21	Foundation Soils	14.4	6.5	121	0.9	0.6	74.2	0.562	1.4	26	43.9	74.2	1.0	-0.2	0.0	1.0	0.111	1.011	0.117	0.187	0.630	33.9	64.2	0.070
SC-15	SB-20 & SB-21	Foundation Soils	14.4	6.4	121	0.9	0.6	75.1	0.559	1.4	26	43.4	75.1	1.1	-0.2	0.0	1.0	0.112	1.011	0.118	0.187	0.634	32.2	63.9	0.070
SC-15	SB-20 & SB-21	Foundation Soils	14.5	6.3	121	0.9	0.6	75.3	0.559	1.4	26	43.1	75.3	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.187	0.634	31.3	63.6	0.069
SC-15	SB-20 & SB-21	Foundation Soils	14.6	6.2	121	0.9	0.6	75.6	0.558	1.4	26	44.0	75.6	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.187	0.634	33.5	65.0	0.071
SC-15	SB-20 & SB-21	Foundation Soils	14.7	6.1	121	0.9	0.6	74.9	0.560	1.4	26	44.5	74.9	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.187	0.630	35.4	65.8	0.072
SC-15	SB-20 & SB-21	Foundation Soils	14.8	6.1	121	0.9	0.6	73.5	0.564	1.4	26	44.9	73.5	1.0	-0.2	0.0	1.0	0.110	1.011	0.117	0.188	0.622	37.7	66.3	0.073
SC-15	SB-20 & SB-21	Foundation Soils	14.8	6.0	121	0.9	0.6	73.2	0.565	1.4	26	45.2	73.2	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.188	0.619	39.4	67.3	0.074
SC-15	SB-20 & SB-21	Foundation Soils	14.9	5.9	121	0.9	0.6	73.9	0.563	1.4	26	45.4	73.9	1.0	-0.2	0.0	1.0	0.110	1.011	0.117	0.188	0.622	39.6	68.0	0.075
SC-15	SB-20 & SB-21	Foundation Soils	15.0	5.8	121	0.9	0.6	75.4	0.559	1.4	26	45.8	75.4	1.0	-0.2	0.0	1.0	0.112	1.011	0.118	0.188	0.628	40.2	69.8	0.077
SC-15	SB-20 & SB-21	Foundation Soils	15.1	5.7	121	0.9	0.6	74.7	0.560	1.4	26	45.7	74.7	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.189	0.624	40.3	69.4	0.076
SC-15	SB-20 & SB-21	Foundation Soils	15.2	5.6	121	0.9	0.6	75.7	0.558	1.3	26	45.9	75.7	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.189	0.629	40.6	70.4	0.078
SC-15	SB-20 & SB-21	Foundation Soils	15.3	5.6	121	0.9	0.6	76.8	0.555	1.3	26	45.7	76.8	1.0	-0.2	0.0	1.0	0.113	1.011	0.120	0.189	0.633	38.6	69.7	0.077
SC-15	SB-20 & SB-21	Foundation Soils	15.3	5.5	121	0.9	0.6	81.0	0.544	1.3	26	46.0	81.0	1.0	-0.2	0.0	1.0	0.117	1.012	0.124	0.189	0.655	36.7	71.7	0.079
SC-15	SB-20 & SB-21	Foundation Soils	15.4	5.4	121	1.0	0.6	77.9	0.552	1.3	26	46.8	77.9	1.0	-0.2	0.0	1.0	0.114	1.012	0.121	0.189	0.637	43.5	74.6	0.083
SC-15	SB-20 & SB-21	Foundation Soils	15.5	5.3	121	1.0	0.6	79.3	0.548	1.3	26	47.6	79.3	1.0	-0.2	0.0	1.0	0.115	1.012	0.122	0.190	0.644	47.0	78.8	0.089
SC-15	SB-20 & SB-21	Foundation Soils	15.6	5.2	121	1.0	0.6	76.6	0.555	1.3	26	45.5	76.6	1.0	-0.2	0.0	1.0	0.113	1.011	0.119	0.190	0.629	37.9	69.0	0.076
SC-15	SB-20 & SB-21	Foundation Soils	15.7	5.2	121	1.0	0.6	86.3	0.530	1.3	26	46.2	86.3	1.0	-0.3	0.0	1.0	0.122	1.014	0.129	0.190	0.682	34.4	74.5	0.083
SC-15	SB-20 & SB-21	Foundation Soils	15.7	5.1	121	1.0	0.6	100.8	0.496	1.3	26	47.8	100.8	1.1	-0.3	0.0	1.0	0.138	1.018	0.149	0.190	0.781	31.9	84.9	0.097
SC-15	SB-20 & SB-21	Foundation Soils	15.8	5.0	121	1.0	0.6	104.8	0.488	1.3	26	47.5	104.8	1.1	-0.3	0.0	1.0	0.144	1.020	0.155	0.190	0.814	29.9	87.3	0.100
SC-15	SB-20 & SB-21	Foundation Soils	15.9	4.9	121	1.0	0.6	92.3	0.516	1.3	26	48.3	92.3	1.1	-0.3	0.0	1.0	0.128	1.015	0.137	0.190	0.717	37.5	81.5	0.092
SC-15	SB-20 & SB-21	Foundation Soils	16.0	4.8	121	1.0	0.6	98.6	0.501	1.3	26	48.1	98.6	1.1	-0.3	0.0	1.0	0.135	1.017	0.145	0.191	0.761	33.5	84.0	0.096
SC-15	SB-20 & SB-21	Foundation Soils	16.1	4.7	124	1.0	0.6	104.4	0.489	1.3	26	41.8	104.4	1.1	-0.3	0.0	1.0	0.143	1.019	0.154	0.191	0.807	23.5	86.0	0.098
SC-15	SB-20 & SB-21	Foundation Soils	16.2	4.7	124	1.0	0.6	75.4	0.559	1.3	26	0.5	75.4	1.0	-0.3	0.0	1.0	0.112	1.011	0.118	0.191	0.617	9.6	84.4	0.096
SC-15	SB-20 & SB-21	Foundation Soils	16.2	4.6	124	1.0	0.7	83.5	0.537	1.3	26	0.0	83.5	1.0	-0.3	0.0	1.0	0.119	1.013	0.126	0.191	0.659	6.0	89.5	0.103
SC-15	SB-20 & SB-21	Foundation Soils	16.3	4.5	124	1.0	0.7	94.9	0.510	1.3	26	0.0	94.9	1.0	-0.3	0.0	1.0	0.131	1.016	0.140	0.191	0.730	6.0	100.9	0.121
SC-15	SB-20 & SB-21	Foundation Soils	16.4	4.4	124	1.0	0.7	97.7	0.503	1.3	26	0.0	97.7	1.1	-0.3	0.0	1.0	0.134	1.017	0.143	0.192	0.749	6.0	103.7	0.125

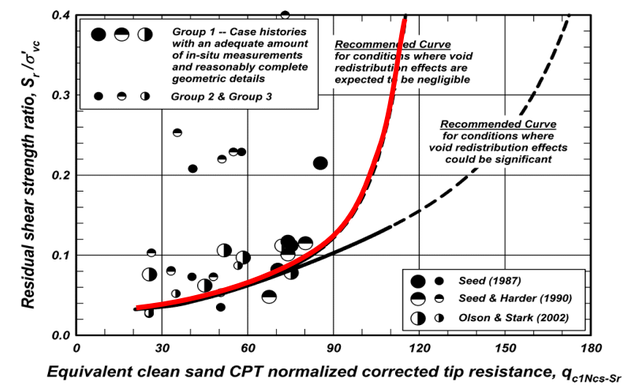
CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
SC-15	SB-20 & SB-21	Foundation Soils	16.5	4.3	124	1.0	0.7	93.4	0.513	1.3	26	0.0	93.4	1.0	-0.3	0.0	1.0	0.129	1.016	0.138	0.192	0.718	6.0	99.4	0.118
SC-15	SB-20 & SB-21	Foundation Soils	16.6	4.3	124	1.0	0.7	86.7	0.529	1.3	26	0.0	86.7	1.0	-0.3	0.0	1.0	0.122	1.014	0.129	0.192	0.675	6.0	92.7	0.108
SC-15	SB-20 & SB-21	Foundation Soils	16.7	4.2	124	1.0	0.7	91.5	0.518	1.3	26	0.0	91.5	1.0	-0.3	0.0	1.0	0.127	1.015	0.135	0.192	0.704	6.0	97.5	0.115
SC-15	SB-20 & SB-21	Foundation Soils	16.7	4.1	124	1.0	0.7	94.5	0.511	1.3	26	0.0	94.5	1.0	-0.3	0.0	1.0	0.131	1.016	0.139	0.192	0.723	6.0	100.5	0.120
SC-15	SB-20 & SB-21	Foundation Soils	16.8	4.0	124	1.0	0.7	100.0	0.498	1.3	26	0.0	100.0	1.0	-0.3	0.0	1.0	0.137	1.018	0.147	0.192	0.762	6.0	106.0	0.129
SC-15	SB-20 & SB-21	Foundation Soils	16.9	3.9	124	1.0	0.7	90.1	0.521	1.3	26	0.0	90.1	1.0	-0.3	0.0	1.0	0.126	1.015	0.133	0.192	0.693	6.0	96.1	0.113
SC-15	SB-20 & SB-21	Foundation Soils	17.0	3.8	124	1.0	0.7	87.5	0.527	1.3	26	0.0	87.5	1.0	-0.3	0.0	1.0	0.123	1.014	0.130	0.193	0.676	8.1	95.6	0.112
SC-15	SB-20 & SB-21	Foundation Soils	17.1	3.8	124	1.1	0.7	104.4	0.489	1.2	26	0.0	104.4	1.0	-0.3	0.0	1.0	0.143	1.019	0.153	0.193	0.796	6.0	110.4	0.137
SC-15	SB-20 & SB-21	Foundation Soils	17.1	3.7	124	1.1	0.7	118.8	0.459	1.2	26	0.0	118.8	1.1	-0.3	0.0	1.0	0.169	1.026	0.182	0.193	0.946	6.0	124.8	0.168
SC-15	SB-20 & SB-21	Foundation Soils	17.2	3.6	124	1.1	0.7	126.0	0.445	1.2	26	0.0	126.0	1.1	-0.3	0.0	1.0	0.186	1.029	0.202	0.193	1.048	6.0	132.0	
SC-15	SB-20 & SB-21	Foundation Soils	17.3	3.5	124	1.1	0.7	129.8	0.438	1.2	26	0.0	129.8	1.1	-0.3	0.0	1.0	0.197	1.032	0.215	0.193	1.112	6.0	135.8	
SC-15	SB-20 & SB-21	Foundation Soils	17.4	3.4	124	1.1	0.7	126.5	0.444	1.2	26	0.0	126.5	1.1	-0.3	0.0	1.0	0.187	1.030	0.204	0.193	1.054	6.0	132.5	
SC-15	SB-20 & SB-21	Foundation Soils	17.5	3.4	124	1.1	0.7	122.7	0.451	1.2	26	0.0	122.7	1.1	-0.3	0.0	1.0	0.178	1.028	0.192	0.193	0.995	6.0	128.7	0.178
SC-15	SB-20 & SB-21	Foundation Soils	17.6	3.3	124	1.1	0.7	115.0	0.467	1.2	26	0.0	115.0	1.1	-0.3	0.0	1.0	0.161	1.024	0.173	0.194	0.894	6.0	121.0	0.159
SC-15	SB-20 & SB-21	Foundation Soils	17.6	3.2	124	1.1	0.7	109.3	0.478	1.2	26	0.0	109.3	1.0	-0.3	0.0	1.0	0.151	1.021	0.162	0.194	0.834	6.0	115.3	0.147
SC-15	SB-20 & SB-21	Foundation Soils	17.7	3.1	124	1.1	0.7	102.7	0.492	1.2	26	0.0	102.7	1.0	-0.3	0.0	0.9	0.141	1.019	0.150	0.194	0.774	6.0	108.7	0.134
SC-15	SB-20 & SB-21	Foundation Soils	17.8	3.0	124	1.1	0.7	102.7	0.492	1.2	26	0.0	102.7	1.0	-0.3	0.0	0.9	0.141	1.019	0.150	0.194	0.773	6.0	108.7	0.134
SC-15	SB-20 & SB-21	Foundation Soils	17.9	2.9	124	1.1	0.7	106.2	0.485	1.2	26	0.0	106.2	1.0	-0.3	0.0	0.9	0.146	1.020	0.156	0.194	0.803	6.0	112.2	0.141
SC-15	SB-20 & SB-21	Foundation Soils	18.0	2.9	124	1.1	0.7	106.3	0.484	1.2	26	0.0	106.3	1.0	-0.3	0.0	0.9	0.146	1.020	0.156	0.194	0.803	6.0	112.3	0.141
SC-15	SB-20 & SB-21	Foundation Soils	18.0	2.8	124	1.1	0.7	105.1	0.487	1.2	26	0.0	105.1	1.0	-0.3	0.0	0.9	0.144	1.020	0.154	0.194	0.791	6.0	111.1	0.139
SC-15	SB-20 & SB-21	Foundation Soils	18.1	2.7	124	1.1	0.7	109.0	0.479	1.2	26	0.0	109.0	1.0	-0.3	0.0	0.9	0.150	1.021	0.161	0.194	0.826	6.0	115.0	0.146
SC-15	SB-20 & SB-21	Foundation Soils	18.2	2.6	124	1.1	0.7	102.0	0.494	1.2	26	0.0	102.0	1.0	-0.3	0.0	0.9	0.140	1.018	0.149	0.195	0.764	6.0	108.0	0.133
SC-15	SB-20 & SB-21	Foundation Soils	18.3	2.5	124	1.1	0.7	96.4	0.506	1.2	26	0.0	96.4	1.0	-0.3	0.0	0.9	0.133	1.017	0.140	0.195	0.722	6.0	102.4	0.123
SC-15	SB-20 & SB-21	Foundation Soils	18.4	2.5	124	1.1	0.7	88.6	0.525	1.2	26	0.0	88.6	1.0	-0.3	0.0	0.9	0.124	1.014	0.131	0.195	0.670	6.0	94.5	0.111
SC-15	SB-20 & SB-21	Foundation Soils	18.5	2.4	124	1.1	0.7	80.3	0.545	1.2	26	0.0	80.3	1.0	-0.3	0.0	0.9	0.116	1.012	0.122	0.195	0.624	6.0	86.3	0.099
SC-15	SB-20 & SB-21	Foundation Soils	18.5	2.3	124	1.1	0.7	77.7	0.552	1.2	26	0.0	77.7	1.0	-0.3	0.0	0.9	0.114	1.012	0.119	0.195	0.610	6.0	83.7	0.095
SC-15	SB-20 & SB-21	Foundation Soils	18.6	2.2	124	1.2	0.7	77.0	0.554	1.2	26	0.0	77.0	1.0	-0.3	0.0	0.9	0.113	1.011	0.118	0.195	0.606	6.0	83.0	0.094
SC-15	SB-20 & SB-21	Foundation Soils	18.7	2.1	124	1.2	0.7	78.0	0.551	1.2	26	0.0	78.0	1.0	-0.3	0.0	0.9	0.114	1.012	0.119	0.195	0.611	6.0	84.0	0.096
SC-15	SB-20 & SB-21	Foundation Soils	18.8	2.0	119	1.2	0.7	77.7	0.552	1.2	26	0.0	77.7	1.0	-0.3	0.0	0.9	0.114	1.012	0.119	0.195	0.608	6.0	83.6	0.095
SC-15	SB-20 & SB-21	Foundation Soils	18.9	2.0	124	1.2	0.7	74.9	0.560	1.2	26	0.0	74.9	1.0	-0.3	0.0	0.9	0.111	1.011	0.116	0.196	0.594	6.0	80.9	0.091
SC-15	SB-20 & SB-21	Foundation Soils	18.9	1.9	119	1.2	0.7	76.3	0.556	1.2	26	0.0	76.3	1.0	-0.3	0.0	0.9	0.113	1.011	0.117	0.196	0.600	6.0	82.3	0.093
SC-15	SB-20 & SB-21	Foundation Soils	19.0	1.8	124	1.2	0.7	74.0	0.562	1.2	26	0.0	74.0	1.0	-0.3	0.0	0.9	0.111	1.011	0.115	0.196	0.589	6.0	80.0	0.090
SC-15	SB-20 & SB-21	Foundation Soils	19.1	1.7	124	1.2	0.7	74.8	0.560	1.2	26	0.0	74.8	1.0	-0.3	0.0	0.9	0.111	1.011	0.116	0.196	0.592	6.0	80.8	0.091
SC-15	SB-20 & SB-21	Foundation Soils	19.2	1.6	124	1.2	0.7	74.6	0.561	1.2	26	0.0	74.6	1.0	-0.3	0.0	0.9	0.111	1.011	0.116	0.196	0.591	6.0	80.6	0.091
SC-15	SB-20 & SB-21	Foundation Soils	19.3	1.5	124	1.2	0.7	76.7	0.555	1.2	26	0.0	76.7	1.0	-0.3	0.0	0.9	0.113	1.011	0.118	0.196	0.601	6.0	82.7	0.094
SC-15	SB-20 & SB-21	Foundation Soils	19.4	1.5	124	1.2	0.7	71.0	0.571	1.2	26	0.0	71.0	1.0	-0.3	0.0	0.9	0.108	1.010	0.112	0.196	0.573	6.0	77.0	0.086
SC-15	SB-20 & SB-21	Foundation Soils	19.4	1.4	124	1.2	0.7	68.5	0.578	1.2	26	0.0	68.5	1.0	-0.3	0.0	0.9	0.106	1.010	0.110	0.196	0.562	6.4	75.0	0.084
SC-15	SB-20 & SB-21	Foundation Soils	19.5	1.3	124	1.2	0.8	65.3	0.588	1.2	26	0.0	65.3	1.0	-0.3	0.0	0.9	0.104	1.009	0.107	0.196	0.547	8.3	73.5	0.082
SC-15	SB-20 & SB-21	Foundation Soils	19.6	1.2	124	1.2	0.8	67.2	0.582	1.2	26	3.7	67.2	1.0	-0.3	0.0	0.9	0.105	1.010	0.109	0.196	0.555	11.2	74.7	0.083
SC-15	SB-20 & SB-21	Foundation Soils	19.7	1.1	124	1.2	0.8	72.2	0.567	1.2	26	6.2	72.2	1.0	-0.3	0.0	0.9	0.109	1.010	0.113	0.197	0.577	11.9	77.8	0.087
SC-15	SB-20 & SB-21	Foundation Soils	19.8	1.1	124	1.2	0.8	74.0	0.562	1.2	26	3.4	74.0	1.0	-0.3	0.0	0.9	0.111	1.011	0.115	0.197	0.585	11.0	81.6	0.092
SC-15	SB-20 & SB-21	Foundation Soils	19.8	1.0	124	1.2	0.8	83.0	0.538	1.2	26	6.8	83.0	1.0	-0.3	0.0	0.9	0.119	1.013	0.124	0.197	0.629	11.9	88.2	0.101
SC-15	SB-20 & SB-21	Foundation Soils	19.9	0.9	124	1.2	0.8	78.4	0.550	1.2	26	1.8	78.4	1.0	-0.3	0.0	0.9	0.114	1.012	0.119	0.197	0.605	10.4	87.0	0.100
SC-15	SB-20 & SB-21	Foundation Soils	20.0	0.8	124	1.2	0.8	77.7	0.552	1.2	26	0.0	77.7	1.0	-0.3	0.0	0.9	0.114	1.012	0.118	0.197	0.601	8.1	85.9	0.098
SC-15	SB-20 & SB-21	Foundation Soils	20.1	0.7	124	1.2	0.8	87.7	0.527	1.2	26	0.0	87.7	1.0	-0.4	0.0	0.9	0.123	1.014	0.129	0.197	0.653	6.0	93.7	0.110
SC-15	SB-20 & SB-21	Foundation Soils	20.2	0.6	124	1.2	0.8	101.0	0.496	1.2	26	0.0	101.0	1.0	-0.4	0.0	0.9	0.139	1.018	0.146	0.197	0.740	6.0	107.0	0.131
SC-15	SB-20 & SB-21	Foundation Soils	20.3	0.6	124	1.3	0.8	107.5	0.482	1.2	26	0.0	107.5	1.0	-0.4	0.0	0.9	0.148	1.021	0.156	0.197	0.793	6.0	113.5	0.143
SC-15	SB-20 & SB-21	Foundation Soils	20.3	0.5	124	1.3	0.8	118.6	0.459	1.2	26	0.0	118.6	1.0	-0.4	0.0	0.9	0.168	1.026	0.179	0.197	0.908	6.0	124.6	0.167
SC-15	SB-20 & SB-21	Foundation Soils	20.4	0.4	124	1.3	0.8	129.3	0.439	1.1	26	0.0	129.3	1.0	-0.4	0.0	0.9	0.195	1.031	0.210	0.197	1.063	6.0	135.3	
SC-15	SB-20 & SB-21	Foundation Soils	20.5	0.3	124	1.3	0.8	139.0	0.422	1.1	26	0.0	139.0	1.0	-0.4	0.0	0.9	0.230	1.037	0.249	0.197	1.262	6.0	145.0	
SC-15	SB-20 & SB-21	Foundation Soils	20.6	0.2	124	1.3	0.8	149.0	0.405	1.1	26	0.0	149.0	1.0	-0.4	0.0	0.9	0.282	1.045	0.309	0.198	1.564	6.0	155.0	
SC-15	SB-20 & SB-21	Foundation Soils	20.7	0.2	119	1.3	0.8	149.0	0.405	1.1	26	0.0	149.0	1.0	-0.4	0.0	0.9	0.282	1.045	0.308	0.198	1.561	6.0	155.0	
SC-15	SB-20 & SB-21	Foundation Soils	20.8	0.1	119	1.3	0.8	137.9	0.424	1.1	26	0.0	137.9	1.0	-0.4	0.0	0.9	0.225	1.037	0.243	0.198	1.231	6.0	143.9	
SC-15	SB-20 & SB-21	Foundation Soils	20.8	-0.0	124	1.3	0.8	123.6	0.450	1.1	26	0.0	123.6	1.0	-0.4	0.0	0.9	0.180	1.028	0.192	0.198	0.969	6.0	129.6	0.180
SC-15	SB-20 & SB-21	Foundation Soils	20.9	-0.1	124	1.3	0.8	119.8	0.457	1.1	26	0.0	119.8	1.0	-0.4	0.0	0.9	0.171	1.026	0.182	0.198	0.918	6.0	125.8	0.170
SC-15	SB-20 & SB-21	Foundation Soils	21.0	-0.2	124	1.3	0.8	111.5	0.474	1.1	26	0.0	111.5	1.0	-0.4	0.0	0.9	0.155	1.022	0.163	0.198	0.824	6.0	117.5	0.151
SC-15	SB-20 & SB-21	Foundation Soils	21.1	-0.3	124	1.3	0.8	111.4	0.474	1.1	26	0.0	111.4	1.0	-0.4	0.0	0.9	0.154	1.022	0.163	0.198	0.823	6.0	117.4	0.151
SC-15	SB-20 & SB-21	Foundation Soils	21.2	-0.3	124	1.3	0.8	117.9	0.461	1.1	26	0.0	117.9	1.0	-0.4	0.0	0.9	0.167	1.025	0.177	0.198	0.892	6.0	123.9	0.165
SC-15	SB-20 & SB-21	Foundation Soils	21.2	-0.4	124	1.3	0.8	124.1	0.449	1.1	26	0.0	124.1	1.0	-0.4	0.0	0.9	0.181	1.028	0.193	0.198	0.973	6.0	130.1	0.182
SC-15	SB-20 & SB-21	Foundation Soils	21.3	-0.5	124	1.3	0.8	129.0	0.440	1.1	26	0.0	129.0	1.0	-0.4	0.0	0.9	0.194	1.031	0.208	0.198	1.048	6.0	135.0	
SC-15	SB-20 & SB-21	Foundation Soils	21.4	-0.6	124	1.3	0.8	123.1	0.451	1.1	26	0.0	123.1	1.0	-0.4	0.0	0.9	0.178	1.028	0.190	0.198	0.957	6.0	129.1	0.179
SC-15	SB-20 & SB-21	Foundation Soils	21.5	-0.7	124	1.3	0.8	122.5	0.452	1.1	26	0.0	122.5	1.0	-0.4	0.0	0.9	0.177	1.028	0.188	0.198	0.948	6.0	128.5	0.177
SC-15	SB-20 & SB-21	Foundation Soils	21.6	-0.7	124	1.3	0.8	120.1	0.456	1.1	26	0.0	120.1	1.0	-0.4	0.0	0.9	0.172	1.026	0.182	0.198	0.916	6.0	126.1	0.171
SC-15	SB-20 & SB-21	Foundation Soils	21.7	-0.8	124	1.3	0.8	117.5	0.462	1.1	26	0.0	117.5	1.0	-0.4	0.0	0.9	0.166	1.025	0.175	0.199	0.884	6.0	123.5	0.165
SC-15	SB-20 & SB-21	Foundation Soils	21.7	-0.9	124	1.3	0.8	112.9	0.471	1.1	26	0.0	112.9	1.0	-0.4	0.0	0.9	0.157	1.023	0.165	0.199	0.833	6.0	118.9	0.154
SC-15	SB-20 & SB-21	Foundation Soils	21.8	-1.0	124	1.3	0.8	112.3	0.472	1.1	26	0.0	112.3	1.0	-0.4	0.0	0.9	0.156	1.023	0.164	0.199	0.826	6.0	118.3	0.153
SC-15	SB-20 & SB-21	Foundation Soils	21.9	-1.1	124	1.4	0.8	112.0	0.473	1.1	26	0.0	112.0	1.0	-0.4	0.0	0.9	0.155	1.022	0.164	0.199	0.823	6.0	118.0	0.152
SC-15	SB-20 & SB-21	Foundation Soils	22.0	-1.2	124	1.4	0.8	111.0	0.475	1.1	26	0.0	111.0	1.0	-0.4	0.0	0.9	0.154	1.022	0.162	0.199	0.812	6.0	117.0	0.150
SC-15	SB-20 & SB-21	Foundation Soils	22.1	-1.2	124	1.4	0.8	150.8	0.402	1.1	26	40.4	150.8	1.0	-0.4	0.0	0.9	0.294	1.046	0.319	0.199	1.605	19.2	129.6	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5,\sigma' vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M,\sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1

[1]Earthquake magnitude taken as modal event for the deaggregation of the 5,000 year peak ground accleration
[2]PGA estimated from 2014 USGS seismic hazard maps for a 5,000-year return period earthquake
[3]Averaged corrected tip resistence cone tip resistance corrected for unequal end area effects. See Conetec report for additional info.
[4]Unit weight of soil based on Soil Behavior Type. See Conetec report for additional info.
[5]Equilibrium pore water pressure based on Pore Pressure Dissipation Tests. See Conetec report for additional info.
[6]m =1.338-0.249*q_{c1Ncs} ^0.264 where 21<q_{c1Ncs}<254 (Boulanger&Idriss, 2014, Equation 2.15b)
[7]C_N = overburden correction factor = (1.06 tsf/s'_{vc})^m, where C_N <=1.7 (Boulanger&Idriss, 2014, Equation 2.15a)
[8]q_{c1N} = C_N*qt/1.06 tsf (Boulanger&Idriss, 2014, Equation 2.4)
[9]Values based on sieve test results and boring log descriptions
[10]Dq_{c1N} = (11.9+q_{c1N}/14.6)*exp[1.63 - (9.7 / (FC + 2)) - (15.7 / (FC + 2))^2] (Boulanger&Idriss, 2014, Equation 2.22)
[11]q_{c1Ncs} = q_{c1N} + Dq_{c1N} (Boulanger&Idriss, 2014, Equation 2.10)
[12]Cσ = 1 / (37.3 - 8.27 * q_{c1Ncs}^0.264 where q_{c1Ncs}<=211 K_s = 1-(C_s*ln(s'_{vc}/106 tsf)) <=1.1 (Boulanger&Idriss,2014, Equations 2.16a, 2.16b)
[13]a(z) = -1.012 - 1.126 * sin(z / 11.73 + 5.133), where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14b)
[14]b(z) = 0.106 + 0.118 * sin(z /11.28 + 5.142), where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14c)
[15]r_d = shear stress reduction coefficient = exp[a(z) + b(z) * M] (Boulanger&Idriss, 2014, Equation 2.14a)
[16]$CRR_{M=7.5,\sigma'vc=1atm}$ = exp((q_{c1Ncs}/113+q_{c1Ncs}/1000)^2-(q_{c1Ncs}/140)^3+(q_{c1Ncs}/137))^4-2.8) (Boulanger&Idriss, 2014, Equation, 2.24), say q_{c1Ncs} <= 300
[17]MSF=1+(MSF_{max}-1)(8.64exp(-M/4)-1.325) MSF_{max}=1.09(q_{c1Ncs}/180)^2<=2.2 (Boulanger&Idriss, Equations 2.19,2.20)
[18]$CRR_{corr.}$=$CRR_{M=7.5,\sigma'vc=1atm}$*$K_\sigma$.MSF (Boulanger and Idriss,2014, Equation 2.7)
[19]$CSR_{M,}$σ'v = 0.65*PHGA*(s_v/s'_{vc})*r_d (Boulanger and Idriss,2014, Equation 2.2)
[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,s'v}$ = factor of safety against liquefaction
[21]$Dq_{c1Ncs-Sr}$ is a function of fines content, values were estimated based on recommendations from Idriss and Boulanger, 2008
[22]$q_{c1Ncs-Sr}$ = q_{c1N} + $Dq_{c1Ncs-Sr}$
[23]S_r/s'_{vo} estimated based on recommendations from Idriss and Boulanger, 2008, Equation 82

FS<=1.0	soil is likely to liquefy
1.0<FS<=1.5	soil is unlikely to liquefy, but could develop excess pore water pressu
FS>1.5	soil is likely to develop negligible excess pore water pressure

Idriss & Boulanger, 2008



Idriss & Boulanger, 2008

FC	$\Delta q_{c1Ncs-Sr}$
10	10
25	25
50	45
75	55

$$\frac{S_r}{\sigma'_{vo}} = \exp\left(\frac{q_{c1Ncs-Sr}}{24.5} - \left(\frac{q_{c1Ncs-Sr}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs-Sr}}{106}\right)^3 - 4.42\right) \leq \tan\phi' \quad (82)$$

for conditions where void redistribution effects are expected to be negligible

ANALYSIS OF LIQUEFACTION POTENTIAL FOR EMBANKMENT AND FOUNDATION

By: CDS 6/1/2020 Site: North Lake, Pine Lake, and Upper Lake Dams
Checked: EMG 6/8/2020 Location: Boiling Spring Lakes, NC

Boulanger&Idriss, CPT and SPT Based Liquefaction Triggering Procedures, April 2014
https://faculty.engineering.ucdavis.edu/boulanger/wp-content/uploads/sites/71/2014/09/Boulanger_Idriss_CPT_and_SPT_Liq_triggering_CGM-14-01_20141.pdf

[1]Earthquake Magnitude, M: 7.3
[2]Peak Ground Acceleration, PHGA (g): 0.14

Jndrained Residual Shear Strengtl

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
NC-01	NB-02	Foundation Soils	15.0	26.2	124	0.9	0.9	158.0	0.390	1.1	0	0.0	158.0	1.0	-0.2	0.0	1.0	0.351	1.052	0.378	0.087	4.328	6.0	164.0	
NC-01	NB-02	Foundation Soils	15.1	26.1	124	0.9	0.9	148.6	0.406	1.1	0	0.0	148.6	1.0	-0.2	0.0	1.0	0.279	1.044	0.298	0.088	3.398	6.0	154.5	
NC-01	NB-02	Foundation Soils	15.2	26.0	124	0.9	0.9	137.3	0.425	1.1	0	0.0	137.3	1.0	-0.2	0.0	1.0	0.223	1.036	0.235	0.088	2.680	6.0	143.3	
NC-01	NB-02	Foundation Soils	15.3	25.9	124	0.9	0.9	125.5	0.446	1.1	0	0.0	125.5	1.0	-0.2	0.0	1.0	0.185	1.029	0.193	0.088	2.193	8.1	133.6	
NC-01	NB-02	Foundation Soils	15.3	25.9	124	0.9	0.9	118.6	0.460	1.1	0	0.0	118.6	1.0	-0.2	0.0	1.0	0.168	1.026	0.175	0.088	1.984	10.5	129.1	
NC-01	NB-02	Foundation Soils	15.4	25.8	124	1.0	0.9	100.0	0.498	1.1	0	0.4	100.0	1.0	-0.2	0.0	1.0	0.137	1.018	0.142	0.088	1.600	17.4	117.0	
NC-01	NB-02	Foundation Soils	15.5	25.7	124	1.0	0.9	85.4	0.532	1.1	0	0.5	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.124	0.089	1.398	23.6	108.5	
NC-01	NB-02	Foundation Soils	15.6	25.6	121	1.0	0.9	64.6	0.590	1.1	0	0.6	64.6	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.089	1.181	33.7	97.8	
NC-01	NB-02	Foundation Soils	15.7	25.5	121	1.0	0.9	53.4	0.626	1.1	0	0.6	53.4	1.0	-0.3	0.0	1.0	0.095	1.008	0.096	0.089	1.081	40.1	93.0	
NC-01	NB-02	Foundation Soils	15.7	25.4	121	1.0	0.9	50.5	0.637	1.1	0	0.6	50.5	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.089	1.054	40.7	90.6	
NC-01	NB-02	Foundation Soils	15.8	25.4	121	1.0	0.9	50.1	0.638	1.1	0	0.6	50.1	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.089	1.048	40.1	89.6	
NC-01	NB-02	Foundation Soils	15.9	25.3	121	1.0	1.0	50.7	0.636	1.1	0	0.6	50.7	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.090	1.050	37.8	87.9	
NC-01	NB-02	Foundation Soils	16.0	25.2	121	1.0	1.0	50.6	0.636	1.1	0	0.5	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.090	1.047	36.3	86.3	
NC-01	NB-02	Foundation Soils	16.1	25.1	121	1.0	1.0	49.1	0.642	1.1	0	0.5	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.090	1.032	33.7	82.2	
NC-01	NB-02	Foundation Soils	16.2	25.0	124	1.0	1.0	48.6	0.644	1.1	0	0.5	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.090	1.026	25.8	73.9	
NC-01	NB-02	Foundation Soils	16.2	25.0	124	1.0	1.0	49.1	0.642	1.1	0	0.4	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.090	1.027	22.0	70.6	
NC-01	NB-02	Foundation Soils	16.3	24.9	124	1.0	1.0	47.6	0.647	1.1	0	0.4	47.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.091	1.014	23.6	70.8	
NC-01	NB-02	Foundation Soils	16.4	24.8	121	1.0	1.0	43.4	0.664	1.1	0	0.5	43.4	1.0	-0.3	0.0	1.0	0.088	1.007	0.089	0.091	0.978	30.8	73.6	0.082
NC-01	NB-02	Foundation Soils	16.5	24.7	121	1.0	1.0	40.0	0.679	1.1	0	0.5	40.0	1.0	-0.3	0.0	1.0	0.085	1.007	0.086	0.091	0.950	32.5	72.0	0.080
NC-01	NB-02	Foundation Soils	16.6	24.6	121	1.0	1.0	34.3	0.705	1.1	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.091	0.905	36.2	70.0	0.077
NC-01	NB-02	Foundation Soils	16.7	24.5	121	1.0	1.0	32.4	0.714	1.1	0	0.5	32.4	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.091	0.889	36.1	68.0	0.075
NC-01	NB-02	Foundation Soils	16.7	24.5	121	1.0	1.0	31.9	0.717	1.1	0	0.5	31.9	1.0	-0.3	0.0	1.0	0.080	1.006	0.081	0.092	0.884	36.4	67.8	0.074
NC-01	NB-02	Foundation Soils	16.8	24.4	121	1.0	1.0	31.1	0.721	1.1	0	0.5	31.1	1.0	-0.3	0.0	1.0	0.080	1.006	0.080	0.092	0.876	35.3	65.9	0.072
NC-01	NB-02	Foundation Soils	16.9	24.3	121	1.0	1.0	29.8	0.728	1.1	0	0.5	29.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.092	0.865	36.1	65.4	0.071
NC-01	NB-02	Foundation Soils	17.0	24.2	121	1.0	1.0	30.8	0.723	1.1	0	0.5	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.092	0.870	36.2	66.5	0.073
NC-01	NB-02	Foundation Soils	17.1	24.1	121	1.1	1.0	32.2	0.715	1.1	0	0.5	32.2	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.092	0.878	38.3	69.9	0.077
NC-01	NB-02	Foundation Soils	17.1	24.0	121	1.1	1.0	34.6	0.703	1.1	0	0.5	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.093	0.894	31.0	65.1	0.071
NC-01	NB-02	Foundation Soils	17.2	24.0	124	1.1	1.0	35.2	0.701	1.0	0	0.4	35.2	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.093	0.896	23.1	57.8	0.062
NC-01	NB-02	Foundation Soils	17.3	23.9	124	1.1	1.0	33.6	0.708	1.0	0	0.4	33.6	1.0	-0.3	0.0	1.0	0.081	1.007	0.082	0.093	0.883	22.8	56.0	0.060
NC-01	NB-02	Foundation Soils	17.4	23.8	121	1.1	1.0	28.0	0.738	1.0	0	0.4	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.093	0.841	28.3	55.9	0.060
NC-01	NB-02	Foundation Soils	17.5	23.7	121	1.1	1.0	20.4	0.782	1.0	0	0.5	20.4	1.0	-0.3	0.0	1.0	0.073	1.006	0.073	0.093	0.787	39.1	59.1	0.064
NC-01	NB-02	Foundation Soils	17.6	23.6	121	1.1	1.0	16.0	0.782	1.0	0	0.5	16.0	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.756	50.8	66.4	0.073
NC-01	NB-02	Foundation Soils	17.6	23.6	121	1.1	1.0	16.9	0.782	1.0	0	0.5	16.9	1.0	-0.3	0.0	1.0	0.071	1.006	0.071	0.094	0.761	51.8	68.2	0.075
NC-01	NB-02	Foundation Soils	17.7	23.5	121	1.1	1.0	19.6	0.782	1.0	0	0.5	19.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.094	0.777	45.6	64.7	0.071
NC-01	NB-02	Foundation Soils	17.8	23.4	121	1.1	1.0	24.7	0.758	1.0	0	0.5	24.7	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.094	0.810	39.2	63.4	0.069
NC-01	NB-02	Foundation Soils	17.9	23.3	121	1.1	1.0	29.1	0.732	1.0	0	0.5	29.1	1.0	-0.3	0.0	0.9	0.078	1.006	0.079	0.094	0.839	34.5	63.1	0.069
NC-01	NB-02	Foundation Soils	18.0	23.2	121	1.1	1.0	30.8	0.723	1.0	0	0.5	30.8	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.094	0.849	33.5	63.8	0.069
NC-01	NB-02	Foundation Soils	18.0	23.1	121	1.1	1.0	31.3	0.720	1.0	0	0.5	31.3	1.0	-0.3	0.0	0.9	0.080	1.006	0.080	0.094	0.851	34.5	65.3	0.071
NC-01	NB-02	Foundation Soils	18.1	23.1	121	1.1	1.0	36.3	0.695	1.0	0	0.5	36.3	1.0	-0.3	0.0	0.9	0.083	1.007	0.084	0.095	0.885	32.1	67.9	0.075
NC-01	NB-02	Foundation Soils	18.2	23.0	121	1.1	1.0	41.0	0.674	1.0	0	0.5	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.095	0.917	29.5	70.0	0.077
NC-01	NB-02	Foundation Soils	18.3	22.9	121	1.1	1.0	44.8	0.659	1.0	0	0.5	44.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.095	0.943	28.1	72.5	0.080
NC-01	NB-02	Foundation Soils	18.4	22.8	121	1.1	1.0	47.4	0.648	1.0	0	0.5	47.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.095	0.961	27.0	73.9	0.082
NC-01	NB-02	Foundation Soils	18.5	22.7	121	1.1	1.0	50.0	0.639	1.0	0	0.5	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.095	0.979	25.8	75.3	0.084
NC-01	NB-02	Foundation Soils	18.5	22.7	124	1.1	1.0	51.8	0.632	1.0	0	0.5	51.8	1.0	-0.3	0.0	0.9	0.094	1.008	0.094	0.095	0.990	25.6	76.9	0.086
NC-01	NB-02	Foundation Soils	18.6	22.6	124	1.1	1.0	54.8	0.622	1.0	0	0.5	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.097	0.096	1.012	24.2	78.5	
NC-01	NB-02	Foundation Soils	18.7	22.5	124	1.2	1.0	56.5	0.616	1.0	0	0.5	56.5	1.0	-0.3	0.0	0.9	0.097	1.008	0.098	0.096	1.024	23.8	79.9	
NC-01	NB-02	Foundation Soils	18.8	22.4	124	1.2	1.0	58.2	0.610	1.0	0	0.5	58.2	1.0	-0.3	0.0	0.9	0.098	1.008	0.099	0.096	1.035	23.5	81.2	
NC-01	NB-02	Foundation Soils	18.9	22.3	124	1.2	1.0	59.3	0.607	1.0	0	0.5	59.3	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.096	1.041	23.7	82.5	
NC-01	NB-02	Foundation Soils	18.9	22.2	124	1.2	1.0	60.2	0.603	1.0	0	0.5	60.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.101	0.096	1.047	23.7	83.5	
NC-01	NB-02	Foundation Soils	19.0	22.2	124	1.2	1.0	61.5	0.599	1.0	0	0.5	61.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.096	1.055	23.5	84.4	
NC-01	NB-02	Foundation Soils	19.1	22.1	124	1.2	1.0	62.1	0.597	1.0	0	0.5	62.1	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.096	1.059	23.7	85.3	
NC-01	NB-02	Foundation Soils	19.2	22.0	124	1.2	1.0	63.5	0.593	1.0	0	0.5	63.5	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.097	1.068	23.6	86.5	
NC-01	NB-02	Foundation Soils	19.3	21.9	124	1.2	1.1	64.9	0.589	1.0	0	0.5	64.9	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.097	1.078	23.3	87.7	
NC-01	NB-02	Foundation Soils	19.4	21.8	124	1.2	1.1	65.4	0.587	1.0	0	0.5	65.4	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.097	1.080	23.5	88.5	
NC-01	NB-02	Foundation Soils	19.4	21.8	124	1.2	1.1	65.6	0.587	1.0	0	0.4	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.097	1.080	21.9	87.1	
NC-01	NB-02	Foundation Soils	19.5	21.7	124	1.2	1.1	65.5	0.587	1.0	0	0.5	65.5	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.097	1.077	23.0	88.0	
NC-01	NB-02	Foundation Soils	19.6	21.6	124	1.2	1.1	65.6	0.587	1.0	0	0.5	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.097	1.076	23.8	89.0	
NC-01	NB-02	Foundation Soils	19.7	21.5	124	1.2	1.1	65.8	0.586	1.0	0	0.5	65.8	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.097	1.076	24.7	90.0	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
NC-01	NB-02	Foundation Soils	19.8	21.4	121	1.2	1.1	63.9	0.592	1.0	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.098	1.058	26.0	89.4	
NC-01	NB-02	Foundation Soils	19.8	21.3	121	1.2	1.1	63.7	0.592	1.0	0	0.5	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.098	1.056	26.3	89.6	
NC-01	NB-02	Foundation Soils	19.9	21.3	121	1.2	1.1	63.9	0.592	1.0	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.098	1.055	26.3	89.7	
NC-01	NB-02	Foundation Soils	20.0	21.2	121	1.2	1.1	65.1	0.588	1.0	0	0.5	65.1	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.098	1.063	25.5	90.0	
NC-01	NB-02	Foundation Soils	20.1	21.1	124	1.2	1.1	65.9	0.586	1.0	0	0.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.098	1.068	24.7	90.1	
NC-01	NB-02	Foundation Soils	20.2	21.0	124	1.2	1.1	66.6	0.584	1.0	0	0.5	66.6	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.098	1.072	24.5	90.6	
NC-01	NB-02	Foundation Soils	20.3	20.9	124	1.2	1.1	67.8	0.580	1.0	0	0.5	67.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.098	1.080	24.0	91.3	
NC-01	NB-02	Foundation Soils	20.3	20.9	124	1.3	1.1	68.5	0.578	1.0	0	0.5	68.5	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.099	1.084	23.6	91.6	
NC-01	NB-02	Foundation Soils	20.4	20.8	124	1.3	1.1	68.9	0.577	1.0	0	0.5	68.9	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.099	1.086	23.5	91.9	
NC-01	NB-02	Foundation Soils	20.5	20.7	124	1.3	1.1	69.1	0.576	1.0	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.099	1.086	24.0	92.6	
NC-01	NB-02	Foundation Soils	20.6	20.6	124	1.3	1.1	69.1	0.576	1.0	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.099	1.084	24.6	93.2	
NC-01	NB-02	Foundation Soils	20.7	20.5	121	1.3	1.1	68.3	0.579	1.0	0	0.5	68.3	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.099	1.076	25.1	92.9	
NC-01	NB-02	Foundation Soils	20.8	20.4	121	1.3	1.1	67.0	0.582	1.0	0	0.5	67.0	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.099	1.064	25.8	92.3	
NC-01	NB-02	Foundation Soils	20.8	20.4	121	1.3	1.1	64.0	0.591	1.0	0	0.5	64.0	1.0	-0.4	0.0	0.9	0.103	1.009	0.103	0.099	1.038	27.3	90.8	
NC-01	NB-02	Foundation Soils	20.9	20.3	121	1.3	1.1	60.8	0.602	1.0	0	0.5	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.100	1.012	29.3	89.6	
NC-01	NB-02	Foundation Soils	21.0	20.2	121	1.3	1.1	59.2	0.607	1.0	0	0.5	59.2	1.0	-0.4	0.0	0.9	0.099	1.009	0.099	0.100	0.998	30.3	89.0	0.103
NC-01	NB-02	Foundation Soils	21.1	20.1	121	1.3	1.1	56.2	0.617	1.0	0	0.5	56.2	1.0	-0.4	0.0	0.9	0.097	1.008	0.097	0.100	0.974	31.9	87.5	0.101
NC-01	NB-02	Foundation Soils	21.2	20.0	121	1.3	1.1	54.3	0.623	1.0	0	0.5	54.3	1.0	-0.4	0.0	0.9	0.095	1.008	0.096	0.100	0.958	32.3	86.1	0.099
NC-01	NB-02	Foundation Soils	21.2	19.9	121	1.3	1.1	51.9	0.632	1.0	0	0.5	51.9	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.100	0.940	33.1	84.4	0.096
NC-01	NB-02	Foundation Soils	21.3	19.9	121	1.3	1.1	50.7	0.636	1.0	0	0.5	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.100	0.930	33.1	83.3	0.095
NC-01	NB-02	Foundation Soils	21.4	19.8	121	1.3	1.1	49.8	0.639	1.0	0	0.5	49.8	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.100	0.922	32.9	82.1	0.093
NC-01	NB-02	Foundation Soils	21.5	19.7	121	1.3	1.1	48.9	0.643	1.0	0	0.5	48.9	1.0	-0.4	0.0	0.9	0.092	1.007	0.092	0.100	0.915	33.1	81.5	0.092
NC-01	NB-02	Foundation Soils	21.6	19.6	121	1.3	1.1	48.6	0.644	1.0	0	0.5	48.6	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.101	0.911	33.3	81.3	0.092
NC-01	NB-02	Foundation Soils	21.7	19.5	121	1.3	1.1	49.3	0.641	1.0	0	0.5	49.3	1.0	-0.4	0.0	0.9	0.092	1.008	0.092	0.101	0.915	32.4	81.2	0.092
NC-01	NB-02	Foundation Soils	21.7	19.5	121	1.3	1.1	51.4	0.633	1.0	0	0.5	51.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.101	0.929	30.3	81.2	0.092
NC-01	NB-02	Foundation Soils	21.8	19.4	121	1.3	1.1	53.6	0.626	1.0	0	0.5	53.6	1.0	-0.4	0.0	0.9	0.095	1.008	0.095	0.101	0.943	28.3	81.4	0.092
NC-01	NB-02	Foundation Soils	21.9	19.3	121	1.3	1.1	57.7	0.612	1.0	0	0.5	57.7	1.0	-0.4	0.0	0.9	0.098	1.008	0.098	0.101	0.971	26.0	83.2	0.094
NC-01	NB-02	Foundation Soils	22.0	19.2	124	1.4	1.1	60.7	0.602	1.0	0	0.5	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.101	0.993	24.3	84.5	0.096
NC-01	NB-02	Foundation Soils	22.1	19.1	124	1.4	1.1	61.0	0.601	1.0	0	0.5	61.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.101	0.993	24.7	85.2	0.097
NC-01	NB-02	Foundation Soils	22.1	19.0	121	1.4	1.1	60.6	0.602	1.0	0	0.5	60.6	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.101	0.989	25.2	85.3	0.097
NC-01	NB-02	Foundation Soils	22.2	19.0	121	1.4	1.1	57.1	0.614	1.0	0	0.5	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.098	0.101	0.962	27.6	84.1	0.096
NC-01	NB-02	Foundation Soils	22.3	18.9	121	1.4	1.1	50.6	0.637	1.0	0	0.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.102	0.914	33.0	83.0	0.094
NC-01	NB-02	Foundation Soils	22.4	18.8	121	1.4	1.1	42.7	0.667	0.9	0	0.5	42.7	1.0	-0.4	0.0	0.9	0.087	1.007	0.087	0.102	0.859	39.2	81.4	0.092
NC-01	NB-02	Foundation Soils	22.5	18.7	121	1.4	1.1	37.9	0.688	0.9	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.084	0.102	0.826	42.4	79.7	0.090
NC-01	NB-02	Foundation Soils	22.6	18.6	121	1.4	1.2	35.7	0.698	0.9	0	0.5	35.7	1.0	-0.4	0.0	0.9	0.083	1.007	0.083	0.102	0.811	43.8	79.0	0.089
NC-01	NB-02	Foundation Soils	22.6	18.6	121	1.4	1.2	35.6	0.699	0.9	0	0.5	35.6	1.0	-0.4	0.0	0.9	0.082	1.007	0.083	0.102	0.809	43.0	78.1	0.088
NC-01	NB-02	Foundation Soils	22.7	18.5	121	1.4	1.2	35.4	0.699	0.9	0	0.5	35.4	1.0	-0.4	0.0	0.9	0.082	1.007	0.082	0.102	0.807	40.3	75.2	0.084
NC-01	NB-02	Foundation Soils	22.8	18.4	121	1.4	1.2	32.8	0.712	0.9	0	0.5	32.8	1.0	-0.4	0.0	0.9	0.081	1.007	0.081	0.102	0.789	40.2	72.5	0.080
NC-01	NB-02	Foundation Soils	22.9	18.3	121	1.4	1.2	30.5	0.724	0.9	0	0.5	30.5	1.0	-0.4	0.0	0.9	0.079	1.006	0.079	0.102	0.773	41.2	71.1	0.079
NC-01	NB-02	Foundation Soils	23.0	18.2	121	1.4	1.2	26.7	0.746	0.9	0	0.5	26.7	1.0	-0.4	0.0	0.9	0.077	1.006	0.077	0.103	0.748	44.0	70.1	0.077
NC-01	NB-02	Foundation Soils	23.0	18.1	121	1.4	1.2	23.8	0.763	0.9	0	0.5	23.8	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.730	47.4	70.7	0.078
NC-01	NB-02	Foundation Soils	23.1	18.1	121	1.4	1.2	22.2	0.773	0.9	0	0.5	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.719	49.1	70.8	0.078
NC-01	NB-02	Foundation Soils	23.2	18.0	121	1.4	1.2	23.0	0.768	0.9	0	0.5	23.0	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.723	47.2	69.7	0.077
NC-01	NB-02	Foundation Soils	23.3	17.9	121	1.4	1.2	24.5	0.759	0.9	0	0.5	24.5	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.731	44.2	68.2	0.075
NC-01	NB-02	Foundation Soils	23.4	17.8	121	1.4	1.2	24.0	0.762	0.9	0	0.5	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.728	44.7	68.2	0.075
NC-01	NB-02	Foundation Soils	23.5	17.7	121	1.4	1.2	23.4	0.766	0.9	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.723	45.7	68.6	0.075
NC-01	NB-02	Foundation Soils	23.5	17.7	121	1.4	1.2	22.9	0.769	0.9	0	0.5	22.9	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.719	46.1	68.5	0.075
NC-01	NB-02	Foundation Soils	23.6	17.6	121	1.5	1.2	22.3	0.773	0.9	0	0.5	22.3	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.715	47.3	69.1	0.076
NC-01	NB-02	Foundation Soils	23.7	17.5	121	1.5	1.2	21.3	0.779	0.9	0	0.5	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.103	0.708	49.0	69.8	0.077
NC-01	NB-02	Foundation Soils	23.8	17.4	115	1.5	1.2	67.7	0.580	0.9	30	47.4	67.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.104	1.018	50.9	71.2	
NC-01	NB-02	Foundation Soils	23.9	17.3	115	1.5	1.2	65.9	0.586	0.9	30	47.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.104	0.104	1.004	57.0	75.4	
NC-01	NB-02	Foundation Soils	23.9	17.2	115	1.5	1.2	64.4	0.590	0.9	30	47.4	64.4	1.0	-0.4	0.1	0.9	0.103	1.009	0.103	0.104	0.991	59.8	76.8	0.086
NC-01	NB-02	Foundation Soils	24.0	17.2	115	1.5	1.2	62.8	0.595	0.9	30	47.2	62.8	1.0	-0.4	0.1	0.9	0.102	1.009	0.102	0.104	0.978	62.8	78.4	0.088
NC-01	NB-02	Foundation Soils	24.1	17.1	115	1.5	1.2	60.9	0.601	0.9	30	47.0	60.9	1.0	-0.4	0.1	0.9	0.100	1.009	0.100	0.104	0.963	66.9	80.8	0.091
NC-01	NB-02	Foundation Soils	24.2	17.0	115	1.5	1.2	59.5	0.606	0.9	30	46.8	59.5	1.0	-0.5	0.1	0.9	0.099	1.009	0.099	0.104	0.952	69.3	81.9	0.093
NC-01	NB-02	Foundation Soils	24.3	16.9	115	1.5	1.2	57.7	0.612	0.9	30	46.5	57.7	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.104	0.938	71.9	83.1	0.094
NC-01	NB-02	Foundation Soils	24.4	16.8	115	1.5	1.2	57.4	0.612	0.9	30	46.4	57.4	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.104	0.935	69.2	80.3	0.091
NC-01	NB-02	Foundation Soils	24.4	16.7	115	1.5	1.2	57.8	0.611	0.9	30	46.3	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.104	0.936	64.3	75.8	0.085
NC-01	NB-02	Foundation Soils	24.5	16.7	115	1.5	1.2	57.9	0.611	0.9	30	46.1	57.9	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.104	0.936	60.2	72.0	0.080
NC-01	NB-02	Foundation Soils	24.6	16.6	115	1.5	1.2	57.8	0.611	0.9	30	46.0	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.105	0.935	58.2	70.0	0.077
NC-01	NB-02	Foundation Soils	24.7	16.5	115	1.5	1.2	58.0	0.611	0.9	30	46.0	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.105	0.935	58.2	70.2	0.077
NC-01	NB-02	Foundation Soils	24.8	16.4	115	1.5	1.2	58.0	0.611	0.9	30	46.1	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.105	0.934	58.8	70.8	0.078
NC-01	NB-02	Foundation Soils	24.9	16.3	115	1.5	1.2	57.6	0.612	0.9	30	46.1	57.6	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.105	0.930	62.1	73.5	0.082
NC-01	NB-02	Foundation Soils	24.9	16.3	115	1.5	1.2	57.3	0.613	0.9	30	46.2	57.3	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.105	0.927	65.7	76.8	0.086
NC-01	NB-02	Foundation Soils	25.0	16.2	115	1.5	1.2	57.1	0.614	0.9	30	46.3	57.1	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.105	0.925	68.0	78.9	0.089
NC-01	NB-02	Foundation Soils	25.1	16.1	115	1.5	1.2	57.2	0.613	0.9	30	46.1	57.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.105	0.924	62.7	73.8	0.082
NC-01	NB-02	Foundation Soils	25.2	16.0	115	1.5	1.2	56.4	0.616	0.9	30	45.9	56.4	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.105	0.918	62.3	72.8	0.081

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
NC-01	NB-02	Foundation Soils	25.3	15.9	115	1.5	1.2	56.0	0.617	0.9	30	45.9	56.0	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.105	0.914	65.1	75.2	0.084
NC-01	NB-02	Foundation Soils	25.3	15.8	115	1.5	1.2	56.2	0.617	0.9	30	45.9	56.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.105	0.915	63.8	74.1	0.082
NC-01	NB-02	Foundation Soils	25.4	15.8	115	1.6	1.2	55.6	0.619	0.9	30	45.9	55.6	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.106	0.910	65.7	75.4	0.084
NC-01	NB-02	Foundation Soils	25.5	15.7	115	1.6	1.2	55.0	0.621	0.9	30	45.8	55.0	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.106	0.905	66.5	75.8	0.085
NC-01	NB-02	Foundation Soils	25.6	15.6	115	1.6	1.2	43.2	0.665	0.9	15	35.0	43.2	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.106	0.825	69.8	78.0	0.088
NC-01	NB-02	Foundation Soils	25.7	15.5	111	1.6	1.2	41.8	0.671	0.9	15	34.8	41.8	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.106	0.816	72.0	78.9	0.089
NC-01	NB-02	Foundation Soils	25.8	15.4	111	1.6	1.2	39.7	0.680	0.9	15	34.5	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.106	0.801	75.4	80.5	0.091
NC-01	NB-02	Foundation Soils	25.8	15.4	111	1.6	1.2	38.2	0.686	0.9	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.106	0.792	75.4	79.3	0.089
NC-01	NB-02	Foundation Soils	25.9	15.3	111	1.6	1.2	38.2	0.686	0.9	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.106	0.791	75.4	79.3	0.089
NC-01	NB-02	Foundation Soils	26.0	15.2	115	1.6	1.2	43.1	0.666	0.9	15	35.0	43.1	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.106	0.821	71.3	79.4	0.089
NC-01	NB-02	Foundation Soils	26.1	15.1	115	1.6	1.2	46.1	0.653	0.9	15	35.2	46.1	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.106	0.839	61.4	72.4	0.080
NC-01	NB-02	Foundation Soils	26.2	15.0	121	1.6	1.2	48.3	0.645	0.9	15	34.9	48.3	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.106	0.853	49.6	63.0	0.068
NC-01	NB-02	Foundation Soils	26.2	14.9	121	1.6	1.3	49.1	0.642	0.9	15	34.9	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.106	0.857	48.6	62.8	0.068
NC-01	NB-02	Foundation Soils	26.3	14.9	121	1.6	1.3	51.1	0.635	0.9	15	34.9	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.869	45.2	61.4	0.067
NC-01	NB-02	Foundation Soils	26.4	14.8	121	1.6	1.3	51.1	0.635	0.9	15	34.7	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.869	43.6	59.9	0.065
NC-01	NB-02	Foundation Soils	26.5	14.7	121	1.6	1.3	51.4	0.633	0.9	15	34.8	51.4	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.870	43.4	60.1	0.065
NC-01	NB-02	Foundation Soils	26.6	14.6	121	1.6	1.3	51.2	0.634	0.9	15	34.6	51.2	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.868	42.3	58.9	0.064
NC-01	NB-02	Foundation Soils	26.7	14.5	121	1.6	1.3	51.0	0.635	0.9	15	34.3	51.0	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.866	40.6	57.3	0.062
NC-01	NB-02	Foundation Soils	26.7	14.5	121	1.6	1.3	51.5	0.633	0.9	15	34.4	51.5	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.869	40.3	57.5	0.062
NC-01	NB-02	Foundation Soils	26.8	14.4	121	1.6	1.3	52.0	0.631	0.9	15	34.5	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.107	0.871	40.6	58.1	0.063
NC-01	NB-02	Foundation Soils	26.9	14.3	121	1.6	1.3	51.1	0.635	0.9	15	34.5	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.864	41.7	58.3	0.063
NC-01	NB-02	Foundation Soils	27.0	14.2	121	1.6	1.3	49.9	0.639	0.9	15	34.5	49.9	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.107	0.856	43.1	58.6	0.063
NC-01	NB-02	Foundation Soils	27.1	14.1	121	1.7	1.3	49.1	0.642	0.9	15	34.4	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.107	0.850	43.7	58.4	0.063
NC-01	NB-02	Foundation Soils	27.1	14.0	121	1.7	1.3	48.9	0.643	0.9	15	34.2	48.9	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.107	0.848	42.2	56.8	0.061
NC-01	NB-02	Foundation Soils	27.2	14.0	121	1.7	1.3	49.0	0.642	0.9	15	34.1	49.0	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.107	0.848	41.1	56.0	0.060
NC-01	NB-02	Foundation Soils	27.3	13.9	121	1.7	1.3	49.8	0.639	0.9	15	33.7	49.8	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.107	0.853	38.1	54.2	0.058
NC-01	NB-02	Foundation Soils	27.4	13.8	121	1.7	1.3	50.8	0.636	0.9	15	33.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.108	0.858	35.5	53.0	0.057
NC-01	NB-02	Foundation Soils	27.5	13.7	121	1.7	1.3	52.0	0.631	0.9	15	32.8	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.108	0.865	32.8	51.9	0.056
NC-01	NB-02	Foundation Soils	27.6	13.6	121	1.7	1.3	52.6	0.629	0.9	15	31.9	52.6	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.108	0.869	30.0	50.6	0.054
NC-01	NB-02	Foundation Soils	27.6	13.6	121	1.7	1.3	52.9	0.628	0.9	15	31.9	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.108	0.870	29.7	50.7	0.054
NC-01	NB-02	Foundation Soils	27.7	13.5	121	1.7	1.3	53.1	0.627	0.9	15	32.1	53.1	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.108	0.870	30.1	51.1	0.055
NC-01	NB-02	Foundation Soils	27.8	13.4	121	1.7	1.3	52.9	0.628	0.9	15	32.3	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.108	0.868	30.8	51.4	0.055
NC-01	NB-02	Foundation Soils	27.9	13.3	121	1.7	1.3	52.3	0.630	0.9	15	32.6	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.108	0.863	31.9	51.5	0.055
NC-01	NB-02	Foundation Soils	28.0	13.2	121	1.7	1.3	51.7	0.632	0.9	15	32.7	51.7	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.108	0.859	32.6	51.6	0.055
NC-01	NB-02	Foundation Soils	28.1	13.1	121	1.7	1.3	50.8	0.636	0.9	15	32.9	50.8	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.108	0.853	33.6	51.5	0.055
NC-01	NB-02	Foundation Soils	28.1	13.1	121	1.7	1.3	50.1	0.638	0.9	15	33.0	50.1	1.0	-0.6	0.1	0.9	0.092	1.008	0.092	0.108	0.847	34.4	51.5	0.055
NC-01	NB-02	Foundation Soils	28.2	13.0	121	1.7	1.3	49.5	0.641	0.9	15	33.1	49.5	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.108	0.843	35.3	51.7	0.055
NC-01	NB-02	Foundation Soils	28.3	12.9	121	1.7	1.3	49.1	0.642	0.9	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.108	0.840	36.0	51.9	0.055
NC-01	NB-02	Foundation Soils	28.4	12.8	121	1.7	1.3	49.0	0.642	0.9	15	33.2	49.0	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.108	0.839	36.1	51.9	0.055
NC-01	NB-02	Foundation Soils	28.5	12.7	121	1.7	1.3	49.1	0.642	0.9	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.108	0.839	35.9	51.9	0.055
NC-01	NB-02	Foundation Soils	28.5	12.6	121	1.7	1.3	49.3	0.641	0.9	15	33.3	49.3	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.109	0.839	36.2	52.2	0.056
NC-01	NB-02	Foundation Soils	28.6	12.6	121	1.7	1.3	49.8	0.639	0.9	15	33.8	49.8	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.109	0.842	38.3	54.4	0.058
NC-01	NB-02	Foundation Soils	28.7	12.5	121	1.8	1.3	49.6	0.640	0.9	15	34.2	49.6	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.109	0.840	41.0	56.4	0.061
NC-01	NB-02	Foundation Soils	28.8	12.4	121	1.8	1.3	47.9	0.646	0.9	15	34.3	47.9	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.109	0.829	44.0	57.7	0.062
NC-01	NB-02	Foundation Soils	28.9	12.3	121	1.8	1.3	46.3	0.653	0.9	15	34.5	46.3	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.109	0.818	49.1	60.9	0.066
NC-01	NB-02	Foundation Soils	29.0	12.2	115	1.8	1.3	44.6	0.659	0.9	15	35.0	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.109	0.807	63.1	72.7	0.081
NC-01	NB-02	Foundation Soils	29.0	12.2	115	1.8	1.3	42.5	0.668	0.9	15	34.9	42.5	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.109	0.793	72.5	80.1	0.090
NC-01	NB-02	Foundation Soils	29.1	12.1	111	1.8	1.3	41.6	0.672	0.9	15	34.8	41.6	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.109	0.787	75.3	82.1	0.093
NC-01	NB-02	Foundation Soils	29.2	12.0	111	1.8	1.3	41.5	0.672	0.9	15	34.8	41.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.109	0.786	75.0	81.7	0.093
NC-01	NB-02	Foundation Soils	29.3	11.9	111	1.8	1.3	42.0	0.670	0.9	15	34.9	42.0	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.109	0.788	75.4	82.5	0.094
NC-01	NB-02	Foundation Soils	29.4	11.8	111	1.8	1.3	42.7	0.667	0.9	15	35.0	42.7	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.109	0.792	75.4	83.0	0.094
NC-01	NB-02	Foundation Soils	29.4	11.7	111	1.8	1.3	44.6	0.659	0.9	15	35.3	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.109	0.803	75.1	84.4	0.096
NC-01	NB-02	Foundation Soils	29.5	11.7	115	1.8	1.3	45.6	0.655	0.9	15	35.3	45.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.109	0.809	68.8	79.1	0.089
NC-01	NB-02	Foundation Soils	29.6	11.6	115	1.8	1.3	52.2	0.631	0.9	15	36.0	52.2	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.109	0.850	57.7	73.9	0.082
NC-01	NB-02	Foundation Soils	29.7	11.5	121	1.8	1.3	54.8	0.621	0.9	15	35.6	54.8	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.109	0.866	46.6	65.7	0.072
NC-01	NB-02	Foundation Soils	29.8	11.4	121	1.8	1.4	63.3	0.594	0.9	15	34.4	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.110	0.922	32.7	61.5	0.067
NC-01	NB-02	Foundation Soils	29.9	11.3	124	1.8	1.4	69.4	0.575	0.9	15	30.6	69.4	1.0	-0.6	0.1	0.9	0.107	1.010	0.106	0.110	0.964	24.0	62.8	0.068
NC-01	NB-02	Foundation Soils	29.9	11.3	124	1.8	1.4	74.5	0.561	0.9	15	30.6	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.110	0.110	1.002	23.3	67.2	
NC-01	NB-02	Foundation Soils	30.0	11.2	124	1.8	1.4	52.3	0.630	0.9	15	4.1	52.3	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.110	0.847	11.7	59.8	0.065
NC-01	NB-02	Foundation Soils	30.1	11.1	124	1.8	1.4	55.2	0.620	0.9	15	0.0	55.2	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.110	0.865	8.6	63.8	0.069
NC-01	NB-02	Foundation Soils	30.2	11.0	124	1.8	1.4	61.0	0.601	0.9	15	0.5	61.0	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.110	0.904	9.7	70.3	0.077
NC-01	NB-02	Foundation Soils	30.3	10.9	124	1.8	1.4	60.3	0.603	0.9	15	0.0	60.3	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.110	0.898	8.5	68.8	0.076
NC-01	NB-02	Foundation Soils	30.3	10.8	124	1.8	1.4	76.5	0.555	0.9	15	18.9	76.5	1.0	-0.6	0.1	0.9	0.113	1.011	0.111	0.110	1.014	16.2	73.8	
NC-01	NB-02	Foundation Soils	30.4	10.8	124	1.9	1.4	73.1	0.565	0.9	15	13.4	73.1	1.0	-0.6	0.1	0.9	0.110	1.011	0.109	0.110	0.987	14.4	74.1	0.082
NC-01	NB-02	Foundation Soils	30.5	10.7	124	1.9	1.4	66.0	0.586	0.9	15	0.0	66.0	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.110	0.935	7.6	73.5	0.082
NC-01	NB-02	Foundation Soils	30.6	10.6	124	1.9	1.4	63.3	0.594	0.9	15	0.0	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.110	0.916	6.2	69.5	0.077
NC-01	NB-02	Foundation Soils	30.7	10.5	124	1.9	1.4	62.0	0.598	0.9	15	5.4	62.0	1.0	-0.6	0.1	0.9	0.101	1.009	0.100	0.110	0.907	12.1	68.6	0.075

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
NC-01	NB-02	Foundation Soils	30.8	10.4	124	1.9	1.4	75.9	0.557	0.9	15	18.9	75.9	1.0	-0.6	0.1	0.9	0.112	1.011	0.111	0.110	1.006	16.2	73.3	
NC-01	NB-02	Foundation Soils	30.8	10.4	124	1.9	1.4	66.7	0.583	0.9	15	4.6	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.110	0.938	11.8	73.9	0.082
NC-01	NB-02	Foundation Soils	30.9	10.3	124	1.9	1.4	64.7	0.589	0.9	15	0.0	64.7	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.110	0.924	8.5	73.2	0.081
NC-01	NB-02	Foundation Soils	31.0	10.2	124	1.9	1.4	67.0	0.582	0.9	15	0.0	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.104	0.110	0.939	7.7	74.7	0.083
NC-01	NB-02	Foundation Soils	31.1	10.1	124	1.9	1.4	68.7	0.577	0.9	15	4.6	68.7	1.0	-0.6	0.1	0.9	0.106	1.010	0.105	0.110	0.950	11.7	75.9	0.085
NC-01	NB-02	Foundation Soils	31.2	10.0	124	1.9	1.4	82.4	0.540	0.9	15	21.8	82.4	1.0	-0.6	0.1	0.9	0.118	1.013	0.117	0.110	1.056	17.2	77.8	
NC-01	NB-02	Foundation Soils	31.2	9.9	124	1.9	1.4	72.8	0.566	0.9	15	12.6	72.8	1.0	-0.6	0.1	0.9	0.110	1.011	0.108	0.110	0.979	14.2	74.3	0.083
NC-01	NB-02	Foundation Soils	31.3	9.9	124	1.9	1.4	69.5	0.575	0.9	15	0.0	69.5	1.0	-0.6	0.1	0.9	0.107	1.010	0.105	0.110	0.954	8.7	78.1	0.088
NC-01	NB-02	Foundation Soils	31.4	9.8	124	1.9	1.4	66.7	0.583	0.8	15	1.0	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.111	0.934	10.1	75.9	0.085
NC-01	NB-02	Foundation Soils	31.5	9.7	124	1.9	1.4	65.8	0.586	0.8	15	1.4	65.8	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.111	0.928	10.4	74.8	0.083
NC-01	NB-02	Foundation Soils	31.6	9.6	124	1.9	1.4	65.0	0.589	0.8	15	0.1	65.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.111	0.921	8.9	73.8	0.082
NC-01	NB-02	Foundation Soils	31.7	9.5	124	1.9	1.4	66.6	0.584	0.8	15	0.0	66.6	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.111	0.932	6.0	72.6	0.080
NC-01	NB-02	Foundation Soils	31.7	9.4	124	1.9	1.4	66.6	0.584	0.8	15	0.0	66.6	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.111	0.931	6.0	72.6	0.080
NC-01	NB-02	Foundation Soils	31.8	9.4	124	1.9	1.4	67.0	0.582	0.8	15	0.0	67.0	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.111	0.933	6.0	73.0	0.081
NC-01	NB-02	Foundation Soils	31.9	9.3	119	1.9	1.4	66.2	0.585	0.8	15	0.0	66.2	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.111	0.928	6.0	72.2	0.080
NC-01	NB-02	Foundation Soils	32.0	9.2	124	1.9	1.4	62.2	0.597	0.8	15	0.0	62.2	1.0	-0.7	0.1	0.9	0.101	1.009	0.100	0.111	0.900	6.0	68.2	0.075
NC-01	NB-02	Foundation Soils	32.1	9.1	124	2.0	1.4	57.0	0.614	0.8	15	0.0	57.0	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.111	0.865	6.0	62.9	0.068
NC-01	NB-02	Foundation Soils	32.2	9.0	124	2.0	1.4	52.6	0.629	0.8	15	0.0	52.6	1.0	-0.7	0.1	0.9	0.094	1.008	0.093	0.111	0.837	7.3	60.0	0.065
NC-01	NB-02	Foundation Soils	32.2	9.0	124	2.0	1.4	50.0	0.639	0.8	15	0.0	50.0	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.111	0.820	8.7	58.6	0.063
NC-01	NB-02	Foundation Soils	32.3	8.9	124	2.0	1.4	49.0	0.642	0.8	15	3.3	49.0	1.0	-0.7	0.1	0.9	0.092	1.007	0.090	0.111	0.814	11.4	57.1	0.061
NC-01	NB-02	Foundation Soils	32.4	8.8	124	2.0	1.4	51.3	0.634	0.8	15	9.8	51.3	1.0	-0.7	0.1	0.9	0.093	1.008	0.092	0.111	0.827	13.6	55.1	0.059
NC-01	NB-02	Foundation Soils	32.5	8.7	124	2.0	1.4	46.4	0.652	0.8	15	1.9	46.4	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.111	0.797	10.8	55.2	0.059
NC-01	NB-02	Foundation Soils	32.6	8.6	124	2.0	1.4	46.8	0.651	0.8	15	0.7	46.8	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.111	0.799	9.9	56.1	0.060
NC-01	NB-02	Foundation Soils	32.6	8.5	124	2.0	1.4	49.7	0.640	0.8	15	0.2	49.7	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.111	0.816	9.3	58.8	0.063
NC-01	NB-02	Foundation Soils	32.7	8.5	124	2.0	1.4	49.5	0.641	0.8	15	0.5	49.5	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.111	0.815	9.7	58.7	0.063
NC-01	NB-02	Foundation Soils	32.8	8.4	124	2.0	1.4	50.8	0.636	0.8	15	0.3	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.111	0.822	9.4	60.0	0.065
NC-01	NB-02	Foundation Soils	32.9	8.3	124	2.0	1.4	68.7	0.577	0.8	15	21.7	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.111	0.939	17.6	64.7	0.071
NC-01	NB-02	Foundation Soils	33.0	8.2	124	2.0	1.4	72.5	0.567	0.8	15	29.3	72.5	1.0	-0.7	0.1	0.9	0.109	1.011	0.107	0.111	0.965	22.3	65.4	0.071
NC-01	NB-02	Foundation Soils	33.1	8.1	124	2.0	1.5	68.7	0.577	0.8	15	23.4	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.111	0.938	18.5	63.8	0.069
NC-01	NB-02	Foundation Soils	33.1	8.1	124	2.0	1.5	66.8	0.583	0.8	15	15.3	66.8	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.111	0.925	15.1	66.7	0.073
NC-01	NB-02	Foundation Soils	33.2	8.0	124	2.0	1.5	59.1	0.607	0.8	15	2.6	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.111	0.873	11.0	67.6	0.074
NC-01	NB-02	Foundation Soils	33.3	7.9	124	2.0	1.5	60.0	0.604	0.8	15	2.6	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.111	0.879	11.0	68.5	0.075
NC-01	NB-02	Foundation Soils	33.4	7.8	124	2.0	1.5	60.0	0.604	0.8	15	4.9	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.112	0.878	11.9	67.0	0.073
NC-01	NB-02	Foundation Soils	33.5	7.7	124	2.0	1.5	73.0	0.565	0.8	15	17.0	73.0	1.0	-0.7	0.1	0.9	0.110	1.011	0.108	0.112	0.967	15.6	71.6	0.079
NC-01	NB-02	Foundation Soils	33.5	7.6	124	2.0	1.5	81.2	0.543	0.8	15	28.3	81.2	1.0	-0.7	0.1	0.9	0.117	1.012	0.115	0.112	1.029	20.7	73.6	
NC-01	NB-02	Foundation Soils	33.6	7.6	121	2.1	1.5	85.1	0.533	0.8	15	33.3	85.1	1.0	-0.7	0.1	0.9	0.121	1.013	0.118	0.112	1.061	24.8	76.6	
NC-01	NB-02	Foundation Soils	33.7	7.5	124	2.1	1.5	71.5	0.569	0.8	15	22.0	71.5	1.0	-0.7	0.1	0.9	0.109	1.010	0.107	0.112	0.955	17.7	67.2	0.074
NC-01	NB-02	Foundation Soils	33.8	7.4	124	2.1	1.5	69.7	0.574	0.8	15	18.5	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.112	0.941	16.2	67.5	0.074
NC-01	NB-02	Foundation Soils	33.9	7.3	124	2.1	1.5	67.1	0.582	0.8	15	14.3	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.112	0.923	14.8	67.7	0.074
NC-01	NB-02	Foundation Soils	34.0	7.2	124	2.1	1.5	68.8	0.577	0.8	15	16.6	68.8	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.112	0.934	15.5	67.8	0.074
NC-01	NB-02	Foundation Soils	34.0	7.2	124	2.1	1.5	69.2	0.576	0.8	15	23.2	69.2	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.112	0.936	18.4	64.3	0.070
NC-01	NB-02	Foundation Soils	34.1	7.1	124	2.1	1.5	68.6	0.578	0.8	15	23.7	68.6	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.112	0.932	18.7	63.5	0.069
NC-01	NB-02	Foundation Soils	34.2	7.0	124	2.1	1.5	55.5	0.619	0.8	15	9.8	55.5	1.0	-0.7	0.1	0.9	0.096	1.008	0.095	0.112	0.845	13.5	59.2	0.064
NC-01	NB-02	Foundation Soils	34.3	6.9	124	2.1	1.5	47.3	0.649	0.8	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.112	0.794	9.3	56.4	0.061
NC-01	NB-02	Foundation Soils	34.4	6.8	124	2.1	1.5	47.3	0.649	0.8	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.112	0.794	9.3	56.4	0.061
NC-01	NB-02	Foundation Soils	34.4	6.7	119	2.1	1.5	48.8	0.643	0.8	15	0.6	48.8	1.0	-0.7	0.1	0.9	0.091	1.007	0.090	0.112	0.803	9.9	58.1	0.063
NC-01	NB-02	Foundation Soils	34.5	6.7	119	2.1	1.5	50.8	0.636	0.8	15	0.0	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.112	0.815	8.2	58.9	0.064
NC-01	NB-02	Foundation Soils	34.6	6.6	124	2.1	1.5	54.0	0.624	0.8	15	0.1	54.0	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.112	0.835	9.1	63.0	0.069
NC-01	NB-02	Foundation Soils	34.7	6.5	124	2.1	1.5	54.7	0.622	0.8	15	0.0	54.7	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.112	0.839	6.1	60.8	0.066
NC-01	NB-02	Foundation Soils	34.8	6.4	124	2.1	1.5	54.4	0.623	0.8	15	0.0	54.4	1.0	-0.7	0.1	0.9	0.095	1.008	0.094	0.112	0.836	6.2	60.6	0.066
NC-01	NB-02	Foundation Soils	34.9	6.3	124	2.1	1.5	55.1	0.621	0.8	15	0.0	55.1	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.112	0.840	7.3	62.3	0.068
NC-01	NB-02	Foundation Soils	34.9	6.3	124	2.1	1.5	59.6	0.605	0.8	15	4.5	59.6	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.112	0.868	11.8	66.9	0.073
NC-01	NB-02	Foundation Soils	35.0	6.2	124	2.1	1.5	54.9	0.621	0.8	15	0.0	54.9	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.112	0.839	6.0	60.9	0.066
NC-01	NB-02	Foundation Soils	35.1	6.1	124	2.1	1.5	53.2	0.627	0.8	15	0.0	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.112	0.827	7.5	60.7	0.066
NC-01	NB-02	Foundation Soils	35.2	6.0	124	2.1	1.5	51.8	0.632	0.8	15	0.0	51.8	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.112	0.819	8.4	60.2	0.065
NC-01	NB-02	Foundation Soils	35.3	5.9	124	2.2	1.5	51.1	0.635	0.8	15	1.2	51.1	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.112	0.814	10.3	60.2	0.065
NC-01	NB-02	Foundation Soils	35.4	5.8	124	2.2	1.5	51.5	0.633	0.8	15	2.3	51.5	1.0	-0.8	0.1	0.9	0.093	1.008	0.092	0.112	0.816	10.9	60.2	0.065
NC-01	NB-02	Foundation Soils	35.4	5.8	124	2.2	1.5	49.8	0.639	0.8	15	0.4	49.8	1.0	-0.8	0.1	0.9	0.092	1.008	0.090	0.112	0.806	9.7	59.1	0.064
NC-01	NB-02	Foundation Soils	35.5	5.7	124	2.2	1.5	55.8	0.618	0.8	15	3.8	55.8	1.0	-0.8	0.1	0.9	0.096	1.008	0.095	0.112	0.842	11.6	63.5	0.069
NC-01	NB-02	Foundation Soils	35.6	5.6	124	2.2	1.5	69.7	0.574	0.8	15	21.5	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.105	0.112	0.933	17.5	65.8	0.072
NC-01	NB-02	Foundation Soils	35.7	5.5	124	2.2	1.5	62.5	0.596	0.8	15	10.6	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.112	0.884	13.7	65.6	0.072
NC-01	NB-02	Foundation Soils	35.8	5.4	124	2.2	1.5	55.6	0.619	0.8	15	1.8	55.6	1.0	-0.8	0.1	0.9	0.096	1.008	0.094	0.112	0.840	10.7	64.5	0.070
NC-01	NB-02	Foundation Soils	35.8	5.3	124	2.2	1.5	52.6	0.629	0.8	15	0.0	52.6	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.112	0.821	8.5	61.1	0.066
NC-01	NB-02	Foundation Soils	35.9	5.3	124	2.2	1.5	50.6	0.637	0.8	15	0.0	50.6	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.112	0.809	7.8	58.3	0.063
NC-01	NB-02	Foundation Soils	36.0	5.2	124	2.2	1.5	48.8	0.643	0.8	15	0.0	48.8	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.112	0.798	8.5	57.3	0.062
NC-01	NB-02	Foundation Soils	36.1	5.1	119	2.2	1.5	46.9	0.650	0.8	15	0.4	46.9	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.112	0.786	9.7	56.1	0.060
NC-01	NB-02	Foundation Soils	36.2	5.0	124	2.2	1.5	47.3	0.649	0.8	15	5.7	47.3	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.113	0.788	12.3	53.9	0.058

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
NC-01	NB-02	Foundation Soils	36.3	4.9	124	2.2	1.5	48.3	0.645	0.8	15	8.1	48.3	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.113	0.794	13.1	53.3	0.057
NC-01	NB-02	Foundation Soils	36.3	4.9	124	2.2	1.6	48.1	0.646	0.8	15	8.0	48.1	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.113	0.792	13.1	53.1	0.057
NC-01	NB-02	Foundation Soils	36.4	4.8	124	2.2	1.6	63.0	0.595	0.8	15	23.2	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.113	0.884	18.7	58.4	0.063
NC-01	NB-02	Foundation Soils	36.5	4.7	124	2.2	1.6	65.5	0.587	0.8	15	27.1	65.5	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.113	0.901	21.1	59.5	0.064
NC-01	NB-02	Foundation Soils	36.6	4.6	121	2.2	1.6	69.3	0.576	0.8	15	30.8	69.3	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.113	0.926	24.2	62.7	0.068
NC-01	NB-02	Foundation Soils	36.7	4.5	124	2.2	1.6	66.6	0.584	0.8	15	27.2	66.6	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.113	0.907	21.1	60.5	0.065
NC-01	NB-02	Foundation Soils	36.7	4.4	124	2.2	1.6	64.6	0.590	0.8	15	21.6	64.6	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.113	0.894	17.8	60.7	0.066
NC-01	NB-02	Foundation Soils	36.8	4.4	124	2.2	1.6	69.5	0.575	0.8	15	24.2	69.5	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.113	0.927	18.9	64.2	0.070
NC-01	NB-02	Foundation Soils	36.9	4.3	124	2.3	1.6	74.8	0.560	0.8	15	27.5	74.8	1.0	-0.8	0.1	0.9	0.111	1.011	0.109	0.113	0.964	20.6	68.0	0.075
NC-01	NB-02	Foundation Soils	37.0	4.2	124	2.3	1.6	65.9	0.586	0.8	15	10.0	65.9	1.0	-0.8	0.1	0.9	0.104	1.009	0.102	0.113	0.902	13.5	69.4	0.076
NC-01	NB-02	Foundation Soils	37.1	4.1	124	2.3	1.6	60.7	0.602	0.8	15	0.0	60.7	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.113	0.868	6.1	66.8	0.073
NC-01	NB-02	Foundation Soils	37.2	4.0	124	2.3	1.6	63.4	0.593	0.8	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.113	0.884	6.0	69.4	0.076
NC-01	NB-02	Foundation Soils	37.2	4.0	124	2.3	1.6	63.4	0.593	0.8	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.113	0.884	6.0	69.4	0.076
NC-01	NB-02	Foundation Soils	37.3	3.9	124	2.3	1.6	61.5	0.599	0.8	15	0.0	61.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.113	0.872	6.0	67.5	0.074
NC-01	NB-02	Foundation Soils	37.4	3.8	124	2.3	1.6	53.3	0.627	0.8	15	0.2	53.3	1.0	-0.8	0.1	0.9	0.095	1.008	0.093	0.113	0.821	9.2	62.4	0.068
NC-01	NB-02	Foundation Soils	37.5	3.7	124	2.3	1.6	70.3	0.573	0.8	15	11.4	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.113	0.930	13.8	72.8	0.081
NC-01	NB-02	Foundation Soils	37.6	3.6	124	2.3	1.6	61.7	0.599	0.8	15	0.0	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.113	0.872	6.6	68.3	0.075
NC-01	NB-02	Foundation Soils	37.6	3.5	124	2.3	1.6	61.7	0.599	0.8	15	0.6	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.113	0.872	9.9	70.9	0.078
NC-01	NB-02	Foundation Soils	37.7	3.5	124	2.3	1.6	76.1	0.557	0.8	15	17.6	76.1	1.0	-0.8	0.1	0.9	0.112	1.011	0.110	0.113	0.970	15.7	74.2	0.083
NC-01	NB-02	Foundation Soils	37.8	3.4	124	2.3	1.6	75.9	0.557	0.8	15	27.0	75.9	1.0	-0.8	0.1	0.9	0.112	1.011	0.109	0.113	0.968	20.2	69.1	0.076
NC-01	NB-02	Foundation Soils	37.9	3.3	124	2.3	1.6	67.3	0.582	0.8	15	22.8	67.3	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.113	0.908	18.3	62.7	0.068
NC-01	NB-02	Foundation Soils	38.0	3.2	124	2.3	1.6	64.9	0.589	0.8	15	25.4	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.113	0.892	19.9	59.4	0.064
NC-01	NB-02	Foundation Soils	38.1	3.1	124	2.3	1.6	61.0	0.601	0.8	15	22.2	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.113	0.867	18.3	57.1	0.061
NC-01	NB-02	Foundation Soils	38.1	3.1	124	2.3	1.6	60.6	0.602	0.8	15	20.8	60.6	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.113	0.863	17.6	57.3	0.062
NC-01	NB-02	Foundation Soils	38.2	3.0	124	2.3	1.6	61.1	0.600	0.8	15	19.1	61.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.113	0.867	16.8	58.8	0.063
NC-01	NB-02	Foundation Soils	38.3	2.9	124	2.3	1.6	66.3	0.584	0.8	15	17.4	66.3	1.0	-0.8	0.1	0.9	0.104	1.010	0.102	0.113	0.900	15.9	64.9	0.071
NC-01	NB-02	Foundation Soils	38.4	2.8	124	2.3	1.6	60.1	0.604	0.8	15	1.9	60.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.097	0.113	0.860	10.7	68.9	0.076
NC-01	NB-02	Foundation Soils	38.5	2.7	124	2.3	1.6	64.3	0.591	0.8	15	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.100	0.113	0.886	8.5	72.8	0.081
NC-01	NB-02	Foundation Soils	38.5	2.6	124	2.4	1.6	67.5	0.581	0.8	15	0.4	67.5	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.113	0.907	9.5	76.7	0.086
NC-01	NB-02	Foundation Soils	38.6	2.6	124	2.4	1.6	74.9	0.560	0.8	15	9.8	74.9	1.0	-0.8	0.1	0.9	0.111	1.011	0.108	0.113	0.958	13.3	78.3	0.088
NC-01	NB-02	Foundation Soils	38.7	2.5	124	2.4	1.6	77.9	0.552	0.8	15	15.2	77.9	1.0	-0.9	0.1	0.9	0.114	1.012	0.111	0.113	0.980	14.9	77.6	0.087
NC-01	NB-02	Foundation Soils	38.8	2.4	124	2.4	1.6	70.9	0.571	0.8	15	6.4	70.9	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.113	0.930	12.3	76.8	0.086
NC-01	NB-02	Foundation Soils	38.9	2.3	124	2.4	1.6	74.6	0.561	0.8	15	0.1	74.6	1.0	-0.9	0.1	0.9	0.111	1.011	0.108	0.113	0.955	9.0	83.5	0.095
NC-01	NB-02	Foundation Soils	39.0	2.2	124	2.4	1.6	82.3	0.540	0.8	15	0.0	82.3	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.113	1.013	6.0	88.3	
NC-01	NB-02	Foundation Soils	39.0	2.1	124	2.4	1.6	88.2	0.526	0.8	15	0.0	88.2	1.0	-0.9	0.1	0.9	0.124	1.014	0.120	0.113	1.062	6.0	94.2	
NC-01	NB-02	Foundation Soils	39.1	2.1	124	2.4	1.6	86.5	0.530	0.8	15	0.0	86.5	1.0	-0.9	0.1	0.9	0.122	1.014	0.118	0.113	1.047	6.0	92.5	
NC-01	NB-02	Foundation Soils	39.2	2.0	124	2.4	1.6	82.6	0.540	0.8	15	0.0	82.6	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.113	1.014	6.0	88.5	
NC-01	NB-02	Foundation Soils	39.3	1.9	124	2.4	1.6	75.8	0.557	0.8	15	0.0	75.8	1.0	-0.9	0.1	0.9	0.112	1.011	0.109	0.113	0.963	6.0	81.8	0.093
NC-01	NB-02	Foundation Soils	39.4	1.8	124	2.4	1.6	73.2	0.565	0.8	15	0.0	73.2	1.0	-0.9	0.1	0.9	0.110	1.011	0.107	0.113	0.944	6.0	79.2	0.089
NC-01	NB-02	Foundation Soils	39.5	1.7	124	2.4	1.6	71.0	0.571	0.8	15	0.0	71.0	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.113	0.928	6.0	77.0	0.086
NC-01	NB-02	Foundation Soils	39.5	1.7	124	2.4	1.7	67.5	0.581	0.8	15	0.0	67.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.102	0.113	0.905	6.0	73.5	0.082
NC-01	NB-02	Foundation Soils	39.6	1.6	124	2.4	1.7	68.1	0.579	0.8	15	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.113	0.908	6.0	74.1	0.082
NC-01	NB-02	Foundation Soils	39.698	1.5	124	2.4	1.7	70.6	0.572	0.8	15	0.0	70.6	1.0	-0.9	0.1	0.8	0.108	1.010	0.105	0.113	0.925	6.0	76.6	0.086
NC-01	NB-02	Foundation Soils	39.8	1.4	124	2.4	1.7	76.6	0.555	0.8	15	0.0	76.6	1.0	-0.9	0.1	0.8	0.113	1.011	0.110	0.113	0.967	6.0	82.6	0.094
NC-01	NB-02	Foundation Soils	39.9	1.3	124	2.4	1.7	80.0	0.546	0.8	15	0.0	80.0	1.0	-0.9	0.1	0.8	0.116	1.012	0.112	0.113	0.993	6.0	86.0	0.098
NC-01	NB-02	Foundation Soils	39.9	1.2	124	2.4	1.7	85.8	0.531	0.8	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.113	1.039	6.0	91.8	
NC-01	NB-02	Foundation Soils	40.0	1.2	124	2.4	1.7	84.0	0.536	0.8	15	0.0	84.0	1.0	-0.9	0.1	0.8	0.120	1.013	0.116	0.113	1.024	6.0	90.0	
NC-01	NB-02	Foundation Soils	40.1	1.1	124	2.5	1.7	82.6	0.540	0.8	15	0.0	82.6	1.0	-0.9	0.1	0.8	0.118	1.013	0.115	0.113	1.012	6.0	88.6	
NC-01	NB-02	Foundation Soils	40.2	1.0	124	2.5	1.7	85.8	0.531	0.8	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.113	1.038	6.0	91.8	
NC-01	NB-02	Foundation Soils	40.3	0.9	124	2.5	1.7	98.2	0.502	0.8	15	0.0	98.2	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.113	1.154	6.0	104.2	
NC-01	NB-02	Foundation Soils	40.4	0.8	124	2.5	1.7	108.4	0.480	0.8	15	0.0	108.4	0.9	-0.9	0.1	0.8	0.149	1.021	0.145	0.113	1.277	6.0	114.4	
NC-01	NB-02	Foundation Soils	40.4	0.8	124	2.5	1.7	109.3	0.478	0.8	15	0.0	109.3	0.9	-0.9	0.1	0.8	0.151	1.021	0.146	0.113	1.288	6.0	115.3	
NC-01	NB-02	Foundation Soils	40.5	0.7	124	2.5	1.7	98.5	0.502	0.8	15	0.0	98.5	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.113	1.156	7.4	105.9	
NC-01	NB-02	Foundation Soils	40.6	0.6	124	2.5	1.7	104.0	0.489	0.8	15	8.2	104.0	0.9	-0.9	0.1	0.8	0.143	1.019	0.138	0.113	1.218	12.6	108.4	
NC-01	NB-02	Foundation Soils	40.7	0.5	124	2.5	1.7	98.8	0.501	0.8	15	0.0	98.8	1.0	-0.9	0.1	0.8	0.136	1.017	0.131	0.113	1.159	6.0	104.8	
NC-01	NB-02	Foundation Soils	40.8	0.4	124	2.5	1.7	102.0	0.494	0.8	15	0.0	102.0	0.9	-0.9	0.1	0.8	0.140	1.018	0.135	0.113	1.194	6.0	107.9	
NC-01	NB-02	Foundation Soils	40.8	0.3	124	2.5	1.7	103.1	0.491	0.8	15	0.0	103.1	0.9	-0.9	0.1	0.8	0.141	1.019	0.137	0.113	1.207	6.0	109.1	
NC-01	NB-02	Foundation Soils	40.9	0.3	124	2.5	1.7	100.9	0.496	0.8	15	0.0	100.9	0.9	-0.9	0.1	0.8	0.138	1.018	0.134	0.113	1.181	6.0	106.9	
NC-01	NB-02	Foundation Soils	41.0	0.2	124	2.5	1.7	88.5	0.525	0.8	15	0.0	88.5	1.0	-0.9	0.1	0.8	0.124	1.014	0.120	0.113	1.059	7.7	96.2	
NC-01	NB-02	Foundation Soils	41.1	0.1	124	2.5	1.7	87.3	0.528	0.8	15	15.5	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.119	0.113	1.048	14.8	86.6	
NC-01	NB-02	Foundation Soils	41.2	0.0	124	2.5	1.7	78.5	0.550	0.8	15	13.6	78.5	1.0	-0.9	0.1	0.8	0.114	1.012	0.111	0.113	0.978	14.4	79.3	0.089
NC-01	NB-02	Foundation Soils	41.3	-0.1	124	2.5	1.7	76.7	0.555	0.8	15	8.8	76.7	1.0	-0.9	0.1	0.8	0.113	1.011	0.109	0.113	0.964	13.0	80.9	0.091
NC-01	NB-02	Foundation Soils	41.3	-0.1	124	2.5	1.7	68.1	0.579	0.8	15	5.5	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.113	0.905	12.1	74.6	0.083
NC-01	NB-02	Foundation Soils	41.4	-0.2	124	2.5	1.7	59.4	0.606	0.7	15	0.3	59.4	1.0	-0.9	0.1	0.8	0.099	1.009	0.096	0.113	0.849	9.5	68.6	0.075
NC-01	NB-02	Foundation Soils	41.5	-0.3	124	2.5	1.7	58.5	0.609	0.7	15	1.9	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.113	0.843	10.7	67.3	0.074
NC-01	NB-02	Foundation Soils	41.6	-0.4	124	2.5	1.7	55.8	0.618	0.7	15	0.0	55.8	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.113	0.827	7.5	63.3	0.069
NC-01	NB-02	Foundation Soils	41.7	-0.5	124	2.5	1.7	56.9	0.614	0.7	15	0.0	56.9	1.0	-0.9	0.1	0.8	0.097	1.008	0.094	0.113	0.833	6.0	62.9	0.068

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
NC-01	NB-02	Foundation Soils	41.7	-0.6	124	2.6	1.7	55.7	0.618	0.7	15	0.0	55.7	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.113	0.826	6.0	61.7	0.067
NC-01	NB-02	Foundation Soils	41.8	-0.6	124	2.6	1.7	53.1	0.627	0.7	15	0.0	53.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.092	0.113	0.810	6.1	59.2	0.064
NC-01	NB-02	Foundation Soils	41.9	-0.7	119	2.6	1.7	51.6	0.633	0.7	15	0.0	51.6	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.113	0.801	6.9	58.5	0.063
NC-01	NB-02	Foundation Soils	42.0	-0.8	124	2.6	1.7	51.7	0.633	0.7	15	0.0	51.7	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.113	0.801	6.7	58.4	0.063
NC-01	NB-02	Foundation Soils	42.1	-0.9	124	2.6	1.7	52.9	0.628	0.7	15	0.0	52.9	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.113	0.809	6.7	59.6	0.064
NC-01	NB-02	Foundation Soils	42.2	-1.0	124	2.6	1.7	53.8	0.625	0.7	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.113	0.813	6.1	59.9	0.065
NC-01	NB-02	Foundation Soils	42.2	-1.0	124	2.6	1.7	53.8	0.625	0.7	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.113	0.814	7.1	60.9	0.066
NC-01	NB-02	Foundation Soils	42.3	-1.1	124	2.6	1.7	54.8	0.621	0.7	15	0.0	54.8	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.113	0.819	6.0	60.8	0.066
NC-01	NB-02	Foundation Soils	42.4	-1.2	124	2.6	1.7	55.0	0.621	0.7	15	0.0	55.0	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.113	0.821	6.0	61.0	0.066
NC-01	NB-02	Foundation Soils	42.5	-1.3	124	2.6	1.7	56.5	0.616	0.7	15	0.0	56.5	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.113	0.829	6.0	62.5	0.068
NC-01	NB-02	Foundation Soils	42.6	-1.4	124	2.6	1.7	57.8	0.611	0.7	15	0.0	57.8	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.113	0.838	6.0	63.8	0.070
NC-01	NB-02	Foundation Soils	42.7	-1.5	124	2.6	1.7	58.2	0.610	0.7	15	0.0	58.2	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.113	0.840	6.0	64.2	0.070
NC-01	NB-02	Foundation Soils	42.7	-1.5	124	2.6	1.7	56.2	0.617	0.7	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.113	0.828	6.1	62.4	0.068
NC-01	NB-02	Foundation Soils	42.8	-1.6	124	2.6	1.8	54.3	0.623	0.7	15	0.0	54.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.113	0.816	8.0	62.3	0.068
NC-01	NB-02	Foundation Soils	42.9	-1.7	124	2.6	1.8	54.1	0.624	0.7	15	0.0	54.1	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.113	0.814	8.0	62.1	0.067
NC-01	NB-02	Foundation Soils	43.0	-1.8	124	2.6	1.8	53.9	0.625	0.7	15	0.1	53.9	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.113	0.813	8.9	62.7	0.068
NC-01	NB-02	Foundation Soils	43.1	-1.9	124	2.6	1.8	56.2	0.617	0.7	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.113	0.827	6.8	63.0	0.068
NC-01	NB-02	Foundation Soils	43.1	-2.0	124	2.6	1.8	63.4	0.593	0.7	15	0.1	63.4	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.113	0.871	9.0	72.3	0.080
NC-01	NB-02	Foundation Soils	43.2	-2.0	124	2.6	1.8	68.4	0.578	0.7	15	0.6	68.4	1.0	-1.0	0.1	0.8	0.106	1.010	0.103	0.113	0.904	9.8	77.7	0.087
NC-01	NB-02	Foundation Soils	43.3	-2.1	124	2.7	1.8	76.2	0.556	0.8	15	0.1	76.2	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.113	0.957	8.8	84.9	0.097
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NC-02	NB-02 & NB-03	Foundation Soils	15.0	25.6	121	0.9	0.9	63.8	0.592	1.1	4	14.2	63.8	1.0	-0.2	0.0	1.0	0.102	1.009	0.104	0.087	1.194	40.7	90.3	
NC-02	NB-02 & NB-03	Foundation Soils	15.1	25.5	121	0.9	0.9	62.6	0.596	1.1	4	14.0	62.6	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.088	1.181	39.5	88.2	
NC-02	NB-02 & NB-03	Foundation Soils	15.2	25.4	121	0.9	0.9	61.5	0.599	1.1	4	13.8	61.5	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.088	1.168	38.0	85.8	
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.3	121	0.9	0.9	65.0	0.588	1.1	4	13.7	65.0	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.088	1.197	34.4	85.8	
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.2	121	0.9	0.9	75.0	0.559	1.1	4	13.0	75.0	1.0	-0.2	0.0	1.0	0.111	1.011	0.114	0.088	1.290	27.3	89.3	
NC-02	NB-02 & NB-03	Foundation Soils	15.4	25.2	124	1.0	0.9	87.2	0.528	1.1	4	10.2	87.2	1.0	-0.2	0.0	1.0	0.123	1.014	0.126	0.088	1.422	19.5	96.5	
NC-02	NB-02 & NB-03	Foundation Soils	15.5	25.1	124	1.0	0.9	93.8	0.512	1.1	4	7.4	93.8	1.0	-0.2	0.0	1.0	0.130	1.016	0.133	0.089	1.505	16.1	102.6	
NC-02	NB-02 & NB-03	Foundation Soils	15.6	25.0	124	1.0	0.9	98.2	0.502	1.1	4	5.0	98.2	1.0	-0.2	0.0	1.0	0.135	1.017	0.139	0.089	1.563	14.1	107.3	
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.9	124	1.0	0.9	103.4	0.491	1.1	4	0.8	103.4	1.0	-0.3	0.0	1.0	0.142	1.019	0.146	0.089	1.643	10.7	113.3	
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.8	124	1.0	0.9	108.2	0.480	1.1	4	0.0	108.2	1.0	-0.3	0.0	1.0	0.149	1.021	0.154	0.089	1.727	9.0	117.2	
NC-02	NB-02 & NB-03	Foundation Soils	15.8	24.8	124	1.0	1.0	114.1	0.468	1.1	4	0.0	114.1	1.0	-0.3	0.0	1.0	0.159	1.023	0.165	0.089	1.843	7.6	121.6	
NC-02	NB-02 & NB-03	Foundation Soils	15.9	24.7	124	1.0	1.0	119.2	0.458	1.0	4	0.0	119.2	1.0	-0.3	0.0	1.0	0.169	1.026	0.176	0.090	1.963	6.2	125.3	
NC-02	NB-02 & NB-03	Foundation Soils	16.0	24.6	124	1.0	1.0	121.6	0.454	1.0	4	0.0	121.6	1.0	-0.3	0.0	1.0	0.175	1.027	0.182	0.090	2.024	6.0	127.6	
NC-02	NB-02 & NB-03	Foundation Soils	16.1	24.5	124	1.0	1.0	123.4	0.450	1.0	4	0.0	123.4	1.0	-0.3	0.0	1.0	0.179	1.028	0.187	0.090	2.072	6.0	129.4	
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.4	124	1.0	1.0	123.6	0.450	1.0	4	0.0	123.6	1.0	-0.3	0.0	1.0	0.180	1.028	0.187	0.090	2.072	6.0	129.6	
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.3	124	1.0	1.0	122.2	0.452	1.0	4	0.0	122.2	1.0	-0.3	0.0	1.0	0.176	1.027	0.183	0.090	2.026	6.0	128.2	
NC-02	NB-02 & NB-03	Foundation Soils	16.3	24.3	124	1.0	1.0	118.2	0.460	1.0	4	0.0	118.2	1.0	-0.3	0.0	1.0	0.167	1.025	0.174	0.091	1.914	6.0	124.2	
NC-02	NB-02 & NB-03	Foundation Soils	16.4	24.2	124	1.0	1.0	113.8	0.469	1.0	4	0.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.164	0.091	1.805	6.0	119.8	
NC-02	NB-02 & NB-03	Foundation Soils	16.5	24.1	124	1.0	1.0	94.6	0.510	1.0	4	0.5	94.6	1.0	-0.3	0.0	1.0	0.131	1.016	0.134	0.091	1.472	10.3	104.5	
NC-02	NB-02 & NB-03	Foundation Soils	16.6	24.0	124	1.0	1.0	90.5	0.520	1.0	4	1.7	90.5	1.0	-0.3	0.0	1.0	0.126	1.015	0.129	0.091	1.415	11.7	100.5	
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	124	1.0	1.0	79.3	0.548	1.0	4	9.7	79.3	1.0	-0.3	0.0	1.0	0.115	1.012	0.117	0.091	1.284	19.2	88.8	
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	124	1.0	1.0	72.2	0.567	1.0	4	12.1	72.2	1.0	-0.3	0.0	1.0	0.109	1.010	0.111	0.092	1.211	24.8	84.8	
NC-02	NB-02 & NB-03	Foundation Soils	16.8	23.8	121	1.0	1.0	57.1	0.614	1.0	4	13.3	57.1	1.0	-0.3	0.0	1.0	0.097	1.008	0.099	0.092	1.076	35.6	79.3	
NC-02	NB-02 & NB-03	Foundation Soils	16.9	23.7	121	1.0	1.0	50.6	0.636	1.0	4	13.4	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.092	1.021	41.1	78.2	
NC-02	NB-02 & NB-03	Foundation Soils	17.0	23.6	121	1.0	1.0	41.3	0.673	1.0	4	13.2	41.3	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.092	0.947	50.7	78.7	0.088
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.5	115	1.1	1.0	34.6	0.703	1.1	4	13.0	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.092	0.896	59.5	81.2	0.092
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.4	115	1.1	1.0	30.8	0.723	1.0	4	12.9	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.092	0.866	64.7	82.6	0.094
NC-02	NB-02 & NB-03	Foundation Soils	17.2	23.4	115	1.1	1.0	28.2	0.737	1.0	4	12.8	28.2	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.093	0.846	68.7	84.1	0.096
NC-02	NB-02 & NB-03	Foundation Soils	17.3	23.3	115	1.1	1.0	26.0	0.749	1.0	4	12.6	26.0	1.0	-0.3	0.0	1.0	0.076	1.006	0.077	0.093	0.829	70.1	83.5	0.095
NC-02	NB-02 & NB-03	Foundation Soils	17.4	23.2	111	1.1	1.0	23.6	0.764	1.0	4	12.5	23.6	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.093	0.811	74.6	85.7	0.098
NC-02	NB-02 & NB-03	Foundation Soils	17.5	23.1	111	1.1	1.0	23.1	0.768	1.0	4	12.5	23.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.093	0.805	73.3	83.9	0.095
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	115	1.1	1.0	22.7	0.770	1.0	4	12.4	22.7	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.093	0.801	72.6	82.9	0.094
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	115	1.1	1.0	21.9	0.776	1.0	4	12.4	21.9	1.0	-0.3	0.0	1.0	0.074	1.006	0.074	0.094	0.794	73.2	82.7	0.094
NC-02	NB-02 & NB-03	Foundation Soils	17.7	22.9	115	1.1	1.0	22.0	0.775	1.0	4	12.4	22.0	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.094	0.794	69.7	79.3	0.089
NC-02	NB-02 & NB-03	Foundation Soils	17.8	22.8	115	1.1	1.0	22.5	0.772	1.0	4	12.3	22.5	1.0	-0.3	0.0	0.9	0.074	1.006	0.075	0.094	0.795	64.4	74.5	0.083
NC-02	NB-02 & NB-03	Foundation Soils	17.9	22.7	115	1.1	1.0	23.9	0.763	1.0	4	12.5	23.9	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.094	0.803	69.9	81.3	0.092
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.6	111	1.1	1.0	25.2	0.755	1.0	4	12.6	25.2	1.0	-0.3	0.0	0.9	0.076	1.006	0.076	0.094	0.810	75.4	87.9	0.101
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.5	111	1.1	1.0	26.0	0.750	1.0	4	12.7	26.0	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.094	0.814	75.4	88.7	0.102
NC-02	NB-02 & NB-03	Foundation Soils	18.1	22.5	119	1.1	1.0	25.5	0.753	1.0	4	12.6	25.5	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.095	0.809	75.4	88.2	0.102
NC-02	NB-02 & NB-03	Foundation Soils	18.2	22.4	115	1.1	1.0	49.5	0.640	1.0	4	14.0	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.095	0.981	59.0	94.6	0.111
NC-02	NB-02 & NB-03	Foundation Soils	18.3	22.3	124	1.1	1.0	129.3	0.439	1.0	4	12.1	129.3	1.0	-0.3	0.0	0.9	0.195	1.031	0.202	0.095	2.133	19.9	137.1	
NC-02	NB-02 & NB-03	Foundation Soils	18.4	22.2	124	1.1	1.0	159.4	0.388	1.0	4	0.6	159.4	1.0	-0.3	0.0	0.9	0.365	1.053	0.387	0.095	4.074	10.3	169.1	
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.1	124	1.1	1.0	163.6	0.382	1.0	4	1.4	163.6	1.0	-0.3	0.0	0.9	0.411	1.057	0.437	0.095	4.590	11.1	173.3	
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.0	124	1.1	1.0	153.3	0.398	1.0	4	5.3	153.3	1.0	-0.3	0.0	0.9	0.312	1.048	0.328	0.095	3.442	13.7	161.7	
NC-02	NB-02 & NB-03	Foundation Soils	18.6	22.0	124	1.1	1.0	141.5	0.418	1.0	4	4.6	141.5	1.0	-0.3	0.0	0.9	0.241	1.039	0.252	0.096	2.633	13.4	150.3	
NC-02	NB-02 & NB-03	Foundation Soils	18.7	21.9	124	1.1	1.0	112.6	0.471	1.0	4	12.1	112.6	1.0	-0.3	0.0	0.9	0.156	1.023	0.161	0.096	1.677	20.8	121.3	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
NC-02	NB-02 & NB-03	Foundation Soils	18.8	21.8	124	1.2	1.0	90.7	0.520	1.0	4	12.8	90.7	1.0	-0.3	0.0	0.9	0.126	1.015	0.128	0.096	1.340	24.2	102.1	
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.7	121	1.2	1.0	78.4	0.550	1.0	4	13.8	78.4	1.0	-0.3	0.0	0.9	0.114	1.012	0.116	0.096	1.207	30.0	94.6	
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.6	121	1.2	1.0	75.7	0.558	1.0	4	14.1	75.7	1.0	-0.3	0.0	0.9	0.112	1.011	0.113	0.096	1.179	32.9	94.5	
NC-02	NB-02 & NB-03	Foundation Soils	19.0	21.6	121	1.2	1.0	73.5	0.564	1.0	4	14.0	73.5	1.0	-0.3	0.0	0.9	0.110	1.011	0.112	0.096	1.158	32.9	92.5	
NC-02	NB-02 & NB-03	Foundation Soils	19.1	21.5	121	1.2	1.0	66.6	0.584	1.0	4	14.0	66.6	1.0	-0.3	0.0	0.9	0.105	1.010	0.106	0.096	1.095	36.3	88.9	
NC-02	NB-02 & NB-03	Foundation Soils	19.2	21.4	121	1.2	1.0	59.2	0.607	1.0	4	13.8	59.2	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.097	1.034	40.2	85.5	
NC-02	NB-02 & NB-03	Foundation Soils	19.3	21.3	121	1.2	1.1	53.2	0.627	1.0	4	13.7	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.095	0.097	0.985	43.0	82.5	0.094
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.2	121	1.2	1.1	47.2	0.649	1.0	4	13.5	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.097	0.939	47.4	81.1	0.092
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.1	121	1.2	1.1	40.9	0.675	1.0	4	13.2	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.097	0.892	49.7	77.4	0.087
NC-02	NB-02 & NB-03	Foundation Soils	19.5	21.1	121	1.2	1.1	37.5	0.690	1.0	4	13.0	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.084	0.097	0.867	50.5	75.0	0.084
NC-02	NB-02 & NB-03	Foundation Soils	19.6	21.0	115	1.2	1.1	32.9	0.712	1.0	4	12.8	32.9	1.0	-0.3	0.0	0.9	0.081	1.007	0.081	0.097	0.834	52.9	73.1	0.081
NC-02	NB-02 & NB-03	Foundation Soils	19.7	20.9	115	1.2	1.1	27.4	0.741	1.0	4	12.6	27.4	1.0	-0.3	0.0	0.9	0.077	1.006	0.078	0.098	0.796	63.4	78.2	0.088
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.8	111	1.2	1.1	21.4	0.779	1.0	4	12.4	21.4	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.098	0.755	75.4	84.4	0.096
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.7	111	1.2	1.1	20.2	0.782	1.0	4	12.3	20.2	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.098	0.746	75.4	83.2	0.095
NC-02	NB-02 & NB-03	Foundation Soils	19.9	20.7	111	1.2	1.1	18.1	0.782	1.0	4	12.2	18.1	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.098	0.732	75.4	81.3	0.092
NC-02	NB-02 & NB-03	Foundation Soils	20.0	20.6	111	1.2	1.1	16.6	0.782	1.0	4	12.1	16.6	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.098	0.721	75.4	79.9	0.090
NC-02	NB-02 & NB-03	Foundation Soils	20.1	20.5	80	1.2	1.1	14.1	0.782	1.0	4	11.9	14.1	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.098	0.705	75.4	77.5	0.087
NC-02	NB-02 & NB-03	Foundation Soils	20.2	20.4	119	1.2	1.1	13.0	0.782	1.0	4	11.9	13.0	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.098	0.697	75.4	76.5	0.086
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.3	119	1.2	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.694	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.2	119	1.2	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.693	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	20.4	20.2	119	1.2	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.692	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	20.5	20.1	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.691	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	20.6	20.0	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.690	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	20.7	19.9	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.689	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.688	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.687	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	20.9	19.7	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.686	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.0	19.6	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.685	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.1	19.5	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.684	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.4	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.683	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.3	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.682	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.3	19.3	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.682	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.4	19.2	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.681	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.5	19.1	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.101	0.680	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.6	19.0	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.101	0.679	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.101	0.678	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	119	1.3	1.1	12.8	0.782	1.0	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.101	0.677	75.4	76.3	0.085
NC-02	NB-02 & NB-03	Foundation Soils	21.8	18.8	119	1.3	1.1	13.1	0.782	1.0	4	11.9	13.1	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.101	0.678	75.4	76.6	0.086
NC-02	NB-02 & NB-03	Foundation Soils	21.9	18.7	119	1.3	1.1	13.4	0.782	1.0	4	11.9	13.4	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.101	0.678	75.4	76.9	0.086
NC-02	NB-02 & NB-03	Foundation Soils	22.0	18.6	119	1.3	1.1	13.8	0.782	1.0	4	11.9	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.101	0.680	75.4	77.3	0.087
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.5	111	1.3	1.1	14.3	0.782	1.0	4	11.9	14.3	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.101	0.682	75.4	77.7	0.087
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.4	111	1.4	1.1	14.6	0.782	1.0	4	12.0	14.6	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.102	0.683	75.4	78.1	0.088
NC-02	NB-02 & NB-03	Foundation Soils	22.2	18.4	111	1.4	1.1	15.2	0.782	1.0	4	12.0	15.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.102	0.686	75.4	78.6	0.088
NC-02	NB-02 & NB-03	Foundation Soils	22.3	18.3	111	1.4	1.1	15.7	0.782	1.0	4	12.0	15.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.102	0.688	75.4	79.0	0.089
NC-02	NB-02 & NB-03	Foundation Soils	22.4	18.2	111	1.4	1.1	16.7	0.782	0.9	4	12.1	16.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.071	0.102	0.693	75.4	80.0	0.090
NC-02	NB-02 & NB-03	Foundation Soils	22.5	18.1	111	1.4	1.1	17.1	0.782	0.9	4	12.1	17.1	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.102	0.695	75.4	80.4	0.091
NC-02	NB-02 & NB-03	Foundation Soils	22.6	18.0	111	1.4	1.1	17.6	0.782	0.9	4	12.1	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.102	0.697	75.4	80.9	0.091
NC-02	NB-02 & NB-03	Foundation Soils	22.6	17.9	111	1.4	1.1	18.5	0.782	0.9	4	12.2	18.5	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.102	0.701	70.9	77.2	0.086
NC-02	NB-02 & NB-03	Foundation Soils	22.7	17.9	111	1.4	1.1	19.0	0.782	0.9	4	12.2	19.0	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.102	0.703	68.6	75.5	0.084
NC-02	NB-02 & NB-03	Foundation Soils	22.8	17.8	111	1.4	1.1	19.8	0.782	0.9	4	12.2	19.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.102	0.707	67.0	74.6	0.083
NC-02	NB-02 & NB-03	Foundation Soils	22.9	17.7	115	1.4	1.1	20.9	0.782	0.9	4	12.3	20.9	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.103	0.713	67.5	76.1	0.085
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.6	115	1.4	1.1	21.3	0.780	0.9	4	12.3	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.103	0.714	67.7	76.7	0.086
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.5	115	1.4	1.2	22.2	0.774	0.9	4	12.3	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.719	65.4	75.2	0.084
NC-02	NB-02 & NB-03	Foundation Soils	23.1	17.5	115	1.4	1.2	22.8	0.770	0.9	4	12.4	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.722	64.3	74.7	0.083
NC-02	NB-02 & NB-03	Foundation Soils	23.2	17.4	115	1.4	1.2	23.9	0.763	0.9	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.727	61.7	73.1	0.081
NC-02	NB-02 & NB-03	Foundation Soils	23.3	17.3	115	1.4	1.2	24.0	0.762	0.9	4	12.4	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.728	62.1	73.7	0.082
NC-02	NB-02 & NB-03	Foundation Soils	23.4	17.2	115	1.4	1.2	24.2	0.761	0.9	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.728	62.7	74.5	0.083
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.1	115	1.4	1.2	23.9	0.763	0.9	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.725	63.7	75.2	0.084
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.0	115	1.4	1.2	24.2	0.760	0.9	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.104	0.726	63.1	74.9	0.083
NC-02	NB-02 & NB-03	Foundation Soils	23.6	17.0	115	1.4	1.2	25.3	0.754	0.9	4	12.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.104	0.732	61.1	73.9	0.082
NC-02	NB-02 & NB-03	Foundation Soils	23.7	16.9	115	1.4	1.2	26.0	0.750	0.9	4	12.5	26.0	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.104	0.735	60.0	73.4	0.082
NC-02	NB-02 & NB-03	Foundation Soils	23.8	16.8	115	1.4	1.2	25.6	0.752	0.9	4	12.5	25.6	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.104	0.732	60.9	74.0	0.082
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.7	115	1.4	1.2	25.1	0.755	0.9	4	12.5	25.1	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.104	0.728	61.6	74.3	0.083
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.6	115	1.5	1.2	24.5	0.758	0.9	4	12.5	24.5	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.104	0.724	62.7	74.8	0.083
NC-02	NB-02 & NB-03	Foundation Soils	24.0	16.6	115	1.5	1.2	24.2	0.761	0.9	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.104	0.721	62.6	74.4	0.083
NC-02	NB-02 & NB-03	Foundation Soils	24.1	16.5	115	1.5	1.2	24.2	0.760	0.9	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.104	0.720	61.8	73.6	0.082
NC-02	NB-02 & NB-03	Foundation Soils	24.2	16.4	115	1.5	1.2	24.7	0.758	0.9	4	12.4	24.7	1.0	-0.5	0.1	0.9	0.075	1.006	0.075	0.104	0.722	60.8	73.0	0.081

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
NC-02	NB-02 & NB-03	Foundation Soils	24.3	16.3	115	1.5	1.2	25.0	0.755	0.9	4	12.5	25.0	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.104	0.724	60.9	73.4	0.082
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.2	115	1.5	1.2	25.7	0.752	0.9	4	12.5	25.7	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.105	0.727	59.2	72.4	0.080
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.1	115	1.5	1.2	26.6	0.746	0.9	4	12.5	26.6	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.105	0.732	57.0	71.2	0.079
NC-02	NB-02 & NB-03	Foundation Soils	24.5	16.1	115	1.5	1.2	27.7	0.740	0.9	4	12.5	27.7	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.105	0.737	55.7	70.9	0.078
NC-02	NB-02 & NB-03	Foundation Soils	24.6	16.0	121	1.5	1.2	29.3	0.731	0.9	4	12.5	29.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.078	0.105	0.747	49.3	66.2	0.072
NC-02	NB-02 & NB-03	Foundation Soils	24.7	15.9	121	1.5	1.2	30.3	0.725	0.9	4	12.5	30.3	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.105	0.752	47.6	65.5	0.072
NC-02	NB-02 & NB-03	Foundation Soils	24.8	15.8	121	1.5	1.2	30.4	0.725	0.9	4	12.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.105	0.752	48.1	66.1	0.072
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	121	1.5	1.2	31.3	0.720	0.9	4	12.5	31.3	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.105	0.756	47.9	66.6	0.073
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	121	1.5	1.2	31.9	0.717	0.9	4	12.6	31.9	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.105	0.759	47.4	66.7	0.073
																									0.000
NC-03	NB-03	Foundation Soils	14.0	26.0	115	0.9	0.9	19.4	0.782	1.2	4	12.2	19.4	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.088	0.834	68.3	75.5	0.084
NC-03	NB-03	Foundation Soils	14.1	25.9	121	0.9	0.9	30.1	0.726	1.2	4	12.3	30.1	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.088	0.912	42.9	60.7	0.066
NC-03	NB-03	Foundation Soils	14.2	25.8	121	0.9	0.9	42.6	0.668	1.1	4	12.0	42.6	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.088	1.007	31.6	62.1	
NC-03	NB-03	Foundation Soils	14.3	25.7	121	0.9	0.9	42.0	0.670	1.1	4	12.6	42.0	1.0	-0.2	0.0	1.0	0.087	1.007	0.088	0.089	1.000	37.7	67.0	0.073
NC-03	NB-03	Foundation Soils	14.4	25.7	121	0.9	0.9	37.7	0.689	1.1	4	12.9	37.7	1.0	-0.2	0.0	1.0	0.084	1.007	0.085	0.089	0.963	46.2	71.1	0.078
NC-03	NB-03	Foundation Soils	14.4	25.6	115	0.9	0.9	30.2	0.726	1.2	4	12.8	30.2	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.089	0.903	62.4	79.8	0.090
NC-03	NB-03	Foundation Soils	14.5	25.5	111	0.9	0.9	24.4	0.759	1.2	4	12.6	24.4	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.089	0.858	75.4	87.2	0.100
NC-03	NB-03	Foundation Soils	14.6	25.4	111	0.9	0.9	20.2	0.782	1.2	4	12.3	20.2	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.089	0.824	75.4	83.2	0.095
NC-03	NB-03	Foundation Soils	14.7	25.3	111	0.9	0.9	18.6	0.782	1.2	4	12.2	18.6	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.090	0.811	75.4	81.8	0.093
NC-03	NB-03	Foundation Soils	14.8	25.3	111	0.9	0.9	22.2	0.774	1.2	4	12.4	22.2	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.090	0.835	75.4	85.1	0.097
NC-03	NB-03	Foundation Soils	14.8	25.2	111	0.9	0.9	23.6	0.764	1.2	4	12.5	23.6	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.090	0.843	75.4	86.5	0.099
NC-03	NB-03	Foundation Soils	14.9	25.1	111	0.9	0.9	22.7	0.770	1.1	4	12.5	22.7	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.090	0.834	75.4	85.6	0.098
NC-03	NB-03	Foundation Soils	15.0	25.0	111	0.9	0.9	20.9	0.782	1.1	4	12.4	20.9	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.091	0.819	75.4	83.9	0.095
NC-03	NB-03	Foundation Soils	15.1	24.9	111	0.9	0.9	20.5	0.782	1.1	4	12.3	20.5	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.091	0.814	75.4	83.5	0.095
NC-03	NB-03	Foundation Soils	15.2	24.8	111	0.9	0.9	18.8	0.782	1.1	4	12.2	18.8	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.091	0.800	75.4	81.9	0.093
NC-03	NB-03	Foundation Soils	15.3	24.8	111	0.9	0.9	16.9	0.782	1.1	4	12.1	16.9	1.0	-0.2	0.0	1.0	0.071	1.006	0.072	0.091	0.785	75.4	80.2	0.090
NC-03	NB-03	Foundation Soils	15.3	24.7	111	0.9	0.9	15.9	0.782	1.1	4	12.0	15.9	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.091	0.776	75.4	79.2	0.089
NC-03	NB-03	Foundation Soils	15.4	24.6	111	0.9	0.9	16.8	0.782	1.1	4	12.1	16.8	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.092	0.781	75.4	80.1	0.090
NC-03	NB-03	Foundation Soils	15.5	24.5	111	0.9	0.9	19.3	0.782	1.1	4	12.3	19.3	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.092	0.796	75.4	82.4	0.093
NC-03	NB-03	Foundation Soils	15.6	24.4	111	1.0	0.9	18.4	0.782	1.1	4	12.2	18.4	1.0	-0.2	0.0	1.0	0.071	1.006	0.073	0.092	0.788	75.4	81.6	0.092
NC-03	NB-03	Foundation Soils	15.7	24.4	111	1.0	0.9	16.3	0.782	1.1	4	12.1	16.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.092	0.772	75.4	79.6	0.090
NC-03	NB-03	Foundation Soils	15.7	24.3	80	1.0	0.9	15.3	0.782	1.1	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.092	0.763	75.4	78.7	0.088
NC-03	NB-03	Foundation Soils	15.8	24.2	111	1.0	0.9	15.3	0.782	1.1	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.762	75.4	78.7	0.088
NC-03	NB-03	Foundation Soils	15.9	24.1	111	1.0	0.9	15.4	0.782	1.1	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.761	75.4	78.8	0.089
NC-03	NB-03	Foundation Soils	16.0	24.0	111	1.0	0.9	15.4	0.782	1.1	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.759	75.4	78.7	0.089
NC-03	NB-03	Foundation Soils	16.1	23.9	111	1.0	0.9	15.4	0.782	1.1	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.757	75.4	78.8	0.089
NC-03	NB-03	Foundation Soils	16.2	23.9	111	1.0	0.9	15.6	0.782	1.1	4	12.0	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.757	75.4	79.0	0.089
NC-03	NB-03	Foundation Soils	16.2	23.8	111	1.0	0.9	17.2	0.782	1.1	4	12.1	17.2	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.094	0.766	75.4	80.4	0.091
NC-03	NB-03	Foundation Soils	16.3	23.7	111	1.0	0.9	17.5	0.782	1.1	4	12.1	17.5	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.094	0.766	75.4	80.8	0.091
NC-03	NB-03	Foundation Soils	16.4	23.6	111	1.0	0.9	16.7	0.782	1.1	4	12.1	16.7	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.094	0.759	75.4	80.0	0.090
NC-03	NB-03	Foundation Soils	16.5	23.5	111	1.0	0.9	19.7	0.782	1.1	4	12.3	19.7	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.094	0.777	75.4	82.8	0.094
NC-03	NB-03	Foundation Soils	16.6	23.4	111	1.0	0.9	18.8	0.782	1.1	4	12.2	18.8	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.094	0.770	75.4	82.0	0.093
NC-03	NB-03	Foundation Soils	16.7	23.4	111	1.0	0.9	20.0	0.782	1.1	4	12.3	20.0	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.095	0.776	75.4	83.0	0.094
NC-03	NB-03	Foundation Soils	16.7	23.3	115	1.0	0.9	23.3	0.766	1.1	4	12.4	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.095	0.797	65.9	76.8	0.086
NC-03	NB-03	Foundation Soils	16.8	23.2	121	1.0	0.9	38.2	0.687	1.1	4	12.3	38.2	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.095	0.900	36.7	62.5	0.068
NC-03	NB-03	Foundation Soils	16.9	23.1	121	1.0	0.9	49.6	0.640	1.1	4	12.0	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.095	0.983	28.8	66.4	0.073
NC-03	NB-03	Foundation Soils	17.0	23.0	121	1.0	0.9	48.8	0.643	1.1	4	12.7	48.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.095	0.975	34.3	70.4	0.078
NC-03	NB-03	Foundation Soils	17.1	23.0	121	1.0	0.9	40.7	0.676	1.1	4	13.2	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.096	0.912	48.9	76.5	0.085
NC-03	NB-03	Foundation Soils	17.1	22.9	115	1.0	0.9	34.8	0.703	1.1	4	13.0	34.8	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.096	0.868	57.9	79.7	0.090
NC-03	NB-03	Foundation Soils	17.2	22.8	111	1.0	0.9	27.6	0.740	1.1	4	12.8	27.6	1.0	-0.3	0.0	1.0	0.077	1.006	0.078	0.096	0.816	72.8	87.6	0.101
NC-03	NB-03	Foundation Soils	17.3	22.7	111	1.0	0.9	23.8	0.763	1.1	4	12.5	23.8	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.096	0.789	75.4	86.6	0.099
NC-03	NB-03	Foundation Soils	17.4	22.6	111	1.1	0.9	23.3	0.766	1.1	4	12.5	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.096	0.784	75.4	86.2	0.099
NC-03	NB-03	Foundation Soils	17.5	22.5	111	1.1	0.9	24.7	0.758	1.1	4	12.6	24.7	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.096	0.791	75.4	87.4	0.100
NC-03	NB-03	Foundation Soils	17.6	22.5	111	1.1	0.9	23.0	0.768	1.1	4	12.5	23.0	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.097	0.778	75.4	85.9	0.098
NC-03	NB-03	Foundation Soils	17.6	22.4	111	1.1	1.0	19.6	0.782	1.1	4	12.3	19.6	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.097	0.755	75.4	82.7	0.094
NC-03	NB-03	Foundation Soils	17.7	22.3	111	1.1	1.0	18.6	0.782	1.1	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.097	0.747	75.4	81.7	0.093
NC-03	NB-03	Foundation Soils	17.8	22.2	111	1.1	1.0	18.2	0.782	1.1	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.097	0.743	75.4	81.4	0.092
NC-03	NB-03	Foundation Soils	17.9	22.1	111	1.1	1.0	16.8	0.782	1.1	4	12.1	16.8	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.097	0.732	75.4	80.1	0.090
NC-03	NB-03	Foundation Soils	18.0	22.1	111	1.1	1.0	16.7	0.782	1.1	4	12.1	16.7	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.097	0.730	75.4	80.0	0.090
NC-03	NB-03	Foundation Soils	18.0	22.0	111	1.1	1.0	17.5	0.782	1.1	4	12.1	17.5	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.098	0.734	75.4	80.7	0.091
NC-03	NB-03	Foundation Soils	18.1	21.9	111	1.1	1.0	18.2	0.782	1.1	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.098	0.737	75.4	81.4	0.092
NC-03	NB-03	Foundation Soils	18.2	21.8	111	1.1	1.0	18.5	0.782	1.1	4	12.2	18.5	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.098	0.738	75.4	81.7	0.092
NC-03	NB-03	Foundation Soils	18.3	21.7	111	1.1	1.0	18.6	0.782	1.1	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.098	0.737	75.4	81.8	0.093
NC-03	NB-03	Foundation Soils	18.4	21.6	111	1.1	1.0	17.8	0.782	1.1	4	12.2	17.8	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.098	0.731	75.4	81.1	0.092
NC-03	NB-03	Foundation Soils	18.5	21.6	111	1.1	1.0	16.3	0.782	1.1	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.099	0.720	75.4	79.7	0.090
NC-03	NB-03	Foundation Soils	18.5	21.5	111	1.1	1.0	16.0	0.782	1.1	4	12.0	16.0	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.099	0.717	75.4	79.3	0.089
NC-03	NB-03	Foundation Soils	18.6	21.4	111	1.1	1.0	16.3	0.782	1.1	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.099	0.717	75.4	79.6	0.090

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
NC-03	NB-03	Foundation Soils	18.7	21.3	111	1.1	1.0	16.4	0.782	1.1	4	12.1	16.4	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.099	0.717	75.4	79.8	0.090
NC-03	NB-03	Foundation Soils	18.8	21.2	111	1.1	1.0	16.5	0.782	1.1	4	12.1	16.5	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.099	0.716	75.4	79.8	0.090
NC-03	NB-03	Foundation Soils	18.9	21.2	111	1.1	1.0	17.2	0.782	1.1	4	12.1	17.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.071	0.099	0.719	75.4	80.5	0.091
NC-03	NB-03	Foundation Soils	18.9	21.1	115	1.1	1.0	21.8	0.777	1.1	4	12.3	21.8	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.099	0.747	67.7	77.2	0.086
NC-03	NB-03	Foundation Soils	19.0	21.0	115	1.1	1.0	24.1	0.761	1.1	4	12.5	24.1	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.100	0.761	67.5	79.1	0.089
NC-03	NB-03	Foundation Soils	19.1	20.9	115	1.1	1.0	24.0	0.762	1.1	4	12.5	24.0	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.100	0.758	69.8	81.3	0.092
NC-03	NB-03	Foundation Soils	19.2	20.8	111	1.2	1.0	21.5	0.778	1.1	4	12.4	21.5	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.100	0.741	75.4	84.5	0.096
NC-03	NB-03	Foundation Soils	19.3	20.7	111	1.2	1.0	20.3	0.782	1.1	4	12.3	20.3	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.100	0.733	75.4	83.4	0.095
NC-03	NB-03	Foundation Soils	19.4	20.7	111	1.2	1.0	19.1	0.782	1.1	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.100	0.724	75.4	82.2	0.093
NC-03	NB-03	Foundation Soils	19.4	20.6	111	1.2	1.0	17.9	0.782	1.0	4	12.2	17.9	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.100	0.715	75.4	81.1	0.092
NC-03	NB-03	Foundation Soils	19.5	20.5	111	1.2	1.0	19.1	0.782	1.0	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.101	0.721	75.4	82.3	0.093
NC-03	NB-03	Foundation Soils	19.6	20.4	115	1.2	1.0	30.5	0.724	1.0	4	12.8	30.5	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.101	0.793	63.2	80.8	0.091
NC-03	NB-03	Foundation Soils	19.7	20.3	115	1.2	1.0	38.6	0.685	1.0	4	13.2	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.085	0.101	0.846	56.1	81.6	0.092
NC-03	NB-03	Foundation Soils	19.8	20.3	121	1.2	1.0	50.3	0.637	1.0	4	13.6	50.3	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.101	0.926	45.1	81.8	0.093
NC-03	NB-03	Foundation Soils	19.8	20.2	121	1.2	1.0	62.5	0.596	1.0	4	14.0	62.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.103	0.101	1.015	39.3	87.8	
NC-03	NB-03	Foundation Soils	19.9	20.1	121	1.2	1.0	80.6	0.545	1.0	4	13.7	80.6	1.0	-0.3	0.0	0.9	0.116	1.012	0.118	0.101	1.167	29.1	96.0	
NC-03	NB-03	Foundation Soils	20.0	20.0	124	1.2	1.0	98.9	0.501	1.0	4	13.2	98.9	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.101	1.369	24.1	109.8	
NC-03	NB-03	Foundation Soils	20.1	19.9	121	1.2	1.0	101.7	0.494	1.0	4	13.8	101.7	1.0	-0.4	0.0	0.9	0.140	1.018	0.143	0.102	1.405	25.5	113.3	
NC-03	NB-03	Foundation Soils	20.2	19.8	121	1.2	1.0	104.1	0.489	1.0	4	14.6	104.1	1.0	-0.4	0.0	0.9	0.143	1.019	0.146	0.102	1.438	27.7	117.2	
NC-03	NB-03	Foundation Soils	20.3	19.8	121	1.2	1.0	104.3	0.489	1.0	4	15.1	104.3	1.0	-0.4	0.0	0.9	0.143	1.019	0.147	0.102	1.439	29.8	119.0	
NC-03	NB-03	Foundation Soils	20.3	19.7	121	1.2	1.0	97.2	0.504	1.0	4	15.4	97.2	1.0	-0.4	0.0	0.9	0.134	1.017	0.137	0.102	1.339	33.3	115.2	
NC-03	NB-03	Foundation Soils	20.4	19.6	121	1.2	1.0	93.8	0.512	1.0	4	15.4	93.8	1.0	-0.4	0.0	0.9	0.130	1.016	0.132	0.102	1.294	34.8	113.2	
NC-03	NB-03	Foundation Soils	20.5	19.5	121	1.2	1.0	98.2	0.502	1.0	4	15.2	98.2	1.0	-0.4	0.0	0.9	0.135	1.017	0.138	0.102	1.346	31.7	114.7	
NC-03	NB-03	Foundation Soils	20.6	19.4	121	1.2	1.0	103.2	0.491	1.0	4	14.7	103.2	1.0	-0.4	0.0	0.9	0.142	1.019	0.145	0.102	1.414	28.3	116.8	
NC-03	NB-03	Foundation Soils	20.7	19.3	124	1.2	1.0	109.2	0.478	1.0	4	13.2	109.2	1.0	-0.4	0.0	0.9	0.151	1.021	0.154	0.103	1.504	23.1	119.1	
NC-03	NB-03	Foundation Soils	20.8	19.3	124	1.2	1.0	110.3	0.476	1.0	4	9.7	110.3	1.0	-0.4	0.0	0.9	0.153	1.022	0.156	0.103	1.522	17.9	118.5	
NC-03	NB-03	Foundation Soils	20.8	19.2	124	1.2	1.0	107.4	0.482	1.0	4	8.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.103	1.471	16.5	115.7	
NC-03	NB-03	Foundation Soils	20.9	19.1	124	1.3	1.0	106.5	0.484	1.0	4	10.1	106.5	1.0	-0.4	0.0	0.9	0.146	1.020	0.150	0.103	1.454	18.4	114.9	
NC-03	NB-03	Foundation Soils	21.0	19.0	124	1.3	1.0	103.1	0.491	1.0	4	12.1	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.103	1.401	21.4	112.4	
NC-03	NB-03	Foundation Soils	21.1	18.9	124	1.3	1.0	102.2	0.493	1.0	4	12.9	102.2	1.0	-0.4	0.0	0.9	0.140	1.019	0.143	0.103	1.387	23.0	112.4	
NC-03	NB-03	Foundation Soils	21.2	18.9	124	1.3	1.0	105.4	0.486	1.0	4	12.1	105.4	1.0	-0.4	0.0	0.9	0.145	1.020	0.148	0.103	1.430	21.3	114.6	
NC-03	NB-03	Foundation Soils	21.2	18.8	124	1.3	1.0	106.6	0.484	1.0	4	9.0	106.6	1.0	-0.4	0.0	0.9	0.147	1.020	0.150	0.103	1.447	17.3	114.9	
NC-03	NB-03	Foundation Soils	21.3	18.7	124	1.3	1.1	107.4	0.482	1.0	4	6.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.104	1.458	14.9	116.1	
NC-03	NB-03	Foundation Soils	21.4	18.6	124	1.3	1.1	107.7	0.482	1.0	4	6.6	107.7	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.104	1.460	15.2	116.2	
NC-03	NB-03	Foundation Soils	21.5	18.5	124	1.3	1.1	107.6	0.482	1.0	4	8.0	107.6	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.104	1.457	16.3	116.0	
NC-03	NB-03	Foundation Soils	21.6	18.4	124	1.3	1.1	112.2	0.472	1.0	4	8.9	112.2	1.0	-0.4	0.0	0.9	0.156	1.023	0.159	0.104	1.532	17.0	120.3	
NC-03	NB-03	Foundation Soils	21.7	18.4	124	1.3	1.1	116.6	0.463	1.0	4	6.5	116.6	1.0	-0.4	0.0	0.9	0.164	1.025	0.168	0.104	1.614	14.9	125.0	
NC-03	NB-03	Foundation Soils	21.7	18.3	124	1.3	1.1	116.3	0.464	1.0	4	4.7	116.3	1.0	-0.4	0.0	0.9	0.163	1.024	0.167	0.104	1.606	13.7	125.3	
NC-03	NB-03	Foundation Soils	21.8	18.2	124	1.3	1.1	115.1	0.466	1.0	4	2.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.104	1.580	12.2	124.7	
NC-03	NB-03	Foundation Soils	21.9	18.1	124	1.3	1.1	115.1	0.466	1.0	4	0.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.104	1.578	10.4	124.9	
NC-03	NB-03	Foundation Soils	22.0	18.0	124	1.3	1.1	119.1	0.459	1.0	4	0.0	119.1	1.0	-0.4	0.0	0.9	0.169	1.026	0.173	0.105	1.658	7.0	126.1	
NC-03	NB-03	Foundation Soils	22.1	18.0	124	1.3	1.1	129.9	0.438	1.0	4	0.0	129.9	1.0	-0.4	0.0	0.9	0.197	1.032	0.203	0.105	1.940	6.0	135.9	
NC-03	NB-03	Foundation Soils	22.1	17.9	124	1.3	1.1	137.2	0.425	1.0	4	0.0	137.2	1.0	-0.4	0.0	0.9	0.223	1.036	0.230	0.105	2.197	6.0	143.2	
NC-03	NB-03	Foundation Soils	22.2	17.8	124	1.3	1.1	139.2	0.422	1.0	4	0.0	139.2	1.0	-0.4	0.0	0.9	0.231	1.038	0.239	0.105	2.277	6.0	145.2	
NC-03	NB-03	Foundation Soils	22.3	17.7	124	1.3	1.1	133.6	0.431	1.0	4	0.0	133.6	1.0	-0.4	0.0	0.9	0.209	1.034	0.216	0.105	2.054	6.0	139.6	
NC-03	NB-03	Foundation Soils	22.4	17.6	124	1.3	1.1	122.2	0.452	1.0	4	0.0	122.2	1.0	-0.4	0.0	0.9	0.176	1.027	0.181	0.105	1.718	6.0	128.2	
NC-03	NB-03	Foundation Soils	22.5	17.5	124	1.4	1.1	115.9	0.465	1.0	4	0.0	115.9	1.0	-0.4	0.0	0.9	0.163	1.024	0.166	0.105	1.578	8.8	124.7	
NC-03	NB-03	Foundation Soils	22.6	17.5	124	1.4	1.1	110.0	0.477	1.0	4	3.5	110.0	1.0	-0.4	0.0	0.9	0.152	1.022	0.155	0.105	1.469	12.9	119.4	
NC-03	NB-03	Foundation Soils	22.6	17.4	124	1.4	1.1	108.8	0.479	1.0	4	5.7	108.8	1.0	-0.4	0.0	0.9	0.150	1.021	0.153	0.105	1.448	14.5	117.6	
NC-03	NB-03	Foundation Soils	22.7	17.3	124	1.4	1.1	103.1	0.491	1.0	4	2.9	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.106	1.360	12.5	112.7	
NC-03	NB-03	Foundation Soils	22.8	17.2	124	1.4	1.1	101.0	0.496	1.0	4	5.7	101.0	1.0	-0.4	0.0	0.9	0.139	1.018	0.141	0.106	1.330	14.6	109.9	
NC-03	NB-03	Foundation Soils	22.9	17.1	124	1.4	1.1	100.1	0.498	1.0	4	9.1	100.1	1.0	-0.4	0.0	0.9	0.137	1.018	0.139	0.106	1.317	17.6	108.6	
NC-03	NB-03	Foundation Soils	23.0	17.1	124	1.4	1.1	97.7	0.503	1.0	4	11.1	97.7	1.0	-0.4	0.0	0.9	0.134	1.017	0.136	0.106	1.285	20.2	106.8	
NC-03	NB-03	Foundation Soils	23.0	17.0	124	1.4	1.1	95.7	0.508	1.0	4	12.2	95.7	1.0	-0.4	0.0	0.9	0.132	1.016	0.134	0.106	1.260	22.2	105.7	
NC-03	NB-03	Foundation Soils	23.1	16.9	121	1.4	1.1	92.1	0.516	1.0	4	13.3	92.1	1.0	-0.4	0.0	0.9	0.128	1.015	0.129	0.106	1.218	25.3	104.1	
NC-03	NB-03	Foundation Soils	23.2	16.8	121	1.4	1.1	87.8	0.527	1.0	4	13.8	87.8	1.0	-0.4	0.0	0.9	0.123	1.014	0.124	0.106	1.172	28.0	101.9	
NC-03	NB-03	Foundation Soils	23.3	16.7	121	1.4	1.1	85.3	0.533	1.0	4	14.1	85.3	1.0	-0.4	0.0	0.9	0.121	1.013	0.122	0.106	1.146	30.0	101.1	
NC-03	NB-03	Foundation Soils	23.4	16.6	121	1.4	1.1	80.9	0.544	1.0	4	14.3	80.9	1.0	-0.4	0.0	0.9	0.117	1.012	0.117	0.106	1.104	32.4	99.0	
NC-03	NB-03	Foundation Soils	23.5	16.6	121	1.4	1.1	73.1	0.565	1.0	4	14.5	73.1	1.0	-0.4	0.0	0.9	0.110	1.011	0.110	0.107	1.037	37.6	96.3	
NC-03	NB-03	Foundation Soils	23.5	16.5	121	1.4	1.1	70.6	0.572	1.0	4	14.5	70.6	1.0	-0.4	0.0	0.9	0.108	1.010	0.108	0.107	1.016	39.6	95.7	
NC-03	NB-03	Foundation Soils	23.6	16.4	121	1.4	1.1	63.7	0.592	1.0	4	14.3	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.107	0.963	43.0	92.4	0.108
NC-03	NB-03	Foundation Soils	23.7	16.3	121	1.4	1.1	58.6	0.609	1.0	4	14.0	58.6	1.0	-0.4	0.0	0.9	0.099	1.008	0.099	0.107	0.926	43.7	88.3	0.102
NC-03	NB-03	Foundation Soils	23.8	16.2	121	1.4	1.1	52.4	0.630	1.0	4	13.8	52.4	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.107	0.882	47.0	85.7	0.098
NC-03	NB-03	Foundation Soils	23.9	16.1	115	1.4	1.1	45.6	0.655	1.0	4	13.5	45.6	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.107	0.836	51.4	83.5	0.095
NC-03	NB-03	Foundation Soils	23.9	16.1	115	1.4	1.1	38.8	0.684	1.0	4	13.3	38.8	1.0	-0.4	0.1	0.9	0.085	1.007	0.085	0.107	0.792	59.5	85.1	0.097
NC-03	NB-03	Foundation Soils	24.0	16.0	115	1.4	1.1	34.9	0.702	1.0	4	13.1	34.9	1.0	-0.4	0.1	0.9	0.082	1.007	0.082	0.107	0.767	65.8	87.6	0.101
NC-03	NB-03	Foundation Soils	24.1	15.9	115	1.5	1.1	35.6	0.699	1.0	4	13.2	35.6	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.107	0.770	64.5	86.9	0.100

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_f/σ'_{vo} for FS < 1
NC-03	NB-03	Foundation Soils	24.2	15.8	115	1.5	1.1	38.1	0.687	1.0	4	13.2	38.1	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.107	0.785	57.9	82.9	0.094
NC-03	NB-03	Foundation Soils	24.3	15.7	121	1.5	1.1	42.3	0.669	1.0	4	13.2	42.3	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.108	0.810	48.2	77.2	0.087
NC-03	NB-03	Foundation Soils	24.4	15.7	121	1.5	1.1	44.7	0.659	1.0	4	13.0	44.7	1.0	-0.5	0.1	0.9	0.089	1.007	0.089	0.108	0.825	40.5	72.2	0.080
NC-03	NB-03	Foundation Soils	24.4	15.6	121	1.5	1.1	43.9	0.662	1.0	4	12.8	43.9	1.0	-0.5	0.1	0.9	0.088	1.007	0.088	0.108	0.819	38.0	69.2	0.076
NC-03	NB-03	Foundation Soils	24.5	15.5	121	1.5	1.1	43.0	0.666	0.9	4	12.8	43.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.088	0.108	0.812	39.7	69.8	0.077
NC-03	NB-03	Foundation Soils	24.6	15.4	121	1.5	1.1	42.0	0.670	0.9	4	13.0	42.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.108	0.805	43.0	72.0	0.080
NC-03	NB-03	Foundation Soils	24.7	15.3	121	1.5	1.2	39.7	0.680	0.9	4	13.1	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.108	0.790	48.2	74.9	0.083
NC-03	NB-03	Foundation Soils	24.8	15.2	115	1.5	1.2	36.8	0.693	0.9	4	13.0	36.8	1.0	-0.5	0.1	0.9	0.083	1.007	0.083	0.108	0.771	51.2	75.0	0.084
NC-03	NB-03	Foundation Soils	24.9	15.2	121	1.5	1.2	42.6	0.668	0.9	4	13.1	42.6	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.108	0.806	44.4	73.9	0.082
NC-03	NB-03	Foundation Soils	24.9	15.1	121	1.5	1.2	52.7	0.629	0.9	4	13.3	52.7	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.108	0.871	37.7	77.1	0.086
																									0.000
PC-01	PB-01 & PB-02	Foundation Soils	11.1	33.4	111	0.6	0.6	46.8	0.651	1.4	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.089	1.055	75.4	81.8	
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.4	111	0.6	0.6	47.2	0.649	1.4	21	40.4	47.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.089	1.054	75.4	82.1	
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.3	111	0.6	0.6	47.4	0.648	1.4	21	40.5	47.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.090	1.052	75.4	82.3	
PC-01	PB-01 & PB-02	Foundation Soils	11.3	33.2	111	0.7	0.6	47.3	0.649	1.4	21	40.4	47.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.090	1.047	75.4	82.2	
PC-01	PB-01 & PB-02	Foundation Soils	11.4	33.1	111	0.7	0.6	47.1	0.650	1.4	21	40.4	47.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.090	1.041	75.4	82.1	
PC-01	PB-01 & PB-02	Foundation Soils	11.5	33.0	111	0.7	0.6	46.8	0.651	1.4	21	40.4	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.091	1.035	75.4	81.9	
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	111	0.7	0.6	46.9	0.650	1.4	21	40.4	46.9	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.091	1.032	75.4	81.9	
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	111	0.7	0.6	47.5	0.648	1.4	21	40.5	47.5	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.091	1.034	75.4	82.4	
PC-01	PB-01 & PB-02	Foundation Soils	11.7	32.8	111	0.7	0.7	48.6	0.644	1.4	21	40.7	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.092	1.039	74.4	82.3	
PC-01	PB-01 & PB-02	Foundation Soils	11.8	32.7	115	0.7	0.7	48.6	0.644	1.4	21	40.6	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.092	1.035	73.3	81.3	
PC-01	PB-01 & PB-02	Foundation Soils	11.9	32.6	111	0.7	0.7	47.9	0.647	1.4	21	40.5	47.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.092	1.025	75.4	82.7	
PC-01	PB-01 & PB-02	Foundation Soils	12.0	32.5	111	0.7	0.7	46.6	0.651	1.4	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.093	1.011	75.4	81.7	
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.5	111	0.7	0.7	45.9	0.654	1.4	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.093	1.002	75.4	81.1	
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.4	111	0.7	0.7	45.5	0.656	1.4	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.093	0.996	75.4	80.8	0.091
PC-01	PB-01 & PB-02	Foundation Soils	12.2	32.3	111	0.7	0.7	45.3	0.657	1.4	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.093	0.990	75.4	80.6	0.091
PC-01	PB-01 & PB-02	Foundation Soils	12.3	32.2	111	0.7	0.7	45.2	0.657	1.4	21	40.0	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.094	0.986	75.4	80.5	0.091
PC-01	PB-01 & PB-02	Foundation Soils	12.4	32.1	111	0.7	0.7	45.0	0.658	1.4	21	40.0	45.0	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.094	0.981	75.4	80.3	0.091
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	111	0.7	0.7	44.7	0.659	1.4	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.094	0.976	75.4	80.1	0.090
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	111	0.7	0.7	44.7	0.659	1.4	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.095	0.972	75.4	80.1	0.090
PC-01	PB-01 & PB-02	Foundation Soils	12.6	31.9	111	0.7	0.7	44.6	0.660	1.3	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.095	0.968	75.4	80.0	0.090
PC-01	PB-01 & PB-02	Foundation Soils	12.7	31.8	111	0.7	0.7	44.6	0.660	1.3	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.095	0.965	75.4	80.0	0.090
PC-01	PB-01 & PB-02	Foundation Soils	12.8	31.7	111	0.7	0.7	44.5	0.660	1.3	21	39.9	44.5	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.095	0.961	75.4	79.9	0.090
PC-01	PB-01 & PB-02	Foundation Soils	12.9	31.6	111	0.7	0.7	44.9	0.658	1.3	21	40.0	44.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.096	0.962	75.4	80.3	0.091
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.6	111	0.7	0.7	45.3	0.656	1.3	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.096	0.962	75.4	80.6	0.091
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.5	111	0.7	0.7	45.7	0.655	1.3	21	40.2	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.096	0.962	75.4	81.0	0.091
PC-01	PB-01 & PB-02	Foundation Soils	13.1	31.4	111	0.8	0.7	45.9	0.654	1.3	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.097	0.961	75.4	81.1	0.092
PC-01	PB-01 & PB-02	Foundation Soils	13.2	31.3	111	0.8	0.7	46.4	0.652	1.3	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.097	0.962	75.4	81.5	0.092
PC-01	PB-01 & PB-02	Foundation Soils	13.3	31.2	119	0.8	0.7	46.4	0.652	1.3	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.097	0.959	75.4	81.5	0.092
PC-01	PB-01 & PB-02	Foundation Soils	13.4	31.1	111	0.8	0.7	54.0	0.624	1.3	21	41.7	54.1	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.097	1.016	75.4	87.8	
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.1	111	0.8	0.7	62.7	0.596	1.3	21	43.2	62.7	1.0	-0.2	0.0	1.0	0.102	1.009	0.106	0.098	1.085	72.4	91.9	
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.0	115	0.8	0.7	69.1	0.576	1.3	21	43.9	69.1	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.098	1.138	61.0	86.2	
PC-01	PB-01 & PB-02	Foundation Soils	13.6	30.9	121	0.8	0.7	99.5	0.499	1.2	21	46.2	99.5	1.0	-0.2	0.0	1.0	0.137	1.018	0.145	0.098	1.480	36.1	89.4	
PC-01	PB-01 & PB-02	Foundation Soils	13.7	30.8	124	0.8	0.7	127.4	0.443	1.2	21	29.8	127.4	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.098	2.094	17.3	114.9	
PC-01	PB-01 & PB-02	Foundation Soils	13.8	30.7	124	0.8	0.7	128.3	0.441	1.2	21	12.9	128.3	1.1	-0.2	0.0	1.0	0.192	1.031	0.209	0.099	2.119	13.1	128.5	
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.7	124	0.8	0.7	129.0	0.440	1.2	21	43.7	129.0	1.1	-0.2	0.0	1.0	0.194	1.031	0.211	0.099	2.136	24.3	109.6	
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.6	121	0.8	0.7	122.4	0.452	1.2	21	46.7	122.4	1.1	-0.2	0.0	1.0	0.177	1.027	0.191	0.099	1.925	28.8	104.5	
PC-01	PB-01 & PB-02	Foundation Soils	14.0	30.5	121	0.8	0.7	95.3	0.509	1.2	21	47.5	95.3	1.0	-0.2	0.0	1.0	0.131	1.016	0.139	0.099	1.399	46.7	94.5	
PC-01	PB-01 & PB-02	Foundation Soils	14.1	30.4	115	0.8	0.7	77.8	0.552	1.2	21	45.3	77.8	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.100	1.196	57.6	90.0	
PC-01	PB-01 & PB-02	Foundation Soils	14.2	30.3	115	0.8	0.7	71.3	0.570	1.3	21	44.4	71.3	1.0	-0.2	0.0	1.0	0.108	1.010	0.113	0.100	1.132	61.6	88.6	
PC-01	PB-01 & PB-02	Foundation Soils	14.3	30.2	111	0.8	0.7	62.4	0.596	1.3	21	43.1	62.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.105	0.100	1.053	70.0	89.4	
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.2	115	0.8	0.7	65.5	0.587	1.3	21	43.3	65.5	1.0	-0.2	0.0	1.0	0.104	1.009	0.108	0.100	1.075	61.2	83.3	
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.1	115	0.8	0.7	75.7	0.558	1.2	21	44.5	75.7	1.0	-0.2	0.0	1.0	0.112	1.011	0.117	0.101	1.164	51.6	82.8	
PC-01	PB-01 & PB-02	Foundation Soils	14.5	30.0	121	0.8	0.7	85.4	0.532	1.2	21	45.0	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.127	0.101	1.259	41.4	81.9	
PC-01	PB-01 & PB-02	Foundation Soils	14.6	29.9	121	0.8	0.7	92.1	0.516	1.2	21	44.6	92.1	1.0	-0.2	0.0	1.0	0.128	1.015	0.135	0.101	1.332	35.1	82.5	
PC-01	PB-01 & PB-02	Foundation Soils	14.7	29.8	121	0.8	0.7	98.1	0.502	1.2	21	44.0	98.1	1.0	-0.2	0.0	1.0	0.135	1.017	0.143	0.101	1.407	30.8	85.0	
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.8	121	0.8	0.7	101.2	0.496	1.2	21	42.8	101.2	1.0	-0.2	0.0	1.0	0.139	1.018	0.147	0.102	1.448	28.0	86.4	
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.7	121	0.9	0.7	101.9	0.494	1.2	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.102	1.455	27.8	86.9	
PC-01	PB-01 & PB-02	Foundation Soils	14.9	29.6	121	0.9	0.7	102.6	0.493	1.2	21	42.9	102.6	1.0	-0.2	0.0	1.0	0.141	1.019	0.149	0.102	1.461	27.8	87.4	
PC-01	PB-01 & PB-02	Foundation Soils	15.0	29.5	121	0.9	0.7	102.9	0.492	1.2	21	43.0	102.9	1.0	-0.2	0.0	1.0	0.141	1.019	0.150	0.102	1.463	27.9	87.8	
PC-01	PB-01 & PB-02	Foundation Soils	15.1	29.4	121	0.9	0.7	101.9	0.494	1.2	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.102	1.444	27.7	86.9	
PC-01	PB-01 & PB-02	Foundation Soils	15.2	29.3	121	0.9	0.7	99.4	0.500	1.2	21	43.6	99.4	1.0	-0.2	0.0	1.0	0.136	1.018	0.144	0.103	1.403	29.8	85.5	
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.3	121	0.9	0.7	95.6	0.508	1.2	21	44.8	95.6	1.0	-0.2	0.0	1.0	0.132	1.016	0.139	0.103	1.349	33.8	84.6	
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.2	121	0.9	0.7	87.0	0.528	1.2	21	45.4	87.0	1.0	-0.2	0.0	1.0	0.122	1.014	0.128	0.103	1.245	42.1	83.7	
PC-01	PB-01 & PB-02	Foundation Soils	15.4	29.1	115	0.9	0.7	77.7	0.552	1.2	21	45.0	77.7	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.103	1.148	52.6	85.3	
PC-01	PB-01 & PB-02	Foundation Soils	15.5	29.0	115	0.9	0.8	69.6	0.575	1.2	21	44.0	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.104	1.073	60.0	85.6	
PC-01	PB-01 & PB-02	Foundation Soils	15.6	28.9	111	0.9	0.8	60.9	0.601	1.2	21	42.7	60.9	1.0	-0.2	0.0	1.0	0.100	1.009	0.104	0.104	1.000	68.8	86.9	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	111	0.9	0.8	57.5	0.612	1.2	21	42.3	57.5	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.104	0.972	73.2	88.5	0.102
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	111	0.9	0.8	55.3	0.620	1.2	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.104	0.953	75.4	88.8	0.102
PC-01	PB-01 & PB-02	Foundation Soils	15.8	28.7	121	0.9	0.8	66.6	0.583	1.2	21	43.0	66.6	1.0	-0.3	0.0	1.0	0.105	1.010	0.108	0.104	1.039	52.3	76.0	
PC-01	PB-01 & PB-02	Foundation Soils	15.9	28.6	124	0.9	0.8	82.8	0.539	1.2	21	16.2	82.8	1.0	-0.3	0.0	1.0	0.118	1.013	0.124	0.105	1.181	14.4	81.1	
PC-01	PB-01 & PB-02	Foundation Soils	16.0	28.5	124	0.9	0.8	88.5	0.525	1.2	21	0.0	88.5	1.0	-0.3	0.0	1.0	0.124	1.014	0.130	0.105	1.238	6.0	94.5	
PC-01	PB-01 & PB-02	Foundation Soils	16.1	28.4	124	0.9	0.8	90.2	0.521	1.2	21	0.0	90.2	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.105	1.254	6.0	96.1	
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.4	124	0.9	0.8	89.6	0.522	1.2	21	2.5	89.6	1.0	-0.3	0.0	1.0	0.125	1.015	0.131	0.105	1.245	10.7	97.9	
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.3	124	0.9	0.8	90.8	0.519	1.2	21	4.7	90.8	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.105	1.256	11.5	97.5	
PC-01	PB-01 & PB-02	Foundation Soils	16.3	28.2	124	0.9	0.8	100.2	0.498	1.2	21	16.2	100.2	1.0	-0.3	0.0	1.0	0.138	1.018	0.145	0.106	1.371	14.2	98.2	
PC-01	PB-01 & PB-02	Foundation Soils	16.4	28.1	124	0.9	0.8	111.6	0.473	1.2	21	29.3	111.6	1.0	-0.3	0.0	1.0	0.155	1.022	0.164	0.106	1.550	17.7	100.0	
PC-01	PB-01 & PB-02	Foundation Soils	16.5	28.0	124	1.0	0.8	113.8	0.469	1.2	21	34.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.168	0.106	1.588	19.5	99.3	
PC-01	PB-01 & PB-02	Foundation Soils	16.6	27.9	124	1.0	0.8	116.4	0.464	1.2	21	36.1	116.4	1.0	-0.3	0.0	1.0	0.164	1.024	0.174	0.106	1.637	20.3	100.7	
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.9	124	1.0	0.8	118.5	0.460	1.1	21	40.0	118.5	1.0	-0.3	0.0	1.0	0.168	1.025	0.179	0.106	1.680	22.5	101.0	
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.8	124	1.0	0.8	117.6	0.462	1.1	21	42.8	117.6	1.0	-0.3	0.0	1.0	0.166	1.025	0.176	0.107	1.655	25.0	99.7	
PC-01	PB-01 & PB-02	Foundation Soils	16.8	27.7	121	1.0	0.8	109.9	0.477	1.2	21	46.3	109.9	1.0	-0.3	0.0	1.0	0.152	1.022	0.160	0.107	1.503	31.8	95.4	
PC-01	PB-01 & PB-02	Foundation Soils	16.9	27.6	121	1.0	0.8	95.6	0.508	1.2	21	46.8	95.6	1.0	-0.3	0.0	1.0	0.132	1.016	0.138	0.107	1.291	41.5	90.3	
PC-01	PB-01 & PB-02	Foundation Soils	17.0	27.5	115	1.0	0.8	75.8	0.557	1.2	21	44.9	75.8	1.0	-0.3	0.0	1.0	0.112	1.011	0.116	0.107	1.086	56.9	87.8	
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.5	111	1.0	0.8	63.0	0.595	1.2	21	43.2	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.107	0.979	72.2	91.9	0.107
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.4	111	1.0	0.8	55.3	0.620	1.2	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.107	0.920	75.4	88.7	0.102
PC-01	PB-01 & PB-02	Foundation Soils	17.2	27.3	111	1.0	0.8	54.1	0.624	1.2	21	41.7	54.1	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.108	0.910	75.4	87.8	0.101
PC-01	PB-01 & PB-02	Foundation Soils	17.3	27.2	111	1.0	0.8	51.2	0.634	1.2	21	41.2	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.108	0.888	75.4	85.4	0.098
PC-01	PB-01 & PB-02	Foundation Soils	17.4	27.1	111	1.0	0.8	49.0	0.642	1.2	21	40.7	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.108	0.871	75.4	83.6	0.095
PC-01	PB-01 & PB-02	Foundation Soils	17.5	27.0	111	1.0	0.8	48.6	0.644	1.2	21	40.7	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.108	0.866	75.4	83.3	0.095
PC-01	PB-01 & PB-02	Foundation Soils	17.6	27.0	121	1.0	0.8	69.1	0.576	1.2	21	42.6	69.1	1.0	-0.3	0.0	1.0	0.107	1.010	0.110	0.108	1.015	44.1	70.6	
PC-01	PB-01 & PB-02	Foundation Soils	17.6	26.9	124	1.0	0.8	99.9	0.498	1.1	21	0.0	99.9	1.0	-0.3	0.0	1.0	0.137	1.018	0.144	0.109	1.323	6.0	105.9	
PC-01	PB-01 & PB-02	Foundation Soils	17.7	26.8	124	1.0	0.8	104.1	0.489	1.1	21	0.0	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.150	0.109	1.378	6.0	110.0	
PC-01	PB-01 & PB-02	Foundation Soils	17.8	26.7	124	1.0	0.8	90.9	0.519	1.1	21	2.0	90.9	1.0	-0.3	0.0	0.9	0.126	1.015	0.132	0.109	1.210	10.5	99.3	
PC-01	PB-01 & PB-02	Foundation Soils	17.9	26.6	124	1.0	0.8	106.1	0.485	1.1	21	40.2	106.1	1.0	-0.3	0.0	0.9	0.146	1.020	0.153	0.109	1.404	24.1	90.0	
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.6	121	1.0	0.8	92.3	0.516	1.1	21	45.7	92.3	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.109	1.221	39.1	85.7	
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.5	115	1.0	0.8	74.2	0.562	1.2	21	44.5	74.2	1.0	-0.3	0.0	0.9	0.111	1.011	0.114	0.109	1.046	55.2	84.9	
PC-01	PB-01 & PB-02	Foundation Soils	18.1	26.4	111	1.0	0.8	63.7	0.592	1.2	21	43.3	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.110	0.962	68.5	89.0	0.103
PC-01	PB-01 & PB-02	Foundation Soils	18.2	26.3	111	1.1	0.8	54.8	0.622	1.2	21	41.8	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.098	0.110	0.896	75.4	88.4	0.102
PC-01	PB-01 & PB-02	Foundation Soils	18.3	26.2	111	1.1	0.8	52.6	0.629	1.2	21	41.4	52.6	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.110	0.879	75.4	86.5	0.099
PC-01	PB-01 & PB-02	Foundation Soils	18.4	26.1	111	1.1	0.8	50.8	0.636	1.2	21	41.1	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.110	0.865	75.4	85.1	0.097
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.1	111	1.1	0.8	47.8	0.647	1.2	21	40.5	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.110	0.843	75.4	82.6	0.094
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.0	111	1.1	0.8	46.9	0.650	1.2	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.110	0.836	75.4	81.9	0.093
PC-01	PB-01 & PB-02	Foundation Soils	18.6	25.9	111	1.1	0.8	46.9	0.650	1.2	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.111	0.834	75.4	81.9	0.093
PC-01	PB-01 & PB-02	Foundation Soils	18.7	25.8	111	1.1	0.8	47.1	0.649	1.2	21	40.4	47.1	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.111	0.835	75.4	82.1	0.093
PC-01	PB-01 & PB-02	Foundation Soils	18.8	25.7	115	1.1	0.8	56.3	0.616	1.2	21	41.9	56.3	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.111	0.895	67.9	82.3	0.093
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	115	1.1	0.8	63.3	0.594	1.1	21	42.6	63.3	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.111	0.944	54.9	75.6	0.084
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	111	1.1	0.8	53.4	0.626	1.2	21	41.5	53.4	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.111	0.873	72.0	83.9	0.096
PC-01	PB-01 & PB-02	Foundation Soils	19.0	25.5	111	1.1	0.8	49.2	0.642	1.2	21	40.8	49.2	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.111	0.843	75.4	83.8	0.095
PC-01	PB-01 & PB-02	Foundation Soils	19.1	25.4	111	1.1	0.9	48.9	0.643	1.2	21	40.7	48.9	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.111	0.840	75.4	83.6	0.095
PC-01	PB-01 & PB-02	Foundation Soils	19.2	25.3	111	1.1	0.9	47.2	0.649	1.2	21	40.4	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.112	0.827	75.4	82.1	0.093
PC-01	PB-01 & PB-02	Foundation Soils	19.3	25.2	115	1.1	0.9	46.4	0.652	1.2	21	40.3	46.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.112	0.821	75.4	81.5	0.092
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.2	115	1.1	0.9	46.6	0.652	1.1	21	40.3	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.112	0.820	73.7	80.0	0.090
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.1	115	1.1	0.9	46.7	0.651	1.1	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.112	0.820	75.4	81.7	0.092
PC-01	PB-01 & PB-02	Foundation Soils	19.5	25.0	115	1.1	0.9	46.7	0.651	1.1	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.112	0.819	74.7	81.0	0.092
PC-01	PB-01 & PB-02	Foundation Soils	19.6	24.9	115	1.1	0.9	47.8	0.647	1.1	21	40.3	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.112	0.825	68.3	75.7	0.084
PC-01	PB-01 & PB-02	Foundation Soils	19.7	24.8	115	1.1	0.9	48.5	0.644	1.1	21	40.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.113	0.828	67.9	76.0	0.085
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	115	1.1	0.9	49.6	0.640	1.1	21	40.6	49.6	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.113	0.834	65.3	74.4	0.083
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	115	1.1	0.9	49.5	0.640	1.1	21	40.6	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.113	0.832	66.9	75.8	0.085
PC-01	PB-01 & PB-02	Foundation Soils	19.9	24.6	115	1.2	0.9	51.1	0.635	1.1	21	40.5	51.1	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.113	0.841	57.4	67.9	0.075
PC-01	PB-01 & PB-02	Foundation Soils	20.0	24.5	115	1.2	0.9	51.4	0.633	1.1	21	40.7	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.113	0.843	59.8	70.6	0.078
PC-01	PB-01 & PB-02	Foundation Soils	20.1	24.4	121	1.2	0.9	66.9	0.583	1.1	21	38.8	66.9	1.0	-0.4	0.0	0.9	0.105	1.010	0.107	0.113	0.948	30.6	58.7	0.063
PC-01	PB-01 & PB-02	Foundation Soils	20.2	24.3	124	1.2	0.9	73.5	0.564	1.1	21	29.8	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.113	0.998	19.8	63.5	0.069
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.3	124	1.2	0.9	78.6	0.550	1.1	21	38.2	78.6	1.0	-0.4	0.0	0.9	0.115	1.012	0.118	0.114	1.038	26.4	66.8	
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.2	121	1.2	0.9	73.5	0.564	1.1	21	42.3	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.114	0.995	38.2	69.4	0.076
PC-01	PB-01 & PB-02	Foundation Soils	20.4	24.1	115	1.2	0.9	62.5	0.596	1.1	21	42.5	62.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.114	0.912	57.1	77.1	0.086
PC-01	PB-01 & PB-02	Foundation Soils	20.5	24.0	111	1.2	0.9	57.4	0.613	1.1	21	42.2	57.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.114	0.876	70.4	85.7	0.098
PC-01	PB-01 & PB-02	Foundation Soils	20.6	23.9	111	1.2	0.9	51.3	0.634	1.1	21	41.2	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.114	0.834	75.4	85.5	0.098
PC-01	PB-01 & PB-02	Foundation Soils	20.7	23.8	111	1.2	0.9	48.8	0.643	1.1	21	40.7	48.8	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.114	0.817	75.4	83.5	0.095
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.8	111	1.2	0.9	47.0	0.650	1.1	21	40.4	47.0	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.114	0.804	75.4	82.0	0.093
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.7	111	1.2	0.9	45.4	0.656	1.1	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.114	0.793	75.4	80.7	0.091
PC-01	PB-01 & PB-02	Foundation Soils	20.9	23.6	111	1.2	0.9	45.4	0.656	1.1	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.115	0.792	75.4	80.7	0.091
PC-01	PB-01 & PB-02	Foundation Soils	21.0	23.5	111	1.2	0.9	45.8	0.655	1.1	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.115	0.793	75.4	81.0	0.092
PC-01	PB-01 & PB-02	Foundation Soils	21.1	23.4	115	1.2	0.9	47.5	0.648	1.1	21	40.3	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.115	0.803	69.6	76.8	0.086

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.4	115	1.2	0.9	48.5	0.644	1.1	21	40.3	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.115	0.808	64.1	72.2	0.080
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.3	115	1.2	0.9	49.2	0.641	1.1	21	40.4	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.115	0.812	62.7	71.5	0.079
PC-01	PB-01 & PB-02	Foundation Soils	21.3	23.2	115	1.2	0.9	50.6	0.636	1.1	21	40.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.115	0.819	58.2	68.4	0.075
PC-01	PB-01 & PB-02	Foundation Soils	21.4	23.1	121	1.2	0.9	51.6	0.633	1.1	21	40.4	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.115	0.825	53.7	64.9	0.071
PC-01	PB-01 & PB-02	Foundation Soils	21.5	23.0	115	1.2	0.9	50.0	0.638	1.1	21	40.7	50.0	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.116	0.814	65.2	74.6	0.083
PC-01	PB-01 & PB-02	Foundation Soils	21.6	22.9	111	1.2	0.9	48.5	0.644	1.1	21	40.7	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.116	0.803	75.4	83.2	0.095
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.9	111	1.3	0.9	46.6	0.652	1.1	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.116	0.790	75.4	81.6	0.092
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.8	111	1.3	0.9	46.6	0.652	1.1	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.116	0.789	75.4	81.6	0.092
PC-01	PB-01 & PB-02	Foundation Soils	21.8	22.7	115	1.3	0.9	48.3	0.645	1.1	21	40.6	48.3	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.116	0.799	72.9	80.7	0.091
PC-01	PB-01 & PB-02	Foundation Soils	21.9	22.6	115	1.3	0.9	51.6	0.633	1.1	21	40.7	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.116	0.819	60.3	71.2	0.079
PC-01	PB-01 & PB-02	Foundation Soils	22.0	22.5	121	1.3	0.9	54.9	0.621	1.1	21	40.7	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.116	0.839	50.5	64.7	0.071
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.5	121	1.3	0.9	57.8	0.611	1.1	21	40.7	57.8	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.116	0.857	44.7	61.9	0.067
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.4	121	1.3	0.9	63.2	0.594	1.1	21	40.6	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.116	0.892	38.5	61.1	0.066
PC-01	PB-01 & PB-02	Foundation Soils	22.2	22.3	121	1.3	0.9	68.6	0.578	1.1	21	41.0	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.117	0.929	36.1	63.7	0.069
PC-01	PB-01 & PB-02	Foundation Soils	22.3	22.2	124	1.3	0.9	75.7	0.558	1.1	21	31.4	75.7	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.117	0.981	20.6	64.8	0.071
PC-01	PB-01 & PB-02	Foundation Soils	22.4	22.1	124	1.3	0.9	64.3	0.591	1.1	21	17.2	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.117	0.897	15.1	62.1	0.067
PC-01	PB-01 & PB-02	Foundation Soils	22.5	22.0	124	1.3	0.9	71.4	0.570	1.1	21	29.2	71.4	1.0	-0.4	0.0	0.9	0.108	1.010	0.111	0.117	0.947	19.6	61.8	0.067
PC-01	PB-01 & PB-02	Foundation Soils	22.6	22.0	121	1.3	0.9	77.4	0.553	1.1	21	39.4	77.4	1.0	-0.4	0.0	0.9	0.114	1.012	0.116	0.117	0.992	28.4	66.5	0.073
PC-01	PB-01 & PB-02	Foundation Soils	22.6	21.9	124	1.3	0.9	81.6	0.542	1.1	21	37.7	81.6	1.0	-0.4	0.0	0.9	0.117	1.012	0.120	0.117	1.025	25.1	69.1	
PC-01	PB-01 & PB-02	Foundation Soils	22.7	21.8	124	1.3	0.9	80.2	0.546	1.1	21	26.9	80.2	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.117	1.012	18.0	71.3	
PC-01	PB-01 & PB-02	Foundation Soils	22.8	21.7	124	1.3	1.0	82.8	0.539	1.1	21	27.6	82.8	1.0	-0.4	0.0	0.9	0.118	1.013	0.121	0.117	1.033	18.2	73.5	
PC-01	PB-01 & PB-02	Foundation Soils	22.9	21.6	124	1.3	1.0	83.1	0.538	1.1	21	32.1	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.117	1.034	20.4	71.4	
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	124	1.3	1.0	68.6	0.578	1.1	21	18.8	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.117	0.921	15.5	65.3	0.071
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	124	1.3	1.0	59.8	0.605	1.1	21	0.0	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.118	0.859	6.0	65.8	0.072
PC-01	PB-01 & PB-02	Foundation Soils	23.1	21.4	124	1.3	1.0	72.5	0.567	1.1	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.111	0.118	0.947	6.0	78.5	0.088
PC-01	PB-01 & PB-02	Foundation Soils	23.2	21.3	124	1.3	1.0	80.3	0.545	1.1	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.118	1.007	6.0	86.3	
PC-01	PB-01 & PB-02	Foundation Soils	23.3	21.2	124	1.3	1.0	80.3	0.545	1.1	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.118	0.118	1.005	6.0	86.3	
PC-01	PB-01 & PB-02	Foundation Soils	23.4	21.1	124	1.4	1.0	76.9	0.554	1.1	21	0.0	76.9	1.0	-0.4	0.0	0.9	0.113	1.011	0.115	0.118	0.977	6.8	83.7	0.095
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.1	124	1.4	1.0	70.5	0.572	1.1	21	0.0	70.5	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.118	0.928	8.1	78.6	0.088
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.0	124	1.4	1.0	65.1	0.588	1.1	21	0.0	65.1	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.118	0.890	6.6	71.7	0.079
PC-01	PB-01 & PB-02	Foundation Soils	23.6	20.9	124	1.4	1.0	63.7	0.592	1.1	21	0.0	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.118	0.880	7.6	71.3	0.079
PC-01	PB-01 & PB-02	Foundation Soils	23.7	20.8	124	1.4	1.0	71.3	0.570	1.0	21	0.0	71.3	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.118	0.932	6.0	77.3	0.087
PC-01	PB-01 & PB-02	Foundation Soils	23.8	20.7	124	1.4	1.0	84.5	0.535	1.0	21	0.0	84.5	1.0	-0.4	0.0	0.9	0.120	1.013	0.122	0.118	1.035	6.0	90.5	
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	124	1.4	1.0	104.9	0.488	1.0	21	0.0	104.9	1.0	-0.4	0.0	0.9	0.144	1.020	0.148	0.118	1.250	6.0	110.9	
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	124	1.4	1.0	113.6	0.469	1.0	21	0.0	113.6	1.0	-0.4	0.1	0.9	0.158	1.023	0.163	0.119	1.378	6.0	119.6	
PC-01	PB-01 & PB-02	Foundation Soils	24.0	20.5	124	1.4	1.0	119.1	0.458	1.0	21	0.0	119.1	1.0	-0.4	0.1	0.9	0.169	1.026	0.175	0.119	1.477	6.0	125.1	
PC-01	PB-01 & PB-02	Foundation Soils	24.1	20.4	124	1.4	1.0	124.4	0.448	1.0	21	0.0	124.4	1.0	-0.4	0.1	0.9	0.182	1.029	0.188	0.119	1.588	6.0	130.4	
PC-01	PB-01 & PB-02	Foundation Soils	24.2	20.3	124	1.4	1.0	125.7	0.446	1.0	21	0.0	125.7	1.0	-0.5	0.1	0.9	0.185	1.029	0.192	0.119	1.618	6.0	131.7	
PC-01	PB-01 & PB-02	Foundation Soils	24.3	20.2	124	1.4	1.0	123.8	0.450	1.0	21	0.0	123.8	1.0	-0.5	0.1	0.9	0.180	1.028	0.187	0.119	1.571	6.0	129.8	
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.2	124	1.4	1.0	115.4	0.466	1.0	21	0.0	115.4	1.0	-0.5	0.1	0.9	0.162	1.024	0.167	0.119	1.402	6.0	121.4	
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.1	124	1.4	1.0	106.8	0.483	1.0	21	0.0	106.8	1.0	-0.5	0.1	0.9	0.147	1.020	0.151	0.119	1.268	6.0	112.8	
PC-01	PB-01 & PB-02	Foundation Soils	24.5	20.0	124	1.4	1.0	99.0	0.500	1.0	21	0.0	99.0	1.0	-0.5	0.1	0.9	0.136	1.017	0.139	0.119	1.169	6.0	105.0	
PC-01	PB-01 & PB-02	Foundation Soils	24.6	19.9	124	1.4	1.0	92.5	0.515	1.0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.119	1.099	6.0	98.5	
PC-01	PB-01 & PB-02	Foundation Soils	24.7	19.8	124	1.4	1.0	88.1	0.526	1.0	21	0.0	88.1	1.0	-0.5	0.1	0.9	0.124	1.014	0.126	0.119	1.056	6.0	94.0	
PC-01	PB-01 & PB-02	Foundation Soils	24.8	19.7	124	1.4	1.0	81.4	0.543	1.0	21	0.0	81.4	1.0	-0.5	0.1	0.9	0.117	1.012	0.119	0.119	0.998	6.0	87.4	0.100
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.7	124	1.4	1.0	78.9	0.549	1.0	21	0.0	78.9	1.0	-0.5	0.1	0.9	0.115	1.012	0.117	0.119	0.977	6.0	84.9	0.097
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.6	124	1.5	1.0	80.1	0.546	1.0	21	0.0	80.1	1.0	-0.5	0.1	0.9	0.116	1.012	0.118	0.119	0.985	6.0	86.1	0.098
PC-01	PB-01 & PB-02	Foundation Soils	25.0	19.5	124	1.5	1.0	86.3	0.530	1.0	21	0.0	86.3	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.120	1.037	6.0	92.3	
PC-01	PB-01 & PB-02	Foundation Soils	25.1	19.4	124	1.5	1.0	90.1	0.521	1.0	21	0.0	90.1	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.120	1.070	6.0	96.1	
PC-01	PB-01 & PB-02	Foundation Soils	25.2	19.3	124	1.5	1.0	90.7	0.519	1.0	21	0.0	90.7	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.120	1.075	6.0	96.7	
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.3	124	1.5	1.0	92.7	0.515	1.0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.120	1.093	6.0	98.6	
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.2	124	1.5	1.0	96.4	0.506	1.0	21	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.135	0.120	1.130	6.0	102.4	
PC-01	PB-01 & PB-02	Foundation Soils	25.4	19.1	124	1.5	1.0	97.9	0.503	1.0	21	0.0	97.9	1.0	-0.5	0.1	0.9	0.135	1.017	0.137	0.120	1.146	6.0	103.9	
PC-01	PB-01 & PB-02	Foundation Soils	25.5	19.0	124	1.5	1.0	103.4	0.491	1.0	21	0.0	103.4	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.120	1.209	6.0	109.4	
PC-01	PB-01 & PB-02	Foundation Soils	25.6	18.9	124	1.5	1.0	109.3	0.478	1.0	21	0.0	109.3	1.0	-0.5	0.1	0.9	0.151	1.021	0.155	0.120	1.287	6.0	115.3	
PC-01	PB-01 & PB-02	Foundation Soils	25.7	18.8	124	1.5	1.0	107.9	0.481	1.0	21	0.0	107.9	1.0	-0.5	0.1	0.9	0.149	1.021	0.152	0.120	1.266	6.0	113.9	
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.8	124	1.5	1.0	103.6	0.490	1.0	21	0.0	103.6	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.120	1.208	6.0	109.6	
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.7	124	1.5	1.0	101.5	0.495	1.0	21	0.0	101.5	1.0	-0.5	0.1	0.9	0.139	1.018	0.142	0.120	1.182	6.0	107.5	
PC-01	PB-01 & PB-02	Foundation Soils	25.9	18.6	124	1.5	1.0	100.5	0.497	1.0	21	0.0	100.5	1.0	-0.5	0.1	0.9	0.138	1.018	0.141	0.120	1.169	6.0	106.5	
PC-01	PB-01 & PB-02	Foundation Soils	26.0	18.5	124	1.5	1.0	98.9	0.501	1.0	21	0.0	98.9	1.0	-0.5	0.1	0.9	0.136	1.017	0.138	0.120	1.150	6.0	104.9	
PC-01	PB-01 & PB-02	Foundation Soils	26.1	18.4	124	1.5	1.1	96.1	0.507	1.0	21	0.0	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.120	1.119	6.0	102.1	
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	124	1.5	1.1	91.7	0.517	1.0	21	0.0	91.7	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.120	1.074	6.0	97.6	
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	124	1.5	1.1	87.2	0.528	1.0	21	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.124	0.121	1.032	6.0	93.2	
PC-01	PB-01 & PB-02	Foundation Soils	26.3	18.2	124	1.5	1.1	78.6	0.550	1.0	21	0.0	78.6	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.121	0.961	6.0	84.6	0.096
PC-01	PB-01 & PB-02	Foundation Soils	26.4	18.1	124	1.5	1.1	81.0	0.543	1.0	21	0.0	81.0	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.121	0.979	6.0	87.0	0.100
PC-01	PB-01 & PB-02	Foundation Soils	26.5	18.0	124	1.5	1.1	79.2	0.548	1.0	21	0.0	79.2	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.121	0.964	6.0	85.2	0.097
PC-01	PB-01 & PB-02	Foundation Soils	26.6	17.9	124	1.6	1.1	78.1	0.551	1.0	21	0.0	78.1	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.121	0.955	6.0	84.1	0.096

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.9	124	1.6	1.1	76.1	0.557	1.0	21	0.0	76.1	1.0	-0.5	0.1	0.9	0.112	1.011	0.114	0.121	0.939	6.0	82.1	0.093
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.8	124	1.6	1.1	76.9	0.554	1.0	21	0.0	76.9	1.0	-0.5	0.1	0.9	0.113	1.011	0.114	0.121	0.945	6.0	82.9	0.094
PC-01	PB-01 & PB-02	Foundation Soils	26.8	17.7	124	1.6	1.1	77.5	0.553	1.0	21	0.0	77.5	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.121	0.948	6.0	83.5	0.095
PC-01	PB-01 & PB-02	Foundation Soils	26.9	17.6	124	1.6	1.1	78.2	0.551	1.0	21	0.0	78.2	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.121	0.953	6.0	84.2	0.096
PC-01	PB-01 & PB-02	Foundation Soils	27.0	17.5	124	1.6	1.1	80.2	0.546	1.0	21	0.0	80.2	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.121	0.968	6.0	86.2	0.099
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	119	1.6	1.1	87.0	0.528	1.0	21	0.0	87.0	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.121	1.023	6.0	93.0	
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	119	1.6	1.1	90.4	0.520	1.0	21	0.0	90.4	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.121	1.053	6.0	96.4	
PC-01	PB-01 & PB-02	Foundation Soils	27.2	17.3	124	1.6	1.1	92.5	0.515	1.0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.130	0.121	1.071	6.0	98.5	
PC-01	PB-01 & PB-02	Foundation Soils	27.3	17.2	124	1.6	1.1	92.7	0.515	1.0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.129	1.015	0.130	0.121	1.073	6.0	98.7	
PC-01	PB-01 & PB-02	Foundation Soils	27.4	17.1	124	1.6	1.1	89.1	0.523	1.0	21	0.0	89.1	1.0	-0.5	0.1	0.9	0.125	1.014	0.126	0.121	1.038	6.0	95.1	
PC-01	PB-01 & PB-02	Foundation Soils	27.5	17.0	124	1.6	1.1	81.5	0.542	1.0	21	0.4	81.5	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.121	0.974	9.5	90.6	0.105
PC-01	PB-01 & PB-02	Foundation Soils	27.6	17.0	124	1.6	1.1	93.9	0.512	1.0	21	23.4	93.9	1.0	-0.5	0.1	0.9	0.130	1.016	0.131	0.121	1.082	16.3	86.8	
PC-01	PB-01 & PB-02	Foundation Soils	27.6	16.9	124	1.6	1.1	96.1	0.507	1.0	21	34.9	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.134	0.122	1.104	21.2	82.4	
PC-01	PB-01 & PB-02	Foundation Soils	27.7	16.8	121	1.6	1.1	91.5	0.518	1.0	21	40.8	91.5	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.122	1.057	27.2	77.9	
PC-01	PB-01 & PB-02	Foundation Soils	27.8	16.7	121	1.6	1.1	88.6	0.525	1.0	21	42.3	88.6	1.0	-0.5	0.1	0.9	0.124	1.014	0.125	0.122	1.031	30.6	76.9	
PC-01	PB-01 & PB-02	Foundation Soils	27.9	16.6	121	1.6	1.1	85.6	0.532	1.0	21	42.1	85.6	1.0	-0.5	0.1	0.9	0.121	1.013	0.122	0.122	1.004	31.1	74.6	
PC-01	PB-01 & PB-02	Foundation Soils	28.0	16.5	121	1.6	1.1	80.7	0.544	1.0	21	43.0	80.7	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.122	0.964	36.0	73.7	0.082
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.5	121	1.6	1.1	73.2	0.564	1.0	21	43.3	73.2	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.122	0.908	43.9	73.9	0.082
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.4	115	1.6	1.1	67.5	0.581	1.0	21	43.0	67.5	1.0	-0.6	0.1	0.9	0.105	1.010	0.106	0.122	0.869	51.3	75.8	0.085
PC-01	PB-01 & PB-02	Foundation Soils	28.2	16.3	115	1.7	1.1	63.5	0.593	1.0	21	42.9	63.5	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.122	0.842	59.7	80.3	0.091
PC-01	PB-01 & PB-02	Foundation Soils	28.3	16.2	115	1.7	1.1	67.0	0.583	1.0	21	42.9	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.122	0.864	50.8	74.9	0.083
PC-01	PB-01 & PB-02	Foundation Soils	28.4	16.1	121	1.7	1.1	70.1	0.573	1.0	21	42.8	70.1	1.0	-0.6	0.1	0.9	0.107	1.010	0.108	0.122	0.884	44.8	72.1	0.080
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.1	121	1.7	1.1	68.8	0.577	1.0	21	42.5	68.8	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.122	0.875	44.3	70.6	0.078
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.0	115	1.7	1.1	64.0	0.591	1.0	21	42.5	64.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.103	0.122	0.843	52.6	74.0	0.082
PC-01	PB-01 & PB-02	Foundation Soils	28.6	15.9	115	1.7	1.1	62.3	0.597	1.0	21	42.7	62.3	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.122	0.832	60.8	80.4	0.091
PC-01	PB-01 & PB-02	Foundation Soils	28.7	15.8	115	1.7	1.1	66.9	0.583	1.0	21	43.0	66.9	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.122	0.861	51.8	75.7	0.084
PC-01	PB-01 & PB-02	Foundation Soils	28.8	15.7	121	1.7	1.1	79.0	0.549	1.0	21	42.9	79.0	1.0	-0.6	0.1	0.9	0.115	1.012	0.116	0.122	0.945	36.8	72.9	0.081
PC-01	PB-01 & PB-02	Foundation Soils	28.9	15.6	124	1.7	1.1	90.2	0.521	1.0	21	31.9	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.127	0.122	1.036	19.8	78.2	
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.6	124	1.7	1.1	74.7	0.560	1.0	21	0.8	74.7	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.122	0.912	9.9	83.8	0.095
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.5	124	1.7	1.1	80.6	0.545	1.0	21	0.0	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.122	0.955	6.0	86.6	0.099
PC-01	PB-01 & PB-02	Foundation Soils	29.1	15.4	124	1.7	1.1	87.0	0.529	1.0	21	0.0	87.0	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.122	1.006	6.0	93.0	
PC-01	PB-01 & PB-02	Foundation Soils	29.2	15.3	124	1.7	1.1	89.4	0.523	1.0	21	0.0	89.4	1.0	-0.6	0.1	0.9	0.125	1.014	0.126	0.123	1.027	6.0	95.4	
PC-01	PB-01 & PB-02	Foundation Soils	29.3	15.2	124	1.7	1.1	92.2	0.516	1.0	21	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.129	0.123	1.051	6.0	98.2	
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.2	124	1.7	1.1	94.0	0.512	1.0	21	0.0	94.0	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.123	1.068	6.0	100.0	
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.1	124	1.7	1.2	93.9	0.512	1.0	21	0.0	93.9	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.123	1.067	6.4	100.3	
PC-01	PB-01 & PB-02	Foundation Soils	29.5	15.0	124	1.7	1.2	91.6	0.517	1.0	21	0.0	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.123	1.045	8.3	100.0	
PC-01	PB-01 & PB-02	Foundation Soils	29.6	14.9	124	1.7	1.2	96.2	0.507	1.0	21	12.8	96.2	1.0	-0.6	0.1	0.9	0.133	1.016	0.134	0.123	1.088	13.4	96.8	
PC-01	PB-01 & PB-02	Foundation Soils	29.7	14.8	124	1.7	1.2	107.8	0.481	1.0	21	27.0	107.8	1.0	-0.6	0.1	0.9	0.149	1.021	0.150	0.123	1.222	17.0	97.8	
PC-01	PB-01 & PB-02	Foundation Soils	29.8	14.7	124	1.7	1.2	110.0	0.477	1.0	21	34.0	110.0	1.0	-0.6	0.1	0.9	0.152	1.022	0.154	0.123	1.251	19.7	95.6	
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.7	124	1.8	1.2	108.9	0.479	1.0	21	34.6	108.9	1.0	-0.6	0.1	0.9	0.150	1.021	0.152	0.123	1.234	20.1	94.3	
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.6	124	1.8	1.2	103.5	0.491	1.0	21	31.9	103.5	1.0	-0.6	0.1	0.9	0.142	1.019	0.143	0.123	1.165	19.1	90.6	
PC-01	PB-01 & PB-02	Foundation Soils	30.0	14.5	124	1.8	1.2	101.6	0.495	1.0	21	36.0	101.6	1.0	-0.6	0.1	0.9	0.139	1.018	0.140	0.123	1.143	21.4	87.0	
PC-01	PB-01 & PB-02	Foundation Soils	30.1	14.4	124	1.8	1.2	98.7	0.501	1.0	21	37.5	98.7	1.0	-0.6	0.1	0.9	0.136	1.017	0.136	0.123	1.110	22.7	83.9	
PC-01	PB-01 & PB-02	Foundation Soils	30.2	14.3	121	1.8	1.2	98.2	0.502	0.9	21	40.1	98.2	1.0	-0.6	0.1	0.9	0.135	1.017	0.136	0.123	1.104	25.1	83.2	
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	121	1.8	1.2	99.2	0.500	0.9	21	45.1	99.2	1.0	-0.6	0.1	0.9	0.136	1.017	0.137	0.123	1.114	33.1	87.1	
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	121	1.8	1.2	94.7	0.510	0.9	21	45.8	94.7	1.0	-0.6	0.1	0.9	0.131	1.016	0.131	0.123	1.068	37.8	86.7	
PC-01	PB-01 & PB-02	Foundation Soils	30.4	14.1	121	1.8	1.2	88.8	0.524	0.9	21	45.7	88.8	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.123	1.013	41.9	85.0	
PC-01	PB-01 & PB-02	Foundation Soils	30.5	14.0	115	1.8	1.2	82.3	0.540	0.9	21	45.4	82.3	1.0	-0.6	0.1	0.9	0.118	1.013	0.118	0.123	0.960	48.2	85.1	0.097
PC-01	PB-01 & PB-02	Foundation Soils	30.6	13.9	115	1.8	1.2	76.4	0.556	0.9	21	44.6	76.4	1.0	-0.6	0.1	0.9	0.113	1.011	0.113	0.123	0.915	51.3	83.1	0.094
PC-01	PB-01 & PB-02	Foundation Soils	30.7	13.8	121	1.8	1.2	79.5	0.548	0.9	21	44.9	79.5	1.0	-0.6	0.1	0.9	0.115	1.012	0.115	0.123	0.937	48.0	82.6	0.094
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.8	121	1.8	1.2	82.8	0.539	0.9	21	44.7	82.8	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.123	0.962	42.5	80.6	0.091
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.7	121	1.8	1.2	88.5	0.525	0.9	21	44.0	88.5	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.123	1.008	34.8	79.4	
PC-01	PB-01 & PB-02	Foundation Soils	30.9	13.6	121	1.8	1.2	90.2	0.521	0.9	21	42.6	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.126	0.123	1.023	30.6	78.2	
PC-01	PB-01 & PB-02	Foundation Soils	31.0	13.5	121	1.8	1.2	89.1	0.523	0.9	21	43.1	89.1	1.0	-0.6	0.1	0.9	0.125	1.014	0.125	0.123	1.012	32.2	78.2	
PC-01	PB-01 & PB-02	Foundation Soils	31.1	13.4	121	1.8	1.2	88.3	0.525	0.9	21	40.2	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.123	1.005	27.0	75.2	
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	121	1.8	1.2	88.9	0.524	0.9	21	40.5	88.9	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.123	1.010	27.4	75.8	
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	121	1.8	1.2	88.3	0.525	0.9	21	43.5	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.123	1.004	33.6	78.4	
PC-01	PB-01 & PB-02	Foundation Soils	31.3	13.2	121	1.8	1.2	91.6	0.517	0.9	21	41.4	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.124	1.032	28.1	78.3	
PC-01	PB-01 & PB-02	Foundation Soils	31.4	13.1	124	1.8	1.2	94.3	0.511	0.9	21	39.3	94.3	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.124	1.057	24.9	79.9	
PC-01	PB-01 & PB-02	Foundation Soils	31.5	13.0	124	1.9	1.2	96.1	0.507	0.9	21	28.9	96.1	1.0	-0.6	0.1	0.9	0.132	1.016	0.133	0.124	1.075	18.1	85.4	
PC-01	PB-01 & PB-02	Foundation Soils	31.6	12.9	124	1.9	1.2	91.8	0.517	0.9	21	17.3	91.8	1.0	-0.6	0.1	0.9	0.128	1.015	0.128	0.124	1.033	14.6	89.1	
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.9	124	1.9	1.2	98.0	0.503	0.9	21	30.2	98.0	1.0	-0.6	0.1	0.9	0.135	1.017	0.135	0.124	1.092	18.6	86.4	
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.8	124	1.9	1.2	94.4	0.511	0.9	21	28.8	94.4	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.124	1.057	18.2	83.8	
PC-01	PB-01 & PB-02	Foundation Soils	31.8	12.7	124	1.9	1.2	90.0	0.521	0.9	21	27.4	90.0	1.0	-0.7	0.1	0.9	0.126	1.015	0.126	0.124	1.016	17.8	80.4	
PC-01	PB-01 & PB-02	Foundation Soils	31.9	12.6	124	1.9	1.2	86.0	0.531	0.9	21	27.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.124	0.981	18.0	76.5	0.086
PC-01	PB-01 & PB-02	Foundation Soils	32.0	12.5	121	1.9	1.2	88.8	0.524	0.9	21	39.3	88.8	1.0	-0.7	0.1	0.9	0.124	1.014	0.124	0.124	1.004	25.8	75.3	
PC-01	PB-01 & PB-02	Foundation Soils	32.1	12.4	121	1.9	1.2	85.3	0.533	0.9	21	42.7	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.124	0.975	32.7	75.3	0.084

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.4	121	1.9	1.2	77.4	0.553	0.9	21	43.5	77.4	1.0	-0.7	0.1	0.9	0.113	1.012	0.113	0.124	0.915	40.9	74.8	0.083
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.3	121	1.9	1.2	72.7	0.566	0.9	21	43.6	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.124	0.882	47.6	76.7	0.086
PC-01	PB-01 & PB-02	Foundation Soils	32.3	12.2	115	1.9	1.2	68.0	0.580	0.9	21	43.5	68.0	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.124	0.850	57.4	81.8	0.093
PC-01	PB-01 & PB-02	Foundation Soils	32.4	12.1	115	1.9	1.2	67.5	0.581	0.9	21	43.1	67.5	1.0	-0.7	0.1	0.9	0.105	1.010	0.105	0.124	0.847	52.2	76.5	0.086
PC-01	PB-01 & PB-02	Foundation Soils	32.5	12.0	121	1.9	1.2	69.4	0.575	0.9	21	42.6	69.4	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.124	0.859	43.7	70.5	0.078
PC-01	PB-01 & PB-02	Foundation Soils	32.6	12.0	121	1.9	1.2	70.7	0.572	0.9	21	41.5	70.7	1.0	-0.7	0.1	0.9	0.108	1.010	0.107	0.124	0.867	36.6	65.9	0.072
PC-01	PB-01 & PB-02	Foundation Soils	32.6	11.9	124	1.9	1.2	71.1	0.570	0.9	21	32.0	71.1	1.0	-0.7	0.1	0.9	0.108	1.010	0.108	0.124	0.869	21.4	60.5	0.065
PC-01	PB-01 & PB-02	Foundation Soils	32.7	11.8	124	1.9	1.2	73.3	0.564	0.9	21	28.1	73.3	1.0	-0.7	0.1	0.9	0.110	1.011	0.110	0.124	0.884	18.9	64.1	0.070
PC-01	PB-01 & PB-02	Foundation Soils	32.8	11.7	124	1.9	1.3	79.8	0.547	0.9	21	31.2	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.124	0.929	20.2	68.7	0.076
PC-01	PB-01 & PB-02	Foundation Soils	32.9	11.6	124	1.9	1.3	79.9	0.547	0.9	21	33.6	79.9	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.124	0.929	21.7	67.9	0.075
PC-01	PB-01 & PB-02	Foundation Soils	33.0	11.5	121	1.9	1.3	79.5	0.547	0.9	21	37.9	79.5	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.124	0.927	25.7	67.4	0.074
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.5	121	1.9	1.3	79.4	0.548	0.9	21	37.6	79.4	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.124	0.925	25.4	67.2	0.074
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.4	124	2.0	1.3	82.1	0.541	0.9	21	36.5	82.1	1.0	-0.7	0.1	0.9	0.118	1.013	0.117	0.124	0.945	23.8	69.5	0.076
PC-01	PB-01 & PB-02	Foundation Soils	33.2	11.3	124	2.0	1.3	84.1	0.536	0.9	21	37.2	84.1	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.124	0.960	24.3	71.1	0.079
PC-01	PB-01 & PB-02	Foundation Soils	33.3	11.2	124	2.0	1.3	87.6	0.527	0.9	21	36.4	87.6	1.0	-0.7	0.1	0.9	0.123	1.014	0.123	0.124	0.988	23.0	74.3	0.083
PC-01	PB-01 & PB-02	Foundation Soils	33.4	11.1	124	2.0	1.3	86.7	0.529	0.9	21	34.9	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.122	0.124	0.980	21.9	73.8	0.082
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	124	2.0	1.3	85.7	0.532	0.9	21	35.8	85.7	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.124	0.972	22.8	72.7	0.081
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	124	2.0	1.3	84.5	0.535	0.9	21	35.1	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.124	0.962	22.3	71.8	0.079
PC-01	PB-01 & PB-02	Foundation Soils	33.6	10.9	124	2.0	1.3	85.3	0.533	0.9	21	33.8	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.120	0.124	0.968	21.3	72.9	0.081
PC-01	PB-01 & PB-02	Foundation Soils	33.7	10.8	124	2.0	1.3	84.5	0.535	0.9	21	29.9	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.124	0.962	19.2	73.8	0.082
PC-01	PB-01 & PB-02	Foundation Soils	33.8	10.7	124	2.0	1.3	86.0	0.531	0.9	21	32.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.124	0.973	20.4	73.9	0.082
PC-01	PB-01 & PB-02	Foundation Soils	33.9	10.6	124	2.0	1.3	83.8	0.536	0.9	21	37.0	83.8	1.0	-0.7	0.1	0.9	0.119	1.013	0.119	0.124	0.955	24.1	70.9	0.078
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.6	121	2.0	1.3	83.0	0.538	0.9	21	42.1	83.0	1.0	-0.7	0.1	0.9	0.119	1.013	0.118	0.124	0.949	32.1	73.0	0.081
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.5	121	2.0	1.3	79.8	0.547	0.9	21	43.4	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.124	0.925	38.1	74.6	0.083
PC-01	PB-01 & PB-02	Foundation Soils	34.1	10.4	121	2.0	1.3	69.7	0.574	0.9	21	42.7	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.124	0.855	44.2	71.2	0.079
PC-01	PB-01 & PB-02	Foundation Soils	34.2	10.3	121	2.0	1.3	65.7	0.586	0.9	21	42.5	65.7	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.124	0.830	48.8	72.0	0.080
PC-01	PB-01 & PB-02	Foundation Soils	34.3	10.2	121	2.0	1.3	72.6	0.566	0.9	21	42.6	72.6	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.124	0.874	40.5	70.5	0.078
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	124	2.0	1.3	79.1	0.548	0.9	21	35.3	79.1	1.0	-0.7	0.1	0.9	0.115	1.012	0.114	0.124	0.919	23.1	67.0	0.073
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	124	2.0	1.3	56.5	0.616	0.9	21	1.1	56.5	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.124	0.774	10.2	65.5	0.072
PC-01	PB-01 & PB-02	Foundation Soils	34.5	10.0	124	2.0	1.3	59.8	0.605	0.9	21	0.0	59.8	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.124	0.793	6.0	65.8	0.072
PC-01	PB-01 & PB-02	Foundation Soils	34.6	9.9	124	2.0	1.3	63.3	0.594	0.9	21	0.0	63.3	1.0	-0.7	0.1	0.9	0.102	1.009	0.101	0.124	0.814	6.0	69.3	0.076
PC-01	PB-01 & PB-02	Foundation Soils	34.7	9.8	124	2.0	1.3	64.2	0.591	0.9	21	0.0	64.2	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.124	0.819	7.2	71.3	0.079
PC-01	PB-01 & PB-02	Foundation Soils	34.8	9.7	124	2.1	1.3	64.6	0.590	0.9	21	0.0	64.6	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.124	0.821	7.5	72.1	0.080
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.7	124	2.1	1.3	67.1	0.582	0.9	21	0.0	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.104	0.124	0.837	6.0	73.1	0.081
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.6	124	2.1	1.3	72.7	0.566	0.9	21	0.0	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.124	0.873	6.0	78.7	0.088
PC-01	PB-01 & PB-02	Foundation Soils	35.0	9.5	124	2.1	1.3	69.6	0.575	0.9	21	0.0	69.6	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.124	0.852	6.0	75.6	0.084
PC-01	PB-01 & PB-02	Foundation Soils	35.1	9.4	124	2.1	1.3	71.7	0.569	0.9	21	0.0	71.7	1.0	-0.7	0.1	0.9	0.109	1.010	0.108	0.124	0.865	6.0	77.6	0.087
PC-01	PB-01 & PB-02	Foundation Soils	35.2	9.3	124	2.1	1.3	68.2	0.579	0.9	21	0.4	68.2	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.124	0.843	9.5	77.3	0.087
PC-01	PB-01 & PB-02	Foundation Soils	35.3	9.2	124	2.1	1.3	63.0	0.594	0.9	21	0.1	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.124	0.811	9.1	72.0	0.080
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.2	124	2.1	1.3	64.9	0.589	0.9	21	4.2	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.124	0.822	11.4	72.2	0.080
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.1	124	2.1	1.3	55.7	0.618	0.9	21	0.7	55.7	1.0	-0.8	0.1	0.9	0.096	1.008	0.096	0.125	0.767	9.9	64.9	0.071
PC-01	PB-01 & PB-02	Foundation Soils	35.5	9.0	124	2.1	1.3	49.6	0.640	0.9	21	0.1	49.6	1.0	-0.8	0.1	0.9	0.092	1.008	0.091	0.125	0.732	9.1	58.5	0.063
PC-01	PB-01 & PB-02	Foundation Soils	35.6	8.9	124	2.1	1.3	48.6	0.644	0.9	21	2.8	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.125	0.727	11.0	56.8	0.061
PC-01	PB-01 & PB-02	Foundation Soils	35.7	8.8	124	2.1	1.3	48.6	0.644	0.9	21	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.125	0.726	9.5	57.7	0.062
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.8	124	2.1	1.3	57.1	0.614	0.9	21	0.0	57.1	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.125	0.775	6.0	63.1	0.069
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.7	119	2.1	1.3	64.1	0.591	0.9	21	0.0	64.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.125	0.815	6.0	70.1	0.077
PC-01	PB-01 & PB-02	Foundation Soils	35.9	8.6	119	2.1	1.3	69.6	0.575	0.9	21	0.0	69.6	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.125	0.850	6.0	75.6	0.084
PC-01	PB-01 & PB-02	Foundation Soils	36.0	8.5	124	2.1	1.3	71.8	0.568	0.9	21	0.0	71.8	1.0	-0.8	0.1	0.9	0.109	1.010	0.108	0.125	0.864	6.0	77.8	0.087
PC-01	PB-01 & PB-02	Foundation Soils	36.1	8.4	124	2.1	1.4	70.9	0.571	0.9	21	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.125	0.858	6.0	76.9	0.086
PC-01	PB-01 & PB-02	Foundation Soils	36.2	8.3	124	2.1	1.4	69.7	0.574	0.9	21	0.0	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.125	0.850	6.0	75.7	0.085
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.3	124	2.1	1.4	64.5	0.590	0.9	21	0.0	64.5	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.125	0.817	6.0	70.5	0.078
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.2	124	2.1	1.4	63.1	0.594	0.9	21	0.0	63.1	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.125	0.809	8.5	71.6	0.079
PC-01	PB-01 & PB-02	Foundation Soils	36.4	8.1	124	2.2	1.4	67.4	0.581	0.9	21	4.3	67.4	1.0	-0.8	0.1	0.9	0.105	1.010	0.104	0.125	0.835	11.4	74.6	0.083
PC-01	PB-01 & PB-02	Foundation Soils	36.5	8.0	124	2.2	1.4	63.7	0.593	0.9	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.125	0.812	6.2	69.9	0.077
PC-01	PB-01 & PB-02	Foundation Soils	36.6	7.9	124	2.2	1.4	63.5	0.593	0.9	21	0.0	63.5	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.125	0.811	6.0	69.5	0.077
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.9	124	2.2	1.4	63.7	0.592	0.9	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.125	0.812	6.0	69.7	0.077
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.8	124	2.2	1.4	64.8	0.589	0.9	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.125	0.818	6.0	70.8	0.078
PC-01	PB-01 & PB-02	Foundation Soils	36.8	7.7	124	2.2	1.4	65.1	0.588	0.9	21	0.0	65.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.125	0.820	6.0	71.1	0.079
PC-01	PB-01 & PB-02	Foundation Soils	36.9	7.6	124	2.2	1.4	61.8	0.598	0.9	21	0.0	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.125	0.800	6.0	67.8	0.074
PC-01	PB-01 & PB-02	Foundation Soils	37.0	7.5	124	2.2	1.4	59.5	0.606	0.9	21	0.0	59.5	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.125	0.786	6.0	65.5	0.071
PC-01	PB-01 & PB-02	Foundation Soils	37.1	7.4	124	2.2	1.4	62.9	0.595	0.9	21	0.0	62.9	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.125	0.806	6.0	68.9	0.076
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.4	124	2.2	1.4	72.6	0.566	0.9	21	0.0	72.6	1.0	-0.8	0.1	0.9	0.109	1.011	0.108	0.125	0.866	6.0	78.5	0.088
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.3	124	2.2	1.4	73.9	0.563	0.9	21	0.0	73.9	1.0	-0.8	0.1	0.9	0.110	1.011	0.109	0.125	0.875	6.0	79.9	0.090
PC-01	PB-01 & PB-02	Foundation Soils	37.3	7.2	124	2.2	1.4	77.0	0.554	0.9	21	0.0	77.0	1.0	-0.8	0.1	0.9	0.113	1.011	0.112	0.125	0.896	6.0	83.0	0.094
PC-01	PB-01 & PB-02	Foundation Soils	37.4	7.1	124	2.2	1.4	87.0	0.528	0.9	21	0.0	87.0	1.0	-0.8	0.1	0.9	0.123	1.014	0.121	0.125	0.970	6.0	93.0	0.109
PC-01	PB-01 & PB-02	Foundation Soils	37.5	7.0	124	2.2	1.4	93.3	0.513	0.9	21	0.0	93.3	1.0	-0.8	0.1	0.9	0.129	1.016	0.128	0.125	1.023	6.0	99.2	
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	124	2.2	1.4	94.0	0.512	0.9	21	0.0	94.0	1.0	-0.8	0.1	0.9	0.130	1.016	0.128	0.125	1.030	6.0	100.0	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	124	2.2	1.4	89.4	0.523	0.9	21	0.0	89.4	1.0	-0.8	0.1	0.9	0.125	1.014	0.123	0.125	0.989	6.0	95.4	0.112
PC-01	PB-01 & PB-02	Foundation Soils	37.7	6.8	124	2.2	1.4	76.7	0.555	0.9	21	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.111	0.125	0.893	6.0	82.7	0.094
PC-01	PB-01 & PB-02	Foundation Soils	37.8	6.7	124	2.2	1.4	64.8	0.589	0.8	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.125	0.816	6.0	70.8	0.078
PC-01	PB-01 & PB-02	Foundation Soils	37.9	6.6	124	2.2	1.4	64.3	0.591	0.8	21	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.125	0.813	6.0	70.3	0.077
PC-01	PB-01 & PB-02	Foundation Soils	38.0	6.5	124	2.3	1.4	62.5	0.596	0.8	21	0.0	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.125	0.802	6.0	68.5	0.075
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.5	124	2.3	1.4	57.3	0.613	0.8	21	0.0	57.3	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.125	0.772	6.2	63.4	0.069
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.4	124	2.3	1.4	54.1	0.624	0.8	21	0.0	54.1	1.0	-0.8	0.1	0.9	0.095	1.008	0.094	0.125	0.754	8.0	62.1	0.067
PC-01	PB-01 & PB-02	Foundation Soils	38.2	6.3	124	2.3	1.4	52.9	0.628	0.8	21	0.0	52.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.093	0.125	0.747	7.3	60.2	0.065
PC-01	PB-01 & PB-02	Foundation Soils	38.3	6.2	124	2.3	1.4	51.9	0.632	0.8	21	0.0	51.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.125	0.741	7.3	59.2	0.064
PC-01	PB-01 & PB-02	Foundation Soils	38.4	6.1	124	2.3	1.4	48.7	0.643	0.8	21	0.1	48.7	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.125	0.723	8.9	57.5	0.062
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	124	2.3	1.4	46.8	0.651	0.8	21	1.2	46.8	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.125	0.713	10.2	55.8	0.060
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	119	2.3	1.4	61.8	0.598	0.8	21	18.5	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.125	0.798	15.6	58.9	0.064
PC-01	PB-01 & PB-02	Foundation Soils	38.6	5.9	119	2.3	1.4	61.8	0.598	0.8	21	18.1	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.125	0.797	15.4	59.1	0.064
PC-01	PB-01 & PB-02	Foundation Soils	38.7	5.8	124	2.3	1.4	47.2	0.649	0.8	21	3.5	47.2	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.125	0.715	11.3	55.0	0.059
PC-01	PB-01 & PB-02	Foundation Soils	38.8	5.7	124	2.3	1.4	49.1	0.642	0.8	21	3.1	49.1	1.0	-0.9	0.1	0.9	0.092	1.007	0.090	0.125	0.725	11.1	57.1	0.061
PC-01	PB-01 & PB-02	Foundation Soils	38.9	5.6	124	2.3	1.4	47.0	0.650	0.8	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.125	0.714	9.7	56.2	0.060
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.6	124	2.3	1.4	47.0	0.650	0.8	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.125	0.714	9.7	56.2	0.060
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.5	119	2.3	1.4	50.2	0.638	0.8	21	0.0	50.2	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.125	0.731	8.3	58.5	0.063
PC-01	PB-01 & PB-02	Foundation Soils	39.1	5.4	119	2.3	1.4	51.5	0.633	0.8	21	3.0	51.5	1.0	-0.9	0.1	0.9	0.093	1.008	0.092	0.125	0.738	11.1	59.6	0.064
PC-01	PB-01 & PB-02	Foundation Soils	39.2	5.3	119	2.3	1.4	51.8	0.632	0.8	21	1.6	51.8	1.0	-0.9	0.1	0.9	0.094	1.008	0.092	0.125	0.740	10.5	60.7	0.066
PC-01	PB-01 & PB-02	Foundation Soils	39.3	5.2	124	2.3	1.4	49.9	0.639	0.8	21	0.0	49.9	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.125	0.729	8.1	58.0	0.062
PC-01	PB-01 & PB-02	Foundation Soils	39.4	5.1	124	2.3	1.5	50.4	0.637	0.8	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.125	0.731	8.6	58.9	0.064
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.1	124	2.3	1.5	50.4	0.637	0.8	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.125	0.732	8.2	58.6	0.063
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.0	124	2.3	1.5	52.0	0.631	0.8	21	0.0	52.0	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.125	0.740	7.8	59.8	0.065
PC-01	PB-01 & PB-02	Foundation Soils	39.6	4.9	124	2.4	1.5	57.3	0.613	0.8	21	0.0	57.3	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.125	0.770	8.0	65.3	0.071
PC-01	PB-01 & PB-02	Foundation Soils	39.7	4.8	124	2.4	1.5	60.8	0.602	0.8	21	0.0	60.8	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.125	0.790	7.0	67.7	0.074
PC-01	PB-01 & PB-02	Foundation Soils	39.8	4.7	124	2.4	1.5	60.4	0.603	0.8	21	0.0	60.4	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.125	0.788	6.0	66.4	0.073
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.7	124	2.4	1.5	59.3	0.606	0.8	21	0.0	59.3	1.0	-0.9	0.1	0.8	0.099	1.009	0.097	0.125	0.781	6.0	65.3	0.071
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.6	124	2.4	1.5	61.1	0.600	0.8	21	0.0	61.1	1.0	-0.9	0.1	0.8	0.100	1.009	0.099	0.125	0.792	6.0	67.1	0.074
PC-01	PB-01 & PB-02	Foundation Soils	40.0	4.5	124	2.4	1.5	67.9	0.580	0.8	21	0.0	67.9	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.125	0.832	6.0	73.9	0.082
PC-01	PB-01 & PB-02	Foundation Soils	40.1	4.4	124	2.4	1.5	66.5	0.584	0.8	21	0.0	66.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.125	0.824	6.0	72.5	0.080
PC-01	PB-01 & PB-02	Foundation Soils	40.2	4.3	124	2.4	1.5	65.5	0.587	0.8	21	0.5	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.125	0.818	9.6	74.6	0.083
PC-01	PB-01 & PB-02	Foundation Soils	40.3	4.2	124	2.4	1.5	62.1	0.598	0.8	21	0.0	62.1	1.0	-0.9	0.1	0.8	0.101	1.009	0.099	0.125	0.797	8.2	70.2	0.077
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.2	124	2.4	1.5	62.7	0.596	0.8	21	0.0	62.7	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.125	0.801	7.0	69.7	0.077
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.1	124	2.4	1.5	68.6	0.578	0.8	21	0.0	68.6	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.125	0.837	6.0	74.6	0.083
PC-01	PB-01 & PB-02	Foundation Soils	40.5	4.0	124	2.4	1.5	69.6	0.575	0.8	21	0.0	69.6	1.0	-0.9	0.1	0.8	0.107	1.010	0.105	0.125	0.843	6.0	75.6	0.084
PC-01	PB-01 & PB-02	Foundation Soils	40.6	3.9	124	2.4	1.5	68.1	0.579	0.8	21	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.125	0.834	6.0	74.1	0.082
PC-01	PB-01 & PB-02	Foundation Soils	40.7	3.8	124	2.4	1.5	73.3	0.564	0.8	21	0.0	73.3	1.0	-0.9	0.1	0.8	0.110	1.011	0.108	0.125	0.866	7.0	80.2	0.091
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	124	2.4	1.5	65.5	0.587	0.8	21	0.0	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.125	0.817	8.3	73.8	0.082
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	124	2.4	1.5	65.5	0.587	0.8	21	1.2	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.124	0.818	10.2	74.5	0.083
PC-01	PB-01 & PB-02	Foundation Soils	40.9	3.6	124	2.4	1.5	65.3	0.587	0.8	21	2.3	65.3	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.124	0.816	10.7	73.8	0.082
PC-01	PB-01 & PB-02	Foundation Soils	41.0	3.5	124	2.4	1.5	64.4	0.590	0.8	21	2.1	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.124	0.811	10.6	73.0	0.081
PC-01	PB-01 & PB-02	Foundation Soils	41.1	3.4	124	2.4	1.5	64.3	0.590	0.8	21	0.0	64.3	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.124	0.810	6.4	70.7	0.078
PC-01	PB-01 & PB-02	Foundation Soils	41.2	3.3	124	2.4	1.5	74.0	0.562	0.8	21	0.0	74.0	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.124	0.870	6.0	80.0	0.090
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.3	124	2.5	1.5	83.1	0.538	0.8	21	0.0	83.1	1.0	-0.9	0.1	0.8	0.119	1.013	0.116	0.124	0.934	6.0	89.1	0.103
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.2	124	2.5	1.5	93.5	0.513	0.8	21	0.0	93.5	1.0	-0.9	0.1	0.8	0.129	1.016	0.127	0.124	1.018	6.0	99.5	
PC-01	PB-01 & PB-02	Foundation Soils	41.4	3.1	124	2.5	1.5	87.3	0.528	0.8	21	0.0	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.120	0.124	0.966	6.0	93.3	0.109
PC-01	PB-01 & PB-02	Foundation Soils	41.5	3.0	124	2.5	1.5	74.1	0.562	0.8	21	0.0	74.1	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.124	0.871	6.0	80.1	0.090
PC-01	PB-01 & PB-02	Foundation Soils	41.6	2.9	124	2.5	1.5	66.7	0.583	0.8	21	0.0	66.7	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.124	0.824	6.0	72.7	0.081
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	124	2.5	1.5	64.4	0.590	0.8	21	0.0	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.124	0.810	6.0	70.4	0.078
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	124	2.5	1.5	63.5	0.593	0.8	21	0.0	63.5	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.124	0.805	8.7	72.2	0.080
PC-01	PB-01 & PB-02	Foundation Soils	41.8	2.7	124	2.5	1.5	57.9	0.611	0.8	21	0.5	57.9	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.124	0.772	9.6	67.0	0.073
PC-01	PB-01 & PB-02	Foundation Soils	41.9	2.6	124	2.5	1.5	55.3	0.620	0.8	21	0.0	55.3	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.124	0.758	7.8	63.1	0.069
PC-01	PB-01 & PB-02	Foundation Soils	42.0	2.5	124	2.5	1.5	55.1	0.620	0.8	21	0.1	55.1	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.124	0.756	8.8	63.8	0.069
PC-01	PB-01 & PB-02	Foundation Soils	42.1	2.4	124	2.5	1.5	54.4	0.623	0.8	21	0.3	54.4	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.124	0.752	9.5	63.5	0.069
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.4	124	2.5	1.5	52.4	0.630	0.8	21	0.6	52.4	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.124	0.742	9.7	61.6	0.067
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.3	124	2.5	1.5	53.4	0.626	0.8	21	3.2	53.4	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.124	0.747	11.1	61.4	0.067
PC-01	PB-01 & PB-02	Foundation Soils	42.3	2.2	124	2.5	1.5	50.3	0.637	0.8	21	1.7	50.3	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.124	0.730	10.5	59.1	0.064
PC-01	PB-01 & PB-02	Foundation Soils	42.4	2.1	124	2.5	1.5	58.0	0.611	0.8	21	10.4	58.0	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.124	0.773	13.3	60.8	0.066
PC-01	PB-01 & PB-02	Foundation Soils	42.5	2.0	124	2.5	1.5	59.0	0.607	0.8	21	12.7	59.0	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.124	0.778	13.9	60.2	0.065
PC-01	PB-01 & PB-02	Foundation Soils	42.6	1.9	124	2.5	1.5	50.9	0.635	0.8	21	4.1	50.9	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.124	0.733	11.5	58.3	0.063
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.9	124	2.5	1.6	51.4	0.633	0.8	21	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.124	0.736	8.0	59.4	0.064
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.8	124	2.5	1.6	61.9	0.598	0.8	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.124	0.795	6.0	67.9	0.074
PC-01	PB-01 & PB-02	Foundation Soils	42.8	1.7	124	2.6	1.6	67.0	0.582	0.8	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.124	0.826	6.0	73.0	0.081
PC-01	PB-01 & PB-02	Foundation Soils	42.9	1.6	124	2.6	1.6	67.0	0.582	0.8	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.124	0.826	6.0	73.0	0.081
PC-01	PB-01 & PB-02	Foundation Soils	43.0	1.5	124	2.6	1.6	61.9	0.598	0.8	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.124	0.795	6.0	67.8	0.074
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.5	124	2.6	1.6	60.4	0.603	0.8	21	0.0	60.4	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.124	0.787	6.0	66.4	0.073

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.4	124	2.6	1.6	59.7	0.605	0.8	21	0.0	59.7	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.124	0.782	6.0	65.7	0.072
PC-01	PB-01 & PB-02	Foundation Soils	43.2	1.3	124	2.6	1.6	62.9	0.595	0.8	21	0.0	62.9	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.124	0.801	6.0	68.9	0.076
PC-01	PB-01 & PB-02	Foundation Soils	43.3	1.2	124	2.6	1.6	71.5	0.569	0.8	21	0.0	71.5	1.0	-1.0	0.1	0.8	0.109	1.010	0.106	0.124	0.854	6.0	77.5	0.087
PC-01	PB-01 & PB-02	Foundation Soils	43.4	1.1	124	2.6	1.6	75.4	0.558	0.8	21	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.124	0.879	6.0	81.4	0.092
PC-01	PB-01 & PB-02	Foundation Soils	43.5	1.0	124	2.6	1.6	76.9	0.555	0.8	21	0.0	76.9	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.124	0.889	6.0	82.9	0.094
PC-01	PB-01 & PB-02	Foundation Soils	43.6	1.0	124	2.6	1.6	80.4	0.545	0.8	21	3.8	80.4	1.0	-1.0	0.1	0.8	0.116	1.012	0.113	0.124	0.913	11.2	87.8	0.101
PC-01	PB-01 & PB-02	Foundation Soils	43.6	0.9	124	2.6	1.6	74.3	0.561	0.8	21	0.3	74.3	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.124	0.872	9.4	83.4	0.095
PC-01	PB-01 & PB-02	Foundation Soils	43.7	0.8	124	2.6	1.6	74.7	0.560	0.8	21	2.1	74.7	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.124	0.874	10.6	83.3	0.095
PC-01	PB-01 & PB-02	Foundation Soils	43.8	0.7	124	2.6	1.6	88.9	0.524	0.8	21	21.9	88.9	1.0	-1.0	0.1	0.8	0.124	1.014	0.121	0.124	0.977	15.9	82.9	0.094
PC-01	PB-01 & PB-02	Foundation Soils	43.9	0.6	124	2.6	1.6	81.5	0.542	0.8	21	18.8	81.5	1.0	-1.0	0.1	0.8	0.117	1.012	0.114	0.124	0.921	15.2	77.9	0.087
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.6	124	2.6	1.6	67.0	0.582	0.8	21	4.3	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.102	0.124	0.825	11.5	74.1	0.082
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.5	124	2.6	1.6	76.5	0.555	0.8	21	0.0	76.5	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.124	0.886	6.4	82.9	0.094
PC-01	PB-01 & PB-02	Foundation Soils	44.1	0.4	124	2.6	1.6	87.1	0.528	0.8	21	0.0	87.1	1.0	-1.0	0.1	0.8	0.123	1.014	0.119	0.124	0.963	6.0	93.1	0.109
PC-01	PB-01 & PB-02	Foundation Soils	44.2	0.3	124	2.6	1.6	97.4	0.504	0.8	21	0.0	97.4	1.0	-1.0	0.1	0.8	0.134	1.017	0.130	0.124	1.052	6.0	103.4	
PC-01	PB-01 & PB-02	Foundation Soils	44.3	0.2	124	2.6	1.6	110.9	0.475	0.8	21	0.0	110.9	1.0	-1.0	0.1	0.8	0.154	1.022	0.149	0.124	1.205	6.0	116.9	
PC-01	PB-01 & PB-02	Foundation Soils	44.4	0.1	124	2.6	1.6	128.0	0.442	0.8	21	0.0	128.0	0.9	-1.0	0.1	0.8	0.192	1.031	0.187	0.124	1.506	6.0	134.0	
PC-01	PB-01 & PB-02	Foundation Soils	44.5	0.1	124	2.7	1.6	144.1	0.413	0.8	21	0.0	144.1	0.9	-1.0	0.1	0.8	0.254	1.041	0.247	0.124	1.998	6.0	150.1	
PC-01	PB-01 & PB-02	Foundation Soils	44.5	-0.0	124	2.7	1.6	131.2	0.436	0.8	21	0.0	131.2	0.9	-1.0	0.1	0.8	0.201	1.032	0.196	0.124	1.581	6.0	137.2	
PC-01	PB-01 & PB-02	Foundation Soils	44.6	-0.1	124	2.7	1.6	91.7	0.517	0.8	21	0.0	91.7	1.0	-1.0	0.1	0.8	0.127	1.015	0.124	0.124	1.001	6.0	97.7	
PC-01	PB-01 & PB-02	Foundation Soils	44.7	-0.2	124	2.7	1.6	79.2	0.548	0.8	21	0.0	79.2	1.0	-1.0	0.1	0.8	0.115	1.012	0.112	0.124	0.905	6.0	85.2	0.097
PC-01	PB-01 & PB-02	Foundation Soils	44.8	-0.3	124	2.7	1.6	68.8	0.577	0.8	21	0.0	68.8	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.124	0.837	6.0	74.8	0.083
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	124	2.7	1.6	65.0	0.588	0.8	21	0.0	65.0	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.124	0.814	6.0	71.0	0.078
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	124	2.7	1.6	65.4	0.587	0.8	21	0.0	65.4	1.0	-1.0	0.1	0.8	0.104	1.009	0.101	0.124	0.816	6.0	71.4	0.079
PC-01	PB-01 & PB-02	Foundation Soils	45.0	-0.5	124	2.7	1.6	65.1	0.588	0.8	21	0.0	65.1	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.124	0.814	6.0	71.1	0.079
PC-01	PB-01 & PB-02	Foundation Soils	45.1	-0.6	124	2.7	1.6	63.1	0.594	0.8	21	0.0	63.1	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.124	0.802	6.3	69.4	0.076
PC-01	PB-01 & PB-02	Foundation Soils	45.2	-0.7	124	2.7	1.6	61.5	0.599	0.8	21	0.0	61.5	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.124	0.793	7.2	68.7	0.076
PC-01	PB-01 & PB-02	Foundation Soils	45.3	-0.8	124	2.7	1.6	62.8	0.595	0.8	21	0.0	62.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.124	0.801	6.5	69.3	0.076
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.8	124	2.7	1.6	62.7	0.595	0.8	21	0.0	62.7	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.124	0.800	7.1	69.8	0.077
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.9	124	2.7	1.6	61.6	0.599	0.8	21	4.9	61.6	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.124	0.794	11.7	68.4	0.075
PC-01	PB-01 & PB-02	Foundation Soils	45.5	-1.0	124	2.7	1.6	63.8	0.592	0.8	21	10.5	63.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.100	0.124	0.807	13.2	66.5	0.073
PC-01	PB-01 & PB-02	Foundation Soils	45.6	-1.1	124	2.7	1.6	67.6	0.581	0.8	21	18.9	67.6	1.0	-1.1	0.1	0.8	0.105	1.010	0.103	0.124	0.830	15.5	64.3	0.070
PC-01	PB-01 & PB-02	Foundation Soils	45.7	-1.2	124	2.7	1.6	77.6	0.553	0.8	21	33.4	77.6	1.0	-1.1	0.1	0.8	0.114	1.012	0.110	0.124	0.894	21.8	66.0	0.072
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	121	2.7	1.6	84.5	0.535	0.8	21	43.1	84.5	1.0	-1.1	0.1	0.8	0.120	1.013	0.117	0.124	0.943	34.2	75.6	0.084
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	111	2.7	1.7	83.2	0.538	0.8	21	46.6	83.2	1.0	-1.1	0.1	0.8	0.119	1.013	0.115	0.124	0.933	64.7	101.2	0.121
PC-01	PB-01 & PB-02	Foundation Soils	45.9	-1.4	111	2.7	1.7	86.0	0.531	0.8	21	47.4	86.0	1.0	-1.1	0.1	0.8	0.121	1.014	0.118	0.124	0.954	70.1	108.7	0.134
PC-01	PB-01 & PB-02	Foundation Soils	46.0	-1.5	115	2.7	1.7	111.7	0.473	0.8	21	51.4	111.7	0.9	-1.1	0.1	0.8	0.155	1.022	0.150	0.124	1.215	57.7	118.0	
PC-01	PB-01 & PB-02	Foundation Soils	46.1	-1.6	121	2.8	1.7	168.0	0.375	0.8	21	57.9	168.0	0.9	-1.1	0.1	0.8	0.471	1.061	0.458	0.124	3.710	36.5	146.6	
PC-01	PB-01 & PB-02	Foundation Soils	46.2	-1.7	124	2.8	1.7	211.0	0.315	0.9	21	0.0	211.0	0.9	-1.1	0.1	0.8	3.724	1.082	3.485	0.123	28.219	7.5	218.5	
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.7	124	2.8	1.7	205.7	0.322	0.9	21	0.0	205.7	0.9	-1.1	0.1	0.8	2.650	1.082	2.503	0.123	20.274	6.0	211.7	
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.8	124	2.8	1.7	154.5	0.396	0.8	21	5.5	154.5	0.9	-1.1	0.1	0.8	0.321	1.049	0.312	0.123	2.525	11.4	160.3	
PC-01	PB-01 & PB-02	Foundation Soils	46.4	-1.9	124	2.8	1.7	148.6	0.406	0.8	21	0.0	148.6	0.9	-1.1	0.1	0.8	0.280	1.044	0.271	0.123	2.198	6.0	154.6	
PC-01	PB-01 & PB-02	Foundation Soils	46.5	-2.0	124	2.8	1.7	110.9	0.475	0.8	21	0.0	110.9	0.9	-1.1	0.1	0.8	0.153	1.022	0.149	0.123	1.204	6.1	117.0	
PC-01	PB-01 & PB-02	Foundation Soils	46.6	-2.1	124	2.8	1.7	103.0	0.492	0.8	21	0.0	103.0	1.0	-1.1	0.1	0.8	0.141	1.019	0.137	0.123	1.109	6.0	109.0	
PC-01	PB-01 & PB-02	Foundation Soils	46.7	-2.2	124	2.8	1.7	93.7	0.512	0.8	21	0.0	93.7	1.0	-1.1	0.1	0.8	0.130	1.016	0.126	0.123	1.018	6.0	99.7	
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.2	124	2.8	1.7	79.5	0.547	0.8	21	0.1	79.5	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.123	0.907	8.8	88.2	0.102
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.3	124	2.8	1.7	75.8	0.558	0.8	21	2.5	75.8	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.123	0.882	10.8	84.0	0.096
PC-01	PB-01 & PB-02	Foundation Soils	46.9	-2.4	124	2.8	1.7	79.3	0.548	0.8	21	10.0	79.3	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.123	0.906	12.9	82.3	0.093
PC-01	PB-01 & PB-02	Foundation Soils	47.0	-2.5	124	2.8	1.7	64.4	0.590	0.8	21	5.0	64.4	1.0	-1.1	0.1	0.8	0.103	1.009	0.100	0.123	0.811	11.7	71.1	0.079
PC-01	PB-01 & PB-02	Foundation Soils	47.1	-2.6	124	2.8	1.7	78.0	0.552	0.8	21	23.5	78.0	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.123	0.897	16.8	71.3	0.079
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.6	124	2.8	1.7	78.9	0.549	0.8	21	29.6	78.9	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.123	0.903	19.4	68.6	0.075
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.7	121	2.8	1.7	72.5	0.567	0.8	21	35.1	72.5	1.0	-1.1	0.1	0.8	0.109	1.011	0.106	0.123	0.860	23.9	61.2	0.066
PC-01	PB-01 & PB-02	Foundation Soils	47.3	-2.8	121	2.8	1.7	74.1	0.562	0.8	21	35.2	74.1	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.123	0.871	23.7	62.6	0.068
PC-01	PB-01 & PB-02	Foundation Soils	47.4	-2.9	121	2.8	1.7	71.4	0.570	0.8	21	39.2	71.4	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.123	0.854	29.8	62.0	0.067
PC-01	PB-01 & PB-02	Foundation Soils	47.5	-3.0	121	2.8	1.7	67.7	0.580	0.8	21	35.3	67.7	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.123	0.831	24.8	57.2	0.062
PC-01	PB-01 & PB-02	Foundation Soils	47.6	-3.1	121	2.8	1.7	74.2	0.562	0.8	21	39.4	74.2	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.123	0.872	29.3	64.1	0.070
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.1	121	2.8	1.7	75.7	0.558	0.8	21	42.6	75.7	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.123	0.882	38.0	71.1	0.079
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.2	121	2.9	1.7	76.1	0.557	0.8	21	43.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.123	0.884	39.5	72.6	0.080
PC-01	PB-01 & PB-02	Foundation Soils	47.8	-3.3	121	2.9	1.7	80.5	0.545	0.8	21	41.7	80.5	1.0	-1.1	0.1	0.8	0.116	1.012	0.113	0.123	0.915	32.2	71.0	0.078
PC-01	PB-01 & PB-02	Foundation Soils	47.9	-3.4	124	2.9	1.7	84.3	0.535	0.8	21	28.7	84.3	1.0	-1.1	0.1	0.8	0.120	1.013	0.116	0.123	0.942	18.6	74.3	0.083
PC-01	PB-01 & PB-02	Foundation Soils	48.0	-3.5	124	2.9	1.7	75.6	0.558	0.8	21	0.0	75.6	1.0	-1.1	0.1	0.8	0.112	1.011	0.108	0.123	0.881	7.6	83.2	0.094
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.5	124	2.9	1.7	81.9	0.541	0.8	21	35.4	81.9	1.0	-1.1	0.1	0.8	0.118	1.013	0.114	0.123	0.925	22.9	69.4	0.076
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.6	121	2.9	1.7	80.1	0.546	0.8	21	36.7	80.1	1.0	-1.1	0.1	0.8	0.116	1.012	0.112	0.123	0.912	24.3	67.7	0.074
PC-01	PB-01 & PB-02	Foundation Soils	48.2	-3.7	121	2.9	1.7	79.4	0.548	0.8	21	41.4	79.4	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.123	0.907	31.9	69.9	0.077
PC-01	PB-01 & PB-02	Foundation Soils	48.3	-3.8	121	2.9	1.7	73.7	0.563	0.8	21	42.0	73.7	1.0	-1.1	0.1	0.8	0.110	1.011	0.107	0.123	0.869	36.6	68.3	0.075
PC-01	PB-01 & PB-02	Foundation Soils	48.4	-3.9	121	2.9	1.7	69.6	0.575	0.8	21	42.2	69.6	1.0	-1.1	0.1	0.8	0.107	1.010	0.104	0.123	0.843	41.0	68.4	0.075
PC-01	PB-01 & PB-02	Foundation Soils	48.5	-4.0	121	2.9	1.7	63.3	0.594	0.7	21	37.9	63.3	1.0	-1.1	0.1	0.8	0.102	1.009	0.099	0.123	0.805	29.8	55.3	0.059
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.0	121	2.9	1.7	70.9	0.571	0.8	21	33.7	70.9	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.123	0.851	22.7	59.9	0.065

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.1	124	2.9	1.7	56.4	0.616	0.7	21	10.1	56.4	1.0	-1.1	0.1	0.8	0.097	1.008	0.094	0.123	0.766	13.2	59.5	0.064
PC-01	PB-01 & PB-02	Foundation Soils	48.7	-4.2	124	2.9	1.7	66.9	0.583	0.8	21	0.0	66.9	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.123	0.827	6.0	72.9	0.081
PC-01	PB-01 & PB-02	Foundation Soils	48.8	-4.3	124	2.9	1.7	76.6	0.555	0.8	21	27.9	76.6	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.123	0.888	18.6	67.3	0.074
PC-01	PB-01 & PB-02	Foundation Soils	48.9	-4.4	121	2.9	1.7	76.8	0.555	0.8	21	40.2	76.8	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.123	0.890	30.2	66.7	0.073
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	121	2.9	1.7	71.2	0.570	0.8	21	38.5	71.2	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.123	0.853	28.6	61.3	0.066
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	121	2.9	1.7	69.6	0.575	0.8	21	38.8	69.6	1.0	-1.2	0.1	0.8	0.107	1.010	0.104	0.123	0.844	29.6	60.4	0.065
PC-01	PB-01 & PB-02	Foundation Soils	49.1	-4.6	121	2.9	1.7	68.7	0.577	0.7	21	33.0	68.7	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.123	0.838	22.4	58.1	0.063
PC-01	PB-01 & PB-02	Foundation Soils	49.2	-4.7	124	2.9	1.8	57.5	0.612	0.7	21	15.0	57.5	1.0	-1.2	0.1	0.8	0.098	1.008	0.095	0.123	0.772	14.6	57.0	0.061
PC-01	PB-01 & PB-02	Foundation Soils	49.3	-4.8	121	2.9	1.8	64.9	0.589	0.7	21	36.7	64.9	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.123	0.815	27.2	55.4	0.059
PC-01	PB-01 & PB-02	Foundation Soils	49.4	-4.9	115	3.0	1.8	61.8	0.598	0.7	21	42.4	61.8	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.123	0.797	57.4	76.8	0.086
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-4.9	115	3.0	1.8	56.7	0.615	0.7	21	41.7	56.7	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.123	0.768	60.2	75.2	0.084
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-5.0	115	3.0	1.8	54.0	0.624	0.7	21	41.2	54.0	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.123	0.753	60.5	73.3	0.081
PC-01	PB-01 & PB-02	Foundation Soils	49.6	-5.1	115	3.0	1.8	56.8	0.615	0.7	21	41.6	56.8	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.123	0.768	59.1	74.3	0.083
PC-01	PB-01 & PB-02	Foundation Soils	49.7	-5.2	121	3.0	1.8	72.5	0.567	0.7	21	41.8	72.5	1.0	-1.2	0.1	0.8	0.109	1.011	0.106	0.123	0.862	36.8	67.5	0.074
PC-01	PB-01 & PB-02	Foundation Soils	49.8	-5.3	121	3.0	1.8	89.2	0.523	0.8	21	41.1	89.2	1.0	-1.2	0.1	0.8	0.125	1.014	0.120	0.123	0.981	28.2	76.3	0.085
PC-01	PB-01 & PB-02	Foundation Soils	49.9	-5.4	121	3.0	1.8	98.6	0.501	0.8	21	39.9	98.6	0.9	-1.2	0.1	0.8	0.136	1.017	0.130	0.122	1.065	24.8	83.6	
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.4	121	3.0	1.8	99.3	0.500	0.8	21	40.8	99.3	0.9	-1.2	0.1	0.8	0.136	1.018	0.131	0.122	1.072	25.7	84.2	
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.5	124	3.0	1.8	83.5	0.537	0.8	21	22.8	83.5	1.0	-1.2	0.1	0.8	0.119	1.013	0.115	0.122	0.938	16.4	77.1	0.086
PC-01	PB-01 & PB-02	Foundation Soils	50.1	-5.6	124	3.0	1.8	64.7	0.589	0.7	21	2.1	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.122	0.815	10.6	73.3	0.081
PC-01	PB-01 & PB-02	Foundation Soils	50.2	-5.7	124	3.0	1.8	65.9	0.586	0.7	21	0.0	65.9	1.0	-1.2	0.1	0.8	0.104	1.009	0.101	0.122	0.822	6.8	72.7	0.081
PC-01	PB-01 & PB-02	Foundation Soils	50.3	-5.8	124	3.0	1.8	88.5	0.525	0.8	21	28.6	88.5	0.9	-1.2	0.1	0.8	0.124	1.014	0.119	0.122	0.976	18.4	78.2	0.088
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.8	121	3.0	1.8	95.3	0.509	0.8	21	41.1	95.3	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.122	1.034	26.9	81.0	
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.9	121	3.0	1.8	92.1	0.516	0.8	21	41.5	92.1	0.9	-1.2	0.1	0.8	0.128	1.015	0.123	0.122	1.006	28.1	78.7	
PC-01	PB-01 & PB-02	Foundation Soils	50.5	-6.0	121	3.0	1.8	84.0	0.536	0.8	21	42.4	84.0	1.0	-1.2	0.1	0.8	0.120	1.013	0.115	0.122	0.941	32.6	74.1	0.082
PC-01	PB-01 & PB-02	Foundation Soils	50.6	-6.1	121	3.0	1.8	78.2	0.551	0.7	21	37.8	78.2	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.122	0.900	25.9	66.3	0.073
PC-01	PB-01 & PB-02	Foundation Soils	50.7	-6.2	124	3.0	1.8	70.7	0.572	0.7	21	31.0	70.7	1.0	-1.2	0.1	0.8	0.108	1.010	0.104	0.122	0.852	20.7	60.4	0.065
PC-01	PB-01 & PB-02	Foundation Soils	50.8	-6.3	124	3.0	1.8	74.5	0.561	0.7	21	33.4	74.5	1.0	-1.2	0.1	0.8	0.111	1.011	0.107	0.122	0.876	22.1	63.2	0.069
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.3	121	3.0	1.8	78.0	0.552	0.7	21	35.5	78.0	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.122	0.899	23.4	65.9	0.072
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.4	124	3.0	1.8	71.8	0.568	0.7	21	26.9	71.8	1.0	-1.2	0.1	0.8	0.109	1.010	0.105	0.122	0.859	18.4	63.3	0.069
PC-01	PB-01 & PB-02	Foundation Soils	51.0	-6.5	124	3.1	1.8	62.3	0.597	0.7	21	18.7	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.122	0.801	15.6	59.2	0.064
PC-01	PB-01 & PB-02	Foundation Soils	51.1	-6.6	121	3.1	1.8	67.8	0.580	0.7	21	38.5	67.8	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.122	0.834	29.7	58.9	0.064
PC-01	PB-01 & PB-02	Foundation Soils	51.2	-6.7	121	3.1	1.8	65.4	0.587	0.7	21	40.9	65.4	1.0	-1.2	0.1	0.8	0.104	1.009	0.100	0.122	0.820	38.4	62.8	0.068
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.7	121	3.1	1.8	63.8	0.592	0.7	21	41.6	63.8	1.0	-1.2	0.1	0.8	0.102	1.009	0.099	0.122	0.811	43.9	66.1	0.072
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.8	121	3.1	1.8	60.6	0.602	0.7	21	40.7	60.6	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.122	0.792	41.7	61.6	0.067
PC-01	PB-01 & PB-02	Foundation Soils	51.4	-6.9	121	3.1	1.8	60.0	0.604	0.7	21	40.8	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.096	0.122	0.789	43.1	62.3	0.068
PC-01	PB-01 & PB-02	Foundation Soils	51.5	-7.0	121	3.1	1.8	62.7	0.596	0.7	21	41.6	62.7	1.0	-1.2	0.1	0.8	0.102	1.009	0.098	0.122	0.804	45.1	66.2	0.072
PC-01	PB-01 & PB-02	Foundation Soils	51.6	-7.1	121	3.1	1.8	68.6	0.578	0.7	21	40.7	68.6	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.122	0.840	35.2	63.1	0.069
PC-01	PB-01 & PB-02	Foundation Soils	51.7	-7.2	121	3.1	1.8	75.7	0.558	0.7	21	41.7	75.7	1.0	-1.2	0.1	0.8	0.112	1.011	0.108	0.122	0.885	34.3	68.4	0.075
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.2	121	3.1	1.8	79.6	0.547	0.7	21	35.8	79.6	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.122	0.911	23.6	67.3	0.074
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.3	124	3.1	1.8	51.0	0.635	0.7	21	2.6	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.090	0.122	0.739	10.9	59.3	0.064
PC-01	PB-01 & PB-02	Foundation Soils	51.9	-7.4	124	3.1	1.8	57.2	0.613	0.7	21	16.6	57.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.122	0.773	15.1	55.7	0.060
PC-01	PB-01 & PB-02	Foundation Soils	52.0	-7.5	121	3.1	1.8	79.4	0.548	0.7	21	39.4	79.4	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.122	0.910	27.9	68.0	0.075
PC-01	PB-01 & PB-02	Foundation Soils	52.1	-7.6	124	3.1	1.8	77.3	0.553	0.7	21	33.3	77.3	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.122	0.896	21.8	65.7	0.072
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	124	3.1	1.8	76.8	0.555	0.7	21	27.9	76.8	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.122	0.893	18.6	67.5	0.074
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	121	3.1	1.8	95.0	0.509	0.8	21	40.0	95.0	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.122	1.033	25.5	80.5	
PC-01	PB-01 & PB-02	Foundation Soils	52.3	-7.8	121	3.1	1.8	109.0	0.479	0.8	21	40.2	109.0	0.9	-1.2	0.1	0.8	0.150	1.021	0.144	0.122	1.182	23.7	92.5	
PC-01	PB-01 & PB-02	Foundation Soils	52.4	-7.9	124	3.1	1.8	97.3	0.504	0.8	21	36.6	97.3	0.9	-1.2	0.1	0.8	0.134	1.017	0.128	0.122	1.055	22.2	82.9	
PC-01	PB-01 & PB-02	Foundation Soils	52.5	-8.0	124	3.1	1.8	80.5	0.545	0.7	21	31.5	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.122	0.918	20.3	69.3	0.076
PC-01	PB-01 & PB-02	Foundation Soils	52.6	-8.1	121	3.1	1.8	78.9	0.549	0.7	21	37.2	78.9	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.122	0.907	25.1	66.7	0.073
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.1	124	3.2	1.9	81.2	0.543	0.7	21	33.1	81.2	0.9	-1.3	0.1	0.8	0.117	1.012	0.112	0.122	0.923	21.3	69.3	0.076
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.2	124	3.2	1.9	76.9	0.554	0.7	21	27.3	76.9	1.0	-1.3	0.1	0.8	0.113	1.011	0.109	0.122	0.894	18.3	68.0	0.075
PC-01	PB-01 & PB-02	Foundation Soils	52.8	-8.3	124	3.2	1.9	80.5	0.545	0.7	21	24.7	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.121	0.919	17.1	72.9	0.081
PC-01	PB-01 & PB-02	Foundation Soils	52.9	-8.4	124	3.2	1.9	66.3	0.585	0.7	21	3.9	66.3	1.0	-1.3	0.1	0.8	0.104	1.010	0.100	0.121	0.827	11.3	73.7	0.082
PC-01	PB-01 & PB-02	Foundation Soils	53.0	-8.5	124	3.2	1.9	80.5	0.545	0.7	21	0.0	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.121	0.919	6.0	86.5	0.099
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	124	3.2	1.9	100.0	0.498	0.8	21	0.0	100.0	0.9	-1.3	0.1	0.8	0.137	1.018	0.131	0.121	1.082	6.0	106.0	
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	124	3.2	1.9	87.2	0.528	0.7	21	0.0	87.2	0.9	-1.3	0.1	0.8	0.123	1.014	0.118	0.121	0.969	6.0	93.2	0.109
PC-01	PB-01 & PB-02	Foundation Soils	53.2	-8.7	124	3.2	1.9	62.6	0.596	0.7	21	0.0	62.6	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.121	0.806	6.0	68.6	0.075
PC-01	PB-01 & PB-02	Foundation Soils	53.3	-8.8	124	3.2	1.9	59.1	0.607	0.7	21	0.0	59.1	1.0	-1.3	0.1	0.8	0.099	1.009	0.095	0.121	0.786	8.1	67.2	0.074
PC-01	PB-01 & PB-02	Foundation Soils	53.4	-8.9	124	3.2	1.9	58.4	0.609	0.7	21	1.8	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.121	0.782	10.5	67.1	0.074
PC-01	PB-01 & PB-02	Foundation Soils	53.5	-9.0	124	3.2	1.9	57.4	0.613	0.7	21	9.9	57.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.121	0.777	13.1	60.7	0.066
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.0	121	3.2	1.9	83.5	0.537	0.7	21	41.7	83.5	0.9	-1.3	0.1	0.8	0.119	1.013	0.114	0.121	0.942	31.1	72.8	0.081
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.1	124	3.2	1.9	75.1	0.559	0.7	21	32.8	75.1	0.9	-1.3	0.1	0.8	0.111	1.011	0.107	0.121	0.884	21.5	63.9	0.070
PC-01	PB-01 & PB-02	Foundation Soils	53.7	-9.2	124	3.2	1.9	49.7	0.640	0.7	21	3.5	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.089	0.121	0.735	11.3	57.5	0.062
PC-01	PB-01 & PB-02	Foundation Soils	53.8	-9.3	124	3.2	1.9	54.0	0.624	0.7	21	7.2	54.0	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.121	0.758	12.4	59.2	0.064
PC-01	PB-01 & PB-02	Foundation Soils	53.9	-9.4	124	3.2	1.9	62.8	0.595	0.7	21	25.9	62.8	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.121	0.808	18.4	55.3	0.059
PC-01	PB-01 & PB-02	Foundation Soils	54.0	-9.5	121	3.2	1.9	62.3	0.597	0.7	21	34.6	62.3	1.0	-1.3	0.1	0.8	0.101	1.009	0.097	0.121	0.805	24.9	52.6	0.056
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.5	121	3.2	1.9	58.9	0.608	0.7	21	37.7	58.9	1.0	-1.3	0.1	0.8	0.099	1.008	0.095	0.121	0.786	30.9	52.2	0.056

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.6	121	3.2	1.9	58.4	0.609	0.7	21	39.5	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.121	0.783	37.1	56.0	0.060
PC-01	PB-01 & PB-02	Foundation Soils	54.2	-9.7	115	3.2	1.9	55.2	0.620	0.7	21	41.6	55.2	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.121	0.765	64.3	77.9	0.087
PC-01	PB-01 & PB-02	Foundation Soils	54.3	-9.8	115	3.3	1.9	55.3	0.620	0.7	21	41.8	55.3	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.121	0.766	73.1	86.5	0.099
PC-01	PB-01 & PB-02	Foundation Soils	54.4	-9.9	115	3.3	1.9	58.4	0.609	0.7	21	42.2	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.121	0.784	66.5	82.7	0.094
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-9.9	121	3.3	1.9	67.5	0.581	0.7	21	41.3	67.5	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.121	0.837	38.1	64.4	0.070
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-10.0	124	3.3	1.9	75.9	0.557	0.7	21	32.8	75.9	0.9	-1.3	0.1	0.8	0.112	1.011	0.108	0.121	0.890	21.5	64.6	0.070
PC-01	PB-01 & PB-02	Foundation Soils	54.6	-10.1	124	3.3	1.9	63.4	0.593	0.7	21	5.3	63.4	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.121	0.813	11.8	69.9	0.077
PC-01	PB-01 & PB-02	Foundation Soils	54.7	-10.2	121	3.3	1.9	71.2	0.570	0.7	21	33.4	71.2	0.9	-1.3	0.1	0.8	0.108	1.010	0.104	0.121	0.860	22.4	60.3	0.065
PC-01	PB-01 & PB-02	Foundation Soils	54.8	-10.3	121	3.3	1.9	66.7	0.583	0.7	21	36.6	66.7	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.121	0.833	26.6	56.8	0.061
PC-01	PB-01 & PB-02	Foundation Soils	54.9	-10.4	121	3.3	1.9	56.6	0.615	0.7	21	37.7	56.6	1.0	-1.3	0.1	0.8	0.097	1.008	0.093	0.121	0.774	32.0	50.9	0.054
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.4	121	3.3	1.9	54.5	0.622	0.7	21	39.9	54.5	1.0	-1.3	0.1	0.8	0.096	1.008	0.092	0.121	0.763	43.1	57.7	0.062
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.5	111	3.3	1.9	52.8	0.629	0.7	21	41.4	52.8	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.121	0.753	75.1	86.5	0.099
PC-01	PB-01 & PB-02	Foundation Soils	55.1	-10.6	115	3.3	1.9	52.2	0.631	0.7	21	41.3	52.2	1.0	-1.3	0.1	0.8	0.094	1.008	0.090	0.121	0.750	73.0	83.9	0.095
PC-01	PB-01 & PB-02	Foundation Soils	55.2	-10.7	115	3.3	1.9	53.5	0.626	0.7	21	41.1	53.5	1.0	-1.3	0.1	0.8	0.095	1.008	0.091	0.121	0.757	60.4	72.8	0.081
PC-01	PB-01 & PB-02	Foundation Soils	55.3	-10.8	115	3.3	1.9	57.6	0.612	0.7	21	41.8	57.6	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.121	0.780	60.7	76.5	0.086
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.8	121	3.3	1.9	73.4	0.564	0.7	21	39.0	73.4	0.9	-1.3	0.1	0.8	0.110	1.011	0.105	0.121	0.875	28.8	63.2	0.069
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.9	121	3.3	1.9	71.5	0.569	0.7	21	38.3	71.5	0.9	-1.3	0.1	0.8	0.109	1.010	0.104	0.121	0.863	28.1	61.3	0.066
PC-01	PB-01 & PB-02	Foundation Soils	55.5	-11.0	115	3.3	1.9	74.6	0.561	0.7	21	43.8	74.6	0.9	-1.3	0.1	0.8	0.111	1.011	0.106	0.121	0.883	46.3	77.1	0.086
PC-01	PB-01 & PB-02	Foundation Soils	55.6	-11.1	121	3.3	1.9	75.4	0.559	0.7	21	43.7	75.4	0.9	-1.3	0.1	0.8	0.112	1.011	0.107	0.120	0.888	44.7	76.4	0.085
PC-01	PB-01 & PB-02	Foundation Soils	55.7	-11.2	121	3.3	1.9	79.1	0.549	0.7	21	43.9	79.1	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.120	0.913	41.6	76.8	0.086
PC-01	PB-01 & PB-02	Foundation Soils	55.8	-11.3	121	3.3	1.9	110.1	0.477	0.7	21	42.2	110.1	0.9	-1.3	0.1	0.8	0.152	1.022	0.145	0.120	1.201	25.5	93.4	
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.3	124	3.3	1.9	160.2	0.387	0.8	21	0.0	160.2	0.9	-1.3	0.1	0.8	0.374	1.054	0.352	0.120	2.924	6.0	166.2	
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.4	124	3.4	1.9	199.3	0.330	0.8	21	0.0	199.3	0.8	-1.3	0.1	0.8	1.819	1.082	1.655	0.120	13.752	6.0	205.3	
PC-01	PB-01 & PB-02	Foundation Soils	56.0	-11.5	124	3.4	2.0	155.5	0.394	0.8	21	0.0	155.5	0.9	-1.4	0.1	0.8	0.329	1.050	0.310	0.120	2.580	6.0	161.5	
PC-01	PB-01 & PB-02	Foundation Soils	56.1	-11.6	124	3.4	2.0	116.8	0.463	0.8	21	0.0	116.8	0.9	-1.4	0.1	0.8	0.164	1.025	0.156	0.120	1.297	6.0	122.8	
PC-01	PB-01 & PB-02	Foundation Soils	56.2	-11.7	124	3.4	2.0	88.6	0.525	0.7	21	0.0	88.6	0.9	-1.4	0.1	0.8	0.124	1.014	0.118	0.120	0.985	6.0	94.6	0.111
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	121	3.4	2.0	84.9	0.534	0.7	21	40.7	84.9	0.9	-1.4	0.1	0.8	0.120	1.013	0.115	0.120	0.956	28.7	72.9	0.081
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	124	3.4	2.0	67.2	0.582	0.7	21	29.6	67.2	0.9	-1.4	0.1	0.8	0.105	1.010	0.101	0.120	0.838	20.1	57.7	0.062
PC-01	PB-01 & PB-02	Foundation Soils	56.4	-11.9	121	3.4	2.0	72.1	0.568	0.7	21	39.5	72.1	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.120	0.868	30.2	62.8	0.068
PC-01	PB-01 & PB-02	Foundation Soils	56.5	-12.0	121	3.4	2.0	64.0	0.592	0.7	21	37.6	64.0	1.0	-1.4	0.2	0.8	0.103	1.009	0.098	0.120	0.819	29.0	55.4	0.059
PC-01	PB-01 & PB-02	Foundation Soils	56.6	-12.1	121	3.4	2.0	65.3	0.588	0.7	21	39.5	65.3	0.9	-1.4	0.2	0.8	0.104	1.009	0.099	0.120	0.827	33.0	58.8	0.063
PC-01	PB-01 & PB-02	Foundation Soils	56.7	-12.2	121	3.4	2.0	71.9	0.568	0.7	21	42.2	71.9	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.120	0.868	39.2	68.9	0.076
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.2	121	3.4	2.0	81.6	0.542	0.7	21	39.8	81.6	0.9	-1.4	0.2	0.8	0.117	1.012	0.112	0.120	0.933	28.0	69.8	0.077
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.3	121	3.4	2.0	87.9	0.526	0.7	21	36.9	87.9	0.9	-1.4	0.2	0.8	0.123	1.014	0.118	0.120	0.980	23.5	74.4	0.083
PC-01	PB-01 & PB-02	Foundation Soils	56.9	-12.4	124	3.4	2.0	53.5	0.626	0.7	21	3.4	53.5	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.120	0.760	11.2	61.3	0.066
PC-01	PB-01 & PB-02	Foundation Soils	57.0	-12.5	124	3.4	2.0	49.4	0.641	0.7	21	2.5	49.4	1.0	-1.4	0.2	0.8	0.092	1.008	0.088	0.120	0.738	10.9	57.8	0.062
PC-01	PB-01 & PB-02	Foundation Soils	57.1	-12.6	124	3.4	2.0	54.0	0.624	0.7	21	0.1	54.0	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.120	0.763	9.1	62.9	0.068
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	124	3.4	2.0	64.0	0.591	0.7	21	0.0	64.0	0.9	-1.4	0.2	0.8	0.103	1.009	0.098	0.120	0.820	6.9	71.0	0.078
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	121	3.4	2.0	103.3	0.491	0.7	21	40.4	103.3	0.9	-1.4	0.2	0.8	0.142	1.019	0.135	0.120	1.123	24.7	87.6	
PC-01	PB-01 & PB-02	Foundation Soils	57.3	-12.8	121	3.4	2.0	96.7	0.506	0.7	21	39.4	96.7	0.9	-1.4	0.2	0.8	0.133	1.017	0.127	0.120	1.057	24.7	81.9	
PC-01	PB-01 & PB-02	Foundation Soils	57.4	-12.9	124	3.4	2.0	91.2	0.518	0.7	21	30.8	91.2	0.9	-1.4	0.2	0.8	0.127	1.015	0.121	0.120	1.008	19.2	79.7	
PC-01	PB-01 & PB-02	Foundation Soils	57.5	-13.0	124	3.4	2.0	72.2	0.567	0.7	21	5.9	72.2	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.120	0.871	11.9	78.2	0.088
PC-01	PB-01 & PB-02	Foundation Soils	57.6	-13.1	124	3.5	2.0	114.2	0.468	0.7	21	0.0	114.2	0.9	-1.4	0.2	0.8	0.159	1.023	0.151	0.120	1.260	6.0	120.2	
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.1	124	3.5	2.0	100.5	0.497	0.7	21	0.0	100.5	0.9	-1.4	0.2	0.8	0.138	1.018	0.131	0.120	1.094	6.0	106.5	
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.2	124	3.5	2.0	78.2	0.551	0.7	21	0.0	78.2	0.9	-1.4	0.2	0.8	0.114	1.012	0.109	0.120	0.911	6.0	84.2	0.096
PC-01	PB-01 & PB-02	Foundation Soils	57.8	-13.3	124	3.5	2.0	62.6	0.596	0.7	21	0.1	62.6	0.9	-1.4	0.2	0.8	0.101	1.009	0.097	0.120	0.813	8.8	71.3	0.079
PC-01	PB-01 & PB-02	Foundation Soils	57.9	-13.4	124	3.5	2.0	69.8	0.574	0.7	21	2.6	69.8	0.9	-1.4	0.2	0.8	0.107	1.010	0.102	0.120	0.857	10.9	78.0	0.087
PC-01	PB-01 & PB-02	Foundation Soils	58.0	-13.5	124	3.5	2.0	76.8	0.555	0.7	21	8.2	76.8	0.9	-1.4	0.2	0.8	0.113	1.011	0.108	0.119	0.902	12.5	81.1	0.092
PC-01	PB-01 & PB-02	Foundation Soils	58.1	-13.6	124	3.5	2.0	92.8	0.515	0.7	21	24.2	92.8	0.9	-1.4	0.2	0.8	0.129	1.015	0.122	0.119	1.023	16.6	85.1	
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.6	121	3.5	2.0	104.4	0.489	0.7	21	37.7	104.4	0.9	-1.4	0.2	0.8	0.143	1.019	0.136	0.119	1.137	22.3	89.0	
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.7	121	3.5	2.0	102.7	0.492	0.7	21	45.7	102.7	0.9	-1.4	0.2	0.8	0.141	1.019	0.134	0.119	1.118	33.1	90.1	
PC-01	PB-01 & PB-02	Foundation Soils	58.3	-13.8	115	3.5	2.0	106.2	0.485	0.7	21	49.6	106.2	0.9	-1.4	0.2	0.8	0.146	1.020	0.138	0.119	1.158	47.8	104.4	
PC-01	PB-01 & PB-02	Foundation Soils	58.4	-13.9	121	3.5	2.0	111.1	0.475	0.7	21	47.8	111.1	0.9	-1.4	0.2	0.8	0.154	1.022	0.145	0.119	1.219	35.0	98.3	
PC-01	PB-01 & PB-02	Foundation Soils	58.5	-14.0	121	3.5	2.0	105.5	0.486	0.7	21	48.3	105.5	0.9	-1.4	0.2	0.8	0.145	1.020	0.137	0.119	1.150	40.5	97.7	
PC-01	PB-01 & PB-02	Foundation Soils	58.6	-14.0	121	3.5	2.0	147.2	0.408	0.8	21	53.3	147.2	0.9	-1.4	0.2	0.8	0.271	1.043	0.254	0.119	2.130	33.7	127.5	
																									0.000
PC-02	PB-02 & PB-03	Foundation Soils	14.0	30.1	115	0.8	0.8	48.4	0.645	1.2	21	40.6	48.4	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.088	1.063	72.1	79.9	
PC-02	PB-02 & PB-03	Foundation Soils	14.1	30.1	115	0.8	0.8	48.9	0.643	1.2	21	40.6	48.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.088	1.064	69.9	78.2	
PC-02	PB-02 & PB-03	Foundation Soils	14.2	30.0	115	0.8	0.8	49.0	0.642	1.2	21	40.6	49.0	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.088	1.062	69.2	77.6	
PC-02	PB-02 & PB-03	Foundation Soils	14.3	29.9	115	0.9	0.8	49.1	0.642	1.2	21	40.7	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.089	1.059	71.2	79.6	
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.8	115	0.9	0.8	50.7	0.636	1.2	21	40.7	50.7	1.0	-0.2	0.0	1.0	0.093	1.008	0.095	0.089	1.070	63.7	73.7	
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.7	115	0.9	0.8	52.7	0.629	1.1	21	40.9	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.089	1.084	60.5	72.2	
PC-02	PB-02 & PB-03	Foundation Soils	14.5	29.6	115	0.9	0.9	54.2	0.624	1.1	21	41.1	54.2	1.0	-0.2	0.0	1.0	0.095	1.008	0.098	0.089	1.093	58.3	71.4	
PC-02	PB-02 & PB-03	Foundation Soils	14.6	29.6	115	0.9	0.9	54.0	0.624	1.1	21	40.9	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.097	0.089	1.089	55.8	68.8	
PC-02	PB-02 & PB-03	Foundation Soils	14.7	29.5	115	0.9	0.9	52.3	0.630	1.1	21	40.8	52.3	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.090	1.071	59.2	70.7	
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.4	115	0.9	0.9	49.2	0.642	1.1	21	40.6	49.2	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.090	1.043	69.6	78.2	
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.3	111	0.9	0.9	47.8	0.647	1.1	21	40.5	47.8	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.090	1.029	75.4	82.6	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-02	PB-02 & PB-03	Foundation Soils	14.9	29.2	111	0.9	0.9	46.8	0.651	1.1	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.090	1.018	75.4	81.8	
PC-02	PB-02 & PB-03	Foundation Soils	15.0	29.2	111	0.9	0.9	46.6	0.652	1.1	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.091	1.014	75.4	81.7	
PC-02	PB-02 & PB-03	Foundation Soils	15.1	29.1	111	0.9	0.9	46.1	0.653	1.1	21	40.2	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.091	0.091	1.007	75.4	81.3	
PC-02	PB-02 & PB-03	Foundation Soils	15.2	29.0	111	0.9	0.9	45.9	0.654	1.1	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.091	1.003	75.4	81.1	
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.9	111	0.9	0.9	45.8	0.655	1.1	21	40.2	45.8	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.091	0.999	75.4	81.0	0.092
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.8	111	0.9	0.9	45.7	0.655	1.1	21	40.1	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.091	0.996	75.4	80.9	0.091
PC-02	PB-02 & PB-03	Foundation Soils	15.4	28.7	111	0.9	0.9	45.5	0.656	1.1	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.092	0.992	75.4	80.8	0.091
PC-02	PB-02 & PB-03	Foundation Soils	15.5	28.7	111	0.9	0.9	45.4	0.656	1.1	21	40.1	45.4	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.092	0.989	75.4	80.7	0.091
PC-02	PB-02 & PB-03	Foundation Soils	15.6	28.6	111	0.9	0.9	45.2	0.657	1.1	21	40.1	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.092	0.985	75.4	80.5	0.091
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.5	111	0.9	0.9	45.0	0.658	1.1	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.092	0.981	75.4	80.4	0.091
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.4	111	0.9	0.9	44.8	0.658	1.1	21	40.0	44.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.093	0.977	75.4	80.2	0.090
PC-02	PB-02 & PB-03	Foundation Soils	15.8	28.3	111	0.9	0.9	44.9	0.658	1.1	21	40.0	44.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.093	0.976	75.4	80.3	0.091
PC-02	PB-02 & PB-03	Foundation Soils	15.9	28.3	111	0.9	0.9	45.1	0.657	1.1	21	40.0	45.1	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.093	0.975	75.4	80.5	0.091
PC-02	PB-02 & PB-03	Foundation Soils	16.0	28.2	111	1.0	0.9	45.3	0.657	1.1	21	40.1	45.3	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.093	0.974	75.4	80.6	0.091
PC-02	PB-02 & PB-03	Foundation Soils	16.1	28.1	111	1.0	0.9	45.7	0.655	1.1	21	40.1	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.093	0.974	75.4	80.9	0.091
PC-02	PB-02 & PB-03	Foundation Soils	16.2	28.0	111	1.0	0.9	46.0	0.654	1.1	21	40.2	46.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.094	0.975	75.4	81.2	0.092
PC-02	PB-02 & PB-03	Foundation Soils	16.2	27.9	111	1.0	0.9	46.8	0.651	1.1	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.094	0.978	75.4	81.8	0.093
PC-02	PB-02 & PB-03	Foundation Soils	16.3	27.8	111	1.0	0.9	47.5	0.648	1.1	21	40.5	47.5	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.094	0.982	75.4	82.4	0.093
PC-02	PB-02 & PB-03	Foundation Soils	16.4	27.8	111	1.0	0.9	47.8	0.647	1.1	21	40.5	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.094	0.982	75.4	82.7	0.094
PC-02	PB-02 & PB-03	Foundation Soils	16.5	27.7	115	1.0	0.9	49.6	0.640	1.1	21	40.6	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.094	0.994	66.4	75.4	0.084
PC-02	PB-02 & PB-03	Foundation Soils	16.6	27.6	115	1.0	0.9	48.6	0.644	1.1	21	40.4	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.095	0.984	66.0	74.2	0.082
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.5	115	1.0	0.9	47.9	0.647	1.1	21	40.4	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.095	0.976	68.2	75.7	0.084
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.4	115	1.0	0.9	47.1	0.649	1.1	21	40.3	47.1	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.095	0.968	72.6	79.3	0.089
PC-02	PB-02 & PB-03	Foundation Soils	16.8	27.4	115	1.0	0.9	46.8	0.651	1.1	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.095	0.963	75.4	81.8	0.093
PC-02	PB-02 & PB-03	Foundation Soils	16.9	27.3	115	1.0	0.9	46.5	0.652	1.1	21	40.3	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.095	0.959	75.4	81.6	0.092
PC-02	PB-02 & PB-03	Foundation Soils	17.0	27.2	115	1.0	0.9	46.4	0.652	1.1	21	40.3	46.4	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.096	0.956	75.4	81.5	0.092
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.1	111	1.0	0.9	46.2	0.653	1.1	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.096	0.953	75.4	81.4	0.092
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.0	111	1.0	0.9	46.2	0.653	1.1	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.096	0.951	75.4	81.4	0.092
PC-02	PB-02 & PB-03	Foundation Soils	17.2	26.9	111	1.0	0.9	45.9	0.654	1.1	21	40.2	45.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.096	0.946	75.4	81.1	0.092
PC-02	PB-02 & PB-03	Foundation Soils	17.3	26.9	111	1.0	0.9	45.4	0.656	1.1	21	40.1	45.4	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.096	0.941	75.4	80.7	0.091
PC-02	PB-02 & PB-03	Foundation Soils	17.4	26.8	111	1.0	0.9	45.0	0.658	1.1	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.096	0.936	75.4	80.4	0.091
PC-02	PB-02 & PB-03	Foundation Soils	17.5	26.7	111	1.0	0.9	45.8	0.655	1.1	21	40.2	45.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.097	0.940	75.4	81.0	0.092
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.6	115	1.0	0.9	46.9	0.650	1.1	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.097	0.946	73.6	80.2	0.090
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.5	115	1.0	0.9	46.9	0.650	1.1	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.097	0.944	73.3	79.9	0.090
PC-02	PB-02 & PB-03	Foundation Soils	17.7	26.4	111	1.0	0.9	46.2	0.653	1.1	21	40.2	46.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.097	0.937	75.4	81.4	0.092
PC-02	PB-02 & PB-03	Foundation Soils	17.8	26.4	111	1.1	0.9	45.5	0.656	1.1	21	40.1	45.5	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.097	0.930	75.4	80.8	0.091
PC-02	PB-02 & PB-03	Foundation Soils	17.9	26.3	111	1.1	0.9	46.0	0.654	1.1	21	40.2	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.098	0.932	75.4	81.2	0.092
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.2	115	1.1	0.9	49.4	0.641	1.1	21	40.7	49.4	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.098	0.955	71.2	79.9	0.090
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.1	121	1.1	0.9	54.3	0.623	1.1	21	40.7	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.098	0.990	51.4	65.0	0.071
PC-02	PB-02 & PB-03	Foundation Soils	18.1	26.0	121	1.1	0.9	60.4	0.603	1.1	21	41.0	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.098	1.036	44.2	63.5	
PC-02	PB-02 & PB-03	Foundation Soils	18.2	26.0	121	1.1	0.9	65.3	0.587	1.1	21	41.1	65.3	1.0	-0.3	0.0	0.9	0.104	1.009	0.106	0.098	1.074	39.1	63.4	
PC-02	PB-02 & PB-03	Foundation Soils	18.3	25.9	121	1.1	0.9	70.6	0.572	1.1	21	41.3	70.6	1.0	-0.3	0.0	0.9	0.108	1.010	0.110	0.098	1.116	36.2	65.5	
PC-02	PB-02 & PB-03	Foundation Soils	18.4	25.8	121	1.1	0.9	81.3	0.543	1.1	21	38.7	81.3	1.0	-0.3	0.0	0.9	0.117	1.012	0.120	0.099	1.213	26.5	69.1	
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.7	124	1.1	1.0	86.8	0.529	1.1	21	21.7	86.8	1.0	-0.3	0.0	0.9	0.122	1.014	0.125	0.099	1.268	15.9	81.0	
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.6	124	1.1	1.0	87.9	0.526	1.1	21	9.0	87.9	1.0	-0.3	0.0	0.9	0.123	1.014	0.126	0.099	1.278	12.6	91.5	
PC-02	PB-02 & PB-03	Foundation Soils	18.6	25.5	124	1.1	1.0	91.8	0.517	1.1	21	0.9	91.8	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.099	1.320	9.9	100.9	
PC-02	PB-02 & PB-03	Foundation Soils	18.7	25.5	124	1.1	1.0	96.5	0.506	1.1	21	3.2	96.5	1.0	-0.3	0.0	0.9	0.133	1.017	0.136	0.099	1.375	11.0	104.2	
PC-02	PB-02 & PB-03	Foundation Soils	18.8	25.4	124	1.1	1.0	101.8	0.494	1.0	21	7.4	101.8	1.0	-0.3	0.0	0.9	0.140	1.018	0.144	0.099	1.446	12.1	106.5	
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.3	124	1.1	1.0	104.1	0.489	1.0	21	11.2	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.147	0.100	1.479	13.0	105.9	
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.2	124	1.1	1.0	105.7	0.486	1.0	21	15.0	105.7	1.0	-0.3	0.0	0.9	0.145	1.020	0.150	0.100	1.500	13.8	104.5	
PC-02	PB-02 & PB-03	Foundation Soils	19.0	25.1	124	1.1	1.0	107.5	0.482	1.0	21	20.2	107.5	1.0	-0.3	0.0	0.9	0.148	1.021	0.153	0.100	1.528	15.0	102.4	
PC-02	PB-02 & PB-03	Foundation Soils	19.1	25.1	124	1.1	1.0	108.1	0.481	1.0	21	23.7	108.1	1.0	-0.3	0.0	0.9	0.149	1.021	0.153	0.100	1.534	16.0	100.4	
PC-02	PB-02 & PB-03	Foundation Soils	19.2	25.0	124	1.1	1.0	106.2	0.485	1.0	21	23.3	106.2	1.0	-0.3	0.0	0.9	0.146	1.020	0.150	0.100	1.501	15.9	98.9	
PC-02	PB-02 & PB-03	Foundation Soils	19.3	24.9	124	1.1	1.0	105.6	0.486	1.0	21	25.3	105.6	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.100	1.488	16.5	96.9	
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.8	124	1.1	1.0	105.4	0.486	1.0	21	26.5	105.4	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.100	1.483	16.9	95.8	
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.7	124	1.2	1.0	104.8	0.488	1.0	21	30.9	104.8	1.0	-0.3	0.0	0.9	0.144	1.020	0.148	0.101	1.470	18.6	92.5	
PC-02	PB-02 & PB-03	Foundation Soils	19.5	24.6	124	1.2	1.0	101.0	0.496	1.0	21	32.6	101.0	1.0	-0.3	0.0	0.9	0.139	1.018	0.142	0.101	1.411	19.5	87.9	
PC-02	PB-02 & PB-03	Foundation Soils	19.6	24.6	124	1.2	1.0	100.3	0.497	1.0	21	35.2	100.3	1.0	-0.3	0.0	0.9	0.138	1.018	0.141	0.101	1.399	21.0	86.1	
PC-02	PB-02 & PB-03	Foundation Soils	19.7	24.5	124	1.2	1.0	98.7	0.501	1.0	21	34.5	98.7	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.101	1.375	20.7	84.9	
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.4	124	1.2	1.0	97.2	0.505	1.0	21	33.4	97.2	1.0	-0.3	0.0	0.9	0.134	1.017	0.137	0.101	1.352	20.2	83.9	
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.3	124	1.2	1.0	96.2	0.507	1.0	21	32.6	96.2	1.0	-0.3	0.0	0.9	0.133	1.016	0.136	0.101	1.338	19.8	83.5	
PC-02	PB-02 & PB-03	Foundation Soils	19.9	24.2	124	1.2	1.0	95.5	0.508	1.0	21	35.7	95.5	1.0	-0.3	0.0	0.9	0.132	1.016	0.135	0.102	1.328	21.7	81.6	
PC-02	PB-02 & PB-03	Foundation Soils	20.0	24.2	121	1.2	1.0	92.6	0.515	1.0	21	40.8	92.6	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.102	1.290	27.0	78.7	
PC-02	PB-02 & PB-03	Foundation Soils	20.1	24.1	121	1.2	1.0	86.5	0.530	1.0	21	43.4	86.5	1.0	-0.4	0.0	0.9	0.122	1.014	0.124	0.102	1.221	34.2	77.2	
PC-02	PB-02 & PB-03	Foundation Soils	20.2	24.0	121	1.2	1.0	83.0	0.538	1.0	21	44.2	83.0	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.102	1.184	39.6	78.3	
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.9	121	1.2	1.0	74.8	0.560	1.0	21	44.2	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.102	1.107	49.3	79.9	
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.8	115	1.2	1.0	66.7	0.583	1.0	21	43.5	66.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.102	1.037	60.8	84.0	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-02	PB-02 & PB-03	Foundation Soils	20.4	23.7	111	1.2	1.0	59.0	0.607	1.0	21	42.5	59.0	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.102	0.976	71.7	88.2	0.102
PC-02	PB-02 & PB-03	Foundation Soils	20.5	23.7	111	1.2	1.0	53.0	0.628	1.0	21	41.5	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.103	0.932	75.4	86.9	0.100
PC-02	PB-02 & PB-03	Foundation Soils	20.6	23.6	111	1.2	1.0	51.2	0.634	1.0	21	41.2	51.2	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.103	0.917	75.4	85.4	0.098
PC-02	PB-02 & PB-03	Foundation Soils	20.7	23.5	115	1.2	1.0	59.1	0.607	1.0	21	42.4	59.1	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.103	0.973	67.6	84.3	0.096
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.4	121	1.2	1.0	68.8	0.577	1.0	21	43.2	68.8	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.103	1.047	50.3	75.9	
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.3	121	1.2	1.0	66.8	0.583	1.0	21	42.7	66.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.103	1.028	48.6	72.7	
PC-02	PB-02 & PB-03	Foundation Soils	20.9	23.2	115	1.2	1.0	59.8	0.605	1.0	21	42.2	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.103	0.974	58.8	76.5	0.086
PC-02	PB-02 & PB-03	Foundation Soils	21.0	23.2	121	1.2	1.0	68.7	0.577	1.0	21	42.4	68.7	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.103	1.041	43.5	69.9	
PC-02	PB-02 & PB-03	Foundation Soils	21.1	23.1	121	1.2	1.0	74.8	0.560	1.0	21	42.3	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.103	1.089	37.4	69.8	
PC-02	PB-02 & PB-03	Foundation Soils	21.2	23.0	115	1.3	1.0	58.4	0.609	1.0	21	42.2	58.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.104	0.959	65.0	81.2	0.092
PC-02	PB-02 & PB-03	Foundation Soils	21.2	22.9	111	1.3	1.0	52.3	0.630	1.0	21	41.4	52.3	1.0	-0.4	0.0	0.9	0.094	1.008	0.095	0.104	0.914	75.4	86.3	0.099
PC-02	PB-02 & PB-03	Foundation Soils	21.3	22.8	111	1.3	1.0	49.2	0.641	1.0	21	40.8	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.104	0.891	75.4	83.8	0.095
PC-02	PB-02 & PB-03	Foundation Soils	21.4	22.8	111	1.3	1.0	47.5	0.648	1.0	21	40.5	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.091	0.104	0.878	75.4	82.4	0.093
PC-02	PB-02 & PB-03	Foundation Soils	21.5	22.7	111	1.3	1.0	45.8	0.655	1.0	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.104	0.865	75.4	81.0	0.092
PC-02	PB-02 & PB-03	Foundation Soils	21.6	22.6	111	1.3	1.0	45.8	0.654	1.0	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.104	0.864	75.4	81.1	0.092
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.5	111	1.3	1.0	46.8	0.651	1.0	21	40.3	46.8	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.104	0.869	75.4	81.8	0.093
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.4	115	1.3	1.0	50.4	0.637	1.0	21	40.4	50.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.105	0.893	58.0	68.0	0.075
PC-02	PB-02 & PB-03	Foundation Soils	21.8	22.3	121	1.3	1.0	50.7	0.636	1.0	21	40.4	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.105	0.894	56.6	66.8	0.073
PC-02	PB-02 & PB-03	Foundation Soils	21.9	22.3	115	1.3	1.0	48.4	0.645	1.0	21	40.3	48.4	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.105	0.877	65.0	73.0	0.081
PC-02	PB-02 & PB-03	Foundation Soils	22.0	22.2	115	1.3	1.1	46.4	0.652	1.0	21	40.3	46.4	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.105	0.862	75.4	81.5	0.092
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.1	111	1.3	1.1	45.9	0.654	1.0	21	40.2	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.105	0.858	75.4	81.1	0.092
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.0	111	1.3	1.1	45.0	0.658	1.0	21	40.0	45.0	1.0	-0.4	0.0	0.9	0.089	1.007	0.089	0.105	0.850	75.4	80.3	0.091
PC-02	PB-02 & PB-03	Foundation Soils	22.2	21.9	111	1.3	1.1	45.3	0.657	1.0	21	40.1	45.3	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.105	0.851	75.4	80.6	0.091
PC-02	PB-02 & PB-03	Foundation Soils	22.3	21.9	111	1.3	1.1	46.2	0.653	1.0	21	40.2	46.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.105	0.856	75.4	81.3	0.092
PC-02	PB-02 & PB-03	Foundation Soils	22.4	21.8	121	1.3	1.1	51.3	0.634	1.0	21	39.9	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.106	0.890	48.6	60.0	0.065
PC-02	PB-02 & PB-03	Foundation Soils	22.5	21.7	121	1.3	1.1	59.7	0.605	1.0	21	35.9	59.7	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.106	0.947	27.2	51.0	0.054
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.6	124	1.3	1.1	60.7	0.602	1.0	21	30.9	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.106	0.954	21.6	51.4	0.055
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.5	121	1.3	1.1	62.6	0.596	1.0	21	35.7	62.6	1.0	-0.4	0.0	0.9	0.101	1.009	0.102	0.106	0.966	26.2	53.1	0.057
PC-02	PB-02 & PB-03	Foundation Soils	22.7	21.4	121	1.3	1.1	63.9	0.592	1.0	21	39.7	63.9	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.106	0.975	34.2	58.5	0.063
PC-02	PB-02 & PB-03	Foundation Soils	22.8	21.4	121	1.3	1.1	61.5	0.599	1.0	21	40.4	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.106	0.956	38.9	60.0	0.065
PC-02	PB-02 & PB-03	Foundation Soils	22.9	21.3	121	1.4	1.1	61.5	0.599	1.0	21	41.0	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.106	0.955	42.3	62.8	0.068
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.2	121	1.4	1.1	62.8	0.595	1.0	21	40.5	62.8	1.0	-0.4	0.0	0.9	0.102	1.009	0.102	0.106	0.963	38.1	60.5	0.065
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.1	121	1.4	1.1	64.3	0.591	1.0	21	37.6	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.104	0.106	0.973	28.9	55.6	0.060
PC-02	PB-02 & PB-03	Foundation Soils	23.1	21.0	121	1.4	1.1	66.5	0.584	1.0	21	35.8	66.5	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.107	0.988	25.6	56.3	0.061
PC-02	PB-02 & PB-03	Foundation Soils	23.2	21.0	124	1.4	1.1	58.1	0.610	1.0	21	10.1	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.107	0.926	13.2	61.2	0.066
PC-02	PB-02 & PB-03	Foundation Soils	23.3	20.9	124	1.4	1.1	65.9	0.586	1.0	21	0.0	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.107	0.981	6.0	71.9	0.080
PC-02	PB-02 & PB-03	Foundation Soils	23.4	20.8	124	1.4	1.1	75.2	0.559	1.0	21	0.0	75.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.113	0.107	1.053	6.0	81.2	
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.7	124	1.4	1.1	80.5	0.545	1.0	21	0.0	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.117	0.107	1.097	6.0	86.5	
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.6	124	1.4	1.1	82.9	0.539	1.0	21	0.0	82.9	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.107	1.117	6.0	88.9	
PC-02	PB-02 & PB-03	Foundation Soils	23.6	20.5	124	1.4	1.1	81.1	0.543	1.0	21	0.0	81.1	1.0	-0.4	0.0	0.9	0.117	1.012	0.118	0.107	1.099	6.0	87.1	
PC-02	PB-02 & PB-03	Foundation Soils	23.7	20.5	124	1.4	1.1	75.0	0.559	1.0	21	0.0	75.0	1.0	-0.4	0.0	0.9	0.111	1.011	0.112	0.107	1.047	6.0	81.0	
PC-02	PB-02 & PB-03	Foundation Soils	23.8	20.4	124	1.4	1.1	72.5	0.567	1.0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.110	0.107	1.025	6.0	78.5	
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.3	124	1.4	1.1	79.3	0.548	1.0	21	0.0	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.116	0.107	1.080	6.0	85.3	
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.2	124	1.4	1.1	95.5	0.508	1.0	21	0.0	95.5	1.0	-0.4	0.1	0.9	0.132	1.016	0.133	0.108	1.238	6.0	101.5	
PC-02	PB-02 & PB-03	Foundation Soils	24.0	20.1	124	1.4	1.1	108.2	0.480	1.0	21	0.0	108.2	1.0	-0.4	0.1	0.9	0.149	1.021	0.151	0.108	1.406	6.0	114.2	
PC-02	PB-02 & PB-03	Foundation Soils	24.1	20.1	124	1.4	1.1	117.2	0.462	1.0	21	0.0	117.2	1.0	-0.4	0.1	0.9	0.165	1.025	0.168	0.108	1.562	6.0	123.2	
PC-02	PB-02 & PB-03	Foundation Soils	24.2	20.0	124	1.4	1.1	124.5	0.448	1.0	21	0.0	124.5	1.0	-0.5	0.1	0.9	0.182	1.029	0.186	0.108	1.723	6.0	130.5	
PC-02	PB-02 & PB-03	Foundation Soils	24.3	19.9	124	1.4	1.1	135.0	0.429	1.0	21	0.0	135.0	1.0	-0.5	0.1	0.9	0.214	1.035	0.220	0.108	2.036	6.0	141.0	
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.8	124	1.4	1.1	150.7	0.402	1.0	21	0.0	150.7	1.0	-0.5	0.1	0.9	0.293	1.046	0.304	0.108	2.810	6.0	156.7	
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.7	127	1.5	1.1	160.8	0.386	1.0	21	0.0	160.8	1.0	-0.5	0.1	0.9	0.379	1.055	0.396	0.108	3.661	6.0	166.8	
PC-02	PB-02 & PB-03	Foundation Soils	24.5	19.6	127	1.5	1.1	162.7	0.383	1.0	21	0.0	162.7	1.0	-0.5	0.1	0.9	0.401	1.056	0.419	0.108	3.871	6.0	168.7	
PC-02	PB-02 & PB-03	Foundation Soils	24.6	19.6	127	1.5	1.1	159.3	0.388	1.0	21	0.0	159.3	1.0	-0.5	0.1	0.9	0.365	1.053	0.380	0.108	3.505	6.0	165.3	
PC-02	PB-02 & PB-03	Foundation Soils	24.7	19.5	124	1.5	1.1	155.0	0.395	1.0	21	0.0	155.0	1.0	-0.5	0.1	0.9	0.325	1.049	0.337	0.108	3.111	6.0	161.0	
PC-02	PB-02 & PB-03	Foundation Soils	24.8	19.4	124	1.5	1.1	146.5	0.409	1.0	21	0.0	146.5	1.0	-0.5	0.1	0.9	0.267	1.043	0.275	0.109	2.538	6.0	152.5	
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.3	124	1.5	1.1	142.2	0.416	1.0	21	0.0	142.2	1.0	-0.5	0.1	0.9	0.244	1.040	0.251	0.109	2.315	6.0	148.2	
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.2	124	1.5	1.1	135.2	0.428	1.0	21	0.0	135.2	1.0	-0.5	0.1	0.9	0.215	1.035	0.220	0.109	2.027	6.0	141.2	
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PC-03	PB-03 & PB-04	Foundation Soils	10.0	34.4	124	0.6	0.6	103.0	0.492	1.3	25	41.6	103.0	1.1	-0.1	0.0	1.0	0.141	1.019	0.153	0.089	1.718	23.8	85.2	
PC-03	PB-03 & PB-04	Foundation Soils	10.1	34.3	124	0.6	0.6	107.0	0.483	1.3	25	41.2	107.0	1.1	-0.1	0.0	1.0	0.147	1.020	0.160	0.089	1.787	23.0	88.8	
PC-03	PB-03 & PB-04	Foundation Soils	10.2	34.2	124	0.6	0.6	109.8	0.477	1.3	25	39.5	109.8	1.1	-0.1	0.0	1.0	0.152	1.022	0.165	0.090	1.837	21.6	91.9	
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	124	0.6	0.6	113.4	0.470	1.3	25	40.0	113.4	1.1	-0.1	0.0	1.0	0.158	1.023	0.172	0.090	1.912	21.6	95.0	
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	124	0.6	0.6	116.5	0.464	1.3	25	42.6	116.5	1.1	-0.1	0.0	1.0	0.164	1.025	0.179	0.090	1.982	23.0	96.9	
PC-03	PB-03 & PB-04	Foundation Soils	10.4	34.0	124	0.6	0.6	118.2	0.460	1.3	25	43.2	118.2	1.1	-0.1	0.0	1.0	0.167	1.025	0.183	0.091	2.019	23.3	98.3	
PC-03	PB-03 & PB-04	Foundation Soils	10.5	33.9	124	0.6	0.6	119.2	0.458	1.3	25	43.8	119.2	1.1	-0.1	0.0	1.0	0.170	1.026	0.186	0.091	2.038	23.6	99.1	
PC-03	PB-03 & PB-04	Foundation Soils	10.6	33.8	124	0.6	0.6	119.2	0.458	1.3	25	44.5	119.2	1.1	-0.1	0.0	1.0	0.169	1.026	0.185	0.091	2.028	24.2	98.9	
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	124	0.6	0.6	121.0	0.455	1.3	25	44.7	121.0	1.1	-0.1	0.0	1.0	0.174	1.027	0.190	0.092	2.072	24.1	100.5	
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	124	0.6	0.6	123.8	0.449	1.3	25	43.4	123.8	1.1	-0.2	0.0	1.0	0.180	1.028	0.198	0.092	2.150	22.8	103.3	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-03	PB-03 & PB-04	Foundation Soils	10.8	33.6	124	0.6	0.6	126.4	0.445	1.3	25	40.9	126.4	1.1	-0.2	0.0	1.0	0.187	1.030	0.206	0.092	2.227	21.1	106.6	
PC-03	PB-03 & PB-04	Foundation Soils	10.9	33.5	124	0.7	0.6	128.4	0.441	1.3	25	38.1	128.4	1.1	-0.2	0.0	1.0	0.193	1.031	0.212	0.093	2.289	19.6	109.9	
PC-03	PB-03 & PB-04	Foundation Soils	11.0	33.4	124	0.7	0.6	131.1	0.436	1.3	25	32.7	131.1	1.1	-0.2	0.0	1.0	0.201	1.032	0.222	0.093	2.386	17.6	115.9	
PC-03	PB-03 & PB-04	Foundation Soils	11.1	33.3	124	0.7	0.6	132.8	0.433	1.3	25	22.5	132.8	1.1	-0.2	0.0	1.0	0.206	1.033	0.229	0.093	2.446	14.9	125.1	
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	124	0.7	0.6	140.5	0.419	1.2	25	24.5	140.5	1.1	-0.2	0.0	1.0	0.237	1.038	0.264	0.094	2.820	15.2	131.2	
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	124	0.7	0.6	145.7	0.410	1.2	25	19.9	145.7	1.1	-0.2	0.0	1.0	0.263	1.042	0.295	0.094	3.141	14.2	140.0	
PC-03	PB-03 & PB-04	Foundation Soils	11.3	33.1	124	0.7	0.6	143.2	0.415	1.2	25	5.1	143.2	1.1	-0.2	0.0	1.0	0.249	1.040	0.279	0.094	2.959	11.2	149.3	
PC-03	PB-03 & PB-04	Foundation Soils	11.4	33.0	124	0.7	0.6	152.7	0.399	1.2	25	7.6	152.7	1.1	-0.2	0.0	1.0	0.308	1.048	0.349	0.095	3.687	11.7	156.9	
PC-03	PB-03 & PB-04	Foundation Soils	11.5	32.9	124	0.7	0.6	163.0	0.382	1.2	25	0.4	163.0	1.1	-0.2	0.0	1.0	0.405	1.057	0.466	0.095	4.910	9.3	172.0	
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	124	0.7	0.6	193.4	0.338	1.2	25	0.0	193.4	1.1	-0.2	0.0	1.0	1.325	1.082	1.577	0.095	16.557	6.0	199.3	
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	124	0.7	0.6	204.2	0.324	1.2	25	0.0	204.2	1.1	-0.2	0.0	1.0	2.413	1.082	2.871	0.096	30.052	6.0	210.2	
PC-03	PB-03 & PB-04	Foundation Soils	11.7	32.7	124	0.7	0.7	203.1	0.325	1.2	25	0.0	203.1	1.1	-0.2	0.0	1.0	2.263	1.082	2.692	0.096	28.090	6.0	209.1	
PC-03	PB-03 & PB-04	Foundation Soils	11.8	32.6	124	0.7	0.7	200.7	0.329	1.2	25	0.0	200.7	1.1	-0.2	0.0	1.0	1.967	1.082	2.340	0.096	24.347	6.0	206.7	
PC-03	PB-03 & PB-04	Foundation Soils	11.9	32.5	124	0.7	0.7	192.2	0.340	1.2	25	0.0	192.2	1.1	-0.2	0.0	1.0	1.253	1.082	1.491	0.096	15.462	6.0	198.2	
PC-03	PB-03 & PB-04	Foundation Soils	12.0	32.4	124	0.7	0.7	200.5	0.329	1.2	25	0.0	200.5	1.1	-0.2	0.0	1.0	1.947	1.082	2.316	0.097	23.957	6.0	206.5	
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	124	0.7	0.7	208.9	0.318	1.2	25	0.0	208.9	1.1	-0.2	0.0	1.0	3.238	1.082	3.852	0.097	39.728	6.0	214.9	
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	124	0.7	0.7	211.5	0.315	1.2	25	0.0	211.5	1.1	-0.2	0.0	1.0	3.854	1.082	4.585	0.097	47.153	6.0	217.5	
PC-03	PB-03 & PB-04	Foundation Soils	12.2	32.2	124	0.7	0.7	209.6	0.317	1.2	25	0.0	209.6	1.1	-0.2	0.0	1.0	3.383	1.082	4.025	0.098	41.268	6.0	215.5	
PC-03	PB-03 & PB-04	Foundation Soils	12.3	32.1	124	0.7	0.7	205.0	0.323	1.2	25	0.0	205.0	1.1	-0.2	0.0	1.0	2.536	1.082	3.017	0.098	30.851	6.0	211.0	
PC-03	PB-03 & PB-04	Foundation Soils	12.4	32.0	124	0.7	0.7	195.6	0.335	1.2	25	0.0	195.6	1.1	-0.2	0.0	1.0	1.486	1.082	1.768	0.098	18.028	6.0	201.6	
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.9	124	0.8	0.7	186.0	0.349	1.2	25	0.0	186.0	1.1	-0.2	0.0	1.0	0.934	1.081	1.111	0.098	11.294	6.0	192.0	
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.8	124	0.8	0.7	179.0	0.359	1.2	25	0.0	179.0	1.1	-0.2	0.0	1.0	0.697	1.073	0.818	0.099	8.295	7.8	186.7	
PC-03	PB-03 & PB-04	Foundation Soils	12.6	31.8	124	0.8	0.7	170.2	0.372	1.2	25	1.0	170.2	1.1	-0.2	0.0	1.0	0.507	1.064	0.585	0.099	5.917	9.8	179.0	
PC-03	PB-03 & PB-04	Foundation Soils	12.7	31.7	124	0.8	0.7	167.0	0.376	1.2	25	4.5	167.0	1.1	-0.2	0.0	1.0	0.457	1.060	0.525	0.099	5.296	11.0	173.5	
PC-03	PB-03 & PB-04	Foundation Soils	12.8	31.6	124	0.8	0.7	162.8	0.383	1.2	25	8.0	162.8	1.1	-0.2	0.0	1.0	0.402	1.056	0.458	0.099	4.604	11.8	166.5	
PC-03	PB-03 & PB-04	Foundation Soils	12.9	31.5	124	0.8	0.7	155.9	0.394	1.2	25	0.0	155.9	1.1	-0.2	0.0	1.0	0.332	1.050	0.375	0.100	3.760	7.0	162.8	
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	124	0.8	0.7	153.6	0.397	1.2	25	0.0	153.6	1.1	-0.2	0.0	1.0	0.315	1.048	0.353	0.100	3.536	7.4	161.1	
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	124	0.8	0.7	144.0	0.413	1.2	25	1.3	144.0	1.1	-0.2	0.0	1.0	0.254	1.041	0.281	0.100	2.807	10.0	152.7	
PC-03	PB-03 & PB-04	Foundation Soils	13.1	31.3	124	0.8	0.7	142.6	0.416	1.2	25	7.4	142.6	1.1	-0.2	0.0	1.0	0.246	1.040	0.272	0.100	2.714	11.8	146.9	
PC-03	PB-03 & PB-04	Foundation Soils	13.2	31.2	124	0.8	0.7	145.8	0.410	1.2	25	27.0	145.8	1.1	-0.2	0.0	1.0	0.263	1.042	0.292	0.101	2.899	15.7	134.4	
PC-03	PB-03 & PB-04	Foundation Soils	13.3	31.1	124	0.8	0.7	147.2	0.408	1.2	25	29.9	147.2	1.1	-0.2	0.0	1.0	0.271	1.043	0.301	0.101	2.986	16.3	133.6	
PC-03	PB-03 & PB-04	Foundation Soils	13.4	31.0	124	0.8	0.7	147.5	0.407	1.2	25	31.9	147.5	1.1	-0.2	0.0	1.0	0.273	1.043	0.303	0.101	2.995	16.8	132.4	
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	124	0.8	0.7	146.8	0.409	1.2	25	34.7	146.8	1.1	-0.2	0.0	1.0	0.269	1.043	0.298	0.101	2.938	17.6	129.7	
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	124	0.8	0.7	145.1	0.411	1.2	25	37.0	145.1	1.1	-0.2	0.0	1.0	0.260	1.042	0.287	0.102	2.826	18.4	126.6	
PC-03	PB-03 & PB-04	Foundation Soils	13.6	30.8	124	0.8	0.7	143.8	0.414	1.2	25	39.2	143.8	1.1	-0.2	0.0	1.0	0.253	1.041	0.279	0.102	2.738	19.3	123.9	
PC-03	PB-03 & PB-04	Foundation Soils	13.7	30.7	124	0.8	0.7	141.9	0.417	1.2	25	40.7	141.9	1.1	-0.2	0.0	1.0	0.243	1.039	0.267	0.102	2.620	20.0	121.2	
PC-03	PB-03 & PB-04	Foundation Soils	13.8	30.6	124	0.8	0.7	135.8	0.428	1.2	25	42.3	135.8	1.1	-0.2	0.0	1.0	0.217	1.035	0.237	0.102	2.319	21.1	114.7	
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	124	0.8	0.7	132.2	0.434	1.2	25	43.8	132.2	1.1	-0.2	0.0	1.0	0.205	1.033	0.223	0.103	2.172	22.3	110.8	
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	124	0.8	0.7	129.4	0.439	1.2	25	43.7	129.4	1.1	-0.2	0.0	1.0	0.195	1.031	0.212	0.103	2.063	22.5	108.2	
PC-03	PB-03 & PB-04	Foundation Soils	14.0	30.4	124	0.8	0.7	127.6	0.442	1.2	25	44.4	127.6	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.103	2.000	23.1	106.3	
PC-03	PB-03 & PB-04	Foundation Soils	14.1	30.3	124	0.9	0.7	126.0	0.445	1.2	25	44.8	126.0	1.0	-0.2	0.0	1.0	0.186	1.029	0.201	0.103	1.945	23.6	104.8	
PC-03	PB-03 & PB-04	Foundation Soils	14.2	30.2	124	0.9	0.7	124.8	0.447	1.2	25	45.1	124.8	1.0	-0.2	0.0	1.0	0.183	1.029	0.197	0.103	1.907	24.0	103.7	
PC-03	PB-03 & PB-04	Foundation Soils	14.3	30.1	124	0.9	0.7	123.4	0.450	1.2	25	45.6	123.4	1.0	-0.2	0.0	1.0	0.179	1.028	0.193	0.104	1.861	24.6	102.4	
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	124	0.9	0.7	122.4	0.452	1.2	25	45.7	122.4	1.0	-0.2	0.0	1.0	0.177	1.027	0.190	0.104	1.830	24.8	101.5	
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	124	0.9	0.7	121.3	0.454	1.2	25	46.2	121.3	1.0	-0.2	0.0	1.0	0.174	1.027	0.187	0.104	1.796	25.4	100.5	
PC-03	PB-03 & PB-04	Foundation Soils	14.5	29.9	121	0.9	0.7	120.2	0.456	1.2	25	46.9	120.2	1.0	-0.2	0.0	1.0	0.172	1.026	0.184	0.104	1.765	26.3	99.6	
PC-03	PB-03 & PB-04	Foundation Soils	14.6	29.8	121	0.9	0.7	119.1	0.459	1.2	25	47.4	119.1	1.0	-0.2	0.0	1.0	0.169	1.026	0.181	0.105	1.734	27.1	98.8	
PC-03	PB-03 & PB-04	Foundation Soils	14.7	29.7	121	0.9	0.7	117.0	0.463	1.2	25	48.0	117.0	1.0	-0.2	0.0	1.0	0.165	1.025	0.176	0.105	1.684	28.3	97.4	
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	121	0.9	0.7	113.4	0.470	1.2	25	48.6	113.4	1.0	-0.2	0.0	1.0	0.158	1.023	0.168	0.105	1.604	30.3	95.1	
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	121	0.9	0.7	110.4	0.476	1.2	25	48.7	110.4	1.0	-0.2	0.0	1.0	0.153	1.022	0.162	0.105	1.544	31.4	93.1	
PC-03	PB-03 & PB-04	Foundation Soils	14.9	29.5	121	0.9	0.7	107.9	0.481	1.2	25	48.7	107.9	1.0	-0.2	0.0	1.0	0.149	1.021	0.158	0.105	1.495	32.2	91.4	
PC-03	PB-03 & PB-04	Foundation Soils	15.0	29.4	121	0.9	0.8	105.6	0.486	1.2	25	47.8	105.6	1.0	-0.2	0.0	1.0	0.145	1.020	0.154	0.106	1.455	31.3	89.0	
PC-03	PB-03 & PB-04	Foundation Soils	15.1	29.3	121	0.9	0.8	104.4	0.489	1.2	25	47.0	104.4	1.0	-0.2	0.0	1.0	0.143	1.019	0.152	0.106	1.433	30.1	87.5	
PC-03	PB-03 & PB-04	Foundation Soils	15.2	29.2	121	0.9	0.8	103.9	0.490	1.2	25	46.2	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.106	1.422	28.8	86.6	
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	121	0.9	0.8	103.9	0.490	1.2	25	46.5	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.106	1.419	29.4	86.8	
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	121	0.9	0.8	102.3	0.493	1.2	25	47.8	102.3	1.0	-0.2	0.0	1.0	0.140	1.019	0.148	0.106	1.392	32.4	86.9	
PC-03	PB-03 & PB-04	Foundation Soils	15.4	29.0	121	0.9	0.8	96.6	0.506	1.2	25	48.8	96.6	1.0	-0.2	0.0	1.0	0.133	1.017	0.140	0.107	1.312	38.7	86.4	
PC-03	PB-03 & PB-04	Foundation Soils	15.5	28.9	121	0.9	0.8	84.2	0.536	1.2	25	48.3	84.2	1.0	-0.2	0.0	1.0	0.120	1.013	0.125	0.107	1.170	49.8	85.7	
PC-03	PB-03 & PB-04	Foundation Soils	15.6	28.8	115	0.9	0.8	70.8	0.571	1.2	25	46.6	70.8	1.0	-0.2	0.0	1.0	0.108	1.010	0.112	0.107	1.047	62.6	86.8	
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.7	111	0.9	0.8	63.0	0.595	1.2	25	45.5	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.107	0.983	72.6	90.1	0.104
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.6	111	1.0	0.8	57.9	0.611	1.2	25	44.6	57.9	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.107	0.942	75.4	88.7	0.102
PC-03	PB-03 & PB-04	Foundation Soils	15.8	28.6	111	1.0	0.8	56.7	0.615	1.2	25	44.3	56.7	1.0	-0.3	0.0	1.0	0.097	1.008	0.100	0.108	0.931	75.2	87.5	0.101
PC-03	PB-03 & PB-04	Foundation Soils	15.9	28.5	115	1.0	0.8	57.2	0.613	1.2	25	44.3	57.2	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.108	0.933	69.5	82.5	0.094
PC-03	PB-03 & PB-04	Foundation Soils	16.0	28.4	121	1.0	0.8	68.2	0.579	1.2	25	44.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.110	0.108	1.015	45.9	69.3	
PC-03	PB-03 & PB-04	Foundation Soils	16.1	28.3	121	1.0	0.8	80.2	0.546	1.2	25	41.4	80.2	1.0	-0.3	0.0	1.0	0.116	1.012	0.121	0.108	1.115	27.5	66.3	
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	124	1.0	0.8	74.3	0.561	1.2	25	20.5	74.3	1.0	-0.3	0.0	1.0	0.111	1.011	0.115	0.108	1.061	15.5	69.3	
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	124	1.0	0.8	65.8	0.586	1.2	25	9.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.109	0.990	12.8	68.9	0.076

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-03	PB-03 & PB-04	Foundation Soils	16.3	28.1	124	1.0	0.8	83.6	0.537	1.2	25	30.1	83.6	1.0	-0.3	0.0	1.0	0.119	1.013	0.124	0.109	1.140	18.5	72.0	
PC-03	PB-03 & PB-04	Foundation Soils	16.4	28.0	124	1.0	0.8	90.6	0.520	1.2	25	40.1	90.6	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.109	1.210	24.1	74.6	
PC-03	PB-03 & PB-04	Foundation Soils	16.5	27.9	121	1.0	0.8	90.4	0.520	1.2	25	44.9	90.4	1.0	-0.3	0.0	1.0	0.126	1.015	0.131	0.109	1.206	30.7	76.1	
PC-03	PB-03 & PB-04	Foundation Soils	16.6	27.8	121	1.0	0.8	87.8	0.526	1.2	25	46.8	87.8	1.0	-0.3	0.0	1.0	0.123	1.014	0.129	0.109	1.177	37.0	78.0	
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	121	1.0	0.8	79.0	0.549	1.2	25	47.0	79.0	1.0	-0.3	0.0	1.0	0.115	1.012	0.119	0.109	1.090	46.8	78.8	
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	115	1.0	0.8	71.6	0.569	1.2	25	46.3	71.6	1.0	-0.3	0.0	1.0	0.109	1.010	0.112	0.110	1.025	54.5	79.7	
PC-03	PB-03 & PB-04	Foundation Soils	16.8	27.6	111	1.0	0.8	59.1	0.607	1.2	25	44.8	59.1	1.0	-0.3	0.0	1.0	0.099	1.009	0.102	0.110	0.928	75.0	89.3	0.103
PC-03	PB-03 & PB-04	Foundation Soils	16.9	27.5	111	1.0	0.8	52.6	0.629	1.2	25	43.6	52.6	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.110	0.880	75.4	84.4	0.096
PC-03	PB-03 & PB-04	Foundation Soils	17.0	27.4	111	1.0	0.8	50.6	0.636	1.2	25	43.2	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.095	0.110	0.865	75.4	82.8	0.094
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	111	1.0	0.8	49.8	0.639	1.2	25	43.0	49.8	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.110	0.858	75.4	82.1	0.093
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	111	1.0	0.8	50.3	0.638	1.2	25	43.1	50.3	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.110	0.860	75.4	82.5	0.094
PC-03	PB-03 & PB-04	Foundation Soils	17.2	27.2	111	1.0	0.8	49.0	0.642	1.2	25	42.9	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.111	0.849	75.4	81.5	0.092
PC-03	PB-03 & PB-04	Foundation Soils	17.3	27.1	111	1.0	0.8	47.9	0.646	1.2	25	42.7	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.111	0.841	75.4	80.7	0.091
PC-03	PB-03 & PB-04	Foundation Soils	17.4	27.0	111	1.0	0.8	47.8	0.647	1.2	25	42.6	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.111	0.839	75.4	80.6	0.091
PC-03	PB-03 & PB-04	Foundation Soils	17.5	26.9	115	1.1	0.8	51.2	0.634	1.2	25	42.8	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.111	0.860	61.3	69.7	0.077
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	121	1.1	0.8	65.9	0.586	1.2	25	37.8	65.9	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.111	0.962	25.8	53.8	0.058
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	124	1.1	0.8	68.6	0.578	1.2	25	26.8	68.6	1.0	-0.3	0.0	1.0	0.106	1.010	0.109	0.111	0.982	17.9	59.7	0.064
PC-03	PB-03 & PB-04	Foundation Soils	17.7	26.7	124	1.1	0.8	76.1	0.557	1.1	25	27.4	76.1	1.0	-0.3	0.0	0.9	0.112	1.011	0.116	0.112	1.040	17.8	66.5	
PC-03	PB-03 & PB-04	Foundation Soils	17.8	26.6	124	1.1	0.8	87.7	0.527	1.1	25	38.5	87.7	1.0	-0.3	0.0	0.9	0.123	1.014	0.128	0.112	1.144	23.1	72.3	
PC-03	PB-03 & PB-04	Foundation Soils	17.9	26.5	124	1.1	0.8	88.7	0.524	1.1	25	41.0	88.7	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.112	1.152	25.4	73.1	
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	121	1.1	0.8	89.3	0.523	1.1	25	44.2	89.3	1.0	-0.3	0.0	0.9	0.125	1.014	0.130	0.112	1.156	29.6	74.7	
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	121	1.1	0.8	89.9	0.521	1.1	25	45.5	89.9	1.0	-0.3	0.0	0.9	0.125	1.015	0.130	0.112	1.160	32.2	76.5	
PC-03	PB-03 & PB-04	Foundation Soils	18.1	26.3	121	1.1	0.8	91.9	0.517	1.1	25	46.6	91.9	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.112	1.180	34.1	79.4	
PC-03	PB-03 & PB-04	Foundation Soils	18.2	26.2	121	1.1	0.8	93.1	0.514	1.1	25	48.1	93.1	1.0	-0.3	0.0	0.9	0.129	1.016	0.134	0.113	1.191	38.2	83.3	
PC-03	PB-03 & PB-04	Foundation Soils	18.3	26.1	121	1.1	0.8	88.5	0.525	1.1	25	48.2	88.5	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.113	1.141	43.3	83.5	
PC-03	PB-03 & PB-04	Foundation Soils	18.4	26.0	115	1.1	0.8	68.3	0.578	1.1	15	38.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.109	0.113	0.966	54.2	84.2	0.096
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	115	1.1	0.8	60.4	0.603	1.1	15	37.5	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.113	0.907	63.2	86.1	0.099
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	111	1.1	0.8	56.2	0.617	1.1	15	37.0	56.2	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.113	0.876	69.3	88.4	0.102
PC-03	PB-03 & PB-04	Foundation Soils	18.6	25.8	115	1.1	0.9	61.2	0.600	1.1	15	37.6	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.113	0.909	61.3	84.9	0.097
PC-03	PB-03 & PB-04	Foundation Soils	18.7	25.7	115	1.1	0.9	58.9	0.608	1.1	15	37.3	58.9	1.0	-0.3	0.0	0.9	0.099	1.008	0.101	0.113	0.892	63.0	84.6	0.096
PC-03	PB-03 & PB-04	Foundation Soils	18.8	25.6	111	1.1	0.9	49.1	0.642	1.1	15	36.1	49.1	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.114	0.825	75.4	88.5	0.102
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	111	1.1	0.9	44.7	0.659	1.1	15	35.3	44.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.114	0.796	75.4	84.8	0.097
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	111	1.1	0.9	44.1	0.661	1.1	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.114	0.791	75.4	84.2	0.096
PC-03	PB-03 & PB-04	Foundation Soils	19.0	25.4	111	1.1	0.9	42.6	0.668	1.1	15	35.0	42.6	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.114	0.780	75.4	83.0	0.094
PC-03	PB-03 & PB-04	Foundation Soils	19.1	25.3	111	1.1	0.9	41.8	0.671	1.1	15	34.9	41.8	1.0	-0.3	0.0	0.9	0.087	1.007	0.088	0.114	0.774	75.4	82.3	0.093
PC-03	PB-03 & PB-04	Foundation Soils	19.2	25.2	111	1.2	0.9	40.9	0.675	1.1	15	34.7	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.114	0.767	75.4	81.6	0.092
PC-03	PB-03 & PB-04	Foundation Soils	19.3	25.1	111	1.2	0.9	41.0	0.674	1.1	15	34.7	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.115	0.767	75.4	81.6	0.092
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	115	1.2	0.9	41.4	0.672	1.1	15	34.7	41.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.115	0.768	70.3	77.1	0.086
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	115	1.2	0.9	42.1	0.670	1.1	15	34.9	42.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.115	0.772	73.8	81.1	0.092
PC-03	PB-03 & PB-04	Foundation Soils	19.5	24.9	115	1.2	0.9	43.1	0.666	1.1	15	35.0	43.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.115	0.776	73.1	81.1	0.092
PC-03	PB-03 & PB-04	Foundation Soils	19.6	24.8	115	1.2	0.9	43.9	0.662	1.1	15	35.1	43.9	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.115	0.781	69.7	78.6	0.088
PC-03	PB-03 & PB-04	Foundation Soils	19.7	24.7	111	1.2	0.9	45.0	0.658	1.1	15	35.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.115	0.786	74.7	84.4	0.096
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.6	111	1.2	0.9	45.8	0.654	1.1	15	35.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.115	0.790	73.7	84.0	0.096
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.5	111	1.2	0.9	45.7	0.655	1.1	15	35.5	45.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.115	0.788	75.2	85.4	0.098
PC-03	PB-03 & PB-04	Foundation Soils	19.9	24.5	111	1.2	0.9	44.1	0.662	1.1	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.116	0.777	75.4	84.2	0.096
PC-03	PB-03 & PB-04	Foundation Soils	20.0	24.4	111	1.2	0.9	41.1	0.674	1.1	15	34.8	41.1	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.116	0.758	75.4	81.8	0.093
PC-03	PB-03 & PB-04	Foundation Soils	20.1	24.3	111	1.2	0.9	40.3	0.678	1.1	15	34.6	40.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.116	0.752	75.4	81.0	0.092
PC-03	PB-03 & PB-04	Foundation Soils	20.2	24.2	115	1.2	0.9	48.2	0.645	1.1	15	35.6	48.2	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.116	0.800	64.9	77.5	0.087
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	121	1.2	0.9	55.0	0.621	1.1	15	36.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.116	0.842	52.3	71.1	0.079
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	115	1.2	0.9	47.5	0.648	1.1	15	35.6	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.116	0.794	67.0	78.9	0.089
PC-03	PB-03 & PB-04	Foundation Soils	20.4	24.0	111	1.2	0.9	43.9	0.662	1.1	15	35.2	43.9	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.116	0.771	75.4	84.1	0.096
PC-03	PB-03 & PB-04	Foundation Soils	20.5	23.9	111	1.2	0.9	41.1	0.674	1.1	15	34.7	41.1	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.117	0.752	75.4	81.7	0.093
PC-03	PB-03 & PB-04	Foundation Soils	20.6	23.8	111	1.2	0.9	40.0	0.678	1.1	15	34.6	40.0	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.117	0.745	75.4	80.8	0.091
PC-03	PB-03 & PB-04	Foundation Soils	20.7	23.7	111	1.2	0.9	40.4	0.677	1.1	15	34.6	40.4	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.117	0.746	75.4	81.2	0.092
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	111	1.2	0.9	41.2	0.673	1.1	15	34.8	41.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.117	0.750	75.4	81.8	0.093
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	111	1.2	0.9	42.8	0.667	1.1	15	35.0	42.8	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.117	0.759	75.4	83.1	0.094
PC-03	PB-03 & PB-04	Foundation Soils	20.9	23.5	111	1.3	0.9	42.6	0.667	1.1	15	35.0	42.6	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.117	0.757	75.4	83.0	0.094
PC-03	PB-03 & PB-04	Foundation Soils	21.0	23.4	111	1.3	0.9	41.9	0.670	1.1	15	34.9	41.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.088	0.117	0.752	75.4	82.4	0.093
PC-03	PB-03 & PB-04	Foundation Soils	21.1	23.3	111	1.3	0.9	44.8	0.658	1.1	15	35.3	44.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.117	0.768	74.0	83.5	0.095
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	115	1.3	0.9	49.6	0.640	1.1	15	35.7	49.6	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.118	0.797	61.4	75.3	0.084
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	121	1.3	0.9	53.0	0.628	1.1	15	35.7	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.118	0.817	50.9	68.1	0.075
PC-03	PB-03 & PB-04	Foundation Soils	21.3	23.1	121	1.3	0.9	54.9	0.621	1.1	15	35.8	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.118	0.828	48.1	67.2	0.074
PC-03	PB-03 & PB-04	Foundation Soils	21.4	23.0	121	1.3	0.9	57.1	0.614	1.1	15	35.8	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.118	0.842	44.9	66.2	0.072
PC-03	PB-03 & PB-04	Foundation Soils	21.5	22.9	121	1.3	0.9	60.8	0.602	1.1	15	36.2	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.118	0.865	43.5	68.1	0.075
PC-03	PB-03 & PB-04	Foundation Soils	21.6	22.8	121	1.3	0.9	63.6	0.593	1.1	15	36.4	63.6	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.118	0.883	41.8	68.9	0.076
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	121	1.3	0.9	64.7	0.589	1.1	15	36.9	64.7	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.118	0.889	43.9	71.7	0.079
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	121	1.3	0.9	65.9	0.586	1.1	15	37.3	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.106	0.118	0.897	45.6	74.2	0.083

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
PC-03	PB-03 & PB-04	Foundation Soils	21.8	22.6	121	1.3	0.9	72.5	0.567	1.1	15	37.8	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.112	0.118	0.943	41.7	76.4	0.085
PC-03	PB-03 & PB-04	Foundation Soils	21.9	22.5	121	1.3	0.9	75.3	0.559	1.1	15	36.9	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.119	0.963	35.3	73.6	0.082
PC-03	PB-03 & PB-04	Foundation Soils	22.0	22.4	121	1.3	0.9	78.1	0.551	1.1	15	34.2	78.1	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.119	0.984	27.4	71.3	0.079
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	124	1.3	0.9	76.2	0.556	1.1	15	21.6	76.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.115	0.119	0.968	17.3	71.9	0.080
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	124	1.3	0.9	74.4	0.561	1.1	15	0.0	74.4	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.119	0.953	7.8	82.2	0.093
PC-03	PB-03 & PB-04	Foundation Soils	22.2	22.2	124	1.3	0.9	82.0	0.541	1.1	15	0.0	82.0	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.119	1.013	6.0	88.0	
PC-03	PB-03 & PB-04	Foundation Soils	22.3	22.1	124	1.3	0.9	91.4	0.518	1.1	15	0.0	91.4	1.0	-0.4	0.0	0.9	0.127	1.015	0.130	0.119	1.096	6.0	97.4	
PC-03	PB-03 & PB-04	Foundation Soils	22.4	22.0	124	1.3	1.0	108.5	0.480	1.1	15	0.0	108.5	1.0	-0.4	0.0	0.9	0.150	1.021	0.155	0.119	1.298	6.0	114.5	
PC-03	PB-03 & PB-04	Foundation Soils	22.5	21.9	124	1.3	1.0	122.6	0.452	1.0	15	0.0	122.6	1.0	-0.4	0.0	0.9	0.177	1.028	0.185	0.119	1.549	6.0	128.6	
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	124	1.3	1.0	132.2	0.434	1.0	15	0.0	132.2	1.0	-0.4	0.0	0.9	0.204	1.033	0.214	0.119	1.795	6.0	138.2	
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	124	1.4	1.0	133.7	0.431	1.0	15	0.0	133.7	1.0	-0.4	0.0	0.9	0.210	1.034	0.220	0.119	1.841	6.0	139.7	
PC-03	PB-03 & PB-04	Foundation Soils	22.7	21.7	124	1.4	1.0	133.5	0.432	1.0	15	0.0	133.5	1.0	-0.4	0.0	0.9	0.209	1.034	0.219	0.119	1.832	6.0	139.5	
PC-03	PB-03 & PB-04	Foundation Soils	22.8	21.6	124	1.4	1.0	134.0	0.431	1.0	15	0.0	134.0	1.0	-0.4	0.0	0.9	0.211	1.034	0.221	0.120	1.846	6.0	140.0	
PC-03	PB-03 & PB-04	Foundation Soils	22.9	21.5	124	1.4	1.0	133.0	0.432	1.0	15	0.0	133.0	1.0	-0.4	0.0	0.9	0.207	1.034	0.217	0.120	1.813	6.0	139.0	
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.4	124	1.4	1.0	129.7	0.438	1.0	15	0.0	129.7	1.0	-0.4	0.0	0.9	0.197	1.032	0.205	0.120	1.715	6.0	135.7	
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.3	124	1.4	1.0	133.1	0.432	1.0	15	0.0	133.1	1.0	-0.4	0.0	0.9	0.208	1.034	0.217	0.120	1.813	6.0	139.1	
PC-03	PB-03 & PB-04	Foundation Soils	23.1	21.3	124	1.4	1.0	136.5	0.426	1.0	15	0.0	136.5	1.0	-0.4	0.0	0.9	0.220	1.036	0.230	0.120	1.922	6.0	142.5	
PC-03	PB-03 & PB-04	Foundation Soils	23.2	21.2	124	1.4	1.0	135.9	0.427	1.0	15	0.0	135.9	1.0	-0.4	0.0	0.9	0.218	1.035	0.228	0.120	1.899	6.0	141.9	
PC-03	PB-03 & PB-04	Foundation Soils	23.3	21.1	124	1.4	1.0	129.0	0.440	1.0	15	0.0	129.0	1.0	-0.4	0.0	0.9	0.194	1.031	0.203	0.120	1.688	6.0	135.0	
PC-03	PB-03 & PB-04	Foundation Soils	23.4	21.0	124	1.4	1.0	117.8	0.461	1.0	15	0.0	117.8	1.0	-0.4	0.0	0.9	0.166	1.025	0.172	0.120	1.434	6.0	123.8	
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	124	1.4	1.0	102.9	0.492	1.0	15	0.0	102.9	1.0	-0.4	0.0	0.9	0.141	1.019	0.145	0.120	1.206	6.0	108.9	
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	124	1.4	1.0	103.7	0.490	1.0	15	0.0	103.7	1.0	-0.4	0.0	0.9	0.142	1.019	0.146	0.120	1.215	6.0	109.7	
PC-03	PB-03 & PB-04	Foundation Soils	23.6	20.8	124	1.4	1.0	115.3	0.466	1.0	15	0.0	115.3	1.0	-0.4	0.0	0.9	0.161	1.024	0.167	0.120	1.385	6.0	121.3	
PC-03	PB-03 & PB-04	Foundation Soils	23.7	20.7	124	1.4	1.0	138.0	0.424	1.0	15	0.0	138.0	1.0	-0.4	0.0	0.9	0.226	1.037	0.236	0.120	1.963	6.0	144.0	
PC-03	PB-03 & PB-04	Foundation Soils	23.8	20.6	124	1.4	1.0	152.4	0.399	1.0	15	0.0	152.4	1.0	-0.4	0.0	0.9	0.305	1.047	0.323	0.120	2.680	6.0	158.4	
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.5	124	1.4	1.0	164.3	0.381	1.0	15	0.0	164.3	1.0	-0.4	0.0	0.9	0.420	1.058	0.450	0.121	3.729	6.0	170.3	
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.4	124	1.4	1.0	162.5	0.383	1.0	15	0.0	162.5	1.0	-0.4	0.1	0.9	0.399	1.056	0.426	0.121	3.527	6.0	168.5	
PC-03	PB-03 & PB-04	Foundation Soils	24.0	20.4	124	1.4	1.0	155.3	0.395	1.0	15	0.0	155.3	1.0	-0.4	0.1	0.9	0.328	1.050	0.347	0.121	2.878	6.0	161.3	
PC-03	PB-03 & PB-04	Foundation Soils	24.1	20.3	124	1.4	1.0	147.0	0.408	1.0	15	0.0	147.0	1.0	-0.4	0.1	0.9	0.270	1.043	0.284	0.121	2.352	6.0	153.0	
PC-03	PB-03 & PB-04	Foundation Soils	24.2	20.2	124	1.5	1.0	134.3	0.430	1.0	15	0.0	134.3	1.0	-0.5	0.1	0.9	0.212	1.034	0.220	0.121	1.823	6.0	140.3	
PC-03	PB-03 & PB-04	Foundation Soils	24.3	20.1	124	1.5	1.0	122.0	0.453	1.0	15	0.0	122.0	1.0	-0.5	0.1	0.9	0.176	1.027	0.182	0.121	1.502	6.0	128.0	
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	124	1.5	1.0	108.0	0.481	1.0	15	0.0	108.0	1.0	-0.5	0.1	0.9	0.149	1.021	0.153	0.121	1.262	6.0	114.0	
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	124	1.5	1.0	100.9	0.496	1.0	15	0.0	100.9	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.121	1.170	6.0	106.9	
PC-03	PB-03 & PB-04	Foundation Soils	24.5	19.9	124	1.5	1.0	93.2	0.514	1.0	15	0.0	93.2	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.121	1.087	6.0	99.2	
PC-03	PB-03 & PB-04	Foundation Soils	24.6	19.8	124	1.5	1.0	86.2	0.531	1.0	15	0.0	86.2	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.121	1.021	6.0	92.2	
PC-03	PB-03 & PB-04	Foundation Soils	24.7	19.7	124	1.5	1.0	82.6	0.540	1.0	15	0.0	82.6	1.0	-0.5	0.1	0.9	0.118	1.013	0.120	0.121	0.990	6.0	88.6	0.102
PC-03	PB-03 & PB-04	Foundation Soils	24.8	19.6	124	1.5	1.0	75.0	0.560	1.0	15	0.0	75.0	1.0	-0.5	0.1	0.9	0.111	1.011	0.113	0.121	0.931	8.1	83.2	0.094
																									0.000
UC-01	UB-02	Foundation Soils	9.5	31.8	124	0.6	0.5	50.6	0.636	1.7	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.110	0.899	28.3	78.4	0.088
UC-01	UB-02	Foundation Soils	9.6	31.7	124	0.6	0.5	54.6	0.622	1.6	0	0.4	54.6	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.110	0.926	19.1	73.3	0.081
UC-01	UB-02	Foundation Soils	9.7	31.7	124	0.6	0.5	53.9	0.625	1.6	0	0.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.111	0.918	19.8	73.3	0.081
UC-01	UB-02	Foundation Soils	9.8	31.6	124	0.6	0.5	52.2	0.631	1.6	0	0.5	52.2	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.111	0.902	24.0	75.8	0.085
UC-01	UB-02	Foundation Soils	9.8	31.5	124	0.6	0.5	49.7	0.640	1.7	0	0.5	49.7	1.1	-0.1	0.0	1.0	0.092	1.008	0.098	0.111	0.880	27.6	76.8	0.086
UC-01	UB-02	Foundation Soils	9.9	31.4	121	0.6	0.5	48.6	0.644	1.7	0	0.5	48.6	1.1	-0.1	0.0	1.0	0.091	1.007	0.097	0.112	0.870	28.7	76.8	0.086
UC-01	UB-02	Foundation Soils	10.0	31.3	121	0.6	0.5	46.0	0.654	1.7	0	0.5	46.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.095	0.112	0.849	31.8	77.3	0.087
UC-01	UB-02	Foundation Soils	10.1	31.2	121	0.6	0.5	43.7	0.663	1.7	0	0.5	43.7	1.1	-0.1	0.0	1.0	0.088	1.007	0.093	0.112	0.830	35.8	79.0	0.089
UC-01	UB-02	Foundation Soils	10.2	31.2	121	0.6	0.5	45.0	0.658	1.7	0	0.5	45.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.094	0.113	0.836	39.0	83.5	0.095
UC-01	UB-02	Foundation Soils	10.3	31.1	121	0.6	0.5	50.6	0.636	1.6	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.113	0.873	36.9	87.0	0.100
UC-01	UB-02	Foundation Soils	10.3	31.0	121	0.6	0.5	62.8	0.595	1.6	0	0.5	62.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.113	0.961	29.9	92.1	0.107
UC-01	UB-02	Foundation Soils	10.4	30.9	124	0.6	0.5	72.6	0.566	1.5	0	0.5	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.118	0.113	1.037	23.2	95.3	
UC-01	UB-02	Foundation Soils	10.5	30.8	124	0.6	0.5	78.9	0.549	1.5	0	0.4	78.9	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.114	1.090	18.3	96.8	
UC-01	UB-02	Foundation Soils	10.6	30.8	124	0.6	0.5	84.4	0.535	1.5	0	0.1	84.4	1.1	-0.1	0.0	1.0	0.120	1.013	0.130	0.114	1.140	11.7	96.0	
UC-01	UB-02	Foundation Soils	10.7	30.7	124	0.7	0.5	87.0	0.528	1.5	0	0.0	87.0	1.1	-0.1	0.0	1.0	0.122	1.014	0.133	0.114	1.163	7.0	94.0	
UC-01	UB-02	Foundation Soils	10.7	30.6	124	0.7	0.5	84.6	0.534	1.5	0	0.0	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.130	0.115	1.135	6.0	90.6	
UC-01	UB-02	Foundation Soils	10.8	30.5	124	0.7	0.5	80.7	0.544	1.5	0	0.0	80.7	1.1	-0.2	0.0	1.0	0.116	1.012	0.126	0.115	1.094	9.9	90.6	
UC-01	UB-02	Foundation Soils	10.9	30.4	124	0.7	0.5	72.3	0.567	1.5	0	0.3	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.117	0.115	1.017	17.8	89.7	
UC-01	UB-02	Foundation Soils	11.0	30.3	124	0.7	0.5	68.4	0.578	1.5	0	0.4	68.4	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.115	0.982	20.4	88.4	0.102
UC-01	UB-02	Foundation Soils	11.1	30.3	124	0.7	0.5	61.2	0.600	1.5	0	0.5	61.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.116	0.924	24.1	84.9	0.097
UC-01	UB-02	Foundation Soils	11.2	30.2	124	0.7	0.5	59.3	0.606	1.5	0	0.5	59.3	1.1	-0.2	0.0	1.0	0.099	1.009	0.105	0.116	0.908	23.7	82.5	0.094
UC-01	UB-02	Foundation Soils	11.2	30.1	124	0.7	0.5	62.2	0.597	1.5	0	0.4	62.2	1.1	-0.2	0.0	1.0	0.101	1.009	0.108	0.116	0.927	20.3	82.1	0.093
UC-01	UB-02	Foundation Soils	11.3	30.0	124	0.7	0.5	63.2	0.594	1.5	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.117	0.932	19.1	82.0	0.093
UC-01	UB-02	Foundation Soils	11.4	29.9	124	0.7	0.5	63.2	0.594	1.5	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.117	0.929	18.7	81.6	0.092
UC-01	UB-02	Foundation Soils	11.5	29.8	124	0.7	0.5	64.8	0.589	1.5	0	0.4	64.8	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.117	0.938	18.8	83.2	0.095
UC-01	UB-02	Foundation Soils	11.6	29.8	124	0.7	0.5	67.9	0.580	1.5	0	0.4	67.9	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.117	0.960	18.5	86.0	0.098
UC-01	UB-02	Foundation Soils	11.6	29.7	124	0.7	0.5	70.4	0.573	1.5	0	0.4	70.4	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.118	0.977	18.5	88.5	0.102
UC-01	UB-02	Foundation Soils	11.7	29.6	124	0.7	0.5	75.8	0.557	1.5	0	0.3	75.8	1.1	-0.2	0.0	1.0	0.112	1.011	0.120	0.118	1.019	16.9	92.4	
UC-01	UB-02	Foundation Soils	11.8	29.5	124	0.7	0.5	80.2	0.546	1.4	0	0.3	80.2	1.1	-0.2	0.0	1.0	0.116	1.012	0.125	0.118	1.055	16.5	96.3	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-01	UB-02	Foundation Soils	11.9	29.4	124	0.7	0.5	85.3	0.533	1.4	0	0.2	85.3	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.118	1.100	15.2	100.3	
UC-01	UB-02	Foundation Soils	12.0	29.4	124	0.7	0.5	88.5	0.525	1.4	0	0.2	88.5	1.1	-0.2	0.0	1.0	0.124	1.014	0.134	0.119	1.129	14.9	103.1	
UC-01	UB-02	Foundation Soils	12.1	29.3	124	0.7	0.5	90.5	0.520	1.4	0	0.2	90.5	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.119	1.147	14.8	105.1	
UC-01	UB-02	Foundation Soils	12.1	29.2	124	0.7	0.6	92.6	0.515	1.4	0	0.2	92.6	1.1	-0.2	0.0	1.0	0.128	1.015	0.139	0.119	1.167	14.2	106.6	
UC-01	UB-02	Foundation Soils	12.2	29.1	124	0.7	0.6	94.1	0.512	1.4	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.119	1.181	14.0	107.9	
UC-01	UB-02	Foundation Soils	12.3	29.0	124	0.8	0.6	95.2	0.509	1.4	0	0.2	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.119	1.190	13.3	108.4	
UC-01	UB-02	Foundation Soils	12.4	28.9	124	0.8	0.6	95.2	0.509	1.4	0	0.1	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.120	1.188	13.2	108.2	
UC-01	UB-02	Foundation Soils	12.5	28.9	124	0.8	0.6	94.1	0.511	1.4	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.120	1.173	13.4	107.4	
UC-01	UB-02	Foundation Soils	12.5	28.8	124	0.8	0.6	92.4	0.516	1.4	0	0.2	92.4	1.1	-0.2	0.0	1.0	0.128	1.015	0.138	0.120	1.151	13.8	105.9	
UC-01	UB-02	Foundation Soils	12.6	28.7	124	0.8	0.6	90.7	0.520	1.4	0	0.2	90.7	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.120	1.131	13.8	104.3	
UC-01	UB-02	Foundation Soils	12.7	28.6	124	0.8	0.6	88.4	0.525	1.4	0	0.2	88.4	1.1	-0.2	0.0	1.0	0.124	1.014	0.133	0.121	1.105	14.2	102.4	
UC-01	UB-02	Foundation Soils	12.8	28.5	124	0.8	0.6	86.5	0.530	1.4	0	0.2	86.5	1.1	-0.2	0.0	1.0	0.122	1.014	0.131	0.121	1.084	14.2	100.5	
UC-01	UB-02	Foundation Soils	12.9	28.5	124	0.8	0.6	85.5	0.532	1.4	0	0.2	85.5	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.121	1.072	13.8	99.1	
UC-01	UB-02	Foundation Soils	13.0	28.4	124	0.8	0.6	84.6	0.535	1.4	0	0.1	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.129	0.121	1.061	13.1	97.5	
UC-01	UB-02	Foundation Soils	13.0	28.3	124	0.8	0.6	84.1	0.536	1.4	0	0.1	84.1	1.1	-0.2	0.0	1.0	0.120	1.013	0.128	0.121	1.054	13.1	97.1	
UC-01	UB-02	Foundation Soils	13.1	28.2	124	0.8	0.6	83.7	0.537	1.4	0	0.1	83.7	1.1	-0.2	0.0	1.0	0.119	1.013	0.128	0.122	1.049	12.9	96.5	
UC-01	UB-02	Foundation Soils	13.2	28.1	124	0.8	0.6	78.7	0.550	1.4	0	0.2	78.7	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.122	1.003	15.1	93.6	
UC-01	UB-02	Foundation Soils	13.3	28.0	124	0.8	0.6	81.7	0.542	1.4	0	0.2	81.7	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.122	1.027	14.0	95.5	
UC-01	UB-02	Foundation Soils	13.4	28.0	124	0.8	0.6	81.0	0.543	1.4	0	0.2	81.0	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.122	1.019	14.1	94.9	
UC-01	UB-02	Foundation Soils	13.5	27.9	124	0.8	0.6	79.8	0.547	1.4	0	0.2	79.8	1.1	-0.2	0.0	1.0	0.116	1.012	0.123	0.122	1.006	14.4	94.0	
UC-01	UB-02	Foundation Soils	13.5	27.8	124	0.8	0.6	77.9	0.552	1.4	0	0.2	77.9	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.123	0.988	14.8	92.5	0.108
UC-01	UB-02	Foundation Soils	13.6	27.7	124	0.8	0.6	76.5	0.555	1.4	0	0.3	76.5	1.1	-0.2	0.0	1.0	0.113	1.011	0.120	0.123	0.975	15.5	91.7	0.107
UC-01	UB-02	Foundation Soils	13.7	27.6	124	0.8	0.6	75.8	0.557	1.4	0	0.3	75.8	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.123	0.968	16.8	92.3	0.108
UC-01	UB-02	Foundation Soils	13.8	27.6	124	0.8	0.6	75.5	0.558	1.4	0	0.4	75.5	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.123	0.963	19.7	94.8	0.111
UC-01	UB-02	Foundation Soils	13.9	27.5	124	0.9	0.6	74.6	0.561	1.4	0	0.5	74.6	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.123	0.955	21.8	96.0	0.113
UC-01	UB-02	Foundation Soils	13.9	27.4	124	0.9	0.6	72.9	0.565	1.4	0	0.5	72.9	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.124	0.939	23.5	95.9	0.113
UC-01	UB-02	Foundation Soils	14.0	27.3	124	0.9	0.6	69.5	0.575	1.4	0	0.5	69.5	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.124	0.912	23.3	92.3	0.108
UC-01	UB-02	Foundation Soils	14.1	27.2	124	0.9	0.6	66.1	0.585	1.4	0	0.5	66.1	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.124	0.887	24.8	90.4	0.105
UC-01	UB-02	Foundation Soils	14.2	27.1	124	0.9	0.6	71.2	0.570	1.4	0	0.4	71.2	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.124	0.922	21.7	92.5	0.108
UC-01	UB-02	Foundation Soils	14.3	27.1	124	0.9	0.6	88.1	0.526	1.3	0	0.2	88.1	1.1	-0.2	0.0	1.0	0.124	1.014	0.132	0.124	1.062	13.5	101.5	
UC-01	UB-02	Foundation Soils	14.4	27.0	124	0.9	0.6	98.4	0.502	1.3	0	0.0	98.4	1.1	-0.2	0.0	1.0	0.135	1.017	0.145	0.124	1.168	10.3	108.7	
UC-01	UB-02	Foundation Soils	14.4	26.9	124	0.9	0.6	93.5	0.513	1.3	0	0.1	93.5	1.1	-0.2	0.0	1.0	0.129	1.016	0.139	0.125	1.112	13.3	106.6	
UC-01	UB-02	Foundation Soils	14.5	26.8	124	0.9	0.6	82.5	0.540	1.3	0	0.4	82.5	1.0	-0.2	0.0	1.0	0.118	1.013	0.125	0.125	1.006	18.7	100.8	
UC-01	UB-02	Foundation Soils	14.6	26.7	124	0.9	0.6	69.7	0.574	1.4	0	0.5	69.7	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.125	0.903	25.9	95.1	0.112
UC-01	UB-02	Foundation Soils	14.7	26.6	121	0.9	0.6	50.0	0.639	1.4	0	0.6	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.125	0.769	39.5	88.7	0.102
UC-01	UB-02	Foundation Soils	14.8	26.6	115	0.9	0.6	35.3	0.700	1.4	0	0.5	35.1	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.125	0.681	53.6	88.1	0.101
UC-01	UB-02	Foundation Soils	14.8	26.5	111	0.9	0.6	22.6	0.771	1.5	0	0.5	22.4	1.0	-0.2	0.0	1.0	0.074	1.006	0.076	0.125	0.609	66.7	88.7	0.102
UC-01	UB-02	Foundation Soils	14.9	26.4	111	0.9	0.6	15.1	0.782	1.5	0	0.5	15.1	1.0	-0.2	0.0	1.0	0.069	1.006	0.072	0.126	0.570	75.4	90.0	0.104
UC-01	UB-02	Foundation Soils	15.0	26.3	111	0.9	0.6	12.7	0.782	1.5	0	0.5	12.7	1.0	-0.2	0.0	1.0	0.068	1.006	0.070	0.126	0.557	75.4	87.6	0.101
UC-01	UB-02	Foundation Soils	15.1	26.2	111	0.9	0.6	10.6	0.782	1.5	0	0.5	10.6	1.0	-0.2	0.0	1.0	0.067	1.006	0.069	0.126	0.545	75.4	85.5	0.098
UC-01	UB-02	Foundation Soils	15.2	26.2	111	0.9	0.6	10.0	0.782	1.5	0	0.5	10.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.126	0.541	75.4	84.9	0.097
UC-01	UB-02	Foundation Soils	15.3	26.1	111	0.9	0.6	9.0	0.782	1.5	0	0.5	9.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.126	0.536	75.4	83.9	0.096
UC-01	UB-02	Foundation Soils	15.3	26.0	111	0.9	0.6	5.9	0.782	1.5	0	0.5	5.9	1.0	-0.2	0.0	1.0	0.064	1.006	0.066	0.127	0.520	75.4	80.9	0.091
UC-01	UB-02	Foundation Soils	15.4	25.9	111	0.9	0.6	5.0	0.782	1.5	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.127	0.515	75.4	79.9	0.090
UC-01	UB-02	Foundation Soils	15.5	25.8	111	0.9	0.7	5.0	0.782	1.5	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.127	0.513	75.4	79.9	0.090
UC-01	UB-02	Foundation Soils	15.6	25.7	111	1.0	0.7	4.9	0.782	1.5	0	0.5	4.9	1.0	-0.2	0.0	1.0	0.063	1.006	0.065	0.127	0.512	75.4	79.8	0.090
UC-01	UB-02	Foundation Soils	15.7	25.7	111	1.0	0.7	4.8	0.782	1.5	0	0.5	4.8	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.127	0.511	75.4	79.8	0.090
UC-01	UB-02	Foundation Soils	15.7	25.6	111	1.0	0.7	4.7	0.782	1.5	0	0.5	4.7	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.127	0.510	75.4	79.7	0.090
UC-01	UB-02	Foundation Soils	15.8	25.5	111	1.0	0.7	5.2	0.782	1.4	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.128	0.512	75.4	80.1	0.090
UC-01	UB-02	Foundation Soils	15.9	25.4	121	1.0	0.7	15.6	0.782	1.4	0	0.5	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.128	0.562	43.5	58.6	0.063
UC-01	UB-02	Foundation Soils	16.0	25.3	121	1.0	0.7	31.1	0.721	1.4	0	0.5	31.0	1.0	-0.3	0.0	1.0	0.079	1.006	0.082	0.128	0.642	29.9	60.4	0.065
UC-01	UB-02	Foundation Soils	16.1	25.3	121	1.0	0.7	34.5	0.704	1.4	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.084	0.128	0.659	29.3	63.2	0.069
UC-01	UB-02	Foundation Soils	16.2	25.2	121	1.0	0.7	25.7	0.751	1.4	0	0.5	25.6	1.0	-0.3	0.0	1.0	0.076	1.006	0.078	0.128	0.611	46.1	71.2	0.079
UC-01	UB-02	Foundation Soils	16.2	25.1	115	1.0	0.7	22.2	0.773	1.4	0	0.5	22.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.076	0.128	0.592	55.1	76.7	0.086
UC-01	UB-02	Foundation Soils	16.3	25.0	115	1.0	0.7	21.1	0.781	1.4	0	0.5	21.1	1.0	-0.3	0.0	1.0	0.073	1.006	0.075	0.129	0.586	57.9	78.5	0.088
UC-01	UB-02	Foundation Soils	16.4	24.9	115	1.0	0.7	16.4	0.782	1.4	0	0.5	16.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.129	0.561	66.2	82.1	0.093
UC-01	UB-02	Foundation Soils	16.5	24.8	111	1.0	0.7	12.9	0.782	1.4	0	0.5	12.9	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.129	0.543	74.3	86.7	0.099
UC-01	UB-02	Foundation Soils	16.6	24.8	111	1.0	0.7	14.1	0.782	1.4	0	0.5	14.1	1.0	-0.3	0.0	1.0	0.069	1.006	0.071	0.129	0.548	70.6	84.2	0.096
UC-01	UB-02	Foundation Soils	16.7	24.7	115	1.0	0.7	16.1	0.782	1.4	0	0.5	16.1	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.129	0.557	64.7	80.3	0.091
UC-01	UB-02	Foundation Soils	16.7	24.6	111	1.0	0.7	12.3	0.782	1.4	0	0.5	12.3	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.129	0.538	72.7	84.5	0.096
UC-01	UB-02	Foundation Soils	16.8	24.5	111	1.0	0.7	7.8	0.782	1.4	0	0.5	7.8	1.0	-0.3	0.0	1.0	0.065	1.006	0.067	0.130	0.516	75.4	82.7	0.094
UC-01	UB-02	Foundation Soils	16.9	24.4	111	1.0	0.7	6.0	0.782	1.4	0	0.5	6.0	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.130	0.506	75.4	80.9	0.091
UC-01	UB-02	Foundation Soils	17.0	24.4	111	1.0	0.7	5.6	0.782	1.4	0	0.5	5.6	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.130	0.504	75.4	80.5	0.091
UC-01	UB-02	Foundation Soils	17.1	24.3	111	1.0	0.7	5.5	0.782	1.4	0	0.5	5.5	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.130	0.503	75.4	80.4	0.091
UC-01	UB-02	Foundation Soils	17.1	24.2	111	1.0	0.7	5.2	0.782	1.4	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.130	0.501	75.4	80.1	0.090
UC-01	UB-02	Foundation Soils	17.2	24.1	111	1.0	0.7	5.2	0.782	1.4	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.130	0.500	75.4	80.1	0.090
UC-01	UB-02	Foundation Soils	17.3	24.0	111	1.1	0.7	5.2	0.782	1.4	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.130	0.500	75.4	80.1	0.090

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-01	UB-02	Foundation Soils	17.4	23.9	111	1.1	0.7	6.3	0.782	1.4	0	0.5	6.3	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.131	0.504	75.4	81.2	0.092
UC-01	UB-02	Foundation Soils	17.5	23.9	115	1.1	0.7	10.5	0.782	1.4	0	0.5	10.5	1.0	-0.3	0.0	1.0	0.067	1.006	0.068	0.131	0.523	59.8	69.8	0.077
UC-01	UB-02	Foundation Soils	17.6	23.8	115	1.1	0.7	13.9	0.782	1.4	0	0.5	13.9	1.0	-0.3	0.0	1.0	0.069	1.006	0.070	0.131	0.539	61.1	74.5	0.083
UC-01	UB-02	Foundation Soils	17.6	23.7	115	1.1	0.7	15.8	0.782	1.4	0	0.5	15.8	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.131	0.547	60.3	75.6	0.084
UC-01	UB-02	Foundation Soils	17.7	23.6	111	1.1	0.7	9.1	0.782	1.4	0	0.5	9.1	1.0	-0.3	0.0	0.9	0.066	1.006	0.068	0.131	0.515	75.4	84.0	0.096
UC-01	UB-02	Foundation Soils	17.8	23.5	111	1.1	0.7	7.3	0.782	1.4	0	0.5	7.3	1.0	-0.3	0.0	0.9	0.065	1.006	0.066	0.131	0.506	75.4	82.2	0.093
UC-01	UB-02	Foundation Soils	17.9	23.5	111	1.1	0.7	6.4	0.782	1.4	0	0.5	6.4	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.131	0.501	75.4	81.3	0.092
UC-01	UB-02	Foundation Soils	18.0	23.4	111	1.1	0.7	5.9	0.782	1.4	0	0.5	5.9	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.132	0.498	75.4	80.8	0.091
UC-01	UB-02	Foundation Soils	18.0	23.3	111	1.1	0.7	39.2	0.682	1.3	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.132	0.666	75.4	80.2	0.090
UC-01	UB-02	Foundation Soils	18.1	23.2	111	1.1	0.7	40.3	0.677	1.3	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.132	0.671	75.4	81.1	0.092
UC-01	UB-02	Foundation Soils	18.2	23.1	111	1.1	0.7	41.6	0.672	1.3	15	34.8	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.132	0.677	75.4	82.2	0.093
UC-01	UB-02	Foundation Soils	18.3	23.0	111	1.1	0.7	41.2	0.673	1.3	15	34.8	41.2	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.132	0.674	75.4	81.9	0.093
UC-01	UB-02	Foundation Soils	18.4	23.0	111	1.1	0.7	40.6	0.676	1.3	15	34.7	40.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.132	0.670	75.4	81.3	0.092
UC-01	UB-02	Foundation Soils	18.5	22.9	111	1.1	0.7	39.6	0.681	1.3	15	34.5	39.6	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.132	0.663	75.4	80.4	0.091
UC-01	UB-02	Foundation Soils	18.5	22.8	111	1.1	0.7	39.0	0.683	1.3	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.132	0.659	75.4	80.0	0.090
UC-01	UB-02	Foundation Soils	18.6	22.7	111	1.1	0.7	38.7	0.684	1.3	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.133	0.657	75.4	79.7	0.090
UC-01	UB-02	Foundation Soils	18.7	22.6	111	1.1	0.7	38.7	0.684	1.3	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.133	0.656	75.4	79.7	0.090
UC-01	UB-02	Foundation Soils	18.8	22.5	111	1.1	0.7	38.7	0.684	1.3	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.133	0.656	75.4	79.7	0.090
UC-01	UB-02	Foundation Soils	18.9	22.5	111	1.1	0.7	38.6	0.685	1.3	15	34.3	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.087	0.133	0.655	75.4	79.7	0.090
UC-01	UB-02	Foundation Soils	18.9	22.4	111	1.1	0.7	39.0	0.683	1.3	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.133	0.656	75.4	80.0	0.090
UC-01	UB-02	Foundation Soils	19.0	22.3	111	1.1	0.7	39.5	0.681	1.3	15	34.5	39.5	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.133	0.658	75.4	80.4	0.091
UC-01	UB-02	Foundation Soils	19.1	22.2	111	1.2	0.7	40.8	0.675	1.3	15	34.6	40.8	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.133	0.664	70.9	77.1	0.086
UC-01	UB-02	Foundation Soils	19.2	22.1	115	1.2	0.7	41.6	0.672	1.3	15	34.7	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.133	0.668	68.8	75.7	0.084
UC-01	UB-02	Foundation Soils	19.3	22.1	115	1.2	0.7	40.4	0.677	1.3	15	34.6	40.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.134	0.660	75.4	81.1	0.092
UC-01	UB-02	Foundation Soils	19.4	22.0	111	1.2	0.7	39.2	0.682	1.3	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.134	0.654	75.4	80.1	0.090
UC-01	UB-02	Foundation Soils	19.4	21.9	111	1.2	0.8	39.3	0.682	1.3	15	34.5	39.3	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.134	0.653	75.4	80.2	0.091
UC-01	UB-02	Foundation Soils	19.5	21.8	111	1.2	0.8	39.9	0.679	1.3	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.134	0.656	75.4	80.8	0.091
UC-01	UB-02	Foundation Soils	19.6	21.7	111	1.2	0.8	40.3	0.677	1.3	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.134	0.657	75.4	81.1	0.092
UC-01	UB-02	Foundation Soils	19.7	21.6	111	1.2	0.8	39.9	0.679	1.3	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.134	0.654	75.4	80.7	0.091
UC-01	UB-02	Foundation Soils	19.8	21.6	111	1.2	0.8	40.1	0.678	1.3	15	34.6	40.1	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.134	0.655	75.4	80.9	0.091
UC-01	UB-02	Foundation Soils	19.8	21.5	121	1.2	0.8	50.8	0.636	1.2	15	35.2	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.134	0.713	48.3	63.9	0.070
UC-01	UB-02	Foundation Soils	19.9	21.4	124	1.2	0.8	62.2	0.597	1.2	0	0.0	62.2	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.134	0.779	6.0	68.2	0.075
UC-01	UB-02	Foundation Soils	20.0	21.3	124	1.2	0.8	70.5	0.572	1.2	0	0.0	70.5	1.0	-0.3	0.0	0.9	0.108	1.010	0.112	0.134	0.831	6.0	76.5	0.086
UC-01	UB-02	Foundation Soils	20.1	21.2	124	1.2	0.8	54.5	0.622	1.2	0	0.2	54.5	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.135	0.732	15.3	69.6	0.077
UC-01	UB-02	Foundation Soils	20.2	21.2	124	1.2	0.8	43.7	0.663	1.2	0	0.4	43.7	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.135	0.672	25.2	68.5	0.075
UC-01	UB-02	Foundation Soils	20.3	21.1	121	1.2	0.8	27.2	0.743	1.3	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.135	0.585	46.9	73.6	0.082
UC-01	UB-02	Foundation Soils	20.3	21.0	115	1.2	0.8	24.6	0.758	1.3	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.135	0.572	54.4	78.5	0.088
UC-01	UB-02	Foundation Soils	20.4	20.9	121	1.2	0.8	33.2	0.710	1.2	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.135	0.615	46.1	78.7	0.088
UC-01	UB-02	Foundation Soils	20.5	20.8	121	1.2	0.8	36.2	0.696	1.2	0	0.5	36.2	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.135	0.630	41.7	77.4	0.087
UC-01	UB-02	Foundation Soils	20.6	20.7	115	1.2	0.8	20.2	0.782	1.3	0	0.5	20.2	1.0	-0.4	0.0	0.9	0.073	1.006	0.074	0.135	0.549	57.3	77.0	0.086
UC-01	UB-02	Foundation Soils	20.7	20.7	115	1.2	0.8	16.2	0.782	1.3	0	0.5	16.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.135	0.530	61.7	77.5	0.087
UC-01	UB-02	Foundation Soils	20.8	20.6	121	1.2	0.8	28.3	0.736	1.2	0	0.5	28.3	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.135	0.588	37.5	65.3	0.071
UC-01	UB-02	Foundation Soils	20.8	20.5	124	1.3	0.8	55.0	0.621	1.2	0	0.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.135	0.730	13.2	68.0	0.075
UC-01	UB-02	Foundation Soils	20.9	20.4	124	1.3	0.8	80.6	0.545	1.2	0	0.0	80.6	1.0	-0.4	0.0	0.9	0.116	1.012	0.121	0.135	0.893	6.0	86.6	0.099
UC-01	UB-02	Foundation Soils	21.0	20.3	124	1.3	0.8	83.6	0.537	1.2	0	0.0	83.6	1.0	-0.4	0.0	0.9	0.119	1.013	0.124	0.135	0.915	6.0	89.6	0.104
UC-01	UB-02	Foundation Soils	21.1	20.3	124	1.3	0.8	58.1	0.610	1.2	0	0.4	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.136	0.746	21.3	78.9	0.089
UC-01	UB-02	Foundation Soils	21.2	20.2	121	1.3	0.8	38.6	0.685	1.2	0	0.5	38.6	1.0	-0.4	0.0	0.9	0.084	1.007	0.087	0.136	0.638	38.0	76.1	0.085
UC-01	UB-02	Foundation Soils	21.2	20.1	115	1.3	0.8	23.3	0.766	1.2	0	0.5	23.3	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.136	0.561	54.9	77.7	0.087
UC-01	UB-02	Foundation Soils	21.3	20.0	115	1.3	0.8	18.3	0.782	1.2	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.136	0.537	67.5	85.3	0.097
UC-01	UB-02	Foundation Soils	21.4	19.9	115	1.3	0.8	18.8	0.782	1.2	0	0.5	18.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.136	0.539	65.4	83.8	0.095
UC-01	UB-02	Foundation Soils	21.5	19.8	121	1.3	0.8	42.9	0.667	1.2	0	0.5	42.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.090	0.136	0.659	31.1	73.4	0.082
UC-01	UB-02	Foundation Soils	21.6	19.8	121	1.3	0.8	47.2	0.649	1.2	0	0.5	47.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.093	0.136	0.682	28.8	75.5	0.084
UC-01	UB-02	Foundation Soils	21.7	19.7	121	1.3	0.8	39.9	0.679	1.2	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.136	0.642	34.5	73.8	0.082
UC-01	UB-02	Foundation Soils	21.7	19.6	121	1.3	0.8	40.2	0.678	1.2	0	0.5	40.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.136	0.644	30.6	70.3	0.078
UC-01	UB-02	Foundation Soils	21.8	19.5	121	1.3	0.8	39.9	0.679	1.2	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.136	0.641	34.2	73.5	0.082
UC-01	UB-02	Foundation Soils	21.9	19.4	121	1.3	0.8	44.7	0.659	1.2	0	0.5	44.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.136	0.666	37.3	81.4	0.092
UC-01	UB-02	Foundation Soils	22.0	19.3	124	1.3	0.8	58.2	0.610	1.2	0	0.5	58.2	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.136	0.740	26.1	83.8	0.095
UC-01	UB-02	Foundation Soils	22.1	19.3	124	1.3	0.8	72.0	0.568	1.2	0	0.5	72.0	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.136	0.825	22.4	94.0	0.110
UC-01	UB-02	Foundation Soils	22.1	19.2	124	1.3	0.8	79.3	0.548	1.1	0	0.2	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.119	0.136	0.873	14.4	93.5	0.109
UC-01	UB-02	Foundation Soils	22.2	19.1	124	1.3	0.8	76.5	0.555	1.1	0	0.2	76.5	1.0	-0.4	0.0	0.9	0.113	1.011	0.116	0.136	0.854	13.8	90.2	0.104
UC-01	UB-02	Foundation Soils	22.3	19.0	124	1.3	0.8	76.1	0.557	1.1	0	0.0	76.1	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.137	0.850	10.9	86.9	0.100
UC-01	UB-02	Foundation Soils	22.4	18.9	124	1.3	0.8	77.6	0.553	1.1	0	0.1	77.6	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.137	0.860	13.4	90.8	0.105
UC-01	UB-02	Foundation Soils	22.5	18.9	124	1.4	0.8	74.1	0.562	1.1	0	0.3	74.1	1.0	-0.4	0.0	0.9	0.111	1.011	0.114	0.137	0.835	17.9	91.6	0.106
UC-01	UB-02	Foundation Soils	22.6	18.8	124	1.4	0.8	69.6	0.575	1.1	0	0.4	69.6	1.0	-0.4	0.0	0.9	0.107	1.010	0.110	0.137	0.806	20.5	89.7	0.104
UC-01	UB-02	Foundation Soils	22.6	18.7	124	1.4	0.8	61.7	0.599	1.1	0	0.5	61.7	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.137	0.757	23.6	84.8	0.097
UC-01	UB-02	Foundation Soils	22.7	18.6	124	1.4	0.8	57.6	0.612	1.1	0	0.4	57.6	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.137	0.733	21.2	78.4	0.088
UC-01	UB-02	Foundation Soils	22.8	18.5	124	1.4	0.8	63.2	0.594	1.1	0	0.3	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.137	0.765	17.7	80.6	0.091

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-01	UB-02	Foundation Soils	22.9	18.4	124	1.4	0.9	81.3	0.543	1.1	0	0.0	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.137	0.883	10.8	92.0	0.107
UC-01	UB-02	Foundation Soils	23.0	18.4	124	1.4	0.9	81.4	0.542	1.1	0	0.0	81.4	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.137	0.883	10.8	92.2	0.107
UC-01	UB-02	Foundation Soils	23.0	18.3	124	1.4	0.9	77.7	0.552	1.1	0	0.1	77.7	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.137	0.856	12.6	90.2	0.104
UC-01	UB-02	Foundation Soils	23.1	18.2	124	1.4	0.9	80.0	0.546	1.1	0	0.1	80.0	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.137	0.872	12.3	92.2	0.107
UC-01	UB-02	Foundation Soils	23.2	18.1	124	1.4	0.9	85.0	0.533	1.1	0	0.0	85.0	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.137	0.909	9.9	95.0	0.111
UC-01	UB-02	Foundation Soils	23.3	18.0	124	1.4	0.9	85.9	0.531	1.1	0	0.0	85.9	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.137	0.915	10.6	96.4	0.114
UC-01	UB-02	Foundation Soils	23.4	18.0	124	1.4	0.9	85.0	0.534	1.1	0	0.2	85.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.137	0.907	13.9	98.7	0.117
UC-01	UB-02	Foundation Soils	23.5	17.9	124	1.4	0.9	82.3	0.540	1.1	0	0.3	82.3	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.137	0.886	16.3	98.2	0.117
UC-01	UB-02	Foundation Soils	23.5	17.8	124	1.4	0.9	80.5	0.545	1.1	0	0.3	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.120	0.137	0.873	17.6	97.8	0.116
UC-01	UB-02	Foundation Soils	23.6	17.7	124	1.4	0.9	77.3	0.553	1.1	0	0.4	77.3	1.0	-0.4	0.0	0.9	0.113	1.011	0.117	0.137	0.850	18.6	95.5	0.112
UC-01	UB-02	Foundation Soils	23.7	17.6	124	1.4	0.9	81.3	0.543	1.1	0	0.3	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.137	0.878	16.9	97.9	0.116
UC-01	UB-02	Foundation Soils	23.8	17.5	124	1.4	0.9	86.6	0.530	1.1	0	0.3	86.6	1.0	-0.4	0.0	0.9	0.122	1.014	0.126	0.137	0.917	16.0	102.3	0.123
UC-01	UB-02	Foundation Soils	23.9	17.5	124	1.4	0.9	85.4	0.532	1.1	0	0.3	85.4	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.137	0.907	17.0	102.0	0.123
UC-01	UB-02	Foundation Soils	23.9	17.4	124	1.4	0.9	82.3	0.540	1.1	0	0.3	82.3	1.0	-0.4	0.1	0.9	0.118	1.013	0.121	0.137	0.884	16.9	98.8	0.117
UC-01	UB-02	Foundation Soils	24.0	17.3	124	1.4	0.9	80.4	0.545	1.1	0	0.3	80.4	1.0	-0.4	0.1	0.9	0.116	1.012	0.120	0.137	0.870	17.4	97.5	0.115
UC-01	UB-02	Foundation Soils	24.1	17.2	124	1.5	0.9	93.4	0.513	1.1	0	0.1	93.4	1.0	-0.4	0.1	0.9	0.129	1.016	0.134	0.137	0.973	11.4	104.8	0.127
UC-01	UB-02	Foundation Soils	24.2	17.1	124	1.5	0.9	105.0	0.487	1.1	0	0.0	105.0	1.0	-0.5	0.1	0.9	0.144	1.020	0.150	0.137	1.090	6.0	111.0	
UC-01	UB-02	Foundation Soils	24.3	17.1	124	1.5	0.9	104.5	0.488	1.1	0	0.0	104.5	1.0	-0.5	0.1	0.9	0.143	1.019	0.149	0.138	1.083	6.0	110.5	
UC-01	UB-02	Foundation Soils	24.4	17.0	124	1.5	0.9	99.9	0.498	1.1	0	0.0	99.9	1.0	-0.5	0.1	0.9	0.137	1.018	0.142	0.138	1.033	7.6	107.4	
UC-01	UB-02	Foundation Soils	24.4	16.9	124	1.5	0.9	94.2	0.511	1.1	0	0.0	94.2	1.0	-0.5	0.1	0.9	0.130	1.016	0.135	0.138	0.978	9.5	103.7	0.126
UC-01	UB-02	Foundation Soils	24.5	16.8	124	1.5	0.9	87.2	0.528	1.1	0	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.126	0.138	0.918	10.8	97.9	0.116
UC-01	UB-02	Foundation Soils	24.6	16.7	124	1.5	0.9	83.2	0.538	1.1	0	0.1	83.2	1.0	-0.5	0.1	0.9	0.119	1.013	0.122	0.138	0.887	12.1	95.2	0.112
UC-01	UB-02	Foundation Soils	24.7	16.6	124	1.5	0.9	73.8	0.563	1.1	0	0.3	73.8	1.0	-0.5	0.1	0.9	0.110	1.011	0.113	0.138	0.822	17.1	90.6	0.105
UC-01	UB-02	Foundation Soils	24.8	16.6	124	1.5	0.9	66.4	0.584	1.1	0	0.4	66.4	1.0	-0.5	0.1	0.9	0.104	1.010	0.107	0.138	0.775	21.7	87.6	0.101
UC-01	UB-02	Foundation Soils	24.9	16.5	121	1.5	0.9	52.3	0.630	1.1	0	0.5	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.138	0.695	30.9	82.7	0.094
UC-01	UB-02	Foundation Soils	24.9	16.4	121	1.5	0.9	44.8	0.659	1.1	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.138	0.655	36.1	80.4	0.091
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UC-02	UB-02 & UB-03	Foundation Soils	10.0	31.7	111	0.6	0.6	46.0	0.654	1.4	20	39.6	46.0	1.0	-0.1	0.0	1.0	0.090	1.007	0.094	0.089	1.050	75.4	81.8	
UC-02	UB-02 & UB-03	Foundation Soils	10.1	31.6	111	0.6	0.6	45.7	0.655	1.4	20	39.5	45.7	1.0	-0.1	0.0	1.0	0.089	1.007	0.093	0.089	1.043	75.4	81.6	
UC-02	UB-02 & UB-03	Foundation Soils	10.2	31.5	80	0.6	0.6	43.9	0.662	1.4	20	39.2	43.9	1.0	-0.1	0.0	1.0	0.088	1.007	0.092	0.090	1.024	75.4	80.1	
UC-02	UB-02 & UB-03	Foundation Soils	10.3	31.5	119	0.6	0.6	42.7	0.667	1.4	20	39.0	42.7	1.0	-0.1	0.0	1.0	0.087	1.007	0.091	0.090	1.010	75.4	79.1	
UC-02	UB-02 & UB-03	Foundation Soils	10.3	31.4	111	0.6	0.6	44.1	0.661	1.4	20	39.2	44.1	1.0	-0.1	0.0	1.0	0.088	1.007	0.092	0.090	1.018	75.4	80.3	
UC-02	UB-02 & UB-03	Foundation Soils	10.4	31.3	115	0.6	0.6	49.0	0.642	1.4	20	39.9	49.0	1.0	-0.1	0.0	1.0	0.092	1.007	0.096	0.091	1.054	68.6	77.6	
UC-02	UB-02 & UB-03	Foundation Soils	10.5	31.2	111	0.6	0.6	73.0	0.565	1.3	20	44.2	73.0	1.0	-0.1	0.0	1.0	0.110	1.011	0.116	0.091	1.273	66.0	94.9	
UC-02	UB-02 & UB-03	Foundation Soils	10.6	31.1	121	0.6	0.6	146.0	0.410	1.2	20	47.8	146.0	1.1	-0.1	0.0	1.0	0.264	1.042	0.298	0.091	3.259	26.5	124.8	
UC-02	UB-02 & UB-03	Foundation Soils	10.7	31.0	124	0.7	0.6	157.5	0.391	1.2	20	26.7	157.5	1.1	-0.1	0.0	1.0	0.347	1.052	0.398	0.092	4.335	15.8	146.6	
UC-02	UB-02 & UB-03	Void	10.7	31.0	124	0.7	0.6	115.1	0.466	1.3		0.5	115.1	1.1	-0.2	0.0	1.0	0.161	1.024	0.175	0.092	1.902	22.4	137.0	
UC-02	UB-02 & UB-03	Void	10.8	30.9	119	0.7	0.6	1.9	0.782	1.5		0.5	1.9	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.092		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	10.9	30.8	119	0.7	0.6	1.9	0.782	1.5		0.5	1.9	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.093		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.0	30.7	119	0.7	0.6	1.9	0.782	1.5		0.5	1.9	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.093		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.1	30.6	119	0.7	0.6	1.9	0.782	1.5		0.5	1.9	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.093		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.2	30.6	119	0.7	0.6	1.9	0.782	1.5		0.5	1.9	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.094		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.2	30.5	119	0.7	0.6	1.9	0.782	1.5		0.5	1.9	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.094		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.3	30.4	119	0.7	0.6	1.9	0.782	1.5		0.5	1.9	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.094		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.4	30.3	119	0.7	0.7	1.9	0.782	1.5		0.5	1.9	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.095		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.5	30.2	119	0.7	0.7	1.9	0.782	1.5		0.5	1.9	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.095		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.6	30.1	119	0.7	0.7	1.9	0.782	1.5		0.5	1.9	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.095		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.6	30.1	119	0.7	0.7	1.8	0.782	1.5		0.5	1.8	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.095		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.7	30.0	119	0.7	0.7	1.8	0.782	1.4		0.5	1.8	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.096		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.8	29.9	119	0.7	0.7	1.8	0.782	1.4		0.5	1.8	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.096		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	11.9	29.8	119	0.7	0.7	1.8	0.782	1.4		0.5	1.8	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.096		75.4	76.8	0.086
UC-02	UB-02 & UB-03	Void	12.0	29.7	119	0.7	0.7	1.8	0.782	1.4		0.5	1.8	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.097		75.4	76.7	0.086
UC-02	UB-02 & UB-03	Void	12.1	29.7	119	0.7	0.7	1.8	0.782	1.4		0.5	1.8	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.097		75.4	76.7	0.086
UC-02	UB-02 & UB-03	Void	12.1	29.6	119	0.7	0.7	1.8	0.782	1.4		0.5	1.8	1.0	-0.2	0.0	1.0	0.062	1.006	0.063	0.097		75.4	76.7	0.086
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UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.7	121	0.4	0.4	75.2	0.559	1.6	20	42.3	75.2	1.1	-0.1	0.0	1.0	0.112	1.011	0.122	0.090	1.348	40.2	73.1	
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.6	121	0.4	0.4	74.3	0.561	1.6	20	42.2	74.3	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.091	1.330	40.3	72.4	
UC-02A	UB-02 & UB-03	Foundation Soils	7.2	34.5	121	0.4	0.4	72.6	0.566	1.6	20	42.0	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.119	0.091	1.303	40.6	71.3	
UC-02A	UB-02 & UB-03	Foundation Soils	7.3	34.5	121	0.5	0.4	71.2	0.570	1.6	20	41.6	71.2	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.092	1.281	40.0	69.6	
UC-02A	UB-02 & UB-03	Foundation Soils	7.4	34.4	121	0.5	0.4	70.8	0.571	1.6	20	41.3	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.092	1.270	38.5	68.1	
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.3	121	0.5	0.4	70.9	0.571	1.6	20	40.8	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.093	1.264	36.6	66.7	
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.2	121	0.5	0.4	71.1	0.571	1.6	20	40.6	71.1	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.093	1.258	35.5	66.0	
UC-02A	UB-02 & UB-03	Foundation Soils	7.6	34.1	121	0.5	0.5	70.6	0.572	1.6	20	40.4	70.6	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.094	1.246	35.2	65.4	
UC-02A	UB-02 & UB-03	Foundation Soils	7.7	34.0	121	0.5	0.5	69.7	0.574	1.6	20	40.1	69.7	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.094	1.231	34.8	64.4	
UC-02A	UB-02 & UB-03	Foundation Soils	7.8	34.0	121	0.5	0.5	69.1	0.576	1.6	20	40.5	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.095	1.218	36.5	65.1	
UC-02A	UB-02 & UB-03	Foundation Soils	7.9	33.9	121	0.5	0.5	69.1	0.576	1.6	20	40.7	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.095	1.211	37.5	65.8	
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.8	121	0.5	0.5	68.3	0.579	1.6	20	40.8	68.3	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.095	1.198	38.4	65.9	

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.7	121	0.5	0.5	67.7	0.580	1.6	20	41.0	67.7	1.1	-0.1	0.0	1.0	0.105	1.010	0.114	0.096	1.186	40.1	66.8	
UC-02A	UB-02 & UB-03	Foundation Soils	8.1	33.6	121	0.5	0.5	67.3	0.582	1.6	20	41.2	67.3	1.1	-0.1	0.0	1.0	0.105	1.010	0.113	0.096	1.176	41.6	67.7	
UC-02A	UB-02 & UB-03	Foundation Soils	8.2	33.5	121	0.5	0.5	66.1	0.585	1.6	20	41.3	66.1	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.097	1.159	43.5	68.3	
UC-02A	UB-02 & UB-03	Foundation Soils	8.3	33.5	121	0.5	0.5	65.2	0.588	1.6	20	41.2	65.2	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.097	1.145	44.2	68.1	
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.4	121	0.5	0.5	64.5	0.590	1.6	20	41.2	64.5	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.098	1.133	44.7	68.0	
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.3	121	0.5	0.5	63.8	0.592	1.6	20	41.1	63.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.098	1.122	45.1	67.8	
UC-02A	UB-02 & UB-03	Foundation Soils	8.5	33.2	121	0.5	0.5	63.5	0.593	1.6	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.098	1.114	45.0	67.5	
UC-02A	UB-02 & UB-03	Foundation Soils	8.6	33.1	121	0.5	0.5	63.5	0.593	1.6	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.099	1.109	44.8	67.3	
UC-02A	UB-02 & UB-03	Foundation Soils	8.7	33.1	121	0.5	0.5	63.3	0.594	1.6	20	41.1	63.3	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.099	1.102	45.5	67.7	
UC-02A	UB-02 & UB-03	Foundation Soils	8.8	33.0	121	0.5	0.5	62.7	0.596	1.6	20	41.1	62.7	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.100	1.092	47.0	68.5	
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.9	121	0.5	0.5	61.7	0.599	1.6	20	41.0	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.108	0.100	1.079	47.7	68.4	
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.8	121	0.6	0.5	60.7	0.602	1.6	20	40.7	60.7	1.1	-0.1	0.0	1.0	0.100	1.009	0.107	0.100	1.065	46.5	66.5	
UC-02A	UB-02 & UB-03	Foundation Soils	9.0	32.7	121	0.6	0.5	59.5	0.606	1.6	20	40.6	59.5	1.1	-0.1	0.0	1.0	0.099	1.009	0.106	0.101	1.051	47.7	66.5	
UC-02A	UB-02 & UB-03	Foundation Soils	9.1	32.6	121	0.6	0.5	57.9	0.611	1.6	20	40.6	57.9	1.1	-0.1	0.0	1.0	0.098	1.008	0.105	0.101	1.034	50.4	67.7	
UC-02A	UB-02 & UB-03	Foundation Soils	9.2	32.6	121	0.6	0.5	57.1	0.614	1.6	20	40.6	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.102	1.023	51.8	68.3	
UC-02A	UB-02 & UB-03	Foundation Soils	9.3	32.5	121	0.6	0.5	57.3	0.613	1.6	20	40.6	57.3	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.102	1.020	51.6	68.3	
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.4	121	0.6	0.5	57.4	0.613	1.6	20	40.7	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.102	1.017	52.4	69.2	
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.3	121	0.6	0.5	57.4	0.613	1.6	20	40.8	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.103	1.013	54.3	70.9	
UC-02A	UB-02 & UB-03	Foundation Soils	9.5	32.2	121	0.6	0.5	57.0	0.614	1.6	20	40.7	57.0	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.103	1.006	53.8	70.0	
UC-02A	UB-02 & UB-03	Foundation Soils	9.6	32.2	115	0.6	0.5	56.1	0.617	1.6	20	40.7	56.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.103	0.103	0.995	56.0	71.4	0.079
UC-02A	UB-02 & UB-03	Foundation Soils	9.7	32.1	115	0.6	0.5	54.9	0.621	1.6	20	40.5	54.9	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.104	0.981	56.2	70.6	0.078
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	32.0	115	0.6	0.5	53.8	0.625	1.6	20	40.5	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.104	0.969	59.6	73.0	0.081
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	31.9	115	0.6	0.5	52.6	0.629	1.6	20	40.4	52.6	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.104	0.956	62.2	74.4	0.083
UC-02A	UB-02 & UB-03	Foundation Soils	9.9	31.8	115	0.6	0.5	54.0	0.624	1.6	20	40.3	54.0	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.105	0.964	56.6	70.3	0.078
UC-02A	UB-02 & UB-03	Foundation Soils	10.0	31.7	115	0.6	0.5	55.4	0.619	1.6	20	40.6	55.4	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.105	0.971	56.5	71.4	0.079
UC-02A	UB-02 & UB-03	Foundation Soils	10.1	31.7	115	0.6	0.5	54.8	0.622	1.6	20	40.5	54.8	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.105	0.963	57.6	71.9	0.080
UC-02A	UB-02 & UB-03	Foundation Soils	10.2	31.6	115	0.6	0.5	54.5	0.623	1.5	20	40.5	54.5	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.106	0.957	57.6	71.6	0.079
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.5	115	0.6	0.5	53.9	0.625	1.5	20	40.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.106	0.949	57.2	70.7	0.078
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.4	115	0.6	0.5	53.8	0.625	1.5	20	40.4	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.106	0.946	57.8	71.3	0.079
UC-02A	UB-02 & UB-03	Foundation Soils	10.4	31.3	115	0.6	0.5	53.7	0.625	1.5	20	40.2	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.107	0.941	55.3	68.8	0.076
UC-02A	UB-02 & UB-03	Foundation Soils	10.5	31.3	115	0.6	0.5	54.1	0.624	1.5	20	40.4	54.1	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.107	0.941	57.0	70.7	0.078
UC-02A	UB-02 & UB-03	Foundation Soils	10.6	31.2	115	0.6	0.5	53.7	0.625	1.5	20	40.4	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.107	0.935	59.0	72.3	0.080
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.1	115	0.7	0.5	52.5	0.630	1.5	20	40.4	52.5	1.0	-0.1	0.0	1.0	0.094	1.008	0.099	0.108	0.923	62.5	74.6	0.083
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.0	115	0.7	0.5	52.0	0.631	1.5	20	40.3	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.108	0.917	63.9	75.6	0.084
UC-02A	UB-02 & UB-03	Foundation Soils	10.8	30.9	115	0.7	0.5	53.9	0.625	1.5	20	40.4	53.9	1.0	-0.2	0.0	1.0	0.095	1.008	0.101	0.108	0.928	57.7	71.2	0.079
UC-02A	UB-02 & UB-03	Foundation Soils	10.9	30.8	115	0.7	0.5	55.8	0.618	1.5	20	40.6	55.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.102	0.109	0.940	54.7	70.0	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	11.0	30.8	121	0.7	0.5	58.7	0.608	1.5	20	41.0	58.7	1.1	-0.2	0.0	1.0	0.099	1.008	0.104	0.109	0.958	53.2	70.9	0.078
UC-02A	UB-02 & UB-03	Foundation Soils	11.1	30.7	121	0.7	0.5	60.0	0.604	1.5	20	41.1	60.0	1.1	-0.2	0.0	1.0	0.100	1.009	0.105	0.109	0.966	52.6	71.5	0.079
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.6	121	0.7	0.6	60.3	0.603	1.5	20	41.1	60.3	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.110	0.965	51.8	71.0	0.078
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.5	121	0.7	0.6	60.2	0.603	1.5	20	41.1	60.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.110	0.962	50.9	70.1	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	11.3	30.4	121	0.7	0.6	61.1	0.600	1.5	20	41.2	61.1	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.110	0.966	50.1	70.1	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	11.4	30.4	121	0.7	0.6	63.3	0.594	1.5	20	41.3	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.110	0.980	47.9	69.9	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	11.5	30.3	121	0.7	0.6	64.5	0.590	1.5	20	41.6	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.111	0.987	48.1	71.0	0.078
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.2	121	0.7	0.6	64.7	0.589	1.5	20	41.8	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.111	0.986	50.0	72.9	0.081
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.1	121	0.7	0.6	65.3	0.587	1.4	20	42.0	65.3	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.111	0.988	51.7	75.0	0.084
UC-02A	UB-02 & UB-03	Foundation Soils	11.7	30.0	121	0.7	0.6	66.2	0.585	1.4	20	42.0	66.2	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.111	0.992	49.8	74.0	0.082
UC-02A	UB-02 & UB-03	Foundation Soils	11.8	29.9	121	0.7	0.6	67.2	0.582	1.4	20	42.0	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.111	0.112	0.997	48.2	73.4	0.081
UC-02A	UB-02 & UB-03	Foundation Soils	11.9	29.9	121	0.7	0.6	69.0	0.577	1.4	20	42.2	69.0	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.112	1.009	46.6	73.4	
UC-02A	UB-02 & UB-03	Foundation Soils	12.0	29.8	121	0.7	0.6	70.3	0.573	1.4	20	42.0	70.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.114	0.112	1.017	43.4	71.7	
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.7	121	0.7	0.6	71.3	0.570	1.4	20	41.7	71.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.113	1.023	40.6	70.2	
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.6	121	0.7	0.6	72.3	0.567	1.4	20	41.5	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.116	0.113	1.028	38.6	69.4	
UC-02A	UB-02 & UB-03	Foundation Soils	12.2	29.5	121	0.7	0.6	73.4	0.564	1.4	20	41.5	73.4	1.1	-0.2	0.0	1.0	0.110	1.011	0.117	0.113	1.035	37.7	69.6	
UC-02A	UB-02 & UB-03	Foundation Soils	12.3	29.4	121	0.8	0.6	74.5	0.561	1.4	20	42.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.113	1.042	39.6	72.0	
UC-02A	UB-02 & UB-03	Foundation Soils	12.4	29.4	121	0.8	0.6	74.6	0.561	1.4	20	42.3	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.114	1.040	40.9	73.2	
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.3	121	0.8	0.6	74.5	0.561	1.4	20	43.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.114	1.036	45.9	77.4	
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.2	121	0.8	0.6	74.6	0.561	1.4	20	43.0	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.114	1.034	45.5	77.1	
UC-02A	UB-02 & UB-03	Foundation Soils	12.6	29.1	121	0.8	0.6	79.1	0.548	1.4	20	43.0	79.1	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.114	1.071	40.5	76.5	
UC-02A	UB-02 & UB-03	Foundation Soils	12.7	29.0	121	0.8	0.6	78.1	0.551	1.4	20	43.0	78.1	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.115	1.060	41.0	76.2	
UC-02A	UB-02 & UB-03	Foundation Soils	12.8	29.0	121	0.8	0.6	74.5	0.561	1.4	20	42.9	74.5	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.115	1.026	44.8	76.4	
UC-02A	UB-02 & UB-03	Foundation Soils	12.9	28.9	121	0.8	0.6	72.8	0.566	1.4	20	42.6	72.8	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.115	1.009	44.3	74.5	
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.8	121	0.8	0.6	70.6	0.572	1.4	20	42.3	70.6	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.115	0.989	45.3	73.5	0.082
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.7	121	0.8	0.6	69.6	0.575	1.4	20	42.6	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.115	0.979	50.2	77.2	0.086
UC-02A	UB-02 & UB-03	Foundation Soils	13.1	28.6	115	0.8	0.6	66.0	0.585	1.4	20	42.4	66.0	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.116	0.949	54.7	78.3	0.088
UC-02A	UB-02 & UB-03	Foundation Soils	13.2	28.5	115	0.8	0.6	61.8	0.598	1.4	20	41.9	61.8	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.116	0.916	59.4	79.4	0.089
UC-02A	UB-02 & UB-03	Foundation Soils	13.3	28.5	115	0.8	0.6	58.7	0.608	1.4	20	41.3	58.7	1.0	-0.2	0.0	1.0	0.099	1.008	0.104	0.116	0.891	58.5	75.9	0.085
UC-02A	UB-02 & UB-03	Foundation Soils	13.4	28.4	115	0.8	0.6	56.9	0.614	1.4	20	40.9	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.116	0.877	57.8	73.8	0.082
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.3	121	0.8	0.6	64.2	0.591	1.4	20	41.1	64.2	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.117	0.927	44.3	67.4	0.074

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.2	121	0.8	0.6	65.1	0.588	1.4	20	38.5	65.1	1.0	-0.2	0.0	1.0	0.103	1.009	0.109	0.117	0.932	32.0	58.6	0.063
UC-02A	UB-02 & UB-03	Foundation Soils	13.6	28.1	121	0.8	0.6	61.4	0.600	1.4	20	38.5	61.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.117	0.903	33.9	56.8	0.061
UC-02A	UB-02 & UB-03	Foundation Soils	13.7	28.1	121	0.8	0.6	59.5	0.606	1.4	20	39.5	59.5	1.0	-0.2	0.0	1.0	0.099	1.009	0.104	0.117	0.888	39.4	59.4	0.064
UC-02A	UB-02 & UB-03	Foundation Soils	13.8	28.0	121	0.8	0.6	56.2	0.617	1.4	20	39.9	56.2	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.117	0.863	45.9	62.2	0.068
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.9	121	0.8	0.6	54.0	0.624	1.4	20	40.2	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.118	0.846	54.8	68.5	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.8	115	0.8	0.6	52.7	0.629	1.4	20	40.1	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.118	0.836	57.3	69.8	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	14.0	27.7	115	0.9	0.6	53.4	0.626	1.4	20	40.2	53.4	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.118	0.839	56.7	69.9	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	14.1	27.6	115	0.9	0.6	56.0	0.617	1.4	20	40.6	56.0	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.118	0.854	54.7	70.1	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	14.2	27.6	121	0.9	0.6	56.9	0.614	1.4	20	40.7	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.119	0.859	53.6	69.9	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	14.3	27.5	121	0.9	0.6	56.4	0.616	1.4	20	40.6	56.4	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.119	0.854	53.8	69.6	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.4	121	0.9	0.6	57.8	0.611	1.4	20	40.8	57.8	1.0	-0.2	0.0	1.0	0.098	1.008	0.102	0.119	0.862	53.5	70.5	0.078
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.3	121	0.9	0.6	64.3	0.591	1.3	20	41.1	64.3	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.119	0.905	44.1	67.3	0.074
UC-02A	UB-02 & UB-03	Foundation Soils	14.5	27.2	121	0.9	0.6	69.0	0.576	1.3	20	41.3	69.0	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.119	0.938	40.2	67.9	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	14.6	27.2	121	0.9	0.6	78.9	0.549	1.3	20	40.5	78.9	1.0	-0.2	0.0	1.0	0.115	1.012	0.121	0.119	1.015	31.5	69.9	
UC-02A	UB-02 & UB-03	Foundation Soils	14.7	27.1	124	0.9	0.7	87.0	0.528	1.3	20	39.2	87.0	1.0	-0.2	0.0	1.0	0.123	1.014	0.130	0.120	1.086	26.8	74.7	
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	27.0	124	0.9	0.7	96.1	0.507	1.3	20	38.6	96.1	1.0	-0.2	0.0	1.0	0.132	1.016	0.141	0.120	1.179	24.6	82.0	
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	26.9	124	0.9	0.7	101.6	0.495	1.3	20	30.6	101.6	1.1	-0.2	0.0	1.0	0.139	1.018	0.149	0.120	1.243	18.8	89.8	
UC-02A	UB-02 & UB-03	Foundation Soils	14.9	26.8	124	0.9	0.7	103.9	0.490	1.3	20	23.8	103.9	1.1	-0.2	0.0	1.0	0.143	1.019	0.153	0.120	1.271	16.3	96.3	
UC-02A	UB-02 & UB-03	Foundation Soils	15.0	26.7	124	0.9	0.7	101.8	0.494	1.3	20	11.4	101.8	1.1	-0.2	0.0	1.0	0.140	1.018	0.149	0.120	1.241	13.1	103.5	
UC-02A	UB-02 & UB-03	Foundation Soils	15.1	26.7	124	0.9	0.7	106.4	0.484	1.3	20	5.4	106.4	1.1	-0.2	0.0	1.0	0.146	1.020	0.157	0.121	1.302	11.6	112.5	
UC-02A	UB-02 & UB-03	Foundation Soils	15.2	26.6	124	0.9	0.7	115.2	0.466	1.2	20	8.4	115.2	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.121	1.444	12.3	119.1	
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.5	124	0.9	0.7	114.3	0.468	1.2	20	3.4	114.3	1.1	-0.2	0.0	1.0	0.160	1.024	0.172	0.121	1.426	11.0	121.9	
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.4	124	0.9	0.7	115.3	0.466	1.2	20	5.1	115.3	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.121	1.440	11.5	121.7	
UC-02A	UB-02 & UB-03	Foundation Soils	15.4	26.3	124	0.9	0.7	124.1	0.449	1.2	20	23.9	124.1	1.1	-0.2	0.0	1.0	0.181	1.028	0.197	0.121	1.624	15.8	116.0	
UC-02A	UB-02 & UB-03	Foundation Soils	15.5	26.2	124	0.9	0.7	123.1	0.451	1.2	20	38.6	123.1	1.1	-0.2	0.0	1.0	0.179	1.028	0.194	0.121	1.598	21.6	106.2	
UC-02A	UB-02 & UB-03	Foundation Soils	15.6	26.2	121	0.9	0.7	112.4	0.472	1.2	20	44.3	112.4	1.1	-0.2	0.0	1.0	0.156	1.023	0.168	0.122	1.382	28.6	96.8	
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.1	121	1.0	0.7	96.3	0.506	1.2	20	45.3	96.3	1.0	-0.3	0.0	1.0	0.133	1.017	0.141	0.122	1.159	37.6	88.6	
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.0	121	1.0	0.7	86.2	0.530	1.3	20	44.7	86.2	1.0	-0.3	0.0	1.0	0.122	1.014	0.128	0.122	1.054	43.5	84.9	
UC-02A	UB-02 & UB-03	Foundation Soils	15.8	25.9	121	1.0	0.7	79.6	0.547	1.3	20	44.3	79.6	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.122	0.995	48.8	84.2	0.096
UC-02A	UB-02 & UB-03	Foundation Soils	15.9	25.8	115	1.0	0.7	68.2	0.579	1.3	20	42.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.111	0.122	0.905	57.4	82.7	0.094
UC-02A	UB-02 & UB-03	Foundation Soils	16.0	25.8	115	1.0	0.7	61.0	0.601	1.3	20	42.0	61.0	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.122	0.854	65.8	84.8	0.097
UC-02A	UB-02 & UB-03	Foundation Soils	16.1	25.7	111	1.0	0.7	53.7	0.625	1.3	20	41.0	53.7	1.0	-0.3	0.0	1.0	0.095	1.008	0.099	0.123	0.805	75.4	88.1	0.101
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.6	111	1.0	0.7	52.4	0.630	1.3	20	40.7	52.4	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.123	0.795	74.5	86.2	0.099
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.5	111	1.0	0.7	49.7	0.640	1.3	20	40.2	49.7	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.123	0.777	75.4	84.8	0.097
UC-02A	UB-02 & UB-03	Foundation Soils	16.3	25.4	111	1.0	0.7	50.3	0.637	1.3	20	40.3	50.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.123	0.780	72.9	82.9	0.094
UC-02A	UB-02 & UB-03	Foundation Soils	16.4	25.3	121	1.0	0.7	59.6	0.605	1.3	20	40.7	59.6	1.0	-0.3	0.0	1.0	0.099	1.009	0.103	0.123	0.838	48.4	67.3	0.074
UC-02A	UB-02 & UB-03	Foundation Soils	16.5	25.3	121	1.0	0.7	62.6	0.596	1.3	20	40.2	62.6	1.0	-0.3	0.0	1.0	0.101	1.009	0.106	0.123	0.856	40.3	62.7	0.068
UC-02A	UB-02 & UB-03	Foundation Soils	16.6	25.2	121	1.0	0.7	60.8	0.602	1.3	20	40.6	60.8	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.124	0.843	45.4	65.6	0.072
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.1	121	1.0	0.7	65.6	0.586	1.3	20	41.3	65.6	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.124	0.875	44.0	68.4	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.0	121	1.0	0.7	65.8	0.586	1.3	20	41.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.124	0.874	47.5	71.6	0.079
UC-02A	UB-02 & UB-03	Foundation Soils	16.8	24.9	115	1.0	0.7	57.8	0.611	1.3	20	41.1	57.8	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.124	0.820	58.7	75.3	0.084
UC-02A	UB-02 & UB-03	Foundation Soils	16.9	24.9	111	1.0	0.7	52.3	0.630	1.3	20	40.6	52.3	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.124	0.784	72.3	84.0	0.096
UC-02A	UB-02 & UB-03	Foundation Soils	17.0	24.8	111	1.0	0.7	49.5	0.640	1.3	20	40.2	49.5	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.124	0.766	75.4	84.7	0.097
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.7	115	1.0	0.7	52.0	0.631	1.3	20	40.4	52.0	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.124	0.780	66.0	77.5	0.087
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.6	115	1.0	0.7	53.3	0.627	1.3	20	40.4	53.3	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.125	0.787	60.0	72.9	0.081
UC-02A	UB-02 & UB-03	Foundation Soils	17.2	24.5	115	1.0	0.7	53.1	0.628	1.3	20	40.4	53.1	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.125	0.784	60.3	73.0	0.081
UC-02A	UB-02 & UB-03	Foundation Soils	17.3	24.4	115	1.0	0.7	51.0	0.635	1.3	20	40.2	51.0	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.125	0.770	65.3	76.1	0.085
UC-02A	UB-02 & UB-03	Foundation Soils	17.4	24.4	111	1.1	0.7	48.6	0.644	1.3	20	40.0	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.125	0.755	74.2	82.8	0.094
UC-02A	UB-02 & UB-03	Foundation Soils	17.5	24.3	111	1.1	0.7	46.3	0.653	1.3	20	39.6	46.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.125	0.740	75.4	82.1	0.093
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.2	111	1.1	0.7	45.7	0.655	1.3	20	39.5	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.125	0.735	75.4	81.6	0.092
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.1	111	1.1	0.7	45.0	0.658	1.3	20	39.4	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.126	0.730	75.4	81.0	0.091
UC-02A	UB-02 & UB-03	Foundation Soils	17.7	24.0	111	1.1	0.7	45.2	0.657	1.3	20	39.4	45.2	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.126	0.730	75.4	81.1	0.092
UC-02A	UB-02 & UB-03	Foundation Soils	17.8	24.0	111	1.1	0.7	46.3	0.653	1.3	20	39.6	46.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.126	0.736	75.4	82.0	0.093
UC-02A	UB-02 & UB-03	Foundation Soils	17.9	23.9	115	1.1	0.7	47.3	0.649	1.3	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.126	0.741	74.7	82.2	0.093
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.8	121	1.1	0.7	52.7	0.629	1.3	20	39.9	52.7	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.126	0.772	53.9	66.6	0.073
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.7	121	1.1	0.7	59.1	0.607	1.2	20	39.7	59.1	1.0	-0.3	0.0	0.9	0.099	1.009	0.102	0.126	0.811	40.9	60.3	0.065
UC-02A	UB-02 & UB-03	Foundation Soils	18.1	23.6	121	1.1	0.7	55.3	0.620	1.2	20	40.0	55.3	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.126	0.786	49.0	64.3	0.070
UC-02A	UB-02 & UB-03	Foundation Soils	18.2	23.5	115	1.1	0.7	50.3	0.637	1.2	20	40.0	50.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.127	0.755	62.3	72.7	0.081
UC-02A	UB-02 & UB-03	Foundation Soils	18.3	23.5	115	1.1	0.8	48.1	0.646	1.2	20	39.9	48.1	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.127	0.741	71.0	79.3	0.089
UC-02A	UB-02 & UB-03	Foundation Soils	18.4	23.4	111	1.1	0.8	47.3	0.649	1.2	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.127	0.735	75.4	82.9	0.094
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.3	115	1.1	0.8	51.4	0.634	1.2	20	40.0	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.127	0.758	58.3	69.7	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.2	121	1.1	0.8	53.5	0.626	1.2	20	40.1	53.5	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.127	0.771	53.6	67.0	0.073
UC-02A	UB-02 & UB-03	Foundation Soils	18.6	23.1	121	1.1	0.8	56.9	0.614	1.2	20	40.1	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.127	0.790	46.9	63.7	0.069
UC-02A	UB-02 & UB-03	Foundation Soils	18.7	23.1	121	1.1	0.8	58.7	0.608	1.2	20	39.5	58.7	1.0	-0.3	0.0	0.9	0.099	1.008	0.102	0.127	0.800	39.9	59.1	0.064
UC-02A	UB-02 & UB-03	Foundation Soils	18.8	23.0	121	1.1	0.8	54.9	0.621	1.2	20	40.0	54.9	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.127	0.776	49.6	64.5	0.070
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.9	115	1.1	0.8	53.2	0.627	1.2	20	40.2	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.128	0.765	57.4	70.4	0.078
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.8	115	1.1	0.8	53.0	0.628	1.2	20	40.4	53.0	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.128	0.763	60.3	73.0	0.081

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-02A	UB-02 & UB-03	Foundation Soils	19.0	22.7	111	1.1	0.8	48.6	0.644	1.2	20	40.0	48.6	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.128	0.736	75.4	83.9	0.096
UC-02A	UB-02 & UB-03	Foundation Soils	19.1	22.6	111	1.2	0.8	46.0	0.654	1.2	20	39.6	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.128	0.720	75.4	81.8	0.093
UC-02A	UB-02 & UB-03	Foundation Soils	19.2	22.6	111	1.2	0.8	44.9	0.658	1.2	20	39.4	44.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.128	0.713	75.4	80.9	0.091
UC-02A	UB-02 & UB-03	Foundation Soils	19.3	22.5	111	1.2	0.8	44.5	0.660	1.2	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.128	0.710	75.4	80.6	0.091
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.4	111	1.2	0.8	44.5	0.660	1.2	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.128	0.709	75.4	80.5	0.091
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.3	111	1.2	0.8	45.0	0.658	1.2	20	39.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.128	0.711	75.4	81.0	0.091
UC-02A	UB-02 & UB-03	Foundation Soils	19.5	22.2	111	1.2	0.8	45.8	0.655	1.2	20	39.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.129	0.715	75.4	81.6	0.092
UC-02A	UB-02 & UB-03	Foundation Soils	19.6	22.1	111	1.2	0.8	45.9	0.654	1.2	20	39.6	45.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.129	0.715	75.4	81.8	0.093
UC-02A	UB-02 & UB-03	Foundation Soils	19.7	22.1	115	1.2	0.8	47.7	0.647	1.2	20	39.8	47.7	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.129	0.724	72.5	80.4	0.091
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	22.0	115	1.2	0.8	51.3	0.634	1.2	20	40.1	51.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.129	0.744	62.4	73.6	0.082
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	21.9	115	1.2	0.8	50.0	0.639	1.2	20	40.1	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.095	0.129	0.736	68.3	78.1	0.088
UC-02A	UB-02 & UB-03	Foundation Soils	19.9	21.8	115	1.2	0.8	48.2	0.645	1.2	20	39.9	48.2	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.129	0.725	72.0	80.3	0.091
UC-02A	UB-02 & UB-03	Foundation Soils	20.0	21.7	111	1.2	0.8	46.7	0.651	1.2	20	39.7	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.129	0.715	75.4	82.3	0.093
UC-02A	UB-02 & UB-03	Foundation Soils	20.1	21.7	115	1.2	0.8	12.7	0.782	1.2	0	0.5	12.7	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.129	0.536	56.3	68.5	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	20.2	21.6	121	1.2	0.8	26.3	0.748	1.2	0	0.5	26.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.129	0.603	41.2	67.0	0.073
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.5	121	1.2	0.8	22.4	0.772	1.2	0	0.5	22.4	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.130	0.583	52.3	74.2	0.083
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.4	115	1.2	0.8	16.6	0.782	1.2	0	0.5	16.6	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.130	0.554	59.8	75.9	0.085
UC-02A	UB-02 & UB-03	Foundation Soils	20.4	21.3	111	1.2	0.8	11.4	0.782	1.2	0	0.5	11.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.130	0.528	73.2	84.1	0.096
UC-02A	UB-02 & UB-03	Foundation Soils	20.5	21.2	115	1.2	0.8	18.3	0.782	1.2	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.130	0.561	57.3	75.0	0.084
UC-02A	UB-02 & UB-03	Foundation Soils	20.6	21.2	124	1.2	0.8	63.3	0.594	1.2	0	0.3	63.3	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.130	0.809	16.0	79.1	0.089
UC-02A	UB-02 & UB-03	Foundation Soils	20.7	21.1	124	1.2	0.8	71.6	0.569	1.2	0	0.4	71.6	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.130	0.863	20.1	91.3	0.106
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	21.0	121	1.2	0.8	52.7	0.629	1.2	0	0.6	52.7	1.0	-0.4	0.0	0.9	0.094	1.008	0.097	0.130	0.744	37.3	89.4	0.103
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	20.9	115	1.3	0.8	34.5	0.704	1.2	0	0.5	34.5	1.0	-0.4	0.0	0.9	0.082	1.007	0.084	0.130	0.642	51.1	85.1	0.097
UC-02A	UB-02 & UB-03	Foundation Soils	20.9	20.8	115	1.3	0.8	29.0	0.732	1.2	0	0.5	29.0	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.130	0.612	55.6	84.1	0.096
UC-02A	UB-02 & UB-03	Foundation Soils	21.0	20.8	124	1.3	0.8	97.6	0.504	1.1	0	0.2	97.6	1.0	-0.4	0.0	0.9	0.134	1.017	0.140	0.130	1.075	14.9	112.2	
UC-02A	UB-02 & UB-03	Foundation Soils	21.1	20.7	124	1.3	0.8	222.5	0.301	1.1	0	0.0	222.5	1.1	-0.4	0.0	0.9	8.684	1.082	10.094	0.130	77.366	6.0	228.5	
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.6	124	1.3	0.8	260.8	0.264	1.1	0	0.0	260.8	1.1	-0.4	0.0	0.9	518.132	1.082	601.719	0.131	4609.242	6.0	266.8	
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.5	127	1.3	0.8	276.9	0.264	1.1	0	0.0	276.9	1.1	-0.4	0.0	0.9	5888.862	1.082	6832.903	0.131	52312.099	6.0	282.9	
UC-02A	UB-02 & UB-03	Foundation Soils	21.3	20.4	127	1.3	0.8	281.5	0.264	1.1	0	0.0	281.5	1.1	-0.4	0.0	0.9	12926.975	1.082	14985.879	0.131	########	6.0	287.5	
UC-02A	UB-02 & UB-03	Foundation Soils	21.4	20.3	124	1.3	0.8	279.4	0.264	1.1	0	0.0	279.4	1.1	-0.4	0.0	0.9	8958.875	1.082	10376.732	0.131	79359.871	6.0	285.4	
UC-02A	UB-02 & UB-03	Foundation Soils	21.5	20.3	124	1.3	0.8	271.3	0.264	1.1	0	0.0	271.3	1.1	-0.4	0.0	0.9	2397.744	1.082	2774.867	0.131	21210.020	6.0	277.3	
UC-02A	UB-02 & UB-03	Foundation Soils	21.6	20.2	124	1.3	0.8	253.3	0.265	1.1	0	0.0	253.3	1.1	-0.4	0.0	0.9	193.153	1.082	223.344	0.131	1706.221	6.0	259.3	
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.1	124	1.3	0.8	241.2	0.278	1.1	0	0.0	241.2	1.1	-0.4	0.0	0.9	48.660	1.082	56.218	0.131	429.243	6.0	247.2	
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.0	124	1.3	0.8	226.7	0.296	1.1	0	0.0	226.7	1.1	-0.4	0.0	0.9	12.292	1.082	14.189	0.131	108.280	6.0	232.7	
UC-02A	UB-02 & UB-03	Foundation Soils	21.8	19.9	124	1.3	0.8	216.9	0.308	1.1	0	0.0	216.9	1.1	-0.4	0.0	0.9	5.661	1.082	6.529	0.131	49.801	6.0	222.9	
UC-02A	UB-02 & UB-03	Foundation Soils	21.9	19.9	124	1.3	0.9	200.0	0.330	1.1	0	0.0	200.0	1.1	-0.4	0.0	0.9	1.890	1.082	2.161	0.131	16.474	6.0	206.0	
UC-02A	UB-02 & UB-03	Foundation Soils	22.0	19.8	124	1.3	0.9	176.9	0.362	1.1	0	0.0	176.9	1.0	-0.4	0.0	0.9	0.643	1.071	0.719	0.131	5.478	6.0	182.9	
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.7	124	1.3	0.9	150.4	0.403	1.1	0	0.0	150.4	1.0	-0.4	0.0	0.9	0.291	1.046	0.315	0.131	2.398	6.0	156.4	
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.6	124	1.3	0.9	122.9	0.451	1.1	0	0.0	122.9	1.0	-0.4	0.0	0.9	0.178	1.028	0.188	0.131	1.428	6.0	128.9	
UC-02A	UB-02 & UB-03	Foundation Soils	22.2	19.5	124	1.3	0.9	103.0	0.492	1.1	0	0.0	103.0	1.0	-0.4	0.0	0.9	0.141	1.019	0.147	0.131	1.120	8.3	111.2	
UC-02A	UB-02 & UB-03	Foundation Soils	22.3	19.4	124	1.3	0.9	83.1	0.538	1.1	0	0.2	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.122	0.132	0.931	15.1	98.0	0.116
UC-02A	UB-02 & UB-03	Foundation Soils	22.4	19.4	124	1.3	0.9	69.2	0.576	1.1	0	0.5	69.2	1.0	-0.4	0.0	0.9	0.107	1.010	0.109	0.132	0.832	22.3	91.1	0.106
UC-02A	UB-02 & UB-03	Foundation Soils	22.5	19.3	121	1.4	0.9	56.6	0.615	1.1	0	0.5	56.6	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.132	0.754	30.0	86.1	0.099
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.2	121	1.4	0.9	44.1	0.661	1.1	0	0.5	44.1	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.132	0.683	38.9	82.5	0.094
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.1	121	1.4	0.9	38.0	0.687	1.1	0	0.5	38.0	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.132	0.650	44.8	82.3	0.093
UC-02A	UB-02 & UB-03	Foundation Soils	22.7	19.0	121	1.4	0.9	31.4	0.719	1.1	0	0.5	31.4	1.0	-0.4	0.0	0.9	0.080	1.006	0.081	0.132	0.615	47.4	78.3	0.088
UC-02A	UB-02 & UB-03	Foundation Soils	22.8	18.9	121	1.4	0.9	27.4	0.741	1.1	0	0.5	27.4	1.0	-0.4	0.0	0.9	0.077	1.006	0.078	0.132	0.594	51.4	78.3	0.088
UC-02A	UB-02 & UB-03	Foundation Soils	22.9	18.9	115	1.4	0.9	17.9	0.782	1.2	0	0.5	17.9	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.132	0.547	63.6	80.9	0.091
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.8	115	1.4	0.9	14.9	0.782	1.2	0	0.5	14.9	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.132	0.533	68.3	82.7	0.094
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.7	115	1.4	0.9	19.2	0.782	1.2	0	0.5	19.2	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.132	0.553	55.0	73.7	0.082
UC-02A	UB-02 & UB-03	Foundation Soils	23.1	18.6	121	1.4	0.9	33.2	0.710	1.1	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.082	0.132	0.622	31.4	64.1	0.070
UC-02A	UB-02 & UB-03	Foundation Soils	23.2	18.5	124	1.4	0.9	47.3	0.649	1.1	0	0.3	47.3	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.132	0.697	18.5	65.5	0.071
UC-02A	UB-02 & UB-03	Foundation Soils	23.3	18.5	124	1.4	0.9	52.6	0.629	1.1	0	0.2	52.6	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.132	0.726	15.5	67.9	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	23.4	18.4	124	1.4	0.9	50.7	0.636	1.1	0	0.3	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.132	0.715	17.9	68.3	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.3	124	1.4	0.9	43.8	0.663	1.1	0	0.4	43.8	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.132	0.676	25.1	68.4	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.2	121	1.4	0.9	40.5	0.676	1.1	0	0.5	40.5	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.132	0.659	28.0	68.1	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	23.6	18.1	121	1.4	0.9	37.3	0.691	1.1	0	0.5	37.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.133	0.641	31.4	68.3	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	23.7	18.0	121	1.4	0.9	36.8	0.693	1.1	0	0.5	36.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.133	0.638	31.7	68.0	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	23.8	18.0	121	1.4	0.9	37.9	0.688	1.1	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.133	0.644	29.7	67.1	0.074
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.9	121	1.4	0.9	38.8	0.684	1.1	0	0.5	38.8	1.0	-0.4	0.0	0.9	0.085	1.007	0.086	0.133	0.648	27.6	65.9	0.072
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.8	121	1.4	0.9	39.7	0.680	1.1	0	0.5	39.7	1.0	-0.4	0.1	0.9	0.085	1.007	0.087	0.133	0.652	27.0	66.2	0.072
UC-02A	UB-02 & UB-03	Foundation Soils	24.0	17.7	121	1.4	0.9	41.3	0.673	1.1	0	0.5	41.3	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.133	0.660	27.2	68.0	0.075
UC-02A	UB-02 & UB-03	Foundation Soils	24.1	17.6	121	1.5	0.9	41.5	0.672	1.1	0	0.5	41.5	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.133	0.661	28.5	69.5	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	24.2	17.6	121	1.5	0.9	41.5	0.672	1.1	0	0.5	41.5	1.0	-0.5	0.1	0.9	0.086	1.007	0.088	0.133	0.661	28.8	69.8	0.077
UC-02A	UB-02 & UB-03	Foundation Soils	24.3	17.5	121	1.5	0.9	44.8	0.658	1.1	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.133	0.678	26.3	70.7	0.078
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.4	124	1.5	0.9	48.2	0.645	1.1	0	0.4	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.133	0.696	23.5	71.3	0.079
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.3	124	1.5	0.9	51.1	0.634	1.1	0	0.4	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.095	0.133	0.712	21.5	72.3	0.080

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-02A	UB-02 & UB-03	Foundation Soils	24.5	17.2	124	1.5	0.9	50.8	0.636	1.1	0	0.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.094	0.133	0.709	23.5	73.9	0.082
UC-02A	UB-02 & UB-03	Foundation Soils	24.6	17.1	121	1.5	0.9	48.2	0.645	1.1	0	0.5	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.133	0.695	26.7	74.4	0.083
UC-02A	UB-02 & UB-03	Foundation Soils	24.7	17.1	121	1.5	0.9	44.8	0.659	1.1	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.133	0.676	30.2	74.5	0.083
UC-02A	UB-02 & UB-03	Foundation Soils	24.8	17.0	121	1.5	0.9	40.7	0.676	1.1	0	0.5	40.7	1.0	-0.5	0.1	0.9	0.086	1.007	0.087	0.133	0.654	33.3	73.5	0.082
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.9	121	1.5	0.9	36.7	0.694	1.1	0	0.5	36.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.133	0.633	36.9	73.0	0.081
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.8	121	1.5	0.9	35.7	0.698	1.1	0	0.5	35.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.133	0.627	38.2	73.4	0.081
																									0.000
UC-03	UB-03	Foundation Soils	6.1	36.1	121	0.4	0.4	101.7	0.495	1.7	30	49.9	101.7	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.091	1.723	31.4	83.8	
UC-03	UB-03	Foundation Soils	6.2	36.0	121	0.4	0.4	101.9	0.494	1.7	30	49.5	101.9	1.1	-0.1	0.0	1.0	0.140	1.018	0.157	0.091	1.716	30.9	84.0	
UC-03	UB-03	Foundation Soils	6.2	35.9	121	0.4	0.4	102.4	0.493	1.7	30	49.3	102.4	1.1	-0.1	0.0	1.0	0.141	1.019	0.157	0.092	1.715	28.6	82.4	
UC-03	UB-03	Foundation Soils	6.3	35.8	121	0.4	0.4	101.6	0.495	1.7	30	47.8	101.6	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.092	1.689	29.3	82.1	
UC-03	UB-03	Foundation Soils	6.4	35.8	121	0.4	0.4	101.0	0.496	1.7	30	48.1	101.0	1.1	-0.1	0.0	1.0	0.139	1.018	0.155	0.093	1.669	32.8	81.5	
UC-03	UB-03	Foundation Soils	6.5	35.7	121	0.4	0.4	98.2	0.502	1.7	30	49.5	98.2	1.1	-0.1	0.0	1.0	0.135	1.017	0.151	0.094	1.614	35.3	81.9	
UC-03	UB-03	Foundation Soils	6.6	35.6	121	0.4	0.4	96.7	0.506	1.7	30	50.1	96.7	1.1	-0.1	0.0	1.0	0.133	1.017	0.149	0.094	1.583	38.5	81.5	
UC-03	UB-03	Foundation Soils	6.6	35.5	121	0.4	0.4	93.4	0.513	1.7	30	50.5	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.145	0.095	1.527	37.7	80.8	
UC-03	UB-03	Foundation Soils	6.7	35.4	121	0.4	0.4	93.4	0.513	1.7	30	50.2	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.144	0.095	1.517	37.0	80.6	
UC-03	UB-03	Foundation Soils	6.8	35.4	121	0.4	0.4	93.7	0.513	1.7	30	50.1	93.7	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.096	1.513	36.1	80.8	
UC-03	UB-03	Foundation Soils	6.9	35.3	121	0.4	0.4	94.7	0.510	1.6	30	50.0	94.7	1.1	-0.1	0.0	1.0	0.131	1.016	0.146	0.096	1.520	36.3	80.5	
UC-03	UB-03	Foundation Soils	7.0	35.2	121	0.4	0.4	94.2	0.511	1.6	30	50.0	94.2	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.097	1.504	41.5	79.2	
UC-03	UB-03	Foundation Soils	7.1	35.1	121	0.4	0.4	87.8	0.526	1.7	30	50.0	87.8	1.1	-0.1	0.0	1.0	0.123	1.014	0.137	0.097	1.406	46.5	79.2	
UC-03	UB-03	Foundation Soils	7.1	35.0	121	0.4	0.4	82.5	0.540	1.7	30	49.8	82.5	1.1	-0.1	0.0	1.0	0.118	1.013	0.130	0.098	1.333	56.0	78.8	
UC-03	UB-03	Foundation Soils	7.2	34.9	115	0.4	0.4	71.4	0.570	1.7	30	48.5	71.4	1.1	-0.1	0.0	1.0	0.108	1.010	0.118	0.098	1.206	60.4	78.1	
UC-03	UB-03	Foundation Soils	7.3	34.9	115	0.5	0.4	65.3	0.587	1.7	30	47.6	65.3	1.1	-0.1	0.0	1.0	0.104	1.009	0.113	0.099	1.140	70.8	83.8	
UC-03	UB-03	Foundation Soils	7.4	34.8	111	0.5	0.4	59.9	0.604	1.7	30	46.9	59.9	1.1	-0.1	0.0	1.0	0.099	1.009	0.108	0.099	1.085	75.4	86.0	
UC-03	UB-03	Foundation Soils	7.5	34.7	111	0.5	0.4	57.1	0.614	1.7	30	46.5	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.105	0.100	1.055	75.4	84.0	
UC-03	UB-03	Foundation Soils	7.5	34.6	111	0.5	0.4	54.5	0.622	1.7	30	46.0	54.5	1.1	-0.1	0.0	1.0	0.096	1.008	0.103	0.100	1.028	75.4	82.5	
UC-03	UB-03	Foundation Soils	7.6	34.5	111	0.5	0.4	52.7	0.629	1.7	30	45.6	52.7	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.101	1.007	75.4	81.8	
UC-03	UB-03	Foundation Soils	7.7	34.5	111	0.5	0.4	51.8	0.632	1.7	30	45.4	51.8	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.101	0.995	75.4	80.6	0.091
UC-03	UB-03	Foundation Soils	7.8	34.4	111	0.5	0.4	50.4	0.637	1.7	30	45.1	50.4	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.102	0.979	75.4	79.9	0.090
UC-03	UB-03	Foundation Soils	7.9	34.3	111	0.5	0.4	49.5	0.641	1.7	30	44.9	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.102	0.967	75.4	79.9	0.090
UC-03	UB-03	Foundation Soils	8.0	34.2	111	0.5	0.4	49.5	0.640	1.7	30	45.0	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.102	0.962	75.4	80.5	0.091
UC-03	UB-03	Foundation Soils	8.0	34.1	111	0.5	0.4	50.3	0.638	1.7	30	45.1	50.3	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.103	0.964	75.4	81.6	0.092
UC-03	UB-03	Foundation Soils	8.1	34.0	111	0.5	0.4	51.6	0.633	1.7	30	45.4	51.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.103	0.970	75.4	81.3	0.092
UC-03	UB-03	Foundation Soils	8.2	34.0	111	0.5	0.4	51.2	0.634	1.7	30	45.3	51.2	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.104	0.962	75.4	81.9	0.093
UC-03	UB-03	Foundation Soils	8.3	33.9	111	0.5	0.4	51.9	0.632	1.7	30	45.4	51.9	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.104	0.964	75.4	83.8	0.095
UC-03	UB-03	Foundation Soils	8.4	33.8	111	0.5	0.4	54.4	0.623	1.7	30	45.9	54.4	1.1	-0.1	0.0	1.0	0.095	1.008	0.102	0.105	0.979	57.1	72.1	0.080
UC-03	UB-03	Foundation Soils	8.4	33.7	115	0.5	0.4	61.7	0.599	1.7	30	46.7	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.109	0.105	1.034	39.8	69.1	
UC-03	UB-03	Foundation Soils	8.5	33.6	121	0.5	0.4	77.0	0.554	1.6	30	47.6	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.106	1.169	36.8	70.1	
UC-03	UB-03	Foundation Soils	8.6	33.6	121	0.5	0.4	81.0	0.544	1.6	30	47.7	81.0	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.106	1.205	36.4	70.2	
UC-03	UB-03	Foundation Soils	8.7	33.5	121	0.5	0.4	81.5	0.542	1.6	30	47.7	81.5	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.106	1.205	39.4	71.7	
UC-03	UB-03	Foundation Soils	8.8	33.4	121	0.5	0.4	80.5	0.545	1.6	30	48.2	80.5	1.1	-0.1	0.0	1.0	0.116	1.012	0.127	0.107	1.190	42.5	72.2	
UC-03	UB-03	Foundation Soils	8.9	33.3	121	0.5	0.4	78.1	0.551	1.6	30	48.4	78.1	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.107	1.161	46.9	75.1	
UC-03	UB-03	Foundation Soils	8.9	33.2	121	0.5	0.5	77.0	0.554	1.6	30	48.8	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.107	1.145	50.8	76.9	
UC-03	UB-03	Foundation Soils	9.0	33.1	121	0.5	0.5	74.9	0.560	1.6	30	48.8	74.9	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.108	1.120	52.8	74.7	
UC-03	UB-03	Foundation Soils	9.1	33.1	115	0.6	0.5	70.0	0.574	1.6	30	48.0	70.0	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.108	1.071	56.2	74.4	
UC-03	UB-03	Foundation Soils	9.2	33.0	115	0.6	0.5	65.6	0.587	1.6	30	47.4	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.109	1.029	54.6	72.9	
UC-03	UB-03	Foundation Soils	9.3	32.9	115	0.6	0.5	65.6	0.587	1.6	30	47.3	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.109	1.026	48.2	71.9	
UC-03	UB-03	Foundation Soils	9.4	32.8	121	0.6	0.5	71.5	0.569	1.6	30	47.9	71.5	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.109	1.073	41.5	69.4	
UC-03	UB-03	Foundation Soils	9.4	32.7	121	0.6	0.5	75.6	0.558	1.6	30	47.7	75.6	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.110	1.106	37.6	69.6	
UC-03	UB-03	Foundation Soils	9.5	32.6	121	0.6	0.5	79.6	0.547	1.6	30	47.6	79.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.125	0.110	1.139	33.0	65.4	
UC-03	UB-03	Foundation Soils	9.6	32.6	121	0.6	0.5	78.4	0.551	1.6	30	45.9	78.4	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.110	1.124	33.8	66.1	
UC-03	UB-03	Foundation Soils	9.7	32.5	121	0.6	0.5	78.6	0.550	1.6	30	46.3	78.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.111	1.122	37.4	68.8	
UC-03	UB-03	Foundation Soils	9.8	32.4	121	0.6	0.5	78.8	0.549	1.6	30	47.4	78.8	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.111	1.120	47.3	72.6	
UC-03	UB-03	Foundation Soils	9.8	32.3	121	0.6	0.5	73.5	0.564	1.6	30	48.2	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.111	1.067	44.7	73.0	
UC-03	UB-03	Foundation Soils	9.9	32.2	121	0.6	0.5	76.8	0.555	1.6	30	48.5	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.112	1.094	46.9	73.8	
UC-03	UB-03	Foundation Soils	10.0	32.2	121	0.6	0.5	75.4	0.559	1.6	30	48.5	75.4	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.112	1.077	50.3	75.4	
UC-03	UB-03	Foundation Soils	10.1	32.1	121	0.6	0.5	73.5	0.564	1.6	30	48.5	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.112	1.057	52.4	75.9	
UC-03	UB-03	Foundation Soils	10.2	32.0	115	0.6	0.5	71.8	0.568	1.6	30	48.3	71.8	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.113	1.039	54.9	77.5	
UC-03	UB-03	Foundation Soils	10.3	31.9	121	0.6	0.5	70.9	0.571	1.6	30	48.4	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.113	1.028	54.5	75.6	
UC-03	UB-03	Foundation Soils	10.3	31.8	115	0.6	0.5	69.0	0.576	1.6	30	48.0	69.0	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.113	1.009	53.2	75.8	
UC-03	UB-03	Foundation Soils	10.4	31.7	115	0.6	0.5	70.8	0.571	1.5	30	48.2	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.114	1.020	49.3	77.1	
UC-03	UB-03	Foundation Soils	10.5	31.7	121	0.6	0.5	76.8	0.555	1.5	30	49.0	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.114	1.069	42.6	74.9	
UC-03	UB-03	Foundation Soils	10.6	31.6	121	0.6	0.5	81.3	0.543	1.5	30	49.0	81.3	1.1	-0.1	0.0	1.0	0.117	1.012	0.127	0.114	1.107	51.8	78.2	
UC-03	UB-03	Foundation Soils	10.7	31.5	121	0.6	0.5	75.3	0.559	1.5	30	49.0	75.3	1.1	-0.1	0.0	1.0	0.112	1.011	0.120	0.115	1.050	57.0	76.2	
UC-03	UB-03	Foundation Soils	10.7	31.4	115	0.7	0.5	66.9	0.583	1.5	30	47.7	66.9	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.115	0.977	68.7	83.0	0.094
UC-03	UB-03	Foundation Soils	10.8	31.3	111	0.7	0.5	61.4	0.600	1.6	30	47.2	61.4	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.115	0.932	64.5	80.0	0.090
UC-03	UB-03	Foundation Soils	10.9	31.3	115	0.7	0.5	62.7	0.595	1.6	30	47.3	62.7	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.116	0.939	63.7	78.3	0.088

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-03	UB-03	Foundation Soils	11.0	31.2	115	0.7	0.5	61.5	0.599	1.6	30	47.0	61.5	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.116	0.927	61.0	74.9	0.083
UC-03	UB-03	Foundation Soils	11.1	31.1	115	0.7	0.5	60.6	0.602	1.6	30	46.7	60.6	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.116	0.917	70.2	81.0	0.092
UC-03	UB-03	Foundation Soils	11.2	31.0	115	0.7	0.5	57.2	0.613	1.6	30	46.4	57.2	1.1	-0.2	0.0	1.0	0.097	1.008	0.104	0.116	0.890	75.4	83.1	0.094
UC-03	UB-03	Foundation Soils	11.2	30.9	111	0.7	0.5	53.5	0.626	1.6	30	45.8	53.5	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.117	0.862	75.4	81.1	0.092
UC-03	UB-03	Foundation Soils	11.3	30.8	111	0.7	0.5	51.0	0.635	1.6	30	45.3	51.0	1.1	-0.2	0.0	1.0	0.093	1.008	0.099	0.117	0.842	75.4	82.0	0.093
UC-03	UB-03	Foundation Soils	11.4	30.8	111	0.7	0.5	52.1	0.631	1.6	30	45.5	52.1	1.1	-0.2	0.0	1.0	0.094	1.008	0.099	0.117	0.847	75.4	83.3	0.095
UC-03	UB-03	Foundation Soils	11.5	30.7	111	0.7	0.5	53.7	0.625	1.6	30	45.8	53.7	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.118	0.856	66.1	77.7	0.087
UC-03	UB-03	Foundation Soils	11.6	30.6	115	0.7	0.5	57.9	0.611	1.5	30	46.4	57.9	1.1	-0.2	0.0	1.0	0.098	1.008	0.104	0.118	0.883	56.1	71.2	0.079
UC-03	UB-03	Foundation Soils	11.6	30.5	115	0.7	0.5	61.7	0.599	1.5	30	46.6	61.7	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.118	0.907	56.9	72.7	0.081
UC-03	UB-03	Foundation Soils	11.7	30.4	115	0.7	0.5	62.6	0.596	1.5	30	46.9	62.6	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.118	0.912	55.1	71.6	0.079
UC-03	UB-03	Foundation Soils	11.8	30.4	115	0.7	0.5	63.3	0.594	1.5	30	46.9	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.119	0.915	53.9	70.8	0.078
UC-03	UB-03	Foundation Soils	11.9	30.3	121	0.7	0.5	63.8	0.592	1.5	30	46.9	63.8	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.119	0.916	54.3	71.4	0.079
UC-03	UB-03	Foundation Soils	12.0	30.2	115	0.7	0.5	64.1	0.591	1.5	30	47.0	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.119	0.916	53.5	70.8	0.078
UC-03	UB-03	Foundation Soils	12.1	30.1	121	0.7	0.5	64.2	0.591	1.5	30	46.9	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.120	0.915	54.4	71.8	0.079
UC-03	UB-03	Foundation Soils	12.1	30.0	115	0.7	0.5	64.5	0.590	1.5	30	47.1	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.120	0.915	52.8	70.8	0.078
UC-03	UB-03	Foundation Soils	12.2	29.9	121	0.7	0.5	65.0	0.588	1.5	30	47.0	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.120	0.916	53.9	72.6	0.080
UC-03	UB-03	Foundation Soils	12.3	29.9	121	0.7	0.5	66.1	0.585	1.5	30	47.3	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.120	0.922	54.7	73.1	0.081
UC-03	UB-03	Foundation Soils	12.4	29.8	121	0.7	0.5	65.7	0.586	1.5	30	47.3	65.7	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.120	0.917	54.7	72.0	0.080
UC-03	UB-03	Foundation Soils	12.5	29.7	115	0.8	0.5	64.4	0.590	1.5	30	47.1	64.4	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.121	0.905	56.0	73.1	0.081
UC-03	UB-03	Foundation Soils	12.5	29.6	115	0.8	0.6	64.2	0.591	1.5	30	47.1	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.121	0.902	56.7	73.7	0.082
UC-03	UB-03	Foundation Soils	12.6	29.5	115	0.8	0.6	64.1	0.591	1.5	30	47.1	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.121	0.899	56.8	74.3	0.083
UC-03	UB-03	Foundation Soils	12.7	29.4	115	0.8	0.6	64.7	0.589	1.5	30	47.3	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.121	0.901	57.1	75.7	0.084
UC-03	UB-03	Foundation Soils	12.8	29.4	115	0.8	0.6	66.1	0.585	1.5	30	47.6	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.122	0.909	55.9	75.4	0.084
UC-03	UB-03	Foundation Soils	12.9	29.3	115	0.8	0.6	67.2	0.582	1.5	30	47.7	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.122	0.915	58.5	77.8	0.087
UC-03	UB-03	Foundation Soils	13.0	29.2	115	0.8	0.6	67.2	0.582	1.4	30	47.9	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.122	0.914	66.1	83.4	0.095
UC-03	UB-03	Foundation Soils	13.0	29.1	115	0.8	0.6	65.0	0.588	1.5	30	47.8	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.122	0.896	75.4	88.7	0.102
UC-03	UB-03	Foundation Soils	13.1	29.0	111	0.8	0.6	60.5	0.603	1.5	30	47.2	60.5	1.0	-0.2	0.0	1.0	0.100	1.009	0.106	0.123	0.861	75.4	86.0	0.098
UC-03	UB-03	Foundation Soils	13.2	29.0	111	0.8	0.6	57.1	0.614	1.5	30	46.5	57.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.103	0.123	0.837	75.4	84.0	0.096
UC-03	UB-03	Foundation Soils	13.3	28.9	111	0.8	0.6	54.6	0.622	1.5	30	46.0	54.6	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.123	0.818	75.4	81.9	0.093
UC-03	UB-03	Foundation Soils	13.4	28.8	119	0.8	0.6	52.0	0.631	1.5	30	45.5	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.123	0.800	75.4	81.1	0.092
UC-03	UB-03	Foundation Soils	13.5	28.7	119	0.8	0.6	51.0	0.635	1.5	30	45.2	51.0	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.124	0.792	75.4	80.5	0.091
UC-03	UB-03	Foundation Soils	13.5	28.6	119	0.8	0.6	50.2	0.638	1.5	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.124	0.785	75.4	80.1	0.090
UC-03	UB-03	Foundation Soils	13.6	28.5	119	0.8	0.6	49.7	0.640	1.5	30	45.0	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.124	0.780	75.4	79.7	0.090
UC-03	UB-03	Foundation Soils	13.7	28.5	119	0.8	0.6	49.2	0.642	1.5	30	44.9	49.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.124	0.776	75.4	80.2	0.090
UC-03	UB-03	Foundation Soils	13.8	28.4	119	0.8	0.6	49.9	0.639	1.5	30	45.0	49.9	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.124	0.778	75.4	80.5	0.091
UC-03	UB-03	Foundation Soils	13.9	28.3	119	0.8	0.6	50.2	0.638	1.5	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.125	0.779	75.4	79.6	0.090
UC-03	UB-03	Foundation Soils	13.9	28.2	119	0.8	0.6	49.1	0.642	1.5	30	44.9	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.096	0.125	0.771	75.4	78.5	0.088
UC-03	UB-03	Foundation Soils	14.0	28.1	119	0.8	0.6	47.7	0.647	1.5	30	44.6	47.7	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.125	0.760	75.4	77.4	0.087
UC-03	UB-03	Foundation Soils	14.1	28.1	119	0.8	0.6	46.3	0.653	1.5	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.125	0.751	75.4	77.4	0.087
UC-03	UB-03	Foundation Soils	14.2	28.0	119	0.9	0.6	46.3	0.653	1.5	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.125	0.749	75.4	77.2	0.086
UC-03	UB-03	Foundation Soils	14.3	27.9	119	0.9	0.6	46.1	0.654	1.5	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.126	0.747	75.4	77.2	0.086
UC-03	UB-03	Foundation Soils	14.4	27.8	119	0.9	0.6	46.1	0.653	1.5	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.126	0.746	75.4	77.2	0.086
UC-03	UB-03	Foundation Soils	14.4	27.7	119	0.9	0.6	46.1	0.653	1.4	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.126	0.744	75.4	77.3	0.087
UC-03	UB-03	Foundation Soils	14.5	27.6	119	0.9	0.6	46.2	0.653	1.4	30	44.3	46.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.126	0.743	75.4	81.3	0.092
UC-03	UB-03	Foundation Soils	14.6	27.6	119	0.9	0.6	51.2	0.634	1.4	30	45.3	51.2	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.126	0.773	75.4	81.2	0.092
UC-03	UB-03	Foundation Soils	14.7	27.5	119	0.9	0.6	51.1	0.635	1.4	30	45.3	51.1	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.126	0.771	75.4	81.5	0.092
UC-03	UB-03	Foundation Soils	14.8	27.4	119	0.9	0.6	51.5	0.633	1.4	30	45.4	51.5	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.127	0.772	75.4	82.2	0.093
UC-03	UB-03	Foundation Soils	14.8	27.3	111	0.9	0.6	52.4	0.630	1.4	30	45.5	52.4	1.0	-0.2	0.0	1.0	0.094	1.008	0.098	0.127	0.776	75.4	83.3	0.095
UC-03	UB-03	Foundation Soils	14.9	27.2	111	0.9	0.6	53.7	0.625	1.4	30	45.8	53.7	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.127	0.783	75.4	84.9	0.097
UC-03	UB-03	Foundation Soils	15.0	27.2	111	0.9	0.6	55.7	0.619	1.4	30	46.2	55.7	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.127	0.794	68.6	82.6	0.094
UC-03	UB-03	Foundation Soils	15.1	27.1	115	0.9	0.6	61.0	0.601	1.4	30	47.1	61.0	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.127	0.827	53.6	75.8	0.085
UC-03	UB-03	Foundation Soils	15.2	27.0	121	0.9	0.6	70.5	0.572	1.4	30	48.2	70.5	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.128	0.890	44.7	72.1	0.080
UC-03	UB-03	Foundation Soils	15.3	26.9	121	0.9	0.6	75.6	0.558	1.3	30	48.2	75.6	1.0	-0.2	0.0	1.0	0.112	1.011	0.118	0.128	0.927	44.1	72.6	0.080
UC-03	UB-03	Foundation Soils	15.3	26.8	121	0.9	0.6	76.9	0.554	1.3	30	48.4	76.9	1.0	-0.2	0.0	1.0	0.113	1.011	0.120	0.128	0.936	42.6	72.9	0.081
UC-03	UB-03	Foundation Soils	15.4	26.7	121	0.9	0.6	78.8	0.549	1.3	30	48.5	78.8	1.0	-0.2	0.0	1.0	0.115	1.012	0.122	0.128	0.949	41.3	72.8	0.081
UC-03	UB-03	Foundation Soils	15.5	26.7	121	0.9	0.6	79.9	0.546	1.3	30	48.5	79.9	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.128	0.956	40.1	72.2	0.080
UC-03	UB-03	Foundation Soils	15.6	26.6	121	0.9	0.6	80.5	0.545	1.3	30	48.4	80.5	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.128	0.960	40.1	71.9	0.080
UC-03	UB-03	Foundation Soils	15.7	26.5	121	0.9	0.6	80.1	0.546	1.3	30	48.3	80.1	1.0	-0.3	0.0	1.0	0.116	1.012	0.123	0.129	0.954	41.1	71.6	0.079
UC-03	UB-03	Foundation Soils	15.7	26.4	121	0.9	0.6	78.7	0.550	1.3	30	48.2	78.7	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.129	0.943	46.6	72.1	0.080
UC-03	UB-03	Foundation Soils	15.8	26.3	121	0.9	0.6	73.6	0.563	1.3	30	48.1	73.6	1.0	-0.3	0.0	1.0	0.110	1.011	0.116	0.129	0.902	49.5	72.3	0.080
UC-03	UB-03	Foundation Soils	15.9	26.3	121	1.0	0.6	70.6	0.572	1.3	30	47.8	70.6	1.0	-0.3	0.0	1.0	0.108	1.010	0.113	0.129	0.879	55.6	73.1	0.081
UC-03	UB-03	Foundation Soils	16.0	26.2	115	1.0	0.6	64.6	0.590	1.3	30	47.2	64.6	1.0	-0.3	0.0	1.0	0.103	1.009	0.108	0.129	0.837	71.1	82.1	0.093
UC-03	UB-03	Foundation Soils	16.1	26.1	115	1.0	0.6	57.3	0.613	1.4	30	46.4	57.3	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.129	0.789	75.4	83.9	0.096
UC-03	UB-03	Foundation Soils	16.2	26.0	111	1.0	0.6	54.5	0.622	1.4	30	46.0	54.5	1.0	-0.3	0.0	1.0	0.095	1.008	0.100	0.129	0.770	75.4	81.3	0.092
UC-03	UB-03	Foundation Soils	16.2	25.9	111	1.0	0.7	51.2	0.634	1.4	30	45.3	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.130	0.749	75.4	79.6	0.090
UC-03	UB-03	Foundation Soils	16.3	25.8	111	1.0	0.7	49.1	0.642	1.4	30	44.9	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.096	0.130	0.736	75.4	78.7	0.089
UC-03	UB-03	Foundation Soils	16.4	25.8	80	1.0	0.7	48.0	0.646	1.4	30	44.7	48.0	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.130	0.728	75.4	78.2	0.088

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-03	UB-03	Foundation Soils	16.5	25.7	80	1.0	0.7	47.3	0.649	1.4	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.130	0.722	75.4	78.2	0.088
UC-03	UB-03	Foundation Soils	16.6	25.6	80	1.0	0.7	47.3	0.649	1.4	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.131	0.721	75.4	78.2	0.088
UC-03	UB-03	Foundation Soils	16.7	25.5	80	1.0	0.7	47.3	0.649	1.4	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.131	0.720	75.4	78.6	0.088
UC-03	UB-03	Foundation Soils	16.7	25.4	80	1.0	0.7	47.9	0.647	1.4	30	44.6	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.131	0.721	75.4	80.3	0.091
UC-03	UB-03	Foundation Soils	16.8	25.3	111	1.0	0.7	50.0	0.639	1.4	30	45.0	50.0	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.131	0.733	75.4	84.3	0.096
UC-03	UB-03	Foundation Soils	16.9	25.3	111	1.0	0.7	55.0	0.621	1.3	30	46.0	55.0	1.0	-0.3	0.0	1.0	0.096	1.008	0.100	0.131	0.761	42.6	70.1	0.077
UC-03	UB-03	Foundation Soils	17.0	25.2	121	1.0	0.7	28.0	0.738	1.4	0	0.5	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.080	0.132	0.609	35.7	71.3	0.079
UC-03	UB-03	Foundation Soils	17.1	25.1	121	1.0	0.7	36.1	0.696	1.4	0	0.5	36.1	1.0	-0.3	0.0	1.0	0.083	1.007	0.086	0.132	0.651	37.1	74.9	0.083
UC-03	UB-03	Foundation Soils	17.1	25.0	121	1.0	0.7	38.3	0.686	1.4	0	0.5	38.3	1.0	-0.3	0.0	1.0	0.084	1.007	0.087	0.132	0.663	36.3	75.1	0.084
UC-03	UB-03	Foundation Soils	17.2	24.9	121	1.0	0.7	39.4	0.681	1.4	0	0.5	39.4	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.132	0.668	36.0	75.3	0.084
UC-03	UB-03	Foundation Soils	17.3	24.9	121	1.0	0.7	39.8	0.679	1.4	0	0.5	39.8	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.132	0.669	34.2	74.8	0.083
UC-03	UB-03	Foundation Soils	17.4	24.8	121	1.0	0.7	41.2	0.674	1.4	0	0.5	41.2	1.0	-0.3	0.0	1.0	0.086	1.007	0.089	0.132	0.676	29.3	75.4	0.084
UC-03	UB-03	Foundation Soils	17.5	24.7	121	1.0	0.7	46.5	0.652	1.3	0	0.5	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.132	0.705	25.2	76.1	0.085
UC-03	UB-03	Foundation Soils	17.6	24.6	124	1.0	0.7	51.3	0.634	1.3	0	0.5	51.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.132	0.732	22.4	77.9	0.087
UC-03	UB-03	Foundation Soils	17.6	24.5	124	1.0	0.7	56.0	0.618	1.3	0	0.4	56.0	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.132	0.759	21.0	81.7	0.092
UC-03	UB-03	Foundation Soils	17.7	24.4	124	1.1	0.7	61.2	0.600	1.3	0	0.4	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.105	0.133	0.790	20.0	85.6	0.098
UC-03	UB-03	Foundation Soils	17.8	24.4	124	1.1	0.7	66.0	0.586	1.3	0	0.4	66.0	1.0	-0.3	0.0	0.9	0.104	1.009	0.109	0.133	0.819	19.3	88.8	0.102
UC-03	UB-03	Foundation Soils	17.9	24.3	124	1.1	0.7	69.9	0.574	1.3	0	0.4	69.9	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.133	0.845	20.0	89.9	0.104
UC-03	UB-03	Foundation Soils	18.0	24.2	124	1.1	0.7	70.3	0.573	1.3	0	0.4	70.3	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.133	0.846	21.7	89.6	0.103
UC-03	UB-03	Foundation Soils	18.0	24.1	124	1.1	0.7	68.3	0.579	1.3	0	0.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.133	0.832	23.6	88.3	0.102
UC-03	UB-03	Foundation Soils	18.1	24.0	124	1.1	0.7	65.2	0.588	1.3	0	0.5	65.2	1.0	-0.3	0.0	0.9	0.103	1.009	0.108	0.133	0.811	25.6	86.9	0.100
UC-03	UB-03	Foundation Soils	18.2	24.0	124	1.1	0.7	61.7	0.599	1.3	0	0.5	61.7	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.133	0.788	27.4	85.3	0.097
UC-03	UB-03	Foundation Soils	18.3	23.9	121	1.1	0.7	58.4	0.609	1.3	0	0.5	58.4	1.0	-0.3	0.0	0.9	0.098	1.008	0.102	0.133	0.767	29.0	84.0	0.096
UC-03	UB-03	Foundation Soils	18.4	23.8	121	1.1	0.7	55.6	0.619	1.3	0	0.5	55.6	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.133	0.750	30.3	84.9	0.097
UC-03	UB-03	Foundation Soils	18.5	23.7	121	1.1	0.7	55.1	0.621	1.3	0	0.5	55.1	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.134	0.746	29.3	85.7	0.098
UC-03	UB-03	Foundation Soils	18.5	23.6	121	1.1	0.7	56.9	0.614	1.3	0	0.5	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.134	0.756	26.2	84.5	0.096
UC-03	UB-03	Foundation Soils	18.6	23.5	124	1.1	0.7	58.8	0.608	1.3	0	0.5	58.8	1.0	-0.3	0.0	0.9	0.099	1.008	0.103	0.134	0.767	24.1	87.4	0.100
UC-03	UB-03	Foundation Soils	18.7	23.5	124	1.1	0.7	63.8	0.592	1.3	0	0.5	63.8	1.0	-0.3	0.0	0.9	0.102	1.009	0.107	0.134	0.796	21.6	90.6	0.105
UC-03	UB-03	Foundation Soils	18.8	23.4	124	1.1	0.7	69.5	0.575	1.3	0	0.4	69.5	1.0	-0.3	0.0	0.9	0.107	1.010	0.111	0.134	0.832	19.2	94.7	0.111
UC-03	UB-03	Foundation Soils	18.9	23.3	124	1.1	0.7	75.9	0.557	1.2	0	0.4	75.9	1.0	-0.3	0.0	0.9	0.112	1.011	0.117	0.134	0.875	17.8	97.1	0.115
UC-03	UB-03	Foundation Soils	18.9	23.2	124	1.1	0.7	79.6	0.547	1.2	0	0.3	79.6	1.0	-0.3	0.0	0.9	0.115	1.012	0.121	0.134	0.902	19.2	96.1	0.113
UC-03	UB-03	Foundation Soils	19.0	23.1	124	1.1	0.7	77.3	0.553	1.2	0	0.4	77.3	1.0	-0.3	0.0	0.9	0.113	1.011	0.119	0.134	0.884	19.9	94.4	0.111
UC-03	UB-03	Foundation Soils	19.1	23.1	124	1.1	0.7	75.0	0.560	1.2	0	0.4	75.0	1.0	-0.3	0.0	0.9	0.111	1.011	0.116	0.134	0.866	21.0	92.2	0.107
UC-03	UB-03	Foundation Soils	19.2	23.0	124	1.1	0.7	71.6	0.569	1.2	0	0.4	71.6	1.0	-0.3	0.0	0.9	0.109	1.010	0.113	0.134	0.842	21.8	90.3	0.105
UC-03	UB-03	Foundation Soils	19.3	22.9	124	1.1	0.7	69.0	0.577	1.2	0	0.4	69.0	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.134	0.824	23.0	89.0	0.103
UC-03	UB-03	Foundation Soils	19.4	22.8	124	1.2	0.7	66.5	0.584	1.2	0	0.5	66.5	1.0	-0.3	0.0	0.9	0.104	1.010	0.109	0.135	0.807	23.4	86.4	0.099
UC-03	UB-03	Foundation Soils	19.4	22.7	124	1.2	0.7	63.4	0.593	1.2	0	0.5	63.4	1.0	-0.3	0.0	0.9	0.102	1.009	0.106	0.135	0.788	23.8	83.6	0.095
UC-03	UB-03	Foundation Soils	19.5	22.6	124	1.2	0.7	60.3	0.603	1.2	0	0.5	60.3	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.135	0.768	25.5	82.3	0.093
UC-03	UB-03	Foundation Soils	19.6	22.6	124	1.2	0.7	57.3	0.613	1.2	0	0.5	57.3	1.0	-0.3	0.0	0.9	0.098	1.008	0.101	0.135	0.749	27.1	81.0	0.091
UC-03	UB-03	Foundation Soils	19.7	22.5	121	1.2	0.7	54.3	0.623	1.2	0	0.5	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.099	0.135	0.731	31.0	79.0	0.089
UC-03	UB-03	Foundation Soils	19.8	22.4	121	1.2	0.7	48.5	0.644	1.3	0	0.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.135	0.698	33.6	79.7	0.090
UC-03	UB-03	Foundation Soils	19.8	22.3	121	1.2	0.8	46.6	0.651	1.3	0	0.5	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.135	0.687	36.6	80.6	0.091
UC-03	UB-03	Foundation Soils	19.9	22.2	121	1.2	0.8	44.5	0.660	1.3	0	0.5	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.135	0.675	44.2	81.2	0.092
UC-03	UB-03	Foundation Soils	20.0	22.2	121	1.2	0.8	37.5	0.690	1.3	0	0.5	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.086	0.135	0.637	55.6	82.3	0.093
UC-03	UB-03	Foundation Soils	20.1	22.1	115	1.2	0.8	27.2	0.742	1.3	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.135	0.584	69.7	87.8	0.101
UC-03	UB-03	Foundation Soils	20.2	22.0	111	1.2	0.8	18.7	0.782	1.3	0	0.5	18.7	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.135	0.542	75.4	88.6	0.102
UC-03	UB-03	Foundation Soils	20.3	21.9	111	1.2	0.8	13.7	0.782	1.3	0	0.5	13.7	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.135	0.518	75.4	86.2	0.099
UC-03	UB-03	Foundation Soils	20.3	21.8	111	1.2	0.8	11.3	0.782	1.3	0	0.5	11.3	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.136	0.506	75.4	84.1	0.096
UC-03	UB-03	Foundation Soils	20.4	21.7	111	1.2	0.8	9.2	0.782	1.3	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.136	0.496	75.4	82.7	0.094
UC-03	UB-03	Foundation Soils	20.5	21.7	111	1.2	0.8	7.8	0.782	1.3	0	0.5	7.8	1.0	-0.4	0.0	0.9	0.065	1.006	0.066	0.136	0.489	75.4	82.8	0.094
UC-03	UB-03	Foundation Soils	20.6	21.6	111	1.2	0.8	7.9	0.782	1.3	0	0.5	7.9	1.0	-0.4	0.0	0.9	0.065	1.006	0.067	0.136	0.490	73.5	82.2	0.093
UC-03	UB-03	Foundation Soils	20.7	21.5	115	1.2	0.8	9.2	0.782	1.3	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.136	0.495	37.0	61.8	0.067
UC-03	UB-03	Foundation Soils	20.8	21.4	121	1.2	0.8	25.3	0.754	1.3	0	0.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.136	0.570	28.8	64.2	0.070
UC-03	UB-03	Foundation Soils	20.8	21.3	121	1.2	0.8	35.8	0.698	1.2	0	0.5	35.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.136	0.622	43.1	69.7	0.077
UC-03	UB-03	Foundation Soils	20.9	21.2	121	1.2	0.8	27.1	0.743	1.3	0	0.5	27.1	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.136	0.578	61.0	78.1	0.088
UC-03	UB-03	Foundation Soils	21.0	21.2	115	1.2	0.8	17.6	0.782	1.3	0	0.5	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.136	0.532	75.4	86.7	0.099
UC-03	UB-03	Foundation Soils	21.1	21.1	111	1.3	0.8	11.9	0.782	1.3	0	0.5	11.9	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.136	0.505	75.4	84.1	0.096
UC-03	UB-03	Foundation Soils	21.2	21.0	111	1.3	0.8	9.2	0.782	1.3	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.137	0.493	75.4	83.5	0.095
UC-03	UB-03	Foundation Soils	21.2	20.9	111	1.3	0.8	8.6	0.782	1.3	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.137	0.489	50.0	72.9	0.081
UC-03	UB-03	Foundation Soils	21.3	20.8	121	1.3	0.8	23.4	0.766	1.3	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.137	0.558	40.2	73.4	0.081
UC-03	UB-03	Foundation Soils	21.4	20.8	121	1.3	0.8	33.7	0.708	1.2	0	0.5	33.7	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.137	0.608	53.9	77.9	0.087
UC-03	UB-03	Foundation Soils	21.5	20.7	115	1.3	0.8	24.6	0.758	1.2	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.137	0.563	68.3	82.9	0.094
UC-03	UB-03	Foundation Soils	21.6	20.6	115	1.3	0.8	15.0	0.782	1.3	0	0.5	15.0	1.0	-0.4	0.0	0.9	0.069	1.006	0.071	0.137	0.517	75.4	86.7	0.099
UC-03	UB-03	Foundation Soils	21.7	20.5	111	1.3	0.8	11.8	0.782	1.2	0	0.5	11.8	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.137	0.502	75.4	84.1	0.096
UC-03	UB-03	Foundation Soils	21.7	20.4	111	1.3	0.8	9.2	0.782	1.2	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.137	0.490	75.4	85.3	0.097
UC-03	UB-03	Foundation Soils	21.8	20.3	111	1.3	0.8	10.4	0.782	1.2	0	0.5	10.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.137	0.495	32.5	70.3	0.077
UC-03	UB-03	Foundation Soils	21.9	20.3	121	1.3	0.8	38.3	0.686	1.2	0	0.5	38.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.137	0.629	11.8	77.0	0.086

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-03	UB-03	Foundation Soils	22.0	20.2	124	1.3	0.8	65.3	0.588	1.2	0	0.1	65.3	1.0	-0.4	0.0	0.9	0.104	1.009	0.107	0.137	0.778	6.8	82.1	0.093
UC-03	UB-03	Foundation Soils	22.1	20.1	124	1.3	0.8	75.3	0.559	1.2	0	0.0	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.137	0.841	6.0	90.0	0.104
UC-03	UB-03	Foundation Soils	22.1	20.0	124	1.3	0.8	84.0	0.536	1.2	0	0.0	84.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.137	0.903	14.0	84.8	0.097
UC-03	UB-03	Foundation Soils	22.2	19.9	124	1.3	0.8	70.9	0.571	1.2	0	0.2	70.9	1.0	-0.4	0.0	0.9	0.108	1.010	0.112	0.137	0.812	22.3	82.7	0.094
UC-03	UB-03	Foundation Soils	22.3	19.9	124	1.3	0.8	60.9	0.601	1.2	0	0.4	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.138	0.750	39.0	79.8	0.090
UC-03	UB-03	Foundation Soils	22.4	19.8	121	1.3	0.8	41.3	0.673	1.2	0	0.5	41.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.138	0.642	54.8	83.9	0.096
UC-03	UB-03	Foundation Soils	22.5	19.7	115	1.3	0.8	29.7	0.729	1.2	0	0.5	29.7	1.0	-0.4	0.0	0.9	0.079	1.006	0.080	0.138	0.583	67.5	88.5	0.102
UC-03	UB-03	Foundation Soils	22.6	19.6	111	1.3	0.8	21.5	0.779	1.2	0	0.5	21.5	1.0	-0.4	0.0	0.9	0.073	1.006	0.075	0.138	0.543	74.1	90.6	0.105
UC-03	UB-03	Foundation Soils	22.6	19.5	111	1.3	0.8	17.0	0.782	1.2	0	0.5	17.0	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.138	0.522	74.4	87.4	0.100
UC-03	UB-03	Foundation Soils	22.7	19.4	111	1.3	0.8	13.5	0.782	1.2	0	0.5	13.5	1.0	-0.4	0.0	0.9	0.068	1.006	0.070	0.138	0.506	75.4	85.1	0.097
UC-03	UB-03	Foundation Soils	22.8	19.4	111	1.4	0.8	10.2	0.782	1.2	0	0.5	10.2	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.138	0.491	75.4	83.5	0.095
UC-03	UB-03	Foundation Soils	22.9	19.3	111	1.4	0.8	8.6	0.782	1.2	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.138	0.483	46.6	68.9	0.076
UC-03	UB-03	Foundation Soils	23.0	19.2	121	1.4	0.8	22.8	0.770	1.2	0	0.5	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.138	0.548	20.7	66.2	0.072
UC-03	UB-03	Foundation Soils	23.0	19.1	124	1.4	0.8	45.9	0.654	1.2	0	0.4	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.092	0.138	0.663	19.4	68.2	0.075
UC-03	UB-03	Foundation Soils	23.1	19.0	124	1.4	0.8	49.1	0.642	1.2	0	0.4	49.1	1.0	-0.4	0.0	0.9	0.092	1.007	0.094	0.138	0.679	27.5	72.7	0.081
UC-03	UB-03	Foundation Soils	23.2	19.0	121	1.4	0.8	45.7	0.655	1.2	0	0.5	45.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.138	0.661	42.8	76.2	0.085
UC-03	UB-03	Foundation Soils	23.3	18.9	121	1.4	0.8	33.9	0.707	1.2	0	0.5	33.9	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.138	0.600	53.9	82.1	0.093
UC-03	UB-03	Foundation Soils	23.4	18.8	115	1.4	0.8	28.7	0.734	1.2	0	0.5	28.7	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.138	0.575	68.2	87.3	0.100
UC-03	UB-03	Foundation Soils	23.5	18.7	111	1.4	0.8	19.6	0.782	1.2	0	0.5	19.6	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.138	0.531	75.4	88.7	0.102
UC-03	UB-03	Foundation Soils	23.5	18.6	111	1.4	0.8	13.8	0.782	1.2	0	0.5	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.138	0.504	75.4	86.0	0.098
UC-03	UB-03	Foundation Soils	23.6	18.5	111	1.4	0.9	11.1	0.782	1.2	0	0.5	11.1	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.139	0.492	75.4	83.6	0.095
UC-03	UB-03	Foundation Soils	23.7	18.5	111	1.4	0.9	8.7	0.782	1.2	0	0.5	8.7	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.139	0.481	74.9	87.7	0.101
UC-03	UB-03	Foundation Soils	23.8	18.4	111	1.4	0.9	13.3	0.782	1.2	0	0.5	13.3	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.139	0.501	46.7	74.6	0.083
UC-03	UB-03	Foundation Soils	23.9	18.3	121	1.4	0.9	28.4	0.736	1.2	0	0.5	28.4	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.139	0.571	37.5	71.4	0.079
UC-03	UB-03	Foundation Soils	23.9	18.2	121	1.4	0.9	34.4	0.704	1.2	0	0.5	34.4	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.139	0.600	30.7	68.7	0.076
UC-03	UB-03	Foundation Soils	24.0	18.1	121	1.4	0.9	38.4	0.685	1.2	0	0.5	38.4	1.0	-0.4	0.1	0.9	0.084	1.007	0.086	0.139	0.620	17.9	66.1	0.072
UC-03	UB-03	Foundation Soils	24.1	18.0	124	1.4	0.9	48.5	0.644	1.1	0	0.3	48.5	1.0	-0.4	0.1	0.9	0.091	1.007	0.093	0.139	0.672	9.3	68.1	0.075
UC-03	UB-03	Foundation Soils	24.2	18.0	124	1.4	0.9	58.8	0.608	1.1	0	0.0	58.8	1.0	-0.5	0.1	0.9	0.099	1.008	0.101	0.139	0.727	6.7	73.4	0.081
UC-03	UB-03	Foundation Soils	24.3	17.9	124	1.4	0.9	66.6	0.584	1.1	0	0.0	66.6	1.0	-0.5	0.1	0.9	0.105	1.010	0.107	0.139	0.772	11.6	72.3	0.080
UC-03	UB-03	Foundation Soils	24.4	17.8	124	1.4	0.9	60.8	0.601	1.1	0	0.1	60.8	1.0	-0.5	0.1	0.9	0.100	1.009	0.103	0.139	0.738	21.3	72.7	0.081
UC-03	UB-03	Foundation Soils	24.4	17.7	124	1.5	0.9	51.8	0.632	1.1	0	0.4	51.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.139	0.688	30.1	72.3	0.080
UC-03	UB-03	Foundation Soils	24.5	17.6	121	1.5	0.9	42.7	0.667	1.1	0	0.5	42.7	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.139	0.640	38.7	73.7	0.082
UC-03	UB-03	Foundation Soils	24.6	17.6	121	1.5	0.9	35.6	0.699	1.1	0	0.5	35.6	1.0	-0.5	0.1	0.9	0.082	1.007	0.084	0.139	0.604	44.5	75.6	0.084
UC-03	UB-03	Foundation Soils	24.7	17.5	121	1.5	0.9	31.7	0.718	1.1	0	0.5	31.7	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.139	0.584	49.8	77.5	0.087
UC-03	UB-03	Foundation Soils	24.8	17.4	121	1.5	0.9	28.3	0.736	1.1	0	0.5	28.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.079	0.139	0.568	50.1	76.4	0.085
UC-03	UB-03	Foundation Soils	24.9	17.3	121	1.5	0.9	26.8	0.745	1.1	0	0.5	26.8	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.139	0.560	45.4	72.1	0.080
UC-03	UB-03	Foundation Soils	24.9	17.2	121	1.5	0.9	27.2	0.742	1.1	0	0.5	27.2	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.139	0.562	39.1	68.5	0.075
UC-03	UB-03	Foundation Soils	25.0	17.1	121	1.5	0.9	29.9	0.727	1.1	0	0.5	29.9	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.139	0.575	35.3	66.4	0.073
UC-03	UB-03	Foundation Soils	25.1	17.1	121	1.5	0.9	31.6	0.719	1.1	0	0.5	31.6	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.139	0.582	38.1	68.1	0.075
UC-03	UB-03	Foundation Soils	25.2	17.0	121	1.5	0.9	30.4	0.725	1.1	0	0.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.139	0.577	46.8	71.5	0.079
UC-03	UB-03	Foundation Soils	25.3	16.9	121	1.5	0.9	25.2	0.754	1.1	0	0.5	25.2	1.0	-0.5	0.1	0.9	0.076	1.006	0.077	0.139	0.552	52.3	73.4	0.082
UC-03	UB-03	Foundation Soils	25.3	16.8	121	1.5	0.9	21.6	0.777	1.1	0	0.5	21.6	1.0	-0.5	0.1	0.9	0.073	1.006	0.075	0.139	0.535	60.1	77.9	0.087
UC-03	UB-03	Foundation Soils	25.4	16.7	115	1.5	0.9	18.3	0.782	1.1	0	0.5	18.3	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.139	0.519	64.5	80.1	0.090
UC-03	UB-03	Foundation Soils	25.5	16.7	115	1.5	0.9	16.2	0.782	1.1	0	0.5	16.2	1.0	-0.5	0.1	0.9	0.070	1.006	0.071	0.139	0.510	73.0	85.6	0.098
UC-03	UB-03	Foundation Soils	25.6	16.6	111	1.5	0.9	13.2	0.782	1.1	0	0.5	13.2	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.140	0.496	75.4	86.2	0.099
UC-03	UB-03	Foundation Soils	25.7	16.5	111	1.5	0.9	11.3	0.782	1.1	0	0.5	11.3	1.0	-0.5	0.1	0.9	0.067	1.006	0.068	0.140	0.488	75.4	87.3	0.100
UC-03	UB-03	Foundation Soils	25.8	16.4	111	1.5	0.9	12.4	0.782	1.1	0	0.5	12.4	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.140	0.492	66.4	81.0	0.091
UC-03	UB-03	Foundation Soils	25.8	16.3	115	1.5	0.9	15.1	0.782	1.1	0	0.5	15.1	1.0	-0.5	0.1	0.9	0.069	1.006	0.070	0.140	0.504	59.3	76.3	0.085
UC-03	UB-03	Foundation Soils	25.9	16.2	115	1.5	0.9	17.5	0.782	1.1	0	0.5	17.5	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.140	0.514	50.3	73.4	0.081
UC-03	UB-03	Foundation Soils	26.0	16.2	121	1.5	0.9	23.6	0.765	1.1	0	0.5	23.6	1.0	-0.5	0.1	0.9	0.075	1.006	0.076	0.140	0.542	40.9	72.4	0.080
UC-03	UB-03	Foundation Soils	26.1	16.1	121	1.5	0.9	32.0	0.716	1.1	0	0.5	32.0	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.140	0.582	34.7	71.3	0.079
UC-03	UB-03	Foundation Soils	26.2	16.0	121	1.6	0.9	37.1	0.692	1.1	0	0.5	37.1	1.0	-0.5	0.1	0.9	0.083	1.007	0.085	0.140	0.606	29.1	71.2	0.079
UC-03	UB-03	Foundation Soils	26.2	15.9	121	1.6	0.9	42.5	0.668	1.1	0	0.5	42.5	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.140	0.633	20.2	74.5	0.083
UC-03	UB-03	Foundation Soils	26.3	15.8	124	1.6	0.9	54.7	0.622	1.1	0	0.4	54.7	1.0	-0.5	0.1	0.9	0.096	1.008	0.097	0.140	0.696	11.7	83.4	0.095
UC-03	UB-03	Foundation Soils	26.4	15.8	124	1.6	0.9	71.8	0.569	1.1	0	0.1	71.8	1.0	-0.5	0.1	0.9	0.109	1.010	0.111	0.140	0.794	7.4	93.9	0.110
UC-03	UB-03	Foundation Soils	26.5	15.7	124	1.6	0.9	86.5	0.530	1.1	0	0.0	86.5	1.0	-0.5	0.1	0.9	0.122	1.014	0.125	0.140	0.895	6.0	100.6	0.120
UC-03	UB-03	Foundation Soils	26.6	15.6	124	1.6	0.9	94.6	0.510	1.1	0	0.0	94.6	1.0	-0.5	0.1	0.9	0.131	1.016	0.134	0.140	0.961	7.4	103.7	0.126
UC-03	UB-03	Foundation Soils	26.7	15.5	124	1.6	0.9	96.4	0.506	1.1	0	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.140	0.977	8.8	106.3	0.130
UC-03	UB-03	Foundation Soils	26.7	15.4	124	1.6	0.9	97.6	0.504	1.1	0	0.0	97.6	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.140	0.987	9.1	106.7	0.131
UC-03	UB-03	Foundation Soils	26.8	15.3	124	1.6	0.9	97.7	0.503	1.1	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.140	0.988	9.8	107.5	0.132
UC-03	UB-03	Foundation Soils	26.9	15.3	124	1.6	0.9	97.7	0.503	1.1	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.140	0.988	9.4	110.0	0.137
UC-03	UB-03	Foundation Soils	27.0	15.2	124	1.6	0.9	100.6	0.497	1.1	0	0.0	100.6	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.140	1.017	7.5	115.7	
UC-03	UB-03	Foundation Soils	27.1	15.1	124	1.6	1.0	108.1	0.481	1.1	0	0.0	108.1	1.0	-0.5	0.1	0.9	0.149	1.021	0.154	0.140	1.100	7.7	118.7	
UC-03	UB-03	Foundation Soils	27.1	15.0	124	1.6	1.0	111.0	0.475	1.1	0	0.0	111.0	1.0	-0.5	0.1	0.9	0.154	1.022	0.159	0.140	1.136	8.8	117.5	
UC-03	UB-03	Foundation Soils	27.2	14.9	124	1.6	1.0	108.6	0.480	1.1	0	0.0	108.6	1.0	-0.5	0.1	0.9	0.150	1.021	0.155	0.140	1.105	10.5	114.9	
UC-03	UB-03	Foundation Soils	27.3	14.9	124	1.6	1.0	104.4	0.489	1.1	0	0.0	104.4	1.0	-0.5	0.1	0.9	0.143	1.019	0.148	0.140	1.054	13.0	110.2	
UC-03	UB-03	Foundation Soils	27.4	14.8	124	1.6	1.0	97.4	0.504	1.1	0	0.1	97.4	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.140	0.983	12.8	108.0	0.133

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-03	UB-03	Foundation Soils	27.5	14.7	124	1.6	1.0	95.3	0.509	1.0	0	0.1	95.3	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.140	0.964	12.4	108.9	0.134
UC-03	UB-03	Foundation Soils	27.6	14.6	124	1.6	1.0	96.6	0.506	1.0	0	0.1	96.6	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.140	0.975	13.0	108.6	0.134
UC-03	UB-03	Foundation Soils	27.6	14.5	124	1.6	1.0	95.8	0.508	1.0	0	0.1	95.8	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.140	0.967	14.3	106.6	0.130
UC-03	UB-03	Foundation Soils	27.7	14.4	124	1.6	1.0	92.5	0.515	1.0	0	0.2	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.140	0.938	14.7	103.4	0.125
UC-03	UB-03	Foundation Soils	27.8	14.4	124	1.7	1.0	89.0	0.524	1.0	0	0.2	89.0	1.0	-0.5	0.1	0.9	0.125	1.014	0.127	0.140	0.909	13.4	103.5	0.125
UC-03	UB-03	Foundation Soils	27.9	14.3	124	1.7	1.0	90.2	0.521	1.0	0	0.2	90.2	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.140	0.918	12.7	106.1	0.129
UC-03	UB-03	Foundation Soils	28.0	14.2	124	1.7	1.0	93.5	0.513	1.0	0	0.1	93.5	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.140	0.945	12.9	106.9	0.131
UC-03	UB-03	Foundation Soils	28.1	14.1	124	1.7	1.0	94.1	0.511	1.0	0	0.1	94.1	1.0	-0.6	0.1	0.9	0.130	1.016	0.133	0.140	0.951	14.4	105.1	0.128
UC-03	UB-03	Foundation Soils	28.1	14.0	124	1.7	1.0	90.9	0.519	1.0	0	0.2	90.9	1.0	-0.6	0.1	0.9	0.127	1.015	0.129	0.140	0.923	15.4	103.5	0.125
UC-03	UB-03	Foundation Soils	28.2	13.9	124	1.7	1.0	88.4	0.525	1.0	0	0.3	88.4	1.0	-0.6	0.1	0.9	0.124	1.014	0.127	0.140	0.903	14.7	103.8	0.126
UC-03	UB-03	Foundation Soils	28.3	13.9	124	1.7	1.0	89.2	0.523	1.0	0	0.2	89.2	1.0	-0.6	0.1	0.9	0.125	1.014	0.127	0.140	0.909	12.6	105.5	0.128
UC-03	UB-03	Foundation Soils	28.4	13.8	124	1.7	1.0	92.9	0.514	1.0	0	0.1	92.9	1.0	-0.6	0.1	0.9	0.129	1.015	0.132	0.140	0.939	10.3	109.0	0.135
UC-03	UB-03	Foundation Soils	28.5	13.7	124	1.7	1.0	98.8	0.501	1.0	0	0.0	98.8	1.0	-0.6	0.1	0.9	0.136	1.017	0.139	0.140	0.992	7.6	113.4	0.143
UC-03	UB-03	Foundation Soils	28.5	13.6	124	1.7	1.0	105.8	0.486	1.0	0	0.0	105.8	1.0	-0.6	0.1	0.9	0.145	1.020	0.149	0.140	1.065	7.4	114.0	
UC-03	UB-03	Foundation Soils	28.6	13.5	124	1.7	1.0	106.6	0.484	1.0	0	0.0	106.6	1.0	-0.6	0.1	0.9	0.147	1.020	0.150	0.140	1.074	9.3	111.8	
UC-03	UB-03	Foundation Soils	28.7	13.5	124	1.7	1.0	102.5	0.493	1.0	0	0.0	102.5	1.0	-0.6	0.1	0.9	0.141	1.019	0.144	0.140	1.028	10.7	108.6	
UC-03	UB-03	Foundation Soils	28.8	13.4	124	1.7	1.0	97.9	0.503	1.0	0	0.0	97.9	1.0	-0.6	0.1	0.9	0.135	1.017	0.138	0.140	0.983	10.7	106.4	0.130
UC-03	UB-03	Foundation Soils	28.9	13.3	124	1.7	1.0	95.7	0.508	1.0	0	0.0	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.140	0.962	9.9	106.6	0.130
UC-03	UB-03	Foundation Soils	29.0	13.2	124	1.7	1.0	96.7	0.506	1.0	0	0.0	96.7	1.0	-0.6	0.1	0.9	0.133	1.017	0.136	0.140	0.970	10.4	108.2	0.133
UC-03	UB-03	Foundation Soils	29.0	13.1	124	1.7	1.0	97.8	0.503	1.0	0	0.0	97.8	1.0	-0.6	0.1	0.9	0.135	1.017	0.137	0.140	0.981	11.9	107.6	0.132
UC-03	UB-03	Foundation Soils	29.1	13.0	124	1.7	1.0	95.7	0.508	1.0	0	0.1	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.140	0.961	17.3	104.6	0.127
UC-03	UB-03	Foundation Soils	29.2	13.0	124	1.7	1.0	87.6	0.527	1.0	0	0.3	87.6	1.0	-0.6	0.1	0.9	0.123	1.014	0.125	0.140	0.894	18.4	99.7	0.119
UC-03	UB-03	Foundation Soils	29.3	12.9	124	1.7	1.0	81.6	0.542	1.0	0	0.4	81.6	1.0	-0.6	0.1	0.9	0.117	1.012	0.119	0.140	0.850	30.1	92.7	0.108
UC-03	UB-03	Foundation Soils	29.4	12.8	121	1.8	1.0	63.2	0.594	1.0	0	0.5	63.2	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.140	0.736	39.5	90.0	0.104
UC-03	UB-03	Foundation Soils	29.4	12.7	121	1.8	1.0	51.1	0.635	1.0	0	0.6	51.1	1.0	-0.6	0.1	0.9	0.093	1.008	0.094	0.140	0.671	49.0	87.3	0.100
UC-03	UB-03	Foundation Soils	29.5	12.6	115	1.8	1.0	38.8	0.684	1.0	0	0.5	38.8	1.0	-0.6	0.1	0.9	0.085	1.007	0.085	0.140	0.609	53.9	84.8	0.097
UC-03	UB-03	Foundation Soils	29.6	12.6	115	1.8	1.0	31.4	0.719	1.0	0	0.5	31.4	1.0	-0.6	0.1	0.9	0.080	1.006	0.080	0.140	0.573	47.0	80.5	0.091
UC-03	UB-03	Foundation Soils	29.7	12.5	121	1.8	1.0	34.0	0.706	1.0	0	0.5	34.0	1.0	-0.6	0.1	0.9	0.081	1.007	0.082	0.140	0.585	38.0	77.9	0.087
UC-03	UB-03	Foundation Soils	29.8	12.4	121	1.8	1.0	40.5	0.677	1.0	0	0.5	40.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.140	0.616	18.4	85.8	0.098
UC-03	UB-03	Foundation Soils	29.9	12.3	124	1.8	1.0	67.7	0.580	1.0	0	0.4	67.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.107	0.140	0.761	13.3	93.1	0.109
UC-03	UB-03	Foundation Soils	29.9	12.2	124	1.8	1.0	80.0	0.546	1.0	0	0.1	80.0	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.140	0.837	14.2	94.6	0.111
UC-03	UB-03	Foundation Soils	30.0	12.1	124	1.8	1.0	80.6	0.545	1.0	0	0.2	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.118	0.140	0.841	16.5	93.5	0.109
UC-03	UB-03	Foundation Soils	30.1	12.1	124	1.8	1.0	77.3	0.553	1.0	0	0.3	77.3	1.0	-0.6	0.1	0.9	0.113	1.011	0.115	0.140	0.819	18.2	91.5	0.106
UC-03	UB-03	Foundation Soils	30.2	12.0	124	1.8	1.0	73.7	0.563	1.0	0	0.4	73.7	1.0	-0.6	0.1	0.9	0.110	1.011	0.112	0.140	0.796	20.1	90.2	0.104
UC-03	UB-03	Foundation Soils	30.3	11.9	124	1.8	1.0	70.5	0.572	1.0	0	0.4	70.5	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.140	0.776	20.1	90.7	0.105
UC-03	UB-03	Foundation Soils	30.3	11.8	124	1.8	1.1	71.0	0.571	1.0	0	0.4	71.0	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.140	0.779	18.6	92.8	0.108
UC-03	UB-03	Foundation Soils	30.4	11.7	124	1.8	1.1	74.5	0.561	1.0	0	0.4	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.140	0.801	18.8	92.3	0.108
UC-03	UB-03	Foundation Soils	30.5	11.7	124	1.8	1.1	74.0	0.562	1.0	0	0.4	74.0	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.140	0.797	19.0	91.0	0.106
UC-03	UB-03	Foundation Soils	30.6	11.6	124	1.8	1.1	72.4	0.567	1.0	0	0.4	72.4	1.0	-0.6	0.1	0.9	0.109	1.011	0.110	0.140	0.787	18.8	89.2	0.103
UC-03	UB-03	Foundation Soils	30.7	11.5	124	1.8	1.1	70.8	0.571	1.0	0	0.4	70.8	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.140	0.778	15.8	89.1	0.103
UC-03	UB-03	Foundation Soils	30.8	11.4	124	1.8	1.1	73.5	0.564	1.0	0	0.3	73.5	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.140	0.794	11.2	89.3	0.103
UC-03	UB-03	Foundation Soils	30.8	11.3	124	1.8	1.1	78.2	0.551	1.0	0	0.0	78.2	1.0	-0.6	0.1	0.9	0.114	1.012	0.115	0.140	0.823	6.6	91.3	0.106
UC-03	UB-03	Foundation Soils	30.9	11.2	124	1.8	1.1	84.7	0.534	1.0	0	0.0	84.7	1.0	-0.6	0.1	0.9	0.120	1.013	0.122	0.140	0.868	6.0	95.9	0.113
UC-03	UB-03	Foundation Soils	31.0	11.2	124	1.9	1.1	89.9	0.522	1.0	0	0.0	89.9	1.0	-0.6	0.1	0.9	0.125	1.015	0.127	0.140	0.907	6.0	98.6	0.117
UC-03	UB-03	Foundation Soils	31.1	11.1	124	1.9	1.1	92.6	0.515	1.0	0	0.0	92.6	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.140	0.929	6.0	98.2	0.116
UC-03	UB-03	Foundation Soils	31.2	11.0	124	1.9	1.1	92.2	0.516	1.0	0	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.140	0.925	6.0	96.3	0.114
UC-03	UB-03	Foundation Soils	31.2	10.9	124	1.9	1.1	90.3	0.520	1.0	0	0.0	90.3	1.0	-0.6	0.1	0.9	0.126	1.015	0.128	0.140	0.910	6.0	92.2	0.107
UC-03	UB-03	Foundation Soils	31.3	10.8	124	1.9	1.1	86.2	0.530	1.0	0	0.0	86.2	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.140	0.879	6.0	87.9	0.101
UC-03	UB-03	Foundation Soils	31.4	10.7	124	1.9	1.1	81.9	0.541	1.0	0	0.0	81.9	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.140	0.847	6.0	80.8	0.091
UC-03	UB-03	Foundation Soils	31.5	10.7	124	1.9	1.1	74.8	0.560	1.0	0	0.0	74.8	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.140	0.801	8.9	77.1	0.086
UC-03	UB-03	Foundation Soils	31.6	10.6	124	1.9	1.1	68.2	0.579	1.0	0	0.0	68.2	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.140	0.761	14.4	76.3	0.085
UC-03	UB-03	Foundation Soils	31.7	10.5	124	1.9	1.1	62.1	0.597	1.0	0	0.2	62.1	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.140	0.726	21.1	73.9	0.082
UC-03	UB-03	Foundation Soils	31.7	10.4	124	1.9	1.1	53.2	0.627	1.0	0	0.4	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.095	0.140	0.679	26.1	71.9	0.080
UC-03	UB-03	Foundation Soils	31.8	10.3	121	1.9	1.1	46.3	0.653	1.0	0	0.5	46.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.090	0.140	0.643	32.8	72.7	0.081
UC-03	UB-03	Foundation Soils	31.9	10.3	121	1.9	1.1	40.5	0.677	1.0	0	0.5	40.5	1.0	-0.7	0.1	0.9	0.086	1.007	0.086	0.140	0.615	33.8	71.6	0.079
UC-03	UB-03	Foundation Soils	32.0	10.2	121	1.9	1.1	38.3	0.686	1.0	0	0.5	38.3	1.0	-0.7	0.1	0.9	0.084	1.007	0.085	0.140	0.604	28.4	67.4	0.074
UC-03	UB-03	Foundation Soils	32.1	10.1	121	1.9	1.1	39.4	0.681	1.0	0	0.5	39.4	1.0	-0.7	0.1	0.9	0.085	1.007	0.085	0.140	0.609	24.1	68.2	0.075
UC-03	UB-03	Foundation Soils	32.2	10.0	124	1.9	1.1	44.5	0.660	1.0	0	0.4	44.5	1.0	-0.7	0.1	0.9	0.088	1.007	0.089	0.140	0.634	11.1	64.0	0.070
UC-03	UB-03	Foundation Soils	32.2	9.9	124	1.9	1.1	52.9	0.628	1.0	0	0.0	52.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.095	0.140	0.677	10.9	69.4	0.076
UC-03	UB-03	Foundation Soils	32.3	9.8	124	1.9	1.1	58.5	0.609	1.0	0	0.0	58.5	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.140	0.706	14.1	72.1	0.080
UC-03	UB-03	Foundation Soils	32.4	9.8	124	1.9	1.1	58.2	0.610	1.0	0	0.2	58.2	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.140	0.704	19.9	74.6	0.083
UC-03	UB-03	Foundation Soils	32.5	9.7	124	1.9	1.1	55.2	0.620	1.0	0	0.4	55.2	1.0	-0.7	0.1	0.9	0.096	1.008	0.096	0.140	0.688	20.8	71.8	0.079
UC-03	UB-03	Foundation Soils	32.6	9.6	124	1.9	1.1	51.4	0.634	1.0	0	0.4	51.4	1.0	-0.7	0.1	0.9	0.093	1.008	0.094	0.140	0.669	21.4	69.9	0.077
UC-03	UB-03	Foundation Soils	32.6	9.5	124	2.0	1.1	48.9	0.643	1.0	0	0.4	48.9	1.0	-0.7	0.1	0.9	0.092	1.007	0.092	0.140	0.656	21.0	72.4	0.080
UC-03	UB-03	Foundation Soils	32.7	9.4	124	2.0	1.1	51.9	0.632	1.0	0	0.4	51.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.094	0.140	0.671	15.8	74.6	0.083
UC-03	UB-03	Foundation Soils	32.8	9.4	124	2.0	1.1	59.1	0.607	1.0	0	0.2	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.140	0.709	9.5	77.2	0.086
UC-03	UB-03	Foundation Soils	32.9	9.3	124	2.0	1.1	67.7	0.580	1.0	0	0.0	67.7	1.0	-0.7	0.1	0.9	0.105	1.010	0.106	0.140	0.757	6.0	78.0	0.088

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-03	UB-03	Foundation Soils	33.0	9.2	124	2.0	1.1	72.0	0.568	1.0	0	0.0	72.0	1.0	-0.7	0.1	0.9	0.109	1.010	0.109	0.140	0.782	7.3	82.5	0.094
UC-03	UB-03	Foundation Soils	33.1	9.1	124	2.0	1.1	75.2	0.559	1.0	0	0.0	75.2	1.0	-0.7	0.1	0.9	0.112	1.011	0.112	0.140	0.801	6.0	83.0	0.094
UC-03	UB-03	Foundation Soils	33.1	9.0	124	2.0	1.1	77.0	0.554	1.0	0	0.0	77.0	1.0	-0.7	0.1	0.9	0.113	1.011	0.114	0.140	0.813	6.0	85.2	0.097
UC-03	UB-03	Foundation Soils	33.2	8.9	124	2.0	1.1	79.2	0.548	1.0	0	0.0	79.2	1.0	-0.7	0.1	0.9	0.115	1.012	0.116	0.140	0.827	6.0	91.6	0.106
UC-03	UB-03	Foundation Soils	33.3	8.9	124	2.0	1.1	85.6	0.532	1.0	0	0.0	85.6	1.0	-0.7	0.1	0.9	0.121	1.013	0.122	0.140	0.871	6.0	105.2	0.128
UC-03	UB-03	Foundation Soils	33.4	8.8	124	2.0	1.1	99.2	0.500	1.0	0	0.0	99.2	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.140	0.983	6.0	112.8	0.142
UC-03	UB-03	Foundation Soils	33.5	8.7	124	2.0	1.1	106.8	0.483	1.0	0	0.0	106.8	1.0	-0.7	0.1	0.9	0.147	1.020	0.149	0.140	1.063	6.0	109.7	
UC-03	UB-03	Foundation Soils	33.5	8.6	124	2.0	1.1	103.7	0.490	1.0	0	0.0	103.7	1.0	-0.7	0.1	0.9	0.142	1.019	0.144	0.140	1.028	6.4	105.1	
UC-03	UB-03	Foundation Soils	33.6	8.5	124	2.0	1.2	98.7	0.501	1.0	0	0.0	98.7	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.140	0.978	14.1	102.9	0.124
UC-03	UB-03	Foundation Soils	33.7	8.5	124	2.0	1.2	89.0	0.524	1.0	0	0.2	89.0	1.0	-0.7	0.1	0.9	0.125	1.014	0.125	0.140	0.896	17.2	103.6	0.125
UC-03	UB-03	Foundation Soils	33.8	8.4	124	2.0	1.2	86.7	0.529	1.0	0	0.3	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.123	0.140	0.879	16.2	109.8	0.136
UC-03	UB-03	Foundation Soils	33.9	8.3	124	2.0	1.2	94.0	0.512	1.0	0	0.3	94.0	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.140	0.936	16.0	118.0	0.152
UC-03	UB-03	Foundation Soils	34.0	8.2	124	2.0	1.2	102.4	0.493	1.0	0	0.3	102.4	1.0	-0.7	0.1	0.9	0.140	1.019	0.142	0.140	1.014	8.5	132.6	
UC-03	UB-03	Foundation Soils	34.0	8.1	124	2.0	1.2	124.1	0.449	1.0	0	0.0	124.1	1.0	-0.7	0.1	0.9	0.181	1.028	0.184	0.140	1.316	6.0	165.6	
UC-03	UB-03	Foundation Soils	34.1	8.0	124	2.0	1.2	159.6	0.388	1.0	0	0.0	159.6	1.0	-0.7	0.1	0.9	0.368	1.053	0.381	0.140	2.725	6.0	204.1	
UC-03	UB-03	Foundation Soils	34.2	8.0	124	2.1	1.2	198.1	0.332	1.0	0	0.0	198.1	1.0	-0.7	0.1	0.9	1.703	1.082	1.795	0.140	12.848	6.0	210.1	
UC-03	UB-03	Foundation Soils	34.3	7.9	124	2.1	1.2	204.1	0.324	1.0	0	0.0	204.1	1.0	-0.7	0.1	0.9	2.404	1.082	2.528	0.140	18.096	6.0	207.3	
UC-03	UB-03	Foundation Soils	34.4	7.8	124	2.1	1.2	201.3	0.328	1.0	0	0.0	201.3	1.0	-0.7	0.1	0.9	2.037	1.082	2.142	0.140	15.340	6.0	186.6	
UC-03	UB-03	Foundation Soils	34.4	7.7	124	2.1	1.2	180.6	0.356	1.0	0	0.0	180.6	1.0	-0.7	0.1	0.9	0.743	1.075	0.780	0.140	5.587	6.0	178.5	
UC-03	UB-03	Foundation Soils	34.5	7.6	124	2.1	1.2	172.5	0.368	1.0	0	0.0	172.5	1.0	-0.7	0.1	0.9	0.548	1.066	0.572	0.140	4.097	6.0	161.0	
UC-03	UB-03	Foundation Soils	34.6	7.6	124	2.1	1.2	155.0	0.395	1.0	0	0.0	155.0	1.0	-0.7	0.1	0.9	0.325	1.049	0.335	0.140	2.402	6.0	143.3	
UC-03	UB-03	Foundation Soils	34.7	7.5	124	2.1	1.2	137.3	0.425	1.0	0	0.0	137.3	1.0	-0.7	0.1	0.9	0.223	1.036	0.227	0.140	1.629	6.0	140.4	
UC-03	UB-03	Foundation Soils	34.8	7.4	124	2.1	1.2	134.4	0.430	1.0	0	0.0	134.4	1.0	-0.7	0.1	0.9	0.212	1.034	0.216	0.140	1.547	6.0	140.8	
UC-03	UB-03	Foundation Soils	34.9	7.3	124	2.1	1.2	134.9	0.429	1.0	0	0.0	134.9	1.0	-0.7	0.1	0.9	0.214	1.035	0.217	0.140	1.559	6.0	140.0	
UC-03	UB-03	Foundation Soils	34.9	7.2	124	2.1	1.2	134.0	0.431	1.0	0	0.0	134.0	1.0	-0.7	0.1	0.9	0.211	1.034	0.214	0.140	1.535	6.0	127.0	
UC-03	UB-03	Foundation Soils	35.0	7.1	124	2.1	1.2	121.0	0.455	0.9	0	0.0	121.0	1.0	-0.7	0.1	0.9	0.173	1.027	0.175	0.139	1.257	6.0	112.7	
UC-03	UB-03	Foundation Soils	35.1	7.1	124	2.1	1.2	106.7	0.484	0.9	0	0.0	106.7	1.0	-0.7	0.1	0.9	0.147	1.020	0.148	0.139	1.059	6.0	110.9	
UC-03	UB-03	Foundation Soils	35.2	7.0	124	2.1	1.2	104.9	0.487	0.9	0	0.0	104.9	1.0	-0.7	0.1	0.9	0.144	1.020	0.145	0.139	1.039	6.0	109.7	
UC-03	UB-03	Foundation Soils	35.3	6.9	124	2.1	1.2	103.7	0.490	0.9	0	0.0	103.7	1.0	-0.8	0.1	0.9	0.142	1.019	0.143	0.139	1.026	6.0	110.9	
UC-03	UB-03	Foundation Soils	35.4	6.8	124	2.1	1.2	104.9	0.488	0.9	0	0.0	104.9	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.139	1.038	6.0	111.1	
UC-03	UB-03	Foundation Soils	35.4	6.7	124	2.1	1.2	105.1	0.487	0.9	0	0.0	105.1	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.139	1.041	6.0	107.0	
UC-03	UB-03	Foundation Soils	35.5	6.6	124	2.1	1.2	101.0	0.496	0.9	0	0.0	101.0	1.0	-0.8	0.1	0.9	0.139	1.018	0.139	0.139	0.998	6.0	102.1	0.123
UC-03	UB-03	Foundation Soils	35.6	6.6	124	2.1	1.2	96.1	0.507	0.9	0	0.0	96.1	1.0	-0.8	0.1	0.9	0.132	1.016	0.133	0.139	0.953	6.0	96.9	0.115
UC-03	UB-03	Foundation Soils	35.7	6.5	124	2.1	1.2	90.9	0.519	0.9	0	0.0	90.9	1.0	-0.8	0.1	0.9	0.127	1.015	0.127	0.139	0.910	6.0	95.6	0.112
UC-03	UB-03	Foundation Soils	35.8	6.4	124	2.1	1.2	89.6	0.522	0.9	0	0.0	89.6	1.0	-0.8	0.1	0.9	0.125	1.014	0.125	0.139	0.899	6.0	96.5	0.114
UC-03	UB-03	Foundation Soils	35.8	6.3	124	2.2	1.2	90.5	0.520	0.9	0	0.0	90.5	1.0	-0.8	0.1	0.9	0.126	1.015	0.126	0.139	0.906	6.0	104.8	0.127
UC-03	UB-03	Foundation Soils	35.9	6.2	124	2.2	1.2	98.8	0.501	0.9	0	0.0	98.8	1.0	-0.8	0.1	0.9	0.136	1.017	0.136	0.139	0.977	6.0	103.2	0.125
UC-03	UB-03	Foundation Soils	36.0	6.2	124	2.2	1.2	97.2	0.504	0.9	0	0.0	97.2	1.0	-0.8	0.1	0.9	0.134	1.017	0.134	0.139	0.962	6.0	108.9	0.134
UC-03	UB-03	Foundation Soils	36.1	6.1	124	2.2	1.2	102.9	0.492	0.9	0	0.0	102.9	1.0	-0.8	0.1	0.9	0.141	1.019	0.142	0.139	1.017	6.0	106.3	
UC-03	UB-03	Foundation Soils	36.2	6.0	124	2.2	1.2	100.3	0.497	0.9	0	0.0	100.3	1.0	-0.8	0.1	0.9	0.138	1.018	0.138	0.139	0.991	6.0	103.8	0.126
UC-03	UB-03	Foundation Soils	36.3	5.9	124	2.2	1.2	97.8	0.503	0.9	0	0.0	97.8	1.0	-0.8	0.1	0.9	0.135	1.017	0.135	0.139	0.968	6.0	94.9	0.111
UC-03	UB-03	Foundation Soils	36.3	5.8	124	2.2	1.2	88.9	0.524	0.9	0	0.0	88.9	1.0	-0.8	0.1	0.9	0.124	1.014	0.124	0.139	0.894	6.0	89.6	0.104
UC-03	UB-03	Foundation Soils	36.4	5.7	124	2.2	1.2	83.6	0.537	0.9	0	0.0	83.6	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.139	0.855	6.0	89.4	0.103
UC-03	UB-03	Foundation Soils	36.5	5.7	124	2.2	1.2	83.4	0.538	0.9	0	0.0	83.4	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.139	0.853	6.0	89.0	0.103
UC-03	UB-03	Foundation Soils	36.6	5.6	124	2.2	1.2	83.0	0.538	0.9	0	0.0	83.0	1.0	-0.8	0.1	0.9	0.119	1.013	0.118	0.139	0.851	6.0	86.1	0.099
UC-03	UB-03	Foundation Soils	36.7	5.5	124	2.2	1.2	80.1	0.546	0.9	0	0.0	80.1	1.0	-0.8	0.1	0.9	0.116	1.012	0.116	0.139	0.831	6.0	82.7	0.094
UC-03	UB-03	Foundation Soils	36.7	5.4	124	2.2	1.2	76.7	0.555	0.9	0	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.113	0.139	0.809	6.0	84.2	0.096
UC-03	UB-03	Foundation Soils	36.8	5.3	124	2.2	1.3	78.2	0.551	0.9	0	0.0	78.2	1.0	-0.8	0.1	0.9	0.114	1.012	0.114	0.139	0.819	6.0	79.4	0.089
UC-03	UB-03	Foundation Soils	36.9	5.3	124	2.2	1.3	73.4	0.564	0.9	0	0.0	73.4	1.0	-0.8	0.1	0.9	0.110	1.011	0.110	0.139	0.789	6.0	78.2	0.088
UC-03	UB-03	Foundation Soils	37.0	5.2	124	2.2	1.3	72.2	0.567	0.9	0	0.0	72.2	1.0	-0.8	0.1	0.9	0.109	1.010	0.109	0.139	0.782	6.0	76.9	0.086
UC-03	UB-03	Foundation Soils	37.1	5.1	124	2.2	1.3	70.9	0.571	0.9	0	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.108	0.139	0.774	6.0	76.3	0.085
UC-03	UB-03	Foundation Soils	37.2	5.0	124	2.2	1.3	70.3	0.573	0.9	0	0.0	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.139	0.771	6.0	75.8	0.085
UC-03	UB-03	Foundation Soils	37.2	4.9	124	2.2	1.3	69.8	0.574	0.9	0	0.0	69.8	1.0	-0.8	0.1	0.9	0.107	1.010	0.107	0.139	0.768	6.0	74.1	0.082
UC-03	UB-03	Foundation Soils	37.3	4.8	124	2.2	1.3	68.1	0.579	0.9	0	0.0	68.1	1.0	-0.8	0.1	0.9	0.106	1.010	0.105	0.139	0.758	6.0	72.1	0.080
UC-03	UB-03	Foundation Soils	37.4	4.8	124	2.2	1.3	66.1	0.585	0.9	0	0.0	66.1	1.0	-0.8	0.1	0.9	0.104	1.009	0.104	0.139	0.747	6.0	70.8	0.078
UC-03	UB-03	Foundation Soils	37.5	4.7	124	2.3	1.3	64.8	0.589	0.9	0	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.103	0.139	0.740	6.7	69.5	0.076
UC-03	UB-03	Foundation Soils	37.6	4.6	124	2.3	1.3	62.8	0.595	0.9	0	0.0	62.8	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.139	0.728	6.5	69.1	0.076
UC-03	UB-03	Foundation Soils	37.6	4.5	124	2.3	1.3	62.6	0.596	0.9	0	0.0	62.6	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.139	0.728	7.6	67.3	0.074
UC-03	UB-03	Foundation Soils	37.7	4.4	124	2.3	1.3	59.7	0.605	0.9	0	0.0	59.7	1.0	-0.8	0.1	0.9	0.099	1.009	0.099	0.139	0.712	7.7	67.0	0.073
UC-03	UB-03	Foundation Soils	37.8	4.4	124	2.3	1.3	59.3	0.606	0.9	0	0.0	59.3	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.139	0.710	8.4	69.4	0.076
UC-03	UB-03	Foundation Soils	37.9	4.3	124	2.3	1.3	61.0	0.601	0.9	0	0.0	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.100	0.139	0.719	10.2	71.6	0.079
UC-03	UB-03	Foundation Soils	38.0	4.2	124	2.3	1.3	61.4	0.600	0.9	0	0.0	61.4	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.139	0.721	12.4	72.7	0.081
UC-03	UB-03	Foundation Soils	38.1	4.1	124	2.3	1.3	60.3	0.603	0.9	0	0.1	60.3	1.0	-0.8	0.1	0.9	0.100	1.009	0.099	0.139	0.715	14.6	72.0	0.080
UC-03	UB-03	Foundation Soils	38.1	4.0	124	2.3	1.3	57.5	0.612	0.9	0	0.2	57.5	1.0	-0.8	0.1	0.9	0.098	1.008	0.097	0.139	0.701	15.9	67.4	0.074
UC-03	UB-03	Foundation Soils	38.2	3.9	124	2.3	1.3	51.7	0.632	0.9	0	0.2	51.7	1.0	-0.8	0.1	0.9	0.093	1.008	0.093	0.138	0.670	21.4	69.6	0.077
UC-03	UB-03	Foundation Soils	38.3	3.9	124	2.3	1.3	48.6	0.644	0.9	0	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.091	0.138	0.655	23.9	66.1	0.072
UC-03	UB-03	Foundation Soils	38.4	3.8	124	2.3	1.3	42.7	0.667	0.9	0	0.4	42.7	1.0	-0.8	0.1	0.9	0.087	1.007	0.087	0.138	0.626	23.8	64.5	0.070

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-03	UB-03	Foundation Soils	38.5	3.7	124	2.3	1.3	41.1	0.674	0.9	0	0.4	41.1	1.0	-0.8	0.1	0.9	0.086	1.007	0.086	0.138	0.618	24.3	62.8	0.068
UC-03	UB-03	Foundation Soils	38.5	3.6	121	2.3	1.3	38.9	0.683	0.9	0	0.4	38.9	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.138	0.608	22.2	60.9	0.066
UC-03	UB-03	Foundation Soils	38.6	3.5	124	2.3	1.3	39.0	0.683	0.9	0	0.4	39.0	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.138	0.608	21.0	60.1	0.065
UC-03	UB-03	Foundation Soils	38.7	3.4	124	2.3	1.3	39.5	0.681	0.9	0	0.4	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.138	0.611	19.0	59.4	0.064
UC-03	UB-03	Foundation Soils	38.8	3.4	124	2.3	1.3	40.8	0.675	0.9	0	0.3	40.8	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.138	0.617	17.5	57.5	0.062
UC-03	UB-03	Foundation Soils	38.9	3.3	124	2.3	1.3	40.3	0.677	0.9	0	0.3	40.3	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.138	0.615	19.4	58.6	0.063
UC-03	UB-03	Foundation Soils	39.0	3.2	124	2.3	1.3	39.5	0.681	0.9	0	0.3	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.138	0.611	23.2	61.7	0.067
UC-03	UB-03	Foundation Soils	39.0	3.1	124	2.4	1.3	38.9	0.683	0.9	0	0.4	38.9	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.138	0.608	27.2	66.1	0.072
UC-03	UB-03	Foundation Soils	39.1	3.0	121	2.4	1.3	39.3	0.681	0.9	0	0.5	39.3	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.138	0.610	27.9	65.1	0.071
UC-03	UB-03	Foundation Soils	39.2	3.0	121	2.4	1.3	37.7	0.689	0.9	0	0.5	37.7	1.0	-0.9	0.1	0.9	0.084	1.007	0.083	0.138	0.602	30.1	64.6	0.070
UC-03	UB-03	Foundation Soils	39.3	2.9	121	2.4	1.3	35.1	0.701	0.9	0	0.5	35.1	1.0	-0.9	0.1	0.9	0.082	1.007	0.081	0.138	0.590	28.7	64.6	0.070
UC-03	UB-03	Foundation Soils	39.4	2.8	121	2.4	1.3	36.3	0.695	0.9	0	0.5	36.3	1.0	-0.9	0.1	0.9	0.083	1.007	0.082	0.138	0.596	21.7	64.4	0.070
UC-03	UB-03	Foundation Soils	39.5	2.7	124	2.4	1.3	43.1	0.665	0.9	0	0.4	43.1	1.0	-0.9	0.1	0.9	0.088	1.007	0.087	0.138	0.629	19.5	66.0	0.072
UC-03	UB-03	Foundation Soils	39.5	2.6	124	2.4	1.3	46.8	0.651	0.9	0	0.4	46.8	1.0	-0.9	0.1	0.8	0.090	1.007	0.089	0.138	0.647	19.5	70.9	0.078
UC-03	UB-03	Foundation Soils	39.6	2.5	124	2.4	1.3	51.8	0.632	0.9	0	0.4	51.8	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.138	0.672	24.4	74.5	0.083
UC-03	UB-03	Foundation Soils	39.7	2.5	124	2.4	1.3	50.5	0.637	0.9	0	0.5	50.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.138	0.665	30.8	78.8	0.089
UC-03	UB-03	Foundation Soils	39.8	2.4	121	2.4	1.3	48.5	0.644	0.9	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.138	0.655	31.7	79.6	0.090
UC-03	UB-03	Foundation Soils	39.9	2.3	121	2.4	1.3	48.5	0.644	0.9	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.138	0.655	28.0	80.1	0.090
UC-03	UB-03	Foundation Soils	39.9	2.2	121	2.4	1.3	52.6	0.629	0.9	0	0.5	52.6	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.138	0.676	24.0	80.7	0.091
UC-03	UB-03	Foundation Soils	40.0	2.1	124	2.4	1.3	57.1	0.614	0.9	0	0.5	57.1	1.0	-0.9	0.1	0.8	0.097	1.008	0.096	0.138	0.699	21.6	79.7	0.090
UC-03	UB-03	Foundation Soils	40.1	2.1	124	2.4	1.4	58.5	0.609	0.9	0	0.4	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.138	0.707	21.2	78.1	0.088
UC-03	UB-03	Foundation Soils	40.2	2.0	124	2.4	1.4	57.4	0.613	0.9	0	0.4	57.4	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.138	0.701	22.8	76.4	0.085
UC-03	UB-03	Foundation Soils	40.3	1.9	124	2.4	1.4	54.1	0.624	0.9	0	0.4	54.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.138	0.684	25.8	77.6	0.087
UC-03	UB-03	Foundation Soils	40.4	1.8	121	2.4	1.4	52.3	0.630	0.9	0	0.5	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.138	0.675	28.8	79.7	0.090
UC-03	UB-03	Foundation Soils	40.4	1.7	121	2.4	1.4	51.5	0.633	0.9	0	0.5	51.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.138	0.671	30.2	79.8	0.090
UC-03	UB-03	Foundation Soils	40.5	1.6	121	2.4	1.4	50.1	0.638	0.9	0	0.5	50.1	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.138	0.664	30.7	78.1	0.088
UC-03	UB-03	Foundation Soils	40.6	1.6	121	2.4	1.4	47.9	0.646	0.8	0	0.5	47.9	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.138	0.653	26.9	75.7	0.084
UC-03	UB-03	Foundation Soils	40.7	1.5	121	2.5	1.4	49.2	0.641	0.8	0	0.5	49.2	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.138	0.660	21.1	76.0	0.085
UC-03	UB-03	Foundation Soils	40.8	1.4	124	2.5	1.4	55.2	0.620	0.9	0	0.4	55.2	1.0	-0.9	0.1	0.8	0.096	1.008	0.095	0.138	0.690	14.7	82.6	0.094
UC-03	UB-03	Foundation Soils	40.8	1.3	124	2.5	1.4	68.1	0.579	0.9	0	0.2	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.138	0.760	6.0	83.2	0.095
UC-03	UB-03	Foundation Soils	40.9	1.2	124	2.5	1.4	77.2	0.554	0.9	0	0.0	77.2	1.0	-0.9	0.1	0.8	0.113	1.011	0.112	0.137	0.814	6.0	91.1	0.106
UC-03	UB-03	Foundation Soils	41.0	1.2	124	2.5	1.4	85.1	0.533	0.9	0	0.0	85.1	1.0	-0.9	0.1	0.8	0.121	1.013	0.119	0.137	0.867	6.0	104.0	0.126
UC-03	UB-03	Foundation Soils	41.1	1.1	124	2.5	1.4	98.0	0.503	0.9	0	0.0	98.0	1.0	-0.9	0.1	0.8	0.135	1.017	0.133	0.137	0.970	6.0	112.9	0.142
UC-03	UB-03	Foundation Soils	41.2	1.0	124	2.5	1.4	106.9	0.483	0.9	0	0.0	106.9	1.0	-0.9	0.1	0.8	0.147	1.020	0.146	0.137	1.060	6.0	115.0	
UC-03	UB-03	Foundation Soils	41.3	0.9	124	2.5	1.4	109.0	0.479	0.9	0	0.0	109.0	1.0	-0.9	0.1	0.8	0.150	1.021	0.149	0.137	1.084	6.0	108.1	
UC-03	UB-03	Foundation Soils	41.3	0.8	124	2.5	1.4	102.1	0.493	0.9	0	0.0	102.1	1.0	-0.9	0.1	0.8	0.140	1.019	0.139	0.137	1.009	6.0	83.4	
UC-03	UB-03	Foundation Soils	41.4	0.7	124	2.5	1.4	77.4	0.553	0.9	0	0.0	77.4	1.0	-0.9	0.1	0.8	0.113	1.012	0.112	0.137	0.816	11.0	73.0	0.081
UC-03	UB-03	Foundation Soils	41.5	0.7	124	2.5	1.4	62.0	0.598	0.8	0	0.0	62.0	1.0	-0.9	0.1	0.8	0.101	1.009	0.100	0.137	0.727	15.9	67.9	0.075
UC-03	UB-03	Foundation Soils	41.6	0.6	124	2.5	1.4	52.3	0.630	0.8	0	0.2	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.137	0.676	19.8	64.1	0.070
UC-03	UB-03	Foundation Soils	41.7	0.5	124	2.5	1.4	44.6	0.659	0.8	0	0.4	44.6	1.0	-0.9	0.1	0.8	0.089	1.007	0.088	0.137	0.638	22.6	65.7	0.072
UC-03	UB-03	Foundation Soils	41.7	0.4	124	2.5	1.4	43.6	0.664	0.8	0	0.4	43.6	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.137	0.633	24.4	65.4	0.071
UC-03	UB-03	Foundation Soils	41.8	0.3	121	2.5	1.4	41.4	0.672	0.8	0	0.4	41.4	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.137	0.623	23.8	64.1	0.070
UC-03	UB-03	Foundation Soils	41.9	0.3	124	2.5	1.4	40.8	0.675	0.8	0	0.4	40.8	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.137	0.619	20.5	61.9	0.067
UC-03	UB-03	Foundation Soils	42.0	0.2	124	2.5	1.4	41.7	0.671	0.8	0	0.4	41.7	1.0	-0.9	0.1	0.8	0.087	1.007	0.086	0.137	0.624	17.0	60.7	0.066
UC-03	UB-03	Foundation Soils	42.1	0.1	124	2.5	1.4	44.0	0.662	0.8	0	0.3	44.0	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.137	0.635	13.2	58.7	0.063
UC-03	UB-03	Foundation Soils	42.2	0.0	124	2.5	1.4	45.7	0.655	0.8	0	0.1	45.7	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.137	0.644	12.1	56.5	0.061
UC-03	UB-03	Foundation Soils	42.2	-0.1	124	2.5	1.4	44.5	0.660	0.8	0	0.1	44.5	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.137	0.638	18.4	57.9	0.062
UC-03	UB-03	Foundation Soils	42.3	-0.2	124	2.6	1.4	39.8	0.680	0.8	0	0.3	39.8	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.137	0.615	19.8	58.5	0.063
UC-03	UB-03	Foundation Soils	42.4	-0.2	124	2.6	1.4	39.1	0.683	0.8	0	0.3	39.1	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.137	0.612	18.0	59.0	0.064
UC-03	UB-03	Foundation Soils	42.5	-0.3	124	2.6	1.4	41.3	0.673	0.8	0	0.3	41.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.137	0.623	15.0	58.2	0.063
UC-03	UB-03	Foundation Soils	42.6	-0.4	124	2.6	1.4	43.4	0.664	0.8	0	0.2	43.4	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.137	0.633	11.8	56.7	0.061
UC-03	UB-03	Foundation Soils	42.7	-0.5	124	2.6	1.4	44.9	0.658	0.8	0	0.1	44.9	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.137	0.641	9.8	58.1	0.063
UC-03	UB-03	Foundation Soils	42.7	-0.6	124	2.6	1.4	48.3	0.645	0.8	0	0.0	48.3	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.137	0.657	8.2	59.3	0.064
UC-03	UB-03	Foundation Soils	42.8	-0.7	124	2.6	1.4	51.1	0.635	0.8	0	0.0	51.1	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.137	0.671	8.1	59.5	0.064
UC-03	UB-03	Foundation Soils	42.9	-0.7	124	2.6	1.4	51.4	0.633	0.8	0	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.137	0.673	7.2	59.3	0.064
UC-03	UB-03	Foundation Soils	43.0	-0.8	124	2.6	1.4	52.1	0.631	0.8	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.137	0.677	7.1	59.2	0.064
UC-03	UB-03	Foundation Soils	43.1	-0.9	124	2.6	1.4	52.1	0.631	0.8	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.137	0.677	11.1	60.4	0.065
UC-03	UB-03	Foundation Soils	43.1	-1.0	119	2.6	1.4	49.4	0.641	0.8	0	0.0	49.4	1.0	-1.0	0.1	0.8	0.092	1.008	0.091	0.136	0.663	10.3	59.1	0.064
UC-03	UB-03	Foundation Soils	43.2	-1.1	119	2.6	1.4	48.8	0.643	0.8	0	0.0	48.8	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.136	0.660	11.9	57.4	0.062
UC-03	UB-03	Foundation Soils	43.3	-1.1	124	2.6	1.4	45.5	0.656	0.8	0	0.1	45.5	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.136	0.644	12.1	58.9	0.064
UC-03	UB-03	Foundation Soils	43.4	-1.2	124	2.6	1.5	46.8	0.651	0.8	0	0.1	46.8	1.0	-1.0	0.1	0.8	0.090	1.007	0.089	0.136	0.651	15.6	61.2	0.066
UC-03	UB-03	Foundation Soils	43.5	-1.3	124	2.6	1.5	45.8	0.655	0.8	0	0.2	45.8	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.136	0.646	18.4	62.3	0.068
UC-03	UB-03	Foundation Soils	43.6	-1.4	124	2.6	1.5	44.2	0.661	0.8	0	0.3	44.2	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.136	0.638	19.8	59.7	0.065
UC-03	UB-03	Foundation Soils	43.6	-1.5	124	2.6	1.5	40.3	0.677	0.8	0	0.3	40.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.084	0.136	0.619	28.7	61.4	0.067
UC-03	UB-03	Foundation Soils	43.7	-1.6	121	2.6	1.5	33.2	0.710	0.8	0	0.5	33.2	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.136	0.586	27.8	61.1	0.066
UC-03	UB-03	Foundation Soils	43.8	-1.6	121	2.6	1.5	33.7	0.708	0.8	0	0.5	33.7	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.136	0.588	25.4	61.7	0.067
UC-03	UB-03	Foundation Soils	43.9	-1.7	121	2.6	1.5	36.8	0.693	0.8	0	0.4	36.8	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.136	0.603	19.8	60.9	0.066

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-03	UB-03	Foundation Soils	44.0	-1.8	124	2.7	1.5	41.5	0.672	0.8	0	0.4	41.5	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.136	0.625	10.3	63.6	0.069
UC-03	UB-03	Foundation Soils	44.0	-1.9	124	2.7	1.5	53.3	0.627	0.8	0	0.0	53.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.136	0.684	6.0	74.6	0.083
UC-03	UB-03	Foundation Soils	44.1	-2.0	124	2.7	1.5	68.6	0.578	0.8	0	0.0	68.6	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.136	0.766	6.0	84.4	0.096
UC-03	UB-03	Foundation Soils	44.2	-2.0	124	2.7	1.5	78.5	0.550	0.8	0	0.0	78.5	1.0	-1.0	0.1	0.8	0.114	1.012	0.112	0.136	0.826	6.0	85.9	0.098
UC-03	UB-03	Foundation Soils	44.3	-2.1	124	2.7	1.5	79.9	0.547	0.8	0	0.0	79.9	1.0	-1.0	0.1	0.8	0.116	1.012	0.114	0.136	0.835	6.0	81.4	0.092
UC-03	UB-03	Foundation Soils	44.4	-2.2	124	2.7	1.5	75.4	0.559	0.8	0	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.110	0.136	0.807	6.0	78.6	0.088
UC-03	UB-03	Foundation Soils	44.5	-2.3	124	2.7	1.5	72.6	0.566	0.8	0	0.0	72.6	1.0	-1.0	0.1	0.8	0.109	1.011	0.107	0.136	0.790	6.0	77.8	0.087
UC-03	UB-03	Foundation Soils	44.5	-2.4	124	2.7	1.5	71.8	0.568	0.8	0	0.0	71.8	1.0	-1.0	0.1	0.8	0.109	1.010	0.107	0.136	0.786	6.0	73.9	0.082
UC-03	UB-03	Foundation Soils	44.6	-2.5	124	2.7	1.5	67.9	0.580	0.8	0	0.0	67.9	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.136	0.763	6.0	70.8	0.078
UC-03	UB-03	Foundation Soils	44.7	-2.5	119	2.7	1.5	64.8	0.589	0.8	0	0.0	64.8	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.136	0.746	6.0	67.1	0.074
UC-03	UB-03	Foundation Soils	44.8	-2.6	119	2.7	1.5	61.1	0.601	0.8	0	0.0	61.1	1.0	-1.0	0.1	0.8	0.100	1.009	0.099	0.136	0.726	6.0	66.0	0.072
UC-03	UB-03	Foundation Soils	44.9	-2.7	119	2.7	1.5	60.0	0.604	0.8	0	0.0	60.0	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.136	0.720	6.0	65.6	0.072
UC-03	UB-03	Foundation Soils	44.9	-2.8	119	2.7	1.5	59.6	0.605	0.8	0	0.0	59.6	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.136	0.718	11.3	68.7	0.075
UC-03	UB-03	Foundation Soils	45.0	-2.9	119	2.7	1.5	57.4	0.613	0.8	0	0.0	57.4	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.136	0.707	6.0	61.9	0.067
UC-03	UB-03	Foundation Soils	45.1	-2.9	119	2.7	1.5	55.9	0.618	0.8	0	0.0	55.9	1.0	-1.0	0.1	0.8	0.097	1.008	0.095	0.136	0.699	7.0	59.1	0.064
UC-03	UB-03	Foundation Soils	45.2	-3.0	124	2.7	1.5	52.1	0.631	0.8	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.136	0.679	10.6	55.8	0.060
UC-03	UB-03	Foundation Soils	45.3	-3.1	124	2.7	1.5	45.2	0.657	0.8	0	0.0	45.2	1.0	-1.0	0.1	0.8	0.089	1.007	0.087	0.136	0.645	15.4	54.6	0.059
UC-03	UB-03	Foundation Soils	45.4	-3.2	124	2.7	1.5	39.4	0.681	0.8	0	0.2	39.4	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.135	0.617	22.7	58.4	0.063
UC-03	UB-03	Foundation Soils	45.4	-3.3	124	2.7	1.5	36.1	0.696	0.8	0	0.4	36.1	1.0	-1.0	0.1	0.8	0.083	1.007	0.081	0.135	0.602	18.6	54.7	0.059
UC-03	UB-03	Foundation Soils	45.5	-3.4	124	2.7	1.5	36.4	0.695	0.8	0	0.3	36.4	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.135	0.603	12.1	53.7	0.058
UC-03	UB-03	Foundation Soils	45.6	-3.4	124	2.8	1.5	41.7	0.671	0.8	0	0.1	41.7	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.135	0.629	13.6	55.6	0.060
UC-03	UB-03	Foundation Soils	45.7	-3.5	124	2.8	1.5	42.1	0.670	0.8	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.135	0.631	23.9	63.6	0.069
UC-03	UB-03	Foundation Soils	45.8	-3.6	121	2.8	1.5	40.1	0.678	0.8	0	0.4	40.1	1.0	-1.1	0.1	0.8	0.085	1.007	0.084	0.135	0.621	27.7	66.4	0.073
UC-03	UB-03	Foundation Soils	45.8	-3.7	121	2.8	1.5	39.2	0.682	0.8	0	0.5	39.2	1.0	-1.1	0.1	0.8	0.085	1.007	0.083	0.135	0.617	31.6	72.9	0.081
UC-03	UB-03	Foundation Soils	45.9	-3.8	121	2.8	1.5	41.8	0.671	0.8	0	0.5	41.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.135	0.629	19.8	75.5	0.084
UC-03	UB-03	Foundation Soils	46.0	-3.9	124	2.8	1.5	56.0	0.617	0.8	0	0.4	56.0	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.135	0.701	15.5	71.5	0.079
UC-03	UB-03	Foundation Soils	46.1	-3.9	124	2.8	1.5	56.3	0.616	0.8	0	0.2	56.3	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.135	0.702	23.9	64.3	0.070
UC-03	UB-03	Foundation Soils	46.2	-4.0	121	2.8	1.5	40.8	0.675	0.8	0	0.4	40.8	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.135	0.625	24.0	58.9	0.064
UC-03	UB-03	Foundation Soils	46.3	-4.1	121	2.8	1.5	35.3	0.700	0.8	0	0.4	35.3	1.0	-1.1	0.1	0.8	0.082	1.007	0.081	0.135	0.599	13.2	54.5	0.058
UC-03	UB-03	Foundation Soils	46.3	-4.2	124	2.8	1.5	41.4	0.673	0.8	0	0.1	41.4	1.0	-1.1	0.1	0.8	0.086	1.007	0.085	0.135	0.628	6.9	59.1	0.064
UC-03	UB-03	Foundation Soils	46.4	-4.3	124	2.8	1.5	52.2	0.631	0.8	0	0.0	52.2	1.0	-1.1	0.1	0.8	0.094	1.008	0.092	0.135	0.682	9.5	57.8	0.062
UC-03	UB-03	Foundation Soils	46.5	-4.3	124	2.8	1.5	48.4	0.645	0.8	0	0.0	48.4	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.135	0.663	11.7	53.8	0.058
UC-03	UB-03	Foundation Soils	46.6	-4.4	124	2.8	1.5	42.1	0.669	0.8	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.135	0.632	15.1	51.9	0.056
UC-03	UB-03	Foundation Soils	46.7	-4.5	124	2.8	1.5	37.0	0.692	0.8	0	0.2	37.0	1.0	-1.1	0.1	0.8	0.083	1.007	0.082	0.135	0.608	13.7	54.3	0.058
UC-03	UB-03	Foundation Soils	46.8	-4.6	124	2.8	1.6	40.7	0.675	0.8	0	0.1	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.135	0.626	6.0	63.2	0.069
UC-03	UB-03	Foundation Soils	46.8	-4.7	124	2.8	1.6	57.2	0.613	0.8	0	0.0	57.2	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.135	0.708	6.0	71.0	0.078
UC-03	UB-03	Foundation Soils	46.9	-4.8	124	2.8	1.6	65.0	0.589	0.8	0	0.0	65.0	1.0	-1.1	0.1	0.8	0.103	1.009	0.101	0.135	0.750	6.0	75.9	0.085
UC-03	UB-03	Foundation Soils	47.0	-4.8	124	2.8	1.6	69.9	0.574	0.8	0	0.0	69.9	1.0	-1.1	0.1	0.8	0.107	1.010	0.105	0.135	0.778	6.0	79.8	0.090
UC-03	UB-03	Foundation Soils	47.1	-4.9	124	2.8	1.6	73.8	0.563	0.8	0	0.0	73.8	1.0	-1.1	0.1	0.8	0.110	1.011	0.108	0.135	0.801	6.0	83.9	0.096
UC-03	UB-03	Foundation Soils	47.2	-5.0	124	2.8	1.6	77.9	0.552	0.8	0	0.0	77.9	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.135	0.827	6.0	93.9	0.110
UC-03	UB-03	Foundation Soils	47.2	-5.1	124	2.9	1.6	87.9	0.526	0.8	0	0.0	87.9	1.0	-1.1	0.1	0.8	0.123	1.014	0.120	0.134	0.895	6.0	99.4	0.118
UC-03	UB-03	Foundation Soils	47.3	-5.2	124	2.9	1.6	93.4	0.513	0.8	0	0.0	93.4	1.0	-1.1	0.1	0.8	0.129	1.016	0.126	0.134	0.938	6.0	105.1	0.128
UC-03	UB-03	Foundation Soils	47.4	-5.2	124	2.9	1.6	99.1	0.500	0.8	0	0.0	99.1	1.0	-1.1	0.1	0.8	0.136	1.017	0.133	0.134	0.988	6.0	107.1	0.131
UC-03	UB-03	Foundation Soils	47.5	-5.3	124	2.9	1.6	101.1	0.496	0.8	0	0.0	101.1	1.0	-1.1	0.1	0.8	0.139	1.018	0.135	0.134	1.007	6.0	95.3	
UC-03	UB-03	Foundation Soils	47.6	-5.4	124	2.9	1.6	89.3	0.523	0.8	0	0.0	89.3	1.0	-1.1	0.1	0.8	0.125	1.014	0.122	0.134	0.907	6.0	94.9	0.111
UC-03	UB-03	Foundation Soils	47.7	-5.5	124	2.9	1.6	88.9	0.524	0.8	0	0.0	88.9	1.0	-1.1	0.1	0.8	0.124	1.014	0.121	0.134	0.904	6.0	88.6	0.102
UC-03	UB-03	Foundation Soils	47.7	-5.6	119	2.9	1.6	82.6	0.540	0.8	0	0.0	82.6	1.0	-1.1	0.1	0.8	0.118	1.013	0.115	0.134	0.858	7.4	91.1	0.106
UC-03	UB-03	Foundation Soils	47.8	-5.7	119	2.9	1.6	83.7	0.537	0.8	0	0.0	83.7	1.0	-1.1	0.1	0.8	0.119	1.013	0.116	0.134	0.866	8.3	84.4	0.096
UC-03	UB-03	Foundation Soils	47.9	-5.7	119	2.9	1.6	76.1	0.557	0.8	0	0.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.110	0.134	0.816	6.0	74.0	0.082
UC-03	UB-03	Foundation Soils	48.0	-5.8	124	2.9	1.6	68.0	0.579	0.8	0	0.0	68.0	1.0	-1.1	0.1	0.8	0.106	1.010	0.103	0.134	0.769	6.0	64.7	0.071
UC-03	UB-03	Foundation Soils	48.1	-5.9	119	2.9	1.6	58.7	0.608	0.8	0	0.0	58.7	1.0	-1.1	0.1	0.8	0.099	1.008	0.096	0.134	0.718	8.6	56.8	0.061
UC-03	UB-03	Foundation Soils	48.1	-6.0	124	2.9	1.6	48.2	0.645	0.8	0	0.0	48.2	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.134	0.665	10.1	55.5	0.060
UC-03	UB-03	Foundation Soils	48.2	-6.1	119	2.9	1.6	45.4	0.656	0.8	0	0.0	45.4	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.134	0.651	11.5	54.2	0.058
UC-03	UB-03	Foundation Soils	48.3	-6.1	124	2.9	1.6	42.8	0.667	0.8	0	0.0	42.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.134	0.638	13.2	53.4	0.057
UC-03	UB-03	Foundation Soils	48.4	-6.2	124	2.9	1.6	40.3	0.677	0.8	0	0.1	40.3	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.134	0.626	20.2	60.5	0.065
UC-03	UB-03	Foundation Soils	48.5	-6.3	124	2.9	1.6	40.7	0.676	0.8	0	0.4	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.134	0.628	19.8	64.3	0.070
UC-03	UB-03	Foundation Soils	48.6	-6.4	124	2.9	1.6	44.9	0.658	0.8	0	0.4	44.9	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.134	0.649	14.3	64.7	0.071
UC-03	UB-03	Foundation Soils	48.6	-6.5	124	2.9	1.6	50.5	0.637	0.8	0	0.2	50.5	1.0	-1.1	0.1	0.8	0.093	1.008	0.091	0.134	0.677	8.6	66.5	0.073
UC-03	UB-03	Foundation Soils	48.7	-6.6	124	2.9	1.6	57.9	0.611	0.8	0	0.0	57.9	1.0	-1.1	0.1	0.8	0.098	1.008	0.096	0.134	0.715	6.0	77.5	0.087
UC-03	UB-03	Foundation Soils	48.8	-6.6	124	3.0	1.6	71.6	0.569	0.8	0	0.0	71.6	1.0	-1.1	0.1	0.8	0.109	1.010	0.106	0.134	0.791	6.0	93.0	0.109
UC-03	UB-03	Foundation Soils	48.9	-6.7	124	3.0	1.6	87.0	0.529	0.8	0	0.0	87.0	1.0	-1.1	0.1	0.8	0.122	1.014	0.119	0.134	0.891	6.0	93.1	0.109
UC-03	UB-03	Foundation Soils	49.0	-6.8	124	3.0	1.6	87.1	0.528	0.8	0	0.0	87.1	1.0	-1.1	0.1	0.8	0.123	1.014	0.119	0.134	0.892	6.0	89.3	0.103
UC-03	UB-03	Foundation Soils	49.0	-6.9	124	3.0	1.6	83.3	0.538	0.8	0	0.0	83.3	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.134	0.866	6.0	86.0	0.098
UC-03	UB-03	Foundation Soils	49.1	-7.0	119	3.0	1.6	80.0	0.546	0.8	0	0.0	80.0	1.0	-1.2	0.1	0.8	0.116	1.012	0.113	0.133	0.844	6.0	91.3	0.106
UC-03	UB-03	Foundation Soils	49.2	-7.0	124	3.0	1.6	85.3	0.533	0.8	0	0.0	85.3	1.0	-1.2	0.1	0.8	0.121	1.013	0.117	0.133	0.880	6.0	83.5	0.095
UC-03	UB-03	Foundation Soils	49.3	-7.1	124	3.0	1.6	77.5	0.553	0.8	0	0.0	77.5	1.0	-1.2	0.1	0.8	0.114	1.012	0.111	0.133	0.828	6.0	90.6	0.105
UC-03	UB-03	Foundation Soils	49.4	-7.2	124	3.0	1.6	84.6	0.534	0.8	0	0.0	84.6	1.0	-1.2	0.1	0.8	0.120	1.013	0.117	0.133	0.875	6.0	89.4	0.103

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-03	UB-03	Foundation Soils	49.5	-7.3	124	3.0	1.6	83.4	0.537	0.8	0	0.0	83.4	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.133	0.867	6.0	92.6	0.108
UC-03	UB-03	Foundation Soils	49.5	-7.4	124	3.0	1.6	86.7	0.529	0.8	0	0.0	86.7	1.0	-1.2	0.1	0.8	0.122	1.014	0.119	0.133	0.890	6.0	93.9	0.110
UC-03	UB-03	Foundation Soils	49.6	-7.5	124	3.0	1.6	87.9	0.526	0.8	0	0.0	87.9	1.0	-1.2	0.1	0.8	0.123	1.014	0.120	0.133	0.900	6.0	95.1	0.112
UC-03	UB-03	Foundation Soils	49.7	-7.5	124	3.0	1.6	89.1	0.523	0.8	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.133	0.909	6.0	95.1	0.112
UC-03	UB-03	Foundation Soils	49.8	-7.6	124	3.0	1.6	89.1	0.523	0.8	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.133	0.909	6.0	94.9	0.111
UC-03	UB-03	Foundation Soils	49.9	-7.7	119	3.0	1.6	88.9	0.524	0.8	0	0.0	88.9	1.0	-1.2	0.1	0.8	0.124	1.014	0.121	0.133	0.908	6.0	83.4	0.095
UC-03	UB-03	Foundation Soils	50.0	-7.8	124	3.0	1.6	77.4	0.553	0.8	0	0.0	77.4	1.0	-1.2	0.1	0.8	0.113	1.012	0.110	0.133	0.829	6.0	74.5	0.083
UC-03	UB-03	Foundation Soils	50.0	-7.9	124	3.0	1.7	68.5	0.578	0.8	0	0.0	68.5	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.133	0.776	6.0	68.5	0.075
UC-03	UB-03	Foundation Soils	50.1	-8.0	124	3.0	1.7	62.5	0.596	0.8	0	0.0	62.5	1.0	-1.2	0.1	0.8	0.101	1.009	0.099	0.133	0.742	10.6	65.4	0.071
UC-03	UB-03	Foundation Soils	50.2	-8.0	124	3.0	1.7	54.8	0.622	0.8	0	0.0	54.8	1.0	-1.2	0.1	0.8	0.096	1.008	0.093	0.133	0.702	8.6	69.3	0.076
UC-03	UB-03	Foundation Soils	50.3	-8.1	124	3.0	1.7	60.7	0.602	0.8	0	0.0	60.7	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.133	0.733	6.0	73.0	0.081
UC-03	UB-03	Foundation Soils	50.4	-8.2	124	3.0	1.7	67.0	0.582	0.8	0	0.0	67.0	1.0	-1.2	0.1	0.8	0.105	1.010	0.102	0.133	0.768	12.9	63.7	0.069
UC-03	UB-03	Foundation Soils	50.4	-8.3	124	3.1	1.7	51.0	0.635	0.8	0	0.1	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.133	0.683	11.6	57.2	0.062
UC-03	UB-03	Foundation Soils	50.5	-8.4	124	3.1	1.7	45.7	0.655	0.7	0	0.1	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.133	0.657	14.8	57.2	0.062
UC-03	UB-03	Foundation Soils	50.6	-8.4	124	3.1	1.7	42.6	0.668	0.7	0	0.2	42.6	1.0	-1.2	0.1	0.8	0.087	1.007	0.085	0.133	0.642	18.9	66.3	0.073
UC-03	UB-03	Foundation Soils	50.7	-8.5	124	3.1	1.7	47.7	0.647	0.7	0	0.3	47.7	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.133	0.667	16.6	69.8	0.077
UC-03	UB-03	Foundation Soils	50.8	-8.6	124	3.1	1.7	53.5	0.626	0.8	0	0.3	53.5	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.133	0.696	12.9	66.4	0.073
UC-03	UB-03	Foundation Soils	50.9	-8.7	124	3.1	1.7	53.6	0.626	0.8	0	0.1	53.6	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.133	0.697	11.7	63.3	0.069
UC-03	UB-03	Foundation Soils	50.9	-8.8	124	3.1	1.7	51.7	0.633	0.7	0	0.1	51.7	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.132	0.687	7.1	63.3	0.069
UC-03	UB-03	Foundation Soils	51.0	-8.9	124	3.1	1.7	56.2	0.617	0.8	0	0.0	56.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.132	0.711	6.0	70.2	0.077
UC-03	UB-03	Foundation Soils	51.1	-8.9	124	3.1	1.7	64.2	0.591	0.8	0	0.0	64.2	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.132	0.754	6.0	70.7	0.078
UC-03	UB-03	Foundation Soils	51.2	-9.0	124	3.1	1.7	64.7	0.589	0.8	0	0.0	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.132	0.757	6.0	65.9	0.072
UC-03	UB-03	Foundation Soils	51.3	-9.1	124	3.1	1.7	60.0	0.604	0.8	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.099	1.009	0.097	0.132	0.731	8.7	67.5	0.074
UC-03	UB-03	Foundation Soils	51.3	-9.2	124	3.1	1.7	58.8	0.608	0.8	0	0.0	58.8	1.0	-1.2	0.1	0.8	0.099	1.008	0.096	0.132	0.726	8.2	68.2	0.075
UC-03	UB-03	Foundation Soils	51.4	-9.3	124	3.1	1.7	60.0	0.604	0.8	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.132	0.732	6.0	68.3	0.075
UC-03	UB-03	Foundation Soils	51.5	-9.3	124	3.1	1.7	62.3	0.597	0.8	0	0.0	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.132	0.744	8.9	58.5	0.063
UC-03	UB-03	Foundation Soils	51.6	-9.4	124	3.1	1.7	49.6	0.640	0.7	0	0.0	49.6	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.132	0.678	8.9	56.4	0.061
UC-03	UB-03	Foundation Soils	51.7	-9.5	124	3.1	1.7	47.6	0.648	0.7	0	0.0	47.6	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.132	0.668	13.3	57.7	0.062
UC-03	UB-03	Foundation Soils	51.8	-9.6	124	3.1	1.7	44.5	0.660	0.7	0	0.1	44.5	1.0	-1.2	0.1	0.8	0.088	1.007	0.086	0.132	0.653	10.3	56.0	0.060
UC-03	UB-03	Foundation Soils	51.8	-9.7	124	3.1	1.7	45.7	0.655	0.7	0	0.0	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.132	0.659	10.0	59.8	0.065
UC-03	UB-03	Foundation Soils	51.9	-9.8	124	3.1	1.7	49.8	0.639	0.7	0	0.0	49.8	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.132	0.680	13.6	62.5	0.068
UC-03	UB-03	Foundation Soils	52.0	-9.8	124	3.1	1.7	49.0	0.642	0.7	0	0.1	49.0	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.132	0.676	11.6	60.5	0.065
UC-03	UB-03	Foundation Soils	52.1	-9.9	124	3.2	1.7	48.9	0.643	0.7	0	0.1	48.9	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.132	0.676	8.8	55.9	0.060
UC-03	UB-03	Foundation Soils	52.2	-10.0	124	3.2	1.7	47.1	0.649	0.7	0	0.0	47.1	1.0	-1.2	0.1	0.8	0.090	1.007	0.088	0.132	0.667	9.8	54.8	0.059
UC-03	UB-03	Foundation Soils	52.2	-10.1	124	3.2	1.7	45.0	0.658	0.7	0	0.0	45.0	1.0	-1.2	0.1	0.8	0.089	1.007	0.086	0.132	0.657	7.8	57.4	0.062
UC-03	UB-03	Foundation Soils	52.3	-10.2	124	3.2	1.7	49.5	0.640	0.7	0	0.0	49.5	1.0	-1.2	0.1	0.8	0.092	1.008	0.089	0.132	0.680	7.4	57.6	0.062
UC-03	UB-03	Foundation Soils	52.4	-10.2	124	3.2	1.7	50.1	0.638	0.7	0	0.0	50.1	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.132	0.683	7.5	57.8	0.062
UC-03	UB-03	Foundation Soils	52.5	-10.3	119	3.2	1.7	50.3	0.637	0.7	0	0.0	50.3	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.132	0.684	11.4	63.6	0.069
UC-03	UB-03	Foundation Soils	52.6	-10.4	119	3.2	1.7	52.3	0.630	0.7	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.132	0.694	12.1	61.7	0.067
UC-03	UB-03	Foundation Soils	52.7	-10.5	119	3.2	1.7	49.7	0.640	0.7	0	0.1	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.090	0.131	0.681	13.2	53.3	0.057
UC-03	UB-03	Foundation Soils	52.7	-10.6	119	3.2	1.7	40.2	0.678	0.7	0	0.1	40.2	1.0	-1.3	0.1	0.8	0.086	1.007	0.083	0.131	0.634	17.5	54.8	0.059
UC-03	UB-03	Foundation Soils	52.8	-10.7	119	3.2	1.7	37.5	0.690	0.7	0	0.3	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.131	0.622	14.8	50.9	0.054
UC-03	UB-03	Foundation Soils	52.9	-10.7	124	3.2	1.7	36.3	0.695	0.7	0	0.2	36.3	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.131	0.616	17.8	51.6	0.055
UC-03	UB-03	Foundation Soils	53.0	-10.8	124	3.2	1.7	34.1	0.706	0.7	0	0.3	34.1	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.131	0.605	19.0	53.1	0.057
UC-03	UB-03	Foundation Soils	53.1	-10.9	124	3.2	1.7	34.4	0.704	0.7	0	0.3	34.4	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.131	0.607	16.4	53.6	0.057
UC-03	UB-03	Foundation Soils	53.1	-11.0	124	3.2	1.7	37.5	0.690	0.7	0	0.2	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.131	0.622	10.6	53.8	0.058
UC-03	UB-03	Foundation Soils	53.2	-11.1	124	3.2	1.7	43.2	0.665	0.7	0	0.0	43.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.085	0.131	0.650	10.6	56.8	0.061
UC-03	UB-03	Foundation Soils	53.3	-11.2	124	3.2	1.8	46.3	0.653	0.7	0	0.0	46.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.131	0.665	12.2	57.3	0.062
UC-03	UB-03	Foundation Soils	53.4	-11.2	124	3.2	1.8	45.2	0.657	0.7	0	0.1	45.2	1.0	-1.3	0.1	0.8	0.089	1.007	0.087	0.131	0.660	12.6	59.8	0.065
UC-03	UB-03	Foundation Soils	53.5	-11.3	124	3.2	1.8	47.3	0.649	0.7	0	0.1	47.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.131	0.671	9.6	56.4	0.061
UC-03	UB-03	Foundation Soils	53.6	-11.4	124	3.2	1.8	46.8	0.651	0.7	0	0.0	46.8	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.131	0.669	6.3	60.0	0.065
UC-03	UB-03	Foundation Soils	53.6	-11.5	124	3.2	1.8	53.7	0.625	0.7	0	0.0	53.7	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.131	0.704	6.0	67.9	0.074
UC-03	UB-03	Foundation Soils	53.7	-11.6	124	3.3	1.8	61.9	0.598	0.7	0	0.0	61.9	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.131	0.747	6.0	67.6	0.074
UC-03	UB-03	Foundation Soils	53.8	-11.6	124	3.3	1.8	61.6	0.599	0.7	0	0.0	61.6	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.131	0.746	6.6	66.3	0.073
UC-03	UB-03	Foundation Soils	53.9	-11.7	124	3.3	1.8	59.7	0.605	0.7	0	0.0	59.7	1.0	-1.3	0.1	0.8	0.099	1.009	0.096	0.131	0.736	10.4	66.5	0.073
UC-03	UB-03	Foundation Soils	54.0	-11.8	124	3.3	1.8	56.2	0.617	0.7	0	0.0	56.2	1.0	-1.3	0.1	0.8	0.097	1.008	0.094	0.131	0.717	8.9	62.5	0.068
UC-03	UB-03	Foundation Soils	54.1	-11.9	124	3.3	1.8	53.6	0.626	0.7	0	0.0	53.6	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.131	0.704	10.6	62.9	0.068
UC-03	UB-03	Foundation Soils	54.1	-12.0	124	3.3	1.8	52.3	0.630	0.7	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.131	0.697	12.1	59.7	0.064
UC-03	UB-03	Foundation Soils	54.2	-12.1	124	3.3	1.8	47.7	0.647	0.7	0	0.1	47.7	1.0	-1.3	0.1	0.8	0.091	1.007	0.088	0.131	0.674	12.8	58.7	0.063
UC-03	UB-03	Foundation Soils	54.3	-12.1	124	3.3	1.8	46.0	0.654	0.7	0	0.1	46.0	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.130	0.666	8.3	56.8	0.061
UC-03	UB-03	Foundation Soils	54.4	-12.2	124	3.3	1.8	48.5	0.644	0.7	0	0.0	48.5	1.0	-1.3	0.1	0.8	0.091	1.007	0.089	0.130	0.679	6.0	60.9	0.066
UC-03	UB-03	Foundation Soils	54.5	-12.3	124	3.3	1.8	54.9	0.621	0.7	0	0.0	54.9	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.130	0.712	7.4	58.3	0.063
UC-03	UB-03	Foundation Soils	54.5	-12.4	119	3.3	1.8	50.8	0.636	0.7	0	0.0	50.8	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.130	0.691	12.7	54.2	0.058
UC-03	UB-03	Foundation Soils	54.6	-12.5	124	3.3	1.8	41.6	0.672	0.7	0	0.1	41.6	1.0	-1.3	0.1	0.8	0.086	1.007	0.084	0.130	0.645	20.9	57.1	0.061
UC-03	UB-03	Foundation Soils	54.7	-12.5	124	3.3	1.8	36.5	0.694	0.7	0	0.4	36.5	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.130	0.621	22.2	55.6	0.060
UC-03	UB-03	Foundation Soils	54.8	-12.6	121	3.3	1.8	33.8	0.707	0.7	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.130	0.608	18.1	49.5	0.053
UC-03	UB-03	Foundation Soils	54.9	-12.7	124	3.3	1.8	31.7	0.718	0.7	0	0.3	31.7	1.0	-1.3	0.1	0.8	0.080	1.006	0.078	0.130	0.598	17.6	49.8	0.053

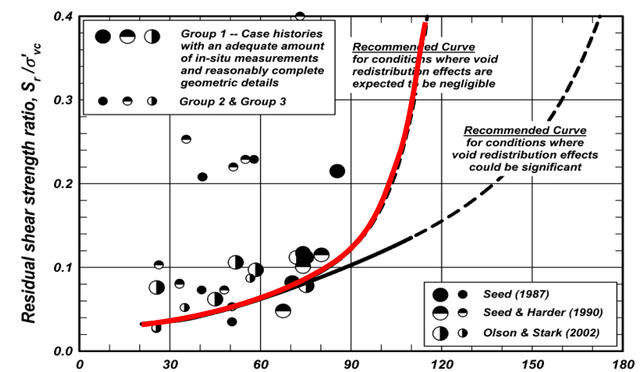
CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1
UC-03	UB-03	Foundation Soils	55.0	-12.8	119	3.3	1.8	32.5	0.714	0.7	0	0.3	32.5	1.0	-1.3	0.1	0.8	0.080	1.007	0.078	0.130	0.602	16.5	54.8	0.059
UC-03	UB-03	Foundation Soils	55.0	-12.9	119	3.3	1.8	38.6	0.685	0.7	0	0.3	38.6	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.130	0.631	13.4	57.4	0.062
UC-03	UB-03	Foundation Soils	55.1	-13.0	119	3.3	1.8	44.2	0.661	0.7	0	0.1	44.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.086	0.130	0.659	14.7	50.3	0.054
UC-03	UB-03	Foundation Soils	55.2	-13.0	124	3.3	1.8	35.7	0.698	0.7	0	0.2	35.7	1.0	-1.3	0.1	0.8	0.083	1.007	0.080	0.130	0.618	20.6	54.1	0.058
UC-03	UB-03	Foundation Soils	55.3	-13.1	124	3.4	1.8	33.8	0.707	0.7	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.130	0.609	18.5	48.6	0.052
UC-03	UB-03	Foundation Soils	55.4	-13.2	124	3.4	1.8	30.4	0.725	0.7	0	0.3	30.4	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.130	0.593	22.5	49.9	0.053
UC-03	UB-03	Foundation Soils	55.4	-13.3	119	3.4	1.8	27.7	0.739	0.7	0	0.4	27.7	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.130	0.581	18.8	49.3	0.053
UC-03	UB-03	Foundation Soils	55.5	-13.4	119	3.4	1.8	30.8	0.723	0.7	0	0.3	30.8	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.130	0.595	15.8	50.8	0.054
UC-03	UB-03	Foundation Soils	55.6	-13.4	124	3.4	1.8	35.2	0.700	0.7	0	0.2	35.2	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.130	0.616	19.4	50.2	0.054
UC-03	UB-03	Foundation Soils	55.7	-13.5	124	3.4	1.8	31.1	0.721	0.7	0	0.3	31.1	1.0	-1.3	0.1	0.8	0.080	1.006	0.077	0.130	0.597	23.4	51.0	0.054
UC-03	UB-03	Foundation Soils	55.8	-13.6	121	3.4	1.8	28.0	0.738	0.7	0	0.4	28.0	1.0	-1.3	0.1	0.8	0.078	1.006	0.076	0.130	0.583	30.9	57.6	0.062
UC-03	UB-03	Foundation Soils	55.9	-13.7	121	3.4	1.8	27.1	0.743	0.7	0	0.5	27.1	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.130	0.579	24.9	54.3	0.058
UC-03	UB-03	Foundation Soils	55.9	-13.8	121	3.4	1.8	29.9	0.727	0.7	0	0.4	29.9	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.130	0.592	24.7	59.0	0.064
UC-03	UB-03	Foundation Soils	56.0	-13.9	121	3.4	1.8	34.7	0.703	0.7	0	0.4	34.7	1.0	-1.4	0.1	0.8	0.082	1.007	0.080	0.130	0.615	24.2	67.3	0.074
UC-03	UB-03	Foundation Soils	56.1	-13.9	121	3.4	1.8	43.5	0.664	0.7	0	0.4	43.5	1.0	-1.4	0.1	0.8	0.088	1.007	0.085	0.129	0.658	20.7	77.9	0.087
UC-03	UB-03	Foundation Soils	56.2	-14.0	124	3.4	1.8	57.6	0.612	0.7	0	0.4	57.6	1.0	-1.4	0.1	0.8	0.098	1.008	0.094	0.129	0.730	24.0	81.8	0.093
UC-03	UB-03	Foundation Soils	56.3	-14.1	121	3.4	1.8	58.3	0.610	0.7	0	0.5	58.3	1.0	-1.4	0.1	0.8	0.098	1.008	0.095	0.129	0.734	11.1	86.0	0.098
UC-03	UB-03	Foundation Soils	56.3	-14.2	124	3.4	1.8	74.9	0.560	0.7	0	0.0	74.9	1.0	-1.4	0.1	0.8	0.111	1.011	0.107	0.129	0.828	6.0	80.3	0.091
UC-03	UB-03	Foundation Soils	56.4	-14.3	124	3.4	1.8	74.3	0.561	0.7	0	0.0	74.3	1.0	-1.4	0.2	0.8	0.111	1.011	0.107	0.129	0.825	6.0	89.7	0.104
UC-03	UB-03	Foundation Soils	56.5	-14.3	124	3.4	1.8	83.7	0.537	0.7	0	0.0	83.7	0.9	-1.4	0.2	0.8	0.119	1.013	0.114	0.129	0.886	6.0	96.0	0.113
UC-03	UB-03	Foundation Soils	56.6	-14.4	124	3.4	1.9	90.0	0.521	0.7	0	0.0	90.0	0.9	-1.4	0.2	0.8	0.126	1.015	0.120	0.129	0.933	6.0	88.9	0.103
UC-03	UB-03	Foundation Soils	56.7	-14.5	124	3.4	1.9	82.9	0.539	0.7	0	0.0	82.9	0.9	-1.4	0.2	0.8	0.118	1.013	0.114	0.129	0.881	8.0	81.2	0.092
UC-03	UB-03	Foundation Soils	56.8	-14.6	124	3.4	1.9	73.2	0.564	0.7	0	0.0	73.2	1.0	-1.4	0.2	0.8	0.110	1.011	0.106	0.129	0.819	15.9	75.1	0.084
UC-03	UB-03	Foundation Soils	56.8	-14.7	124	3.4	1.9	59.4	0.606	0.7	0	0.2	59.4	1.0	-1.4	0.2	0.8	0.099	1.009	0.096	0.129	0.741	13.6	59.0	0.064
UC-03	UB-03	Foundation Soils	56.9	-14.8	124	3.5	1.9	45.5	0.656	0.7	0	0.1	45.5	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.129	0.670	13.9	52.5	0.056
UC-03	UB-03	Foundation Soils	57.0	-14.8	124	3.5	1.9	38.7	0.684	0.7	0	0.1	38.7	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.129	0.636	14.8	52.0	0.056
UC-03	UB-03	Foundation Soils	57.1	-14.9	124	3.5	1.9	37.4	0.690	0.7	0	0.2	37.4	1.0	-1.4	0.2	0.8	0.084	1.007	0.081	0.129	0.630	13.3	52.4	0.056
UC-03	UB-03	Foundation Soils	57.2	-15.0	124	3.5	1.9	39.2	0.682	0.7	0	0.1	39.2	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.129	0.639	17.7	52.0	0.056
UC-03	UB-03	Foundation Soils	57.2	-15.1	124	3.5	1.9	34.6	0.704	0.7	0	0.3	34.6	1.0	-1.4	0.2	0.8	0.082	1.007	0.079	0.129	0.617	22.8	56.2	0.060
UC-03	UB-03	Foundation Soils	57.3	-15.2	121	3.5	1.9	33.8	0.707	0.7	0	0.4	33.8	1.0	-1.4	0.2	0.8	0.081	1.007	0.079	0.129	0.613	11.6	62.6	0.068
UC-03	UB-03	Foundation Soils	57.4	-15.3	124	3.5	1.9	51.0	0.635	0.7	0	0.1	51.0	1.0	-1.4	0.2	0.8	0.093	1.008	0.090	0.129	0.699	9.0	69.1	0.076
UC-03	UB-03	Foundation Soils	57.5	-15.3	124	3.5	1.9	60.2	0.604	0.7	0	0.0	60.2	1.0	-1.4	0.2	0.8	0.100	1.009	0.096	0.129	0.747	7.5	77.6	0.087
UC-03	UB-03	Foundation Soils	57.6	-15.4	124	3.5	1.9	70.1	0.573	0.7	0	0.0	70.1	1.0	-1.4	0.2	0.8	0.107	1.010	0.103	0.129	0.803	7.4	78.1	0.088
UC-03	UB-03	Foundation Soils	57.7	-15.5	124	3.5	1.9	70.7	0.572	0.7	0	0.0	70.7	1.0	-1.4	0.2	0.8	0.108	1.010	0.104	0.129	0.806	10.4	69.6	0.077
UC-03	UB-03	Foundation Soils	57.7	-15.6	124	3.5	1.9	59.2	0.607	0.7	0	0.0	59.2	1.0	-1.4	0.2	0.8	0.099	1.009	0.095	0.128	0.742	13.0	64.9	0.071
UC-03	UB-03	Foundation Soils	57.8	-15.7	124	3.5	1.9	52.0	0.631	0.7	0	0.1	52.0	1.0	-1.4	0.2	0.8	0.094	1.008	0.091	0.128	0.705	9.0	57.7	0.062
UC-03	UB-03	Foundation Soils	57.9	-15.7	124	3.5	1.9	48.7	0.643	0.7	0	0.0	48.7	1.0	-1.4	0.2	0.8	0.091	1.007	0.088	0.128	0.688	6.0	60.2	0.065
UC-03	UB-03	Foundation Soils	58.0	-15.8	124	3.5	1.9	54.2	0.623	0.7	0	0.0	54.2	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.128	0.717	6.0	61.3	0.066
UC-03	UB-03	Foundation Soils	58.1	-15.9	119	3.5	1.9	55.3	0.620	0.7	0	0.0	55.3	1.0	-1.4	0.2	0.8	0.096	1.008	0.093	0.128	0.723	6.0	61.9	0.067
UC-03	UB-03	Foundation Soils	58.2	-16.0	124	3.5	1.9	55.9	0.618	0.7	0	0.0	55.9	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.128	0.726	11.1	64.9	0.071
UC-03	UB-03	Foundation Soils	58.2	-16.1	124	3.5	1.9	53.8	0.625	0.7	0	0.0	53.8	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.128	0.715	11.6	55.3	0.059
UC-03	UB-03	Foundation Soils	58.3	-16.2	124	3.5	1.9	43.8	0.663	0.7	0	0.1	43.8	1.0	-1.4	0.2	0.8	0.088	1.007	0.085	0.128	0.664	11.4	56.7	0.061
UC-03	UB-03	Foundation Soils	58.4	-16.2	119	3.5	1.9	45.4	0.656	0.7	0	0.0	45.4	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.128	0.672	9.7	57.0	0.061
UC-03	UB-03	Foundation Soils	58.5	-16.3	119	3.5	1.9	47.2	0.649	0.7	0	0.0	47.2	1.0	-1.4	0.2	0.8	0.090	1.007	0.087	0.128	0.682	12.2	68.3	0.075
UC-03	UB-03	Foundation Soils	58.6	-16.4	119	3.6	1.9	56.1	0.617	0.7	0	0.1	56.1	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.128	0.728	15.7	58.2	0.063
UC-03	UB-03	Foundation Soils	58.6	-16.5	119	3.6	1.9	42.7	0.667	0.7	0	0.2	42.7	1.0	-1.4	0.2	0.8	0.087	1.007	0.084	0.128	0.660	21.1	49.8	0.053
UC-03	UB-03	Foundation Soils	58.7	-16.6	119	3.6	1.9	29.1	0.732	0.6	0	0.4	29.1	1.0	-1.4	0.2	0.8	0.078	1.006	0.076	0.128	0.594			

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[4]Unit Weight (pcf)	σ_v (tsf)	σ'_{vc} (tsf)	Trial q_{c1Ncs}	[6]m	[7]C_N	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$	[21]$\Delta q_{c1Ncs-Sr}$	[22]$q_{c1Ncs-Sr}$	[23]S_r/σ'_{vo} for FS < 1

[1]Earthquake magnitude taken as modal event for the deaggregation of the 5,000 year peak ground accleration
[2]PGA estimated from 2014 USGS seismic hazard maps for a 5,000-year return period earthquake
[3]Averaged corrected tip resistence cone tip resistance corrected for unequal end area effects. See Conetec report for additional info.
[4]Unit weight of soil based on Soil Behavior Type. See Conetec report for additional info.
[5]Equilibrium pore water pressure based on Pore Pressure Dissipation Tests. See Conetec report for additional info.
[6]m =1.338-0.249*q_{c1Ncs} ^0.264 where 21<q_{c1Ncs}<254 (Boulanger&Idriss, 2014, Equation 2.15b)
[7]C_N = overburden correction factor = $(1.06\ tsf/s'_{vc})^m$ where C_N <=1.7 (Boulanger&Idriss, 2014, Equation 2.15a)
[8]q_{c1N} = C * qt/1.06 tsf (Boulanger&Idriss, 2014, Equation 2.4)
[9] Values based sieve test results and boring log descriptions
[10]Dq_{c1N} = (11.9+q_{c1N}/14.6)*exp[1.63 - (9.7 / (FC + 2)) - (15.7 / (FC + 2))^2] (Boulanger&Idriss, 2014, Equation 2.22)
[11]q_{c1Ncs} = q_{c1N} + Dq_{c1N} (Boulanger&Idriss, 2014, Equation 2.10)
[12]Cσ = 1 / (37.3 - 8.27 * q_{c1Ncs}^0.264 where q_{C1Ncs}<=211 K_s = 1-(C_s*ln(s'$_{vc}$/106 tsf)) <=1.1 (Boulanger&Idriss,2014, Equations 2.16a, 2.16b)
[13]a(z) = -1.012 - 1.126 * sin(z / 11.73 + 5.133), where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14b)
[14]b(z) = 0.106 + 0.118 * sin(z /11.28 + 5.142), where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14c)
[15]r_d = shear stress reduction coefficient = exp[a(z) + b(z) * M] (Boulanger&Idriss, 2014, Equation 2.14a)
[16]$CRR_{M=7.5, \sigma'vc=1atm}$ = exp((q_{c1Ncs}/113+q_{c1Ncs}/1000)^2-(q_{c1Ncs}/140)^3+(q_{c1Ncs}/137))^4-2.8) (Boulanger&Idriss, 2014, Equation, 2.24), say q_{c1Ncs} <= 300
[17]MSF=1+(MSF_{max}-1)(8.64exp(-M/4)-1.325) MSF_{max}=1.09(q_{c1Ncs}/180)^2<=2.2 (Boulanger&Idriss, Equations 2.19,2.20)
[18]$CRR_{corr.}$=$CRR_{M=7.5,\sigma'vc=1atm}$*$K_\sigma$*MSF (Boulanger and Idriss,2014, Equation 2.7)
[19]$CSR_{M,\sigma'v}$ = 0.65*PHGA*(s_v/s'$_{vc}$)*r_d (Boulanger and Idriss,2014, Equation 2.2)
[21]State Param = state parameter index provided by Conetec and based on Been and Jefferies (1985). Positive = contractive soil, negative = dilative soil
[21]$Dq_{c1Ncs-Sr}$ is a function of fines content, values were estimated based on recommendations from Seed and Idriss, 2008
[22]$q_{c1Ncs-Sr}$ = q_{c1N} + $Dq_{c1Ncs-Sr}$
[23]S_r/s'$_{vo}$ estimated based on recommendations from Idriss and Boulanger, 2008, Equation 82

FS<=1.0	soil is likely to liquefy
1.0<FS<=1.5	soil is unlikely to liquefy, but could develop excess pore water pressu
FS>1.5	soil is likely to develop negligible excess pore water pressure

Idriss & Boulanger, 2008



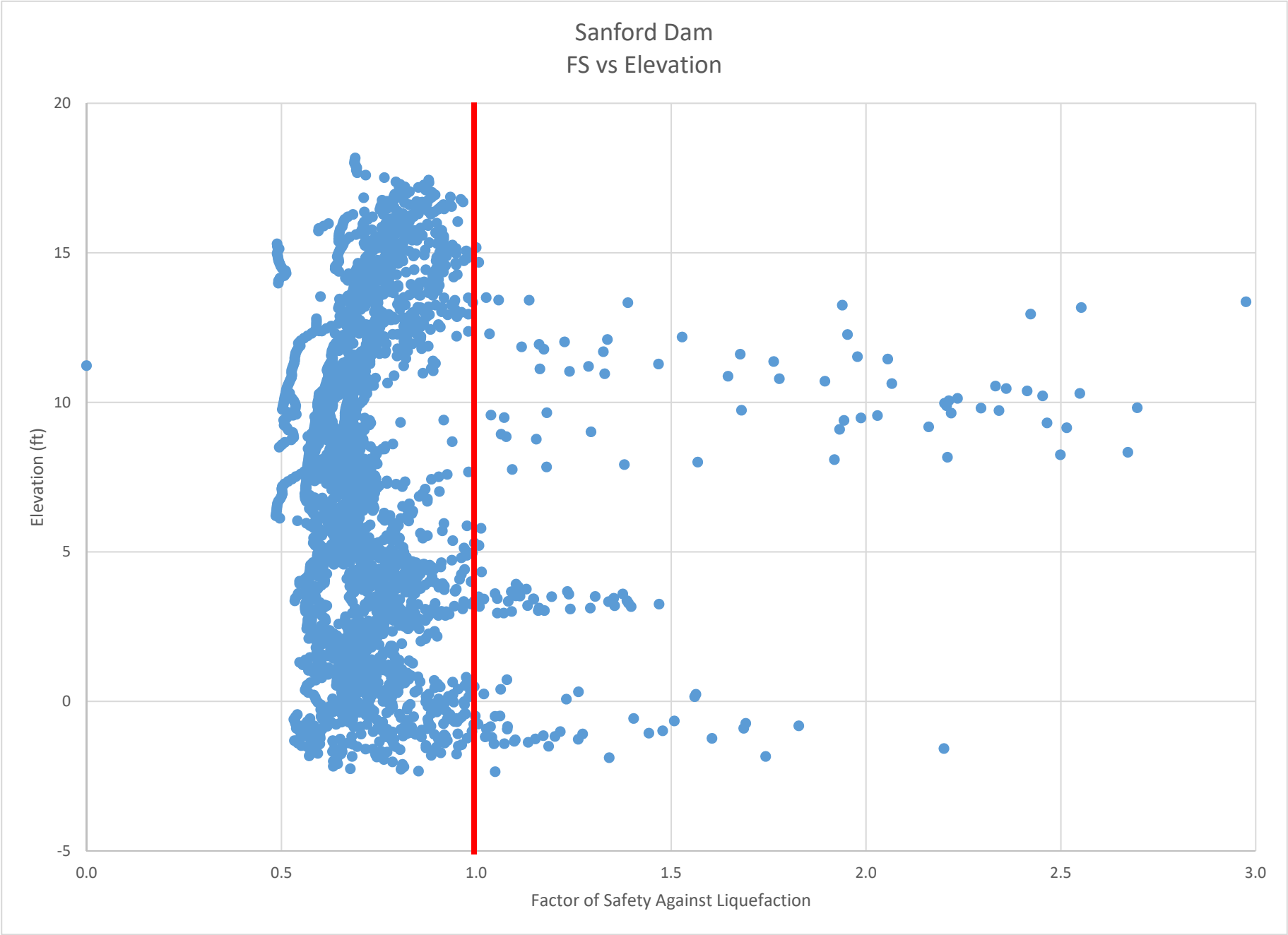
Idriss & Boulanger, 2008

FC	$\Delta q_{c1Ncs-Sr}$
10	10
25	25
50	45
75	55

$$\frac{S_r}{\sigma'_{vo}} = \exp\left(\frac{q_{c1Ncs-Sr}}{24.5} - \left(\frac{q_{c1Ncs-Sr}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs-Sr}}{106}\right)^3 - 4.42\right) \leq \tan\phi' \quad (82)$$

for conditions where void redistribution effects are expected to be negligible

Attachment3



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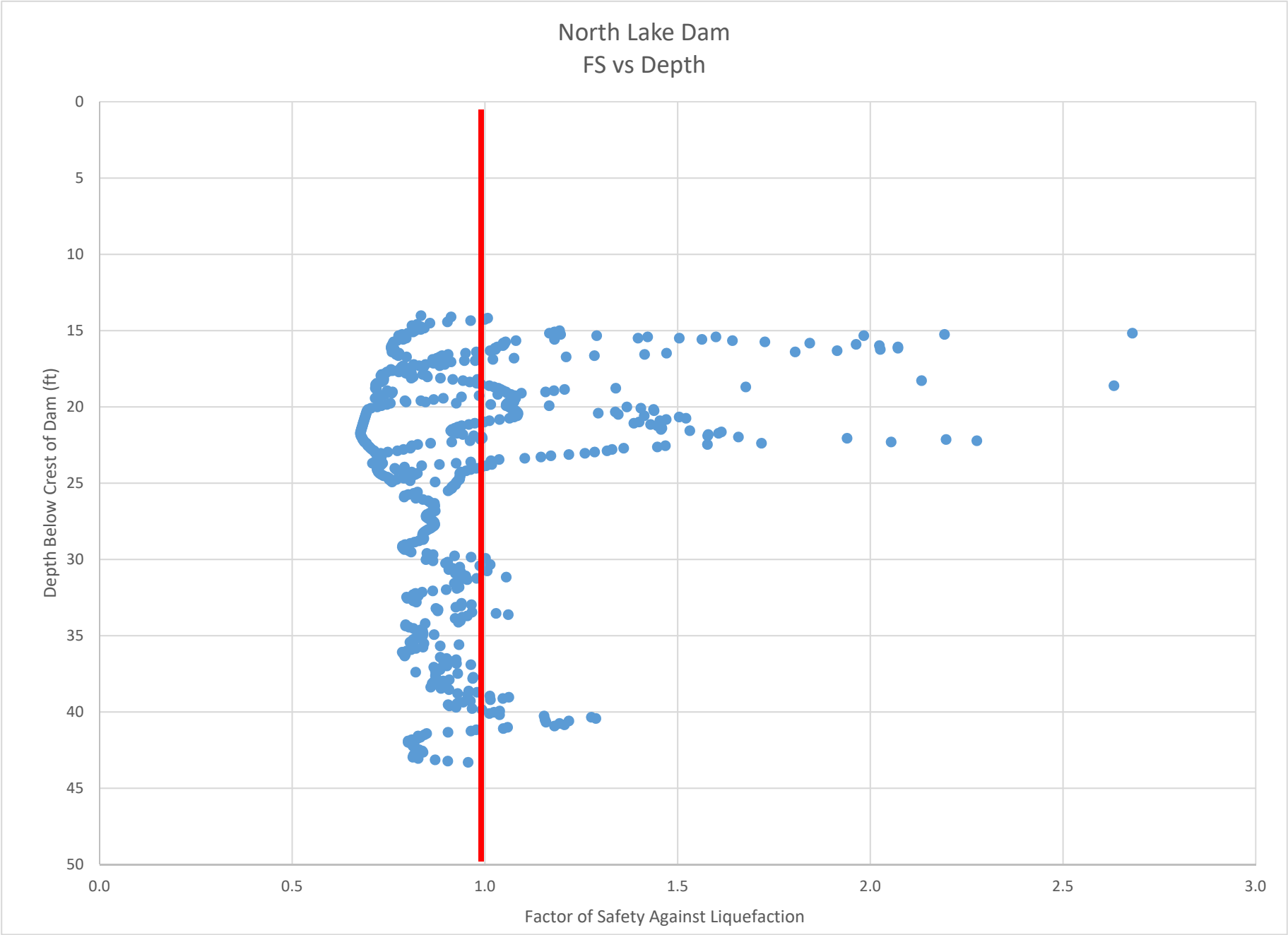

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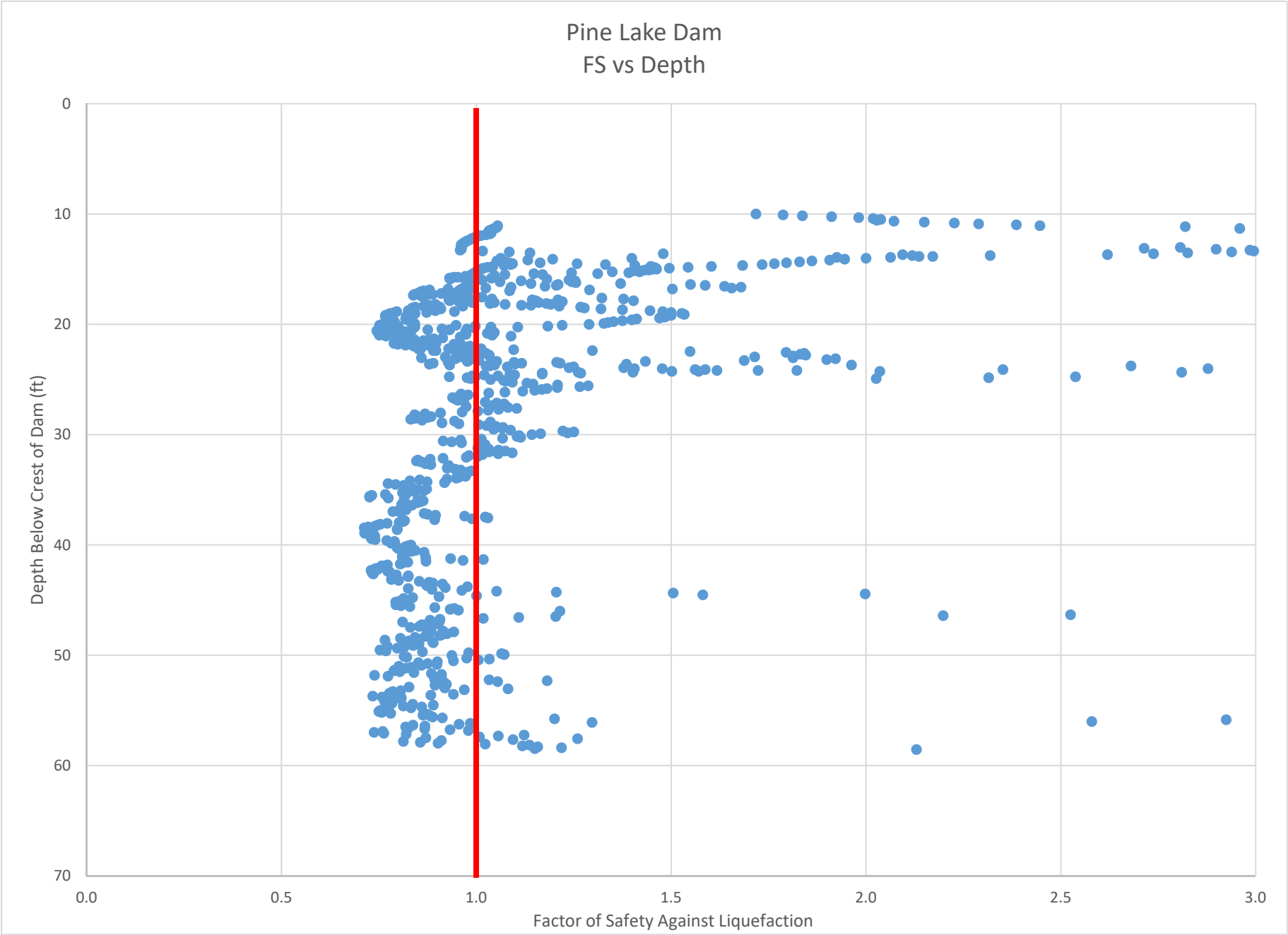
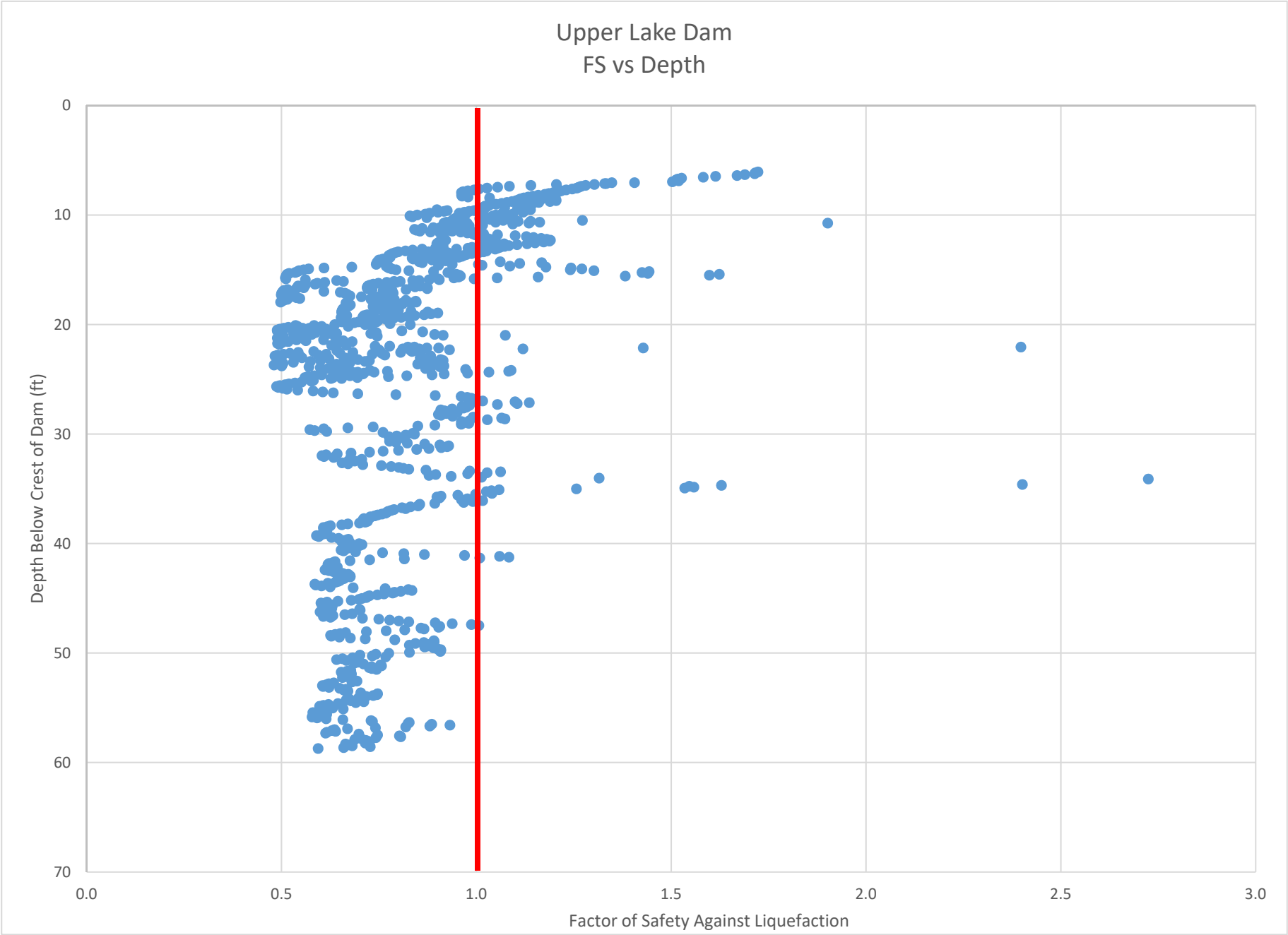


Attachment3



Schnabel ENGINEERING

CALCULATION COVER SHEET

Project	Project Number
Boiling Spring Lakes Dams Construction/Reconstruction	19C21022

Title

Mix-In-Place Panels Analyses and Design

Computer Programs Used	Version/Release No.
GeoStudio 2018 R2	Version 9.1.2
Mathcad 15.0	2015

Purpose and Objective

Develop a Mix-In-Place (MIP) panel design, including layout, strength requirements, and geometry, to improve the stability of the upstream and downstream embankment slopes at Sanford Dam based on the guidance and procedures provided in the FHWA "Deep Mixing for Embankment and Foundation Support" design manual (2013).

Summary of Conclusions

Based on the results of analyses detailed herein, the proposed Sanford Dam MIP panel design is expected to mitigate potential embankment instability due to cyclic liquefaction of the Foundation Soils.

	Print	Sign	Date
Originator	Brendan Stepek, EI	Brendan Stepek	Nov 23, 2020
Checker	Corey Schaal, PE, GIT	Corey Schaal	Nov 25, 2020
Reviewer	Gerald Robblee, PE	Gerald Robblee	Dec 09 , 2020

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TECHNICAL MEMORANDUM

BY:	Brendan Stepek, EI	**DATE:**	November 23, 2020
PROJECT:	Boiling Spring Lakes Dams Construction/Reconstruction	**SUBJECT:**	Mix-In-Place Panels Analyses and Design
LOCATION:	Boiling Spring Lakes, North Carolina	**PROJECT NO.:**	19C21022
REVIEWED BY:	Gerald Robblee, PE	**DATE:**	December 9, 2020

INTRODUCTION

Sanford Dam (SD), North Lake Dam (NLD), Pine Lake Dam (PLD), and Upper Lake Dam (ULD) (collectively herein referred to as the BSL Dams) breached during Hurricane Florence in September 2018. The four BSL Dams are part of a system of dams where NLD, PLD, and ULD are situated upstream of Sanford Dam and independent of each other. NLD and PLD are directly upstream, such that the SD headwater is the tailwater for NLD and PLD. A fifth dam named Middle Lake Dam is founded between SD and ULD and also breached during Hurricane Florence, but is not part of the BSL Dams Construction/Reconstruction project.

The Boiling Spring Lakes Dams Construction/Rehabilitation project includes the replacement of the spillway structures at each dam, as well as the repair of breached sections at SD and ULD. The existing spillway structures will be demolished and replaced with new cast-in-place concrete spillway elements. The asphalt roadways atop SD, NLD, and PLD and the gravel roadway atop ULD will be reconstructed. A seepage cutoff wall will be installed along the entire length of the embankment.

The existing alluvial/coastal deposits (Foundation Soils) beneath the proposed SD spillway and within the existing breached section will be excavated to top of rock and replaced with engineered fill materials (Proposed Select Fill). The SD embankment to the left (looking downstream) of the breached area and spillway excavation will generally not be modified except for minor surface grading and installation of soil-cement panels (described below and referred to herein as mix-in-place (MIP) panels).

Based on the results of the liquefaction potential analysis, the Foundation Soils at each of the BSL Dams sites have the potential to experience cyclic liquefaction and lose strength when subjected to the design ground motions. Post-earthquake slope stability analyses were performed for each embankment. With the exception of the ULD upstream slope, the calculated FS for the proposed SD, NLD, PLD, and ULD sections did not meet the minimum stability criteria for the post-earthquake load case. Additional details related to the liquefaction potential of the Foundation Soils are provided in the “Liquefaction Potential Analyses” memorandum. Post earthquake slope stability analysis results are provided in the “Embankment Seepage and Slope Stability Analyses” memorandum.

To mitigate potential embankment instability due to liquefaction of the Foundation Soils, MIP panels will be installed beneath the SD embankment. The panels will be installed using a mix-in-place construction method (e.g., deep mixing). MIP panels will not be installed within the proposed SD spillway and breached area excavation because the Foundation Soils will be entirely removed and replaced with Proposed Select Fill. MIP panels will not be installed at the NLD, PLD, and ULD sites based on the results of a risk analysis.

This memorandum describes the MIP panel design and analyses at SD. The MIP panels were designed in general accordance with the procedures outlined in the FHWA "Deep Mixing for Embankment and Foundation Support" design manual (FHWA 2013).

EXTERNAL INFORMATION

Subsurface exploration data is presented in the Schnabel 2020 Phase 1 and Phase 2 Geotechnical Data Report, Revision 1 (GDR).

Seepage and slope stability analyses for static load cases are presented in the memorandum entitled "Embankment Seepage and Slope Stability Analyses." A summary of the proposed geometry is given therein.

A summary of the geotechnical materials and properties used in the analyses presented herein is provided in Table 1. Details about the selection of geotechnical properties for soil materials, including shear strength parameters, are provided in the memorandum entitled "Soil and Rock Properties".

Table 1 – Summary of Soil and Rock Properties

Material	**Unit Weight**		**Effective Stress Shear Strength Parameters**		**Total Stress Shear Strength Parameters**	
	Moist	**Saturated**				
	γ_m (pcf)	γ_{sat} (pcf)	ϕ' (deg)	c' (psf)	ϕ (deg)	c (psf)
Existing Embankment Common Fill	120	125	32	0	24	50
Existing Embankment Core Fill	120	125	32	100	20	200
Foundation Soils	115	120	29	0	20	100
Proposed Select Fill	125	130	35	0	24	50
Proposed Common Fill	120	125	32	0	24	50
Proposed Core Fill	120	125	32	100	20	200
Proposed Cutoff Wall	125	125	0	1,800	0	1,800
Bedrock	Impenetrable					

Seismic parameters which are used in the analyses presented herein are defined in the memorandum entitled "Seismic Hazard." The memorandum presents the selection of design ground motions and earthquake magnitude.

ANALYZED SECTIONS

The following embankment sections were selected for analysis. The sections are referred to according to their station (STA) location along the Dam Baseline Alignment. The left and right limits of the Foundation Soil treatment zone were selected based on the location where the minimum FS was met or exceeded without MIP panels. A site plan showing the section locations is included in Attachment 1.

- STA 10+10 –left limit of MIP panels beneath the upstream slope
- STA 11+20 –left limit of MIP panels beneath the downstream slope
- STA 13+75 – transition in downstream MIP panel spacing
- STA 17+50 – approximate maximum section of the embankment outside of the breach and spillway excavation areas
- STA 18+35 –right limit of MIP panels beneath the upstream slope
- STA 18+63 –right limit of MIP panels beneath the downstream slope

EMBANKMENT (GLOBAL) STABILITY ANALYSES

Methodology

Static limit-equilibrium slope stability analyses for the post-earthquake load case were performed for each of the typical sections listed above using GeoStudio's SLOPE/W module (2018). Spencer's method (Spencer 1967) was used to compute factors of safety against slope failure. Critical failure surfaces were defined as circular surfaces intersecting the crest of the dam. Failure surfaces originating on the slope were not considered because they are not expected to lead to failure of the dam. Factors of safety were calculated for shallow failures where the slip surface exit point is on the slope above the MIP panels and for deep failures where the slip surface exit point is beyond the toe of the embankment slope and the slip surface passes through or below the MIP panels.

Based on the results of the liquefaction potential analysis, the Foundation Soils are expected to experience cyclic liquefaction due to the design seismic event. The SHANSEP function within SLOPE/W was used to model the residual undrained shear strength of the Foundation Soils where the undrained strength ratio (USR) was set to 0.09. See the "Liquefaction Potential Analysis" memorandum for additional details regarding the selection of this USR value. The extents of the Foundation Soils were estimated based on data presented in the GDR.

The phreatic surface within the embankment and foundation was based on results of seepage analyses under normal operating conditions as presented in the "Embankment Seepage and Slope Stability Analyses" memorandum. The headwater is based on the proposed normal pool of EL 30.0. For sections where the ground surface is above the proposed normal tailwater elevation (EL 11), we conservatively assumed the tailwater to be within 2 feet of the ground surface. Soils below the phreatic surface were assigned total stress strength parameters, and those above were assigned effective stress strength parameters. A 6-inch thick layer with effective stress strength parameters was modeled at the surface of the dam on the upstream slope to force the program to apply the surcharge from the reservoir to the slope. The phreatic surface was not applied to materials where total stress strength parameters were assigned. No seismic accelerations were applied as our analyses are for post-earthquake stability.

The MIP panels are relatively high-strength, discrete elements embedded within the low-strength Foundation Soils. The MIP panels will be installed along the upstream and downstream toes and will be oriented perpendicular to the embankment baseline. In order to model the increased strength provided by the MIP panels, a composite shear strength was developed for the region within the dam foundation in which MIP panels will be installed. The composite shear strength was calculated as a weighted average of the shear strength contribution from the MIP panels and the shear

strength contribution from the untreated Foundation Soils between MIP panels. The composite zone is referred to herein as "Treated Foundation Soils." Based on guidance provided by FHWA (2013), the composite shear strength is based on the area replacement ratio (a_s), which is a function of the MIP panel width and spacing and the unconfined compressive strength (UCS) of the MIP panels. We selected a UCS of 130 pounds per square inch based on guidance provided by FHWA (2013) and our conversations with contractors experienced in methods of deep mixing. The modeled composite shear strength of the Treated Foundation Soils is based on zero strength contribution from the untreated Foundation Soils between the MIP panels due to strain compatibility concerns. In general, the required composite shear strength is controlled by deep failure surfaces. Therefore, MIP panel spacing was selected, in part, based on deep slope failures that met or exceeded the target post-earthquake stability FS of 1.2. The MIP panels were located as close to the toe of the embankment as possible in an effort to reduce the size and/or necessity for temporary work platforms. However, the location of the MIP panels in the upstream/downstream direction is generally controlled by the locations of the shallow critical slip surfaces. Therefore, the MIP panels were located at a distance from the embankment crest centerline that produces a FS for shallow slope failures that met or exceeded the target FS of 1.2. Internal failure modes were also considered in the selection of MIP panel spacing and are discussed below.

Results of Slope Stability Analyses

Table 2 is a summary of the calculated FS for each analyzed section under post-earthquake loading. Results of these slope stability analyses are included as Attachment 2.

Table 2 – Summary of Factors of Safety from Slope Stability Analyses

Section	MIP Panels Installed?	Calculated FS				Minimum Recommended FS
		Upstream		Downstream		
		Shallow	Deep	Shallow	Deep	
STA 10+10	No	---	1.27	---	---	1.2
STA 11+20	No	---	---	---	1.22	1.2
STA 13+75	Yes	1.24	1.63	1.21	1.19	1.2
STA 17+50	Yes	1.48	1.63	1.37	1.18	1.2
STA 18+35	No	---	1.32	---	---	1.2
STA 18+63	No	---	---	---	1.21	1.2

Note: "---" indicates that analysis was not performed.

As shown in Table 2, the calculated FS against slope stability for the proposed geometry without MIP panels installed meets the minimum post-earthquake load case FS for the upstream embankment slope analyses at STA 10+10 and STA 18+35 and the downstream embankment slope analyses at STA 11+20 and STA 18+63. As previously mentioned, the calculated FS did not meet the minimum FS for upstream and downstream embankment slope analyses at STA 17+50 as shown in the Embankment Seepage and Slope Stability Analyses memorandum. Therefore, the installation of MIP panels installed between STA 10+10 and STA 18+35 beneath the upstream embankment slope and between STA 11+20 and STA 18+63 beneath the downstream embankment slope is recommended to increase embankment stability.

As shown in Table 2, the calculated FS values for the proposed embankment geometry with MIP panels meet or exceed the minimum recommended FS for post-earthquake loading at STA 13+75 and STA 17+50.

INTERNAL STABILITY ANALYSES

Internal stability analyses of the MIP panels were performed in general accordance with the design procedures outlined in the 2013 FHWA manual. The following failure modes were evaluated:

- Overturning,
- Crushing at the toe of the MIP panels ,
- Sliding,
- Shearing along vertical planes of the MIP panels, and
- Extrusion of soil between MIP panels.

Internal stability analyses of the MIP panels beneath the upstream and downstream slopes was performed at STA 17+50 which represents the approximate maximum embankment section. An internal stability analysis of the MIP panels beneath the downstream slope was performed at STA 13+75 due to the change in MIP panel spacing. Internal stability calculations are included as Attachment 3.

DESIGN CRITERIA

Summary

Table 3 is a summary of the selected MIP panel geometry and design parameters based on the analyses outlined above, current industry practices, conversations with contractors experienced in MIP panel installation, and guidance provided by FHWA (2013). Additional details are provided in the following subsections.

Table 3 – Summary of Mix-in-Place Panels Design Parameters

Parameter	B	b	s	a_s	q
Units	feet	feet	feet	%	psi
Criteria	min	min	max	min	min
Upstream (STA 10+10 to 18+35)	10.0	2.70	15.0	18	130
Downstream (STA 11+20 to 13+75)	10.0	2.70	15.0	18	130
Downstream (STA 13+75 to 18+63)	10.0	2.70	8.0	34	130

Where:
B = length of the MIP panel in upstream/downstream direction
b = minimum effective panel width
s = center-to-center spacing of the MIP panels in cross-canyon direction
a_s = area replacement ratio
q = specified 28 day unconfined compressive strength (UCS) of treated soil

Panel Height

The MIP panels will extend through the entire layer of Foundation Soils to the top of rock. The bottom elevation of the MIP Panel and approximate top of rock elevation will be determined based on a refusal criteria developed during a preproduction field validation program. The minimum MIP Panel top elevation will be determined by the embankment toe elevation. The top of rock and embankment toe elevations will likely vary across the site. Therefore, variation in MIP Panel heights are expected.

Column Diameter (d), and Column Overlap Distance (e)

MIP panels are typically constructed using either a single-axis or multi-axis drill rig with circular augers. Table 4 is a summary of design parameters applicable to MIP panels constructed from overlapping circular MIP columns. These design parameters are additional constraints to those listed in Table 3.

Table 4 – Supplemental Design Parameters for MIP Columns

Parameter	d	e/d	c/s
Units	feet	none	none
Criteria	---	min	min
Upstream (STA 10+10 to 18+35)	3.0	0.222	0.126
Downstream (STA 11+20 to 13+75)	3.0	0.222	0.126
Downstream (STA 13+75 to 18+63)	3.0	0.222	0.236

Where:
d = column diameter
e = column overlap distance
c = chord length

Longitudinal Spacing (s) and Area Replacement Ratio (a_s)

The area replacement ratio and strength of the Treated Foundation Soils is a function of MIP panel spacing, UCS, and MIP panel width. MIP panel spacing is considered to be a variable which is modified relatively easily during construction compared to UCS and panel width. Therefore, selected UCS and MIP panel width values are constant across the site for construction efficiency, and MIP panel spacing is variable based on the specified composite shear strength of the Treated Foundation Soils and internal stability criteria.

REFERENCES

- FHWA (2013). "Design Manual: Deep Mixing for Embankment and Foundation Support," FHWA-HRT-13-046, Federal Highway Administration, Washington, D.C., October 2013
- Filz, G.M. and Templeton, E. (2011). Design Guide for Levee and Floodwall Stability Using Deep-Mixed Shear Walls, prepared by Burns Cooley Dennis for the U.S. Army Corps of Engineers.
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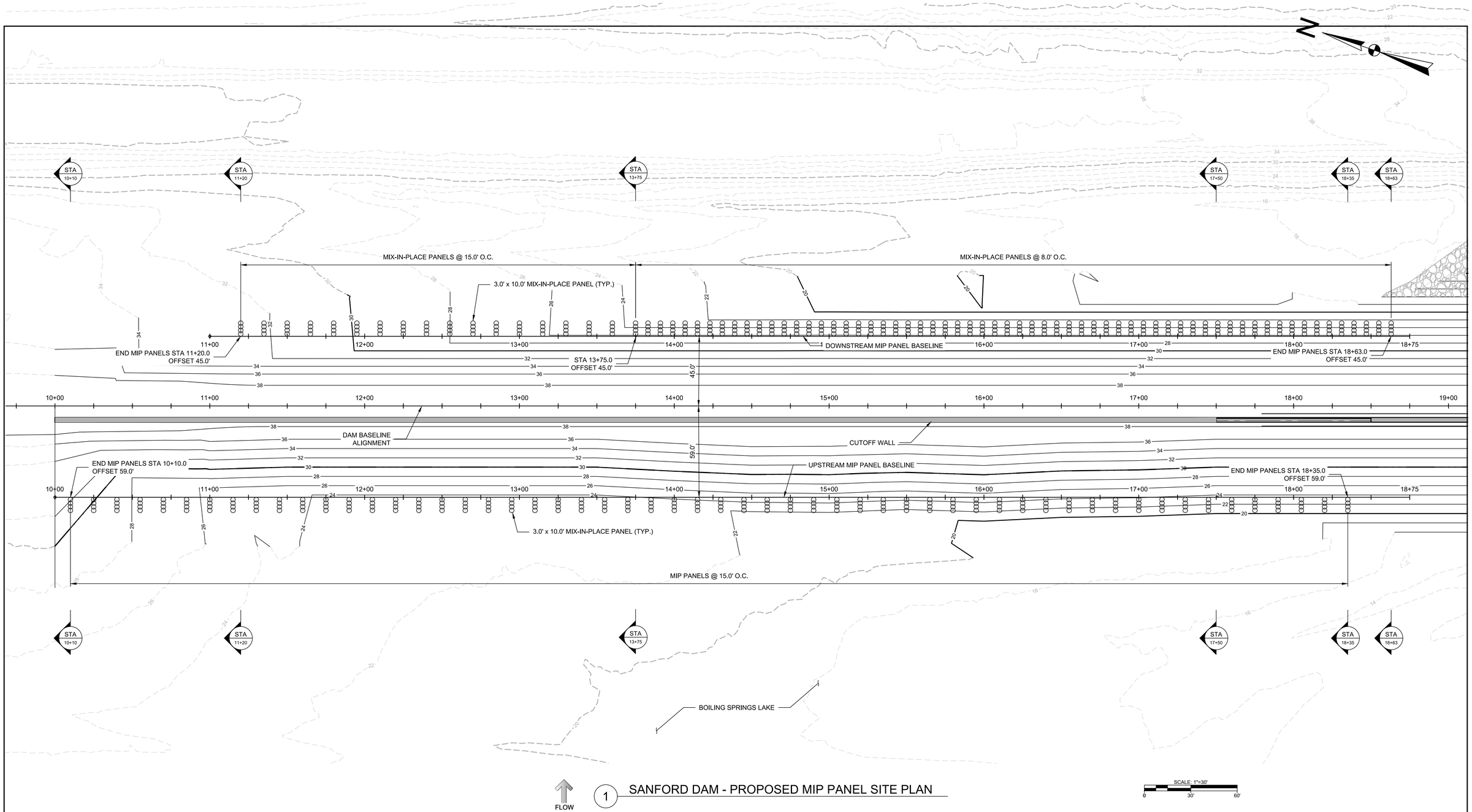
- Schnabel Engineering (2020). "Phase 1 and Phase 2 Geotechnical Data Report, Revision 1, Boiling Spring Lakes Dams Remediation, Boiling Spring Lakes, North Carolina," Prepared for McGill Associates, P.A., December 2020.
- Spencer, E. (1967). "A method of analysis of the stability of embankments assuming parallel inter-slice forces," *Geotechnique*, 17(1), pp. 11-26.

ATTACHMENTS

1. Proposed MIP Panel Site Plan
2. Slope Stability Calculation Results
3. Internal Stability Calculations

ATTACHMENT 1

PROPOSED MIP PANEL SITE PLAN



1 SANFORD DAM - PROPOSED MIP PANEL SITE PLAN

Schnabel ENGINEERING	DAM CONSTRUCTION/RECONSTRUCTION PROJECT BOILING SPRING LAKES, NORTH CAROLINA MCGILL ASSOCIATES, P.A. SCHNABEL PROJECT NO. 19C21022	SANFORD DAM PROPOSED MIP PANEL SITE PLAN

19C21022 - BOILING SPRING LAKES - DAM CONSTRUCTION/ RECONSTRUCTION PROJECT

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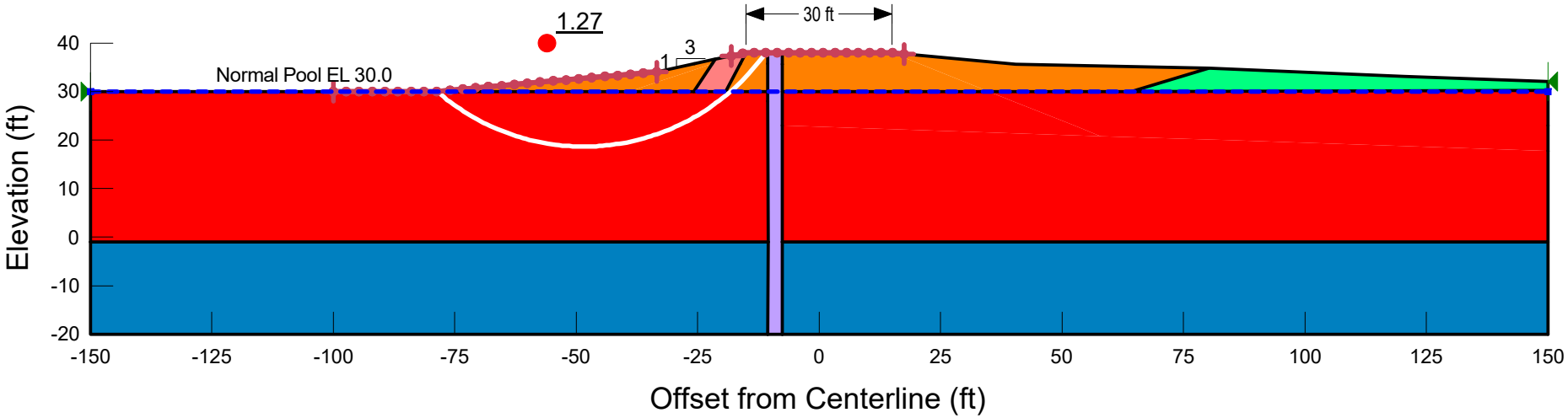
ATTACHMENT 2

SLOPE STABILITY CALCULATION RESULTS

Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Cut-Off Wall	Mohr-Coulomb	125			1,800	0	1
	Existing Embankment Common Fill	Mohr-Coulomb	120			50	32	1
	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			10	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 10+10
Analysis: Post EQ - U/S, untreated
Method: Spencer
Created By: BFS / Checked By: CDS

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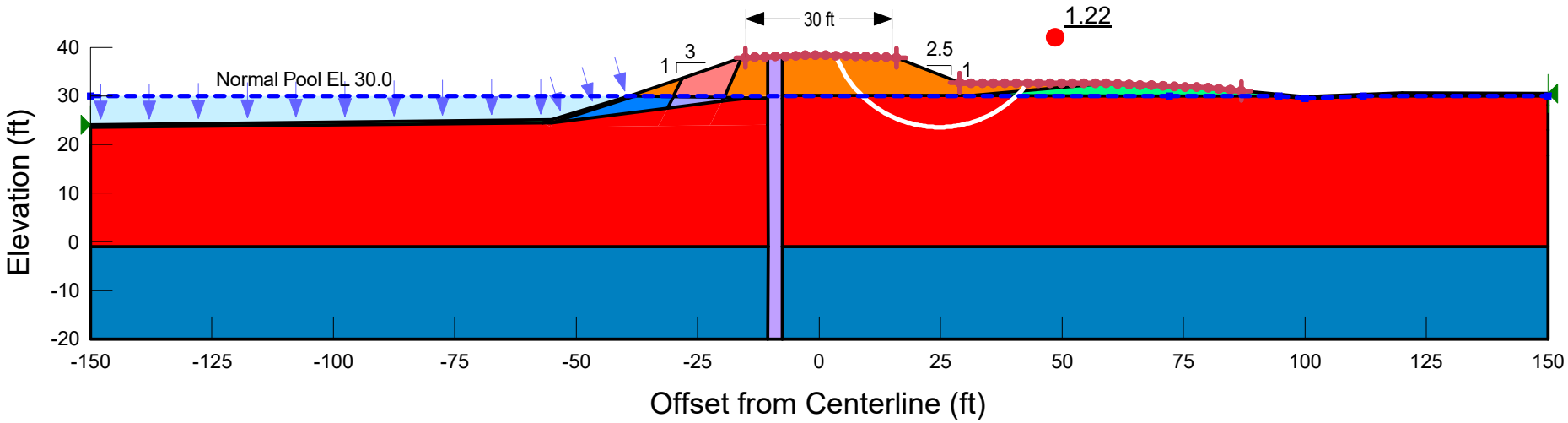
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Cut-Off Wall	Mohr-Coulomb	125			1,800	0	1
	Existing Embankment Common Fill	Mohr-Coulomb	120			50	32	1
	Existing Embankment Common Fill - Undrained	Mohr-Coulomb	120			50	24	
	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	120			200	20	
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			10	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			



Schnabel ENGINEERING

Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 11+20
Analysis: Post EQ - D/S, untreated
Method: Spencer
Created By: BFS / Checked By: CDS

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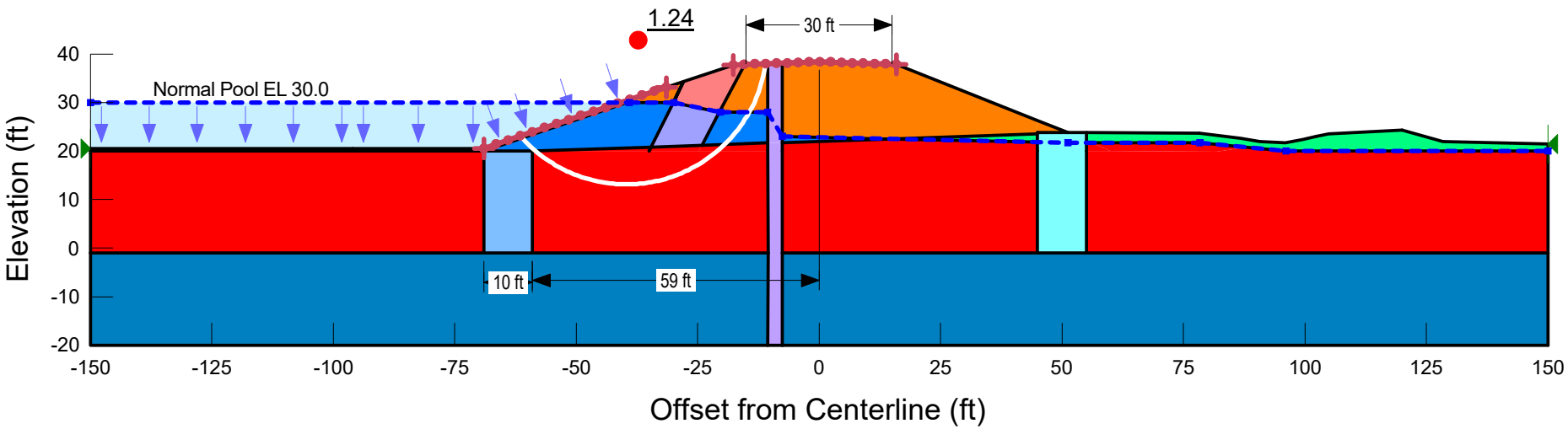
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Cut-Off Wall	Mohr-Coulomb	125			1,800	0	1
	Existing Embankment Common Fill	Mohr-Coulomb	120			50	32	1
	Existing Embankment Common Filll - Undrained	Mohr-Coulomb	125			50	24	
	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	125			200	20	
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Treated Foundation Soils D/S	Mohr-Coulomb	125			1,450	0	
	Treated Foundation Soils U/S	Mohr-Coulomb	125			1,450	0	



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Boiling Spring Lakes Dams Rehabilitation
Boiling Spring Lakes, NC
Schnabel Project: 19C21022

Section: Sanford Dam - STA 13+75
Analysis: Post EQ - U/S, treated, shallow
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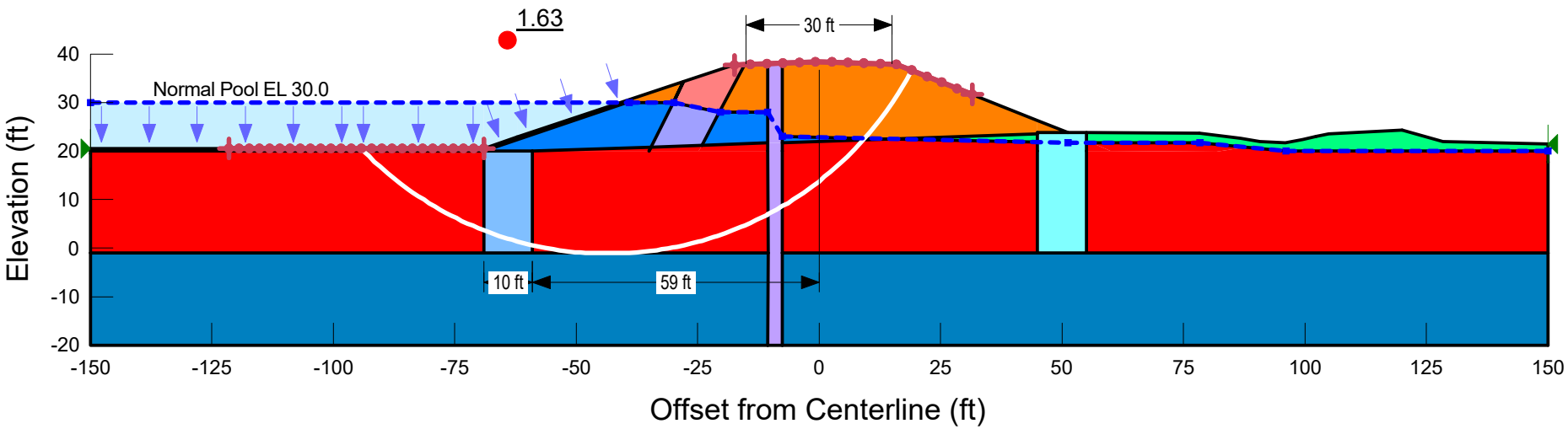
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Cut-Off Wall	Mohr-Coulomb	125			1,800	0	1
	Existing Embankment Common Fill	Mohr-Coulomb	120			50	32	1
	Existing Embankment Common Filll - Undrained	Mohr-Coulomb	125			50	24	
	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	125			200	20	
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Treated Foundation Soils D/S	Mohr-Coulomb	125			1,450	0	
	Treated Foundation Soils U/S	Mohr-Coulomb	125			1,450	0	



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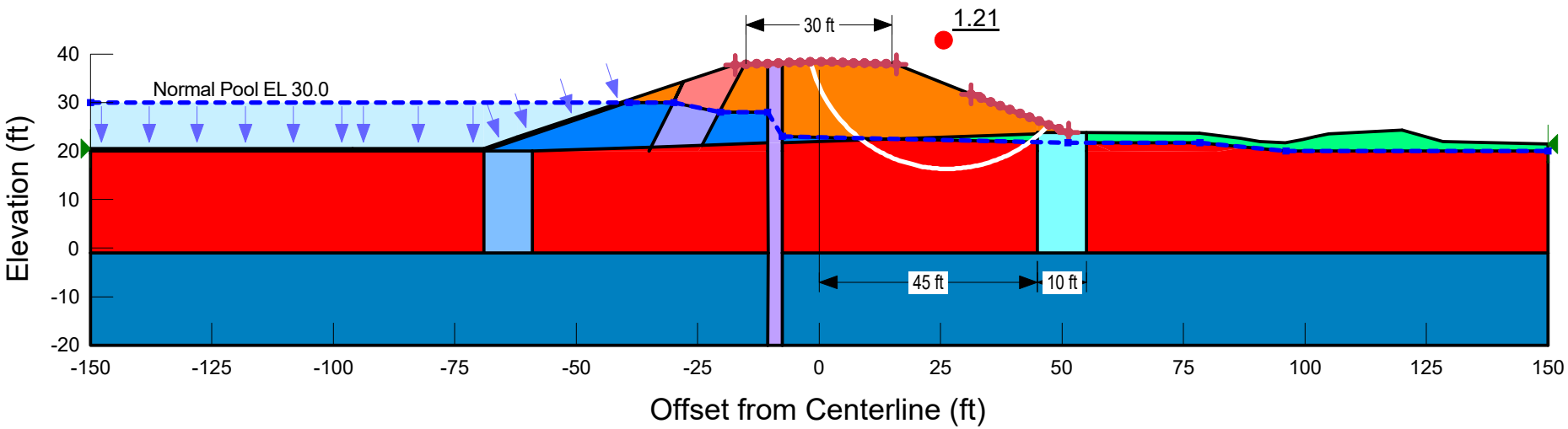
	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	125			200	20	
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Treated Foundation Soils D/S	Mohr-Coulomb	125			1,450	0	
	Treated Foundation Soils U/S	Mohr-Coulomb	125			1,450	0	



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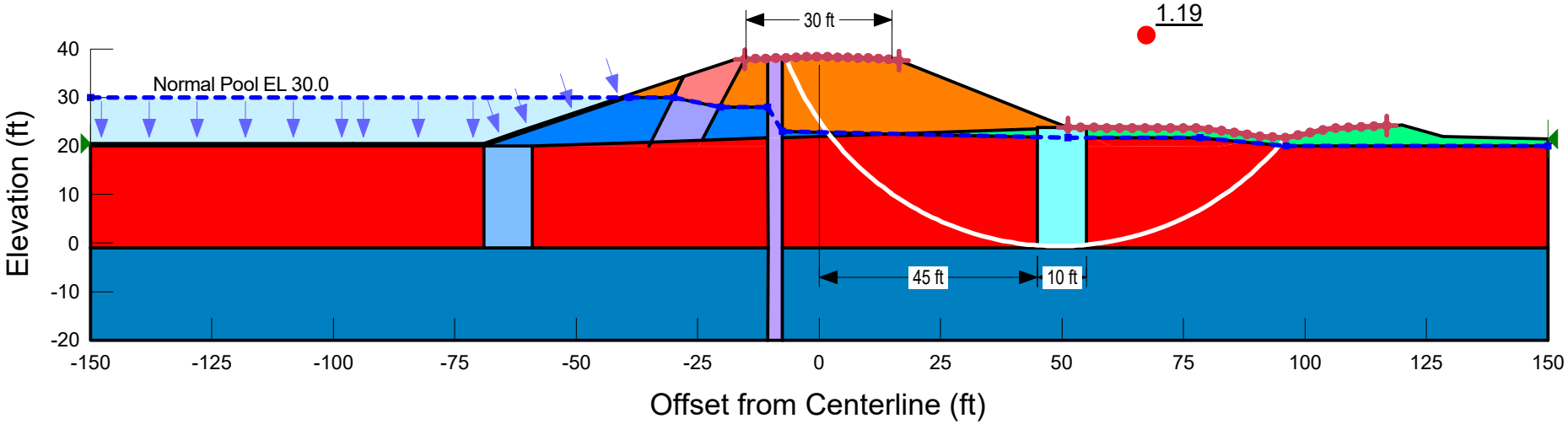
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	125			200	20	
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Treated Foundation Soils D/S	Mohr-Coulomb	125			1,450	0	
	Treated Foundation Soils U/S	Mohr-Coulomb	125			1,450	0	



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	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	125			200	20	
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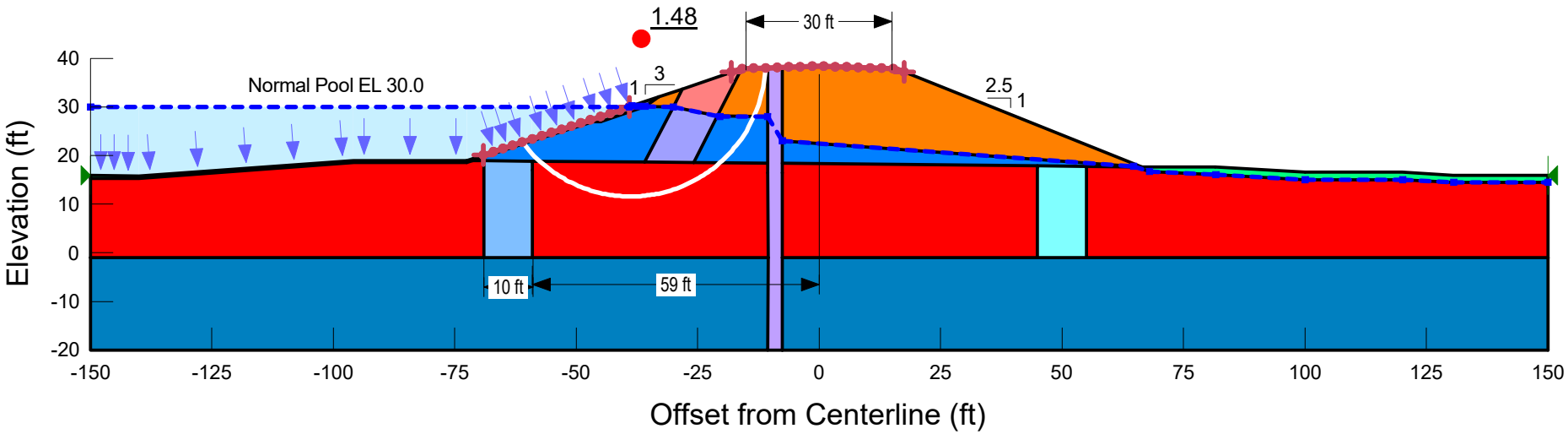
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Rip Rap	Mohr-Coulomb	110			0	35	1
	Treated Foundation Soils D/S	Mohr-Coulomb	125			2,760	0	
	Treated Foundation Soils U/S	Mohr-Coulomb	125			1,450	0	



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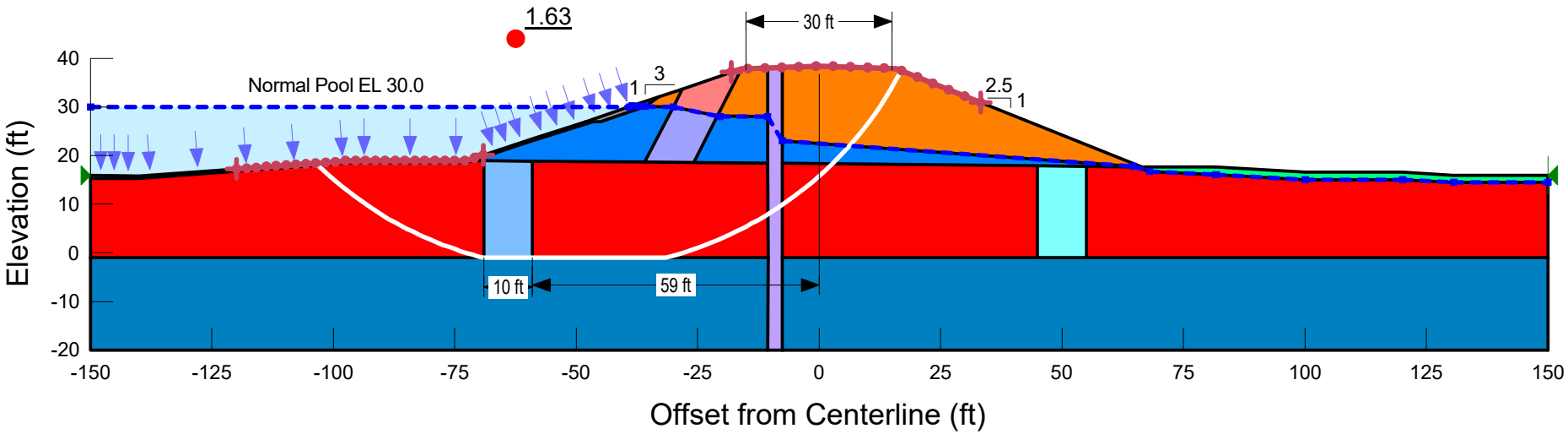
	Cut-Off Wall	Mohr-Coulomb	125			1,800	0	1
	Existing Embankment Common Fill	Mohr-Coulomb	120			50	32	1
	Existing Embankment Common Fill - Undrained	Mohr-Coulomb	125			50	24	
	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	125			200	20	
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Rip Rap	Mohr-Coulomb	110			0	35	1
	Treated Foundation Soils D/S	Mohr-Coulomb	125			2,760	0	
	Treated Foundation Soils U/S	Mohr-Coulomb	125			1,450	0	



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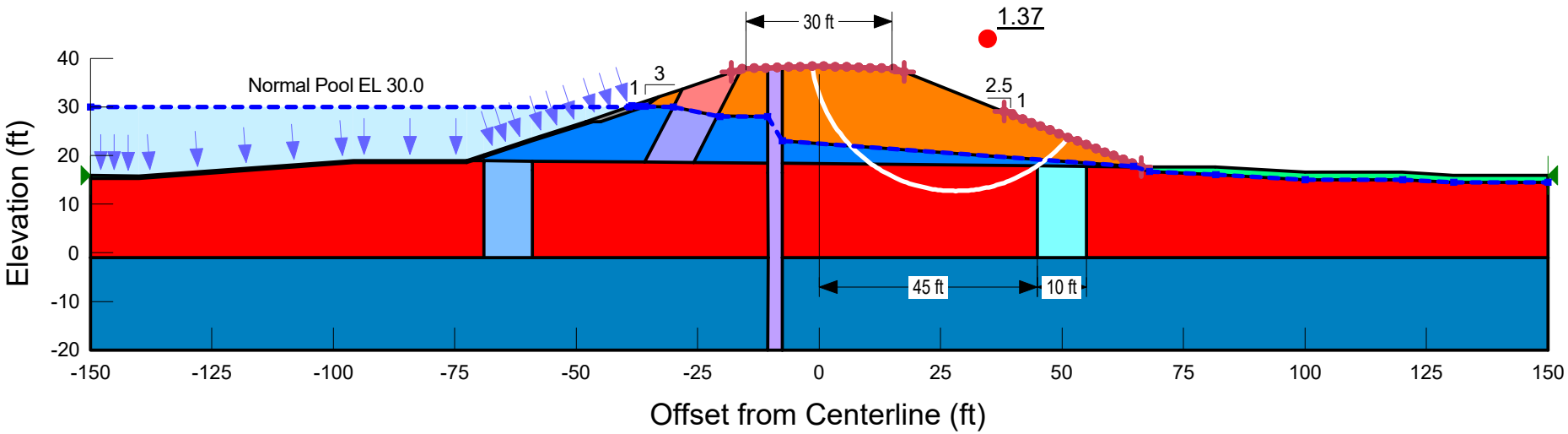
	Existing Embankment Common Fill - Undrained	Mohr-Coulomb	125			50	24	
	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	125			200	20	
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Rip Rap	Mohr-Coulomb	110			0	35	1
	Treated Foundation Soils D/S	Mohr-Coulomb	125			2,760	0	
	Treated Foundation Soils U/S	Mohr-Coulomb	125			1,450	0	



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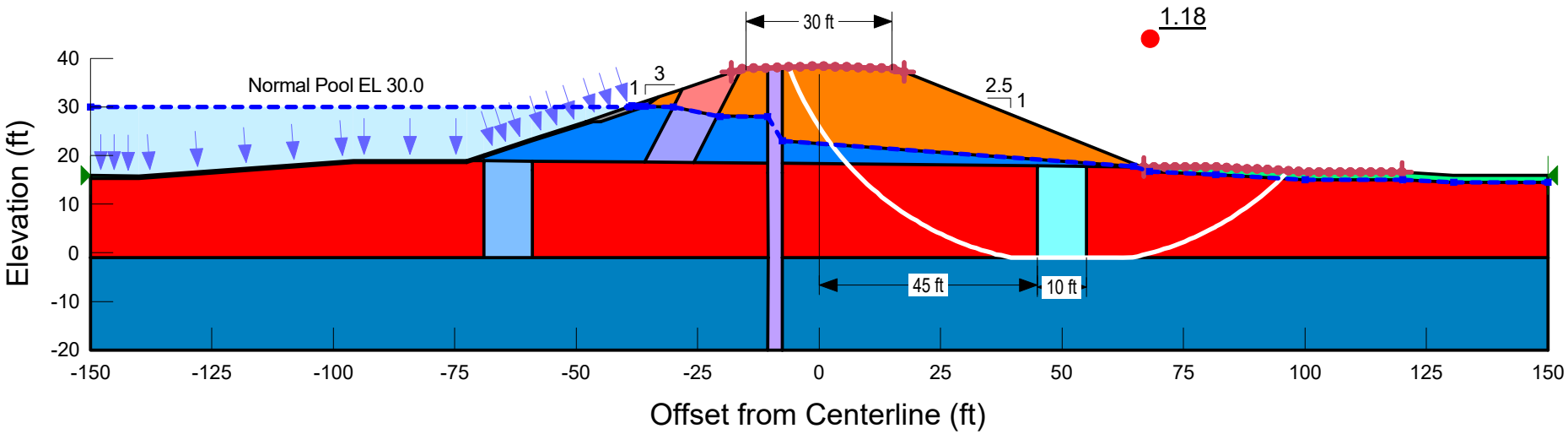
Color	Name	Model	Unit Weight (pcf)	Minimum Strength (psf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)	Piezometric Line
	Cut-Off Wall	Mohr-Coulomb	125			1,800	0	1
	Existing Embankment Common Fill	Mohr-Coulomb	120			50	32	1
	Existing Embankment Common Fill - Undrained	Mohr-Coulomb	125			50	24	
	Existing Embankment Core Fill	Mohr-Coulomb	120			100	32	1
	Existing Embankment Core Fill - Undrained	Mohr-Coulomb	125			200	20	
	Foundation Bedrock	Bedrock (Impenetrable)						1
	Foundation Soils	Mohr-Coulomb	120			0	29	1
	Foundation Soils - Liquefied	SHANSEP	120	0	0.09			
	Rip Rap	Mohr-Coulomb	110			0	35	1
	Treated Foundation Soils D/S	Mohr-Coulomb	125			2,760	0	
	Treated Foundation Soils U/S	Mohr-Coulomb	125			1,450	0	



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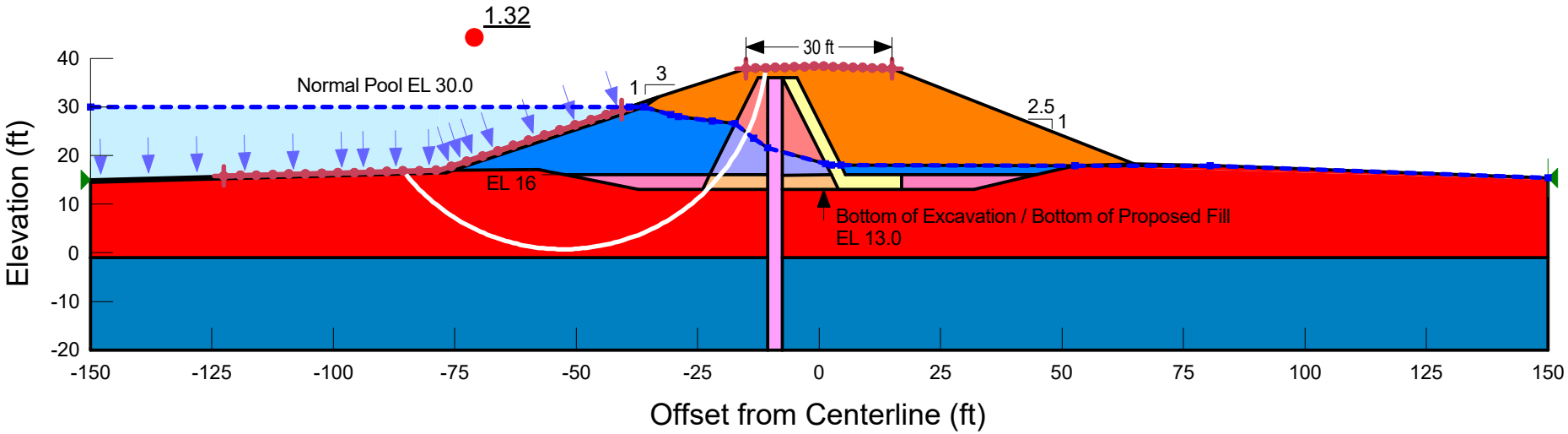
Color	Name	Model	Piezometric Line	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb		125		1,800	0
	Foundation Bedrock	Bedrock (Impenetrable)	1				
	Foundation Soils	Mohr-Coulomb	1	120		0	29
	Foundation Soils - Liquefied	SHANSEP		120	0.09		
	Proposed Common Fill	Mohr-Coulomb	1	125		50	32
	Proposed Common Fill - Undrained	Mohr-Coulomb		120		50	24
	Proposed Core Fill	Mohr-Coulomb		120		50	32
	Proposed Core Fill - Undrained	Mohr-Coulomb		120		200	20
	Proposed Fine Drainfill	Mohr-Coulomb		125		0	34
	Proposed Select Core Fill - Undrained	Mohr-Coulomb	1	120		200	20
	Proposed Select Fill - Undrained	Mohr-Coulomb		120		50	24
	Rip Rap	Mohr-Coulomb	1	110		0	35



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Section: Sanford Dam - STA 18+35
Analysis: Post EQ - U/S, Untreated
Method: Spencer
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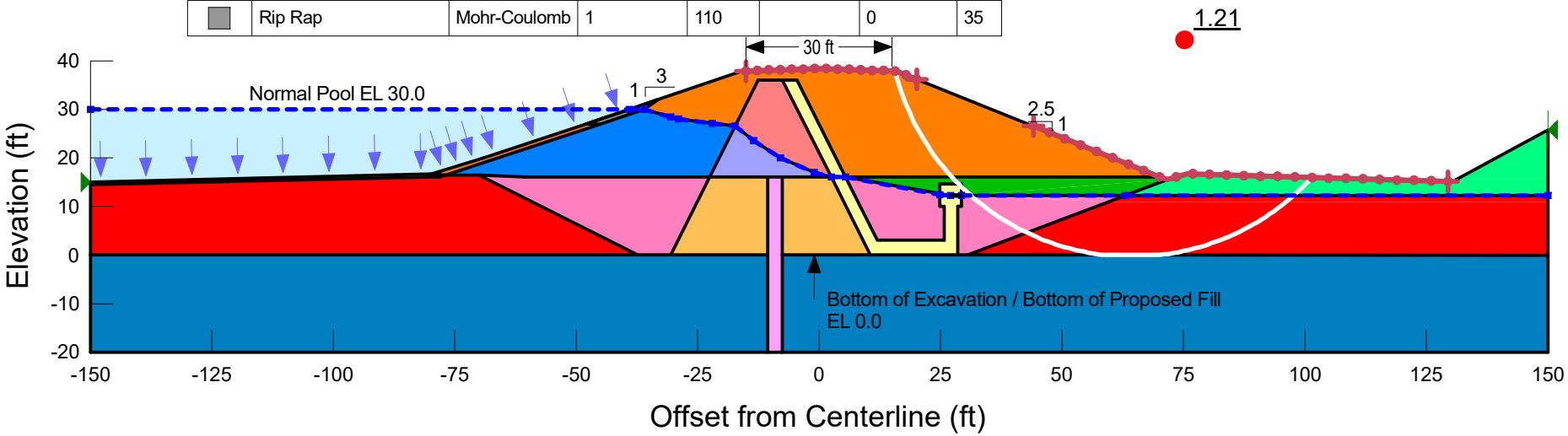
Color	Name	Model	Piezometric Line	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion' (psf)	Phi' (°)
	Cut-Off Wall	Mohr-Coulomb		125		1,800	0
	Foundation Bedrock	Bedrock (Impenetrable)	1				
	Foundation Soils	Mohr-Coulomb	1	120		0	29
	Foundation Soils - Liquefied	SHANSEP		120	0.09		
	Proposed Common Fill	Mohr-Coulomb	1	125		50	32
	Proposed Common Fill - Undrained	Mohr-Coulomb		120		50	24
	Proposed Core Fill	Mohr-Coulomb		120		50	32
	Proposed Core Fill - Undrained	Mohr-Coulomb		120		200	20
	Proposed Fine Drainfill	Mohr-Coulomb		125		0	34
	Proposed Select Core Fill - Undrained	Mohr-Coulomb	1	120		200	20
	Proposed Select Fill	Mohr-Coulomb	1	125		10	35
	Proposed Select Fill - Undrained	Mohr-Coulomb		120		50	24
	Rip Rap	Mohr-Coulomb	1	110		0	35



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ATTACHMENT 3

INTERNAL STABILITY CALCULATIONS

- Internal Stability Calculations for MIP Panels - Upstream Slope at STA 17+50
- Internal Stability Calculations for MIP Panels - Downstream Slope at STA 17+50
- Internal Stability Calculations for MIP Panels - Downstream Slope at STA 13+75

Calculation Objective

1. Design a Mix-In-Place (MIP) panel shear wall system to support the embankment during post earthquake conditions.

Design Assumptions

- Wet Mix Method

References

Federal Highway Administration Design Manual: Deep Mixing for Emankment and Foundation Support - FHWA-HRT-13-046 (2013). US Department of Transportation - Federal Highway Administration.

Filz, G.M. and Templeton, E. (2011). Design Guide for Levee and Floodwall Stability Using Deep-Mixed Shear Walls, prepared by Burns Cooley Dennis for the U.S. Army Corps of Engineers.

Notes

1. All "Table", "Figure", and "Page" references refer to the 2013 FHWA manual unless otherwise noted.
2. Calculation step numbering and terminology are in general accordance with 2013 FHWA design manual. The terms "deep mixing" and "deep mixed zone" are used along with "MIP panel" throughout this calcuation.

1. Establish Project Requirements

Factor of Safety and Design Coefficient Values

$F_{s_eq} := 1.2$	Design FS for Post Earthquake Slope Stability	
$F_o := 1.3$	Design FS against combined overturning and bearing capacity failure at the toe of the deep mixed zone	(Table 11)
$F_c := 1.3$	Design FS against crushing of deep mixed ground at the toe of the deep mixed zone	(Table 11)
$F_v := 1.3$	Design FS for shearing through deep mixed zone	(Table 11)
$F_e := 1.3$	Design FS for extrusion of soil between shear walls	(Table 11)
$COV := 0.5$	Coefficient of Variation for Good Construction	
$f_{v_1.2} := 1.02$	Coefficient of variability for deep mixed ground strength corresponding to a FS of 1.2	(Table 12)
$f_{v_1.3} := 0.95$	Coefficient of variability for deep mixed ground strength corresponding to a FS of 1.3	(Table 12)
$f_r := 0.80$	Residual Compressive Strength Factor (typically between 0.65 and 0.9)	(Page 68)

2. Establish Subsurface Conditions

Material Properties

$\gamma_{dm} := 125pcf$ Unit Weight of MIP panel

$\gamma_w := 62.4pcf$ Unit Weight of Water

Embankment Soils (Shell Fill)

$\gamma_{emb} := 120pcf$ Moist unit weight

$\gamma_{emb_s} := 125pcf$ Saturated unit weight

$\gamma_{emb_b} := \gamma_{emb_s} - \gamma_w = 62.60 \cdot pcf$ Bouyant unit weight

$\phi'_{emb} := 32deg$ $c'_{emb} := 0psf$ Effective stress parameters

Foundation Soils (Alluvial)

$\gamma_{fnd} := 115pcf$ Moist unit weight

$\gamma_{fnd_s} := 120pcf$ Saturated unit weight

$\gamma_{fnd_b} := \gamma_{fnd_s} - \gamma_w = 57.60 \cdot pcf$ Bouyant unit weight

$\phi_{fnd} := 20deg$ $c_{fnd} := 100psf$ Total stress parameters

$\phi'_{fnd} := 29deg$ $c'_{fnd} := 0psf$ Effective stress parameters

$USR := 0.09$ Undrained Strength Ratio

3. Establish Trial Deep Mixed Ground Property Values

Shear Strength

$q_{dm_spec} := 130psi$ 28-day Minimum Unconfined Compressive Strength of Treated Soil (typically between 75 and 150 psi) (Page 78)

$t := 42$ Curing Time in days until full loading

This assumes that loading conditions assumed herein (full resevoir with steady-state seepage conditions and liquefied Foundation Soils from design seismic event) develop no sooner than 2 weeks after confirmation of 28 day strength.

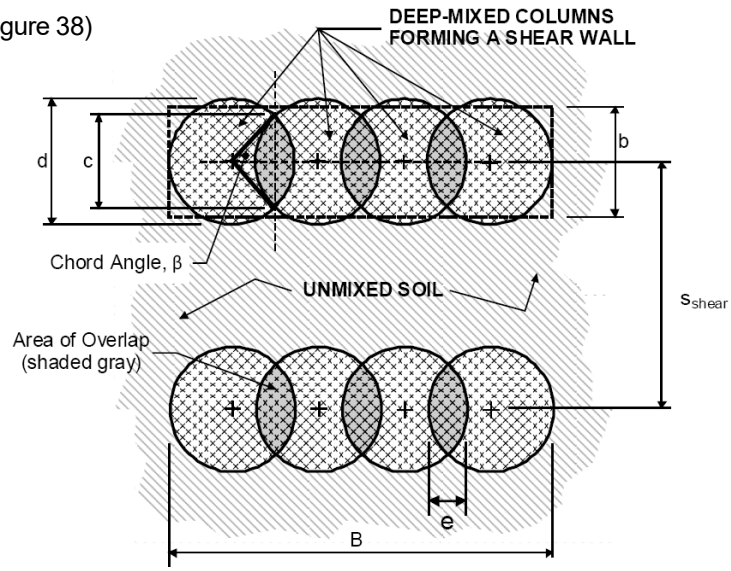
$f_c := 0.187 \cdot ln(t) + 0.375 = 1.07$ Curing Factor (Figure 30)

$s_{dm} := \frac{1}{2} \cdot q_{dm_spec} \cdot f_c \cdot f_r$ Shear Strength of Deep Mixed Zone (Figure 33)

$s_{dm} = 55.85\,psi$

4. Establish Trial Deep Mixed Geometry

Column Overlap Sketch (FHWA Figure 38)



$d := 3ft$	Column Diameter	(Figure 43)
$b := 0.9 \cdot d = 2.70\,ft$	Min. allowable effective width	(Page 68)
$e := 8in$	Overlap Distance	
$r_{overlap} := \frac{e}{d} = 0.222$	Ratio of overlap to column diamter (typically between 0.2 and 0.35)	(Page 59)
$\beta := 2 \cdot acos\left(1 - r_{overlap}\right) = 77.88 \cdot deg$	Chord Angle	(Figure 40)
$\alpha := \frac{\beta}{2} = 38.94 \cdot deg$	Half of the Chord Angle	
$s_{shear} := 15ft$	Spacing of MIP panel, center-to-center (cross canyon direction)	
$a_e := \frac{\alpha - sin(\alpha)}{\pi} = 0.02$	Overlap Area Ratio	(Figure 42)
$a_{s_shear_est} := \frac{b}{s_{shear}} = 0.18$	Estimated Area Replacement Ratio	(Figure 39)
$a_{s_shear} := a_{s_shear_est} = 0.18$	Selected Area Replacement Ratio (typically between 0.2 and 0.4)	(Figure 43)
$c_{chord} := d \cdot sin\left(\frac{\beta}{2}\right) = 1.89 \cdot ft$	Chord Length	(Figure 41)
$c_s_{ratio} := \frac{c_{chord}}{s_{shear}} = 0.13$	Ratio of Chord Length to Wall Spacing	
$n := 4$	Number of columns per MIP panel	
$B := [d + (n - 1) \cdot (d - e)] = 10.00\,ft$	Length of MIP panel (upstream-downstream direction)	

5. Evaluate Settlement

The nature of this project is reconstruction of a failed dam to its original geometry. The stress state at the end of construction will be similar to existing conditions. Therefore, excessive settlement is not expected.

6. Evaluate Stability

6.1 Slope Stability

Static slope stability analysis:

Results of the static slope stability analyses are included in the Slope Stability and Seepage memorandum. The calculated factors of safety for the proposed conditions without MIP panels exceed the minimum design criteria for all static load cases. The MIP panels will increase the shear strength of the Foundation Soils. Therefore, by inspection, the factors of safety under proposed static loading conditions where MIP panels are installed are expected to exceed the minimum design criteria, and static slope stability including MIP panels was not evaluated further.

Post earthquake slope stability analsysis:

$s_{dm_comp_eq} := f_{v_1.2} \cdot a_{s_shear} \cdot s_{dm} = 10.25 \cdot psi$ For FS=1.2

$s_{dm_comp_eq} = 1476.46 \cdot psf$ Max allowable composite shear strength

$s_{req_2} := 1450 psf$ Shear strength used in post-earthquake slope stability analysis

$$strength_{check_2} := \begin{cases} \text{"OK"} & \text{if } s_{req_2} < \left(s_{dm_comp_eq}\right) \\ \text{"Allowable shear strength exceeded"} & \text{otherwise} \end{cases}$$

$strength_{check_2} = \text{"OK"}$

See Attachment 2 of the Mix-In-Place Panel Analysis and Design memorandum for results for the Post Earthquake Slope Stability Analysis with MIP Panels installed.

6.2 Combined Overturning and Bearing Capacity

Sketch and Defintions

(Figure 51)

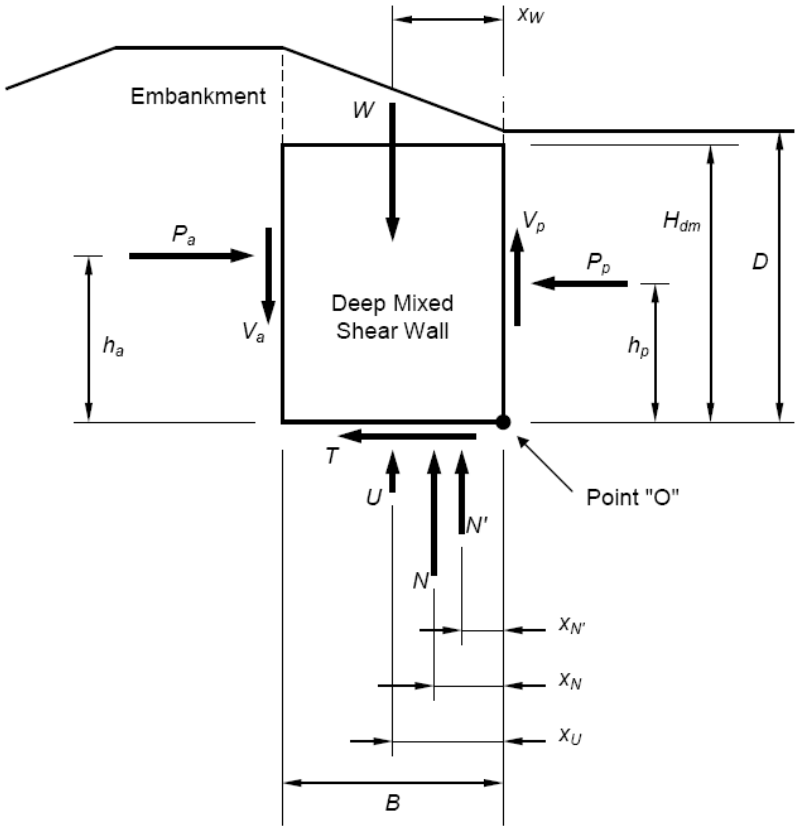


Figure 51. Illustration. Definition sketch for combined overturning and bearing calculations.

Where:
W = Total weight of the deep mixed zone and the overlying untreated soil and embankment material.
x_W = Horizontal distance from point "O" at the toe of the deep mixed zone to the line of action of W.
B = Width of the deep mixed zone.
D = Depth to the base of the deep mixed zone at the toe of the slope.
P_a = Total active force, including the load from water pressures.
h_a = Vertical distance from point "O" to the line of action of Pa.
V_a = Vertical shear force on active side.
P_p = Total passive force, including the load from water pressures.
h_p = Vertical distance from point "O" to the line of action of Pp.
V_p = Vertical shear force on passive side.
N = Total vertical force acting upwards on the base of the deep mixed zone.
U = Vertical water force acting upwards on the base of the deep mixed zone.
N' = Effective vertical force acting upwards on the base of the deep mixed zone.
x_N = Horizontal distance from point "O" to N.
x_U = Horizontal distance from point "O" to U.
$x_{N'}$ = Horizontal distance from point "O" to N'.
T = Horizontal shear force acting on the base of the deep mixed zone.

Earth Pressure Calculation Inputs:

$\theta := atan\left(\frac{1}{2.5}\right) = 21.80 \cdot deg$ Embankment Slope

$H_p := 21.0ft$ Height of soil (foundation & shell) on the passive side of the MIP panel

$H_a := 24.5ft$ Height of soil (foundation & shell) on the active side of the MIP panel

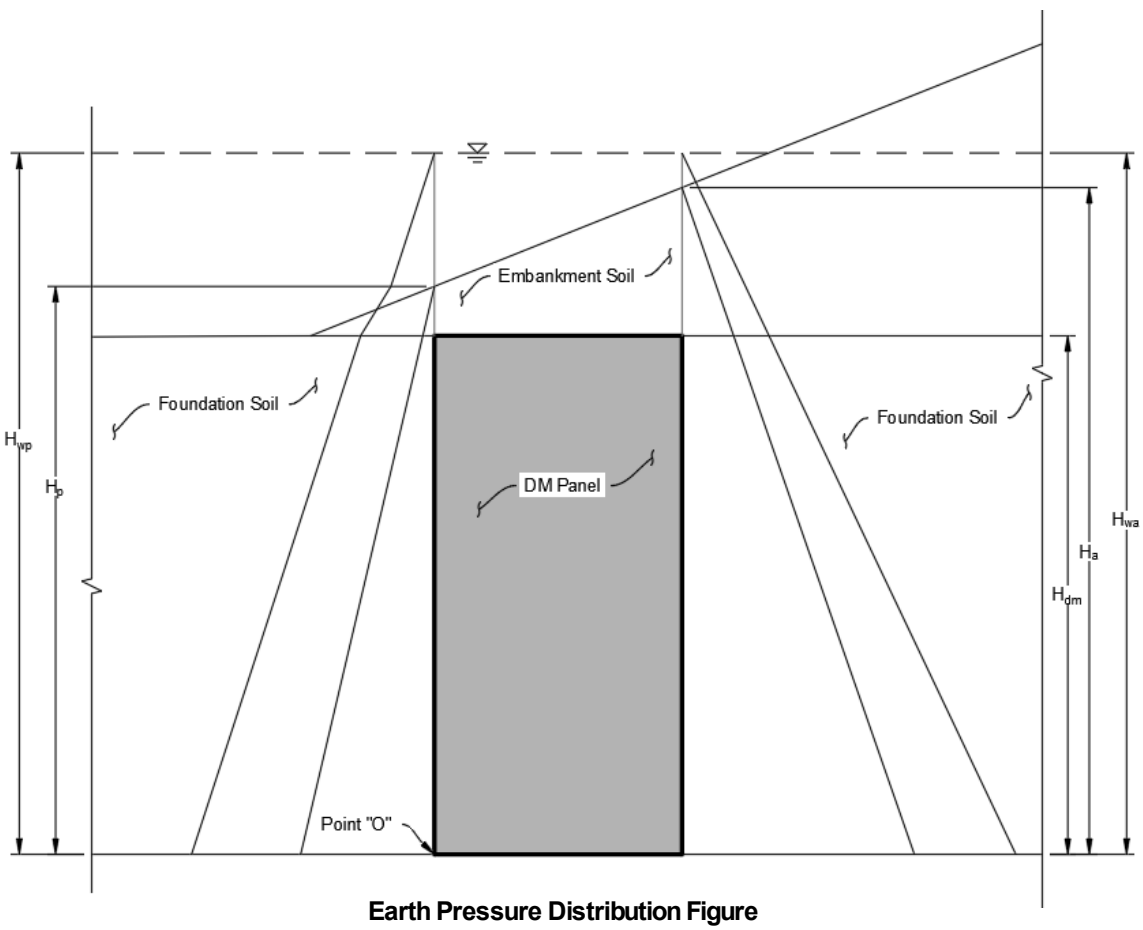
$H_{wa} := 31ft$ Height of water on the active side of the MIP panel

$H_{wp} := 31ft$ Height of water on the passive side of the MIP panel

$H_w := mean(H_{wa}, H_{wp}) = 31.00\,ft$ Average height of water across the MIP panel

$H_{dm} := 21ft$ Height of MIP panel

Note, all heights listed above are relative to point "O".



Earth Pressure Distribution Figure

6.2.1 Mobilized Shear Strength Parameters

Embankment Soils (Shell Fill)

$$\phi'_{m_emb} := \operatorname{atan}\left(\frac{\tan(\phi'_{emb})}{F_o}\right) = 25.67 \cdot deg$$

$$c'_{m_emb} := \frac{c'_{emb}}{F_o} = 0.00 \cdot psf$$

Mobilized effective stress parameters of embankment soil

Foundation Soils (Alluvial)

$$\phi_{m_fnd} := \operatorname{atan}\left(\frac{\tan(\phi_{fnd})}{F_o}\right) = 15.64 \cdot deg$$

$$\phi'_{m_fnd} := \operatorname{atan}\left(\frac{\tan(\phi'_{fnd})}{F_o}\right) = 23.09 \cdot deg$$

Mobilized friction angles of soil to be treated

Note: use the residual undrained strength ratio (USR) to estimate the cohesion of the foundation soils. This is a function of the vertical stress. Consider the vertical stress at the centroid of the MIP panel. Thus,

Vertical stress - active side - Midheight of MIP panel

$$\sigma_{va} := \gamma_{emb_s} \cdot (H_a - H_{dm}) + \gamma_{fnd_s} \cdot \left(\frac{H_{dm}}{2}\right) + \gamma_w \cdot (H_{wa} - H_a) = 2103.10 \cdot psf$$

$$\sigma'_{va} := \sigma_{va} - \gamma_w \cdot \frac{H_{wa}}{2} = 1135.90 \cdot psf$$

Vertical stress - passive side - Midheight of MIP panel

$$\sigma_{vp} := \gamma_{emb_s} \cdot (H_p - H_{dm}) + \gamma_{fnd_s} \cdot \left(\frac{H_{dm}}{2}\right) + \gamma_w \cdot (H_{wp} - H_p) = 1884.00 \cdot psf$$

$$\sigma'_{vp} := \sigma_{vp} - \gamma_w \cdot \frac{H_{wp}}{2} = 916.80 \cdot psf$$

$$\sigma_{v_ave} := mean(\sigma_{va}, \sigma_{vp}) = 1993.55 \cdot psf$$

Average total vertical stress at centroid of MIP panel

$$\sigma'_{v_ave} := mean(\sigma'_{va}, \sigma'_{vp}) = 1026.35 \cdot psf$$

Average effective vertical stress at centroid of MIP panel

$$S_u := USR \cdot \sigma'_{v_ave} = 92.37 \cdot psf$$

Shear strength based on USR

$$c_{m_fnd} := \frac{S_u}{F_o} = 71.06 \cdot psf$$

Selected mobilized cohesion of soil to be treated

6.2.3 Earth Pressure Calculations

Lateral Forces on MIP panel - Active Side (no cohesion accounted for on active side - conservative)

Embankment soil

$$k_{a_emb} := cos(\theta)\cdot\left(\frac{cos(\theta) - \sqrt{cos(\theta)^2 - cos(\phi'_{m_emb})^2}}{cos(\theta) + \sqrt{cos(\theta)^2 - cos(\phi'_{m_emb})^2}}\right) = 0.57$$

Rankine earth pressure coefficient for sloping backfill

$$p_{a_emb} := \gamma_{emb_b}\cdot(H_a - H_{dm}) = 219.10\cdot psf$$

$$P_{a_emb} := \frac{1}{2}p_{a_emb}\cdot k_{a_emb}\cdot(H_a - H_{dm}) = 218.09\cdot\frac{lbf}{ft}$$

$$h_{a_emb} := H_{dm} + \frac{(H_a - H_{dm})}{3} = 22.17\,ft$$

Foundation soil

$$\phi_{fnd_eq} := tan(USR) = 5.17\cdot deg$$

Equivalent friction angle from USR

$$k_{a_fnd} := \frac{1 - sin(\phi_{fnd_eq})}{1 + sin(\phi_{fnd_eq})} = 0.83$$

Rankine earth pressure coefficient for level backfill

$$P_{a_fnd_rec} := k_{a_fnd}\cdot H_{dm}\cdot p_{a_emb} = 3840.35\cdot\frac{lbf}{ft}$$

rectangular portion of earth pressure dsitribution

$$h_{a_fnd_rec} := \frac{H_{dm}}{2} = 10.50\,ft$$

$$P_{a_fnd_tri} := \frac{1}{2}\gamma_{fnd_b}\cdot k_{a_fnd}\cdot H_{dm}^2 = 10600.83\cdot\frac{lbf}{ft}$$

triangular portion of earth pressure dsitribution

$$h_{a_fnd_tri} := \frac{H_{dm}}{3} = 7.00\,ft$$

Groundwater

$$p_{a_w} := H_{wa}\cdot\gamma_w = 1934.40\cdot psf$$

$$P_{a_w} := \frac{1}{2}\cdot p_{a_w}\cdot H_{wa} = 29983.20\cdot\frac{lbf}{ft}$$

$$h_{a_w} := \frac{H_{wa}}{3} = 10.33\,ft$$

$$P_a := P_{a_emb} + P_{a_fnd_rec} + P_{a_fnd_tri} + P_{a_w} = 44642.46\cdot\frac{lbf}{ft}$$

$$h_a := \frac{h_{a_emb}P_{a_emb} + h_{a_fnd_rec}\cdot P_{a_fnd_rec} + h_{a_fnd_tri}\cdot P_{a_fnd_tri} + h_{a_w}\cdot P_{a_w}}{P_a} = 9.61\,ft$$

Lateral Forces on MIP panel - Passive Side (no cohesion accounted for on passive side - conservative)

Embankment Soil

Conservatively assume the passive wedge shears at the top of the MIP panel. Passive force from triangular wedge of embankment soil ommited. Vertical stress contribution applied to overall passive resistance is considered. However, passive side of MIP panel is aligned with embankment toe. Thus,

$$p_{p_emb} := \gamma_{emb_b} \cdot (H_p - H_{dm}) = 0.00 \cdot psf$$

Foundation soil

$$k_{p_fnd} := \frac{1}{k_{a_fnd}} = 1.20$$

Passive earth pressure coefficient of foundation soil

$$P_{p_fnd_rec} := k_{p_fnd} \cdot H_{dm} \cdot p_{p_emb} = 0.00 \cdot \frac{lbf}{ft}$$

$$h_{p_fnd_rec} := \frac{H_{dm}}{2} = 10.50\, ft$$

rectangular portion of earth pressure dsitribution

$$P_{p_fnd_tri} := \frac{1}{2} k_{p_fnd} \cdot \gamma_{fnd_b} \cdot H_{dm}^2 = 15216.77 \cdot \frac{lbf}{ft}$$

triangular portion of earth pressure dsitribution

$$h_{p_fnd_tri} := \frac{H_{dm}}{3} = 7.00\, ft$$

Groundwater

$$p_{p_w} := H_{wp} \cdot \gamma_w = 1934.40 \cdot psf$$

$$P_{p_w} := \frac{1}{2} \cdot p_{p_w} \cdot H_{wp} = 29983.20 \cdot \frac{lbf}{ft}$$

$$h_{p_w} := \frac{H_{wp}}{3} = 10.33\, ft$$

$$P_{p_ult} := P_{p_fnd_tri} + P_{p_fnd_rec} + P_{p_w} = 45199.97 \cdot \frac{lbf}{ft}$$

$$h_p := \frac{h_{p_fnd_tri} \cdot P_{p_fnd_tri} + h_{p_fnd_rec} \cdot P_{p_fnd_rec} + P_{p_w} \cdot h_{p_w}}{P_{p_ult}} = 9.21\, ft$$

The calculation above represents the ultimate passive force capacity. To maintain horizontal equilibrium, the passive force will never exceed the active force. Therefore,

$$P_p := \begin{cases} P_a & \text{if } P_a < P_{p_ult} \\ P_{p_ult} & \text{otherwise} \end{cases} \qquad P_p = 44642.46 \cdot \frac{lbf}{ft}$$

Shear forces acting on the sides of the MIP panel

$V_a := c_{m_fnd} \cdot H_{dm} = 1492.16 \cdot \frac{lbf}{ft}$

$V_p := c_{m_fnd} \cdot H_{dm} = 1492.16 \cdot \frac{lbf}{ft}$

Water uplift force acting on the base of the MIP panel

$U := H_w \cdot \gamma_w \cdot B = 19344.00 \cdot \frac{lbf}{ft}$

$x_u := \frac{B}{2} = 5.00\,ft$

Weight of MIP panel and overburden soil

$H_{ob} := mean(H_a, H_p) - H_{dm} = 1.75\,ft$

Average height of overburden soil above MIP panel

$W_{dm} := \gamma_{dm} \cdot B \cdot H_{dm} = 26250.00 \cdot \frac{lbf}{ft}$

$x_{dm} := \frac{B}{2} = 5.00\,ft$

$W_{ob} := B \cdot H_{ob} \cdot \gamma_{emb_b} = 1095.50 \cdot \frac{lbf}{ft}$

$x_{ob} := \frac{2B}{3} = 6.67\,ft$

$W := W_{ob} + W_{dm} = 27345.50 \cdot \frac{lbf}{ft}$

$x_{dm_ob} := \frac{x_{dm} \cdot W_{dm} + x_{ob} \cdot W_{ob}}{W} = 5.07\,ft$

6.2.4 Determine Resultant Normal Force

$N := W + V_a - V_p = 27345.50 \cdot \frac{lbf}{ft}$ (Figure 56)

$N' := N - U = 8001.50 \cdot \frac{lbf}{ft}$ (Figure 57)

6.2.5 Determine Location of the Resultant Normal Force

$x_N := \frac{(P_p \cdot h_p + W \cdot x_{dm_ob} + V_a \cdot B - P_a \cdot h_a)}{N} = 4.95\,ft$ (Figure 58)

$x_{N'} := \frac{N \cdot x_N - U \cdot x_u}{N'} = 4.85\,ft$ (Figure 59)

Sliding Check

$\delta := 29deg$ Interface friction angle between MIP panel and base material (rock)

$T_{tot} := N \cdot tan(\delta) = 15157.86 \cdot \frac{lbf}{ft}$ Resisting force due to friction (Filz 2011, eq. 17)

$T_{eff} := N' \cdot tan(\delta) = 4435.30 \cdot \frac{lbf}{ft}$ (Filz 2011, eq. 18)

For post earthqauke loading ignore uplift pressure at the base. Thus,

$T := T_{tot}$

$$FS_{slide} := \frac{T + P_p}{P_a} = 1.34$$

$$sliding_{check} := \begin{cases} \text{"OK"} & \text{if } FS_{slide} > 1.3 \\ \text{"Increase resisting forces"} & \text{otherwise} \end{cases}$$

$sliding_{check} = \text{"OK"}$

6.2.6 Calculate Bearing Pressure at Toe of MIP panel

$$B_{0.33} := \frac{B}{3} = 3.33\,ft$$

$$B_{0.5} := \frac{B}{2} = 5.00\,ft$$

$$eccentricity := \frac{B}{2} - x_{N'} = 0.15\,ft$$

$$q_{toe_tot} := \begin{cases} \frac{N}{B} \cdot \left(\frac{2B}{3x_N a_{s_shear}} - \frac{1}{a_{s_shear}} + 1 \right) & \text{if } x_N \le B_{0.33} \\ \frac{N}{B} \cdot \left(\frac{3}{a_{s_shear}} - \frac{6 \cdot x_N}{B \cdot a_{s_shear}} + 1 \right) & \text{if } B_{0.33} \le x_N \le B_{0.5} \end{cases} = 3145.97 \cdot psf$$ (Figure 60)

$$q_{toe_eff} := \begin{cases} \frac{N'}{B} \cdot \left(\frac{2B}{3x_{N'} a_{s_shear}} - \frac{1}{a_{s_shear}} + 1 \right) & \text{if } x_{N'} \le B_{0.33} \\ \frac{N'}{B} \cdot \left(\frac{3}{a_{s_shear}} - \frac{6 \cdot x_{N'}}{B \cdot a_{s_shear}} + 1 \right) & \text{if } B_{0.33} < x_{N'} \le B_{0.5} \end{cases} = 1211.57 \cdot psf$$ (Figure 61)

The material beneath the MIP panel is characterized by effective stress conditions. Thus,

$q_{toe} := q_{toe_eff}$ $q_{toe} = 1211.57 \cdot psf$

6.2.7 Determine Allowable Bearing Pressure

The MIP panels will extend to top of bedrock. By inspection, no bearing capacity analysis is neccessary.

6.3 Crushing of the MIP panel at the Outside Toe

$k_o := 1 - sin(\phi_{m_fnd}) = 0.73$ At-rest earth pressure coefficient of soil adjacent to base of MIP panel, total stress condition

$k'_o := 1 - sin(\phi'_{m_fnd}) = 0.61$ At-rest earth pressure coefficient of soil adjacent to base of MIP panel, effective stress condition

$\sigma_{v_base} := H_{dm} \cdot \gamma_{fnd_s} = 2520.00 \cdot psf$ Total Vertical Stress at Toe of MIP panel

$\sigma_h := \sigma_{v_base} \cdot k_o = 1840.58 \cdot psf$ Total Horizontal Stress at Toe of MIP panel

$\sigma'_{v_base} := \sigma_{v_base} - H_{wp} \cdot \gamma_w = 585.60 \cdot psf$ Effective Vertical Stress at Toe of MIP panel

$\sigma'_h := \sigma'_{v_base} \cdot k'_o = 355.91 \cdot psf$ Effective Horizontal Stress at Toe of MIP panel

Allowable bearing capacity of MIP panel against crushing - Total stress conditions

$$q_{all_crush_tot} := \frac{2 \cdot s_{dm} \cdot f_{v_1.3}}{F_c} + \sigma_h = 13593.83 \cdot psf$$ (Figure 65)

Allowable bearing capacity of MIP panel against crushing - Effective stress conditions

$$q_{all_crush_eff} := \frac{2 \cdot s_{dm} \cdot f_{v_1.3}}{F_c} + \sigma'_h = 12109.16 \cdot psf$$ (Figure 65)

The material beneath the MIP panel is characterized by effective stress conditions. Thus,

$q_{all_crush} := q_{all_crush_eff}$ $q_{all_crush} = 12109.16 \cdot psf$

$$q_{all_crush_check} := \begin{cases} \text{"OK"} & \text{if } q_{toe} \le q_{all_crush} \\ \text{"Allowable Bearing Pressure Against Crushing Exceeded"} & \text{otherwise} \end{cases} = \text{"OK"}$$

$q_{all_crush_check} = \text{"OK"}$

6.4 Shearing on Vertical Planes in the MIP panel

Average Vertical Shear Stress on MIP panel

$$\tau_v := \begin{cases} \dfrac{V_p}{H_{dm}} + \dfrac{N}{H_{dm}} \cdot \left(1 - \dfrac{3x_N}{2B}\right)^2 & \text{if } x_N \le B_{0.33} \\ \left[\dfrac{V_p}{H_{dm}} + \dfrac{3N}{4H_{dm}} \cdot \left(1 - \dfrac{2x_N}{B}\right)\right] & \text{if } B_{0.33} \le x_N \le B_{0.5} \end{cases} = 79.87 \cdot psf$$

(Figure 69)

$$\tau_{v_all} := \frac{f_{v_1.3} \cdot \left(\dfrac{c_{chord}}{s_{shear}}\right) \cdot s_{dm}}{F_v} = 738.74 \cdot psf$$

(Figure 70)

$$\tau_{check} := \begin{cases} \text{"OK"} & \text{if } \tau_v \le \tau_{v_all} \\ \text{"Allowable Vertical Shear Exceeded"} & \text{otherwise} \end{cases}$$

τ_{check} = "OK"

6.5 Extrusion of Soil Between MIP panels

$H_e := H_{dm}$ Thickness of layer subject analyzed for extrusion

$c_e := c_{m_fnd} = 71.06 \cdot psf$ Average total stress cohesion of soil analyzed for extrusion

$s_{shear} - b = 12.30\, ft$ Clear spacing between panels

$$F_{e_check} := \frac{2c_e \cdot \left[2 + B \cdot \left(\frac{1}{s_{shear} - b} + \frac{1}{H_e}\right)\right]}{\left(\sigma_{va} - \sigma_{vp}\right)} = 2.13$$

(Filz 2011, eq. 30)

$$Extrusion_{check} := \begin{cases} \text{"OK"} & \text{if } F_e \le F_{e_check} \\ \text{"Allowable Spacing Exceeded"} & \text{otherwise} \end{cases}$$

$Extrusion_{check} = \text{"OK"}$

Calculation Objective

1. Design a Mix-In-Place (MIP) panel shear wall system to support the embankment during post-earthquake conditions.

Design Assumptions

- Wet Mix Method

References

Federal Highway Administration Design Manual: Deep Mixing for Emankment and Foundation Support - FHWA-HRT-13-046 (2013). US Department of Transportation - Federal Highway Administration.

Filz, G.M. and Templeton, E. (2011). Design Guide for Levee and Floodwall Stability Using Deep-Mixed Shear Walls, prepared by Burns Cooley Dennis for the U.S. Army Corps of Engineers.

Notes

1. All "Table", "Figure", and "Page" references refer to the 2013 FHWA manual unless otherwise noted.
2. Calculation step numbering and terminology are in general accordance with 2013 FHWA design manual. The terms "deep mixing" and "deep mixed zone" are used along with "MIP panel" throughout this calcuation.

1. Establish Project Requirements

Factor of Safety and Design Coefficient Values

$F_{s_eq} := 1.2$	Design FS for Post Earthquake Slope Stability	
$F_o := 1.3$	Design FS against combined overturning and bearing capacity failure at the toe of the deep mixed zone	(Table 11)
$F_c := 1.3$	Design FS against crushing of deep mixed ground at the toe of the deep mixed zone	(Table 11)
$F_v := 1.3$	Design FS for shearing through deep mixed zone	(Table 11)
$F_e := 1.3$	Design FS for extrusion of soil between shear walls	(Table 11)
$COV := 0.5$	Coefficient of Variation for Good Construction	
$f_{v_1.2} := 1.02$	Coefficient of variability for deep mixed ground strength corresponding to a FS of 1.2	(Table 12)
$f_{v_1.3} := 0.95$	Coefficient of variability for deep mixed ground strength corresponding to a FS of 1.3	(Table 12)
$f_r := 0.80$	Residual Compressive Strength Factor (typically between 0.65 and 0.9)	(Page 68)

2. Establish Subsurface Conditions

Material Properties

$\gamma_{dm} := 125pcf$ Unit Weight of MIP panel

$\gamma_w := 62.4pcf$ Unit Weight of Water

Embankment Soils (Shell Fill)

$\gamma_{emb} := 120pcf$ Moist unit weight

$\gamma_{emb_s} := 125pcf$ Saturated unit weight

$\gamma_{emb_b} := \gamma_{emb_s} - \gamma_w = 62.60 \cdot pcf$ Bouyant unit weight

$\phi'_{emb} := 32deg$ $c'_{emb} := 0psf$ Effective stress parameters

Foundation Soils (Alluvial)

$\gamma_{fnd} := 115pcf$ Moist unit weight

$\gamma_{fnd_s} := 120pcf$ Saturated unit weight

$\gamma_{fnd_b} := \gamma_{fnd_s} - \gamma_w = 57.60 \cdot pcf$ Bouyant unit weight

$\phi_{fnd} := 20deg$ $c_{fnd} := 100psf$ Total stress parameters

$\phi'_{fnd} := 29deg$ $c'_{fnd} := 0psf$ Effective stress parameters

$USR := 0.09$ Undrained Strength Ratio

3. Establish Trial Deep Mixed Ground Property Values

Shear Strength

$q_{dm_spec} := 130psi$ 28-day Minimum Unconfined Compressive Strength of Treated Soil (typically between 75 and 150 psi) (Page 78)

$t := 42 \quad days$ Curing Time in days until full loading

This assumes that loading conditions assumed herein (full resevoir with steady-state seepage conditions and liquefied Foundation Soils from design seismic event) develop no sooner than 2 weeks after confirmation of 28 day strength.

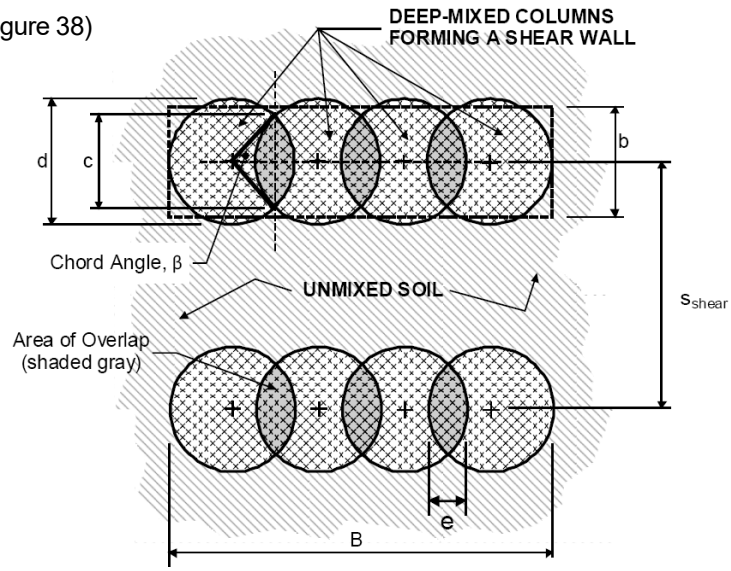
$f_c := 0.187 \cdot ln(t) + 0.375 = 1.07$ Curing Factor (Figure 30)

$s_{dm} := \frac{1}{2} \cdot q_{dm_spec} \cdot f_c \cdot f_r$ Shear Strength of Deep Mixed Zone (Figure 33)

$s_{dm} = 55.85\,psi$

4. Establish Trial Deep Mixed Geometry

Column Overlap Sketch (FHWA Figure 38)



$d := 3ft$	Column Diameter	(Figure 43)
$b := 0.9 \cdot d = 2.70\,ft$	Min. allowable effective width	(Page 68)
$e := 8in$	Overlap Distance	
$r_{overlap} := \frac{e}{d} = 0.222$	Ratio of overlap to column diamter (typically between 0.2 and 0.35)	(Page 59)
$\beta := 2 \cdot acos\left(1 - r_{overlap}\right) = 77.88 \cdot deg$	Chord Angle	(Figure 40)
$\alpha := \frac{\beta}{2} = 38.94 \cdot deg$	Half of the Chord Angle	
$s_{shear} := 8ft$	Spacing of MIP panel, center-to-center (cross canyon direction)	
$a_e := \frac{\alpha - sin(\alpha)}{\pi} = 0.02$	Overlap Area Ratio	(Figure 42)
$a_{s_shear_est} := \frac{b}{s_{shear}} = 0.34$	Estimated Area Replacement Ratio	(Figure 39)
$a_{s_shear} := a_{s_shear_est} = 0.34$	Selected Area Replacement Ratio (typically between 0.2 and 0.4)	(Figure 43)
$c_{chord} := d \cdot sin\left(\frac{\beta}{2}\right) = 1.89 \cdot ft$	Chord Length	(Figure 41)
$c_s_{ratio} := \frac{c_{chord}}{s_{shear}} = 0.24$	Ratio of Chord Length to Wall Spacing	
$n := 4$	Number of columns per MIP panel	
$B := [d + (n - 1) \cdot (d - e)] = 10.00\,ft$	Length of MIP panel (upstream-downstream direction)	

5. Evaluate Settlement

The nature of this project is reconstruction of a failed dam to its original geometry. The stress state at the end of construction will be similar to existing conditions. Therefore, excessive settlement is not expected.

6. Evaluate Stability

6.1 Slope Stability

Static slope stability analysis:

Results of the static slope stability analyses are included in the Slope Stability and Seepage memorandum. The calculated factors of safety for the proposed conditions without MIP panels exceed the minimum design criteria for all static load cases. The MIP panels will increase the shear strength of the Foundation Soils. Therefore, by inspection, the factors of safety under proposed static loading conditions where MIP panels are installed are expected to exceed the minimum design criteria, and static slope stability including MIP panels was not evaluated further.

Post earthquake slope stability analsysis:

$s_{dm_comp_eq} := f_{v_1.2} \cdot a_{s_shear} \cdot s_{dm} = 19.22 \cdot psi$ For FS=1.2

$s_{dm_comp_eq} = 2768.35 \cdot psf$ Max allowable composite shear strength

$s_{req_2} := 2760 psf$ Shear strength used in post-earthquake slope stability analysis

$$strength_{check_2} := \begin{cases} \text{"OK"} & \text{if } s_{req_2} < \left(s_{dm_comp_eq}\right) \\ \text{"Allowable shear strength exceeded"} & \text{otherwise} \end{cases}$$

$strength_{check_2} = \text{"OK"}$

See Attachment 2 of the Mix-In-Place Panel Analysis and Design memorandum for results for the Post Earthquake Slope Stability Analysis with MIP Panels installed.

6.2 Combined Overturning and Bearing Capacity

Sketch and Defintions

(Figure 51)

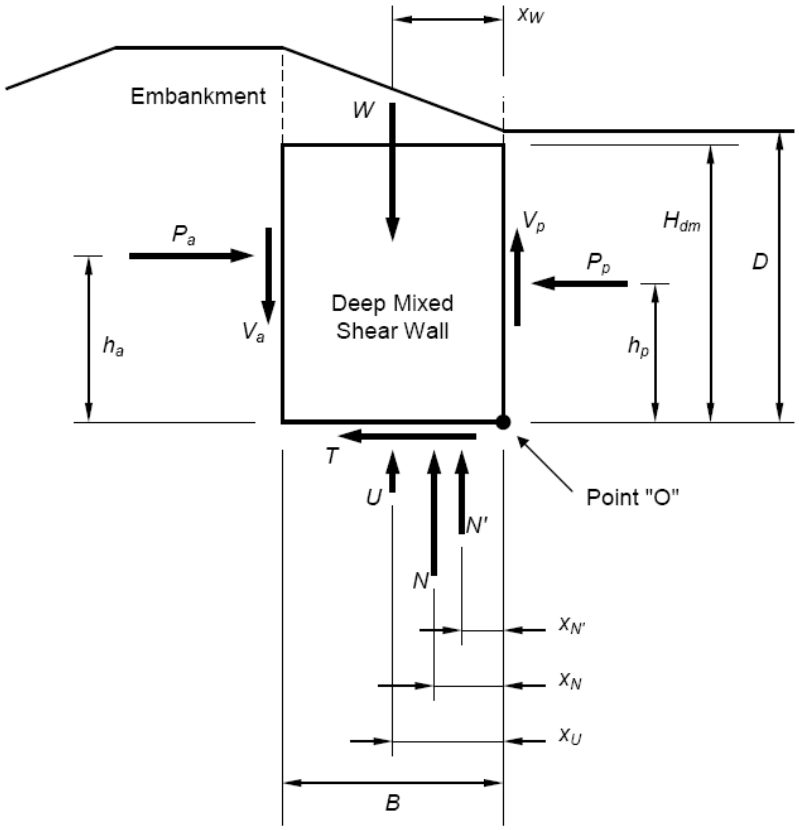


Figure 51. Illustration. Definition sketch for combined overturning and bearing calculations.

Where:
W = Total weight of the deep mixed zone and the overlying untreated soil and embankment material.
x_W = Horizontal distance from point "O" at the toe of the deep mixed zone to the line of action of W.
B = Width of the deep mixed zone.
D = Depth to the base of the deep mixed zone at the toe of the slope.
P_a = Total active force, including the load from water pressures.
h_a = Vertical distance from point "O" to the line of action of Pa.
V_a = Vertical shear force on active side.
P_p = Total passive force, including the load from water pressures.
h_p = Vertical distance from point "O" to the line of action of Pp.
V_p = Vertical shear force on passive side.
N = Total vertical force acting upwards on the base of the deep mixed zone.
U = Vertical water force acting upwards on the base of the deep mixed zone.
N' = Effective vertical force acting upwards on the base of the deep mixed zone.
x_N = Horizontal distance from point "O" to N.
x_U = Horizontal distance from point "O" to U.
$x_{N'}$ = Horizontal distance from point "O" to N'.
T = Horizontal shear force acting on the base of the deep mixed zone.

Earth Pressure Calculation Inputs:

$\theta := atan\left(\frac{1}{2.5}\right) = 21.80 \cdot deg$ — Embankment Slope

$H_p := 23.3ft$ — Height of soil (foundation & shell) on the passive side of the MIP panel

$H_a := 27.3ft$ — Height of soil (foundation & shell) on the active side of the MIP panel

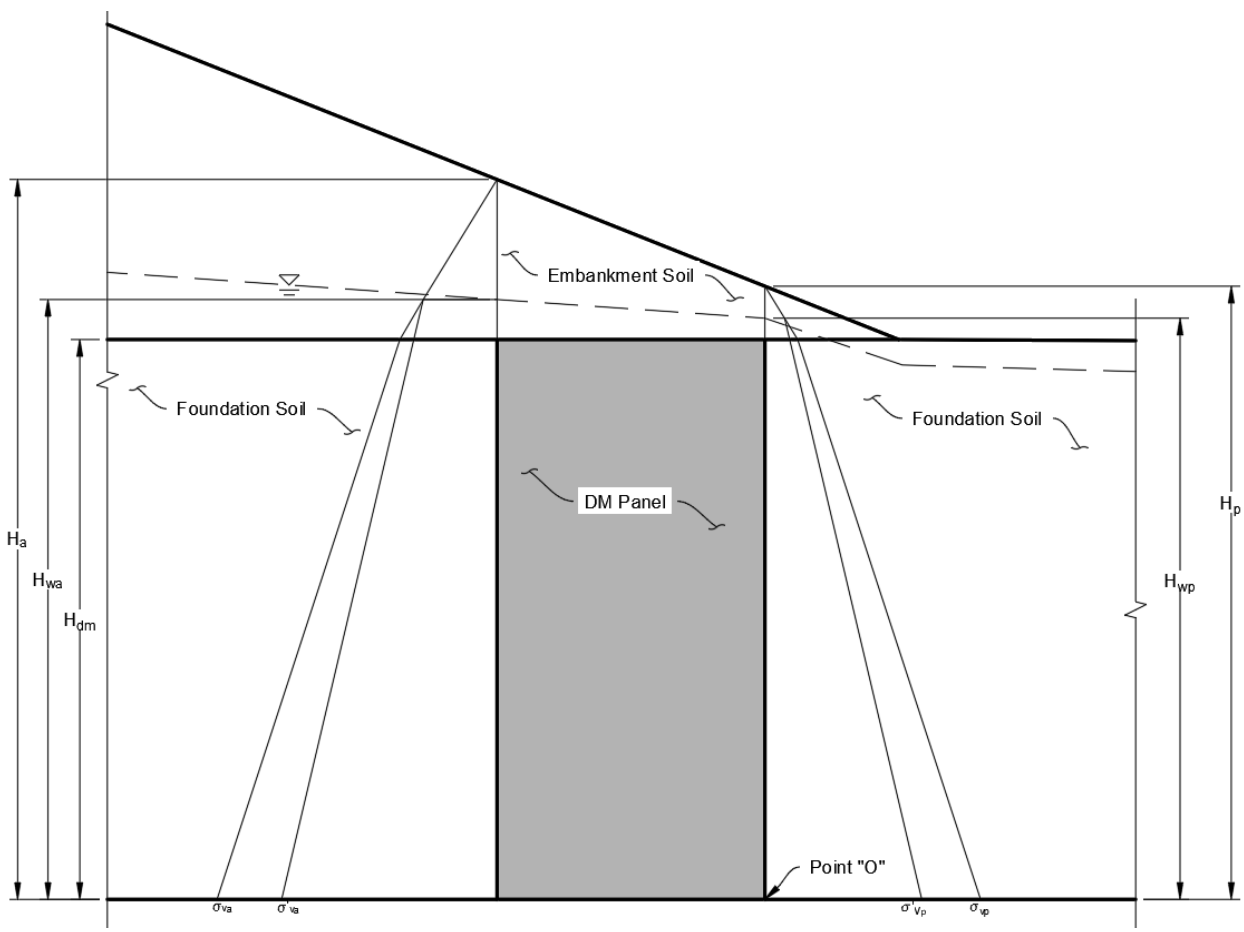
$H_{wa} := 20.2ft$ — Height of water on the active side of the MIP panel

$H_{wp} := 19.5ft$ — Height of water on the passive side of the MIP panel

$H_w := mean(H_{wa}, H_{wp}) = 19.85\,ft$ — Average height of water across the MIP panel

$H_{dm} := 18.5ft$ — Height of MIP panel

Note, all heights listed above are relative to point "O".



Earth Pressure Distribution Figure

6.2.1 Mobilized Shear Strength Parameters

Embankment Soils (Shell Fill)

$$\phi'_{m_emb} := \operatorname{atan}\left(\frac{\tan(\phi'_{emb})}{F_o}\right) = 25.67 \cdot deg$$

$$c'_{m_emb} := \frac{c'_{emb}}{F_o} = 0.00 \cdot psf$$

Mobilized effective stress parameters of embankment soil

Foundation Soils (Alluvial)

$$\phi_{m_fnd} := \operatorname{atan}\left(\frac{\tan(\phi_{fnd})}{F_o}\right) = 15.64 \cdot deg$$

$$\phi'_{m_fnd} := \operatorname{atan}\left(\frac{\tan(\phi'_{fnd})}{F_o}\right) = 23.09 \cdot deg$$

Mobilized friction angles of soil to be treated

Note: use the residual undrained strength ratio (USR) to estimate the cohesion of the foundation soils. This is a function of the vertical stress. Consider the vertical stress at the centroid of the MIP panel. Thus,

Vertical stress - active side - Midheight of MIP panel

$$\sigma_{va} := \gamma_{emb} \cdot (H_a - H_{wa}) + \gamma_{emb_s} \cdot (H_{wa} - H_{dm}) + \gamma_{fnd_s} \cdot \left(\frac{H_{dm}}{2}\right) = 2174.50 \cdot psf$$

$$\sigma'_{va} := \sigma_{va} - \gamma_w \cdot \frac{H_{wa}}{2} = 1544.26 \cdot psf$$

Vertical stress - passive side - Midheight of MIP panel

$$\sigma_{vp} := \gamma_{emb} \cdot (H_p - H_{wp}) + \gamma_{emb_s} \cdot (H_{wp} - H_{dm}) + \gamma_{fnd_s} \cdot \left(\frac{H_{dm}}{2}\right) = 1691.00 \cdot psf$$

$$\sigma'_{vp} := \sigma_{vp} - \gamma_w \cdot \frac{H_{wp}}{2} = 1082.60 \cdot psf$$

$$\sigma_{v_ave} := mean(\sigma_{va}, \sigma_{vp}) = 1932.75 \cdot psf$$

Average total vertical stress at centroid of MIP panel

$$\sigma'_{v_ave} := mean(\sigma'_{va}, \sigma'_{vp}) = 1313.43 \cdot psf$$

Average effective vertical stress at centroid of MIP panel

$$S_u := USR \cdot \sigma'_{v_ave} = 118.21 \cdot psf$$

Shear strength based on USR

$$c_{m_fnd} := \frac{S_u}{F_o} = 90.93 \cdot psf$$

Selected mobilized cohesion of soil to be treated

6.2.3 Earth Pressure Calculations

Lateral Forces on MIP panel - Active Side (no cohesion accounted for on active side - conservative)

Embankment soil

$$k_{a_emb} := cos(\theta)\cdot\left(\frac{cos(\theta) - \sqrt{cos(\theta)^2 - cos(\phi'_{m_emb})^2}}{cos(\theta) + \sqrt{cos(\theta)^2 - cos(\phi'_{m_emb})^2}}\right) = 0.57$$

Rankine earth pressure coefficient for sloping backfill

$$p_{a_emb} := \gamma_{emb}\cdot(H_a - H_{wa}) + \gamma_{emb_b}\cdot(H_{wa} - H_{dm}) = 958.42\cdot psf$$

$$P_{a_emb} := \frac{1}{2}p_{a_emb}\cdot k_{a_emb}\cdot(H_a - H_{dm}) = 2398.62\cdot\frac{lbf}{ft}$$

$$h_{a_emb} := H_{dm} + \frac{(H_a - H_{dm})}{3} = 21.43\,ft$$

Foundation soil

$$\phi_{fnd_eq} := tan(USR) = 5.17\cdot deg$$

Equivalent friction angle from USR

$$k_{a_fnd} := \frac{1 - sin(\phi_{fnd_eq})}{1 + sin(\phi_{fnd_eq})} = 0.83$$

Rankine earth pressure coefficient for level backfill

$$P_{a_fnd_rec} := k_{a_fnd}\cdot H_{dm}\cdot p_{a_emb} = 14799.13\cdot\frac{lbf}{ft}$$

rectangular portion of earth pressure dsitribution

$$h_{a_fnd_rec} := \frac{H_{dm}}{2} = 9.25\,ft$$

$$P_{a_fnd_tri} := \frac{1}{2}\gamma_{fnd_b}\cdot k_{a_fnd}\cdot H_{dm}^2 = 8227.06\cdot\frac{lbf}{ft}$$

triangular portion of earth pressure dsitribution

$$h_{a_fnd_tri} := \frac{H_{dm}}{3} = 6.17\,ft$$

Groundwater

$$p_{a_w} := H_{wa}\cdot\gamma_w = 1260.48\cdot psf$$

$$P_{a_w} := \frac{1}{2}\cdot p_{a_w}\cdot H_{wa} = 12730.85\cdot\frac{lbf}{ft}$$

$$h_{a_w} := \frac{H_{wa}}{3} = 6.73\,ft$$

$$P_a := P_{a_emb} + P_{a_fnd_rec} + P_{a_fnd_tri} + P_{a_w} = 38155.66\cdot\frac{lbf}{ft}$$

$$h_a := \frac{h_{a_emb}P_{a_emb} + h_{a_fnd_rec}\cdot P_{a_fnd_rec} + h_{a_fnd_tri}\cdot P_{a_fnd_tri} + h_{a_w}\cdot P_{a_w}}{P_a} = 8.51\,ft$$

Lateral Forces on MIP panel - Passive Side (no cohesion accounted for on passive side - conservative)

Embankment Soil

Conservatively assume the passive wedge shears at the top of the MIP panel. Passive force from triangular wedge of embankment soil ommited. Vertical stress contribution applied to overall passive resistance is considered. Thus,

$$p_{p_emb} := \gamma_{emb} \cdot (H_p - H_{wp}) + \gamma_{emb_b} \cdot (H_{wp} - H_{dm}) = 518.60 \cdot psf$$

Foundation soil

$$k_{p_fnd} := \frac{1}{k_{a_fnd}} = 1.20$$

Passive earth pressure coefficient of foundation soil

$$P_{p_fnd_rec} := k_{p_fnd} \cdot H_{dm} \cdot (p_{p_emb}) = 11494.65 \cdot \frac{lbf}{ft}$$

Rectangular portion of earth pressure dsitribution

$$h_{p_fnd_rec} := \frac{H_{dm}}{2} = 9.25\,ft$$

$$P_{p_fnd_tri} := \frac{1}{2} k_{p_fnd} \cdot \gamma_{fnd_b} \cdot H_{dm}^2 = 11809.39 \cdot \frac{lbf}{ft}$$

Triangular portion of earth pressure dsitribution

$$h_{p_fnd_tri} := \frac{H_{dm}}{3} = 6.17\,ft$$

Groundwater

$$p_{p_w} := H_{wp} \cdot \gamma_w = 1216.80 \cdot psf$$

$$P_{p_w} := \frac{1}{2} \cdot p_{p_w} \cdot H_{wp} = 11863.80 \cdot \frac{lbf}{ft}$$

$$h_{p_w} := \frac{H_{wp}}{3} = 6.50\,ft$$

$$P_{p_ult} := P_{p_fnd_tri} + P_{p_fnd_rec} + P_{p_w} = 35167.83 \cdot \frac{lbf}{ft}$$

$$h_p := \frac{h_{p_fnd_tri} \cdot P_{p_fnd_tri} + h_{p_fnd_rec} \cdot P_{p_fnd_rec} + P_{p_w} \cdot h_{p_w}}{P_{p_ult}} = 7.29\,ft$$

The calculation above represents the ultimate passive force capacity. To maintain horizontal equilibrium, the passive force will never exceed the active force. Therefore,

$$P_p := \begin{cases} P_a & \text{if } P_a < P_{p_ult} \\ P_{p_ult} & \text{otherwise} \end{cases} \qquad P_p = 35167.83 \cdot \frac{lbf}{ft}$$

Shear forces acting on the sides of the MIP panel

$V_a := c_{m_fnd} \cdot H_{dm} = 1682.20 \cdot \frac{lbf}{ft}$

$V_p := c_{m_fnd} \cdot H_{dm} = 1682.20 \cdot \frac{lbf}{ft}$

Water uplift force acting on the base of the MIP panel

$U := H_w \cdot \gamma_w \cdot B = 12386.40 \cdot \frac{lbf}{ft}$ $\qquad x_u := \frac{B}{2} = 5.00\,ft$

Weight of MIP panel and overburden soil

$H_{ob} := mean(H_a, H_p) - H_{dm} = 6.80\,ft$ Average height of overburden soil above MIP panel

$H_{ob_m} := H_{ob} + H_{dm} - H_w = 5.45\,ft$ Average height of moist overburden soil above MIP panel

$H_{ob_s} := H_{ob} - H_{ob_m} = 1.35\,ft$ Average height of saturated overburden soil above MIP panel

$W_{ob} := B \cdot (H_{ob_s} \cdot \gamma_{emb_b} + H_{ob_m} \cdot \gamma_{emb}) = 7385.10 \cdot \frac{lbf}{ft}$ $\qquad x_{ob} := \frac{2B}{3} = 6.67\,ft$

$W_{dm} := \gamma_{dm} \cdot B \cdot H_{dm} = 23125.00 \cdot \frac{lbf}{ft}$ $\qquad x_{dm} := \frac{B}{2} = 5.00\,ft$

$W := W_{ob} + W_{dm} = 30510.10 \cdot \frac{lbf}{ft}$ $\qquad x_{dm_ob} := \frac{x_{dm} \cdot W_{dm} + x_{ob} \cdot W_{ob}}{W} = 5.40\,ft$

6.2.4 Determine Resultant Normal Force

$N := W + V_a - V_p = 30510.10 \cdot \frac{lbf}{ft}$ (Figure 56)

$N' := N - U = 18123.70 \cdot \frac{lbf}{ft}$ (Figure 57)

6.2.5 Determine Location of the Resultant Normal Force

$x_N := \frac{(P_p \cdot h_p + W \cdot x_{dm_ob} + V_a \cdot B - P_a \cdot h_a)}{N} = 3.71\,ft$ (Figure 58)

$x_{N'} := \frac{N \cdot x_N - U \cdot x_u}{N'} = 2.83\,ft$ (Figure 59)

Sliding Check

$\delta := 29deg$ Interface friction angle between MIP panel and base material (rock)

$T_{tot} := N \cdot tan(\delta) = 16912.02 \cdot \frac{lbf}{ft}$ Resisting force due to friction (Filz 2011, eq. 17)

$T_{eff} := N' \cdot tan(\delta) = 10046.13 \cdot \frac{lbf}{ft}$ (Filz 2011, eq. 18)

For post earthqauke loading ignore uplift pressure at the base. Thus,

$T := T_{tot}$

$$FS_{slide} := \frac{T + P_p}{P_a} = 1.36$$

$$sliding_{check} := \begin{cases} \text{"OK"} & \text{if } FS_{slide} > 1.3 \\ \text{"Increase resisting forces"} & \text{otherwise} \end{cases}$$

$sliding_{check} = \text{"OK"}$

6.2.6 Calculate Bearing Pressure at Toe of MIP panel

$$B_{0.33} := \frac{B}{3} = 3.33\,ft$$

$$B_{0.5} := \frac{B}{2} = 5.00\,ft$$

$$eccentricity := \frac{B}{2} - x_{N'} = 2.17\,ft$$

$$q_{toe_tot} := \begin{cases} \frac{N}{B} \cdot \left(\frac{2B}{3x_N a_{s_shear}} - \frac{1}{a_{s_shear}} + 1 \right) & \text{if } x_N \le B_{0.33} \\ \frac{N}{B} \cdot \left(\frac{3}{a_{s_shear}} - \frac{6 \cdot x_N}{B \cdot a_{s_shear}} + 1 \right) & \text{if } B_{0.33} \le x_N \le B_{0.5} \end{cases} = 10048.66 \cdot psf$$ (Figure 60)

$$q_{toe_eff} := \begin{cases} \frac{N'}{B} \cdot \left(\frac{2B}{3x_{N'} a_{s_shear}} - \frac{1}{a_{s_shear}} + 1 \right) & \text{if } x_{N'} \le B_{0.33} \\ \frac{N'}{B} \cdot \left(\frac{3}{a_{s_shear}} - \frac{6 \cdot x_{N'}}{B \cdot a_{s_shear}} + 1 \right) & \text{if } B_{0.33} < x_{N'} \le B_{0.5} \end{cases} = 9100.76 \cdot psf$$ (Figure 61)

The material beneath the MIP panel is characterized by effective stress conditions. Thus,

$q_{toe} := q_{toe_eff}$ $q_{toe} = 9100.76 \cdot psf$

6.2.7 Determine Allowable Bearing Pressure

The MIP panels will extend to top of bedrock. By inspection, no bearing capacity analysis is neccessary.

6.3 Crushing of the MIP panel at the Outside Toe

$k_o := 1 - sin(\phi_{m_fnd}) = 0.73$ At-rest earth pressure coefficient of soil adjacent to base of MIP panel, total stress condition

$k'_o := 1 - sin(\phi'_{m_fnd}) = 0.61$ At-rest earth pressure coefficient of soil adjacent to base of MIP panel, effective stress condition

$\sigma_{v_base} := H_{dm} \cdot \gamma_{fnd_s} = 2220.00 \cdot psf$ Total Vertical Stress at Toe of MIP panel

$\sigma_h := \sigma_{v_base} \cdot k_o = 1621.47 \cdot psf$ Total Horizontal Stress at Toe of MIP panel

$\sigma'_{v_base} := \sigma_{v_base} - H_{wp} \cdot \gamma_w = 1003.20 \cdot psf$ Effective Vertical Stress at Toe of MIP panel

$\sigma'_h := \sigma'_{v_base} \cdot k'_o = 609.72 \cdot psf$ Effective Horizontal Stress at Toe of MIP panel

Allowable bearing capacity of MIP panel against crushing - Total stress conditions

$$q_{all_crush_tot} := \frac{2 \cdot s_{dm} \cdot f_{v_1.3}}{F_c} + \sigma_h = 13374.71 \cdot psf$$ (Figure 65)

Allowable bearing capacity of MIP panel against crushing - Effective stress conditions

$$q_{all_crush_eff} := \frac{2 \cdot s_{dm} \cdot f_{v_1.3}}{F_c} + \sigma'_h = 12362.97 \cdot psf$$ (Figure 65)

The material beneath the MIP panel is characterized by effective stress conditions. Thus,

$q_{all_crush} := q_{all_crush_eff}$ $q_{all_crush} = 12362.97 \cdot psf$

$$q_{all_crush_check} := \begin{cases} \text{"OK"} & \text{if } q_{toe} \le q_{all_crush} \\ \text{"Allowable Bearing Pressure Against Crushing Exceeded"} & \text{otherwise} \end{cases} = \text{"OK"}$$

$q_{all_crush_check} = \text{"OK"}$

6.4 Shearing on Vertical Planes in the MIP panel

Average Vertical Shear Stress on MIP panel

$$\tau_v := \begin{cases} \dfrac{V_p}{H_{dm}} + \dfrac{N}{H_{dm}} \cdot \left(1 - \dfrac{3x_N}{2B}\right)^2 & \text{if } x_N \le B_{0.33} \\ \left[\dfrac{V_p}{H_{dm}} + \dfrac{3N}{4H_{dm}} \cdot \left(1 - \dfrac{2x_N}{B}\right)\right] & \text{if } B_{0.33} \le x_N \le B_{0.5} \end{cases} = 410.08 \cdot psf$$

(Figure 69)

$$\tau_{v_all} := \frac{f_{v_1.3} \cdot \left(\dfrac{c_{chord}}{s_{shear}}\right) \cdot s_{dm}}{F_v} = 1385.13 \cdot psf$$

(Figure 70)

$$\tau_{check} := \begin{cases} \text{"OK"} & \text{if } \tau_v \le \tau_{v_all} \\ \text{"Allowable Vertical Shear Exceeded"} & \text{otherwise} \end{cases}$$

τ_{check} = "OK"

6.5 Extrusion of Soil Between MIP panels

$H_e := H_{dm}$ Thickness of layer subject analyzed for extrusion

$c_e := c_{m_fnd} = 90.93 \cdot psf$ Average total stress cohesion of soil analyzed for extrusion

$s_{shear} - b = 5.30\,ft$ Clear spacing between panels

$$F_{e_check} := \frac{2c_e \cdot \left[2 + B \cdot \left(\frac{1}{s_{shear} - b} + \frac{1}{H_e}\right)\right]}{\left(\sigma_{va} - \sigma_{vp}\right)} = 1.67$$

(Filz 2011, eq. 30)

$$Extrusion_{check} := \begin{cases} \text{"OK"} & \text{if } F_e \le F_{e_check} \\ \text{"Allowable Spacing Exceeded"} & \text{otherwise} \end{cases}$$

$Extrusion_{check} = \text{"OK"}$

Calculation Objective

1. Design a Mix-In-Place (MIP) panel shear wall system to support the embankment during post-earthquake conditions.

Design Assumptions

- Wet Mix Method

References

Federal Highway Administration Design Manual: Deep Mixing for Emankment and Foundation Support - FHWA-HRT-13-046 (2013). US Department of Transportation - Federal Highway Administration.

Filz, G.M. and Templeton, E. (2011). Design Guide for Levee and Floodwall Stability Using Deep-Mixed Shear Walls, prepared by Burns Cooley Dennis for the U.S. Army Corps of Engineers.

Notes

1. All "Table", "Figure", and "Page" references refer to the 2013 FHWA manual unless otherwise noted.
2. Calculation step numbering and terminology are in general accordance with 2013 FHWA design manual. The terms "deep mixing" and "deep mixed zone" are used along with "MIP panel" throughout this calcuation.

1. Establish Project Requirements

Factor of Safety and Design Coefficient Values

$F_{s_eq} := 1.2$	Design FS for Post Earthquake Slope Stability	
$F_o := 1.3$	Design FS against combined overturning and bearing capacity failure at the toe of the deep mixed zone	(Table 11)
$F_c := 1.3$	Design FS against crushing of deep mixed ground at the toe of the deep mixed zone	(Table 11)
$F_v := 1.3$	Design FS for shearing through deep mixed zone	(Table 11)
$F_e := 1.3$	Design FS for extrusion of soil between shear walls	(Table 11)
$COV := 0.5$	Coefficient of Variation for Good Construction	
$f_{v_1.2} := 1.02$	Coefficient of variability for deep mixed ground strength corresponding to a FS of 1.2	(Table 12)
$f_{v_1.3} := 0.95$	Coefficient of variability for deep mixed ground strength corresponding to a FS of 1.3	(Table 12)
$f_r := 0.80$	Residual Compressive Strength Factor (typically between 0.65 and 0.9)	(Page 68)

2. Establish Subsurface Conditions

Material Properties

$\gamma_{dm} := 125pcf$ Unit Weight of MIP panel

$\gamma_w := 62.4pcf$ Unit Weight of Water

Embankment Soils (Shell Fill)

$\gamma_{emb} := 120pcf$ Moist unit weight

$\gamma_{emb_s} := 125pcf$ Saturated unit weight

$\gamma_{emb_b} := \gamma_{emb_s} - \gamma_w = 62.60 \cdot pcf$ Bouyant unit weight

$\phi'_{emb} := 32deg$ $c'_{emb} := 0psf$ Effective stress parameters

Foundation Soils (Alluvial)

$\gamma_{fnd} := 115pcf$ Moist unit weight

$\gamma_{fnd_s} := 120pcf$ Saturated unit weight

$\gamma_{fnd_b} := \gamma_{fnd_s} - \gamma_w = 57.60 \cdot pcf$ Bouyant unit weight

$\phi_{fnd} := 20deg$ $c_{fnd} := 100psf$ Total stress parameters

$\phi'_{fnd} := 29deg$ $c'_{fnd} := 0psf$ Effective stress parameters

$USR := 0.09$ Undrained Strength Ratio

3. Establish Trial Deep Mixed Ground Property Values

Shear Strength

$q_{dm_spec} := 130psi$ 28-day Minimum Unconfined Compressive Strength of Treated Soil (typically between 75 and 150 psi) (Page 78)

$t := 42$ *days* Curing Time in days until full loading

This assumes that loading conditions assumed herein (full resevoir with steady-state seepage conditions and liquefied Foundation Soils from design seismic event) develop no sooner than 2 weeks after confirmation of 28 day strength.

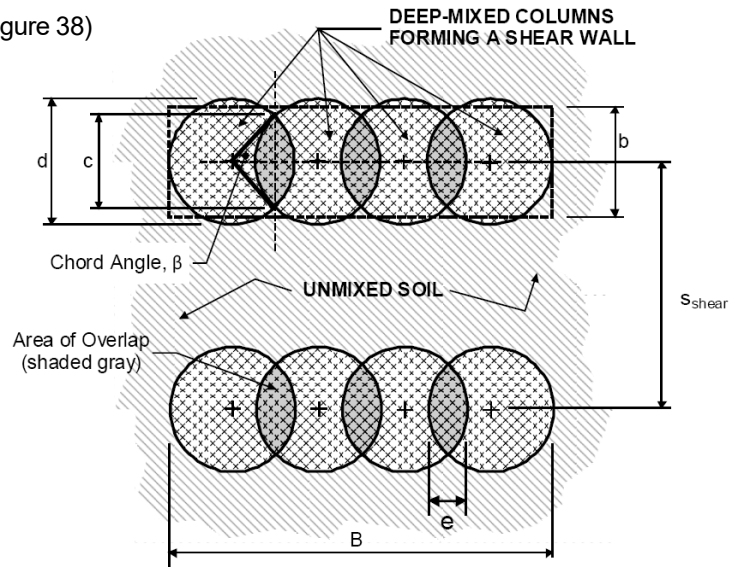
$f_c := 0.187 \cdot ln(t) + 0.375 = 1.07$ Curing Factor (Figure 30)

$s_{dm} := \frac{1}{2} \cdot q_{dm_spec} \cdot f_c \cdot f_r$ Shear Strength of Deep Mixed Zone (Figure 33)

$s_{dm} = 55.85\,psi$

4. Establish Trial Deep Mixed Geometry

Column Overlap Sketch (FHWA Figure 38)



$d := 3ft$	Column Diameter	(Figure 43)
$b := 0.9 \cdot d = 2.70\,ft$	Min. allowable effective width	(Page 68)
$e := 8in$	Overlap Distance	
$r_{overlap} := \frac{e}{d} = 0.222$	Ratio of overlap to column diamter (typically between 0.2 and 0.35)	(Page 59)
$\beta := 2 \cdot acos\left(1 - r_{overlap}\right) = 77.88 \cdot deg$	Chord Angle	(Figure 40)
$\alpha := \frac{\beta}{2} = 38.94 \cdot deg$	Half of the Chord Angle	
$s_{shear} := 15ft$	Spacing of MIP panel, center-to-center (cross canyon direction)	
$a_e := \frac{\alpha - sin(\alpha)}{\pi} = 0.02$	Overlap Area Ratio	(Figure 42)
$a_{s_shear_est} := \frac{b}{s_{shear}} = 0.18$	Estimated Area Replacement Ratio	(Figure 39)
$a_{s_shear} := a_{s_shear_est} = 0.18$	Selected Area Replacement Ratio (typically between 0.2 and 0.4)	(Figure 43)
$c_{chord} := d \cdot sin\left(\frac{\beta}{2}\right) = 1.89 \cdot ft$	Chord Length	(Figure 41)
$c_s_{ratio} := \frac{c_{chord}}{s_{shear}} = 0.13$	Ratio of Chord Length to Wall Spacing	
$n := 4$	Number of columns per MIP panel	
$B := [d + (n - 1) \cdot (d - e)] = 10.00\,ft$	Length of MIP panel (upstream-downstream direction)	

5. Evaluate Settlement

The nature of this project is reconstruction of a failed dam to its original geometry. The stress state at the end of construction will be similar to existing conditions. Therefore, excessive settlement is not expected.

6. Evaluate Stability

6.1 Slope Stability

Static slope stability analysis:

Results of the static slope stability analyses are included in the Slope Stability and Seepage memorandum. The calculated factors of safety for the proposed conditions without MIP panels exceed the minimum design criteria for all static load cases. The MIP panels will increase the shear strength of the Foundation Soils. Therefore, by inspection, the factors of safety under proposed static loading conditions where MIP panels are installed are expected to exceed the minimum design criteria, and static slope stability including MIP panels was not evaluated further.

Post earthquake slope stability analsysis:

$s_{dm_comp_eq} := f_{v_1.2} \cdot a_{s_shear} \cdot s_{dm} = 10.25 \cdot psi$ For FS=1.2

$s_{dm_comp_eq} = 1476.46 \cdot psf$ Max allowable composite shear strength

$s_{req_2} := 1450 psf$ Shear strength used in post-earthquake slope stability analysis

$$strength_{check_2} := \begin{cases} \text{"OK"} & \text{if } s_{req_2} < \left(s_{dm_comp_eq}\right) \\ \text{"Allowable shear strength exceeded"} & \text{otherwise} \end{cases}$$

$strength_{check_2} = \text{"OK"}$

See Attachment 2 of the Mix-In-Place Panel Analysis and Design memorandum for results for the Post Earthquake Slope Stability Analysis with MIP Panels installed.

6.2 Combined Overturning and Bearing Capacity

Sketch and Defintions

(Figure 51)

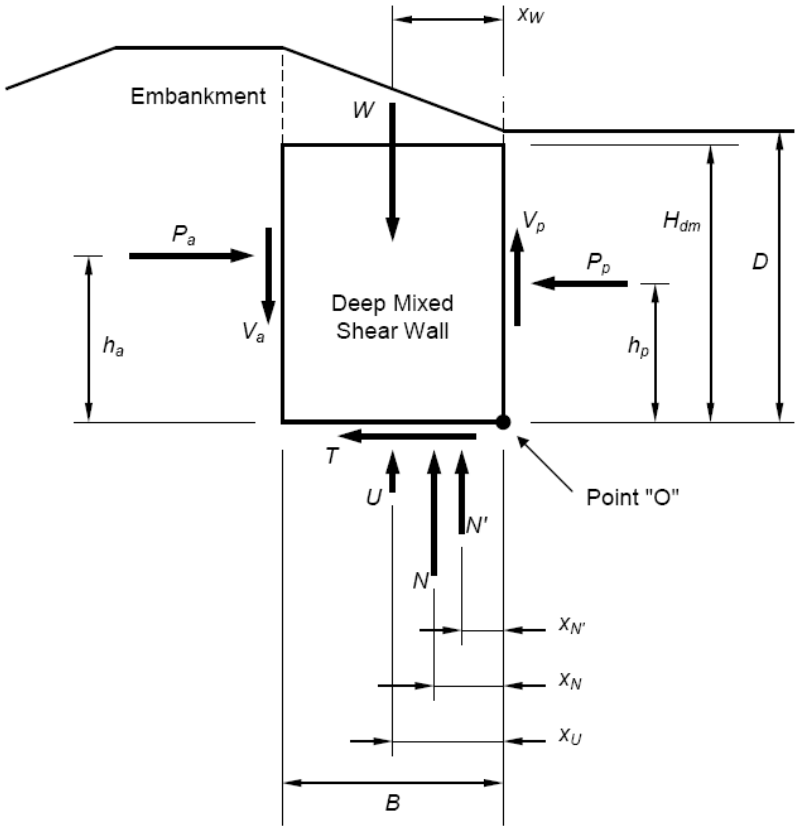


Figure 51. Illustration. Definition sketch for combined overturning and bearing calculations.

Where:
W = Total weight of the deep mixed zone and the overlying untreated soil and embankment material.
x_W = Horizontal distance from point "O" at the toe of the deep mixed zone to the line of action of W.
B = Width of the deep mixed zone.
D = Depth to the base of the deep mixed zone at the toe of the slope.
P_a = Total active force, including the load from water pressures.
h_a = Vertical distance from point "O" to the line of action of Pa.
V_a = Vertical shear force on active side.
P_p = Total passive force, including the load from water pressures.
h_p = Vertical distance from point "O" to the line of action of Pp.
V_p = Vertical shear force on passive side.
N = Total vertical force acting upwards on the base of the deep mixed zone.
U = Vertical water force acting upwards on the base of the deep mixed zone.
N' = Effective vertical force acting upwards on the base of the deep mixed zone.
x_N = Horizontal distance from point "O" to N.
x_U = Horizontal distance from point "O" to U.
$x_{N'}$ = Horizontal distance from point "O" to N'.
T = Horizontal shear force acting on the base of the deep mixed zone.

Earth Pressure Calculation Inputs:

$\theta := atan\left(\frac{1}{2.5}\right) = 21.80 \cdot deg$ — Embankment Slope

$H_p := 28.5ft$ — Height of soil (foundation & shell) on the passive side of the MIP panel

$H_a := 31.5ft$ — Height of soil (foundation & shell) on the active side of the MIP panel

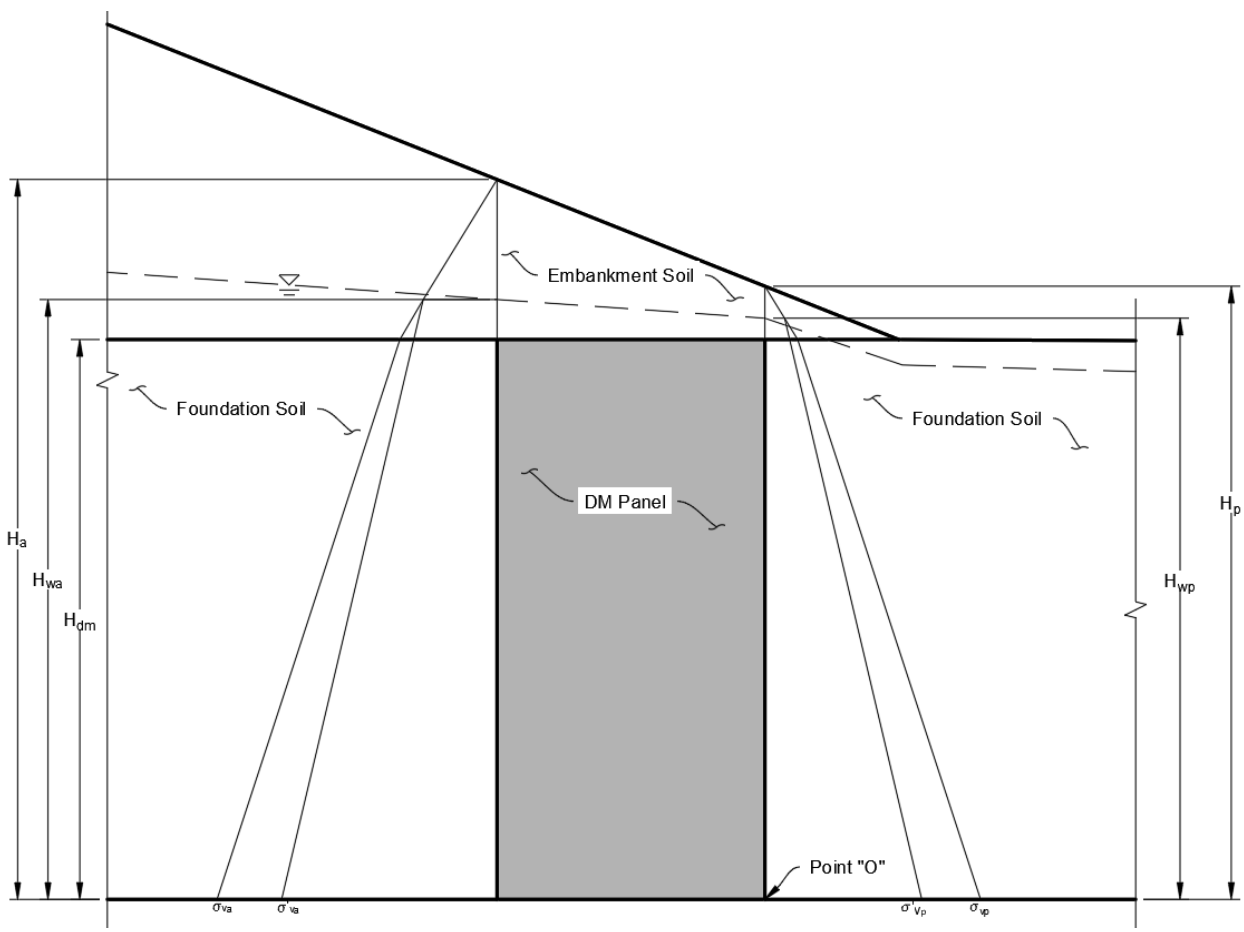
$H_{wa} := 22.ft$ — Height of water on the active side of the MIP panel

$H_{wp} := 21ft$ — Height of water on the passive side of the MIP panel

$H_w := mean(H_{wa}, H_{wp}) = 21.50\,ft$ — Average height of water across the MIP panel

$H_{dm} := 21ft$ — Height of MIP panel

Note, all heights listed above are relative to point "O".



Earth Pressure Distribution Figure

6.2.1 Mobilized Shear Strength Parameters

Embankment Soils (Shell Fill)

$$\phi'_{m_emb} := \operatorname{atan}\left(\frac{\tan(\phi'_{emb})}{F_o}\right) = 25.67 \cdot deg$$

$$c'_{m_emb} := \frac{c'_{emb}}{F_o} = 0.00 \cdot psf$$

Mobilized effective stress parameters of embankment soil

Foundation Soils (Alluvial)

$$\phi_{m_fnd} := \operatorname{atan}\left(\frac{\tan(\phi_{fnd})}{F_o}\right) = 15.64 \cdot deg$$

$$\phi'_{m_fnd} := \operatorname{atan}\left(\frac{\tan(\phi'_{fnd})}{F_o}\right) = 23.09 \cdot deg$$

Mobilized friction angles of soil to be treated

Note: use the residual undrained strength ratio (USR) to estimate the cohesion of the foundation soils. This is a function of the vertical stress. Consider the vertical stress at the centroid of the MIP panel. Thus,

Vertical stress - active side - Midheight of MIP panel

$$\sigma_{va} := \gamma_{emb} \cdot (H_a - H_{wa}) + \gamma_{emb_s} \cdot (H_{wa} - H_{dm}) + \gamma_{fnd_s} \cdot \left(\frac{H_{dm}}{2}\right) = 2525.00 \cdot psf$$

$$\sigma'_{va} := \sigma_{va} - \gamma_w \cdot \frac{H_{wa}}{2} = 1838.60 \cdot psf$$

Vertical stress - passive side - Midheight of MIP panel

$$\sigma_{vp} := \gamma_{emb} \cdot (H_p - H_{wp}) + \gamma_{emb_s} \cdot (H_{wp} - H_{dm}) + \gamma_{fnd_s} \cdot \left(\frac{H_{dm}}{2}\right) = 2160.00 \cdot psf$$

$$\sigma'_{vp} := \sigma_{vp} - \gamma_w \cdot \frac{H_{wp}}{2} = 1504.80 \cdot psf$$

$$\sigma_{v_ave} := mean(\sigma_{va}, \sigma_{vp}) = 2342.50 \cdot psf$$

Average total vertical stress at centroid of MIP panel

$$\sigma'_{v_ave} := mean(\sigma'_{va}, \sigma'_{vp}) = 1671.70 \cdot psf$$

Average effective vertical stress at centroid of MIP panel

$$S_u := USR \cdot \sigma'_{v_ave} = 150.45 \cdot psf$$

Shear strength based on USR

$$c_{m_fnd} := \frac{S_u}{F_o} = 115.73 \cdot psf$$

Selected mobilized cohesion of soil to be treated

6.2.3 Earth Pressure Calculations

Lateral Forces on MIP panel - Active Side (no cohesion accounted for on active side - conservative)

Embankment soil

$$k_{a_emb} := cos(\theta)\cdot\left(\frac{cos(\theta) - \sqrt{cos(\theta)^2 - cos(\phi'_{m_emb})^2}}{cos(\theta) + \sqrt{cos(\theta)^2 - cos(\phi'_{m_emb})^2}}\right) = 0.57$$

Rankine earth pressure coefficient for sloping backfill

$$p_{a_emb} := \gamma_{emb}\cdot(H_a - H_{wa}) + \gamma_{emb_b}\cdot(H_{wa} - H_{dm}) = 1202.60\cdot psf$$

$$P_{a_emb} := \frac{1}{2}p_{a_emb}\cdot k_{a_emb}\cdot(H_a - H_{dm}) = 3591.15\cdot\frac{lbf}{ft}$$

$$h_{a_emb} := H_{dm} + \frac{(H_a - H_{dm})}{3} = 24.50\,ft$$

Foundation soil

$$\phi_{fnd_eq} := tan(USR) = 5.17\cdot deg$$

Equivalent friction angle from USR

$$k_{a_fnd} := \frac{1 - sin(\phi_{fnd_eq})}{1 + sin(\phi_{fnd_eq})} = 0.83$$

Rankine earth pressure coefficient for level backfill

$$P_{a_fnd_rec} := k_{a_fnd}\cdot H_{dm}\cdot p_{a_emb} = 21078.96\cdot\frac{lbf}{ft}$$

rectangular portion of earth pressure dsitribution

$$h_{a_fnd_rec} := \frac{H_{dm}}{2} = 10.50\,ft$$

$$P_{a_fnd_tri} := \frac{1}{2}\gamma_{fnd_b}\cdot k_{a_fnd}\cdot H_{dm}^2 = 10600.83\cdot\frac{lbf}{ft}$$

triangular portion of earth pressure dsitribution

$$h_{a_fnd_tri} := \frac{H_{dm}}{3} = 7.00\,ft$$

Groundwater

$$p_{a_w} := H_{wa}\cdot\gamma_w = 1372.80\cdot psf$$

$$P_{a_w} := \frac{1}{2}\cdot p_{a_w}\cdot H_{wa} = 15100.80\cdot\frac{lbf}{ft}$$

$$h_{a_w} := \frac{H_{wa}}{3} = 7.33\,ft$$

$$P_a := P_{a_emb} + P_{a_fnd_rec} + P_{a_fnd_tri} + P_{a_w} = 50371.74\cdot\frac{lbf}{ft}$$

$$h_a := \frac{h_{a_emb}P_{a_emb} + h_{a_fnd_rec}\cdot P_{a_fnd_rec} + h_{a_fnd_tri}\cdot P_{a_fnd_tri} + h_{a_w}\cdot P_{a_w}}{P_a} = 9.81\,ft$$

Lateral Forces on MIP panel - Passive Side (no cohesion accounted for on passive side - conservative)

Embankment Soil

Conservatively assume the passive wedge shears at the top of the MIP panel. Passive force from triangular wedge of embankment soil ommited. Vertical stress contribution applied to overall passive resistance is considered. Thus,

$$p_{p_emb} := \gamma_{emb} \cdot (H_p - H_{wp}) + \gamma_{emb_b} \cdot (H_{wp} - H_{dm}) = 900.00 \cdot psf$$

Foundation soil

$$k_{p_fnd} := \frac{1}{k_{a_fnd}} = 1.20$$

Passive earth pressure coefficient of foundation soil

$$P_{p_fnd_rec} := k_{p_fnd} \cdot H_{dm} \cdot (p_{p_emb}) = 22644.00 \cdot \frac{lbf}{ft}$$

Rectangular portion of earth pressure dsitribution

$$h_{p_fnd_rec} := \frac{H_{dm}}{2} = 10.50\, ft$$

$$P_{p_fnd_tri} := \frac{1}{2} k_{p_fnd} \cdot \gamma_{fnd_b} \cdot H_{dm}^2 = 15216.77 \cdot \frac{lbf}{ft}$$

Triangular portion of earth pressure dsitribution

$$h_{p_fnd_tri} := \frac{H_{dm}}{3} = 7.00\, ft$$

Groundwater

$$p_{p_w} := H_{wp} \cdot \gamma_w = 1310.40 \cdot psf$$

$$P_{p_w} := \frac{1}{2} \cdot p_{p_w} \cdot H_{wp} = 13759.20 \cdot \frac{lbf}{ft}$$

$$h_{p_w} := \frac{H_{wp}}{3} = 7.00\, ft$$

$$P_{p_ult} := P_{p_fnd_tri} + P_{p_fnd_rec} + P_{p_w} = 51619.97 \cdot \frac{lbf}{ft}$$

$$h_p := \frac{h_{p_fnd_tri} \cdot P_{p_fnd_tri} + h_{p_fnd_rec} \cdot P_{p_fnd_rec} + P_{p_w} \cdot h_{p_w}}{P_{p_ult}} = 8.54\, ft$$

The calculation above represents the ultimate passive force capacity. To maintain horizontal equilibrium, the passive force will never exceed the active force. Therefore,

$$P_p := \begin{cases} P_a & \text{if } P_a < P_{p_ult} \\ P_{p_ult} & \text{otherwise} \end{cases} \qquad P_p = 50371.74 \cdot \frac{lbf}{ft}$$

Shear forces acting on the sides of the MIP panel

$V_a := c_{m_fnd} \cdot H_{dm} = 2430.39 \cdot \frac{lbf}{ft}$

$V_p := c_{m_fnd} \cdot H_{dm} = 2430.39 \cdot \frac{lbf}{ft}$

Water uplift force acting on the base of the MIP panel

$U := H_w \cdot \gamma_w \cdot B = 13416.00 \cdot \frac{lbf}{ft}$ $\quad x_u := \frac{B}{2} = 5.00\,ft$

Weight of MIP panel and overburden soil

$H_{ob} := mean(H_a, H_p) - H_{dm} = 9.00\,ft$ Average height of overburden soil above MIP panel

$H_{ob_m} := H_{ob} + H_{dm} - H_w = 8.50\,ft$ Average height of moist overburden soil above MIP panel

$H_{ob_s} := H_{ob} - H_{ob_m} = 0.50\,ft$ Average height of saturated overburden soil above MIP panel

$W_{ob} := B \cdot (H_{ob_s} \cdot \gamma_{emb_b} + H_{ob_m} \cdot \gamma_{emb}) = 10513.00 \cdot \frac{lbf}{ft}$ $\quad x_{ob} := \frac{2B}{3} = 6.67\,ft$

$W_{dm} := \gamma_{dm} \cdot B \cdot H_{dm} = 26250.00 \cdot \frac{lbf}{ft}$ $\quad x_{dm} := \frac{B}{2} = 5.00\,ft$

$W := W_{ob} + W_{dm} = 36763.00 \cdot \frac{lbf}{ft}$ $\quad x_{dm_ob} := \frac{x_{dm} \cdot W_{dm} + x_{ob} \cdot W_{ob}}{W} = 5.48\,ft$

6.2.4 Determine Resultant Normal Force

$N := W + V_a - V_p = 36763.00 \cdot \frac{lbf}{ft}$ (Figure 56)

$N' := N - U = 23347.00 \cdot \frac{lbf}{ft}$ (Figure 57)

6.2.5 Determine Location of the Resultant Normal Force

$x_N := \frac{(P_p \cdot h_p + W \cdot x_{dm_ob} + V_a \cdot B - P_a \cdot h_a)}{N} = 4.39\,ft$ (Figure 58)

$x_{N'} := \frac{N \cdot x_N - U \cdot x_u}{N'} = 4.04\,ft$ (Figure 59)

Sliding Check

$\delta := 29deg$ Interface friction angle between MIP panel and base material (rock)

$T_{tot} := N \cdot tan(\delta) = 20378.06 \cdot \frac{lbf}{ft}$ Resisting force due to friction (Filz 2011, eq. 17)

$T_{eff} := N' \cdot tan(\delta) = 12941.45 \cdot \frac{lbf}{ft}$ (Filz 2011, eq. 18)

For post earthqauke loading ignore uplift pressure at the base. Thus,

$T := T_{tot}$

$$FS_{slide} := \frac{T + P_p}{P_a} = 1.40$$

$$sliding_{check} := \begin{cases} \text{"OK"} & \text{if } FS_{slide} > 1.3 \\ \text{"Increase resisting forces"} & \text{otherwise} \end{cases}$$

$sliding_{check} = \text{"OK"}$

6.2.6 Calculate Bearing Pressure at Toe of MIP panel

$$B_{0.33} := \frac{B}{3} = 3.33\,ft$$

$$B_{0.5} := \frac{B}{2} = 5.00\,ft$$

$$eccentricity := \frac{B}{2} - x_{N'} = 0.96\,ft$$

$$q_{toe_tot} := \begin{cases} \frac{N}{B} \cdot \left(\frac{2B}{3x_N a_{s_shear}} - \frac{1}{a_{s_shear}} + 1 \right) & \text{if } x_N \le B_{0.33} \\ \frac{N}{B} \cdot \left(\frac{3}{a_{s_shear}} - \frac{6 \cdot x_N}{B \cdot a_{s_shear}} + 1 \right) & \text{if } B_{0.33} \le x_N \le B_{0.5} \end{cases} = 11173.62 \cdot psf$$ (Figure 60)

$$q_{toe_eff} := \begin{cases} \frac{N'}{B} \cdot \left(\frac{2B}{3x_{N'} a_{s_shear}} - \frac{1}{a_{s_shear}} + 1 \right) & \text{if } x_{N'} \le B_{0.33} \\ \frac{N'}{B} \cdot \left(\frac{3}{a_{s_shear}} - \frac{6 \cdot x_{N'}}{B \cdot a_{s_shear}} + 1 \right) & \text{if } B_{0.33} < x_{N'} \le B_{0.5} \end{cases} = 9832.02 \cdot psf$$ (Figure 61)

The material beneath the MIP panel is characterized by effective stress conditions. Thus,

$q_{toe} := q_{toe_eff}$ $q_{toe} = 9832.02 \cdot psf$

6.2.7 Determine Allowable Bearing Pressure

The MIP panels will extend to top of bedrock. By inspection, no bearing capacity analysis is neccessary.

6.3 Crushing of the MIP panel at the Outside Toe

$k_o := 1 - sin(\phi_{m_fnd}) = 0.73$ At-rest earth pressure coefficient of soil adjacent to base of MIP panel, total stress condition

$k'_o := 1 - sin(\phi'_{m_fnd}) = 0.61$ At-rest earth pressure coefficient of soil adjacent to base of MIP panel, effective stress condition

$\sigma_{v_base} := H_{dm} \cdot \gamma_{fnd_s} = 2520.00 \cdot psf$ Total Vertical Stress at Toe of MIP panel

$\sigma_h := \sigma_{v_base} \cdot k_o = 1840.58 \cdot psf$ Total Horizontal Stress at Toe of MIP panel

$\sigma'_{v_base} := \sigma_{v_base} - H_{wp} \cdot \gamma_w = 1209.60 \cdot psf$ Effective Vertical Stress at Toe of MIP panel

$\sigma'_h := \sigma'_{v_base} \cdot k'_o = 735.17 \cdot psf$ Effective Horizontal Stress at Toe of MIP panel

Allowable bearing capacity of MIP panel against crushing - Total stress conditions

$$q_{all_crush_tot} := \frac{2 \cdot s_{dm} \cdot f_{v_1.3}}{F_c} + \sigma_h = 13593.83 \cdot psf$$ (Figure 65)

Allowable bearing capacity of MIP panel against crushing - Effective stress conditions

$$q_{all_crush_eff} := \frac{2 \cdot s_{dm} \cdot f_{v_1.3}}{F_c} + \sigma'_h = 12488.41 \cdot psf$$ (Figure 65)

The material beneath the MIP panel is characterized by effective stress conditions. Thus,

$q_{all_crush} := q_{all_crush_eff}$ $q_{all_crush} = 12488.41 \cdot psf$

$$q_{all_crush_check} := \begin{cases} \text{"OK"} & \text{if } q_{toe} \le q_{all_crush} \\ \text{"Allowable Bearing Pressure Against Crushing Exceeded"} & \text{otherwise} \end{cases} = \text{"OK"}$$

$q_{all_crush_check} = \text{"OK"}$

6.4 Shearing on Vertical Planes in the MIP panel

Average Vertical Shear Stress on MIP panel

$$\tau_v := \begin{cases} \dfrac{V_p}{H_{dm}} + \dfrac{N}{H_{dm}} \cdot \left(1 - \dfrac{3x_N}{2B}\right)^2 & \text{if } x_N \le B_{0.33} \\ \left[\dfrac{V_p}{H_{dm}} + \dfrac{3N}{4H_{dm}} \cdot \left(1 - \dfrac{2x_N}{B}\right)\right] & \text{if } B_{0.33} \le x_N \le B_{0.5} \end{cases} = 276.39 \cdot psf$$

(Figure 69)

$$\tau_{v_all} := \frac{f_{v_1.3} \cdot \left(\dfrac{c_{chord}}{s_{shear}}\right) \cdot s_{dm}}{F_v} = 738.74 \cdot psf$$

(Figure 70)

$$\tau_{check} := \begin{cases} \text{"OK"} & \text{if } \tau_v \le \tau_{v_all} \\ \text{"Allowable Vertical Shear Exceeded"} & \text{otherwise} \end{cases}$$

τ_{check} = "OK"

6.5 Extrusion of Soil Between MIP panels

$H_e := H_{dm}$ Thickness of layer subject analyzed for extrusion

$c_e := c_{m_fnd} = 115.73 \cdot psf$ Average total stress cohesion of soil analyzed for extrusion

$s_{shear} - b = 12.30\, ft$ Clear spacing between panels

$$F_{e_check} := \frac{2c_e \cdot \left[2 + B \cdot \left(\frac{1}{s_{shear} - b} + \frac{1}{H_e}\right)\right]}{\left(\sigma_{va} - \sigma_{vp}\right)} = 2.09$$

(Filz 2011, eq. 30)

$$Extrusion_{check} := \begin{cases} \text{"OK"} & \text{if } F_e \le F_{e_check} \\ \text{"Allowable Spacing Exceeded"} & \text{otherwise} \end{cases}$$

$Extrusion_{check} = \text{"OK"}$

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project Boiling Spring Lakes Dams Construction/Reconstruction	**Project Number** 19C21022
Title Liquefaction Semi Quantitative Risk Assessment (SQRA)	
Computer Programs Used Microsoft Excel	**Version/Release No.** 2013

Purpose and Objective

This memorandum presents the development of a seismic semi-quantative risk assessment (SQRA) for North Lake Dam, Pine Lake Dam, and Upper Lake Dam. The intent of this SQRA is to estimate whether a sufficiently high risk of cyclic liquefaction exists at the three smaller dams, such that the installation of foundation modification measures is warranted.

Summary of Conclusions

Based on the results of this risk analysis, there is limited justification for additional risk reduction measures based on the data, analysis and assumptions described. It is therefore concluded that rehabilitation of the North Lake, Pine Lake, and Upper Lake Dams to address liquefaction is not warranted.

Originator			
Zachary Ostrum			Jan 14, 2021
	Print	Sign	Date
Reviewer			
Gerald Robblee			Jan 14, 2021
	Print	Sign	Date

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TECHNICAL MEMORANDUM

BY:	Zachary Ostrum and Jonathan Harris	**DATE:**	December 13, 2020
PROJECT:	Boiling Spring Lakes Dams Construction/Reconstruction	**SUBJECT:**	Liquefaction Semi Quantitative Risk Assessment (SQRA)
LOCATION:	Boiling Spring Lakes, North Carolina	**PROJECT NO.:**	19C21022
REVIEWED BY:	Gerald Robblee and Tom Fitzgerald	**DATE:**	January 11, 2021

INTRODUCTION

Sanford Dam, North Lake Dam, Pine Lake Dam, and Upper Lake Dam (collectively herein referred to as the BSL Dams) breached during Hurricane Florence in September 2018. The four BSL Dams are part of a system of dams where North Lake Dam, Pine Lake Dam, and Upper Lake Dam are situated upstream of Sanford Dam and independent of each other. North Lake Damand Pine Lake Dam are directly upstream, such that the Sanford Dam headwater is the tailwater for North Lake Dam and Pine Lake Dam. A fifth dam named Middle Lake Dam is founded between Sanford Dam and Upper Lake Dam and also breached during Hurricane Florence, but is not part of the BSL Dams rehabilitation project.

This memorandum presents the development of a seismic semi-quantative risk assessment (SQRA) for North Lake Dam, Pine Lake Dam, and Upper Lake Dam. As demonstrated in the memorandum entitled, “Liquefaction Potential Analysis,” the foundation soils beneath each of the BSL Dams are susceptible to cyclic liquefaction during the design seismic events. Based on the post-earthquake slope stability analysis results detailed in the memorandum entitled, “Embankment Seepage and Slope Stability Analyses,” cyclic liquefaction of the foundation soils is expected to result in exessive slope deformations at each of the BSL Dams. Excessive slope deformations could lead to loss of freeboard, overtopping, and uncontrolled release of the reservoirs. The Military Ocean Terminal Sunny Point (MOTSU) railroad, which is located immediately downstream of Sanford Dam, would be impacted by a failure of Sanford Dam. The consequences of failure of Sanford Dam are high, and foundation modification measures to address liquefaction are warranted. However, the three smaller dams vary in consequences of failure, and the estimated construction costs to address liquefaction are likely to exceed the costs to repair the dams if failure were to occur. The intent of this SQRA is to estimate whether a sufficiently high risk of cyclic liquefaction exists at the three smaller dams, such that the installation of foundation modification measures is warranted.

FAILURE MECHANISM

A failure mechanism description for the liquefaction hazard was developed for North Lake Dam, Pine Lake Dam, and Upper Lake Dam upstream of the reservoir impounded by Sanford Dam. This failure mechanism description outlines the sequence of events to failure and will be used to assign likelihood of occurance and potential consequences. For the three smaller dams, failure was defined as the overtopping of the embankment. The consequences of failure for three smaller dams does not involve potential impacts downstream because Sanford Dam can impound the water released by the breaching of all three upstream embankments and there are no homes or structures impacted since the Sanford Dam impoundment is just downstream of each dam. As stated in Section 2.0 of the design report, breaching of all dams upstream of Sandford Dam during a ½ PMP event is estimated to raise the Sanford Dam pool evelation to 36.04 ft resulting in 2.36 ft of available freeboard. Instead the consequences are defined by the potential life loss of persons traveling in motor vehicles on the crest of the embankment during a potential liquefaction event. The failure mechanism description for each dam is as follows:

An earthquake occurs which is large enough to induce liquefaction in the saturated dam and/or foundation. The seismic shaking intensity and duration is sufficient to cause widespread liquefaction such that the dam and/or foundation liquefies over a large enough area to cause instability of the embankment leading to deformations. The dam deforms enough vertically downward that the reservoir overtops the embankment crest. The resulting deformations of the embankment lead to potential trapping of a motor vehicle occupants traveling along the crest of the embankment and the overtopping flows increase the likelihood of not surving such an event.

It should be clear that the risk team felt that just the deformation of the crest is unlikely to lead to life loss allthough there could be a risk of injury. It was thought that the dam would likely have to deform enough to overtop the structure which would siginifcantly increase the risk to the vehicle occupants. Since, liquefaction and instability can accually take minutes to fully develop, motorists that are able to exit the vehicle and remove themselves from a deformed dam prior to destabilization or those that feel the very large earthquake will reduce the life loss significantly.

ESTIMATES OF LIKELIHOOD OF FAILURE

The described failure mechanism can be divided into the following failure sequence:

A. An earthquake occurs that causes shaking of the embankment and its foundation.
B. Shaking is significant enough that liquefaction occurs.
C. Enough liquefaction occurs such that it is widespread within or under embankment.
D. The liquefaction causes embankment deformations resulting in settlement of the crest.
E. Settlement of the dam crest is greater than the available freeboard, resulting in overtopping which increases the likelihood of threatening the lives of motorists traveling along the crest

The description provided assumes the following:

- Embankment and foundation materials are primarily granular in nature with low percent fines (less than 30% by weight)
- A significant portion of the embankment is fully saturated
- People caught on the crest with deformations less than the freeboard are much less likely to be killed even if injury is likely and that life loss is much more likely if the dam were to deform enough to release the reservoir upstream.

The sequence described above was grouped into 3 nodes to which a likehood of occurance could be assigned based on frequency of events and expert elicitation. These nodes are presented Table 1 and are explored in the following section.

Table 1: Failure Sequence Nodes

Node	Description
1: Earthquake Return Interval	Earthquake occurs in the proximity of the three upstream embankments such that shaking of the embankment and embankment foundation occurs. The earthquake is defined by its return period and a peak horizontal acceleration on the structure and foundation.
2: Widespread Liquefaction - Combine Sequence 2 and 3	Liquefaction triggering occurs in the foundation and/or embankment to such an extent that it is widespread and could result in permanent deformation. Liquefaction potential is based on the results of the subsurface investigation at the three upstream dams and the acceleration imposed by the earthquake event.
3: Loss of Freeboard- Combine Sequence 4 and 5	Loss of freeboard occurs resulting from deformation of the structure due to the liquefaction. This loss of freeboard is large enough to cause overtopping of the embankment.

Expert Analysis and Elicitation

On December 11, 2020 Jonathan Harris, PE and Zachary Ostrum, EIT reviewed the information in a workshop setting with others from the design team. The workshop started with a review of site conditions, site data collected, and liquefaction analyses. The failure sequence described above, nodal development and elicitations were developed by the group based on available information. The following sections describe the development of nodal estimates.

Node 1: Earthquake Return Interval

Five earthquake return intervals were considered for the SQRA: 800 year, 1,250 year, 2,500 year, 5,000 year, and the 10,000 year return interval events. The 800 year interval was selected as it was the estimated return interval that initiated triggering of liquefaction in Sanford Dam and therefore may also lead to triggering of liquefaction of the three upstream dams. The 1,250 year, 2,500 year, 5,000 year, and the 10,000 year return interval events were selected as they represent a series of progressively larger but more infrequent events. Larger events are more likely to trigger liquefaction but are less likely to occur. The likelihood of occurrence is based on the frequency of the event. The effective earthquake frequency accounts for the contribution to the overall frequency by the other earthquake events (e.g. a 10,000 return period event could also be categorized as a 800 year, 1,250 year, 2,500 year, 5,000 year return period event as it exceeds their frequency threshold). To compute the effective earthquake frequency, the frequency of a given return interval was reduced by the frequency of the next largest return interval.

Table 2 summarizes the frequency and characteristics of the aforementioned return periods. Mode Magnitude and Amplified PGA were estimated using the USGS Unified Hazard Tool (USGS, 2019) and the guidance provided by ASCE 7-16. A calculation package containing the results of the USGS Hazard Tool is presented as Attachment 1.

Table 2: Earthquake Return Interval and Characteristics

Earthquake Return Interval (Years)	Earthquake Frequency (1/Years)	Effective Earthquake Frequency (1/Years)	Mode Magnitude (Mw)	Amplified PGA (g)
10000	0.0001	0.0001	7.3	0.26
5000	0.0002	0.0001	7.3	0.20
2500	0.0004	0.0003	7.3	0.14
1250	0.0008	0.0005	7.3	0.09
800	0.00125	0.0008	7.3	0.07

Node 2: Widespread Liquefaction

The likelihood of liquefaction triggering was based on expert elicitation with the experts drawn from members of Schnabel Engineering. To guide the elicitation, the process described in the Schnabel Liquefaction Potential Analysis Memorandum was employed to develop factors of safety against liquefaction.

The earthquake characteristics developed in Node 1 were input in a liquefaction potential spreadsheet for North Lake Dam, Pine Lake Dam, and Upper Lake Dam. These spreadsheets were based on the cone penetration test (CPT) soundings presented in the Schnabel 2020 Phase 1 and Phase 2 Geotechnical Data Report (GDR). The results of the liqufaction potential analysis for this node as well as the location of the CPTs analyzedd are presented in Attachment 2. The intent of this evaluation was to guide the expert elicitation. Liquefaction was considered widespread if liquefaction occured in a layer that extended across every sounding. Based on the results of the liquefaction potential analysis and the expert elicitation, the likelihod of widespread liquefaction was estimated. Table 3 summarizes the results of the liquefaction potential spreadsheet.

Table 3: Liquefaction Potential

	North Lake Dam				Pine Lake Dam				Upper Lake Dam			
Return Period (years)	No Liquefaction (%)	Potential Liquefaction (%)	Liquefaction (%)	Widespread Liquefaction (%)	No Liquefaction (%)	Potential Liquefaction (%)	Liquefaction (%)	Widespread Liquefaction (%)	No Liquefaction (%)	Potential Liquefaction (%)	Liquefaction (%)	Widespread Liquefaction (%)
800	85.0	15.0	0	0	96.9	3.1	0	0	54.9	43.5	1.6	0
1250	30.4	69.6	0	0	49.1	50.9	0	0	22.9	56.1	20.9	1.1
2500	6.3	19.6	74.1	18.9	13.2	27.7	59.1	16.9	3.6	14.7	81.6	61.4
5000	1.7	6.6	91.7	63.9	6.6	8.5	84.9	59.2	1.9	1.9	96.2	90.8
10000	0.8	2.5	96.7	87.7	4.7	4.4	90.9	88.5	1.6	0.3	98.1	92.9

Table 4, presents the estimates of the likelihod of widespread liquefaction for each dam based on the expert elicitations.

Table 4: Widespread Liquefaction Likelihood

Earthquake Return Interval (Years)	Widespread Liquefaction Likelihood		
	North Lake Dam	Pine Lake Dam	Upper Lake Dam
10000	0.99	0.99	0.99
5000	0.9	0.9	0.99
2500	0.25	0.25	0.5
1250	0.001	0.001	0.005
800	0.0005	0.0005	0.001

Node 3: Loss of Freeboard

The likelihood of loss of freeboard was estimated based on expert elicitation considering the thickness of the potentially liquefiable layer and the amount of freeboard. Overtopping would occur if the amount of vertical deformations resulting from liquefaction exceeded the amount of freeboard. The amount of vertical deformations is controlled by the thickness of the potentially liquefiable layer and the expected amount of volumetric strain due to liquefaction. Larger earthquakes would induce larger volumetric strains in the embankment and foundation materials. Table 5 presents the estimated of the likelihood of freeboard loss along with the embankment height, thickness of foundation soils above rock, and the normal pool freeboard.

Table 5: Loss of Freeboard Likelihood

Earthquake Return Interval (Years)	Loss of Freeboard Likelihood		
	North Lake Dam	Pine Lake Dam	Upper Lake Dam
	Embankment Height: 12ft	Embankment Height: 18ft	Embankment Height: 11ft
	Foundation Thickness: 32ft	Foundation Thickness: 41ft	Foundation Thickness: 48ft

	Normal Pool Freeboard: 5.0ft	Normal Pool Freeboard: 9.0ft	Normal Pool Freeboard: 3.3ft
10000	0.01	0.01	0.1
5000	0.005	0.005	0.05
2500	0.001	0.001	0.01
1250	0.001	0.001	0.005
800	0.001	0.001	0.001

CONSEQUENCES

Consequences, for the purposes of the failure mechanism included in this memorandum, are the loss of life to motorists during an overtopping event resulting from liquefaction. It was assumed that any overtopping would increase the likelihood of life loss to motorists that may be trapped on the crest of the dam. Injuries due to accidents caused by driving into large cracks, were neglected in this SQRA. While it is acknowledged that there is a risk to life loss if a car were to drive into a crack on a dam, it was discussed and concluded that cracks are likely to be seen and avoided. However, if a motorist were to be on the dam when the large seismic event occurred, were trapped and the dam deformed enough to cause overtopping, the risk to life loss increases significantly. The group discussed that cracks and deformations of roadways would not likely be unique to the three embankments as other earthen structures in the region (e.g. bridge approaches and highway abutments, areas of loose fill, loose sandy materials near rivers and stream) will present similar hazards to motorists and thus this is considered a regional risk rather than a project specific risk.

Traffic volume of motorists and the local speed were used to develop an average exposure time for vehicles on the embankment crests. North Lake Dam and Pine Lake Dam have a much larger volume of traffic compared to Upper Lake Dam since Boiling Springs Road runs along the crest of the two embankments. The number of passengers per vehicle was approximated as 1.6 individuals based on US Department of Energy information (DOE, 2010). The estimates used in the development of the consequences analysis are presented in Table 6 and include daily traffic counts for the two dams located on Boiling Springs Road. Fatality rates were assumed conservatively to be 100% of the number of people who were estimated to be on the crest of the dam when the dam overtopped.

Table 6: Consequences

Item	**North Lake Dam**	**Pine Lake Dam**	**Upper Lake Dam**
Vehicles Per Day	6,100*	6,100*	20**
Speed Limit (mph)	45	45	20**
Embankment Length (ft)	800	500	750
Travel Time Across Embankment (s)	12.1	7.6	25
Product of Vehicles Per Day and Travel Time (s/day)	74,000	46,000	500
Portion of Day with Vehicles on Crest (day/day)	0.86	0.53	0.006
Population At Risk (persons per vehicle)	1.6	1.6	1.6
Prorated Life Loss	1.37	0.86	0.0093

Note: *Data provided in traffic survey (provided by McGill Associates, P.A.); **Estimated by the team (right now the roads are impassable, but assumed they would be rebuilt as gravel roads for local access only)

SUMMARY OF RESULTS

The following tables (Table 7 through Table 9) present the annualized life loss of the described failure mechanism for each of the three dams upstream of Sanford Dam. The nodal estimates and consequences described in the previous sections were used to develop the annualized life loss.

Table 7: North Lake Dam Annualized Life Loss

Node 1: Earthquake Annualized Frequency	Node 2: Probability of Widespread Liquefaction	Node 3: Probability of Loss of Freeboard	Product of Nodes 1, 2, and 3
0.0001	0.99	0.01	9.9E-07
0.0001	0.9	0.005	4.5E-07
0.0003	0.25	0.001	7.5E-08
0.0005	0.001	0.001	5.0E-10
0.0008	0.0005	0.001	3.8E-10

Total Annualized Frequency	1.5E-06
Prorated Life Loss	1.37
Annualized Life Loss	2.1E-06

Table 8: Pine Lake Dam Annualized Life Loss

Node 1: Earthquake Annualized Frequency	Node 2: Probability of Widespread Liquefaction	Node 3: Probability of Loss of Freeboard	Product of Nodes 1, 2, and 3
0.0001	0.99	0.01	9.9E-07
0.0001	0.9	0.005	4.5E-07
0.0003	0.25	0.001	7.5E-08
0.0005	0.001	0.001	5.0E-10
0.0008	0.0005	0.001	3.8E-10

Total Annualized Frequency	1.5E-06
Prorated Life Loss	0.86
Annualized Life Loss	1.3E-06

Table 9: Upper Lake Dam Annualized Life Loss

Node 1: Earthquake Annualized Frequency	Node 2: Probability of Widespread Liquefaction	Node 3: Probability of Loss of Freeboard	Product of Nodes 1, 2, and 3
0.0001	0.99	0.1	9.9E-06
0.0001	0.99	0.05	5.0E-06
0.0003	0.5	0.01	1.5E-06
0.0005	0.005	0.005	1.3E-08
0.0008	0.001	0.001	7.5E-10

Total Annualized Frequency	1.6E-05
Prorated Life Loss	0.93
Annualized Life Loss	1.5E-07

It is very difficult to determine the appropriate level of acceptable risk for events that are very unlikely to occur. Much of the design standards today provide a maximum level of earthquake shaking on which a structures should be designed providing a very conservative analysis. This site is unique, in that the loss of impounded water by the three upstream dams could be contained within Sanford Dam if they were to fail during the same seismic event. Therefore, the exposure to life loss is limited to those that might be traveling on the crest of each dam during a large seismic event.

Risk assessments such as this are considered semi-quantitative in nature and are meant to capture the main portions of the failure mechanisms that could occur. They are considered conservative and the events are much less likely to occur than those represented, but the SQRA process provides a means to understand the likelihood of such events and the potential results. If the risks for impacts to the public were high, we could consider more advanced studies that could reduce the uncertainty of such studies.

The US Bureau of Reclamation uses a risk framework to assist with decision-making for actions for dam safety (Reclamation, 2011). They use varied levels of risk assessment and base decisions for increased and decreased levels of action on annualized probability of failure of specific structures. They also include the level of consequence in the form of estimated life loss. This standard sets the general risk threshold at about 1 in 10,000 annualized probability of failure. This threshold was set to ensure that dam safety risks were kept below societal levels of mortality in the US for all ages of the population. This way, a dam will not impose added risk to the population compared to all other potential causes of fatalities. This threshold is deemed appropriate for estimated prorated life losses that are less than 10 with reduced thresholds for higher prorated life losses.

The results provided in Table 7 through Table 9 indicate that there is much less than a 1 in 10,000 chance that these structures would fail and overtop based on the seismic loading provided. And, with the limited number of people that could be in harm's way, the societal risk is considered low as well. Therefore, the results of the study indicate that there is decreased justification to take action. The likelihood of failure is driven by very remote events, over 2,500 year level earthquakes, meaning that the more frequent earthquakes are much less likely to cause failure.

Based on the results of this risk analysis, there is limited justification for additional risk reduction measures based on the data, analysis and assumptions described. It is therefore concluded that rehabilitation of the North Lake, Pine Lake, and Upper Lake Dams to address liquefaction is not warranted.

REFERENCES

ASCE (2016). “Site Classification Procedure for Seismic Design,” *ASCE 7-16 Chapter 20*, American Society of Civil Engineers, Reston, VA.

Schnabel. 2020. *Phase 1 and 2 Geotechnical Data Report, Boiling Spring Lakes Dams Construction/Reconstruction.* Greensboro, NC: Schnabel Engineering South, P.C., July 16, 2020.

United States Department of Energy, DOE (2010). *Fact #613: March 8, 2010 Vehicle Occupancy Rates.* https://www.energy.gov/eere/vehicles/fact-613-march-8-2010-vehicle-occupancy-rates

USGS (2019). *Unified Hazard Tool.* Vers. v4.2.0. https://earthquake.usgs.gov/hazards/interactive/.

US Bureau of Reclamation (2011) Dam Safety Public Protection Guidelines.

ATTACHMENTS

1. USGS Unified Hazard Tool Results for 800-year, 1,250-year, 2,500-year, 5,000-year and 10,000-year return periods
2. Liquefaction Potential

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project	Project Number
Boiling Spring Lakes Dams Construction/Reconstruction	19C21022

Title

Attachment 1: USGS Unified Hazard Tool Results for 800-year, 1,250-year, 2,500-year, 5,000-year and 10,000-year return periods

Computer Programs Used	Version/Release No.
USGS Unified Hazard Tool	2019

Purpose and Objective

Estimate the amplified Peak Ground Acceleration (PGA) and Mode Earthquake Magnitude for the Boiling Spring Lakes site for the following return periods:
- 10,000-year,
- 5,000-year,
- 2,500-year,
- 1,250-year
- and 800-year.

Soil amplification was modeled using the ASCE 7-16, Table 11.8-1. The site class D was used to estimate a site coefficient for each return period. The PGA estimated by the hazard tool was multiplied by the site coefficient to account for amplification.

Summary of Conclusions

The estimated amplified Peak Ground Acceleration (PGA) and Mode Earthquake Magnitude for the aforementioned return periods are as follows:

Return Interval	Model Magnitude	PGA (g)
10,000-year	7.3	0.26
5,000-year	7.3	0.2
2,500-year	7.3	0.14
1,250-year	7.3	0.09
800-year	7.3	0.07

Originator		
Zachary Ostrum		Jan 5, 2021
Print	Sign	Date

Checked		
Corey Schaal		Jan 13, 2021
Print	Sign	Date

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.034

Time Horizon

Return period in years

800

Longitude

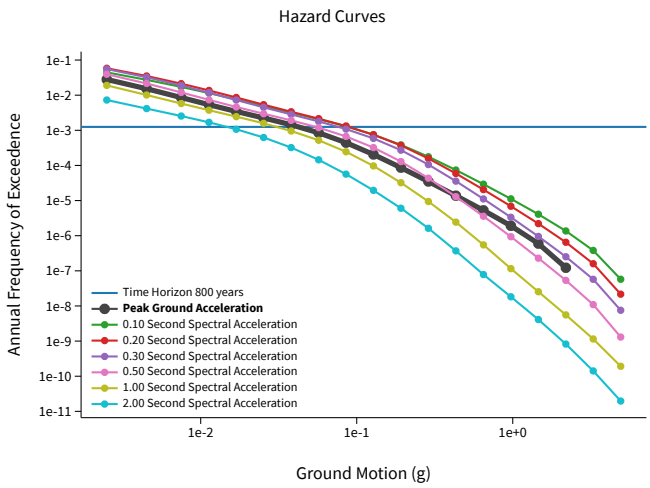
Decimal degrees, negative values for western longitudes

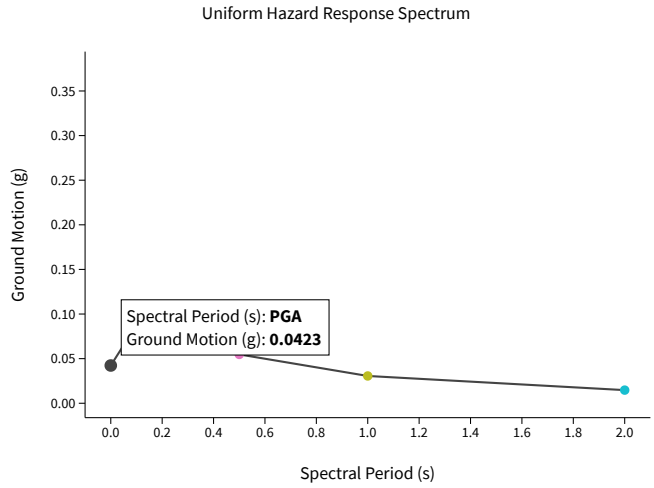
-78.051

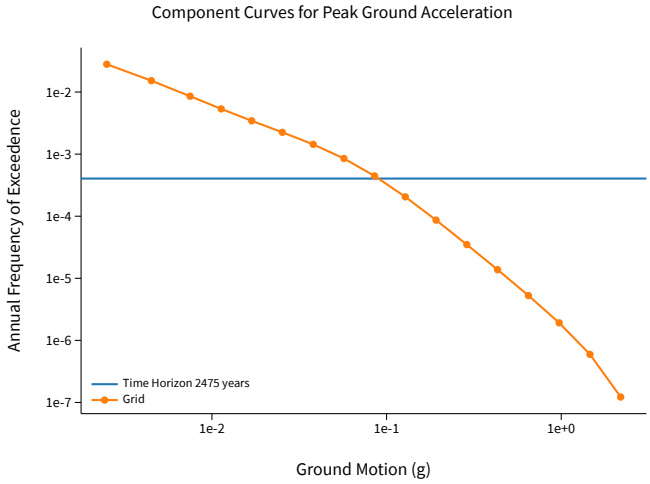
Site Class

760 m/s (B/C boundary)

Hazard Curve





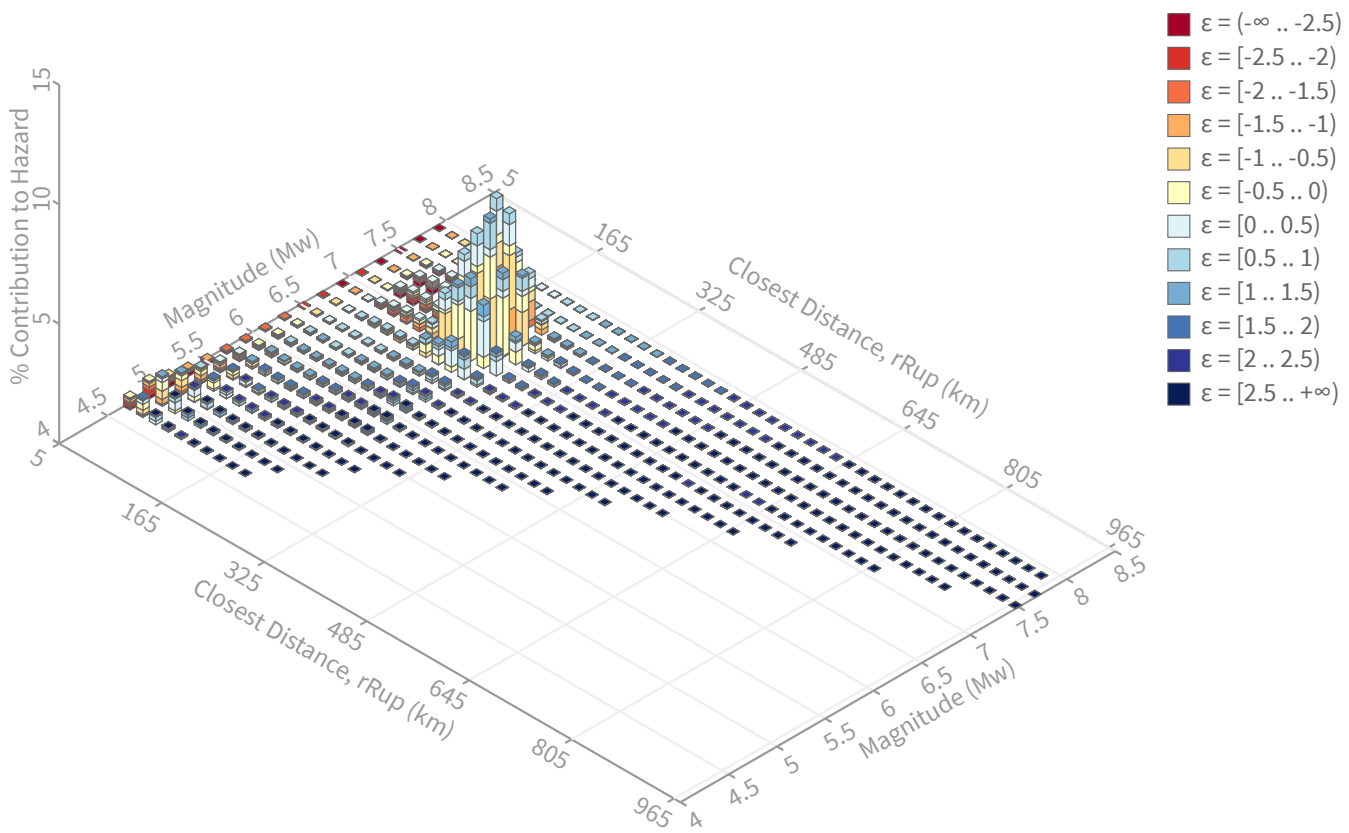


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 800 yrs
Exceedance rate: 0.00125 yr^{-1}
PGA ground motion: 0.042314371 g

Recovered targets

Return period: 791.87662 yrs
Exceedance rate: 0.001262823 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 1.91 %

Mean (over all sources)

m: 6.77
r: 169.06 km
ε_0: -0.34 σ

Mode (largest m-r bin)

m: 7.3
r: 190.23 km
ε_0: -0.7 σ
Contribution: 5.56 %

Mode (largest m-r-ε_0 bin)

m: 7.1
r: 228.07 km
ε_0: -0.26 σ
Contribution: 2.43 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.034

Time Horizon

Return period in years

1250

Longitude

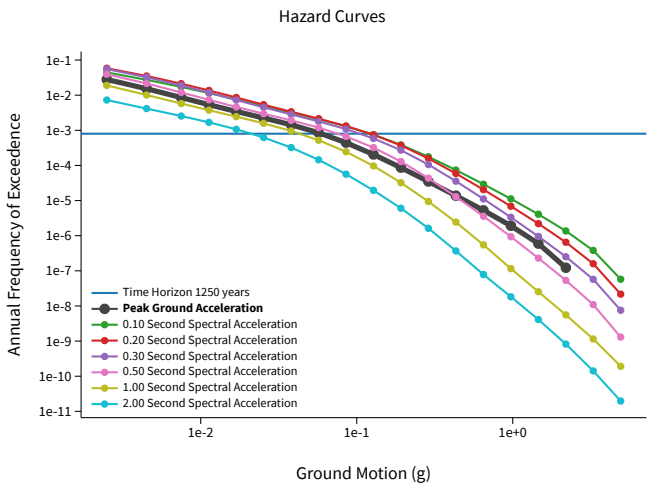
Decimal degrees, negative values for western longitudes

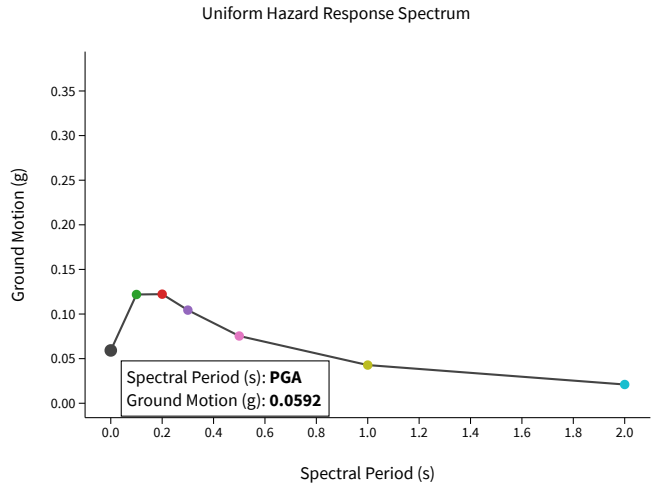
-78.051

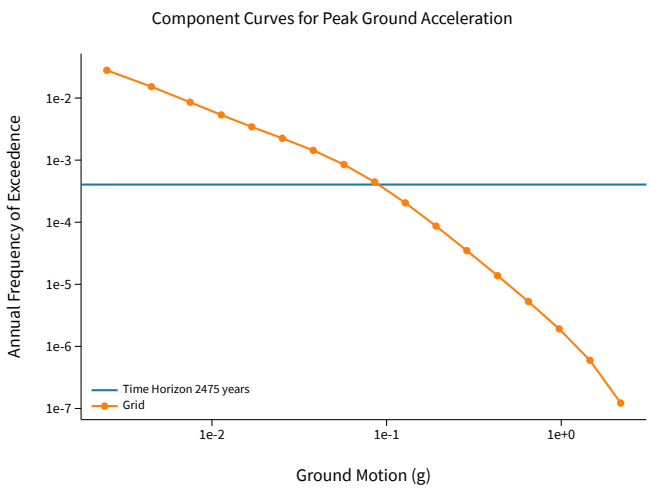
Site Class

760 m/s (B/C boundary)

Hazard Curve





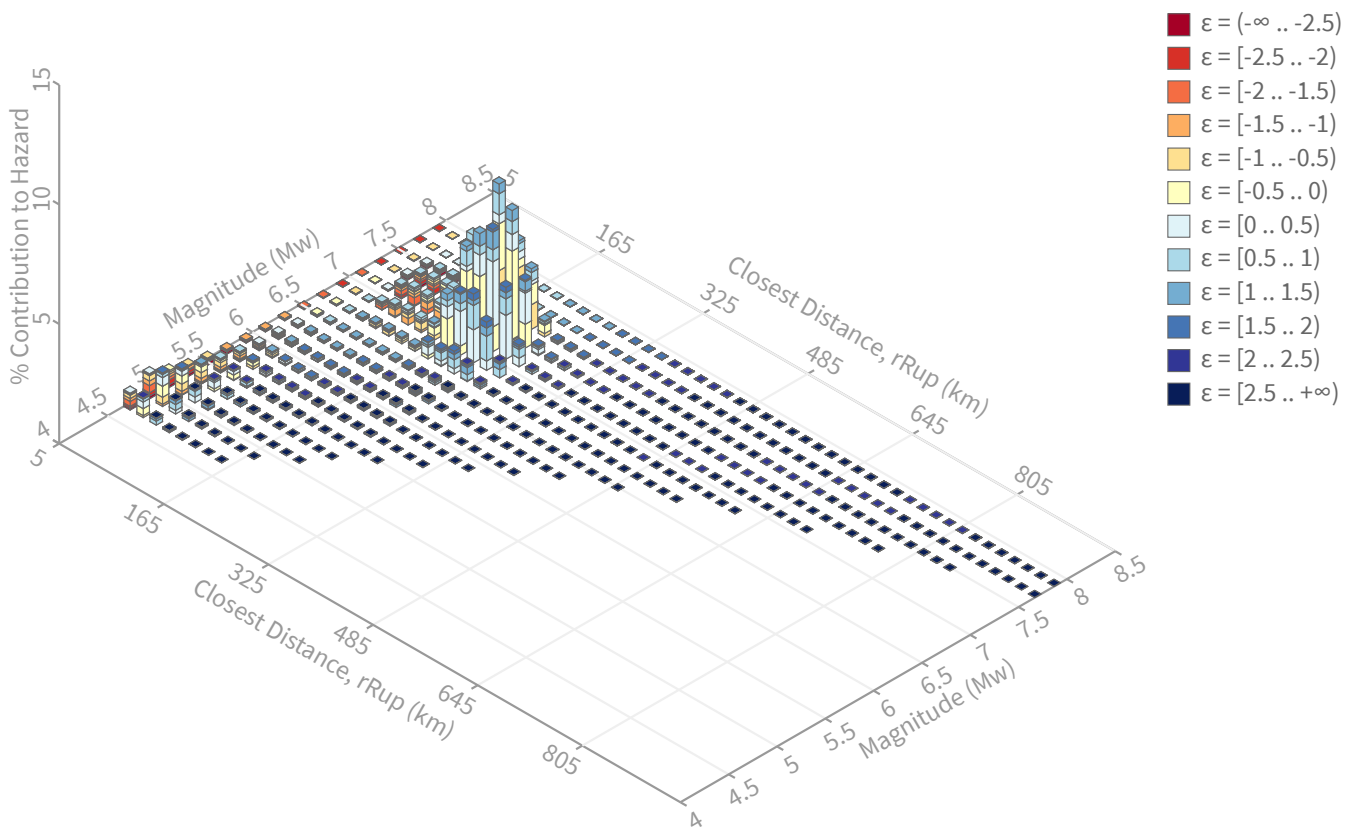


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 1250 yrs
Exceedance rate: 0.0008 yr^{-1}
PGA ground motion: 0.059199975 g

Recovered targets

Return period: 1242.9516 yrs
Exceedance rate: 0.00080453658 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 1.65 %

Mean (over all sources)

m: 6.82
r: 159.82 km
ε_0: -0.08 σ

Mode (largest m-r bin)

m: 7.3
r: 190.11 km
ε_0: -0.19 σ
Contribution: 6.22 %

Mode (largest m-r-ε_0 bin)

m: 7.3
r: 209.23 km
ε_0: -0.26 σ
Contribution: 3.69 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.034

Time Horizon

Return period in years

2500

Longitude

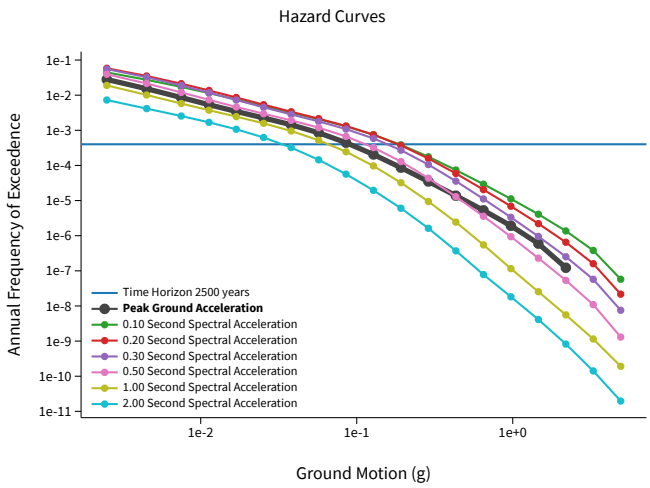
Decimal degrees, negative values for western longitudes

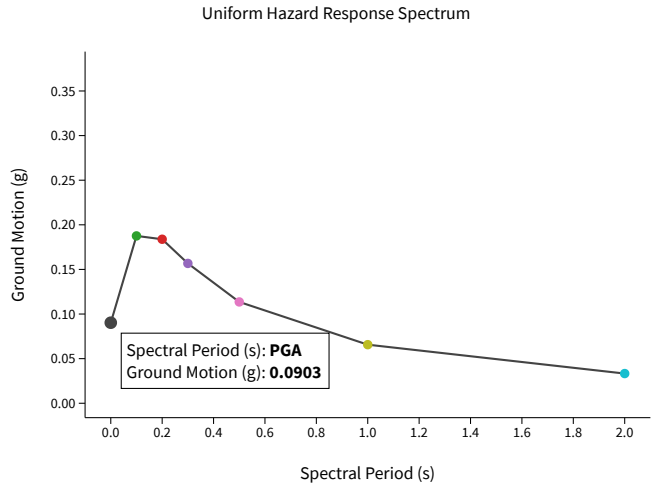
-78.051

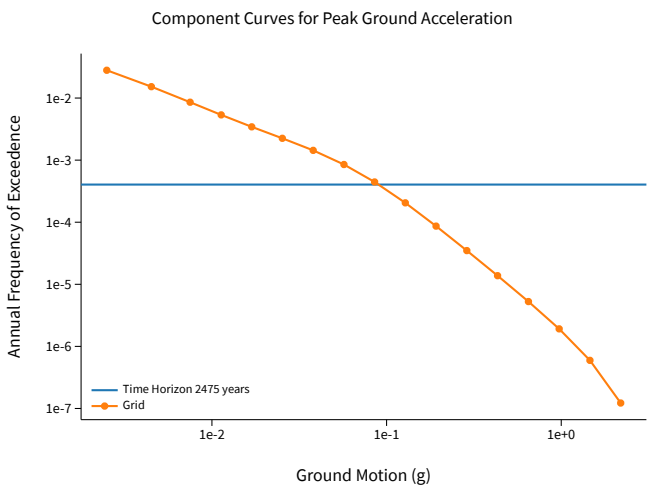
Site Class

760 m/s (B/C boundary)

Hazard Curve





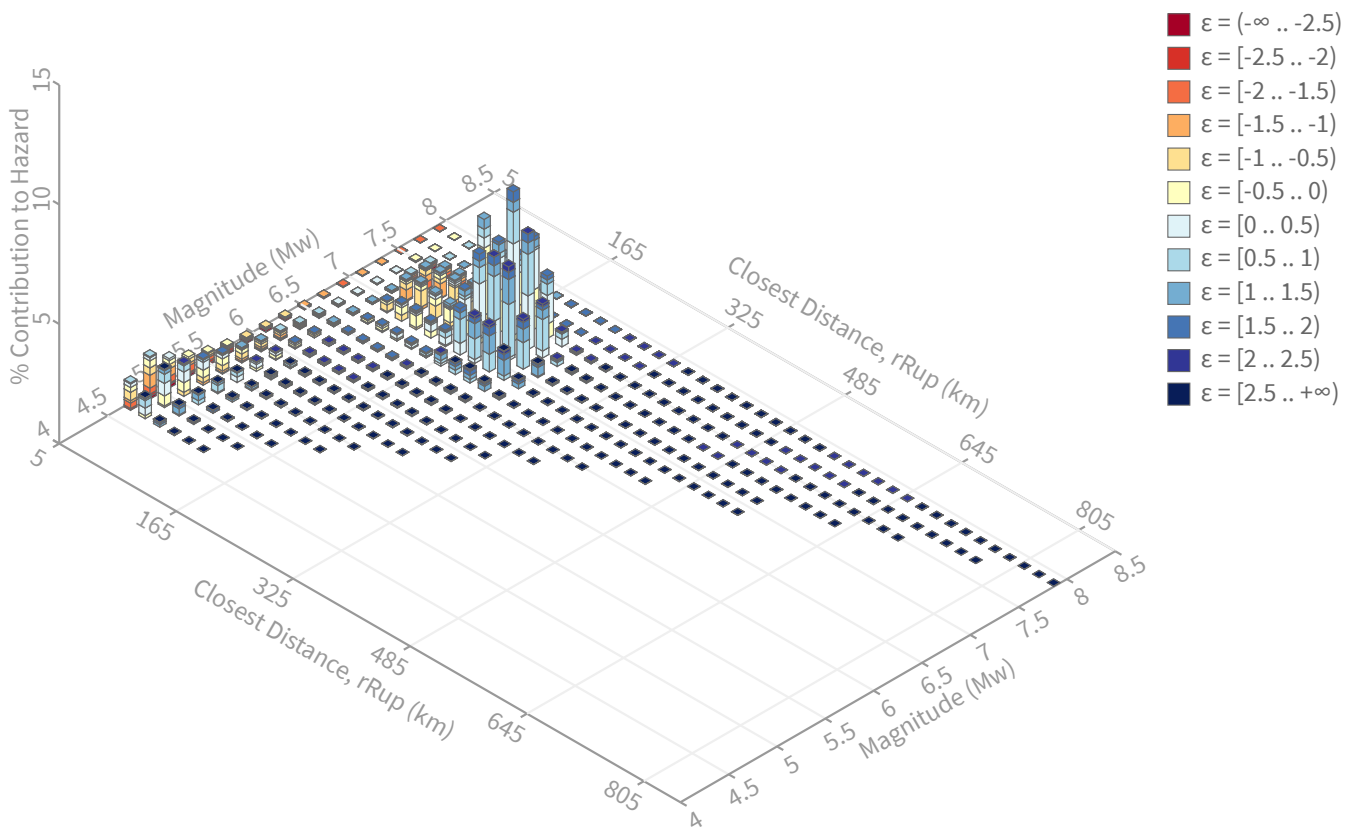


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2500 yrs
Exceedance rate: 0.0004 yr^{-1}
PGA ground motion: 0.090275302 g

Recovered targets

Return period: 2482.9156 yrs
Exceedance rate: 0.00040275232 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 1.48 %

Mean (over all sources)

m: 6.81
r: 144.29 km
ε_0: 0.24 σ

Mode (largest m-r bin)

m: 7.3
r: 189.89 km
ε_0: 0.47 σ
Contribution: 6.24 %

Mode (largest m-r-ε_0 bin)

m: 7.3
r: 190.07 km
ε_0: 0.21 σ
Contribution: 3.82 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.034

Time Horizon

Return period in years

5000

Longitude

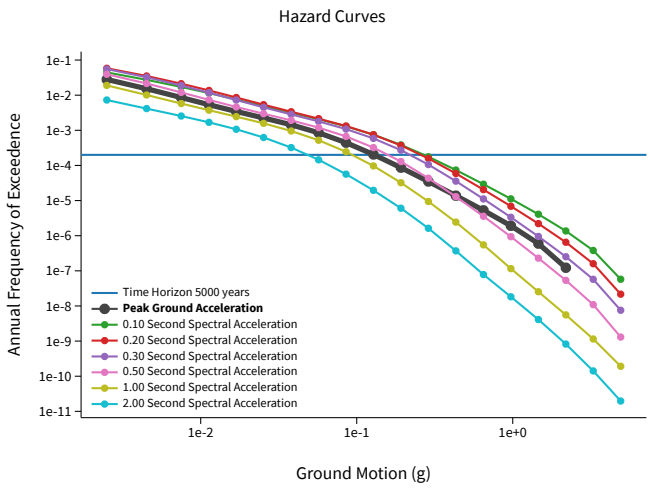
Decimal degrees, negative values for western longitudes

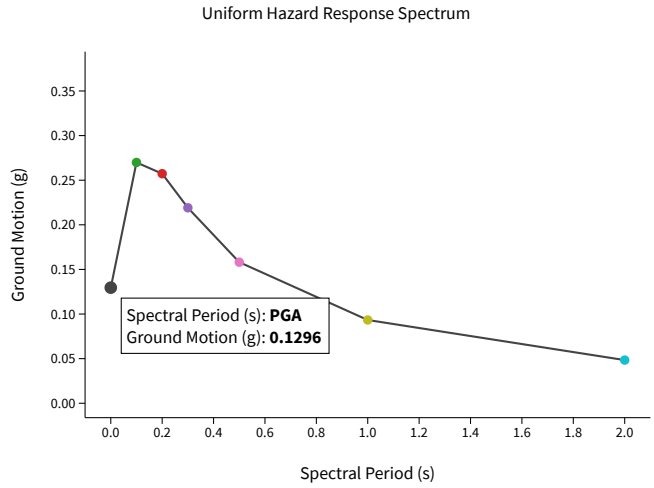
-78.051

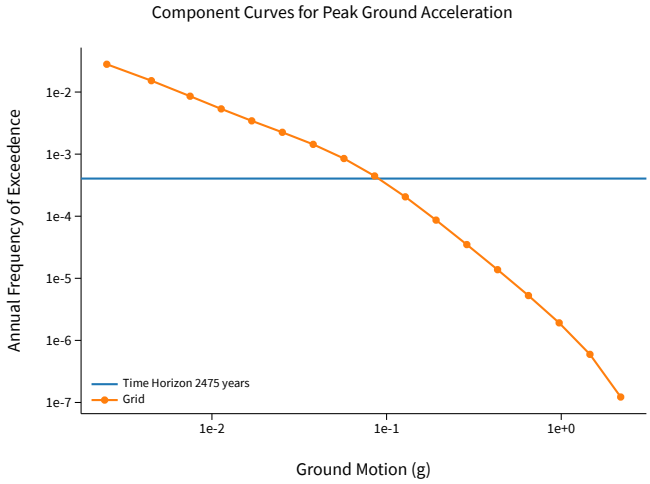
Site Class

760 m/s (B/C boundary)

Hazard Curve





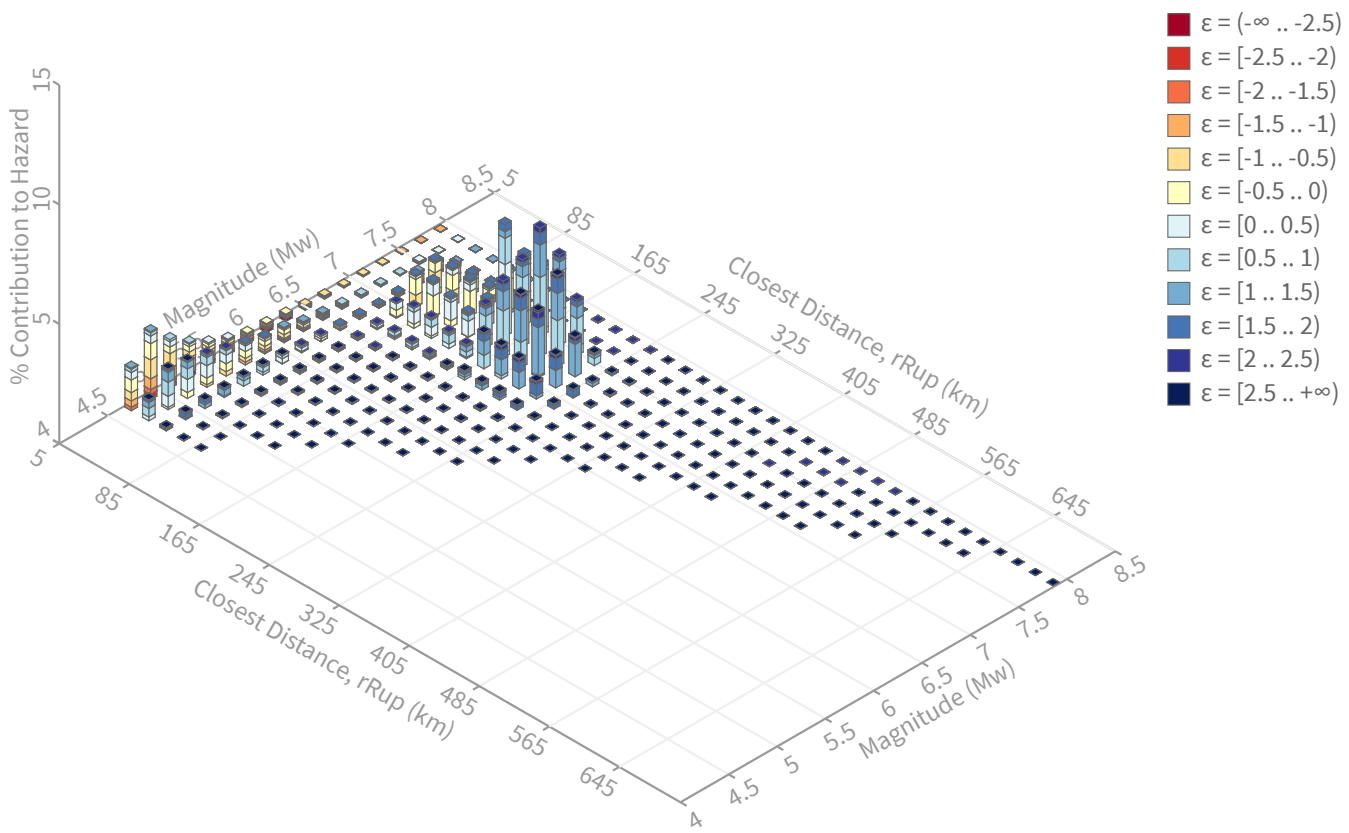


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 5000 yrs
Exceedance rate: 0.0002 yr^{-1}
PGA ground motion: 0.12956183 g

Recovered targets

Return period: 4994.7513 yrs
Exceedance rate: 0.00020021017 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 1.16 %

Mean (over all sources)

m: 6.74
r: 126.64 km
ε_0: 0.47 σ

Mode (largest m-r bin)

m: 7.3
r: 189.72 km
ε_0: 0.98 σ
Contribution: 5.36 %

Mode (largest m-r-ε_0 bin)

m: 7.3
r: 189.9 km
ε_0: 0.7 σ
Contribution: 3.3 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

34.034

Time Horizon

Return period in years

10000

Longitude

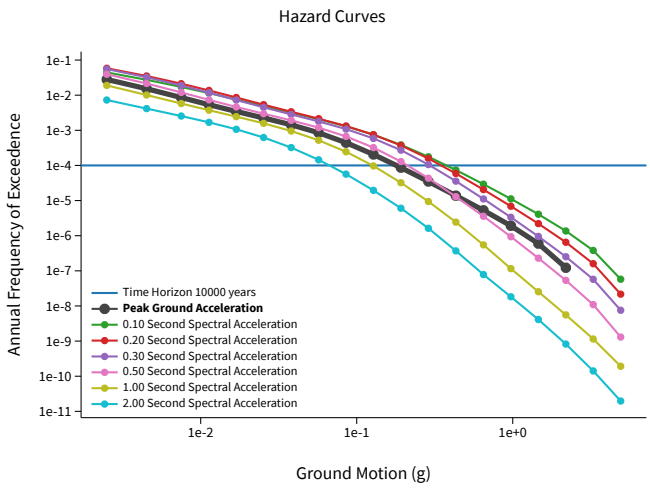
Decimal degrees, negative values for western longitudes

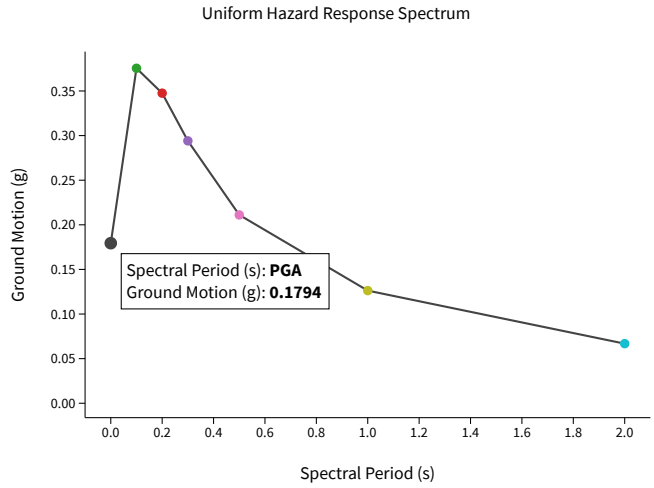
-78.051

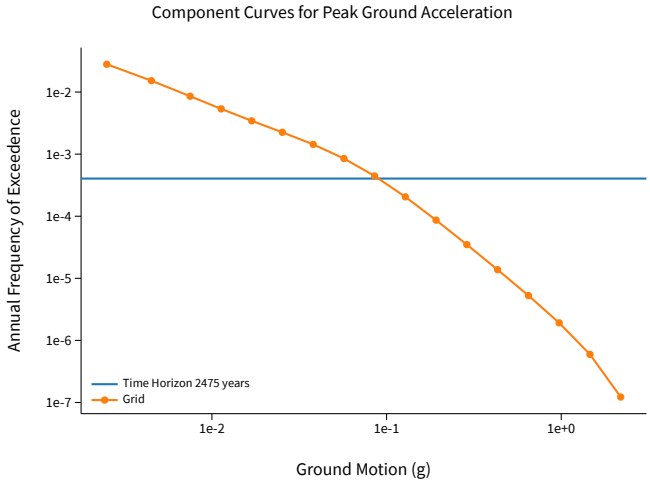
Site Class

760 m/s (B/C boundary)

Hazard Curve





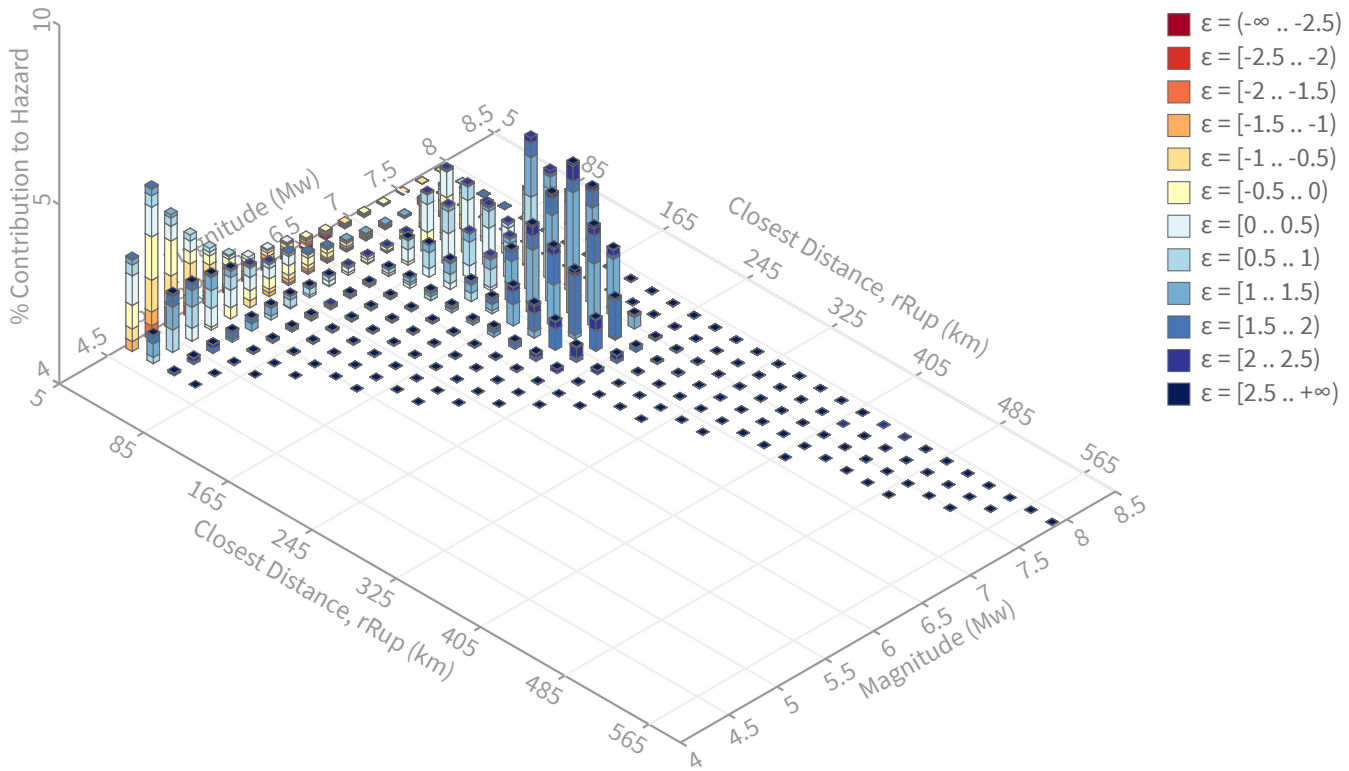


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 10000 yrs
Exceedance rate: 0.0001 yr^{-1}
PGA ground motion: 0.17940002 g

Recovered targets

Return period: 9958.7422 yrs
Exceedance rate: 0.00010041429 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.99 %

Mean (over all sources)

m: 6.63
r: 107.66 km
ε_0: 0.61 σ

Mode (largest m-r bin)

m: 7.3
r: 151.2 km
ε_0: 0.99 σ
Contribution: 4.28 %

Mode (largest m-r-ε_0 bin)

m: 7.3
r: 189.42 km
ε_0: 1.22 σ
Contribution: 3.43 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project	Project Number
Boiling Spring Lakes Dams Construction/Reconstruction	19C21022

Title

Attachment 2: Liquefaction Potential

Computer Programs Used	Version/Release No.
Microsoft Excel	2016

Purpose and Objective

Liquefaction potential for the Foundation Soils at North Lake, Pine Lake, and Upper Lake Dams was evaluated using CPT data from the Schnabel Phase 1 and Phase 2 subsurface explorations. The liquefaction potential was evaluated for the 800, 1,250, 2,500, 5,000, and the 10,000 year return interval.

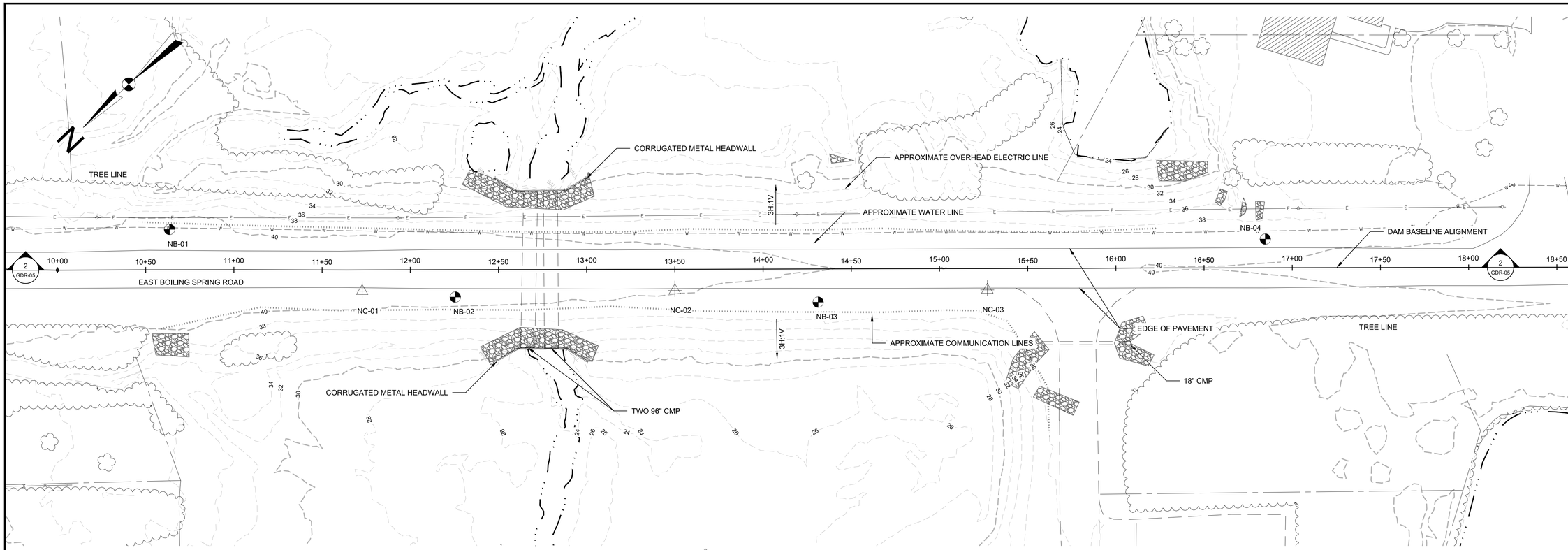
The methodology for the evaluation and liquefaction potential spreadsheet were taken from the Schnabel Liquefaction Potential Analysis Memorandum.

Summary of Conclusions

The factors of safety against liquefaction were estimated and categorized into three groups: No Liquefaction (FS > 1.5), Potential Liquefaction (1.5 > FS >1), and Liquefaction (1 > FS). If at the same elevation all soundings evaluated were liquefiable during a given return period, then widespread liquefaction was said to be likely for that interval. The results of this evaluation are summarized in the main memorandum in Table 3: Liquefaction Potential.

Originator		
Zachary Ostrum		Jan 5, 2021
Print	Sign	Date

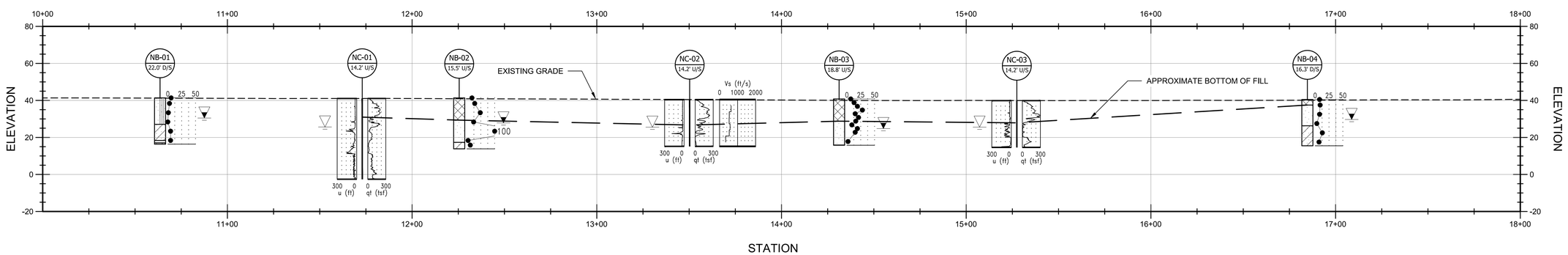
Checked		
Corey Schaal		Jan 13, 2021
Print	Sign	Date



FLOW

1 EXPLORATION PLAN

0 30' 60'



2 DAM BASELINE ALIGNMENT PROFILE

0 30' 60'

NOTES

1. EXISTING TOPOGRAPHY, SITE FEATURE LOCATIONS, TEST BORING LOCATIONS, AND GROUND SURFACE ELEVATIONS SURVEYED BY EAST COAST ENGINEERING & SURVEYING, P.C. OF SHALLOTTE, NC IN AUGUST AND SEPTEMBER 2019 AND APRIL 2020 AND PROVIDED TO SCHNABEL BY MCGILL ASSOCIATES, P.A. OF CARY, NC IN OCTOBER 2019. TOPOGRAPHY OUTSIDE OF TOPOGRAPHIC SURVEY LIMITS DERIVED FROM NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM 2014 LIDAR DATA. HORIZONTAL COORDINATES PLOTTED IN US SURVEY FEET WITH RESPECT TO THE NORTH AMERICAN DATUM 1983 (NAD83) AND NORTH CAROLINA STATE PLANE COORDINATE SYSTEM. ELEVATIONS ARE REPORTED WITH RESPECT TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. PHASE 1 TEST BORINGS WERE DRILLED BY RED DOG DRILLING OF MIDLAND, NC IN AUGUST AND SEPTEMBER 2019.
3. CPT SOUNDING LOCATIONS ARE BASED ON OFFSET MEASUREMENTS FROM SURVEYED LOCATION AND ARE APPROXIMATE.
4. CPT SOUNDINGS WERE PERFORMED BY CONETEC, INC. OF CHARLES CITY, VIRGINIA IN APRIL 2020.
5. LINEAR INTERPRETATIONS OF STRATIGRAPHY BETWEEN BORINGS ARE BASED ON SIMILARITY OF MATERIALS ENCOUNTERED IN THE BORINGS AND MAY NOT BE REPRESENTATIVE OF SUBSURFACE CONDITIONS BETWEEN THE BORINGS.
6. SEE DRAWING GDR-03 FOR CPT AND BORING LEGENDS.

REV.	DESCRIPTION	DATE

DESIGNED BY: ACP
DRAWN BY: FXAS
CHECKED BY: GDR

PHASE 1 & 2
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DATA REPORT

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DAMS CONSTRUCTION/RECONSTRUCTION PROJECT
BOILING SPRING LAKES, NORTH CAROLINA
CITY OF BOILING SPRING LAKES

NORTH LAKE DAM
EXPLORATION PLAN AND
PROFILE

mcgill
FIRM LICENSE NUMBER C-0459

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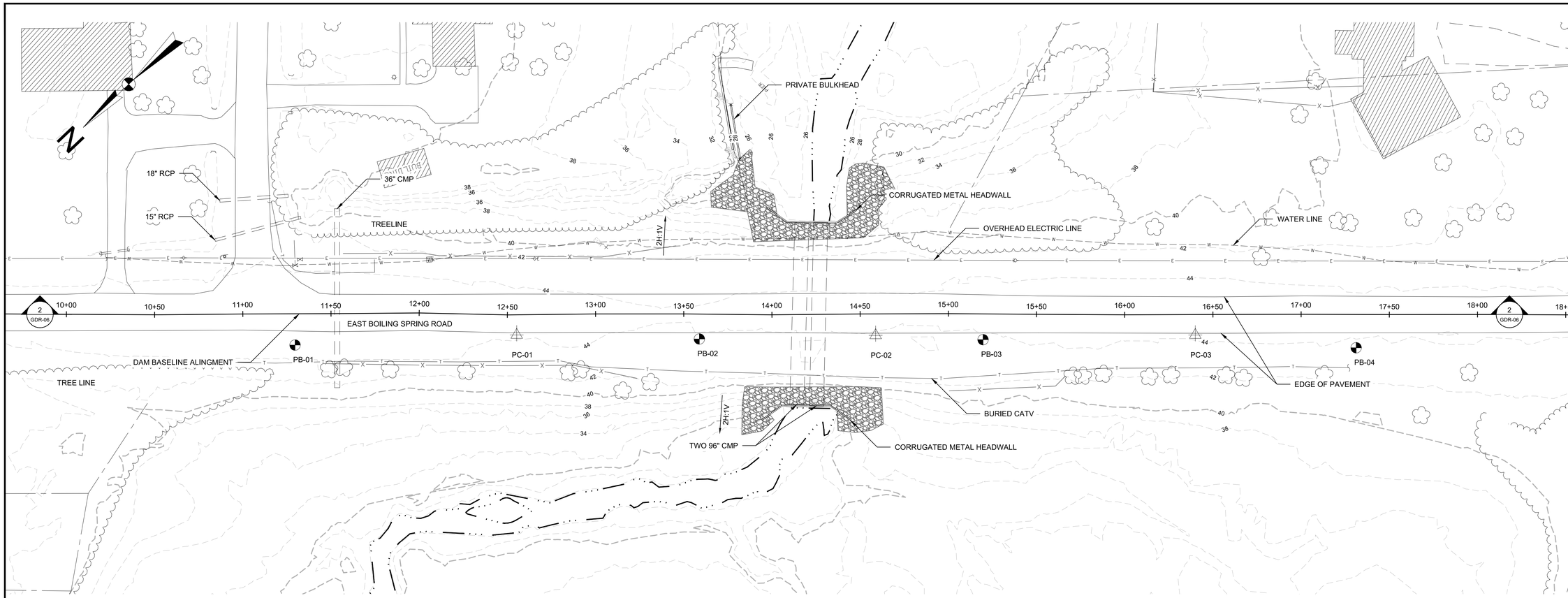
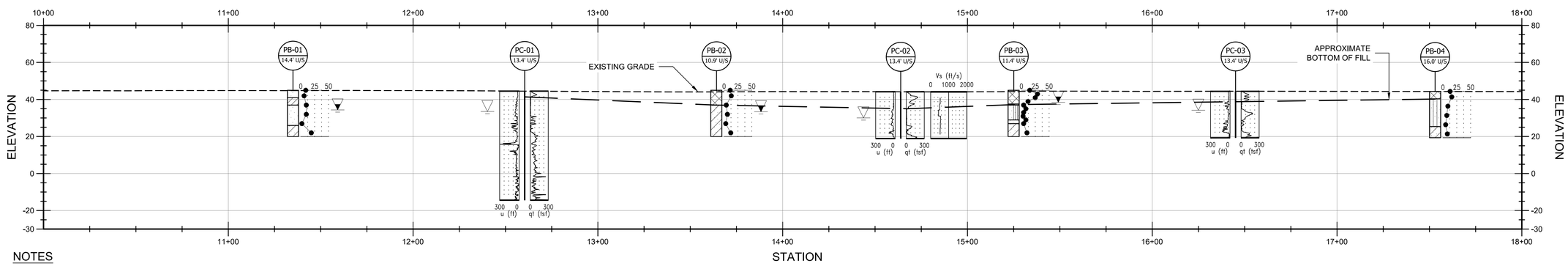
PROJECT: 19C21022
DATE: JULY 2020
DRAWING NO.
GDR-05
SHEET
5 OF 7



FLOW

1 EXPLORATION PLAN

0 30' 60'



2 DAM BASELINE ALIGNMENT PROFILE

0 30' 60'

NOTES

1. EXISTING TOPOGRAPHY, SITE FEATURE LOCATIONS, TEST BORING LOCATIONS, AND GROUND SURFACE ELEVATIONS SURVEYED BY EAST COAST ENGINEERING & SURVEYING, P.C. OF SHALLOTTE, NC IN AUGUST AND SEPTEMBER 2019 AND APRIL 2020 AND PROVIDED TO SCHNABEL BY MCGILL ASSOCIATES, P.A. OF CARY, NC IN OCTOBER 2019. TOPOGRAPHY OUTSIDE OF TOPOGRAPHIC SURVEY LIMITS DERIVED FROM NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM 2014 LIDAR DATA. HORIZONTAL COORDINATES PLOTTED IN US SURVEY FEET WITH RESPECT TO THE NORTH AMERICAN DATUM 1983 (NAD83) AND NORTH CAROLINA STATE PLANE COORDINATE SYSTEM. ELEVATIONS ARE REPORTED WITH RESPECT TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
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6. SEE DRAWING GDR-03 FOR CPT AND BORING LEGENDS.

REV.	DESCRIPTION	DATE

DESIGNED BY: ACP
DRAWN BY: FAAS
CHECKED BY: GDR

PHASE 1 & 2 GEOTECHNICAL DATA REPORT

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DAMS CONSTRUCTION/RECONSTRUCTION PROJECT
BOILING SPRING LAKES, NORTH CAROLINA
CITY OF BOILING SPRING LAKES

PINE LAKE DAM
EXPLORATION PLAN AND PROFILE

mcgill
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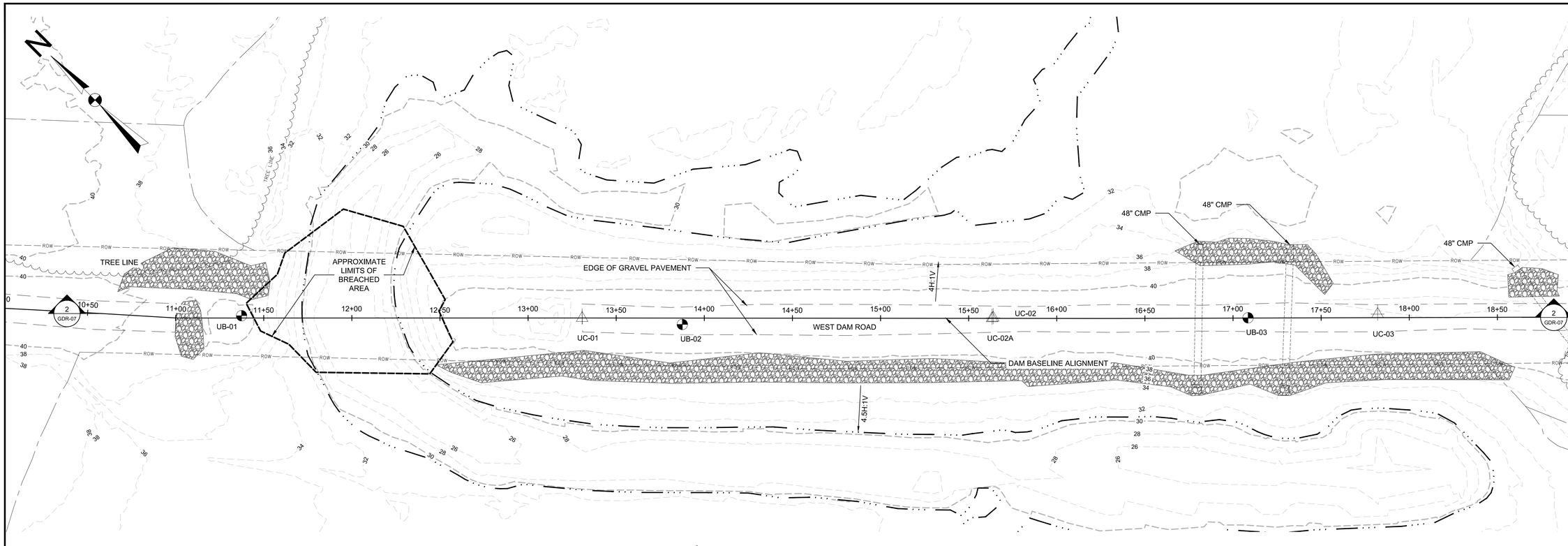
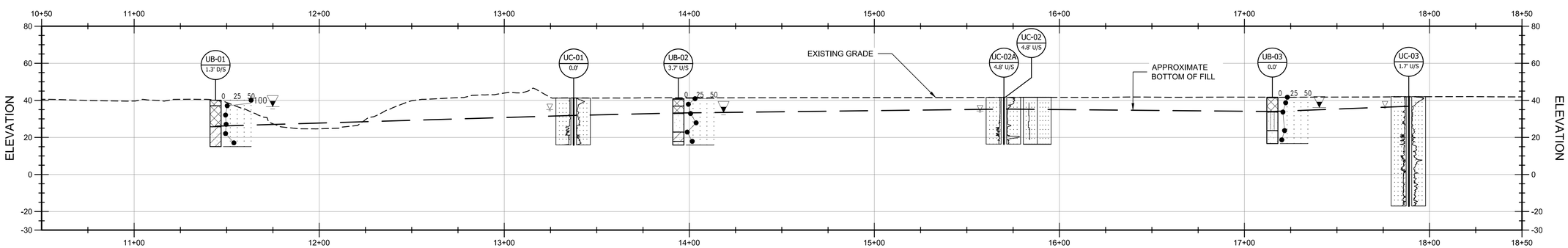
PROJECT: 19C21022
DATE: JULY 2020
DRAWING NO. GDR-06
SHEET 6 OF 7



1 EXPLORATION PLAN

0 30' 60'



NOTE: CPT SOUNDING UC-02 REFUSED SHALLOW ON DEBRIS AND WAS REPLACED WITH UC-02A. UC-02 NOT SHOWN FOR CLARITY.

2 DAM BASELINE ALIGNMENT PROFILE

0 30' 60'

NOTES

1. EXISTING TOPOGRAPHY, SITE FEATURE LOCATIONS, TEST BORING LOCATIONS, AND GROUND SURFACE ELEVATIONS SURVEYED BY EAST COAST ENGINEERING & SURVEYING, P.C. OF SHALLOTTE, NC IN AUGUST AND SEPTEMBER 2019 AND APRIL 2020 AND PROVIDED TO SCHNABEL BY MCGILL ASSOCIATES, P.A. OF CARY, NC IN OCTOBER 2019. TOPOGRAPHY OUTSIDE OF TOPOGRAPHIC SURVEY LIMITS DERIVED FROM NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM 2014 LIDAR DATA. HORIZONTAL COORDINATES PLOTTED IN US SURVEY FEET WITH RESPECT TO THE NORTH AMERICAN DATUM 1983 (NAD83) AND NORTH CAROLINA STATE PLANE COORDINATE SYSTEM. ELEVATIONS ARE REPORTED WITH RESPECT TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
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5. SEE DRAWING GDR-03 FOR CPT AND BORING LEGENDS.

REV.	DESCRIPTION	DATE

CHECKED BY: GDR
DRAWN BY: RAS
DESIGNED BY: ACP

PHASE 1 & 2 GEOTECHNICAL DATA REPORT

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BOILING SPRING LAKES, NORTH CAROLINA
CITY OF BOILING SPRING LAKES

UPPER LAKE DAM
EXPLORATION PLAN AND PROFILE

mcgill
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PROJECT: 19C21022
DATE: JULY 2020
DRAWING NO. GDR-07
SHEET 7 OF 7

ANALYSIS OF LIQUEFACTION POTENTIAL FOR EMBANKMENT AND FOUNDATION FOR 800-YEAR RETURN INTERVAL

By: ZAO 1/5/2020
Checked: CDS 1/13/2020

Method: Boulanger&Idriss, CPT and SPT Based Liquefaction Triggering Procedures, April 2014
https://faculty.engineering.ucdavis.edu/boulanger/wp-content/uploads/sites/71/2014/09/Boulanger_Idriss_CPT_and_SPT_Liq_triggering_CGM-1

[1]Earthquake Magnitude, M: 7.3
[2]Peak Ground Acceleration, PHGA (g): 0.07

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	15.0	26.2	158.8	1.031	0.950	0.649	1.1	158.0	0	0	0.0	158.0	1.0	-0.2	0.0	1.0	0.351	1.052	0.378	0.044	8.656
NC-01	NB-02	Foundation Soils	15.1	26.1	149.2	1.015	0.810	0.680	1.1	148.6	0	0	0.0	148.6	1.0	-0.2	0.0	1.0	0.279	1.044	0.298	0.044	6.796
NC-01	NB-02	Foundation Soils	15.2	26.0	137.7	0.981	0.700	0.713	1.1	137.3	0	0	0.0	137.3	1.0	-0.2	0.0	1.0	0.223	1.036	0.235	0.044	5.361
NC-01	NB-02	Foundation Soils	15.3	25.9	125.6	0.934	0.910	0.743	1.1	125.5	3	0	0.0	125.5	1.0	-0.2	0.0	1.0	0.185	1.029	0.193	0.044	4.386
NC-01	NB-02	Foundation Soils	15.3	25.9	118.6	0.964	1.190	0.813	1.1	118.5	7	0	0.0	118.6	1.0	-0.2	0.0	1.0	0.168	1.026	0.175	0.044	3.967
NC-01	NB-02	Foundation Soils	15.4	25.8	99.3	1.015	1.190	1.022	1.1	99.6	16	0	0.4	100.0	1.0	-0.2	0.0	1.0	0.137	1.018	0.142	0.044	3.199
NC-01	NB-02	Foundation Soils	15.5	25.7	84.5	1.056	0.880	1.250	1.1	84.9	25	0	0.5	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.124	0.044	2.795
NC-01	NB-02	Foundation Soils	15.6	25.6	63.4	1.076	1.190	1.698	1.1	64.1	40	0	0.6	64.6	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.044	2.362
NC-01	NB-02	Foundation Soils	15.7	25.5	52.2	1.055	2.670	2.023	1.1	52.9	49	0	0.6	53.4	1.0	-0.3	0.0	1.0	0.095	1.008	0.096	0.045	2.162
NC-01	NB-02	Foundation Soils	15.7	25.4	49.3	0.967	5.540	1.962	1.1	49.9	50	0	0.6	50.5	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.045	2.108
NC-01	NB-02	Foundation Soils	15.8	25.4	48.9	0.914	7.050	1.868	1.1	49.5	49	0	0.6	50.1	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.045	2.096
NC-01	NB-02	Foundation Soils	15.9	25.3	49.6	0.812	8.620	1.636	1.1	50.1	46	0	0.6	50.7	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.045	2.101
NC-01	NB-02	Foundation Soils	16.0	25.2	49.6	0.733	12.530	1.477	1.1	50.1	44	0	0.5	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.045	2.094
NC-01	NB-02	Foundation Soils	16.1	25.1	48.2	0.571	16.320	1.185	1.1	48.6	40	0	0.5	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.045	2.065
NC-01	NB-02	Foundation Soils	16.2	25.0	47.9	0.307	18.630	0.642	1.1	48.1	28	0	0.5	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.045	2.052
NC-01	NB-02	Foundation Soils	16.2	25.0	48.4	0.228	19.450	0.471	1.1	48.6	23	0	0.4	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.045	2.055
NC-01	NB-02	Foundation Soils	16.3	24.9	47.1	0.242	15.570	0.514	1.1	47.2	25	0	0.4	47.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.045	2.028
NC-01	NB-02	Foundation Soils	16.4	24.8	42.8	0.337	18.200	0.788	1.1	42.9	36	0	0.5	43.4	1.0	-0.3	0.0	1.0	0.088	1.007	0.089	0.045	1.956
NC-01	NB-02	Foundation Soils	16.5	24.7	39.4	0.310	22.390	0.787	1.1	39.5	38	0	0.5	40.0	1.0	-0.3	0.0	1.0	0.085	1.007	0.086	0.046	1.900
NC-01	NB-02	Foundation Soils	16.6	24.6	33.7	0.274	68.340	0.814	1.1	33.8	44	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.046	1.810
NC-01	NB-02	Foundation Soils	16.7	24.5	31.8	0.232	103.200	0.729	1.1	31.9	43	0	0.5	32.4	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.046	1.778
NC-01	NB-02	Foundation Soils	16.7	24.5	31.4	0.227	95.170	0.723	1.1	31.4	44	0	0.5	31.9	1.0	-0.3	0.0	1.0	0.080	1.006	0.081	0.046	1.767
NC-01	NB-02	Foundation Soils	16.8	24.4	30.7	0.192	83.430	0.626	1.1	30.6	42	0	0.5	31.1	1.0	-0.3	0.0	1.0	0.080	1.006	0.080	0.046	1.752
NC-01	NB-02	Foundation Soils	16.9	24.3	29.4	0.182	83.430	0.619	1.1	29.3	43	0	0.5	29.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.046	1.730
NC-01	NB-02	Foundation Soils	17.0	24.2	30.4	0.203	81.570	0.668	1.1	30.3	44	0	0.5	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.046	1.739
NC-01	NB-02	Foundation Soils	17.1	24.1	31.9	0.275	72.130	0.863	1.1	31.7	47	0	0.5	32.2	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.046	1.756
NC-01	NB-02	Foundation Soils	17.1	24.0	34.4	0.182	61.270	0.529	1.1	34.1	36	0	0.5	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.046	1.787
NC-01	NB-02	Foundation Soils	17.2	24.0	35.1	0.080	57.160	0.228	1.0	34.8	25	0	0.4	35.2	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.046	1.792
NC-01	NB-02	Foundation Soils	17.3	23.9	33.6	0.063	44.640	0.187	1.0	33.2	24	0	0.4	33.6	1.0	-0.3	0.0	1.0	0.081	1.007	0.082	0.046	1.766
NC-01	NB-02	Foundation Soils	17.4	23.8	27.9	0.062	33.880	0.222	1.0	27.6	32	0	0.4	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.047	1.683
NC-01	NB-02	Foundation Soils	17.5	23.7	20.2	0.069	63.890	0.342	1.0	19.9	48	0	0.5	20.4	1.0	-0.3	0.0	1.0	0.073	1.006	0.073	0.047	1.574
NC-01	NB-02	Foundation Soils	17.6	23.6	15.8	0.104	122.090	0.660	1.0	15.6	65	0	0.5	16.0	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.047	1.513
NC-01	NB-02	Foundation Soils	17.6	23.6	16.7	0.135	150.800	0.809	1.0	16.4	66	0	0.5	16.9	1.0	-0.3	0.0	1.0	0.071	1.006	0.071	0.047	1.522
NC-01	NB-02	Foundation Soils	17.7	23.5	19.4	0.121	105.960	0.624	1.0	19.1	57	0	0.5	19.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.047	1.554
NC-01	NB-02	Foundation Soils	17.8	23.4	24.7	0.138	65.740	0.560	1.0	24.2	48	0	0.5	24.7	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.047	1.619
NC-01	NB-02	Foundation Soils	17.9	23.3	29.3	0.150	43.100	0.512	1.0	28.6	41	0	0.5	29.1	1.0	-0.3	0.0	0.9	0.078	1.006	0.079	0.047	1.678
NC-01	NB-02	Foundation Soils	18.0	23.2	31.1	0.164	37.120	0.528	1.0	30.3	40	0	0.5	30.8	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.047	1.698
NC-01	NB-02	Foundation Soils	18.0	23.1	31.7	0.190	47.830	0.600	1.0	30.8	41	0	0.5	31.3	1.0	-0.3	0.0	0.9	0.080	1.006	0.080	0.047	1.702
NC-01	NB-02	Foundation Soils	18.1	23.1	36.9	0.240	40.130	0.650	1.0	35.8	38	0	0.5	36.3	1.0	-0.3	0.0	0.9	0.083	1.007	0.084	0.047	1.770
NC-01	NB-02	Foundation Soils	18.2	23.0	41.8	0.273	30.020	0.653	1.0	40.5	34	0	0.5	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.047	1.834
NC-01	NB-02	Foundation Soils	18.3	22.9	45.9	0.314	27.250	0.685	1.0	44.3	32	0	0.5	44.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.047	1.887
NC-01	NB-02	Foundation Soils	18.4	22.8	48.6	0.336	24.610	0.691	1.0	46.9	30	0	0.5	47.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.048	1.922
NC-01	NB-02	Foundation Soils	18.5	22.7	51.4	0.353	20.150	0.686	1.0	49.5	29	0	0.5	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.048	1.957
NC-01	NB-02	Foundation Soils	18.5	22.7	53.4	0.382	18.200	0.715	1.0	51.3	28	0	0.5	51.8	1.0	-0.3	0.0	0.9	0.094	1.008	0.094	0.048	1.981
NC-01	NB-02	Foundation Soils	18.6	22.6	56.6	0.398	15.010	0.703	1.0	54.3	26	0	0.5	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.097	0.048	2.023
NC-01	NB-02	Foundation Soils	18.7	22.5	58.6	0.422	14.770	0.720	1.0	56.1	26	0	0.5	56.5	1.0	-0.3	0.0	0.9	0.097	1.008	0.098	0.048	2.047
NC-01	NB-02	Foundation Soils	18.8	22.4	60.4	0.444	15.340	0.735	1.0	57.7	25	0	0.5	58.2	1.0	-0.3	0.0	0.9	0.098	1.008	0.099	0.048	2.070
NC-01	NB-02	Foundation Soils	18.9	22.3	61.6	0.474	14.050	0.770	1.0	58.8	25	0	0.5	59.3	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.048	2.083
NC-01	NB-02	Foundation Soils	18.9	22.2	62.7	0.497	11.380	0.792	1.0	59.8	26	0	0.5	60.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.101	0.048	2.095
NC-01	NB-02	Foundation Soils	19.0	22.2	64.1	0.513	8.410	0.800	1.0	61.0	25	0	0.5	61.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.048	2.110
NC-01	NB-02	Foundation Soils	19.1	22.1	64.9	0.537	8.000	0.828	1.0	61.6	26	0	0.5	62.1	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.048	2.117
NC-01	NB-02	Foundation Soils	19.2	22.0	66.4	0.562	7.720	0.846	1.0	63.0	25	0	0.5	63.5	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.048	2.135
NC-01	NB-02	Foundation Soils	19.3	21.9	68.0	0.584	7.560	0.858	1.0	64.5	25	0	0.5	64.9	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.048	2.156

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	19.4	21.8	68.7	0.607	7.080	0.884	1.0	65.0	25	0	0.5	65.4	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.048	2.161
NC-01	NB-02	Foundation Soils	19.4	21.8	69.0	0.546	7.000	0.791	1.0	65.2	23	0	0.4	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.049	2.160
NC-01	NB-02	Foundation Soils	19.5	21.7	68.9	0.586	7.150	0.850	1.0	65.0	24	0	0.5	65.5	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.049	2.154
NC-01	NB-02	Foundation Soils	19.6	21.6	69.1	0.628	7.040	0.908	1.0	65.1	26	0	0.5	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.049	2.152
NC-01	NB-02	Foundation Soils	19.7	21.5	69.4	0.671	7.000	0.967	1.0	65.3	27	0	0.5	65.8	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.049	2.151
NC-01	NB-02	Foundation Soils	19.8	21.4	67.5	0.687	3.430	1.019	1.0	63.4	29	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.049	2.117
NC-01	NB-02	Foundation Soils	19.8	21.3	67.4	0.701	5.670	1.040	1.0	63.2	29	0	0.5	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.049	2.111
NC-01	NB-02	Foundation Soils	19.9	21.3	67.7	0.705	6.190	1.042	1.0	63.4	29	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.049	2.111
NC-01	NB-02	Foundation Soils	20.0	21.2	69.0	0.695	6.340	1.007	1.0	64.6	28	0	0.5	65.1	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.049	2.126
NC-01	NB-02	Foundation Soils	20.1	21.1	70.0	0.681	6.340	0.973	1.0	65.4	27	0	0.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.049	2.136
NC-01	NB-02	Foundation Soils	20.2	21.0	70.8	0.688	6.810	0.972	1.0	66.1	27	0	0.5	66.6	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.049	2.143
NC-01	NB-02	Foundation Soils	20.3	20.9	72.2	0.696	7.720	0.964	1.0	67.3	26	0	0.5	67.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.049	2.160
NC-01	NB-02	Foundation Soils	20.3	20.9	73.0	0.692	8.100	0.948	1.0	68.0	25	0	0.5	68.5	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.049	2.168
NC-01	NB-02	Foundation Soils	20.4	20.8	73.6	0.700	8.450	0.951	1.0	68.5	25	0	0.5	68.9	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.049	2.172
NC-01	NB-02	Foundation Soils	20.5	20.7	73.9	0.729	8.620	0.987	1.0	68.6	26	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.049	2.171
NC-01	NB-02	Foundation Soils	20.6	20.6	74.0	0.760	8.560	1.027	1.0	68.6	27	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.049	2.168
NC-01	NB-02	Foundation Soils	20.7	20.5	73.2	0.766	8.580	1.046	1.0	67.8	27	0	0.5	68.3	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.050	2.152
NC-01	NB-02	Foundation Soils	20.8	20.4	72.0	0.772	8.580	1.073	1.0	66.5	29	0	0.5	67.0	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.050	2.128
NC-01	NB-02	Foundation Soils	20.8	20.4	68.8	0.771	8.880	1.121	1.0	63.5	31	0	0.5	64.0	1.0	-0.4	0.0	0.9	0.103	1.009	0.103	0.050	2.077
NC-01	NB-02	Foundation Soils	20.9	20.3	65.4	0.785	9.420	1.200	1.0	60.3	34	0	0.5	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.050	2.024
NC-01	NB-02	Foundation Soils	21.0	20.2	63.8	0.790	9.340	1.238	1.0	58.7	35	0	0.5	59.2	1.0	-0.4	0.0	0.9	0.099	1.009	0.099	0.050	1.997
NC-01	NB-02	Foundation Soils	21.1	20.1	60.6	0.780	9.430	1.288	1.0	55.6	37	0	0.5	56.2	1.0	-0.4	0.0	0.9	0.097	1.008	0.097	0.050	1.948
NC-01	NB-02	Foundation Soils	21.2	20.0	58.6	0.743	10.050	1.269	1.0	53.7	38	0	0.5	54.3	1.0	-0.4	0.0	0.9	0.095	1.008	0.096	0.050	1.917
NC-01	NB-02	Foundation Soils	21.2	19.9	56.1	0.704	11.580	1.255	1.0	51.4	39	0	0.5	51.9	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.050	1.880
NC-01	NB-02	Foundation Soils	21.3	19.9	54.9	0.671	12.530	1.222	1.0	50.2	39	0	0.5	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.050	1.860
NC-01	NB-02	Foundation Soils	21.4	19.8	54.0	0.633	12.670	1.172	1.0	49.3	39	0	0.5	49.8	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.050	1.845
NC-01	NB-02	Foundation Soils	21.5	19.7	53.1	0.618	12.670	1.164	1.0	48.4	39	0	0.5	48.9	1.0	-0.4	0.0	0.9	0.092	1.007	0.092	0.050	1.830
NC-01	NB-02	Foundation Soils	21.6	19.6	52.9	0.616	13.440	1.165	1.0	48.1	39	0	0.5	48.6	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.050	1.823
NC-01	NB-02	Foundation Soils	21.7	19.5	53.6	0.601	13.960	1.121	1.0	48.7	38	0	0.5	49.3	1.0	-0.4	0.0	0.9	0.092	1.008	0.092	0.050	1.829
NC-01	NB-02	Foundation Soils	21.7	19.5	56.1	0.575	13.780	1.026	1.0	50.9	35	0	0.5	51.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.050	1.857
NC-01	NB-02	Foundation Soils	21.8	19.4	58.5	0.551	13.720	0.941	1.0	53.1	32	0	0.5	53.6	1.0	-0.4	0.0	0.9	0.095	1.008	0.095	0.050	1.886
NC-01	NB-02	Foundation Soils	21.9	19.3	63.0	0.559	13.570	0.887	1.0	57.2	29	0	0.5	57.7	1.0	-0.4	0.0	0.9	0.098	1.008	0.098	0.051	1.943
NC-01	NB-02	Foundation Soils	22.0	19.2	66.4	0.561	12.570	0.844	1.0	60.2	26	0	0.5	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.051	1.985
NC-01	NB-02	Foundation Soils	22.1	19.1	66.8	0.586	11.700	0.877	1.0	60.5	27	0	0.5	61.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.051	1.987
NC-01	NB-02	Foundation Soils	22.1	19.0	66.5	0.599	9.960	0.901	1.0	60.1	28	0	0.5	60.6	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.051	1.978
NC-01	NB-02	Foundation Soils	22.2	19.0	62.7	0.613	0.080	0.978	1.0	56.5	31	0	0.5	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.098	0.051	1.924
NC-01	NB-02	Foundation Soils	22.3	18.9	55.6	0.675	-1.290	1.213	1.0	50.0	39	0	0.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.051	1.828
NC-01	NB-02	Foundation Soils	22.4	18.8	47.1	0.697	3.130	1.480	0.9	42.2	48	0	0.5	42.7	1.0	-0.4	0.0	0.9	0.087	1.007	0.087	0.051	1.719
NC-01	NB-02	Foundation Soils	22.5	18.7	41.8	0.655	3.050	1.566	0.9	37.4	52	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.084	0.051	1.652
NC-01	NB-02	Foundation Soils	22.6	18.6	39.5	0.629	9.790	1.593	0.9	35.2	54	0	0.5	35.7	1.0	-0.4	0.0	0.9	0.083	1.007	0.083	0.051	1.621
NC-01	NB-02	Foundation Soils	22.6	18.6	39.4	0.593	7.100	1.506	0.9	35.0	53	0	0.5	35.6	1.0	-0.4	0.0	0.9	0.082	1.007	0.083	0.051	1.617
NC-01	NB-02	Foundation Soils	22.7	18.5	39.3	0.485	-0.820	1.235	0.9	34.9	49	0	0.5	35.4	1.0	-0.4	0.0	0.9	0.082	1.007	0.082	0.051	1.613
NC-01	NB-02	Foundation Soils	22.8	18.4	36.5	0.398	1.240	1.091	0.9	32.3	49	0	0.5	32.8	1.0	-0.4	0.0	0.9	0.081	1.007	0.081	0.051	1.578
NC-01	NB-02	Foundation Soils	22.9	18.3	33.9	0.354	4.170	1.044	0.9	30.0	51	0	0.5	30.5	1.0	-0.4	0.0	0.9	0.079	1.006	0.079	0.051	1.547
NC-01	NB-02	Foundation Soils	23.0	18.2	29.7	0.310	7.290	1.044	0.9	26.1	55	0	0.5	26.7	1.0	-0.4	0.0	0.9	0.077	1.006	0.077	0.051	1.497
NC-01	NB-02	Foundation Soils	23.0	18.1	26.5	0.300	7.120	1.131	0.9	23.3	60	0	0.5	23.8	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.051	1.460
NC-01	NB-02	Foundation Soils	23.1	18.1	24.8	0.284	8.580	1.146	0.9	21.7	62	0	0.5	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.051	1.439
NC-01	NB-02	Foundation Soils	23.2	18.0	25.7	0.270	11.890	1.049	0.9	22.5	59	0	0.5	23.0	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.051	1.447
NC-01	NB-02	Foundation Soils	23.3	17.9	27.4	0.253	11.410	0.922	0.9	24.0	55	0	0.5	24.5	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.051	1.463
NC-01	NB-02	Foundation Soils	23.4	17.8	26.9	0.249	14.010	0.925	0.9	23.5	56	0	0.5	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.052	1.455
NC-01	NB-02	Foundation Soils	23.5	17.7	26.3	0.252	16.390	0.958	0.9	22.9	57	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.052	1.447
NC-01	NB-02	Foundation Soils	23.5	17.7	25.8	0.247	18.340	0.959	0.9	22.4	58	0	0.5	22.9	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.052	1.439
NC-01	NB-02	Foundation Soils	23.6	17.6	25.1	0.252	17.880	1.004	0.9	21.8	59	0	0.5	22.3	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.052	1.430
NC-01	NB-02	Foundation Soils	23.7	17.5	24.1	0.258	18.060	1.072	0.9	20.8	62	0	0.5	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.052	1.417
NC-01	NB-02	Foundation Soils	23.8	17.4	22.9	0.263	18.490	1.147	0.9	20.3	65	30	47.4	67.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.052	2.036
NC-01	NB-02	Foundation Soils	23.9	17.3	20.9	0.264	18.540	1.265	0.9	18.4	74	30	47.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.104	0.052	2.007
NC-01	NB-02	Foundation Soils	23.9	17.2	19.3	0.262	18.720	1.358	0.9	17.0	77	30	47.4	64.4	1.0	-0.4	0.1	0.9	0.103	1.009	0.103	0.052	1.981
NC-01	NB-02	Foundation Soils	24.0	17.2	17.7	0.260	18.870	1.468	0.9	15.6	82	30	47.2	62.8	1.0	-0.4	0.1	0.9	0.102	1.009	0.102	0.052	1.955
NC-01	NB-02	Foundation Soils	24.1	17.1	15.9	0.261	19.200	1.646	0.9	13.9	88	30	47.0	60.9	1.0	-0.4	0.1	0.9	0.100	1.009	0.100	0.052	1.926
NC-01	NB-02	Foundation Soils	24.2	17.0	14.5	0.240	20.250	1.658	0.9	12.7	91	30	46.8	59.5	1.0	-0.5	0.1	0.9	0.099	1.009	0.099	0.052	1.903
NC-01	NB-02	Foundation Soils	24.3	16.9	12.8	0.205	29.540	1.601	0.9	11.2	95	30	46.5	57.7	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.052	1.876
NC-01	NB-02	Foundation Soils	24.4	16.8	12.7	0.158	35.010	1.247	0.9	11.1	91	30	46.4	57.4	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.052	1.870

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	24.4	16.7	13.2	0.115	32.350	0.871	0.9	11.5	84	30	46.3	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.052	1.873
NC-01	NB-02	Foundation Soils	24.5	16.7	13.5	0.083	31.410	0.614	0.9	11.8	78	30	46.1	57.9	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.052	1.872
NC-01	NB-02	Foundation Soils	24.6	16.6	13.6	0.068	34.690	0.500	0.9	11.8	75	30	46.0	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.052	1.869
NC-01	NB-02	Foundation Soils	24.7	16.5	13.8	0.072	32.160	0.522	0.9	12.0	75	30	46.0	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.052	1.870
NC-01	NB-02	Foundation Soils	24.8	16.4	13.8	0.076	32.590	0.551	0.9	12.0	76	30	46.1	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.052	1.868
NC-01	NB-02	Foundation Soils	24.9	16.3	13.2	0.090	32.280	0.683	0.9	11.4	81	30	46.1	57.6	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.052	1.860
NC-01	NB-02	Foundation Soils	24.9	16.3	12.8	0.114	33.260	0.893	0.9	11.1	86	30	46.2	57.3	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.052	1.854
NC-01	NB-02	Foundation Soils	25.0	16.2	12.5	0.131	29.490	1.048	0.9	10.8	89	30	46.3	57.1	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.053	1.849
NC-01	NB-02	Foundation Soils	25.1	16.1	12.8	0.085	32.160	0.663	0.9	11.1	82	30	46.1	57.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.053	1.848
NC-01	NB-02	Foundation Soils	25.2	16.0	12.1	0.066	28.230	0.543	0.9	10.5	81	30	45.9	56.4	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.053	1.836
NC-01	NB-02	Foundation Soils	25.3	15.9	11.7	0.076	22.160	0.651	0.9	10.1	85	30	45.9	56.0	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.053	1.829
NC-01	NB-02	Foundation Soils	25.3	15.8	11.9	0.071	14.240	0.596	0.9	10.3	83	30	45.9	56.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.053	1.829
NC-01	NB-02	Foundation Soils	25.4	15.8	11.3	0.070	21.920	0.620	0.9	9.7	86	30	45.9	55.6	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.053	1.819
NC-01	NB-02	Foundation Soils	25.5	15.7	10.8	0.063	27.590	0.586	0.9	9.2	87	30	45.8	55.0	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.053	1.810
NC-01	NB-02	Foundation Soils	25.6	15.6	9.6	0.057	31.400	0.592	0.9	8.2	92	15	35.0	43.2	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.053	1.651
NC-01	NB-02	Foundation Soils	25.7	15.5	8.2	0.036	30.020	0.439	0.9	7.0	95	15	34.8	41.8	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.053	1.631
NC-01	NB-02	Foundation Soils	25.8	15.4	6.0	0.040	39.550	0.661	0.9	5.1	100	15	34.5	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.053	1.603
NC-01	NB-02	Foundation Soils	25.8	15.4	4.7	0.052	52.080	1.117	0.9	3.9	100	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.053	1.583
NC-01	NB-02	Foundation Soils	25.9	15.3	4.7	0.059	71.090	1.268	0.9	3.9	100	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.053	1.582
NC-01	NB-02	Foundation Soils	26.0	15.2	9.5	0.063	62.400	0.660	0.9	8.1	94	15	35.0	43.1	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.053	1.642
NC-01	NB-02	Foundation Soils	26.1	15.1	12.9	0.071	42.450	0.551	0.9	10.9	80	15	35.2	46.1	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.053	1.679
NC-01	NB-02	Foundation Soils	26.2	15.0	15.8	0.068	29.210	0.431	0.9	13.4	63	15	34.9	48.3	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.053	1.705
NC-01	NB-02	Foundation Soils	26.2	14.9	16.7	0.075	34.860	0.449	0.9	14.2	61	15	34.9	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.053	1.715
NC-01	NB-02	Foundation Soils	26.3	14.9	19.0	0.082	15.200	0.431	0.9	16.1	57	15	34.9	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.053	1.739
NC-01	NB-02	Foundation Soils	26.4	14.8	19.3	0.071	19.520	0.368	0.9	16.3	54	15	34.7	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.053	1.738
NC-01	NB-02	Foundation Soils	26.5	14.7	19.7	0.075	16.440	0.381	0.9	16.7	54	15	34.8	51.4	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.053	1.741
NC-01	NB-02	Foundation Soils	26.6	14.6	19.7	0.065	27.060	0.330	0.9	16.6	52	15	34.6	51.2	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.053	1.737
NC-01	NB-02	Foundation Soils	26.7	14.5	19.8	0.053	34.240	0.268	0.9	16.7	50	15	34.3	51.0	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.053	1.733
NC-01	NB-02	Foundation Soils	26.7	14.5	20.4	0.057	40.350	0.280	0.9	17.2	49	15	34.4	51.5	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.053	1.738
NC-01	NB-02	Foundation Soils	26.8	14.4	20.8	0.065	37.690	0.312	0.9	17.6	50	15	34.5	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.054	1.743
NC-01	NB-02	Foundation Soils	26.9	14.3	19.7	0.060	40.280	0.304	0.9	16.6	51	15	34.5	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.054	1.729
NC-01	NB-02	Foundation Soils	27.0	14.2	18.4	0.054	51.090	0.294	0.9	15.4	54	15	34.5	49.9	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.054	1.712
NC-01	NB-02	Foundation Soils	27.1	14.1	17.5	0.047	59.890	0.269	0.9	14.6	54	15	34.4	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.054	1.700
NC-01	NB-02	Foundation Soils	27.1	14.0	17.5	0.037	55.410	0.212	0.9	14.6	52	15	34.2	48.9	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.054	1.695
NC-01	NB-02	Foundation Soils	27.2	14.0	17.8	0.034	56.190	0.191	0.9	14.9	51	15	34.1	49.0	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.054	1.696
NC-01	NB-02	Foundation Soils	27.3	13.9	19.3	0.029	52.030	0.151	0.9	16.1	46	15	33.7	49.8	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.054	1.705
NC-01	NB-02	Foundation Soils	27.4	13.8	20.9	0.027	55.220	0.129	0.9	17.4	43	15	33.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.054	1.716
NC-01	NB-02	Foundation Soils	27.5	13.7	22.9	0.026	65.750	0.113	0.9	19.1	39	15	32.8	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.054	1.730
NC-01	NB-02	Foundation Soils	27.6	13.6	24.8	0.019	69.680	0.077	0.9	20.7	35	15	31.9	52.6	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.054	1.737
NC-01	NB-02	Foundation Soils	27.6	13.6	25.2	0.021	70.420	0.083	0.9	21.0	34	15	31.9	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.054	1.739
NC-01	NB-02	Foundation Soils	27.7	13.5	25.2	0.025	71.610	0.099	0.9	21.0	35	15	32.1	53.1	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.054	1.740
NC-01	NB-02	Foundation Soils	27.8	13.4	24.7	0.026	72.470	0.105	0.9	20.6	36	15	32.3	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.054	1.736
NC-01	NB-02	Foundation Soils	27.9	13.3	23.7	0.025	76.210	0.106	0.9	19.7	37	15	32.6	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.054	1.727
NC-01	NB-02	Foundation Soils	28.0	13.2	22.9	0.023	78.140	0.101	0.9	18.9	38	15	32.7	51.7	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.054	1.718
NC-01	NB-02	Foundation Soils	28.1	13.1	21.7	0.019	81.420	0.088	0.9	17.9	40	15	32.9	50.8	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.054	1.705
NC-01	NB-02	Foundation Soils	28.1	13.1	20.7	0.015	83.330	0.073	0.9	17.1	41	15	33.0	50.1	1.0	-0.6	0.1	0.9	0.092	1.008	0.092	0.054	1.694
NC-01	NB-02	Foundation Soils	28.2	13.0	19.8	0.010	86.460	0.050	0.9	16.3	42	15	33.1	49.5	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.054	1.685
NC-01	NB-02	Foundation Soils	28.3	12.9	19.3	0.010	89.240	0.052	0.9	15.9	43	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.054	1.680
NC-01	NB-02	Foundation Soils	28.4	12.8	19.2	0.011	91.430	0.057	0.9	15.8	43	15	33.2	49.0	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.054	1.677
NC-01	NB-02	Foundation Soils	28.5	12.7	19.4	0.012	93.050	0.062	0.9	15.9	43	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.054	1.677
NC-01	NB-02	Foundation Soils	28.5	12.6	19.6	0.017	95.530	0.087	0.9	16.1	44	15	33.3	49.3	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.054	1.679
NC-01	NB-02	Foundation Soils	28.6	12.6	19.5	0.031	98.050	0.159	0.9	16.0	47	15	33.8	49.8	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.054	1.684
NC-01	NB-02	Foundation Soils	28.7	12.5	18.9	0.041	98.950	0.217	0.9	15.4	50	15	34.2	49.6	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.054	1.680
NC-01	NB-02	Foundation Soils	28.8	12.4	16.7	0.037	102.290	0.222	0.9	13.6	55	15	34.3	47.9	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.054	1.657
NC-01	NB-02	Foundation Soils	28.9	12.3	14.5	0.041	104.650	0.283	0.9	11.8	62	15	34.5	46.3	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.054	1.636
NC-01	NB-02	Foundation Soils	29.0	12.2	11.8	0.048	111.250	0.405	0.9	9.6	82	15	35.0	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.054	1.614
NC-01	NB-02	Foundation Soils	29.0	12.2	9.4	0.052	127.860	0.555	0.9	7.6	96	15	34.9	42.5	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.054	1.586
NC-01	NB-02	Foundation Soils	29.1	12.1	8.3	0.042	139.790	0.504	0.9	6.7	100	15	34.8	41.6	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.054	1.573
NC-01	NB-02	Foundation Soils	29.2	12.0	8.3	0.040	139.360	0.480	0.9	6.7	99	15	34.8	41.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.055	1.572
NC-01	NB-02	Foundation Soils	29.3	11.9	8.8	0.081	127.640	0.918	0.9	7.1	100	15	34.9	42.0	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.055	1.577
NC-01	NB-02	Foundation Soils	29.4	11.8	9.5	0.099	132.060	1.044	0.9	7.7	100	15	35.0	42.7	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.055	1.583
NC-01	NB-02	Foundation Soils	29.4	11.7	11.5	0.145	121.780	1.258	0.9	9.3	100	15	35.3	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.055	1.607

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	29.5	11.7	12.7	0.115	110.010	0.903	0.9	10.3	91	15	35.3	45.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.055	1.618
NC-01	NB-02	Foundation Soils	29.6	11.6	20.0	0.187	52.550	0.937	0.9	16.2	75	15	36.0	52.2	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.055	1.699
NC-01	NB-02	Foundation Soils	29.7	11.5	23.6	0.173	82.330	0.734	0.9	19.2	58	15	35.6	54.8	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.055	1.732
NC-01	NB-02	Foundation Soils	29.8	11.4	35.3	0.163	143.140	0.462	0.9	28.8	38	15	34.4	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.055	1.843
NC-01	NB-02	Foundation Soils	29.9	11.3	47.3	0.176	68.040	0.372	0.9	38.8	26	15	30.6	69.4	1.0	-0.6	0.1	0.9	0.107	1.010	0.106	0.055	1.929
NC-01	NB-02	Foundation Soils	29.9	11.3	53.4	0.242	-0.810	0.453	0.9	43.9	25	15	30.6	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.110	0.055	2.004
NC-01	NB-02	Foundation Soils	30.0	11.2	59.7	0.088	10.430	0.148	0.9	48.1	8	15	4.1	52.3	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.055	1.695
NC-01	NB-02	Foundation Soils	30.1	11.1	68.2	0.102	6.760	0.149	0.9	55.1	4	15	0.0	55.2	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.055	1.731
NC-01	NB-02	Foundation Soils	30.2	11.0	74.6	0.177	10.010	0.237	0.9	60.5	5	15	0.5	61.0	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.055	1.807
NC-01	NB-02	Foundation Soils	30.3	10.9	74.4	0.149	4.470	0.200	0.9	60.3	4	15	0.0	60.3	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.055	1.796
NC-01	NB-02	Foundation Soils	30.3	10.8	70.4	0.286	11.820	0.406	0.9	57.6	15	15	18.9	76.5	1.0	-0.6	0.1	0.9	0.113	1.011	0.111	0.055	2.028
NC-01	NB-02	Foundation Soils	30.4	10.8	73.1	0.271	11.650	0.371	0.9	59.7	12	15	13.4	73.1	1.0	-0.6	0.1	0.9	0.110	1.011	0.109	0.055	1.974
NC-01	NB-02	Foundation Soils	30.5	10.7	81.3	0.187	12.200	0.230	0.9	66.0	2	15	0.0	66.0	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.055	1.870
NC-01	NB-02	Foundation Soils	30.6	10.6	78.3	0.132	23.570	0.168	0.9	63.3	0	15	0.0	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.055	1.832
NC-01	NB-02	Foundation Soils	30.7	10.5	70.1	0.183	23.490	0.261	0.9	56.6	9	15	5.4	62.0	1.0	-0.6	0.1	0.9	0.101	1.009	0.100	0.055	1.813
NC-01	NB-02	Foundation Soils	30.8	10.4	70.1	0.280	20.010	0.399	0.9	57.1	15	15	18.9	75.9	1.0	-0.6	0.1	0.9	0.112	1.011	0.111	0.055	2.013
NC-01	NB-02	Foundation Soils	30.8	10.4	76.9	0.242	11.980	0.315	0.9	62.1	8	15	4.6	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.055	1.876
NC-01	NB-02	Foundation Soils	30.9	10.3	80.3	0.197	12.260	0.245	0.9	64.7	4	15	0.0	64.7	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.055	1.847
NC-01	NB-02	Foundation Soils	31.0	10.2	83.1	0.202	5.100	0.243	0.9	67.0	2	15	0.0	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.104	0.055	1.878
NC-01	NB-02	Foundation Soils	31.1	10.1	79.5	0.268	41.260	0.337	0.9	64.2	8	15	4.6	68.7	1.0	-0.6	0.1	0.9	0.106	1.010	0.105	0.055	1.901
NC-01	NB-02	Foundation Soils	31.2	10.0	74.5	0.362	14.640	0.486	0.9	60.6	16	15	21.8	82.4	1.0	-0.6	0.1	0.9	0.118	1.013	0.117	0.055	2.111
NC-01	NB-02	Foundation Soils	31.2	9.9	74.5	0.275	17.590	0.369	0.9	60.1	12	15	12.6	72.8	1.0	-0.6	0.1	0.9	0.110	1.011	0.108	0.055	1.957
NC-01	NB-02	Foundation Soils	31.3	9.9	86.3	0.255	15.440	0.295	0.9	69.5	4	15	0.0	69.5	1.0	-0.6	0.1	0.9	0.107	1.010	0.105	0.055	1.909
NC-01	NB-02	Foundation Soils	31.4	9.8	82.0	0.249	27.920	0.304	0.8	65.7	6	15	1.0	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.055	1.868
NC-01	NB-02	Foundation Soils	31.5	9.7	80.5	0.241	8.750	0.299	0.8	64.4	6	15	1.4	65.8	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.055	1.855
NC-01	NB-02	Foundation Soils	31.6	9.6	81.2	0.210	25.760	0.259	0.8	64.9	4	15	0.1	65.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.055	1.842
NC-01	NB-02	Foundation Soils	31.7	9.5	83.3	0.084	20.630	0.101	0.8	66.6	0	15	0.0	66.6	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.055	1.863
NC-01	NB-02	Foundation Soils	31.7	9.4	83.4	0.068	18.720	0.082	0.8	66.6	0	15	0.0	66.6	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.055	1.863
NC-01	NB-02	Foundation Soils	31.8	9.4	84.0	0.045	18.240	0.054	0.8	67.0	0	15	0.0	67.0	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.055	1.867
NC-01	NB-02	Foundation Soils	31.9	9.3	83.1	0.031	20.730	0.037	0.8	66.2	0	15	0.0	66.2	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.055	1.855
NC-01	NB-02	Foundation Soils	32.0	9.2	78.4	0.045	25.970	0.057	0.8	62.2	0	15	0.0	62.2	1.0	-0.7	0.1	0.9	0.101	1.009	0.100	0.055	1.799
NC-01	NB-02	Foundation Soils	32.1	9.1	72.3	0.044	18.820	0.061	0.8	57.0	0	15	0.0	57.0	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.055	1.730
NC-01	NB-02	Foundation Soils	32.2	9.0	67.2	0.057	21.620	0.085	0.8	52.6	2	15	0.0	52.6	1.0	-0.7	0.1	0.9	0.094	1.008	0.093	0.055	1.675
NC-01	NB-02	Foundation Soils	32.2	9.0	64.0	0.058	14.200	0.091	0.8	49.9	4	15	0.0	50.0	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.055	1.640
NC-01	NB-02	Foundation Soils	32.3	8.9	58.7	0.065	21.860	0.111	0.8	45.7	8	15	3.3	49.0	1.0	-0.7	0.1	0.9	0.092	1.007	0.090	0.056	1.628
NC-01	NB-02	Foundation Soils	32.4	8.8	53.2	0.056	25.050	0.105	0.8	41.5	11	15	9.8	51.3	1.0	-0.7	0.1	0.9	0.093	1.008	0.092	0.056	1.655
NC-01	NB-02	Foundation Soils	32.5	8.7	57.4	0.034	18.470	0.059	0.8	44.4	7	15	1.9	46.4	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.056	1.594
NC-01	NB-02	Foundation Soils	32.6	8.6	59.6	0.031	5.720	0.052	0.8	46.1	6	15	0.7	46.8	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.056	1.598
NC-01	NB-02	Foundation Soils	32.6	8.5	63.7	0.067	10.420	0.105	0.8	49.4	5	15	0.2	49.7	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.056	1.632
NC-01	NB-02	Foundation Soils	32.7	8.5	63.2	0.070	10.860	0.111	0.8	49.0	5	15	0.5	49.5	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.056	1.629
NC-01	NB-02	Foundation Soils	32.8	8.4	65.2	0.080	8.800	0.123	0.8	50.5	5	15	0.3	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.056	1.645
NC-01	NB-02	Foundation Soils	32.9	8.3	59.7	0.181	11.910	0.303	0.8	47.0	17	15	21.7	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.056	1.879
NC-01	NB-02	Foundation Soils	33.0	8.2	54.6	0.218	11.910	0.399	0.8	43.1	23	15	29.3	72.5	1.0	-0.7	0.1	0.9	0.109	1.011	0.107	0.056	1.931
NC-01	NB-02	Foundation Soils	33.1	8.1	57.6	0.175	33.020	0.304	0.8	45.3	18	15	23.4	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.056	1.877
NC-01	NB-02	Foundation Soils	33.1	8.1	65.7	0.191	6.580	0.291	0.8	51.6	13	15	15.3	66.8	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.056	1.849
NC-01	NB-02	Foundation Soils	33.2	8.0	72.7	0.171	21.620	0.235	0.8	56.6	7	15	2.6	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.056	1.746
NC-01	NB-02	Foundation Soils	33.3	7.9	73.8	0.181	10.280	0.245	0.8	57.4	7	15	2.6	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.056	1.757
NC-01	NB-02	Foundation Soils	33.4	7.8	70.9	0.172	20.920	0.243	0.8	55.1	9	15	4.9	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.056	1.756
NC-01	NB-02	Foundation Soils	33.5	7.7	71.3	0.261	14.390	0.366	0.8	56.0	14	15	17.0	73.0	1.0	-0.7	0.1	0.9	0.110	1.011	0.108	0.056	1.933
NC-01	NB-02	Foundation Soils	33.5	7.6	66.9	0.344	17.340	0.514	0.8	52.9	21	15	28.3	81.2	1.0	-0.7	0.1	0.9	0.117	1.012	0.115	0.056	2.058
NC-01	NB-02	Foundation Soils	33.6	7.6	65.3	0.452	27.970	0.692	0.8	51.8	27	15	33.3	85.1	1.0	-0.7	0.1	0.9	0.121	1.013	0.118	0.056	2.122
NC-01	NB-02	Foundation Soils	33.7	7.5	63.2	0.217	18.770	0.343	0.8	49.5	17	15	22.0	71.5	1.0	-0.7	0.1	0.9	0.109	1.010	0.107	0.056	1.909
NC-01	NB-02	Foundation Soils	33.8	7.4	65.6	0.211	18.490	0.321	0.8	51.2	15	15	18.5	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.056	1.883
NC-01	NB-02	Foundation Soils	33.9	7.3	68.0	0.203	4.380	0.299	0.8	52.9	13	15	14.3	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.056	1.846
NC-01	NB-02	Foundation Soils	34.0	7.2	67.1	0.210	23.160	0.313	0.8	52.2	14	15	16.6	68.8	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.056	1.868
NC-01	NB-02	Foundation Soils	34.0	7.2	59.1	0.184	18.220	0.312	0.8	45.9	18	15	23.2	69.2	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.056	1.873
NC-01	NB-02	Foundation Soils	34.1	7.1	57.7	0.175	18.490	0.303	0.8	44.8	18	15	23.7	68.6	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.056	1.863
NC-01	NB-02	Foundation Soils	34.2	7.0	59.7	0.101	18.860	0.169	0.8	45.7	11	15	9.8	55.5	1.0	-0.7	0.1	0.9	0.096	1.008	0.095	0.056	1.691
NC-01	NB-02	Foundation Soils	34.3	6.9	62.2	0.034	35.490	0.055	0.8	47.0	5	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.056	1.589
NC-01	NB-02	Foundation Soils	34.4	6.8	62.3	0.036	19.920	0.058	0.8	47.1	5	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.056	1.589
NC-01	NB-02	Foundation Soils	34.4	6.7	63.8	0.020	11.780	0.031	0.8	48.2	6	15	0.6	48.8	1.0	-0.7	0.1	0.9	0.091	1.007	0.090	0.056	1.607
NC-01	NB-02	Foundation Soils	34.5	6.7	67.0	0.025	18.870	0.037	0.8	50.8	3	15	0.0	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.056	1.630

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	34.6	6.6	70.9	0.111	16.910	0.157	0.8	53.9	5	15	0.1	54.0	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.056	1.669
NC-01	NB-02	Foundation Soils	34.7	6.5	72.0	0.055	14.220	0.076	0.8	54.7	0	15	0.0	54.7	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.056	1.677
NC-01	NB-02	Foundation Soils	34.8	6.4	71.7	0.054	18.470	0.075	0.8	54.4	0	15	0.0	54.4	1.0	-0.7	0.1	0.9	0.095	1.008	0.094	0.056	1.673
NC-01	NB-02	Foundation Soils	34.9	6.3	72.6	0.087	6.120	0.120	0.8	55.1	2	15	0.0	55.1	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.056	1.680
NC-01	NB-02	Foundation Soils	34.9	6.3	72.4	0.175	10.480	0.242	0.8	55.2	8	15	4.5	59.6	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.056	1.737
NC-01	NB-02	Foundation Soils	35.0	6.2	72.6	0.045	19.030	0.062	0.8	54.9	0	15	0.0	54.9	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.056	1.677
NC-01	NB-02	Foundation Soils	35.1	6.1	70.5	0.074	14.050	0.105	0.8	53.2	2	15	0.0	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.056	1.655
NC-01	NB-02	Foundation Soils	35.2	6.0	68.9	0.078	17.720	0.113	0.8	51.8	3	15	0.0	51.8	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.056	1.638
NC-01	NB-02	Foundation Soils	35.3	5.9	66.5	0.095	7.240	0.143	0.8	49.9	6	15	1.2	51.1	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.056	1.627
NC-01	NB-02	Foundation Soils	35.4	5.8	65.6	0.099	13.860	0.151	0.8	49.2	7	15	2.3	51.5	1.0	-0.8	0.1	0.9	0.093	1.008	0.092	0.056	1.632
NC-01	NB-02	Foundation Soils	35.4	5.8	66.0	0.079	30.730	0.120	0.8	49.4	5	15	0.4	49.8	1.0	-0.8	0.1	0.9	0.092	1.008	0.090	0.056	1.611
NC-01	NB-02	Foundation Soils	35.5	5.7	69.0	0.138	11.510	0.200	0.8	52.0	8	15	3.8	55.8	1.0	-0.8	0.1	0.9	0.096	1.008	0.095	0.056	1.684
NC-01	NB-02	Foundation Soils	35.6	5.6	63.1	0.202	15.200	0.320	0.8	48.3	17	15	21.5	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.105	0.056	1.866
NC-01	NB-02	Foundation Soils	35.7	5.5	68.5	0.176	29.720	0.257	0.8	51.9	11	15	10.6	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.056	1.769
NC-01	NB-02	Foundation Soils	35.8	5.4	71.7	0.142	11.240	0.198	0.8	53.8	7	15	1.8	55.6	1.0	-0.8	0.1	0.9	0.096	1.008	0.094	0.056	1.680
NC-01	NB-02	Foundation Soils	35.8	5.3	70.4	0.090	20.330	0.128	0.8	52.6	4	15	0.0	52.6	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.056	1.643
NC-01	NB-02	Foundation Soils	35.9	5.3	68.0	0.052	19.720	0.077	0.8	50.6	3	15	0.0	50.6	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.056	1.617
NC-01	NB-02	Foundation Soils	36.0	5.2	65.8	0.048	18.410	0.073	0.8	48.8	4	15	0.0	48.8	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.056	1.595
NC-01	NB-02	Foundation Soils	36.1	5.1	62.9	0.028	17.060	0.045	0.8	46.5	5	15	0.4	46.9	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.056	1.572
NC-01	NB-02	Foundation Soils	36.2	5.0	56.3	0.026	15.650	0.046	0.8	41.6	9	15	5.7	47.3	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.056	1.576
NC-01	NB-02	Foundation Soils	36.3	4.9	54.5	0.026	15.700	0.048	0.8	40.2	10	15	8.1	48.3	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.056	1.588
NC-01	NB-02	Foundation Soils	36.3	4.9	54.3	0.031	11.010	0.057	0.8	40.1	10	15	8.0	48.1	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.056	1.584
NC-01	NB-02	Foundation Soils	36.4	4.8	52.9	0.117	20.120	0.221	0.8	39.7	18	15	23.2	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.056	1.768
NC-01	NB-02	Foundation Soils	36.5	4.7	51.1	0.138	19.050	0.270	0.8	38.5	22	15	27.1	65.5	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.056	1.802
NC-01	NB-02	Foundation Soils	36.6	4.6	50.9	0.194	25.780	0.381	0.8	38.4	26	15	30.8	69.3	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.056	1.852
NC-01	NB-02	Foundation Soils	36.7	4.5	52.3	0.151	28.640	0.289	0.8	39.4	22	15	27.2	66.6	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.056	1.815
NC-01	NB-02	Foundation Soils	36.7	4.4	57.3	0.142	18.200	0.248	0.8	42.9	17	15	21.6	64.6	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.056	1.788
NC-01	NB-02	Foundation Soils	36.8	4.4	60.2	0.193	23.300	0.321	0.8	45.4	19	15	24.2	69.5	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.056	1.853
NC-01	NB-02	Foundation Soils	36.9	4.3	62.5	0.260	21.960	0.416	0.8	47.4	21	15	27.5	74.8	1.0	-0.8	0.1	0.9	0.111	1.011	0.109	0.056	1.927
NC-01	NB-02	Foundation Soils	37.0	4.2	74.7	0.225	16.390	0.301	0.8	56.0	11	15	10.0	65.9	1.0	-0.8	0.1	0.9	0.104	1.009	0.102	0.056	1.803
NC-01	NB-02	Foundation Soils	37.1	4.1	81.7	0.121	13.510	0.148	0.8	60.7	0	15	0.0	60.7	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.056	1.735
NC-01	NB-02	Foundation Soils	37.2	4.0	85.0	0.103	17.870	0.121	0.8	63.4	0	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.056	1.769
NC-01	NB-02	Foundation Soils	37.2	4.0	85.1	0.087	30.300	0.102	0.8	63.4	0	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.056	1.768
NC-01	NB-02	Foundation Soils	37.3	3.9	82.9	0.097	29.160	0.117	0.8	61.5	0	15	0.0	61.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.056	1.744
NC-01	NB-02	Foundation Soils	37.4	3.8	72.5	0.113	28.030	0.156	0.8	53.2	5	15	0.2	53.3	1.0	-0.8	0.1	0.9	0.095	1.008	0.093	0.056	1.641
NC-01	NB-02	Foundation Soils	37.5	3.7	78.7	0.275	21.960	0.349	0.8	58.9	11	15	11.4	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.056	1.860
NC-01	NB-02	Foundation Soils	37.6	3.6	83.3	0.144	24.820	0.173	0.8	61.7	1	15	0.0	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.056	1.745
NC-01	NB-02	Foundation Soils	37.6	3.5	82.6	0.211	31.100	0.256	0.8	61.1	6	15	0.6	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.056	1.744
NC-01	NB-02	Foundation Soils	37.7	3.5	77.9	0.317	22.480	0.407	0.8	58.5	14	15	17.6	76.1	1.0	-0.8	0.1	0.9	0.112	1.011	0.110	0.056	1.940
NC-01	NB-02	Foundation Soils	37.8	3.4	65.2	0.279	19.440	0.428	0.8	49.0	20	15	27.0	75.9	1.0	-0.8	0.1	0.9	0.112	1.011	0.109	0.056	1.937
NC-01	NB-02	Foundation Soils	37.9	3.3	59.9	0.172	15.340	0.287	0.8	44.5	18	15	22.8	67.3	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.056	1.815
NC-01	NB-02	Foundation Soils	38.0	3.2	53.3	0.136	24.590	0.255	0.8	39.5	20	15	25.4	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.056	1.783
NC-01	NB-02	Foundation Soils	38.1	3.1	52.8	0.103	12.340	0.195	0.8	38.8	18	15	22.2	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.056	1.733
NC-01	NB-02	Foundation Soils	38.1	3.1	54.2	0.104	9.670	0.192	0.8	39.8	17	15	20.8	60.6	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.056	1.727
NC-01	NB-02	Foundation Soils	38.2	3.0	57.2	0.118	28.590	0.206	0.8	42.0	16	15	19.1	61.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.056	1.734
NC-01	NB-02	Foundation Soils	38.3	2.9	66.3	0.188	30.780	0.284	0.8	49.0	14	15	17.4	66.3	1.0	-0.8	0.1	0.9	0.104	1.010	0.102	0.057	1.800
NC-01	NB-02	Foundation Soils	38.4	2.8	79.5	0.199	26.200	0.250	0.8	58.1	7	15	1.9	60.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.097	0.057	1.719
NC-01	NB-02	Foundation Soils	38.5	2.7	87.4	0.217	28.320	0.248	0.8	64.3	4	15	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.100	0.057	1.773
NC-01	NB-02	Foundation Soils	38.5	2.6	91.1	0.279	24.210	0.306	0.8	67.1	5	15	0.4	67.5	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.057	1.815
NC-01	NB-02	Foundation Soils	38.6	2.6	87.5	0.354	36.750	0.405	0.8	65.0	11	15	9.8	74.9	1.0	-0.8	0.1	0.9	0.111	1.011	0.108	0.057	1.916
NC-01	NB-02	Foundation Soils	38.7	2.5	84.1	0.363	32.540	0.431	0.8	62.7	13	15	15.2	77.9	1.0	-0.9	0.1	0.9	0.114	1.012	0.111	0.057	1.960
NC-01	NB-02	Foundation Soils	38.8	2.4	87.3	0.320	21.670	0.366	0.8	64.5	9	15	6.4	70.9	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.057	1.859
NC-01	NB-02	Foundation Soils	38.9	2.3	100.5	0.359	1.810	0.357	0.8	74.5	4	15	0.1	74.6	1.0	-0.9	0.1	0.9	0.111	1.011	0.108	0.057	1.910
NC-01	NB-02	Foundation Soils	39.0	2.2	110.1	0.239	-8.370	0.217	0.8	82.3	0	15	0.0	82.3	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.057	2.026
NC-01	NB-02	Foundation Soils	39.0	2.1	117.4	0.242	21.060	0.206	0.8	88.2	0	15	0.0	88.2	1.0	-0.9	0.1	0.9	0.124	1.014	0.120	0.057	2.124
NC-01	NB-02	Foundation Soils	39.1	2.1	115.4	0.178	19.950	0.154	0.8	86.5	0	15	0.0	86.5	1.0	-0.9	0.1	0.9	0.122	1.014	0.118	0.057	2.094
NC-01	NB-02	Foundation Soils	39.2	2.0	110.7	0.206	25.200	0.186	0.8	82.6	0	15	0.0	82.6	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.057	2.029
NC-01	NB-02	Foundation Soils	39.3	1.9	102.5	0.170	28.110	0.166	0.8	75.8	0	15	0.0	75.8	1.0	-0.9	0.1	0.9	0.112	1.011	0.109	0.057	1.926
NC-01	NB-02	Foundation Soils	39.4	1.8	99.4	0.138	25.350	0.139	0.8	73.2	0	15	0.0	73.2	1.0	-0.9	0.1	0.9	0.110	1.011	0.107	0.057	1.888
NC-01	NB-02	Foundation Soils	39.5	1.7	96.8	0.092	11.600	0.095	0.8	71.0	0	15	0.0	71.0	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.057	1.857
NC-01	NB-02	Foundation Soils	39.5	1.7	92.5	0.073	25.700	0.079	0.8	67.5	0	15	0.0	67.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.102	0.057	1.809
NC-01	NB-02	Foundation Soils	39.6	1.6	93.4	0.109	28.300	0.117	0.8	68.1	0	15	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.057	1.817

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	39.698	1.5	96.578	0.057	23.630	0.059	0.8	70.6	0	15	0.0	70.6	1.0	-0.9	0.1	0.8	0.108	1.010	0.105	0.057	1.851
NC-01	NB-02	Foundation Soils	39.8	1.4	104.0	0.127	15.750	0.122	0.8	76.6	0	15	0.0	76.6	1.0	-0.9	0.1	0.8	0.113	1.011	0.110	0.057	1.934
NC-01	NB-02	Foundation Soils	39.9	1.3	108.4	0.173	15.390	0.160	0.8	80.0	0	15	0.0	80.0	1.0	-0.9	0.1	0.8	0.116	1.012	0.112	0.057	1.986
NC-01	NB-02	Foundation Soils	39.9	1.2	115.5	0.261	12.150	0.226	0.8	85.8	0	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.057	2.077
NC-01	NB-02	Foundation Soils	40.0	1.2	113.4	0.267	27.250	0.235	0.8	84.0	0	15	0.0	84.0	1.0	-0.9	0.1	0.8	0.120	1.013	0.116	0.057	2.047
NC-01	NB-02	Foundation Soils	40.1	1.1	111.8	0.199	29.020	0.178	0.8	82.6	0	15	0.0	82.6	1.0	-0.9	0.1	0.8	0.118	1.013	0.115	0.057	2.024
NC-01	NB-02	Foundation Soils	40.2	1.0	115.9	0.133	18.300	0.115	0.8	85.8	0	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.057	2.077
NC-01	NB-02	Foundation Soils	40.3	0.9	130.9	0.200	15.230	0.153	0.8	98.2	0	15	0.0	98.2	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.057	2.308
NC-01	NB-02	Foundation Soils	40.4	0.8	143.2	0.430	15.680	0.300	0.8	108.4	0	15	0.0	108.4	0.9	-0.9	0.1	0.8	0.149	1.021	0.145	0.057	2.553
NC-01	NB-02	Foundation Soils	40.4	0.8	144.3	0.379	17.220	0.263	0.8	109.3	0	15	0.0	109.3	0.9	-0.9	0.1	0.8	0.151	1.021	0.146	0.057	2.576
NC-01	NB-02	Foundation Soils	40.5	0.7	131.5	0.651	18.250	0.495	0.8	98.5	2	15	0.0	98.5	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.057	2.313
NC-01	NB-02	Foundation Soils	40.6	0.6	127.3	0.879	31.250	0.690	0.8	95.8	9	15	8.2	104.0	0.9	-0.9	0.1	0.8	0.143	1.019	0.138	0.057	2.436
NC-01	NB-02	Foundation Soils	40.7	0.5	132.1	0.589	31.620	0.446	0.8	98.8	0	15	0.0	98.8	1.0	-0.9	0.1	0.8	0.136	1.017	0.131	0.057	2.318
NC-01	NB-02	Foundation Soils	40.8	0.4	136.0	0.581	20.020	0.427	0.8	102.0	0	15	0.0	102.0	0.9	-0.9	0.1	0.8	0.140	1.018	0.135	0.057	2.388
NC-01	NB-02	Foundation Soils	40.8	0.3	137.4	0.478	10.910	0.348	0.8	103.1	0	15	0.0	103.1	0.9	-0.9	0.1	0.8	0.141	1.019	0.137	0.057	2.413
NC-01	NB-02	Foundation Soils	40.9	0.3	134.9	0.419	-4.900	0.311	0.8	100.9	0	15	0.0	100.9	0.9	-0.9	0.1	0.8	0.138	1.018	0.134	0.057	2.362
NC-01	NB-02	Foundation Soils	41.0	0.2	120.1	0.516	4.280	0.430	0.8	88.5	2	15	0.0	88.5	1.0	-0.9	0.1	0.8	0.124	1.014	0.120	0.057	2.118
NC-01	NB-02	Foundation Soils	41.1	0.1	97.6	0.525	30.530	0.538	0.8	71.8	13	15	15.5	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.119	0.057	2.096
NC-01	NB-02	Foundation Soils	41.2	0.0	89.3	0.394	25.490	0.441	0.8	64.9	12	15	13.6	78.5	1.0	-0.9	0.1	0.8	0.114	1.012	0.111	0.057	1.956
NC-01	NB-02	Foundation Soils	41.3	-0.1	93.7	0.400	20.300	0.427	0.8	67.9	10	15	8.8	76.7	1.0	-0.9	0.1	0.8	0.113	1.011	0.109	0.057	1.928
NC-01	NB-02	Foundation Soils	41.3	-0.1	87.4	0.297	23.350	0.340	0.8	62.6	9	15	5.5	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.057	1.809
NC-01	NB-02	Foundation Soils	41.4	-0.2	83.7	0.192	26.160	0.229	0.7	59.1	5	15	0.3	59.4	1.0	-0.9	0.1	0.8	0.099	1.009	0.096	0.057	1.698
NC-01	NB-02	Foundation Soils	41.5	-0.3	80.3	0.191	20.150	0.238	0.7	56.6	7	15	1.9	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.057	1.687
NC-01	NB-02	Foundation Soils	41.6	-0.4	79.6	0.114	19.110	0.143	0.7	55.8	2	15	0.0	55.8	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.057	1.654
NC-01	NB-02	Foundation Soils	41.7	-0.5	81.1	0.072	17.490	0.089	0.7	56.9	0	15	0.0	56.9	1.0	-0.9	0.1	0.8	0.097	1.008	0.094	0.057	1.666
NC-01	NB-02	Foundation Soils	41.7	-0.6	79.6	0.067	4.070	0.084	0.7	55.7	0	15	0.0	55.7	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.057	1.651
NC-01	NB-02	Foundation Soils	41.8	-0.6	76.3	0.045	17.910	0.059	0.7	53.1	0	15	0.0	53.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.092	0.057	1.621
NC-01	NB-02	Foundation Soils	41.9	-0.7	74.4	0.034	24.100	0.046	0.7	51.6	1	15	0.0	51.6	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.057	1.602
NC-01	NB-02	Foundation Soils	42.0	-0.8	74.5	0.046	22.680	0.062	0.7	51.7	1	15	0.0	51.7	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.057	1.602
NC-01	NB-02	Foundation Soils	42.1	-0.9	76.2	0.068	18.360	0.089	0.7	52.9	1	15	0.0	52.9	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.057	1.617
NC-01	NB-02	Foundation Soils	42.2	-1.0	77.4	0.061	24.110	0.079	0.7	53.8	0	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.057	1.627
NC-01	NB-02	Foundation Soils	42.2	-1.0	77.6	0.086	26.290	0.111	0.7	53.8	2	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.057	1.628
NC-01	NB-02	Foundation Soils	42.3	-1.1	78.9	0.066	21.490	0.084	0.7	54.8	0	15	0.0	54.8	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.057	1.639
NC-01	NB-02	Foundation Soils	42.4	-1.2	79.3	0.075	22.020	0.095	0.7	55.0	0	15	0.0	55.0	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.057	1.641
NC-01	NB-02	Foundation Soils	42.5	-1.3	81.3	0.059	12.960	0.073	0.7	56.5	0	15	0.0	56.5	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.057	1.659
NC-01	NB-02	Foundation Soils	42.6	-1.4	83.1	0.055	8.120	0.066	0.7	57.8	0	15	0.0	57.8	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.057	1.675
NC-01	NB-02	Foundation Soils	42.7	-1.5	83.7	0.075	7.340	0.090	0.7	58.2	0	15	0.0	58.2	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.057	1.679
NC-01	NB-02	Foundation Soils	42.7	-1.5	81.2	0.091	-7.150	0.112	0.7	56.2	0	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.057	1.655
NC-01	NB-02	Foundation Soils	42.8	-1.6	78.7	0.112	-0.430	0.142	0.7	54.3	3	15	0.0	54.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.057	1.632
NC-01	NB-02	Foundation Soils	42.9	-1.7	78.5	0.110	2.100	0.140	0.7	54.1	3	15	0.0	54.1	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.057	1.629
NC-01	NB-02	Foundation Soils	43.0	-1.8	78.2	0.127	-5.290	0.162	0.7	53.8	4	15	0.1	53.9	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.057	1.626
NC-01	NB-02	Foundation Soils	43.1	-1.9	81.4	0.106	1.050	0.130	0.7	56.2	1	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.057	1.654
NC-01	NB-02	Foundation Soils	43.1	-2.0	90.7	0.234	3.570	0.258	0.7	63.3	4	15	0.1	63.4	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.057	1.742
NC-01	NB-02	Foundation Soils	43.2	-2.0	96.5	0.315	2.950	0.326	0.7	67.8	6	15	0.6	68.4	1.0	-1.0	0.1	0.8	0.106	1.010	0.103	0.057	1.808
NC-01	NB-02	Foundation Soils	43.3	-2.1	107.2	0.396	18.430	0.369	0.8	76.1	4	15	0.1	76.2	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.057	1.914
NC-02	NB-02 & NB-03	Foundation Soils	15.0	25.6	48.6	0.952	2.220	1.961	1.1	49.6	50	4	14.2	63.8	1.0	-0.2	0.0	1.0	0.102	1.009	0.104	0.044	2.388
NC-02	NB-02 & NB-03	Foundation Soils	15.1	25.5	47.6	0.843	9.170	1.769	1.1	48.6	48	4	14.0	62.6	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.044	2.361
NC-02	NB-02 & NB-03	Foundation Soils	15.2	25.4	46.8	0.733	64.700	1.566	1.1	47.7	46	4	13.8	61.5	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.044	2.336
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.3	50.5	0.684	3.660	1.353	1.1	51.4	41	4	13.7	65.0	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.044	2.393
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.2	61.4	0.657	6.910	1.071	1.1	62.0	31	4	13.0	75.0	1.0	-0.2	0.0	1.0	0.111	1.011	0.114	0.044	2.580
NC-02	NB-02 & NB-03	Foundation Soils	15.4	25.2	76.6	0.644	-1.760	0.841	1.1	77.0	19	4	10.2	87.2	1.0	-0.2	0.0	1.0	0.123	1.014	0.126	0.044	2.845
NC-02	NB-02 & NB-03	Foundation Soils	15.5	25.1	86.2	0.674	-4.910	0.782	1.1	86.4	15	4	7.4	93.8	1.0	-0.2	0.0	1.0	0.130	1.016	0.133	0.044	3.009
NC-02	NB-02 & NB-03	Foundation Soils	15.6	25.0	93.2	0.702	-1.980	0.753	1.1	93.2	12	4	5.0	98.2	1.0	-0.2	0.0	1.0	0.135	1.017	0.139	0.044	3.127
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.9	102.8	0.698	0.950	0.679	1.1	102.5	7	4	0.8	103.4	1.0	-0.3	0.0	1.0	0.142	1.019	0.146	0.045	3.285
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.8	108.7	0.707	1.140	0.650	1.1	108.2	4	4	0.0	108.2	1.0	-0.3	0.0	1.0	0.149	1.021	0.154	0.045	3.453
NC-02	NB-02 & NB-03	Foundation Soils	15.8	24.8	114.9	0.726	1.330	0.632	1.1	114.1	2	4	0.0	114.1	1.0	-0.3	0.0	1.0	0.159	1.023	0.165	0.045	3.687
NC-02	NB-02 & NB-03	Foundation Soils	15.9	24.7	120.4	0.732	1.160	0.608	1.0	119.2	0	4	0.0	119.2	1.0	-0.3	0.0	1.0	0.169	1.026	0.176	0.045	3.927
NC-02	NB-02 & NB-03	Foundation Soils	16.0	24.6	123.0	0.734	1.100	0.597	1.0	121.6	0	4	0.0	121.6	1.0	-0.3	0.0	1.0	0.175	1.027	0.182	0.045	4.048
NC-02	NB-02 & NB-03	Foundation Soils	16.1	24.5	125.1	0.731	1.000	0.584	1.0	123.4	0	4	0.0	123.4	1.0	-0.3	0.0	1.0	0.179	1.028	0.187	0.045	4.144
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.4	125.4	0.653	0.890	0.521	1.0	123.6	0	4	0.0	123.6	1.0	-0.3	0.0	1.0	0.180	1.028	0.187	0.045	4.144
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.3	124.1	0.634	0.640	0.511	1.0	122.2	0	4	0.0	122.2	1.0	-0.3	0.0	1.0	0.176	1.027	0.183	0.045	4.053
NC-02	NB-02 & NB-03	Foundation Soils	16.3	24.3	120.1	0.614	0.380	0.511	1.0	118.2	0	4	0.0	118.2	1.0	-0.3	0.0	1.0	0.167	1.025	0.174	0.045	3.828

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-02	NB-02 & NB-03	Foundation Soils	16.4	24.2	115.6	0.592	0.040	0.512	1.0	113.8	0	4	0.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.164	0.045	3.611
NC-02	NB-02 & NB-03	Foundation Soils	16.5	24.1	95.4	0.554	-5.290	0.581	1.0	94.1	6	4	0.5	94.6	1.0	-0.3	0.0	1.0	0.131	1.016	0.134	0.046	2.943
NC-02	NB-02 & NB-03	Foundation Soils	16.6	24.0	90.1	0.529	-5.380	0.587	1.0	88.8	8	4	1.7	90.5	1.0	-0.3	0.0	1.0	0.126	1.015	0.129	0.046	2.829
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	70.5	0.502	-3.480	0.712	1.0	69.6	19	4	9.7	79.3	1.0	-0.3	0.0	1.0	0.115	1.012	0.117	0.046	2.569
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	60.8	0.522	-2.690	0.858	1.0	60.0	27	4	12.1	72.2	1.0	-0.3	0.0	1.0	0.109	1.010	0.111	0.046	2.422
NC-02	NB-02 & NB-03	Foundation Soils	16.8	23.8	44.2	0.521	-1.430	1.178	1.0	43.7	43	4	13.3	57.1	1.0	-0.3	0.0	1.0	0.097	1.008	0.099	0.046	2.152
NC-02	NB-02 & NB-03	Foundation Soils	16.9	23.7	37.6	0.519	-0.860	1.381	1.0	37.2	51	4	13.4	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.046	2.042
NC-02	NB-02 & NB-03	Foundation Soils	17.0	23.6	28.3	0.515	0.050	1.820	1.0	28.0	64	4	13.2	41.3	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.046	1.894
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.5	21.8	0.496	1.430	2.274	1.1	21.6	77	4	13.0	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.046	1.792
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.4	18.1	0.444	1.860	2.460	1.0	17.9	85	4	12.9	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.046	1.732
NC-02	NB-02 & NB-03	Foundation Soils	17.2	23.4	15.6	0.402	3.240	2.582	1.0	15.4	90	4	12.8	28.2	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.046	1.692
NC-02	NB-02 & NB-03	Foundation Soils	17.3	23.3	13.5	0.308	4.940	2.275	1.0	13.4	92	4	12.6	26.0	1.0	-0.3	0.0	1.0	0.076	1.006	0.077	0.046	1.658
NC-02	NB-02 & NB-03	Foundation Soils	17.4	23.2	11.2	0.257	10.390	2.285	1.0	11.1	99	4	12.5	23.6	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.047	1.622
NC-02	NB-02 & NB-03	Foundation Soils	17.5	23.1	10.8	0.204	18.200	1.897	1.0	10.6	97	4	12.5	23.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.047	1.611
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	10.4	0.175	22.060	1.683	1.0	10.2	96	4	12.4	22.7	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.047	1.602
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	9.6	0.144	27.870	1.496	1.0	9.5	97	4	12.4	21.9	1.0	-0.3	0.0	1.0	0.074	1.006	0.074	0.047	1.588
NC-02	NB-02 & NB-03	Foundation Soils	17.7	22.9	9.8	0.113	29.340	1.149	1.0	9.7	92	4	12.4	22.0	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.047	1.587
NC-02	NB-02 & NB-03	Foundation Soils	17.8	22.8	10.3	0.081	31.160	0.785	1.0	10.1	84	4	12.3	22.5	1.0	-0.3	0.0	0.9	0.074	1.006	0.075	0.047	1.590
NC-02	NB-02 & NB-03	Foundation Soils	17.9	22.7	11.6	0.191	32.210	1.645	1.0	11.4	92	4	12.5	23.9	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.047	1.606
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.6	12.8	1.007	37.000	7.848	1.0	12.5	100	4	12.6	25.2	1.0	-0.3	0.0	0.9	0.076	1.006	0.076	0.047	1.620
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.5	13.7	1.240	43.930	9.081	1.0	13.3	100	4	12.7	26.0	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.047	1.629
NC-02	NB-02 & NB-03	Foundation Soils	18.1	22.5	13.2	1.385	57.950	10.515	1.0	12.8	100	4	12.6	25.5	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.047	1.618
NC-02	NB-02 & NB-03	Foundation Soils	18.2	22.4	36.8	1.505	90.670	4.095	1.0	35.6	76	4	14.0	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.047	1.961
NC-02	NB-02 & NB-03	Foundation Soils	18.3	22.3	122.2	1.745	76.740	1.428	1.0	117.2	20	4	12.1	129.3	1.0	-0.3	0.0	0.9	0.195	1.031	0.202	0.047	4.266
NC-02	NB-02 & NB-03	Foundation Soils	18.4	22.2	166.1	1.841	179.340	1.109	1.0	158.8	6	4	0.6	159.4	1.0	-0.3	0.0	0.9	0.365	1.053	0.387	0.048	8.149
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.1	169.7	2.012	130.830	1.185	1.0	162.2	7	4	1.4	163.6	1.0	-0.3	0.0	0.9	0.411	1.057	0.437	0.048	9.180
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.0	154.9	1.950	13.350	1.259	1.0	147.9	11	4	5.3	153.3	1.0	-0.3	0.0	0.9	0.312	1.048	0.328	0.048	6.884
NC-02	NB-02 & NB-03	Foundation Soils	18.6	22.0	143.4	1.633	13.850	1.139	1.0	136.9	11	4	4.6	141.5	1.0	-0.3	0.0	0.9	0.241	1.039	0.252	0.048	5.265
NC-02	NB-02 & NB-03	Foundation Soils	18.7	21.9	105.2	1.349	27.730	1.282	1.0	100.5	21	4	12.1	112.6	1.0	-0.3	0.0	0.9	0.156	1.023	0.161	0.048	3.354
NC-02	NB-02 & NB-03	Foundation Soils	18.8	21.8	81.5	0.961	37.950	1.179	1.0	77.8	26	4	12.8	90.7	1.0	-0.3	0.0	0.9	0.126	1.015	0.128	0.048	2.680
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.7	67.7	0.923	25.640	1.363	1.0	64.6	35	4	13.8	78.4	1.0	-0.3	0.0	0.9	0.114	1.012	0.116	0.048	2.414
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.6	64.6	1.005	20.060	1.555	1.0	61.6	39	4	14.1	75.7	1.0	-0.3	0.0	0.9	0.112	1.011	0.113	0.048	2.359
NC-02	NB-02 & NB-03	Foundation Soils	19.0	21.6	62.6	0.933	18.340	1.491	1.0	59.6	39	4	14.0	73.5	1.0	-0.3	0.0	0.9	0.110	1.011	0.112	0.048	2.315
NC-02	NB-02 & NB-03	Foundation Soils	19.1	21.5	55.3	0.883	10.040	1.597	1.0	52.6	44	4	14.0	66.6	1.0	-0.3	0.0	0.9	0.105	1.010	0.106	0.048	2.190
NC-02	NB-02 & NB-03	Foundation Soils	19.2	21.4	47.7	0.817	1.520	1.711	1.0	45.4	49	4	13.8	59.2	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.048	2.067
NC-02	NB-02 & NB-03	Foundation Soils	19.3	21.3	41.6	0.719	4.530	1.726	1.0	39.5	53	4	13.7	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.095	0.048	1.971
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.2	35.6	0.672	3.480	1.889	1.0	33.7	60	4	13.5	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.048	1.879
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.1	29.3	0.497	3.670	1.698	1.0	27.7	63	4	13.2	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.049	1.785
NC-02	NB-02 & NB-03	Foundation Soils	19.5	21.1	26.0	0.389	3.960	1.498	1.0	24.5	64	4	13.0	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.084	0.049	1.735
NC-02	NB-02 & NB-03	Foundation Soils	19.6	21.0	21.4	0.283	1.760	1.325	1.0	20.2	68	4	12.8	32.9	1.0	-0.3	0.0	0.9	0.081	1.007	0.081	0.049	1.668
NC-02	NB-02 & NB-03	Foundation Soils	19.7	20.9	15.7	0.244	2.620	1.555	1.0	14.8	83	4	12.6	27.4	1.0	-0.3	0.0	0.9	0.077	1.006	0.078	0.049	1.592
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.8	9.5	0.156	-1.950	1.634	1.0	9.0	100	4	12.4	21.4	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.049	1.510
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.7	8.4	0.103	0.830	1.233	1.0	7.8	100	4	12.3	20.2	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.049	1.492
NC-02	NB-02 & NB-03	Foundation Soils	19.9	20.7	6.3	0.057	1.000	0.902	1.0	5.9	100	4	12.2	18.1	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.049	1.463
NC-02	NB-02 & NB-03	Foundation Soils	20.0	20.6	4.8	0.038	0.140	0.795	1.0	4.5	100	4	12.1	16.6	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.049	1.442
NC-02	NB-02 & NB-03	Foundation Soils	20.1	20.5	2.3	0.023	3.860	0.994	1.0	2.2	100	4	11.9	14.1	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.049	1.409
NC-02	NB-02 & NB-03	Foundation Soils	20.2	20.4	1.2	0.011	1.690	0.887	1.0	1.2	100	4	11.9	13.0	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.049	1.394
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.3	1.0	0.010	4.340	0.974	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.049	1.389
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.2	1.0	0.010	4.090	0.975	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.049	1.387
NC-02	NB-02 & NB-03	Foundation Soils	20.4	20.2	1.0	0.010	4.090	0.975	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.049	1.385
NC-02	NB-02 & NB-03	Foundation Soils	20.5	20.1	1.0	0.010	4.790	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.049	1.383
NC-02	NB-02 & NB-03	Foundation Soils	20.6	20.0	1.0	0.010	4.810	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.381
NC-02	NB-02 & NB-03	Foundation Soils	20.7	19.9	1.0	0.010	4.740	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.379
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	1.0	0.010	5.690	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.377
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	1.0	0.010	5.610	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.375
NC-02	NB-02 & NB-03	Foundation Soils	20.9	19.7	1.0	0.010	5.670	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.373
NC-02	NB-02 & NB-03	Foundation Soils	21.0	19.6	1.0	0.010	5.800	0.965	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.371
NC-02	NB-02 & NB-03	Foundation Soils	21.1	19.5	1.0	0.010	5.960	0.964	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.369
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.4	1.0	0.010	6.100	0.963	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.367
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.3	1.0	0.010	6.050	0.964	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.365
NC-02	NB-02 & NB-03	Foundation Soils	21.3	19.3	1.0	0.010	6.260	0.962	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.363
NC-02	NB-02 & NB-03	Foundation Soils	21.4	19.2	1.0	0.010	6.050	0.964	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.361

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-02	NB-02 & NB-03	Foundation Soils	21.5	19.1	1.0	0.010	6.190	0.963	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.359
NC-02	NB-02 & NB-03	Foundation Soils	21.6	19.0	1.0	0.010	6.460	0.961	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.357
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	1.0	0.010	6.610	0.960	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.356
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	1.0	0.010	6.620	0.960	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.050	1.354
NC-02	NB-02 & NB-03	Foundation Soils	21.8	18.8	1.4	0.010	6.530	0.724	1.0	1.2	100	4	11.9	13.1	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.051	1.356
NC-02	NB-02 & NB-03	Foundation Soils	21.9	18.7	1.6	0.010	6.460	0.610	1.0	1.5	100	4	11.9	13.4	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.051	1.357
NC-02	NB-02 & NB-03	Foundation Soils	22.0	18.6	2.1	0.010	5.790	0.470	1.0	1.9	100	4	11.9	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.051	1.361
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.5	2.6	0.010	7.000	0.386	1.0	2.3	100	4	11.9	14.3	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.051	1.364
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.4	3.0	0.010	7.910	0.336	1.0	2.7	100	4	12.0	14.6	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.051	1.367
NC-02	NB-02 & NB-03	Foundation Soils	22.2	18.4	3.6	0.010	9.280	0.278	1.0	3.2	100	4	12.0	15.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.051	1.372
NC-02	NB-02 & NB-03	Foundation Soils	22.3	18.3	4.1	0.011	10.720	0.270	1.0	3.7	100	4	12.0	15.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.051	1.375
NC-02	NB-02 & NB-03	Foundation Soils	22.4	18.2	5.2	0.013	8.430	0.252	0.9	4.6	100	4	12.1	16.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.071	0.051	1.386
NC-02	NB-02 & NB-03	Foundation Soils	22.5	18.1	5.6	0.018	9.030	0.321	0.9	5.0	100	4	12.1	17.1	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.051	1.389
NC-02	NB-02 & NB-03	Foundation Soils	22.6	18.0	6.1	0.020	8.580	0.326	0.9	5.5	100	4	12.1	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.051	1.393
NC-02	NB-02 & NB-03	Foundation Soils	22.6	17.9	7.1	0.021	6.910	0.298	0.9	6.3	94	4	12.2	18.5	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.051	1.401
NC-02	NB-02 & NB-03	Foundation Soils	22.7	17.9	7.7	0.024	9.480	0.311	0.9	6.9	90	4	12.2	19.0	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.051	1.407
NC-02	NB-02 & NB-03	Foundation Soils	22.8	17.8	8.5	0.032	9.650	0.375	0.9	7.6	88	4	12.2	19.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.051	1.414
NC-02	NB-02 & NB-03	Foundation Soils	22.9	17.7	9.8	0.060	9.960	0.615	0.9	8.7	89	4	12.3	20.9	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.051	1.426
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.6	10.1	0.071	10.290	0.701	0.9	9.0	89	4	12.3	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.051	1.429
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.5	11.1	0.078	9.240	0.703	0.9	9.8	86	4	12.3	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.051	1.437
NC-02	NB-02 & NB-03	Foundation Soils	23.1	17.5	11.8	0.087	9.900	0.737	0.9	10.4	84	4	12.4	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.051	1.443
NC-02	NB-02 & NB-03	Foundation Soils	23.2	17.4	13.0	0.094	9.040	0.725	0.9	11.5	80	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.052	1.455
NC-02	NB-02 & NB-03	Foundation Soils	23.3	17.3	13.2	0.103	10.310	0.782	0.9	11.6	81	4	12.4	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.052	1.455
NC-02	NB-02 & NB-03	Foundation Soils	23.4	17.2	13.3	0.113	10.200	0.848	0.9	11.7	82	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.052	1.455
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.1	13.0	0.114	10.060	0.877	0.9	11.4	83	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.052	1.450
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.0	13.4	0.118	11.200	0.881	0.9	11.8	82	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.052	1.452
NC-02	NB-02 & NB-03	Foundation Soils	23.6	17.0	14.6	0.130	10.240	0.891	0.9	12.8	79	4	12.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.052	1.464
NC-02	NB-02 & NB-03	Foundation Soils	23.7	16.9	15.4	0.138	9.910	0.898	0.9	13.5	78	4	12.5	26.0	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.052	1.470
NC-02	NB-02 & NB-03	Foundation Soils	23.8	16.8	14.9	0.137	10.710	0.917	0.9	13.1	79	4	12.5	25.6	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.052	1.464
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.7	14.5	0.131	10.720	0.906	0.9	12.7	80	4	12.5	25.1	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.052	1.457
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.6	13.8	0.124	9.430	0.897	0.9	12.1	82	4	12.5	24.5	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.052	1.448
NC-02	NB-02 & NB-03	Foundation Soils	24.0	16.6	13.5	0.112	10.060	0.831	0.9	11.7	82	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.052	1.442
NC-02	NB-02 & NB-03	Foundation Soils	24.1	16.5	13.6	0.105	9.600	0.774	0.9	11.8	80	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.052	1.441
NC-02	NB-02 & NB-03	Foundation Soils	24.2	16.4	14.1	0.108	9.960	0.767	0.9	12.2	79	4	12.4	24.7	1.0	-0.5	0.1	0.9	0.075	1.006	0.075	0.052	1.445
NC-02	NB-02 & NB-03	Foundation Soils	24.3	16.3	14.5	0.119	10.960	0.822	0.9	12.6	79	4	12.5	25.0	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.052	1.447
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.2	15.2	0.120	11.300	0.789	0.9	13.2	77	4	12.5	25.7	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.052	1.453
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.1	16.3	0.122	11.430	0.750	0.9	14.1	74	4	12.5	26.6	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.052	1.463
NC-02	NB-02 & NB-03	Foundation Soils	24.5	16.1	17.5	0.136	11.390	0.778	0.9	15.1	72	4	12.5	27.7	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.052	1.475
NC-02	NB-02 & NB-03	Foundation Soils	24.6	16.0	19.5	0.142	11.670	0.730	0.9	16.9	62	4	12.5	29.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.078	0.052	1.493
NC-02	NB-02 & NB-03	Foundation Soils	24.7	15.9	20.6	0.145	11.210	0.703	0.9	17.9	60	4	12.5	30.3	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.052	1.504
NC-02	NB-02 & NB-03	Foundation Soils	24.8	15.8	20.7	0.154	11.200	0.743	0.9	17.9	61	4	12.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.053	1.503
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	21.7	0.172	11.670	0.793	0.9	18.7	60	4	12.5	31.3	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.053	1.513
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	22.4	0.181	11.570	0.808	0.9	19.3	60	4	12.6	31.9	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.053	1.519
NC-03	NB-03	Foundation Soils	14.0	26.0	6.5	0.033	85.940	0.510	1.2	7.2	90	4	12.2	19.4	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.044	1.669
NC-03	NB-03	Foundation Soils	14.1	25.9	16.3	0.060	85.580	0.368	1.2	17.9	53	4	12.3	30.1	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.044	1.825
NC-03	NB-03	Foundation Soils	14.2	25.8	28.3	0.119	23.250	0.421	1.1	30.5	37	4	12.0	42.6	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.044	2.015
NC-03	NB-03	Foundation Soils	14.3	25.7	27.2	0.189	6.150	0.695	1.1	29.3	46	4	12.6	42.0	1.0	-0.2	0.0	1.0	0.087	1.007	0.088	0.044	2.000
NC-03	NB-03	Foundation Soils	14.4	25.7	23.0	0.241	9.850	1.049	1.1	24.8	58	4	12.9	37.7	1.0	-0.2	0.0	1.0	0.084	1.007	0.085	0.044	1.926
NC-03	NB-03	Foundation Soils	14.4	25.6	16.0	0.341	12.340	2.129	1.2	17.4	81	4	12.8	30.2	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.044	1.806
NC-03	NB-03	Foundation Soils	14.5	25.5	10.8	0.415	13.700	3.826	1.2	11.8	100	4	12.6	24.4	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.045	1.715
NC-03	NB-03	Foundation Soils	14.6	25.4	7.2	0.372	15.390	5.184	1.2	7.9	100	4	12.3	20.2	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.045	1.649
NC-03	NB-03	Foundation Soils	14.7	25.3	5.8	0.313	18.750	5.362	1.2	6.4	100	4	12.2	18.6	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.045	1.622
NC-03	NB-03	Foundation Soils	14.8	25.3	9.0	0.299	25.350	3.338	1.2	9.8	100	4	12.4	22.2	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.045	1.669
NC-03	NB-03	Foundation Soils	14.8	25.2	10.2	0.289	25.440	2.825	1.2	11.1	100	4	12.5	23.6	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.045	1.686
NC-03	NB-03	Foundation Soils	14.9	25.1	9.4	0.307	27.590	3.262	1.1	10.2	100	4	12.5	22.7	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.045	1.668
NC-03	NB-03	Foundation Soils	15.0	25.0	7.8	0.290	33.810	3.698	1.1	8.5	100	4	12.4	20.9	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.045	1.638
NC-03	NB-03	Foundation Soils	15.1	24.9	7.5	0.243	37.880	3.237	1.1	8.1	100	4	12.3	20.5	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.045	1.628
NC-03	NB-03	Foundation Soils	15.2	24.8	6.1	0.201	43.450	3.311	1.1	6.6	100	4	12.2	18.8	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.045	1.601
NC-03	NB-03	Foundation Soils	15.3	24.8	4.4	0.160	31.950	3.604	1.1	4.8	100	4	12.1	16.9	1.0	-0.2	0.0	1.0	0.071	1.006	0.072	0.046	1.571
NC-03	NB-03	Foundation Soils	15.3	24.7	3.6	0.149	40.900	4.167	1.1	3.9	100	4	12.0	15.9	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.046	1.553
NC-03	NB-03	Foundation Soils	15.4	24.6	4.4	0.168	65.560	3.854	1.1	4.7	100	4	12.1	16.8	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.046	1.561
NC-03	NB-03	Foundation Soils	15.5	24.5	6.5	0.151	67.990	2.307	1.1	7.0	100	4	12.3	19.3	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.046	1.592

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-03	NB-03	Foundation Soils	15.6	24.4	5.8	0.119	38.600	2.051	1.1	6.2	100	4	12.2	18.4	1.0	-0.2	0.0	1.0	0.071	1.006	0.073	0.046	1.576
NC-03	NB-03	Foundation Soils	15.7	24.4	3.9	0.112	39.880	2.836	1.1	4.2	100	4	12.1	16.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.046	1.544
NC-03	NB-03	Foundation Soils	15.7	24.3	3.1	0.110	47.450	3.553	1.1	3.3	100	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.046	1.527
NC-03	NB-03	Foundation Soils	15.8	24.2	3.1	0.108	70.750	3.460	1.1	3.3	100	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.046	1.524
NC-03	NB-03	Foundation Soils	15.9	24.1	3.2	0.062	75.560	1.930	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.046	1.521
NC-03	NB-03	Foundation Soils	16.0	24.0	3.2	0.042	77.420	1.328	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.047	1.517
NC-03	NB-03	Foundation Soils	16.1	23.9	3.2	0.052	79.900	1.636	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.047	1.514
NC-03	NB-03	Foundation Soils	16.2	23.9	3.4	0.110	81.590	3.236	1.1	3.6	100	4	12.0	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.047	1.514
NC-03	NB-03	Foundation Soils	16.2	23.8	4.8	0.119	79.760	2.485	1.1	5.1	100	4	12.1	17.2	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.047	1.531
NC-03	NB-03	Foundation Soils	16.3	23.7	5.1	0.131	60.030	2.571	1.1	5.4	100	4	12.1	17.5	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.047	1.532
NC-03	NB-03	Foundation Soils	16.4	23.6	4.4	0.129	47.550	2.947	1.1	4.6	100	4	12.1	16.7	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.047	1.518
NC-03	NB-03	Foundation Soils	16.5	23.5	7.1	0.142	17.530	2.011	1.1	7.4	100	4	12.3	19.7	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.047	1.555
NC-03	NB-03	Foundation Soils	16.6	23.4	6.3	0.131	20.040	2.091	1.1	6.6	100	4	12.2	18.8	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.047	1.539
NC-03	NB-03	Foundation Soils	16.7	23.4	7.3	0.108	56.650	1.479	1.1	7.7	100	4	12.3	20.0	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.047	1.552
NC-03	NB-03	Foundation Soils	16.7	23.3	10.4	0.117	54.270	1.122	1.1	10.9	86	4	12.4	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.047	1.594
NC-03	NB-03	Foundation Soils	16.8	23.2	25.1	0.124	41.740	0.495	1.1	25.9	44	4	12.3	38.2	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.047	1.800
NC-03	NB-03	Foundation Soils	16.9	23.1	36.7	0.191	29.720	0.520	1.1	37.6	33	4	12.0	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.048	1.966
NC-03	NB-03	Foundation Soils	17.0	23.0	35.3	0.275	-3.050	0.779	1.1	36.1	41	4	12.7	48.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.048	1.950
NC-03	NB-03	Foundation Soils	17.1	23.0	26.9	0.415	7.100	1.545	1.1	27.5	62	4	13.2	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.048	1.825
NC-03	NB-03	Foundation Soils	17.1	22.9	21.2	0.442	10.290	2.088	1.1	21.7	75	4	13.0	34.8	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.048	1.736
NC-03	NB-03	Foundation Soils	17.2	22.8	14.4	0.470	16.020	3.271	1.1	14.8	96	4	12.8	27.6	1.0	-0.3	0.0	1.0	0.077	1.006	0.078	0.048	1.632
NC-03	NB-03	Foundation Soils	17.3	22.7	10.9	0.451	22.300	4.134	1.1	11.2	100	4	12.5	23.8	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.048	1.577
NC-03	NB-03	Foundation Soils	17.4	22.6	10.5	0.387	17.060	3.687	1.1	10.8	100	4	12.5	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.048	1.568
NC-03	NB-03	Foundation Soils	17.5	22.5	11.7	0.361	22.250	3.075	1.1	12.1	100	4	12.6	24.7	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.048	1.582
NC-03	NB-03	Foundation Soils	17.6	22.5	10.2	0.262	26.410	2.567	1.1	10.5	100	4	12.5	23.0	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.048	1.557
NC-03	NB-03	Foundation Soils	17.6	22.4	7.1	0.251	40.260	3.520	1.1	7.3	100	4	12.3	19.6	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.048	1.509
NC-03	NB-03	Foundation Soils	17.7	22.3	6.2	0.230	54.510	3.710	1.1	6.4	100	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.048	1.493
NC-03	NB-03	Foundation Soils	17.8	22.2	5.9	0.189	63.560	3.216	1.1	6.0	100	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.049	1.486
NC-03	NB-03	Foundation Soils	17.9	22.1	4.6	0.135	83.260	2.929	1.1	4.7	100	4	12.1	16.8	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.049	1.465
NC-03	NB-03	Foundation Soils	18.0	22.1	4.5	0.103	88.430	2.288	1.1	4.6	100	4	12.1	16.7	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.049	1.460
NC-03	NB-03	Foundation Soils	18.0	22.0	5.3	0.076	93.780	1.443	1.1	5.4	100	4	12.1	17.5	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.049	1.468
NC-03	NB-03	Foundation Soils	18.1	21.9	5.9	0.064	75.140	1.076	1.1	6.0	100	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.049	1.475
NC-03	NB-03	Foundation Soils	18.2	21.8	6.2	0.071	68.590	1.144	1.1	6.3	100	4	12.2	18.5	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.049	1.476
NC-03	NB-03	Foundation Soils	18.3	21.7	6.3	0.080	54.310	1.264	1.1	6.4	100	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.049	1.474
NC-03	NB-03	Foundation Soils	18.4	21.6	5.6	0.084	42.550	1.496	1.1	5.7	100	4	12.2	17.8	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.049	1.462
NC-03	NB-03	Foundation Soils	18.5	21.6	4.2	0.083	55.510	1.959	1.1	4.3	100	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.049	1.440
NC-03	NB-03	Foundation Soils	18.5	21.5	3.9	0.077	67.420	1.959	1.1	4.0	100	4	12.0	16.0	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.049	1.433
NC-03	NB-03	Foundation Soils	18.6	21.4	4.2	0.067	79.190	1.597	1.1	4.2	100	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.049	1.434
NC-03	NB-03	Foundation Soils	18.7	21.3	4.4	0.047	81.920	1.080	1.1	4.4	100	4	12.1	16.4	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.050	1.434
NC-03	NB-03	Foundation Soils	18.8	21.2	4.4	0.029	92.050	0.660	1.1	4.4	100	4	12.1	16.5	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.050	1.432
NC-03	NB-03	Foundation Soils	18.9	21.2	5.1	0.048	88.520	0.944	1.1	5.1	100	4	12.1	17.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.071	0.050	1.438
NC-03	NB-03	Foundation Soils	18.9	21.1	9.4	0.084	58.460	0.892	1.1	9.4	89	4	12.3	21.8	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.050	1.493
NC-03	NB-03	Foundation Soils	19.0	21.0	11.7	0.164	15.340	1.405	1.1	11.6	89	4	12.5	24.1	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.050	1.521
NC-03	NB-03	Foundation Soils	19.1	20.9	11.6	0.191	2.190	1.653	1.1	11.5	92	4	12.5	24.0	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.050	1.517
NC-03	NB-03	Foundation Soils	19.2	20.8	9.1	0.163	5.530	1.782	1.1	9.1	100	4	12.4	21.5	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.050	1.482
NC-03	NB-03	Foundation Soils	19.3	20.7	8.1	0.160	16.960	1.981	1.1	8.0	100	4	12.3	20.3	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.050	1.465
NC-03	NB-03	Foundation Soils	19.4	20.7	6.9	0.161	28.510	2.334	1.1	6.8	100	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.050	1.447
NC-03	NB-03	Foundation Soils	19.4	20.6	5.8	0.246	45.070	4.226	1.0	5.8	100	4	12.2	17.9	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.050	1.430
NC-03	NB-03	Foundation Soils	19.5	20.5	7.0	0.325	75.090	4.664	1.0	6.9	100	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.050	1.443
NC-03	NB-03	Foundation Soils	19.6	20.4	17.9	0.379	71.630	2.116	1.0	17.6	82	4	12.8	30.5	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.050	1.585
NC-03	NB-03	Foundation Soils	19.7	20.3	25.9	0.580	71.720	2.237	1.0	25.4	72	4	13.2	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.085	0.050	1.692
NC-03	NB-03	Foundation Soils	19.8	20.3	37.6	0.676	-11.820	1.798	1.0	36.7	56	4	13.6	50.3	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.051	1.852
NC-03	NB-03	Foundation Soils	19.8	20.2	49.9	0.870	-14.840	1.744	1.0	48.5	48	4	14.0	62.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.103	0.051	2.031
NC-03	NB-03	Foundation Soils	19.9	20.1	69.0	0.926	-14.480	1.342	1.0	66.9	33	4	13.7	80.6	1.0	-0.3	0.0	0.9	0.116	1.012	0.118	0.051	2.334
NC-03	NB-03	Foundation Soils	20.0	20.0	88.7	1.161	-18.530	1.308	1.0	85.7	26	4	13.2	98.9	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.051	2.737
NC-03	NB-03	Foundation Soils	20.1	19.9	91.1	1.337	-18.530	1.468	1.0	87.8	28	4	13.8	101.7	1.0	-0.4	0.0	0.9	0.140	1.018	0.143	0.051	2.810
NC-03	NB-03	Foundation Soils	20.2	19.8	92.9	1.590	-18.680	1.711	1.0	89.5	31	4	14.6	104.1	1.0	-0.4	0.0	0.9	0.143	1.019	0.146	0.051	2.876
NC-03	NB-03	Foundation Soils	20.3	19.8	92.7	1.793	-18.340	1.933	1.0	89.2	34	4	15.1	104.3	1.0	-0.4	0.0	0.9	0.143	1.019	0.147	0.051	2.878
NC-03	NB-03	Foundation Soils	20.3	19.7	85.2	1.856	-18.770	2.179	1.0	81.9	39	4	15.4	97.2	1.0	-0.4	0.0	0.9	0.134	1.017	0.137	0.051	2.677
NC-03	NB-03	Foundation Soils	20.4	19.6	81.7	1.853	-18.440	2.269	1.0	78.4	41	4	15.4	93.8	1.0	-0.4	0.0	0.9	0.130	1.016	0.132	0.051	2.589
NC-03	NB-03	Foundation Soils	20.5	19.5	86.5	1.743	-18.510	2.014	1.0	83.0	37	4	15.2	98.2	1.0	-0.4	0.0	0.9	0.135	1.017	0.138	0.051	2.693
NC-03	NB-03	Foundation Soils	20.6	19.4	92.4	1.623	-18.530	1.756	1.0	88.5	32	4	14.7	103.2	1.0	-0.4	0.0	0.9	0.142	1.019	0.145	0.051	2.828

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-03	NB-03	Foundation Soils	20.7	19.3	100.3	1.406	-16.900	1.401	1.0	95.9	25	4	13.2	109.2	1.0	-0.4	0.0	0.9	0.151	1.021	0.154	0.051	3.009
NC-03	NB-03	Foundation Soils	20.8	19.3	105.4	1.124	-17.930	1.067	1.0	100.6	17	4	9.7	110.3	1.0	-0.4	0.0	0.9	0.153	1.022	0.156	0.051	3.044
NC-03	NB-03	Foundation Soils	20.8	19.2	104.0	0.998	-19.270	0.960	1.0	99.2	15	4	8.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.051	2.941
NC-03	NB-03	Foundation Soils	20.9	19.1	101.2	1.061	-19.300	1.048	1.0	96.4	18	4	10.1	106.5	1.0	-0.4	0.0	0.9	0.146	1.020	0.150	0.051	2.909
NC-03	NB-03	Foundation Soils	21.0	19.0	95.6	1.133	-18.840	1.185	1.0	91.0	22	4	12.1	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.052	2.801
NC-03	NB-03	Foundation Soils	21.1	18.9	94.0	1.205	-18.200	1.282	1.0	89.4	24	4	12.9	102.2	1.0	-0.4	0.0	0.9	0.140	1.019	0.143	0.052	2.773
NC-03	NB-03	Foundation Soils	21.2	18.9	98.2	1.189	-18.340	1.210	1.0	93.3	22	4	12.1	105.4	1.0	-0.4	0.0	0.9	0.145	1.020	0.148	0.052	2.861
NC-03	NB-03	Foundation Soils	21.2	18.8	102.9	1.017	-18.250	0.988	1.0	97.6	16	4	9.0	106.6	1.0	-0.4	0.0	0.9	0.147	1.020	0.150	0.052	2.895
NC-03	NB-03	Foundation Soils	21.3	18.7	106.8	0.944	-18.550	0.884	1.0	101.2	13	4	6.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.052	2.915
NC-03	NB-03	Foundation Soils	21.4	18.6	106.8	0.961	-18.680	0.900	1.0	101.0	13	4	6.6	107.7	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.052	2.919
NC-03	NB-03	Foundation Soils	21.5	18.5	105.4	1.004	-18.440	0.952	1.0	99.6	15	4	8.0	107.6	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.052	2.914
NC-03	NB-03	Foundation Soils	21.6	18.4	109.4	1.136	-17.960	1.038	1.0	103.3	16	4	8.9	112.2	1.0	-0.4	0.0	0.9	0.156	1.023	0.159	0.052	3.064
NC-03	NB-03	Foundation Soils	21.7	18.4	116.7	1.146	-17.950	0.982	1.0	110.1	13	4	6.5	116.6	1.0	-0.4	0.0	0.9	0.164	1.025	0.168	0.052	3.228
NC-03	NB-03	Foundation Soils	21.7	18.3	118.5	1.091	-18.390	0.921	1.0	111.6	11	4	4.7	116.3	1.0	-0.4	0.0	0.9	0.163	1.024	0.167	0.052	3.213
NC-03	NB-03	Foundation Soils	21.8	18.2	119.6	1.011	-18.380	0.845	1.0	112.5	9	4	2.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.052	3.160
NC-03	NB-03	Foundation Soils	21.9	18.1	121.9	0.933	-18.340	0.766	1.0	114.5	6	4	0.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.052	3.156
NC-03	NB-03	Foundation Soils	22.0	18.0	126.9	0.808	-18.300	0.637	1.0	119.1	1	4	0.0	119.1	1.0	-0.4	0.0	0.9	0.169	1.026	0.173	0.052	3.316
NC-03	NB-03	Foundation Soils	22.1	18.0	138.5	0.562	-18.010	0.406	1.0	129.9	0	4	0.0	129.9	1.0	-0.4	0.0	0.9	0.197	1.032	0.203	0.052	3.880
NC-03	NB-03	Foundation Soils	22.1	17.9	146.4	0.509	-18.320	0.348	1.0	137.2	0	4	0.0	137.2	1.0	-0.4	0.0	0.9	0.223	1.036	0.230	0.052	4.394
NC-03	NB-03	Foundation Soils	22.2	17.8	148.6	0.592	-18.870	0.398	1.0	139.2	0	4	0.0	139.2	1.0	-0.4	0.0	0.9	0.231	1.038	0.239	0.052	4.553
NC-03	NB-03	Foundation Soils	22.3	17.7	142.9	0.649	-19.090	0.454	1.0	133.6	0	4	0.0	133.6	1.0	-0.4	0.0	0.9	0.209	1.034	0.216	0.053	4.109
NC-03	NB-03	Foundation Soils	22.4	17.6	130.9	0.756	-18.720	0.578	1.0	122.2	0	4	0.0	122.2	1.0	-0.4	0.0	0.9	0.176	1.027	0.181	0.053	3.436
NC-03	NB-03	Foundation Soils	22.5	17.5	124.2	0.867	-18.000	0.698	1.0	115.8	4	4	0.0	115.9	1.0	-0.4	0.0	0.9	0.163	1.024	0.166	0.053	3.155
NC-03	NB-03	Foundation Soils	22.6	17.5	114.3	0.943	-16.440	0.825	1.0	106.5	10	4	3.5	110.0	1.0	-0.4	0.0	0.9	0.152	1.022	0.155	0.053	2.937
NC-03	NB-03	Foundation Soils	22.6	17.4	110.8	0.975	-15.210	0.880	1.0	103.1	12	4	5.7	108.8	1.0	-0.4	0.0	0.9	0.150	1.021	0.153	0.053	2.896
NC-03	NB-03	Foundation Soils	22.7	17.3	107.9	0.801	-14.580	0.742	1.0	100.2	9	4	2.9	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.053	2.721
NC-03	NB-03	Foundation Soils	22.8	17.2	102.7	0.822	-14.060	0.800	1.0	95.3	12	4	5.7	101.0	1.0	-0.4	0.0	0.9	0.139	1.018	0.141	0.053	2.660
NC-03	NB-03	Foundation Soils	22.9	17.1	98.3	0.906	-14.250	0.922	1.0	91.0	17	4	9.1	100.1	1.0	-0.4	0.0	0.9	0.137	1.018	0.139	0.053	2.634
NC-03	NB-03	Foundation Soils	23.0	17.1	93.5	0.966	-14.100	1.033	1.0	86.5	21	4	11.1	97.7	1.0	-0.4	0.0	0.9	0.134	1.017	0.136	0.053	2.570
NC-03	NB-03	Foundation Soils	23.0	17.0	90.4	1.015	-8.030	1.123	1.0	83.5	23	4	12.2	95.7	1.0	-0.4	0.0	0.9	0.132	1.016	0.134	0.053	2.519
NC-03	NB-03	Foundation Soils	23.1	16.9	85.4	1.094	-15.680	1.281	1.0	78.8	28	4	13.3	92.1	1.0	-0.4	0.0	0.9	0.128	1.015	0.129	0.053	2.436
NC-03	NB-03	Foundation Soils	23.2	16.8	80.3	1.133	-16.910	1.412	1.0	73.9	32	4	13.8	87.8	1.0	-0.4	0.0	0.9	0.123	1.014	0.124	0.053	2.343
NC-03	NB-03	Foundation Soils	23.3	16.7	77.3	1.183	-16.340	1.530	1.0	71.1	35	4	14.1	85.3	1.0	-0.4	0.0	0.9	0.121	1.013	0.122	0.053	2.292
NC-03	NB-03	Foundation Soils	23.4	16.6	72.5	1.198	-16.830	1.653	1.0	66.5	38	4	14.3	80.9	1.0	-0.4	0.0	0.9	0.117	1.012	0.117	0.053	2.207
NC-03	NB-03	Foundation Soils	23.5	16.6	64.0	1.266	-16.820	1.978	1.0	58.6	46	4	14.5	73.1	1.0	-0.4	0.0	0.9	0.110	1.011	0.110	0.053	2.074
NC-03	NB-03	Foundation Soils	23.5	16.5	61.3	1.308	-17.250	2.133	1.0	56.1	48	4	14.5	70.6	1.0	-0.4	0.0	0.9	0.108	1.010	0.108	0.053	2.032
NC-03	NB-03	Foundation Soils	23.6	16.4	54.2	1.234	-17.200	2.277	1.0	49.5	53	4	14.3	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.053	1.927
NC-03	NB-03	Foundation Soils	23.7	16.3	49.0	1.033	-16.970	2.109	1.0	44.6	54	4	14.0	58.6	1.0	-0.4	0.0	0.9	0.099	1.008	0.099	0.053	1.851
NC-03	NB-03	Foundation Soils	23.8	16.2	42.5	0.938	-16.630	2.205	1.0	38.6	59	4	13.8	52.4	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.053	1.764
NC-03	NB-03	Foundation Soils	23.9	16.1	35.5	0.827	-15.820	2.332	1.0	32.1	65	4	13.5	45.6	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.054	1.673
NC-03	NB-03	Foundation Soils	23.9	16.1	28.3	0.751	-14.580	2.657	1.0	25.5	77	4	13.3	38.8	1.0	-0.4	0.1	0.9	0.085	1.007	0.085	0.054	1.583
NC-03	NB-03	Foundation Soils	24.0	16.0	24.2	0.783	-10.680	3.238	1.0	21.8	86	4	13.1	34.9	1.0	-0.4	0.1	0.9	0.082	1.007	0.082	0.054	1.533
NC-03	NB-03	Foundation Soils	24.1	15.9	24.9	0.769	-6.100	3.083	1.0	22.4	84	4	13.2	35.6	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.054	1.540
NC-03	NB-03	Foundation Soils	24.2	15.8	27.7	0.638	-2.380	2.302	1.0	24.9	75	4	13.2	38.1	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.054	1.570
NC-03	NB-03	Foundation Soils	24.3	15.7	32.3	0.532	0.760	1.645	1.0	29.1	61	4	13.2	42.3	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.054	1.620
NC-03	NB-03	Foundation Soils	24.4	15.7	35.3	0.377	-0.240	1.067	1.0	31.7	50	4	13.0	44.7	1.0	-0.5	0.1	0.9	0.089	1.007	0.089	0.054	1.650
NC-03	NB-03	Foundation Soils	24.4	15.6	34.7	0.297	-0.330	0.855	1.0	31.2	46	4	12.8	43.9	1.0	-0.5	0.1	0.9	0.088	1.007	0.088	0.054	1.638
NC-03	NB-03	Foundation Soils	24.5	15.5	33.6	0.310	1.550	0.921	0.9	30.1	49	4	12.8	43.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.088	0.054	1.624
NC-03	NB-03	Foundation Soils	24.6	15.4	32.5	0.366	6.400	1.127	0.9	29.0	53	4	13.0	42.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.054	1.610
NC-03	NB-03	Foundation Soils	24.7	15.3	29.9	0.437	21.820	1.461	0.9	26.7	61	4	13.1	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.054	1.580
NC-03	NB-03	Foundation Soils	24.8	15.2	26.7	0.409	67.320	1.530	0.9	23.8	65	4	13.0	36.8	1.0	-0.5	0.1	0.9	0.083	1.007	0.083	0.054	1.542
NC-03	NB-03	Foundation Soils	24.9	15.2	33.1	0.424	134.790	1.281	0.9	29.5	55	4	13.1	42.6	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.054	1.612
NC-03	NB-03	Foundation Soils	24.9	15.1	44.2	0.532	67.620	1.204	0.9	39.4	46	4	13.3	52.7	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.054	1.742
PC-01	PB-01 & PB-02	Foundation Soils	11.1	33.4	4.9	0.079	40.120	1.612	1.4	6.5	100	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.045	2.110
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.4	5.1	0.078	42.040	1.517	1.4	6.7	100	21	40.4	47.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.045	2.108
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.3	5.3	0.087	44.450	1.636	1.4	7.0	100	21	40.5	47.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.045	2.104
PC-01	PB-01 & PB-02	Foundation Soils	11.3	33.2	5.2	0.087	44.310	1.661	1.4	6.8	100	21	40.4	47.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.045	2.094
PC-01	PB-01 & PB-02	Foundation Soils	11.4	33.1	5.1	0.097	43.590	1.897	1.4	6.7	100	21	40.4	47.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.045	2.082
PC-01	PB-01 & PB-02	Foundation Soils	11.5	33.0	5.0	0.110	40.690	2.211	1.4	6.5	100	21	40.4	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.045	2.071
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	5.0	0.106	39.070	2.110	1.4	6.5	100	21	40.4	46.9	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.045	2.064
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	5.4	0.101	40.310	1.856	1.4	7.1	100	21	40.5	47.5	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.046	2.067
PC-01	PB-01 & PB-02	Foundation Soils	11.7	32.8	6.1	0.099	44.740	1.613	1.4	7.9	99	21	40.7	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.046	2.077

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	11.8	32.7	6.2	0.092	40.500	1.488	1.4	8.0	97	21	40.6	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.046	2.070
PC-01	PB-01 & PB-02	Foundation Soils	11.9	32.6	5.7	0.087	25.590	1.526	1.4	7.3	100	21	40.5	47.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.046	2.051
PC-01	PB-01 & PB-02	Foundation Soils	12.0	32.5	4.9	0.077	20.260	1.576	1.4	6.3	100	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.046	2.023
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.5	4.4	0.076	17.630	1.712	1.4	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.046	2.004
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.4	4.2	0.080	20.950	1.900	1.4	5.4	100	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.047	1.991
PC-01	PB-01 & PB-02	Foundation Soils	12.2	32.3	4.1	0.084	24.880	2.071	1.4	5.2	100	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.047	1.980
PC-01	PB-01 & PB-02	Foundation Soils	12.3	32.2	4.0	0.085	27.280	2.130	1.4	5.1	100	21	40.0	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.047	1.972
PC-01	PB-01 & PB-02	Foundation Soils	12.4	32.1	3.9	0.092	29.540	2.368	1.4	5.0	100	21	40.0	45.0	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.047	1.963
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	3.7	0.091	28.410	2.468	1.4	4.7	100	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.047	1.951
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	3.7	0.088	29.060	2.384	1.4	4.7	100	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.047	1.945
PC-01	PB-01 & PB-02	Foundation Soils	12.6	31.9	3.6	0.085	29.970	2.343	1.3	4.6	100	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.047	1.937
PC-01	PB-01 & PB-02	Foundation Soils	12.7	31.8	3.6	0.083	31.160	2.284	1.3	4.6	100	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.048	1.931
PC-01	PB-01 & PB-02	Foundation Soils	12.8	31.7	3.6	0.080	30.400	2.235	1.3	4.5	100	21	39.9	44.5	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.048	1.923
PC-01	PB-01 & PB-02	Foundation Soils	12.9	31.6	3.9	0.076	32.880	1.946	1.3	4.9	100	21	40.0	44.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.048	1.925
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.6	4.2	0.073	34.640	1.752	1.3	5.3	100	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.048	1.925
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.5	4.4	0.074	37.140	1.666	1.3	5.6	100	21	40.2	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.048	1.925
PC-01	PB-01 & PB-02	Foundation Soils	13.1	31.4	4.6	0.098	39.210	2.142	1.3	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.048	1.922
PC-01	PB-01 & PB-02	Foundation Soils	13.2	31.3	4.9	0.164	39.160	3.351	1.3	6.1	100	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.048	1.924
PC-01	PB-01 & PB-02	Foundation Soils	13.3	31.2	4.9	0.447	39.160	9.133	1.3	6.1	100	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.049	1.918
PC-01	PB-01 & PB-02	Foundation Soils	13.4	31.1	10.1	0.757	49.220	7.527	1.3	12.4	100	21	41.7	54.1	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.049	2.033
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.1	16.1	0.888	51.500	5.525	1.3	19.5	96	21	43.2	62.7	1.0	-0.2	0.0	1.0	0.102	1.009	0.106	0.049	2.169
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.0	20.9	0.787	25.490	3.759	1.3	25.2	79	21	43.9	69.1	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.049	2.276
PC-01	PB-01 & PB-02	Foundation Soils	13.6	30.9	45.9	0.739	14.630	1.609	1.2	53.4	43	21	46.2	99.5	1.0	-0.2	0.0	1.0	0.137	1.018	0.145	0.049	2.960
PC-01	PB-01 & PB-02	Foundation Soils	13.7	30.8	86.2	0.879	16.250	1.020	1.2	97.6	16	21	29.8	127.4	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.049	4.188
PC-01	PB-01 & PB-02	Foundation Soils	13.8	30.7	102.1	0.973	23.110	0.953	1.2	115.4	10	21	12.9	128.3	1.1	-0.2	0.0	1.0	0.192	1.031	0.209	0.049	4.238
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.7	75.6	1.027	2.100	1.358	1.2	85.3	26	21	43.7	129.0	1.1	-0.2	0.0	1.0	0.194	1.031	0.211	0.049	4.273
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.6	66.8	1.048	-1.760	1.568	1.2	75.7	33	21	46.7	122.4	1.1	-0.2	0.0	1.0	0.177	1.027	0.191	0.050	3.851
PC-01	PB-01 & PB-02	Foundation Soils	14.0	30.5	41.3	1.138	12.420	2.754	1.2	47.8	59	21	47.5	95.3	1.0	-0.2	0.0	1.0	0.131	1.016	0.139	0.050	2.798
PC-01	PB-01 & PB-02	Foundation Soils	14.1	30.4	27.6	1.122	5.340	4.060	1.2	32.4	74	21	45.3	77.8	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.050	2.392
PC-01	PB-01 & PB-02	Foundation Soils	14.2	30.3	22.8	0.952	1.950	4.170	1.3	27.0	80	21	44.4	71.3	1.0	-0.2	0.0	1.0	0.108	1.010	0.113	0.050	2.265
PC-01	PB-01 & PB-02	Foundation Soils	14.3	30.2	16.3	0.758	3.570	4.658	1.3	19.4	92	21	43.1	62.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.105	0.050	2.106
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.2	18.7	0.591	7.330	3.156	1.3	22.2	80	21	43.3	65.5	1.0	-0.2	0.0	1.0	0.104	1.009	0.108	0.050	2.151
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.1	26.7	0.590	18.300	2.210	1.2	31.2	66	21	44.5	75.7	1.0	-0.2	0.0	1.0	0.112	1.011	0.117	0.050	2.328
PC-01	PB-01 & PB-02	Foundation Soils	14.5	30.0	35.0	0.556	20.490	1.589	1.2	40.4	51	21	45.0	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.127	0.050	2.518
PC-01	PB-01 & PB-02	Foundation Soils	14.6	29.9	41.3	0.531	13.880	1.285	1.2	47.4	42	21	44.6	92.1	1.0	-0.2	0.0	1.0	0.128	1.015	0.135	0.051	2.664
PC-01	PB-01 & PB-02	Foundation Soils	14.7	29.8	47.5	0.547	4.880	1.151	1.2	54.1	36	21	44.0	98.1	1.0	-0.2	0.0	1.0	0.135	1.017	0.143	0.051	2.814
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.8	51.4	0.540	1.380	1.050	1.2	58.4	32	21	42.8	101.2	1.0	-0.2	0.0	1.0	0.139	1.018	0.147	0.051	2.896
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.7	52.3	0.550	1.460	1.052	1.2	59.2	31	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.051	2.911
PC-01	PB-01 & PB-02	Foundation Soils	14.9	29.6	52.8	0.564	2.290	1.068	1.2	59.6	31	21	42.9	102.6	1.0	-0.2	0.0	1.0	0.141	1.019	0.149	0.051	2.922
PC-01	PB-01 & PB-02	Foundation Soils	15.0	29.5	53.1	0.574	3.460	1.081	1.2	59.9	32	21	43.0	102.9	1.0	-0.2	0.0	1.0	0.141	1.019	0.150	0.051	2.926
PC-01	PB-01 & PB-02	Foundation Soils	15.1	29.4	52.5	0.551	4.140	1.050	1.2	59.1	31	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.051	2.887
PC-01	PB-01 & PB-02	Foundation Soils	15.2	29.3	49.5	0.551	4.880	1.114	1.2	55.7	34	21	43.6	99.4	1.0	-0.2	0.0	1.0	0.136	1.018	0.144	0.051	2.807
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.3	45.0	0.580	5.180	1.289	1.2	50.8	40	21	44.8	95.6	1.0	-0.2	0.0	1.0	0.132	1.016	0.139	0.051	2.698
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.2	36.7	0.632	5.760	1.723	1.2	41.6	52	21	45.4	87.0	1.0	-0.2	0.0	1.0	0.122	1.014	0.128	0.052	2.489
PC-01	PB-01 & PB-02	Foundation Soils	15.4	29.1	28.7	0.722	6.620	2.519	1.2	32.7	67	21	45.0	77.7	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.052	2.296
PC-01	PB-01 & PB-02	Foundation Soils	15.5	29.0	22.3	0.768	7.450	3.441	1.2	25.6	78	21	44.0	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.052	2.147
PC-01	PB-01 & PB-02	Foundation Soils	15.6	28.9	15.7	0.599	9.050	3.821	1.2	18.1	90	21	42.7	60.9	1.0	-0.2	0.0	1.0	0.100	1.009	0.104	0.052	2.000
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	13.2	0.528	11.710	4.008	1.2	15.3	97	21	42.3	57.5	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.052	1.944
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	11.6	0.498	13.670	4.310	1.2	13.4	100	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.052	1.906
PC-01	PB-01 & PB-02	Foundation Soils	15.8	28.7	20.7	0.324	29.210	1.567	1.2	23.7	67	21	43.0	66.6	1.0	-0.3	0.0	1.0	0.105	1.010	0.108	0.052	2.078
PC-01	PB-01 & PB-02	Foundation Soils	15.9	28.6	59.1	0.261	49.980	0.441	1.2	66.6	12	21	16.2	82.8	1.0	-0.3	0.0	1.0	0.118	1.013	0.124	0.052	2.362
PC-01	PB-01 & PB-02	Foundation Soils	16.0	28.5	79.1	0.237	29.920	0.300	1.2	88.5	0	21	0.0	88.5	1.0	-0.3	0.0	1.0	0.124	1.014	0.130	0.052	2.476
PC-01	PB-01 & PB-02	Foundation Soils	16.1	28.4	80.8	0.273	6.770	0.338	1.2	90.2	0	21	0.0	90.2	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.052	2.507
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.4	78.2	0.410	6.330	0.524	1.2	87.2	7	21	2.5	89.6	1.0	-0.3	0.0	1.0	0.125	1.015	0.131	0.053	2.491
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.3	77.4	0.422	9.010	0.545	1.2	86.1	8	21	4.7	90.8	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.053	2.511
PC-01	PB-01 & PB-02	Foundation Soils	16.3	28.2	76.3	0.498	10.270	0.653	1.2	84.1	12	21	16.2	100.2	1.0	-0.3	0.0	1.0	0.138	1.018	0.145	0.053	2.741
PC-01	PB-01 & PB-02	Foundation Soils	16.4	28.1	75.3	0.621	10.480	0.824	1.2	82.3	17	21	29.3	111.6	1.0	-0.3	0.0	1.0	0.155	1.022	0.164	0.053	3.100
PC-01	PB-01 & PB-02	Foundation Soils	16.5	28.0	73.2	0.657	11.180	0.897	1.2	79.8	19	21	34.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.168	0.053	3.175
PC-01	PB-01 & PB-02	Foundation Soils	16.6	27.9	74.0	0.711	8.910	0.961	1.2	80.3	21	21	36.1	116.4	1.0	-0.3	0.0	1.0	0.164	1.024	0.174	0.053	3.274
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.9	72.5	0.785	8.290	1.082	1.1	78.5	24	21	40.0	118.5	1.0	-0.3	0.0	1.0	0.168	1.025	0.179	0.053	3.359
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.8	69.1	0.826	6.750	1.195	1.1	74.7	27	21	42.8	117.6	1.0	-0.3	0.0	1.0	0.166	1.025	0.176	0.053	3.311
PC-01	PB-01 & PB-02	Foundation Soils	16.8	27.7	58.6	0.890	5.000	1.519	1.2	63.6	37	21	46.3	109.9	1.0	-0.3	0.0	1.0	0.152	1.022	0.160	0.053	3.007

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	16.9	27.6	44.6	0.907	3.720	2.032	1.2	48.8	51	21	46.8	95.6	1.0	-0.3	0.0	1.0	0.132	1.016	0.138	0.053	2.581
PC-01	PB-01 & PB-02	Foundation Soils	17.0	27.5	27.9	0.968	3.750	3.469	1.2	30.9	73	21	44.9	75.8	1.0	-0.3	0.0	1.0	0.112	1.011	0.116	0.054	2.171
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.5	17.7	0.907	6.430	5.124	1.2	19.8	95	21	43.2	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.054	1.959
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.4	11.9	0.782	15.340	6.579	1.2	13.4	100	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.054	1.840
PC-01	PB-01 & PB-02	Foundation Soils	17.2	27.3	11.1	0.656	19.680	5.919	1.2	12.4	100	21	41.7	54.1	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.054	1.821
PC-01	PB-01 & PB-02	Foundation Soils	17.3	27.2	8.9	0.431	23.490	4.828	1.2	10.0	100	21	41.2	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.054	1.776
PC-01	PB-01 & PB-02	Foundation Soils	17.4	27.1	7.3	0.340	35.350	4.657	1.2	8.2	100	21	40.7	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.054	1.741
PC-01	PB-01 & PB-02	Foundation Soils	17.5	27.0	7.0	0.292	95.530	4.150	1.2	7.9	100	21	40.7	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.054	1.733
PC-01	PB-01 & PB-02	Foundation Soils	17.6	27.0	24.0	0.243	115.300	1.010	1.2	26.5	55	21	42.6	69.1	1.0	-0.3	0.0	1.0	0.107	1.010	0.110	0.054	2.030
PC-01	PB-01 & PB-02	Foundation Soils	17.6	26.9	92.7	0.270	88.090	0.291	1.1	99.9	0	21	0.0	99.9	1.0	-0.3	0.0	1.0	0.137	1.018	0.144	0.054	2.645
PC-01	PB-01 & PB-02	Foundation Soils	17.7	26.8	97.0	0.353	34.020	0.364	1.1	104.1	0	21	0.0	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.150	0.054	2.756
PC-01	PB-01 & PB-02	Foundation Soils	17.8	26.7	82.2	0.439	-0.340	0.534	1.1	88.8	7	21	2.0	90.9	1.0	-0.3	0.0	0.9	0.126	1.015	0.132	0.054	2.419
PC-01	PB-01 & PB-02	Foundation Soils	17.9	26.6	61.6	0.583	-2.920	0.946	1.1	65.9	26	21	40.2	106.1	1.0	-0.3	0.0	0.9	0.146	1.020	0.153	0.055	2.807
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.6	43.3	0.711	-2.580	1.642	1.1	46.6	48	21	45.7	92.3	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.055	2.442
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.5	27.3	0.765	-0.330	2.798	1.2	29.7	71	21	44.5	74.2	1.0	-0.3	0.0	0.9	0.111	1.011	0.114	0.055	2.093
PC-01	PB-01 & PB-02	Foundation Soils	18.1	26.4	18.7	0.780	1.810	4.166	1.2	20.5	90	21	43.3	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.055	1.923
PC-01	PB-01 & PB-02	Foundation Soils	18.2	26.3	11.8	0.667	6.790	5.651	1.2	13.0	100	21	41.8	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.098	0.055	1.791
PC-01	PB-01 & PB-02	Foundation Soils	18.3	26.2	10.2	0.558	13.010	5.497	1.2	11.2	100	21	41.4	52.6	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.055	1.757
PC-01	PB-01 & PB-02	Foundation Soils	18.4	26.1	8.8	0.463	15.820	5.244	1.2	9.7	100	21	41.1	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.055	1.730
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.1	6.6	0.375	23.040	5.696	1.2	7.3	100	21	40.5	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.055	1.686
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.0	5.9	0.269	42.830	4.531	1.2	6.5	100	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.055	1.672
PC-01	PB-01 & PB-02	Foundation Soils	18.6	25.9	5.9	0.256	69.320	4.330	1.2	6.5	100	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.055	1.669
PC-01	PB-01 & PB-02	Foundation Soils	18.7	25.8	6.1	0.305	84.240	4.971	1.2	6.7	100	21	40.4	47.1	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.055	1.670
PC-01	PB-01 & PB-02	Foundation Soils	18.8	25.7	13.2	0.312	94.870	2.356	1.2	14.4	89	21	41.9	56.3	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.055	1.790
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	19.2	0.299	71.230	1.554	1.1	20.8	70	21	42.6	63.3	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.056	1.888
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	11.0	0.253	32.120	2.302	1.2	11.9	95	21	41.5	53.4	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.056	1.745
PC-01	PB-01 & PB-02	Foundation Soils	19.0	25.5	7.7	0.237	25.440	3.062	1.2	8.4	100	21	40.8	49.2	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.056	1.686
PC-01	PB-01 & PB-02	Foundation Soils	19.1	25.4	7.5	0.173	39.150	2.296	1.2	8.2	100	21	40.7	48.9	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.056	1.680
PC-01	PB-01 & PB-02	Foundation Soils	19.2	25.3	6.2	0.089	66.420	1.432	1.2	6.8	100	21	40.4	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.056	1.654
PC-01	PB-01 & PB-02	Foundation Soils	19.3	25.2	5.7	0.038	84.530	0.670	1.2	6.2	100	21	40.3	46.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.056	1.642
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.2	5.8	0.033	103.340	0.568	1.1	6.3	98	21	40.3	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.056	1.641
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.1	5.9	0.044	100.290	0.751	1.1	6.3	100	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.056	1.640
PC-01	PB-01 & PB-02	Foundation Soils	19.5	25.0	5.9	0.038	95.150	0.646	1.1	6.4	99	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.056	1.637
PC-01	PB-01 & PB-02	Foundation Soils	19.6	24.9	6.9	0.036	97.350	0.523	1.1	7.4	90	21	40.3	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.056	1.649
PC-01	PB-01 & PB-02	Foundation Soils	19.7	24.8	7.5	0.048	82.570	0.643	1.1	8.0	89	21	40.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.056	1.656
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	8.4	0.058	63.310	0.688	1.1	9.0	86	21	40.6	49.6	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.056	1.669
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	8.3	0.064	66.560	0.770	1.1	8.9	88	21	40.6	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.056	1.665
PC-01	PB-01 & PB-02	Foundation Soils	19.9	24.6	9.9	0.045	86.020	0.454	1.1	10.6	74	21	40.5	51.1	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.056	1.683
PC-01	PB-01 & PB-02	Foundation Soils	20.0	24.5	10.1	0.063	81.080	0.625	1.1	10.8	78	21	40.7	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.057	1.685
PC-01	PB-01 & PB-02	Foundation Soils	20.1	24.4	26.6	0.084	62.560	0.316	1.1	28.0	36	21	38.8	66.9	1.0	-0.4	0.0	0.9	0.105	1.010	0.107	0.057	1.897
PC-01	PB-01 & PB-02	Foundation Soils	20.2	24.3	41.7	0.123	48.980	0.295	1.1	43.8	20	21	29.8	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.057	1.995
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.3	38.7	0.189	7.350	0.488	1.1	40.4	29	21	38.2	78.6	1.0	-0.4	0.0	0.9	0.115	1.012	0.118	0.057	2.076
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.2	29.9	0.250	0.760	0.836	1.1	31.2	46	21	42.3	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.057	1.990
PC-01	PB-01 & PB-02	Foundation Soils	20.4	24.1	19.0	0.338	5.500	1.777	1.1	20.0	74	21	42.5	62.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.057	1.824
PC-01	PB-01 & PB-02	Foundation Soils	20.5	24.0	14.5	0.432	8.290	2.975	1.1	15.3	93	21	42.2	57.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.057	1.751
PC-01	PB-01 & PB-02	Foundation Soils	20.6	23.9	9.6	0.411	14.080	4.269	1.1	10.1	100	21	41.2	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.057	1.668
PC-01	PB-01 & PB-02	Foundation Soils	20.7	23.8	7.7	0.340	17.200	4.423	1.1	8.1	100	21	40.7	48.8	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.057	1.633
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.8	6.3	0.282	21.770	4.508	1.1	6.6	100	21	40.4	47.0	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.057	1.607
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.7	5.0	0.207	29.680	4.119	1.1	5.3	100	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.057	1.585
PC-01	PB-01 & PB-02	Foundation Soils	20.9	23.6	5.0	0.107	46.020	2.124	1.1	5.3	100	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.057	1.583
PC-01	PB-01 & PB-02	Foundation Soils	21.0	23.5	5.4	0.053	64.460	0.987	1.1	5.6	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.057	1.586
PC-01	PB-01 & PB-02	Foundation Soils	21.1	23.4	6.8	0.034	71.180	0.499	1.1	7.1	92	21	40.3	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.057	1.605
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.4	7.8	0.031	62.650	0.398	1.1	8.1	84	21	40.3	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.058	1.616
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.3	8.5	0.038	45.780	0.449	1.1	8.8	82	21	40.4	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.058	1.624
PC-01	PB-01 & PB-02	Foundation Soils	21.3	23.2	9.7	0.040	37.120	0.411	1.1	10.1	75	21	40.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.058	1.639
PC-01	PB-01 & PB-02	Foundation Soils	21.4	23.1	10.8	0.041	31.370	0.380	1.1	11.2	69	21	40.4	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.058	1.649
PC-01	PB-01 & PB-02	Foundation Soils	21.5	23.0	9.0	0.064	26.130	0.708	1.1	9.4	85	21	40.7	50.0	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.058	1.628
PC-01	PB-01 & PB-02	Foundation Soils	21.6	22.9	7.5	0.090	24.950	1.193	1.1	7.8	100	21	40.7	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.058	1.606
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.9	6.0	0.084	28.680	1.391	1.1	6.3	100	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.058	1.580
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.8	6.1	0.070	33.890	1.157	1.1	6.3	100	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.058	1.578
PC-01	PB-01 & PB-02	Foundation Soils	21.8	22.7	7.5	0.066	35.210	0.881	1.1	7.7	96	21	40.6	48.3	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.058	1.598
PC-01	PB-01 & PB-02	Foundation Soils	21.9	22.6	10.5	0.066	33.070	0.627	1.1	10.8	78	21	40.7	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.058	1.637

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	22.0	22.5	13.8	0.070	20.770	0.506	1.1	14.2	64	21	40.7	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.058	1.678
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.5	16.8	0.073	15.480	0.435	1.1	17.2	56	21	40.7	57.8	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.058	1.714
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.4	22.2	0.098	11.290	0.442	1.1	22.6	47	21	40.6	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.058	1.785
PC-01	PB-01 & PB-02	Foundation Soils	22.2	22.3	27.2	0.150	12.240	0.552	1.1	27.6	43	21	41.0	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.058	1.858
PC-01	PB-01 & PB-02	Foundation Soils	22.3	22.2	43.7	0.147	11.200	0.336	1.1	44.2	21	21	31.4	75.7	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.058	1.962
PC-01	PB-01 & PB-02	Foundation Soils	22.4	22.1	46.4	0.093	10.960	0.200	1.1	47.0	13	21	17.2	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.058	1.794
PC-01	PB-01 & PB-02	Foundation Soils	22.5	22.0	41.7	0.110	11.150	0.263	1.1	42.2	20	21	29.2	71.4	1.0	-0.4	0.0	0.9	0.108	1.010	0.111	0.058	1.893
PC-01	PB-01 & PB-02	Foundation Soils	22.6	22.0	37.8	0.198	11.290	0.524	1.1	38.0	32	21	39.4	77.4	1.0	-0.4	0.0	0.9	0.114	1.012	0.116	0.058	1.984
PC-01	PB-01 & PB-02	Foundation Soils	22.6	21.9	43.8	0.227	13.340	0.519	1.1	43.9	28	21	37.7	81.6	1.0	-0.4	0.0	0.9	0.117	1.012	0.120	0.059	2.049
PC-01	PB-01 & PB-02	Foundation Soils	22.7	21.8	53.1	0.210	13.240	0.395	1.1	53.2	17	21	26.9	80.2	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.059	2.024
PC-01	PB-01 & PB-02	Foundation Soils	22.8	21.7	55.3	0.240	9.480	0.434	1.1	55.3	18	21	27.6	82.8	1.0	-0.4	0.0	0.9	0.118	1.013	0.121	0.059	2.066
PC-01	PB-01 & PB-02	Foundation Soils	22.9	21.6	51.0	0.232	8.380	0.455	1.1	51.0	21	21	32.1	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.059	2.068
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	49.7	0.126	9.550	0.254	1.1	49.8	14	21	18.8	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.059	1.841
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	59.6	0.052	15.680	0.087	1.1	59.8	0	21	0.0	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.059	1.719
PC-01	PB-01 & PB-02	Foundation Soils	23.1	21.4	72.7	0.084	11.620	0.116	1.1	72.5	0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.111	0.059	1.894
PC-01	PB-01 & PB-02	Foundation Soils	23.2	21.3	80.8	0.100	10.990	0.124	1.1	80.3	0	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.059	2.013
PC-01	PB-01 & PB-02	Foundation Soils	23.3	21.2	80.9	0.168	10.380	0.208	1.1	80.3	0	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.118	0.059	2.011
PC-01	PB-01 & PB-02	Foundation Soils	23.4	21.1	77.5	0.225	9.910	0.290	1.1	76.9	1	21	0.0	76.9	1.0	-0.4	0.0	0.9	0.113	1.011	0.115	0.059	1.955
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.1	71.0	0.192	9.860	0.270	1.1	70.4	3	21	0.0	70.5	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.059	1.857
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.0	65.6	0.116	10.870	0.177	1.1	65.1	1	21	0.0	65.1	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.059	1.779
PC-01	PB-01 & PB-02	Foundation Soils	23.6	20.9	64.3	0.122	10.960	0.190	1.1	63.7	2	21	0.0	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.059	1.759
PC-01	PB-01 & PB-02	Foundation Soils	23.7	20.8	72.2	0.112	12.440	0.155	1.0	71.3	0	21	0.0	71.3	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.059	1.864
PC-01	PB-01 & PB-02	Foundation Soils	23.8	20.7	85.9	0.130	12.980	0.151	1.0	84.5	0	21	0.0	84.5	1.0	-0.4	0.0	0.9	0.120	1.013	0.122	0.059	2.070
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	107.2	0.148	13.050	0.138	1.0	104.9	0	21	0.0	104.9	1.0	-0.4	0.0	0.9	0.144	1.020	0.148	0.059	2.500
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	116.4	0.161	11.720	0.138	1.0	113.6	0	21	0.0	113.6	1.0	-0.4	0.1	0.9	0.158	1.023	0.163	0.059	2.757
PC-01	PB-01 & PB-02	Foundation Soils	24.0	20.5	122.3	0.178	8.770	0.146	1.0	119.1	0	21	0.0	119.1	1.0	-0.4	0.1	0.9	0.169	1.026	0.175	0.059	2.955
PC-01	PB-01 & PB-02	Foundation Soils	24.1	20.4	127.9	0.200	6.230	0.156	1.0	124.4	0	21	0.0	124.4	1.0	-0.4	0.1	0.9	0.182	1.029	0.188	0.059	3.175
PC-01	PB-01 & PB-02	Foundation Soils	24.2	20.3	129.5	0.226	1.760	0.175	1.0	125.7	0	21	0.0	125.7	1.0	-0.5	0.1	0.9	0.185	1.029	0.192	0.059	3.236
PC-01	PB-01 & PB-02	Foundation Soils	24.3	20.2	127.6	0.237	-2.620	0.186	1.0	123.8	0	21	0.0	123.8	1.0	-0.5	0.1	0.9	0.180	1.028	0.187	0.059	3.142
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.2	119.0	0.205	-6.920	0.172	1.0	115.4	0	21	0.0	115.4	1.0	-0.5	0.1	0.9	0.162	1.024	0.167	0.059	2.804
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.1	110.2	0.156	-5.570	0.142	1.0	106.8	0	21	0.0	106.8	1.0	-0.5	0.1	0.9	0.147	1.020	0.151	0.059	2.536
PC-01	PB-01 & PB-02	Foundation Soils	24.5	20.0	102.2	0.109	-2.720	0.107	1.0	99.0	0	21	0.0	99.0	1.0	-0.5	0.1	0.9	0.136	1.017	0.139	0.060	2.339
PC-01	PB-01 & PB-02	Foundation Soils	24.6	19.9	95.4	0.128	-0.330	0.134	1.0	92.5	0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.060	2.197
PC-01	PB-01 & PB-02	Foundation Soils	24.7	19.8	90.9	0.184	2.490	0.202	1.0	88.1	0	21	0.0	88.1	1.0	-0.5	0.1	0.9	0.124	1.014	0.126	0.060	2.112
PC-01	PB-01 & PB-02	Foundation Soils	24.8	19.7	84.1	0.228	5.860	0.271	1.0	81.4	0	21	0.0	81.4	1.0	-0.5	0.1	0.9	0.117	1.012	0.119	0.060	1.996
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.7	81.6	0.233	9.950	0.286	1.0	78.9	0	21	0.0	78.9	1.0	-0.5	0.1	0.9	0.115	1.012	0.117	0.060	1.953
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.6	82.9	0.187	11.860	0.225	1.0	80.1	0	21	0.0	80.1	1.0	-0.5	0.1	0.9	0.116	1.012	0.118	0.060	1.971
PC-01	PB-01 & PB-02	Foundation Soils	25.0	19.5	89.6	0.204	8.860	0.228	1.0	86.3	0	21	0.0	86.3	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.060	2.074
PC-01	PB-01 & PB-02	Foundation Soils	25.1	19.4	93.7	0.177	7.000	0.189	1.0	90.1	0	21	0.0	90.1	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.060	2.140
PC-01	PB-01 & PB-02	Foundation Soils	25.2	19.3	94.5	0.156	8.390	0.165	1.0	90.7	0	21	0.0	90.7	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.060	2.150
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.3	96.6	0.138	6.380	0.143	1.0	92.7	0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.060	2.186
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.2	100.7	0.125	5.000	0.124	1.0	96.4	0	21	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.135	0.060	2.260
PC-01	PB-01 & PB-02	Foundation Soils	25.4	19.1	102.4	0.115	5.150	0.112	1.0	97.9	0	21	0.0	97.9	1.0	-0.5	0.1	0.9	0.135	1.017	0.137	0.060	2.291
PC-01	PB-01 & PB-02	Foundation Soils	25.5	19.0	108.3	0.104	6.190	0.096	1.0	103.4	0	21	0.0	103.4	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.060	2.418
PC-01	PB-01 & PB-02	Foundation Soils	25.6	18.9	114.7	0.119	7.360	0.104	1.0	109.3	0	21	0.0	109.3	1.0	-0.5	0.1	0.9	0.151	1.021	0.155	0.060	2.575
PC-01	PB-01 & PB-02	Foundation Soils	25.7	18.8	113.3	0.155	8.450	0.137	1.0	107.9	0	21	0.0	107.9	1.0	-0.5	0.1	0.9	0.149	1.021	0.152	0.060	2.532
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.8	108.9	0.135	12.200	0.124	1.0	103.6	0	21	0.0	103.6	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.060	2.416
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.7	106.8	0.106	15.430	0.099	1.0	101.5	0	21	0.0	101.5	1.0	-0.5	0.1	0.9	0.139	1.018	0.142	0.060	2.363
PC-01	PB-01 & PB-02	Foundation Soils	25.9	18.6	105.8	0.112	15.910	0.106	1.0	100.5	0	21	0.0	100.5	1.0	-0.5	0.1	0.9	0.138	1.018	0.141	0.060	2.337
PC-01	PB-01 & PB-02	Foundation Soils	26.0	18.5	104.3	0.136	15.720	0.130	1.0	98.9	0	21	0.0	98.9	1.0	-0.5	0.1	0.9	0.136	1.017	0.138	0.060	2.300
PC-01	PB-01 & PB-02	Foundation Soils	26.1	18.4	101.5	0.118	17.100	0.116	1.0	96.1	0	21	0.0	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.060	2.239
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	96.9	0.085	19.150	0.088	1.0	91.7	0	21	0.0	91.7	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.060	2.147
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	92.3	0.172	21.060	0.186	1.0	87.2	0	21	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.124	0.060	2.064
PC-01	PB-01 & PB-02	Foundation Soils	26.3	18.2	83.3	0.164	16.380	0.197	1.0	78.6	0	21	0.0	78.6	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.060	1.922
PC-01	PB-01 & PB-02	Foundation Soils	26.4	18.1	86.0	0.133	21.920	0.155	1.0	81.0	0	21	0.0	81.0	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.060	1.958
PC-01	PB-01 & PB-02	Foundation Soils	26.5	18.0	84.2	0.133	25.010	0.158	1.0	79.2	0	21	0.0	79.2	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.060	1.929
PC-01	PB-01 & PB-02	Foundation Soils	26.6	17.9	83.1	0.155	25.440	0.187	1.0	78.1	0	21	0.0	78.1	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.060	1.910
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.9	81.0	0.150	35.970	0.185	1.0	76.1	0	21	0.0	76.1	1.0	-0.5	0.1	0.9	0.112	1.011	0.114	0.060	1.878
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.8	82.1	0.129	36.020	0.157	1.0	76.9	0	21	0.0	76.9	1.0	-0.5	0.1	0.9	0.113	1.011	0.114	0.060	1.890
PC-01	PB-01 & PB-02	Foundation Soils	26.8	17.7	82.7	0.100	29.830	0.121	1.0	77.5	0	21	0.0	77.5	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.060	1.897
PC-01	PB-01 & PB-02	Foundation Soils	26.9	17.6	83.6	0.098	26.800	0.117	1.0	78.2	0	21	0.0	78.2	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.061	1.906
PC-01	PB-01 & PB-02	Foundation Soils	27.0	17.5	85.9	0.087	29.040	0.101	1.0	80.2	0	21	0.0	80.2	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.061	1.936

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	93.3	0.036	21.110	0.039	1.0	87.0	0	21	0.0	87.0	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.061	2.046
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	97.0	0.025	16.200	0.026	1.0	90.4	0	21	0.0	90.4	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.061	2.106
PC-01	PB-01 & PB-02	Foundation Soils	27.2	17.3	99.3	0.061	17.680	0.061	1.0	92.5	0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.130	0.061	2.142
PC-01	PB-01 & PB-02	Foundation Soils	27.3	17.2	99.7	0.233	21.540	0.234	1.0	92.7	0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.129	1.015	0.130	0.061	2.146
PC-01	PB-01 & PB-02	Foundation Soils	27.4	17.1	95.9	0.263	36.200	0.274	1.0	89.1	0	21	0.0	89.1	1.0	-0.5	0.1	0.9	0.125	1.014	0.126	0.061	2.076
PC-01	PB-01 & PB-02	Foundation Soils	27.5	17.0	87.5	0.370	40.590	0.423	1.0	81.1	5	21	0.4	81.5	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.061	1.949
PC-01	PB-01 & PB-02	Foundation Soils	27.6	17.0	76.0	0.439	42.830	0.577	1.0	70.5	15	21	23.4	93.9	1.0	-0.5	0.1	0.9	0.130	1.016	0.131	0.061	2.164
PC-01	PB-01 & PB-02	Foundation Soils	27.6	16.9	66.1	0.445	39.640	0.673	1.0	61.2	22	21	34.9	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.134	0.061	2.208
PC-01	PB-01 & PB-02	Foundation Soils	27.7	16.8	54.8	0.435	55.420	0.793	1.0	50.7	31	21	40.8	91.5	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.061	2.115
PC-01	PB-01 & PB-02	Foundation Soils	27.8	16.7	50.1	0.448	42.450	0.894	1.0	46.3	35	21	42.3	88.6	1.0	-0.5	0.1	0.9	0.124	1.014	0.125	0.061	2.061
PC-01	PB-01 & PB-02	Foundation Soils	27.9	16.6	47.2	0.398	45.120	0.843	1.0	43.5	36	21	42.1	85.6	1.0	-0.5	0.1	0.9	0.121	1.013	0.122	0.061	2.008
PC-01	PB-01 & PB-02	Foundation Soils	28.0	16.5	41.0	0.400	89.670	0.976	1.0	37.7	43	21	43.0	80.7	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.061	1.928
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.5	32.6	0.404	119.270	1.238	1.0	30.0	55	21	43.3	73.2	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.061	1.817
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.4	26.7	0.420	150.320	1.574	1.0	24.5	65	21	43.0	67.5	1.0	-0.6	0.1	0.9	0.105	1.010	0.106	0.061	1.737
PC-01	PB-01 & PB-02	Foundation Soils	28.2	16.3	22.6	0.430	244.700	1.906	1.0	20.6	77	21	42.9	63.5	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.061	1.684
PC-01	PB-01 & PB-02	Foundation Soils	28.3	16.2	26.3	0.388	223.410	1.474	1.0	24.1	65	21	42.9	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.061	1.728
PC-01	PB-01 & PB-02	Foundation Soils	28.4	16.1	29.9	0.342	149.050	1.146	1.0	27.3	56	21	42.8	70.1	1.0	-0.6	0.1	0.9	0.107	1.010	0.108	0.061	1.769
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.1	28.8	0.299	110.970	1.038	1.0	26.3	55	21	42.5	68.8	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.061	1.751
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.0	23.6	0.333	146.170	1.411	1.0	21.5	67	21	42.5	64.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.103	0.061	1.687
PC-01	PB-01 & PB-02	Foundation Soils	28.6	15.9	21.5	0.406	204.300	1.884	1.0	19.6	79	21	42.7	62.3	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.061	1.664
PC-01	PB-01 & PB-02	Foundation Soils	28.7	15.8	26.3	0.414	291.590	1.572	1.0	23.9	66	21	43.0	66.9	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.061	1.722
PC-01	PB-01 & PB-02	Foundation Soils	28.8	15.7	39.6	0.384	198.630	0.969	1.0	36.1	44	21	42.9	79.0	1.0	-0.6	0.1	0.9	0.115	1.012	0.116	0.061	1.889
PC-01	PB-01 & PB-02	Foundation Soils	28.9	15.6	64.0	0.358	49.030	0.559	1.0	58.3	20	21	31.9	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.127	0.061	2.073
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.6	81.4	0.299	-17.440	0.367	1.0	73.9	6	21	0.8	74.7	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.061	1.825
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.5	88.9	0.258	-15.530	0.290	1.0	80.6	0	21	0.0	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.061	1.911
PC-01	PB-01 & PB-02	Foundation Soils	29.1	15.4	95.9	0.245	-16.820	0.256	1.0	87.0	0	21	0.0	87.0	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.061	2.013
PC-01	PB-01 & PB-02	Foundation Soils	29.2	15.3	98.6	0.271	-17.050	0.275	1.0	89.4	0	21	0.0	89.4	1.0	-0.6	0.1	0.9	0.125	1.014	0.126	0.061	2.053
PC-01	PB-01 & PB-02	Foundation Soils	29.3	15.2	101.8	0.254	-14.820	0.250	1.0	92.2	0	21	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.129	0.061	2.103
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.2	103.9	0.283	-10.360	0.272	1.0	94.0	0	21	0.0	94.0	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.061	2.137
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.1	103.9	0.439	-11.960	0.423	1.0	93.9	1	21	0.0	93.9	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.061	2.133
PC-01	PB-01 & PB-02	Foundation Soils	29.5	15.0	101.5	0.482	-15.170	0.475	1.0	91.6	3	21	0.0	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.061	2.089
PC-01	PB-01 & PB-02	Foundation Soils	29.6	14.9	92.4	0.560	-4.210	0.606	1.0	83.4	11	21	12.8	96.2	1.0	-0.6	0.1	0.9	0.133	1.016	0.134	0.061	2.176
PC-01	PB-01 & PB-02	Foundation Soils	29.7	14.8	89.4	0.672	-16.150	0.751	1.0	80.8	16	21	27.0	107.8	1.0	-0.6	0.1	0.9	0.149	1.021	0.150	0.061	2.445
PC-01	PB-01 & PB-02	Foundation Soils	29.8	14.7	84.1	0.700	-19.150	0.833	1.0	75.9	20	21	34.0	110.0	1.0	-0.6	0.1	0.9	0.152	1.022	0.154	0.061	2.501
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.7	82.3	0.681	-20.110	0.828	1.0	74.2	20	21	34.6	108.9	1.0	-0.6	0.1	0.9	0.150	1.021	0.152	0.061	2.469
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.6	79.5	0.581	-20.960	0.730	1.0	71.6	19	21	31.9	103.5	1.0	-0.6	0.1	0.9	0.142	1.019	0.143	0.061	2.330
PC-01	PB-01 & PB-02	Foundation Soils	30.0	14.5	73.0	0.556	-21.060	0.762	1.0	65.6	22	21	36.0	101.6	1.0	-0.6	0.1	0.9	0.139	1.018	0.140	0.061	2.286
PC-01	PB-01 & PB-02	Foundation Soils	30.1	14.4	68.1	0.516	-21.440	0.757	1.0	61.1	24	21	37.5	98.7	1.0	-0.6	0.1	0.9	0.136	1.017	0.136	0.061	2.220
PC-01	PB-01 & PB-02	Foundation Soils	30.2	14.3	64.9	0.542	-21.110	0.835	0.9	58.1	28	21	40.1	98.2	1.0	-0.6	0.1	0.9	0.135	1.017	0.136	0.061	2.209
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	60.4	0.800	-20.750	1.326	0.9	54.0	39	21	45.1	99.2	1.0	-0.6	0.1	0.9	0.136	1.017	0.137	0.062	2.228
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	54.7	0.873	-13.820	1.597	0.9	48.8	46	21	45.8	94.7	1.0	-0.6	0.1	0.9	0.131	1.016	0.131	0.062	2.136
PC-01	PB-01 & PB-02	Foundation Soils	30.4	14.1	48.4	0.864	-14.390	1.785	0.9	43.1	52	21	45.7	88.8	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.062	2.027
PC-01	PB-01 & PB-02	Foundation Soils	30.5	14.0	41.6	0.921	-8.960	2.216	0.9	36.9	61	21	45.4	82.3	1.0	-0.6	0.1	0.9	0.118	1.013	0.118	0.062	1.920
PC-01	PB-01 & PB-02	Foundation Soils	30.6	13.9	35.8	0.809	-3.060	2.258	0.9	31.7	65	21	44.6	76.4	1.0	-0.6	0.1	0.9	0.113	1.011	0.113	0.062	1.830
PC-01	PB-01 & PB-02	Foundation Soils	30.7	13.8	39.1	0.790	-0.240	2.022	0.9	34.6	61	21	44.9	79.5	1.0	-0.6	0.1	0.9	0.115	1.012	0.115	0.062	1.874
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.8	43.0	0.682	8.850	1.586	0.9	38.1	53	21	44.7	82.8	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.062	1.925
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.7	50.2	0.578	-8.200	1.151	0.9	44.5	42	21	44.0	88.5	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.062	2.016
PC-01	PB-01 & PB-02	Foundation Soils	30.9	13.6	53.8	0.502	-4.380	0.934	0.9	47.6	35	21	42.6	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.126	0.062	2.045
PC-01	PB-01 & PB-02	Foundation Soils	31.0	13.5	51.9	0.517	-4.910	0.996	0.9	45.9	38	21	43.1	89.1	1.0	-0.6	0.1	0.9	0.125	1.014	0.125	0.062	2.024
PC-01	PB-01 & PB-02	Foundation Soils	31.1	13.4	54.5	0.394	-5.240	0.723	0.9	48.2	30	21	40.2	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.062	2.011
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	54.8	0.411	0.480	0.751	0.9	48.3	31	21	40.5	88.9	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.062	2.019
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	50.8	0.538	11.070	1.059	0.9	44.8	40	21	43.5	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.062	2.008
PC-01	PB-01 & PB-02	Foundation Soils	31.3	13.2	56.9	0.476	-4.290	0.837	0.9	50.2	32	21	41.4	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.062	2.065
PC-01	PB-01 & PB-02	Foundation Soils	31.4	13.1	62.4	0.472	-2.460	0.757	0.9	55.0	27	21	39.3	94.3	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.062	2.115
PC-01	PB-01 & PB-02	Foundation Soils	31.5	13.0	76.3	0.472	1.760	0.619	0.9	67.2	17	21	28.9	96.1	1.0	-0.6	0.1	0.9	0.132	1.016	0.133	0.062	2.149
PC-01	PB-01 & PB-02	Foundation Soils	31.6	12.9	84.7	0.470	2.520	0.555	0.9	74.5	12	21	17.3	91.8	1.0	-0.6	0.1	0.9	0.128	1.015	0.128	0.062	2.066
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.9	77.0	0.500	6.100	0.649	0.9	67.8	18	21	30.2	98.0	1.0	-0.6	0.1	0.9	0.135	1.017	0.135	0.062	2.185
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.8	74.8	0.446	6.080	0.596	0.9	65.7	18	21	28.8	94.4	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.062	2.113
PC-01	PB-01 & PB-02	Foundation Soils	31.8	12.7	71.5	0.383	13.870	0.536	0.9	62.6	17	21	27.4	90.0	1.0	-0.7	0.1	0.9	0.126	1.015	0.126	0.062	2.032
PC-01	PB-01 & PB-02	Foundation Soils	31.9	12.6	66.9	0.323	19.150	0.483	0.9	58.5	17	21	27.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.062	1.963
PC-01	PB-01 & PB-02	Foundation Soils	32.0	12.5	56.7	0.388	19.190	0.685	0.9	49.5	28	21	39.3	88.8	1.0	-0.7	0.1	0.9	0.124	1.014	0.124	0.062	2.009
PC-01	PB-01 & PB-02	Foundation Soils	32.1	12.4	48.9	0.450	22.250	0.921	0.9	42.6	38	21	42.7	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.062	1.949

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.4	39.1	0.470	27.920	1.203	0.9	33.9	50	21	43.5	77.4	1.0	-0.7	0.1	0.9	0.113	1.012	0.113	0.062	1.830
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.3	33.6	0.524	72.900	1.560	0.9	29.1	60	21	43.6	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.062	1.763
PC-01	PB-01 & PB-02	Foundation Soils	32.3	12.2	28.3	0.556	104.150	1.965	0.9	24.4	74	21	43.5	68.0	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.062	1.700
PC-01	PB-01 & PB-02	Foundation Soils	32.4	12.1	28.3	0.472	130.310	1.670	0.9	24.4	67	21	43.1	67.5	1.0	-0.7	0.1	0.9	0.105	1.010	0.105	0.062	1.693
PC-01	PB-01 & PB-02	Foundation Soils	32.5	12.0	31.2	0.321	124.400	1.030	0.9	26.9	54	21	42.6	69.4	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.062	1.718
PC-01	PB-01 & PB-02	Foundation Soils	32.6	12.0	34.0	0.227	113.000	0.669	0.9	29.2	44	21	41.5	70.7	1.0	-0.7	0.1	0.9	0.108	1.010	0.107	0.062	1.734
PC-01	PB-01 & PB-02	Foundation Soils	32.6	11.9	45.5	0.126	37.390	0.277	0.9	39.1	22	21	32.0	71.1	1.0	-0.7	0.1	0.9	0.108	1.010	0.108	0.062	1.739
PC-01	PB-01 & PB-02	Foundation Soils	32.7	11.8	52.6	0.160	26.590	0.304	0.9	45.2	19	21	28.1	73.3	1.0	-0.7	0.1	0.9	0.110	1.011	0.110	0.062	1.767
PC-01	PB-01 & PB-02	Foundation Soils	32.8	11.7	56.4	0.230	35.450	0.408	0.9	48.6	20	21	31.2	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.062	1.859
PC-01	PB-01 & PB-02	Foundation Soils	32.9	11.6	53.7	0.229	25.850	0.426	0.9	46.2	23	21	33.6	79.9	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.062	1.859
PC-01	PB-01 & PB-02	Foundation Soils	33.0	11.5	48.5	0.243	62.400	0.501	0.9	41.7	28	21	37.9	79.5	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.062	1.853
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.5	48.7	0.239	56.130	0.490	0.9	41.8	28	21	37.6	79.4	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.062	1.851
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.4	53.2	0.268	49.790	0.504	0.9	45.6	26	21	36.5	82.1	1.0	-0.7	0.1	0.9	0.118	1.013	0.117	0.062	1.891
PC-01	PB-01 & PB-02	Foundation Soils	33.2	11.3	54.6	0.300	56.690	0.550	0.9	46.9	26	21	37.2	84.1	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.062	1.920
PC-01	PB-01 & PB-02	Foundation Soils	33.3	11.2	59.6	0.347	26.540	0.582	0.9	51.2	25	21	36.4	87.6	1.0	-0.7	0.1	0.9	0.123	1.014	0.123	0.062	1.976
PC-01	PB-01 & PB-02	Foundation Soils	33.4	11.1	60.5	0.328	35.590	0.543	0.9	51.9	23	21	34.9	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.122	0.062	1.961
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	58.3	0.317	50.220	0.544	0.9	49.9	24	21	35.8	85.7	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.062	1.944
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	57.8	0.297	45.710	0.514	0.9	49.4	24	21	35.1	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.062	1.924
PC-01	PB-01 & PB-02	Foundation Soils	33.6	10.9	60.3	0.307	39.400	0.509	0.9	51.6	22	21	33.8	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.120	0.062	1.937
PC-01	PB-01 & PB-02	Foundation Soils	33.7	10.8	64.0	0.301	24.870	0.470	0.9	54.6	19	21	29.9	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.062	1.923
PC-01	PB-01 & PB-02	Foundation Soils	33.8	10.7	62.7	0.317	11.110	0.506	0.9	53.5	21	21	32.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.062	1.945
PC-01	PB-01 & PB-02	Foundation Soils	33.9	10.6	54.9	0.298	26.370	0.542	0.9	46.8	26	21	37.0	83.8	1.0	-0.7	0.1	0.9	0.119	1.013	0.119	0.062	1.911
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.6	48.1	0.398	25.350	0.827	0.9	40.9	38	21	42.1	83.0	1.0	-0.7	0.1	0.9	0.119	1.013	0.118	0.062	1.898
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.5	43.0	0.469	22.870	1.090	0.9	36.5	46	21	43.4	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.062	1.850
PC-01	PB-01 & PB-02	Foundation Soils	34.1	10.4	32.1	0.349	46.910	1.088	0.9	27.0	55	21	42.7	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.062	1.710
PC-01	PB-01 & PB-02	Foundation Soils	34.2	10.3	27.7	0.336	55.600	1.214	0.9	23.2	62	21	42.5	65.7	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.062	1.660
PC-01	PB-01 & PB-02	Foundation Soils	34.3	10.2	35.6	0.345	43.070	0.968	0.9	30.0	50	21	42.6	72.6	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.062	1.748
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	52.0	0.227	22.620	0.437	0.9	43.9	25	21	35.3	79.1	1.0	-0.7	0.1	0.9	0.115	1.012	0.114	0.062	1.837
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	66.6	0.126	4.240	0.189	0.9	55.4	6	21	1.1	56.5	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.062	1.547
PC-01	PB-01 & PB-02	Foundation Soils	34.5	10.0	71.8	0.047	11.340	0.065	0.9	59.8	0	21	0.0	59.8	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.062	1.586
PC-01	PB-01 & PB-02	Foundation Soils	34.6	9.9	76.0	0.079	15.660	0.104	0.9	63.3	0	21	0.0	63.3	1.0	-0.7	0.1	0.9	0.102	1.009	0.101	0.062	1.628
PC-01	PB-01 & PB-02	Foundation Soils	34.7	9.8	77.0	0.153	16.100	0.199	0.9	64.2	2	21	0.0	64.2	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.062	1.637
PC-01	PB-01 & PB-02	Foundation Soils	34.8	9.7	77.6	0.164	18.080	0.211	0.9	64.6	2	21	0.0	64.6	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.062	1.642
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.7	80.6	0.130	17.390	0.161	0.9	67.1	0	21	0.0	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.104	0.062	1.673
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.6	87.1	0.106	17.220	0.122	0.9	72.7	0	21	0.0	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.062	1.745
PC-01	PB-01 & PB-02	Foundation Soils	35.0	9.5	83.7	0.148	17.340	0.177	0.9	69.6	0	21	0.0	69.6	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.062	1.704
PC-01	PB-01 & PB-02	Foundation Soils	35.1	9.4	86.1	0.197	18.530	0.229	0.9	71.7	0	21	0.0	71.7	1.0	-0.7	0.1	0.9	0.109	1.010	0.108	0.062	1.730
PC-01	PB-01 & PB-02	Foundation Soils	35.2	9.3	81.8	0.245	18.200	0.300	0.9	67.8	5	21	0.4	68.2	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.062	1.685
PC-01	PB-01 & PB-02	Foundation Soils	35.3	9.2	76.2	0.183	19.830	0.240	0.9	62.9	4	21	0.1	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.062	1.621
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.2	73.6	0.210	23.350	0.285	0.9	60.8	8	21	4.2	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.062	1.644
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.1	67.1	0.120	23.390	0.179	0.9	55.0	6	21	0.7	55.7	1.0	-0.8	0.1	0.9	0.096	1.008	0.096	0.062	1.534
PC-01	PB-01 & PB-02	Foundation Soils	35.5	9.0	60.7	0.054	24.350	0.089	0.9	49.4	4	21	0.1	49.6	1.0	-0.8	0.1	0.9	0.092	1.008	0.091	0.062	1.464
PC-01	PB-01 & PB-02	Foundation Soils	35.6	8.9	56.3	0.052	24.860	0.092	0.9	45.7	7	21	2.8	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.062	1.453
PC-01	PB-01 & PB-02	Foundation Soils	35.7	8.8	59.4	0.050	22.770	0.084	0.9	48.2	5	21	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.062	1.453
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.8	70.0	0.045	20.300	0.064	0.9	57.1	0	21	0.0	57.1	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.062	1.549
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.7	78.1	0.030	18.910	0.038	0.9	64.1	0	21	0.0	64.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.062	1.631
PC-01	PB-01 & PB-02	Foundation Soils	35.9	8.6	84.6	0.034	22.370	0.040	0.9	69.6	0	21	0.0	69.6	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.062	1.699
PC-01	PB-01 & PB-02	Foundation Soils	36.0	8.5	87.3	0.063	25.730	0.072	0.9	71.8	0	21	0.0	71.8	1.0	-0.8	0.1	0.9	0.109	1.010	0.108	0.062	1.728
PC-01	PB-01 & PB-02	Foundation Soils	36.1	8.4	86.3	0.079	24.030	0.092	0.9	70.9	0	21	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.062	1.715
PC-01	PB-01 & PB-02	Foundation Soils	36.2	8.3	85.1	0.114	24.900	0.134	0.9	69.7	0	21	0.0	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.062	1.700
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.3	79.1	0.136	24.390	0.172	0.9	64.5	0	21	0.0	64.5	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.062	1.634
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.2	77.5	0.175	24.300	0.226	0.9	63.1	4	21	0.0	63.1	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.062	1.618
PC-01	PB-01 & PB-02	Foundation Soils	36.4	8.1	77.4	0.243	21.410	0.314	0.9	63.2	8	21	4.3	67.4	1.0	-0.8	0.1	0.9	0.105	1.010	0.104	0.062	1.670
PC-01	PB-01 & PB-02	Foundation Soils	36.5	8.0	78.3	0.134	21.060	0.171	0.9	63.7	0	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.062	1.623
PC-01	PB-01 & PB-02	Foundation Soils	36.6	7.9	78.2	0.080	26.060	0.102	0.9	63.5	0	21	0.0	63.5	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.062	1.621
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.9	78.6	0.076	17.220	0.097	0.9	63.7	0	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.062	1.623
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.8	79.9	0.056	18.460	0.070	0.9	64.8	0	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.062	1.636
PC-01	PB-01 & PB-02	Foundation Soils	36.8	7.7	80.4	0.063	16.250	0.078	0.9	65.1	0	21	0.0	65.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.062	1.640
PC-01	PB-01 & PB-02	Foundation Soils	36.9	7.6	76.6	0.081	19.770	0.106	0.9	61.8	0	21	0.0	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.062	1.600
PC-01	PB-01 & PB-02	Foundation Soils	37.0	7.5	73.9	0.054	24.010	0.073	0.9	59.5	0	21	0.0	59.5	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.062	1.572
PC-01	PB-01 & PB-02	Foundation Soils	37.1	7.4	78.0	0.061	23.440	0.078	0.9	62.9	0	21	0.0	62.9	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.062	1.612
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.4	89.4	0.159	23.200	0.178	0.9	72.6	0	21	0.0	72.6	1.0	-0.8	0.1	0.9	0.109	1.011	0.108	0.062	1.733

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.3	91.1	0.150	20.440	0.165	0.9	73.9	0	21	0.0	73.9	1.0	-0.8	0.1	0.9	0.110	1.011	0.109	0.062	1.750
PC-01	PB-01 & PB-02	Foundation Soils	37.3	7.2	94.8	0.176	23.850	0.186	0.9	77.0	0	21	0.0	77.0	1.0	-0.8	0.1	0.9	0.113	1.011	0.112	0.062	1.792
PC-01	PB-01 & PB-02	Foundation Soils	37.4	7.1	106.5	0.131	22.680	0.123	0.9	87.0	0	21	0.0	87.0	1.0	-0.8	0.1	0.9	0.123	1.014	0.121	0.062	1.941
PC-01	PB-01 & PB-02	Foundation Soils	37.5	7.0	113.8	0.184	23.060	0.162	0.9	93.3	0	21	0.0	93.3	1.0	-0.8	0.1	0.9	0.129	1.016	0.128	0.062	2.046
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	114.8	0.228	20.490	0.199	0.9	94.0	0	21	0.0	94.0	1.0	-0.8	0.1	0.9	0.130	1.016	0.128	0.062	2.060
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	109.5	0.201	17.480	0.184	0.9	89.4	0	21	0.0	89.4	1.0	-0.8	0.1	0.9	0.125	1.014	0.123	0.062	1.978
PC-01	PB-01 & PB-02	Foundation Soils	37.7	6.8	95.0	0.168	22.580	0.177	0.9	76.7	0	21	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.111	0.062	1.787
PC-01	PB-01 & PB-02	Foundation Soils	37.8	6.7	81.0	0.051	25.200	0.063	0.8	64.8	0	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.062	1.633
PC-01	PB-01 & PB-02	Foundation Soils	37.9	6.6	80.5	0.060	23.820	0.075	0.8	64.3	0	21	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.062	1.626
PC-01	PB-01 & PB-02	Foundation Soils	38.0	6.5	78.5	0.074	25.770	0.094	0.8	62.5	0	21	0.0	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.062	1.604
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.5	72.3	0.078	22.250	0.108	0.8	57.3	0	21	0.0	57.3	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.062	1.543
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.4	68.7	0.085	22.740	0.124	0.8	54.1	3	21	0.0	54.1	1.0	-0.8	0.1	0.9	0.095	1.008	0.094	0.062	1.507
PC-01	PB-01 & PB-02	Foundation Soils	38.2	6.3	67.3	0.059	20.450	0.088	0.8	52.9	2	21	0.0	52.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.093	0.062	1.493
PC-01	PB-01 & PB-02	Foundation Soils	38.3	6.2	66.1	0.046	22.280	0.070	0.8	51.9	2	21	0.0	51.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.062	1.482
PC-01	PB-01 & PB-02	Foundation Soils	38.4	6.1	62.3	0.047	28.210	0.075	0.8	48.6	4	21	0.1	48.7	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.062	1.447
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	58.5	0.031	22.290	0.053	0.8	45.6	6	21	1.2	46.8	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.062	1.425
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	54.9	0.010	24.060	0.018	0.8	43.4	14	21	18.5	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.062	1.595
PC-01	PB-01 & PB-02	Foundation Soils	38.6	5.9	55.4	0.010	23.440	0.018	0.8	43.7	14	21	18.1	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.062	1.594
PC-01	PB-01 & PB-02	Foundation Soils	38.7	5.8	56.3	0.038	27.780	0.068	0.8	43.7	8	21	3.5	47.2	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.062	1.430
PC-01	PB-01 & PB-02	Foundation Soils	38.8	5.7	59.2	0.063	22.760	0.107	0.8	46.0	7	21	3.1	49.1	1.0	-0.9	0.1	0.9	0.092	1.007	0.090	0.062	1.450
PC-01	PB-01 & PB-02	Foundation Soils	38.9	5.6	60.1	0.035	23.060	0.058	0.8	46.5	5	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.062	1.427
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.6	60.1	0.037	24.540	0.062	0.8	46.5	5	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.062	1.427
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.5	64.7	0.027	23.160	0.042	0.8	50.2	3	21	0.0	50.2	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.062	1.462
PC-01	PB-01 & PB-02	Foundation Soils	39.1	5.4	62.5	0.015	24.390	0.024	0.8	48.5	7	21	3.0	51.5	1.0	-0.9	0.1	0.9	0.093	1.008	0.092	0.062	1.476
PC-01	PB-01 & PB-02	Foundation Soils	39.2	5.3	64.8	0.015	25.350	0.023	0.8	50.2	6	21	1.6	51.8	1.0	-0.9	0.1	0.9	0.094	1.008	0.092	0.062	1.479
PC-01	PB-01 & PB-02	Foundation Soils	39.3	5.2	64.5	0.043	25.490	0.067	0.8	49.9	3	21	0.0	49.9	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.062	1.458
PC-01	PB-01 & PB-02	Foundation Soils	39.4	5.1	65.2	0.062	26.010	0.095	0.8	50.3	4	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.062	1.463
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.1	65.3	0.055	27.690	0.084	0.8	50.4	3	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.062	1.463
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.0	67.4	0.064	25.380	0.095	0.8	52.0	3	21	0.0	52.0	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.062	1.481
PC-01	PB-01 & PB-02	Foundation Soils	39.6	4.9	73.9	0.118	29.680	0.160	0.8	57.3	3	21	0.0	57.3	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.062	1.541
PC-01	PB-01 & PB-02	Foundation Soils	39.7	4.8	78.1	0.131	28.680	0.168	0.8	60.8	1	21	0.0	60.8	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.062	1.580
PC-01	PB-01 & PB-02	Foundation Soils	39.8	4.7	77.8	0.068	25.680	0.087	0.8	60.4	0	21	0.0	60.4	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.062	1.576
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.7	76.5	0.050	27.300	0.065	0.8	59.3	0	21	0.0	59.3	1.0	-0.9	0.1	0.8	0.099	1.009	0.097	0.062	1.563
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.6	78.8	0.077	27.400	0.098	0.8	61.1	0	21	0.0	61.1	1.0	-0.9	0.1	0.8	0.100	1.009	0.099	0.062	1.584
PC-01	PB-01 & PB-02	Foundation Soils	40.0	4.5	87.0	0.098	30.350	0.113	0.8	67.9	0	21	0.0	67.9	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.062	1.665
PC-01	PB-01 & PB-02	Foundation Soils	40.1	4.4	85.5	0.131	20.670	0.153	0.8	66.5	0	21	0.0	66.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.062	1.648
PC-01	PB-01 & PB-02	Foundation Soils	40.2	4.3	83.7	0.236	20.110	0.282	0.8	65.0	5	21	0.5	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.062	1.635
PC-01	PB-01 & PB-02	Foundation Soils	40.3	4.2	80.3	0.170	33.460	0.212	0.8	62.0	3	21	0.0	62.1	1.0	-0.9	0.1	0.8	0.101	1.009	0.099	0.062	1.594
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.2	81.1	0.152	27.820	0.187	0.8	62.7	1	21	0.0	62.7	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.062	1.602
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.1	88.4	0.131	28.780	0.148	0.8	68.6	0	21	0.0	68.6	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.062	1.674
PC-01	PB-01 & PB-02	Foundation Soils	40.5	4.0	89.7	0.134	18.820	0.149	0.8	69.6	0	21	0.0	69.6	1.0	-0.9	0.1	0.8	0.107	1.010	0.105	0.062	1.686
PC-01	PB-01 & PB-02	Foundation Soils	40.6	3.9	87.9	0.164	24.530	0.187	0.8	68.1	0	21	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.062	1.667
PC-01	PB-01 & PB-02	Foundation Soils	40.7	3.8	94.2	0.263	27.680	0.279	0.8	73.3	1	21	0.0	73.3	1.0	-0.9	0.1	0.8	0.110	1.011	0.108	0.062	1.732
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	84.9	0.211	21.760	0.248	0.8	65.5	3	21	0.0	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.062	1.635
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	83.5	0.245	23.300	0.294	0.8	64.3	6	21	1.2	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.062	1.635
PC-01	PB-01 & PB-02	Foundation Soils	40.9	3.6	81.9	0.243	26.230	0.297	0.8	63.1	7	21	2.3	65.3	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.062	1.633
PC-01	PB-01 & PB-02	Foundation Soils	41.0	3.5	81.2	0.233	24.010	0.287	0.8	62.4	7	21	2.1	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.062	1.622
PC-01	PB-01 & PB-02	Foundation Soils	41.1	3.4	83.8	0.156	25.150	0.186	0.8	64.3	1	21	0.0	64.3	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.062	1.620
PC-01	PB-01 & PB-02	Foundation Soils	41.2	3.3	95.6	0.124	24.540	0.130	0.8	74.0	0	21	0.0	74.0	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.062	1.741
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.3	106.6	0.146	20.320	0.137	0.8	83.1	0	21	0.0	83.1	1.0	-0.9	0.1	0.8	0.119	1.013	0.116	0.062	1.869
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.2	118.9	0.082	16.390	0.069	0.8	93.5	0	21	0.0	93.5	1.0	-0.9	0.1	0.8	0.129	1.016	0.127	0.062	2.037
PC-01	PB-01 & PB-02	Foundation Soils	41.4	3.1	111.7	0.071	20.770	0.064	0.8	87.3	0	21	0.0	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.120	0.062	1.932
PC-01	PB-01 & PB-02	Foundation Soils	41.5	3.0	96.1	0.086	31.400	0.090	0.8	74.1	0	21	0.0	74.1	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.062	1.742
PC-01	PB-01 & PB-02	Foundation Soils	41.6	2.9	87.2	0.094	30.460	0.108	0.8	66.7	0	21	0.0	66.7	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.062	1.649
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	84.5	0.129	30.250	0.153	0.8	64.4	0	21	0.0	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.062	1.621
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	83.5	0.203	29.160	0.243	0.8	63.5	4	21	0.0	63.5	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.062	1.610
PC-01	PB-01 & PB-02	Foundation Soils	41.8	2.7	76.1	0.158	34.160	0.208	0.8	57.4	5	21	0.5	57.9	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.062	1.545
PC-01	PB-01 & PB-02	Foundation Soils	41.9	2.6	73.6	0.101	33.670	0.137	0.8	55.3	3	21	0.0	55.3	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.062	1.515
PC-01	PB-01 & PB-02	Foundation Soils	42.0	2.5	73.3	0.118	25.490	0.161	0.8	55.0	4	21	0.1	55.1	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.062	1.513
PC-01	PB-01 & PB-02	Foundation Soils	42.1	2.4	72.1	0.121	18.070	0.168	0.8	54.0	5	21	0.3	54.4	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.062	1.505
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.4	69.5	0.105	24.970	0.151	0.8	51.9	5	21	0.6	52.4	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.062	1.483
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.3	67.3	0.113	23.350	0.168	0.8	50.2	7	21	3.2	53.4	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.062	1.494

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	42.3	2.2	65.4	0.087	15.060	0.133	0.8	48.6	7	21	1.7	50.3	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.062	1.460
PC-01	PB-01 & PB-02	Foundation Soils	42.4	2.1	63.4	0.119	17.770	0.188	0.8	47.5	10	21	10.4	58.0	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.062	1.545
PC-01	PB-01 & PB-02	Foundation Soils	42.5	2.0	61.7	0.115	21.200	0.186	0.8	46.3	11	21	12.7	59.0	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.062	1.557
PC-01	PB-01 & PB-02	Foundation Soils	42.6	1.9	63.2	0.085	20.250	0.135	0.8	46.8	8	21	4.1	50.9	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.062	1.467
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.9	69.4	0.069	28.870	0.099	0.8	51.4	3	21	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.062	1.472
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.8	82.5	0.059	-3.630	0.072	0.8	61.9	0	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.062	1.590
PC-01	PB-01 & PB-02	Foundation Soils	42.8	1.7	88.9	0.067	-12.150	0.075	0.8	67.0	0	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.062	1.652
PC-01	PB-01 & PB-02	Foundation Soils	42.9	1.6	88.9	0.071	12.670	0.080	0.8	67.0	0	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.062	1.651
PC-01	PB-01 & PB-02	Foundation Soils	43.0	1.5	82.7	0.054	24.110	0.065	0.8	61.9	0	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.062	1.590
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.5	81.0	0.071	26.040	0.088	0.8	60.4	0	21	0.0	60.4	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.062	1.573
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.4	80.2	0.080	26.350	0.100	0.8	59.7	0	21	0.0	59.7	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.062	1.565
PC-01	PB-01 & PB-02	Foundation Soils	43.2	1.3	84.2	0.083	22.110	0.099	0.8	62.9	0	21	0.0	62.9	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.062	1.602
PC-01	PB-01 & PB-02	Foundation Soils	43.3	1.2	94.9	0.159	22.540	0.168	0.8	71.5	0	21	0.0	71.5	1.0	-1.0	0.1	0.8	0.109	1.010	0.106	0.062	1.708
PC-01	PB-01 & PB-02	Foundation Soils	43.4	1.1	99.7	0.203	20.730	0.204	0.8	75.4	0	21	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.062	1.758
PC-01	PB-01 & PB-02	Foundation Soils	43.5	1.0	101.6	0.278	26.820	0.274	0.8	76.9	0	21	0.0	76.9	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.062	1.777
PC-01	PB-01 & PB-02	Foundation Soils	43.6	1.0	101.0	0.456	31.490	0.452	0.8	76.6	8	21	3.8	80.4	1.0	-1.0	0.1	0.8	0.116	1.012	0.113	0.062	1.827
PC-01	PB-01 & PB-02	Foundation Soils	43.6	0.9	98.3	0.358	25.660	0.364	0.8	74.0	5	21	0.3	74.3	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.062	1.744
PC-01	PB-01 & PB-02	Foundation Soils	43.7	0.8	96.5	0.378	29.880	0.392	0.8	72.6	7	21	2.1	74.7	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.062	1.749
PC-01	PB-01 & PB-02	Foundation Soils	43.8	0.7	87.7	0.456	25.630	0.520	0.8	67.0	14	21	21.9	88.9	1.0	-1.0	0.1	0.8	0.124	1.014	0.121	0.062	1.955
PC-01	PB-01 & PB-02	Foundation Soils	43.9	0.6	82.8	0.362	25.870	0.437	0.8	62.7	13	21	18.8	81.5	1.0	-1.0	0.1	0.8	0.117	1.012	0.114	0.062	1.842
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.6	84.2	0.267	24.500	0.317	0.8	62.6	8	21	4.3	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.102	0.062	1.651
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.5	101.8	0.295	23.200	0.290	0.8	76.5	1	21	0.0	76.5	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.062	1.773
PC-01	PB-01 & PB-02	Foundation Soils	44.1	0.4	114.7	0.382	21.390	0.333	0.8	87.1	0	21	0.0	87.1	1.0	-1.0	0.1	0.8	0.123	1.014	0.119	0.062	1.926
PC-01	PB-01 & PB-02	Foundation Soils	44.2	0.3	127.1	0.226	17.870	0.178	0.8	97.4	0	21	0.0	97.4	1.0	-1.0	0.1	0.8	0.134	1.017	0.130	0.062	2.105
PC-01	PB-01 & PB-02	Foundation Soils	44.3	0.2	143.1	0.109	14.800	0.076	0.8	110.9	0	21	0.0	110.9	1.0	-1.0	0.1	0.8	0.154	1.022	0.149	0.062	2.411
PC-01	PB-01 & PB-02	Foundation Soils	44.4	0.1	163.0	0.128	18.580	0.079	0.8	128.0	0	21	0.0	128.0	0.9	-1.0	0.1	0.8	0.192	1.031	0.187	0.062	3.011
PC-01	PB-01 & PB-02	Foundation Soils	44.5	0.1	181.4	0.133	1.410	0.073	0.8	144.1	0	21	0.0	144.1	0.9	-1.0	0.1	0.8	0.254	1.041	0.247	0.062	3.996
PC-01	PB-01 & PB-02	Foundation Soils	44.5	-0.0	166.9	0.088	17.580	0.053	0.8	131.2	0	21	0.0	131.2	0.9	-1.0	0.1	0.8	0.201	1.032	0.196	0.062	3.163
PC-01	PB-01 & PB-02	Foundation Soils	44.6	-0.1	120.8	0.130	26.960	0.108	0.8	91.7	0	21	0.0	91.7	1.0	-1.0	0.1	0.8	0.127	1.015	0.124	0.062	2.001
PC-01	PB-01 & PB-02	Foundation Soils	44.7	-0.2	105.8	0.152	23.390	0.144	0.8	79.2	0	21	0.0	79.2	1.0	-1.0	0.1	0.8	0.115	1.012	0.112	0.062	1.809
PC-01	PB-01 & PB-02	Foundation Soils	44.8	-0.3	93.1	0.114	16.600	0.122	0.8	68.8	0	21	0.0	68.8	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.062	1.673
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	88.5	0.092	-1.360	0.104	0.8	65.0	0	21	0.0	65.0	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.062	1.627
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	89.1	0.122	-6.630	0.137	0.8	65.4	0	21	0.0	65.4	1.0	-1.0	0.1	0.8	0.104	1.009	0.101	0.062	1.632
PC-01	PB-01 & PB-02	Foundation Soils	45.0	-0.5	88.8	0.112	-0.670	0.126	0.8	65.1	0	21	0.0	65.1	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.062	1.629
PC-01	PB-01 & PB-02	Foundation Soils	45.1	-0.6	86.3	0.153	9.030	0.177	0.8	63.1	0	21	0.0	63.1	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.062	1.605
PC-01	PB-01 & PB-02	Foundation Soils	45.2	-0.7	84.4	0.157	11.520	0.186	0.8	61.5	2	21	0.0	61.5	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.062	1.587
PC-01	PB-01 & PB-02	Foundation Soils	45.3	-0.8	86.1	0.155	13.050	0.180	0.8	62.8	1	21	0.0	62.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.062	1.602
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.8	86.1	0.168	21.250	0.195	0.8	62.7	2	21	0.0	62.7	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.062	1.601
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.9	78.0	0.203	28.460	0.260	0.8	56.7	8	21	4.9	61.6	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.062	1.588
PC-01	PB-01 & PB-02	Foundation Soils	45.5	-1.0	73.2	0.192	12.290	0.262	0.8	53.3	10	21	10.5	63.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.100	0.062	1.614
PC-01	PB-01 & PB-02	Foundation Soils	45.6	-1.1	66.7	0.178	20.080	0.267	0.8	48.8	14	21	18.9	67.6	1.0	-1.1	0.1	0.8	0.105	1.010	0.103	0.062	1.659
PC-01	PB-01 & PB-02	Foundation Soils	45.7	-1.2	59.8	0.238	15.910	0.398	0.8	44.2	23	21	33.4	77.6	1.0	-1.1	0.1	0.8	0.114	1.012	0.110	0.062	1.788
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	55.6	0.553	13.660	0.995	0.8	41.4	41	21	43.1	84.5	1.0	-1.1	0.1	0.8	0.120	1.013	0.117	0.062	1.886
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	49.1	2.187	18.150	4.452	0.8	36.5	85	21	46.6	83.2	1.0	-1.1	0.1	0.8	0.119	1.013	0.115	0.062	1.866
PC-01	PB-01 & PB-02	Foundation Soils	45.9	-1.4	51.8	3.372	14.250	6.507	0.8	38.6	92	21	47.4	86.0	1.0	-1.1	0.1	0.8	0.121	1.014	0.118	0.062	1.908
PC-01	PB-01 & PB-02	Foundation Soils	46.0	-1.5	78.8	3.907	16.420	4.957	0.8	60.2	75	21	51.4	111.7	0.9	-1.1	0.1	0.8	0.155	1.022	0.150	0.062	2.430
PC-01	PB-01 & PB-02	Foundation Soils	46.1	-1.6	137.9	4.454	22.440	3.229	0.8	110.1	44	21	57.9	168.0	0.9	-1.1	0.1	0.8	0.471	1.061	0.458	0.062	7.419
PC-01	PB-01 & PB-02	Foundation Soils	46.2	-1.7	257.6	2.926	69.300	1.136	0.9	211.0	2	21	0.0	211.0	0.9	-1.1	0.1	0.8	3.724	1.082	3.485	0.062	56.439
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.7	252.0	2.349	34.800	0.932	0.9	205.7	0	21	0.0	205.7	0.9	-1.1	0.1	0.8	2.650	1.082	2.503	0.062	40.547
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.8	188.8	1.966	-6.240	1.041	0.8	149.0	8	21	5.5	154.5	0.9	-1.1	0.1	0.8	0.321	1.049	0.312	0.062	5.050
PC-01	PB-01 & PB-02	Foundation Soils	46.4	-1.9	189.3	1.102	-17.800	0.582	0.8	148.6	0	21	0.0	148.6	0.9	-1.1	0.1	0.8	0.280	1.044	0.271	0.062	4.397
PC-01	PB-01 & PB-02	Foundation Soils	46.5	-2.0	145.8	0.768	-19.200	0.527	0.8	110.9	0	21	0.0	110.9	0.9	-1.1	0.1	0.8	0.153	1.022	0.149	0.062	2.408
PC-01	PB-01 & PB-02	Foundation Soils	46.6	-2.1	136.6	0.633	-18.770	0.463	0.8	103.0	0	21	0.0	103.0	1.0	-1.1	0.1	0.8	0.141	1.019	0.137	0.062	2.218
PC-01	PB-01 & PB-02	Foundation Soils	46.7	-2.2	125.6	0.497	-18.580	0.396	0.8	93.7	0	21	0.0	93.7	1.0	-1.1	0.1	0.8	0.130	1.016	0.126	0.062	2.036
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.2	108.3	0.426	-16.160	0.394	0.8	79.4	4	21	0.1	79.5	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.062	1.814
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.3	100.3	0.407	-1.630	0.406	0.8	73.2	7	21	2.5	75.8	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.062	1.763
PC-01	PB-01 & PB-02	Foundation Soils	46.9	-2.4	94.7	0.414	-6.710	0.437	0.8	69.3	10	21	10.0	79.3	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.062	1.812
PC-01	PB-01 & PB-02	Foundation Soils	47.0	-2.5	82.8	0.242	-14.340	0.292	0.8	59.4	8	21	5.0	64.4	1.0	-1.1	0.1	0.8	0.103	1.009	0.100	0.062	1.622
PC-01	PB-01 & PB-02	Foundation Soils	47.1	-2.6	74.6	0.288	-3.150	0.386	0.8	54.5	16	21	23.5	78.0	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.062	1.793
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.6	67.4	0.268	-15.940	0.398	0.8	49.2	19	21	29.6	78.9	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.062	1.806
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.7	51.6	0.175	-18.010	0.339	0.8	37.3	26	21	35.1	72.5	1.0	-1.1	0.1	0.8	0.109	1.011	0.106	0.062	1.721
PC-01	PB-01 & PB-02	Foundation Soils	47.3	-2.8	53.7	0.196	4.160	0.365	0.8	38.9	25	21	35.2	74.1	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.062	1.741

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	47.4	-2.9	44.7	0.199	6.720	0.446	0.8	32.2	34	21	39.2	71.4	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.062	1.707
PC-01	PB-01 & PB-02	Foundation Soils	47.5	-3.0	45.1	0.118	7.720	0.262	0.8	32.4	27	21	35.3	67.7	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.062	1.661
PC-01	PB-01 & PB-02	Foundation Soils	47.6	-3.1	48.2	0.240	19.150	0.498	0.8	34.8	34	21	39.4	74.2	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.062	1.743
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.1	45.7	0.431	22.490	0.943	0.8	33.1	46	21	42.6	75.7	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.062	1.764
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.2	45.7	0.483	25.970	1.058	0.8	33.1	48	21	43.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.062	1.768
PC-01	PB-01 & PB-02	Foundation Soils	47.8	-3.3	53.4	0.412	33.480	0.772	0.8	38.8	38	21	41.7	80.5	1.0	-1.1	0.1	0.8	0.116	1.012	0.113	0.062	1.829
PC-01	PB-01 & PB-02	Foundation Soils	47.9	-3.4	76.3	0.358	32.100	0.469	0.8	55.7	18	21	28.7	84.3	1.0	-1.1	0.1	0.8	0.120	1.013	0.116	0.062	1.885
PC-01	PB-01 & PB-02	Foundation Soils	48.0	-3.5	104.8	0.337	-9.430	0.322	0.8	75.6	2	21	0.0	75.6	1.0	-1.1	0.1	0.8	0.112	1.011	0.108	0.062	1.762
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.5	64.0	0.313	-0.570	0.489	0.8	46.5	24	21	35.4	81.9	1.0	-1.1	0.1	0.8	0.118	1.013	0.114	0.061	1.850
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.6	59.9	0.291	-0.730	0.486	0.8	43.4	26	21	36.7	80.1	1.0	-1.1	0.1	0.8	0.116	1.012	0.112	0.061	1.823
PC-01	PB-01 & PB-02	Foundation Soils	48.2	-3.7	52.5	0.382	7.340	0.728	0.8	38.0	37	21	41.4	79.4	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.061	1.814
PC-01	PB-01 & PB-02	Foundation Soils	48.3	-3.8	44.2	0.350	-0.330	0.791	0.8	31.7	44	21	42.0	73.7	1.0	-1.1	0.1	0.8	0.110	1.011	0.107	0.061	1.738
PC-01	PB-01 & PB-02	Foundation Soils	48.4	-3.9	38.4	0.338	14.770	0.879	0.8	27.4	50	21	42.2	69.6	1.0	-1.1	0.1	0.8	0.107	1.010	0.104	0.061	1.686
PC-01	PB-01 & PB-02	Foundation Soils	48.5	-4.0	36.1	0.089	-3.890	0.247	0.7	25.5	34	21	37.9	63.3	1.0	-1.1	0.1	0.8	0.102	1.009	0.099	0.061	1.611
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.0	52.2	0.156	-4.960	0.299	0.8	37.2	24	21	33.7	70.9	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.061	1.703
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.1	66.4	0.118	-5.060	0.178	0.7	46.3	10	21	10.1	56.4	1.0	-1.1	0.1	0.8	0.097	1.008	0.094	0.061	1.532
PC-01	PB-01 & PB-02	Foundation Soils	48.7	-4.2	94.5	0.081	11.120	0.086	0.8	66.9	0	21	0.0	66.9	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.061	1.653
PC-01	PB-01 & PB-02	Foundation Soils	48.8	-4.3	67.9	0.247	-3.050	0.364	0.8	48.6	18	21	27.9	76.6	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.061	1.776
PC-01	PB-01 & PB-02	Foundation Soils	48.9	-4.4	51.0	0.302	-5.150	0.592	0.8	36.5	35	21	40.2	76.8	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.061	1.779
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	46.0	0.188	3.410	0.409	0.8	32.7	33	21	38.5	71.2	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.061	1.707
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	43.5	0.173	9.220	0.397	0.8	30.8	34	21	38.8	69.6	1.0	-1.2	0.1	0.8	0.107	1.010	0.104	0.061	1.687
PC-01	PB-01 & PB-02	Foundation Soils	49.1	-4.6	50.5	0.130	11.560	0.258	0.7	35.7	24	21	33.0	68.7	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.061	1.676
PC-01	PB-01 & PB-02	Foundation Soils	49.2	-4.7	61.2	0.097	14.910	0.158	0.7	42.5	12	21	15.0	57.5	1.0	-1.2	0.1	0.8	0.098	1.008	0.095	0.061	1.544
PC-01	PB-01 & PB-02	Foundation Soils	49.3	-4.8	40.2	0.096	18.110	0.239	0.7	28.2	31	21	36.7	64.9	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.061	1.630
PC-01	PB-01 & PB-02	Foundation Soils	49.4	-4.9	27.8	0.272	29.060	0.979	0.7	19.4	74	21	42.4	61.8	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.061	1.594
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-4.9	21.7	0.152	29.830	0.700	0.7	15.0	78	21	41.7	56.7	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.061	1.536
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-5.0	18.6	0.084	33.990	0.451	0.7	12.8	78	21	41.2	54.0	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.061	1.506
PC-01	PB-01 & PB-02	Foundation Soils	49.6	-5.1	21.9	0.140	33.450	0.638	0.7	15.1	77	21	41.6	56.8	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.061	1.537
PC-01	PB-01 & PB-02	Foundation Soils	49.7	-5.2	43.4	0.330	35.490	0.760	0.7	30.7	44	21	41.8	72.5	1.0	-1.2	0.1	0.8	0.109	1.011	0.106	0.061	1.724
PC-01	PB-01 & PB-02	Foundation Soils	49.8	-5.3	66.5	0.527	40.450	0.792	0.8	48.1	32	21	41.1	89.2	1.0	-1.2	0.1	0.8	0.125	1.014	0.120	0.061	1.962
PC-01	PB-01 & PB-02	Foundation Soils	49.9	-5.4	80.5	0.664	22.790	0.825	0.8	58.8	27	21	39.9	98.6	0.9	-1.2	0.1	0.8	0.136	1.017	0.130	0.061	2.130
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.4	80.2	0.700	9.910	0.873	0.8	58.5	28	21	40.8	99.3	0.9	-1.2	0.1	0.8	0.136	1.018	0.131	0.061	2.144
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.5	84.9	0.388	-14.150	0.457	0.8	60.7	15	21	22.8	83.5	1.0	-1.2	0.1	0.8	0.119	1.013	0.115	0.061	1.875
PC-01	PB-01 & PB-02	Foundation Soils	50.1	-5.6	90.0	0.269	-18.580	0.299	0.7	62.6	7	21	2.1	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.061	1.629
PC-01	PB-01 & PB-02	Foundation Soils	50.2	-5.7	94.6	0.207	-19.400	0.219	0.7	65.9	1	21	0.0	65.9	1.0	-1.2	0.1	0.8	0.104	1.009	0.101	0.061	1.644
PC-01	PB-01 & PB-02	Foundation Soils	50.3	-5.8	83.3	0.435	-23.200	0.522	0.8	59.8	18	21	28.6	88.5	0.9	-1.2	0.1	0.8	0.124	1.014	0.119	0.061	1.951
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.8	74.8	0.638	-21.960	0.853	0.8	54.2	30	21	41.1	95.3	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.061	2.068
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.9	70.2	0.595	-20.060	0.848	0.8	50.6	32	21	41.5	92.1	0.9	-1.2	0.1	0.8	0.128	1.015	0.123	0.061	2.011
PC-01	PB-01 & PB-02	Foundation Soils	50.5	-6.0	58.3	0.517	-14.980	0.887	0.8	41.6	38	21	42.4	84.0	1.0	-1.2	0.1	0.8	0.120	1.013	0.115	0.061	1.883
PC-01	PB-01 & PB-02	Foundation Soils	50.6	-6.1	57.2	0.280	-11.240	0.490	0.7	40.4	29	21	37.8	78.2	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.061	1.801
PC-01	PB-01 & PB-02	Foundation Soils	50.7	-6.2	56.9	0.161	-9.350	0.283	0.7	39.7	21	21	31.0	70.7	1.0	-1.2	0.1	0.8	0.108	1.010	0.104	0.061	1.703
PC-01	PB-01 & PB-02	Foundation Soils	50.8	-6.3	58.5	0.207	-6.620	0.354	0.7	41.1	23	21	33.4	74.5	1.0	-1.2	0.1	0.8	0.111	1.011	0.107	0.061	1.751
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.3	60.3	0.261	0.630	0.433	0.7	42.5	25	21	35.5	78.0	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.061	1.799
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.4	64.4	0.193	-1.190	0.300	0.7	44.9	18	21	26.9	71.8	1.0	-1.2	0.1	0.8	0.109	1.010	0.105	0.061	1.718
PC-01	PB-01 & PB-02	Foundation Soils	51.0	-6.5	63.5	0.128	-11.920	0.202	0.7	43.6	14	21	18.7	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.061	1.603
PC-01	PB-01 & PB-02	Foundation Soils	51.1	-6.6	42.3	0.151	-17.720	0.357	0.7	29.3	34	21	38.5	67.8	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.061	1.669
PC-01	PB-01 & PB-02	Foundation Soils	51.2	-6.7	35.5	0.203	-14.680	0.572	0.7	24.5	47	21	40.9	65.4	1.0	-1.2	0.1	0.8	0.104	1.009	0.100	0.061	1.640
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.7	32.4	0.252	-2.290	0.779	0.7	22.2	55	21	41.6	63.8	1.0	-1.2	0.1	0.8	0.102	1.009	0.099	0.061	1.622
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.8	29.1	0.148	12.150	0.509	0.7	19.9	51	21	40.7	60.6	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.061	1.584
PC-01	PB-01 & PB-02	Foundation Soils	51.4	-6.9	28.1	0.152	25.060	0.540	0.7	19.2	53	21	40.8	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.096	0.061	1.577
PC-01	PB-01 & PB-02	Foundation Soils	51.5	-7.0	30.9	0.242	30.770	0.784	0.7	21.1	56	21	41.6	62.7	1.0	-1.2	0.1	0.8	0.102	1.009	0.098	0.061	1.608
PC-01	PB-01 & PB-02	Foundation Soils	51.6	-7.1	40.4	0.226	31.260	0.559	0.7	27.9	42	21	40.7	68.6	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.061	1.680
PC-01	PB-01 & PB-02	Foundation Soils	51.7	-7.2	48.8	0.362	17.370	0.741	0.7	34.1	41	21	41.7	75.7	1.0	-1.2	0.1	0.8	0.112	1.011	0.108	0.061	1.770
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.2	62.4	0.289	9.960	0.463	0.7	43.7	25	21	35.8	79.6	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.061	1.822
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.3	72.5	0.112	-3.700	0.155	0.7	48.4	7	21	2.6	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.090	0.061	1.478
PC-01	PB-01 & PB-02	Foundation Soils	51.9	-7.4	60.2	0.088	3.190	0.146	0.7	40.6	13	21	16.6	57.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.061	1.547
PC-01	PB-01 & PB-02	Foundation Soils	52.0	-7.5	57.3	0.330	19.240	0.576	0.7	40.0	32	21	39.4	79.4	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.061	1.821
PC-01	PB-01 & PB-02	Foundation Soils	52.1	-7.6	63.2	0.251	19.250	0.397	0.7	44.0	23	21	33.3	77.3	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.061	1.792
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	70.4	0.260	30.170	0.370	0.7	48.9	18	21	27.9	76.8	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.061	1.786
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	77.3	0.610	28.190	0.789	0.8	55.0	28	21	40.0	95.0	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.061	2.067
PC-01	PB-01 & PB-02	Foundation Soils	52.3	-7.8	95.0	0.893	23.390	0.940	0.8	68.8	26	21	40.2	109.0	0.9	-1.2	0.1	0.8	0.150	1.021	0.144	0.061	2.364
PC-01	PB-01 & PB-02	Foundation Soils	52.4	-7.9	85.1	0.607	4.340	0.713	0.8	60.7	23	21	36.6	97.3	0.9	-1.2	0.1	0.8	0.134	1.017	0.128	0.061	2.110

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	52.5	-8.0	70.3	0.302	14.090	0.430	0.7	49.0	21	21	31.5	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.061	1.837
PC-01	PB-01 & PB-02	Foundation Soils	52.6	-8.1	60.0	0.290	-11.580	0.484	0.7	41.7	27	21	37.2	78.9	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.061	1.815
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.1	68.9	0.311	-1.020	0.451	0.7	48.0	22	21	33.1	81.2	0.9	-1.3	0.1	0.8	0.117	1.012	0.112	0.061	1.847
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.2	71.7	0.266	-7.620	0.371	0.7	49.6	18	21	27.3	76.9	1.0	-1.3	0.1	0.8	0.113	1.011	0.109	0.061	1.788
PC-01	PB-01 & PB-02	Foundation Soils	52.8	-8.3	80.3	0.336	-11.190	0.419	0.7	55.8	16	21	24.7	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.061	1.837
PC-01	PB-01 & PB-02	Foundation Soils	52.9	-8.4	91.9	0.293	2.950	0.319	0.7	62.4	8	21	3.9	66.3	1.0	-1.3	0.1	0.8	0.104	1.010	0.100	0.061	1.655
PC-01	PB-01 & PB-02	Foundation Soils	53.0	-8.5	116.1	0.315	-1.000	0.271	0.7	80.5	0	21	0.0	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.061	1.839
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	140.4	0.234	-0.910	0.167	0.8	100.0	0	21	0.0	100.0	0.9	-1.3	0.1	0.8	0.137	1.018	0.131	0.061	2.163
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	124.7	0.110	-17.610	0.088	0.7	87.2	0	21	0.0	87.2	0.9	-1.3	0.1	0.8	0.123	1.014	0.118	0.061	1.939
PC-01	PB-01 & PB-02	Foundation Soils	53.2	-8.7	93.1	0.105	-21.680	0.113	0.7	62.6	0	21	0.0	62.6	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.061	1.613
PC-01	PB-01 & PB-02	Foundation Soils	53.3	-8.8	88.5	0.173	-22.340	0.195	0.7	59.1	3	21	0.0	59.1	1.0	-1.3	0.1	0.8	0.099	1.009	0.095	0.061	1.572
PC-01	PB-01 & PB-02	Foundation Soils	53.4	-8.9	84.9	0.201	-19.560	0.237	0.7	56.6	7	21	1.8	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.061	1.564
PC-01	PB-01 & PB-02	Foundation Soils	53.5	-9.0	71.5	0.141	-17.940	0.197	0.7	47.5	10	21	9.9	57.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.061	1.554
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.0	60.3	0.480	-14.770	0.796	0.7	41.8	36	21	41.7	83.5	0.9	-1.3	0.1	0.8	0.119	1.013	0.114	0.061	1.883
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.1	61.9	0.223	-10.860	0.360	0.7	42.3	22	21	32.8	75.1	0.9	-1.3	0.1	0.8	0.111	1.011	0.107	0.061	1.767
PC-01	PB-01 & PB-02	Foundation Soils	53.7	-9.2	70.8	0.098	-10.480	0.138	0.7	46.2	8	21	3.5	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.089	0.061	1.469
PC-01	PB-01 & PB-02	Foundation Soils	53.8	-9.3	71.1	0.122	-12.480	0.172	0.7	46.8	9	21	7.2	54.0	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.061	1.516
PC-01	PB-01 & PB-02	Foundation Soils	53.9	-9.4	55.1	0.094	-9.010	0.171	0.7	36.8	18	21	25.9	62.8	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.061	1.616
PC-01	PB-01 & PB-02	Foundation Soils	54.0	-9.5	41.5	0.067	-10.800	0.162	0.7	27.7	27	21	34.6	62.3	1.0	-1.3	0.1	0.8	0.101	1.009	0.097	0.061	1.611
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.5	32.0	0.050	-7.000	0.156	0.7	21.2	36	21	37.7	58.9	1.0	-1.3	0.1	0.8	0.099	1.008	0.095	0.061	1.572
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.6	28.6	0.077	-2.190	0.269	0.7	18.9	45	21	39.5	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.060	1.567
PC-01	PB-01 & PB-02	Foundation Soils	54.2	-9.7	20.7	0.153	13.050	0.738	0.7	13.6	84	21	41.6	55.2	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.060	1.531
PC-01	PB-01 & PB-02	Foundation Soils	54.3	-9.8	20.5	0.320	24.960	1.564	0.7	13.4	97	21	41.8	55.3	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.060	1.532
PC-01	PB-01 & PB-02	Foundation Soils	54.4	-9.9	24.6	0.331	34.880	1.347	0.7	16.2	87	21	42.2	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.060	1.568
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-9.9	39.2	0.253	37.070	0.646	0.7	26.3	46	21	41.3	67.5	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.060	1.674
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-10.0	63.3	0.236	34.190	0.373	0.7	43.0	22	21	32.8	75.9	0.9	-1.3	0.1	0.8	0.112	1.011	0.108	0.060	1.780
PC-01	PB-01 & PB-02	Foundation Soils	54.6	-10.1	87.3	0.251	25.700	0.287	0.7	58.1	8	21	5.3	63.4	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.060	1.626
PC-01	PB-01 & PB-02	Foundation Soils	54.7	-10.2	56.2	0.172	14.340	0.306	0.7	37.9	24	21	33.4	71.2	0.9	-1.3	0.1	0.8	0.108	1.010	0.104	0.060	1.721
PC-01	PB-01 & PB-02	Foundation Soils	54.8	-10.3	45.1	0.124	17.100	0.275	0.7	30.1	30	21	36.6	66.7	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.060	1.666
PC-01	PB-01 & PB-02	Foundation Soils	54.9	-10.4	28.9	0.031	20.620	0.107	0.7	18.9	37	21	37.7	56.6	1.0	-1.3	0.1	0.8	0.097	1.008	0.093	0.060	1.549
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.4	22.5	0.061	23.440	0.271	0.7	14.7	53	21	39.9	54.5	1.0	-1.3	0.1	0.8	0.096	1.008	0.092	0.060	1.526
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.5	17.5	0.218	34.540	1.247	0.7	11.3	100	21	41.4	52.8	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.060	1.506
PC-01	PB-01 & PB-02	Foundation Soils	55.1	-10.6	16.9	0.157	37.590	0.930	0.7	10.9	97	21	41.3	52.2	1.0	-1.3	0.1	0.8	0.094	1.008	0.090	0.060	1.500
PC-01	PB-01 & PB-02	Foundation Soils	55.2	-10.7	19.2	0.068	39.830	0.355	0.7	12.4	78	21	41.1	53.5	1.0	-1.3	0.1	0.8	0.095	1.008	0.091	0.060	1.515
PC-01	PB-01 & PB-02	Foundation Soils	55.3	-10.8	24.2	0.181	41.310	0.749	0.7	15.8	79	21	41.8	57.6	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.060	1.561
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.8	51.2	0.241	39.160	0.471	0.7	34.4	33	21	39.0	73.4	0.9	-1.3	0.1	0.8	0.110	1.011	0.105	0.060	1.750
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.9	49.7	0.203	36.260	0.409	0.7	33.3	32	21	38.3	71.5	0.9	-1.3	0.1	0.8	0.109	1.010	0.104	0.060	1.726
PC-01	PB-01 & PB-02	Foundation Soils	55.5	-11.0	45.8	0.719	25.010	1.571	0.7	30.8	58	21	43.8	74.6	0.9	-1.3	0.1	0.8	0.111	1.011	0.106	0.060	1.766
PC-01	PB-01 & PB-02	Foundation Soils	55.6	-11.1	47.0	0.685	31.870	1.458	0.7	31.6	56	21	43.7	75.4	0.9	-1.3	0.1	0.8	0.112	1.011	0.107	0.060	1.776
PC-01	PB-01 & PB-02	Foundation Soils	55.7	-11.2	51.9	0.702	37.090	1.352	0.7	35.2	51	21	43.9	79.1	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.060	1.826
PC-01	PB-01 & PB-02	Foundation Soils	55.8	-11.3	96.1	0.996	40.550	1.036	0.7	67.9	28	21	42.2	110.1	0.9	-1.3	0.1	0.8	0.152	1.022	0.145	0.060	2.402
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.3	214.9	0.990	40.590	0.461	0.8	160.2	0	21	0.0	160.2	0.9	-1.3	0.1	0.8	0.374	1.054	0.352	0.060	5.849
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.4	258.4	0.789	34.690	0.305	0.8	199.3	0	21	0.0	199.3	0.8	-1.3	0.1	0.8	1.819	1.082	1.655	0.060	27.504
PC-01	PB-01 & PB-02	Foundation Soils	56.0	-11.5	209.6	0.636	-10.490	0.303	0.8	155.5	0	21	0.0	155.5	0.9	-1.4	0.1	0.8	0.329	1.050	0.310	0.060	5.160
PC-01	PB-01 & PB-02	Foundation Soils	56.1	-11.6	164.3	0.553	-6.810	0.337	0.8	116.8	0	21	0.0	116.8	0.9	-1.4	0.1	0.8	0.164	1.025	0.156	0.060	2.595
PC-01	PB-01 & PB-02	Foundation Soils	56.2	-11.7	129.5	0.438	14.960	0.338	0.7	88.6	0	21	0.0	88.6	0.9	-1.4	0.1	0.8	0.124	1.014	0.118	0.060	1.969
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	65.0	0.470	-0.300	0.723	0.7	44.2	33	21	40.7	84.9	0.9	-1.4	0.1	0.8	0.120	1.013	0.115	0.060	1.912
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	57.0	0.132	-0.170	0.232	0.7	37.6	20	21	29.6	67.2	0.9	-1.4	0.1	0.8	0.105	1.010	0.101	0.060	1.676
PC-01	PB-01 & PB-02	Foundation Soils	56.4	-11.9	49.1	0.237	-4.720	0.483	0.7	32.6	35	21	39.5	72.1	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.060	1.737
PC-01	PB-01 & PB-02	Foundation Soils	56.5	-12.0	40.3	0.103	20.870	0.256	0.7	26.4	33	21	37.6	64.0	1.0	-1.4	0.2	0.8	0.103	1.009	0.098	0.060	1.638
PC-01	PB-01 & PB-02	Foundation Soils	56.6	-12.1	39.4	0.150	25.390	0.381	0.7	25.8	39	21	39.5	65.3	0.9	-1.4	0.2	0.8	0.104	1.009	0.099	0.060	1.654
PC-01	PB-01 & PB-02	Foundation Soils	56.7	-12.2	44.8	0.393	36.940	0.878	0.7	29.7	48	21	42.2	71.9	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.060	1.735
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.2	62.2	0.389	34.490	0.626	0.7	41.9	32	21	39.8	81.6	0.9	-1.4	0.2	0.8	0.117	1.012	0.112	0.060	1.866
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.3	75.0	0.451	43.690	0.602	0.7	51.0	25	21	36.9	87.9	0.9	-1.4	0.2	0.8	0.123	1.014	0.118	0.060	1.959
PC-01	PB-01 & PB-02	Foundation Soils	56.9	-12.4	78.5	0.147	38.780	0.187	0.7	50.1	8	21	3.4	53.5	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.060	1.520
PC-01	PB-01 & PB-02	Foundation Soils	57.0	-12.5	74.3	0.106	37.870	0.143	0.7	47.0	7	21	2.5	49.4	1.0	-1.4	0.2	0.8	0.092	1.008	0.088	0.060	1.476
PC-01	PB-01 & PB-02	Foundation Soils	57.1	-12.6	84.4	0.147	41.070	0.174	0.7	53.8	4	21	0.1	54.0	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.060	1.526
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	98.4	0.209	38.100	0.212	0.7	64.0	1	21	0.0	64.0	0.9	-1.4	0.2	0.8	0.103	1.009	0.098	0.060	1.641
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	90.8	0.809	42.640	0.891	0.7	62.9	27	21	40.4	103.3	0.9	-1.4	0.2	0.8	0.142	1.019	0.135	0.060	2.246
PC-01	PB-01 & PB-02	Foundation Soils	57.3	-12.8	83.5	0.655	31.330	0.785	0.7	57.3	27	21	39.4	96.7	0.9	-1.4	0.2	0.8	0.133	1.017	0.127	0.060	2.113
PC-01	PB-01 & PB-02	Foundation Soils	57.4	-12.9	88.9	0.504	36.120	0.567	0.7	60.5	19	21	30.8	91.2	0.9	-1.4	0.2	0.8	0.127	1.015	0.121	0.060	2.016
PC-01	PB-01 & PB-02	Foundation Soils	57.5	-13.0	100.6	0.381	33.640	0.379	0.7	66.3	9	21	5.9	72.2	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.060	1.742

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	57.6	-13.1	162.8	0.242	37.350	0.149	0.7	114.2	0	21	0.0	114.2	0.9	-1.4	0.2	0.8	0.159	1.023	0.151	0.060	2.520
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.1	146.1	0.151	12.390	0.103	0.7	100.5	0	21	0.0	100.5	0.9	-1.4	0.2	0.8	0.138	1.018	0.131	0.060	2.189
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.2	117.6	0.228	9.390	0.194	0.7	78.2	0	21	0.0	78.2	0.9	-1.4	0.2	0.8	0.114	1.012	0.109	0.060	1.821
PC-01	PB-01 & PB-02	Foundation Soils	57.8	-13.3	96.9	0.244	22.070	0.252	0.7	62.5	4	21	0.1	62.6	0.9	-1.4	0.2	0.8	0.101	1.009	0.097	0.060	1.626
PC-01	PB-01 & PB-02	Foundation Soils	57.9	-13.4	102.7	0.366	25.490	0.356	0.7	67.1	7	21	2.6	69.8	0.9	-1.4	0.2	0.8	0.107	1.010	0.102	0.060	1.713
PC-01	PB-01 & PB-02	Foundation Soils	58.0	-13.5	103.7	0.437	33.070	0.421	0.7	68.6	9	21	8.2	76.8	0.9	-1.4	0.2	0.8	0.113	1.011	0.108	0.060	1.804
PC-01	PB-01 & PB-02	Foundation Soils	58.1	-13.6	101.1	0.572	20.540	0.566	0.7	68.6	15	21	24.2	92.8	0.9	-1.4	0.2	0.8	0.129	1.015	0.122	0.060	2.046
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.6	96.7	0.788	22.770	0.815	0.7	66.7	23	21	37.7	104.4	0.9	-1.4	0.2	0.8	0.143	1.019	0.136	0.060	2.273
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.7	82.9	1.156	17.820	1.394	0.7	57.0	39	21	45.7	102.7	0.9	-1.4	0.2	0.8	0.141	1.019	0.134	0.060	2.237
PC-01	PB-01 & PB-02	Foundation Soils	58.3	-13.8	82.1	2.773	28.300	3.379	0.7	56.6	60	21	49.6	106.2	0.9	-1.4	0.2	0.8	0.146	1.020	0.138	0.060	2.316
PC-01	PB-01 & PB-02	Foundation Soils	58.4	-13.9	91.2	1.602	33.110	1.757	0.7	63.3	42	21	47.8	111.1	0.9	-1.4	0.2	0.8	0.154	1.022	0.145	0.060	2.438
PC-01	PB-01 & PB-02	Foundation Soils	58.5	-14.0	83.1	1.846	49.790	2.221	0.7	57.2	50	21	48.3	105.5	0.9	-1.4	0.2	0.8	0.145	1.020	0.137	0.060	2.301
PC-01	PB-01 & PB-02	Foundation Soils	58.6	-14.0	129.6	3.065	33.350	2.365	0.8	93.8	40	21	53.3	147.2	0.9	-1.4	0.2	0.8	0.271	1.043	0.254	0.060	4.259
PC-02	PB-02 & PB-03	Foundation Soils	14.0	30.1	7.1	0.076	33.550	1.067	1.2	7.8	95	21	40.6	48.4	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.044	2.126
PC-02	PB-02 & PB-03	Foundation Soils	14.1	30.1	7.5	0.075	35.070	0.994	1.2	8.3	92	21	40.6	48.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.044	2.127
PC-02	PB-02 & PB-03	Foundation Soils	14.2	30.0	7.7	0.073	37.340	0.953	1.2	8.4	91	21	40.6	49.0	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.044	2.123
PC-02	PB-02 & PB-03	Foundation Soils	14.3	29.9	7.7	0.089	38.160	1.156	1.2	8.4	94	21	40.7	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.044	2.119
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.8	9.2	0.080	46.120	0.869	1.2	10.0	83	21	40.7	50.7	1.0	-0.2	0.0	1.0	0.093	1.008	0.095	0.044	2.141
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.7	10.8	0.101	43.070	0.931	1.1	11.8	79	21	40.9	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.045	2.168
PC-02	PB-02 & PB-03	Foundation Soils	14.5	29.6	12.1	0.116	24.590	0.962	1.1	13.0	75	21	41.1	54.2	1.0	-0.2	0.0	1.0	0.095	1.008	0.098	0.045	2.187
PC-02	PB-02 & PB-03	Foundation Soils	14.6	29.6	12.1	0.091	23.540	0.754	1.1	13.0	72	21	40.9	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.097	0.045	2.177
PC-02	PB-02 & PB-03	Foundation Soils	14.7	29.5	10.6	0.082	14.530	0.773	1.1	11.5	77	21	40.8	52.3	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.045	2.143
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.4	7.9	0.080	7.530	1.014	1.1	8.5	92	21	40.6	49.2	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.045	2.086
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.3	6.7	0.084	10.830	1.252	1.1	7.2	100	21	40.5	47.8	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.045	2.057
PC-02	PB-02 & PB-03	Foundation Soils	14.9	29.2	5.9	0.089	14.340	1.496	1.1	6.4	100	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.045	2.036
PC-02	PB-02 & PB-03	Foundation Soils	15.0	29.2	5.8	0.098	16.940	1.682	1.1	6.3	100	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.045	2.028
PC-02	PB-02 & PB-03	Foundation Soils	15.1	29.1	5.5	0.088	19.770	1.608	1.1	5.9	100	21	40.2	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.091	0.045	2.015
PC-02	PB-02 & PB-03	Foundation Soils	15.2	29.0	5.3	0.085	19.180	1.610	1.1	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.046	2.005
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.9	5.2	0.085	19.680	1.627	1.1	5.6	100	21	40.2	45.8	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.046	1.999
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.8	5.1	0.085	20.750	1.651	1.1	5.5	100	21	40.1	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.046	1.992
PC-02	PB-02 & PB-03	Foundation Soils	15.4	28.7	5.0	0.081	21.870	1.605	1.1	5.4	100	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.046	1.985
PC-02	PB-02 & PB-03	Foundation Soils	15.5	28.7	5.0	0.077	23.040	1.545	1.1	5.3	100	21	40.1	45.4	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.046	1.978
PC-02	PB-02 & PB-03	Foundation Soils	15.6	28.6	4.8	0.077	22.680	1.607	1.1	5.1	100	21	40.1	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.046	1.969
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.5	4.7	0.075	23.120	1.605	1.1	5.0	100	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.046	1.962
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.4	4.5	0.068	23.200	1.496	1.1	4.8	100	21	40.0	44.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.046	1.955
PC-02	PB-02 & PB-03	Foundation Soils	15.8	28.3	4.6	0.064	24.540	1.387	1.1	4.9	100	21	40.0	44.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.046	1.951
PC-02	PB-02 & PB-03	Foundation Soils	15.9	28.3	4.8	0.064	25.060	1.332	1.1	5.1	100	21	40.0	45.1	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.046	1.950
PC-02	PB-02 & PB-03	Foundation Soils	16.0	28.2	4.9	0.069	25.950	1.408	1.1	5.2	100	21	40.1	45.3	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.047	1.947
PC-02	PB-02 & PB-03	Foundation Soils	16.1	28.1	5.2	0.073	28.780	1.399	1.1	5.5	100	21	40.1	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.047	1.949
PC-02	PB-02 & PB-03	Foundation Soils	16.2	28.0	5.5	0.064	29.400	1.169	1.1	5.8	100	21	40.2	46.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.047	1.949
PC-02	PB-02 & PB-03	Foundation Soils	16.2	27.9	6.1	0.071	26.710	1.165	1.1	6.4	100	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.047	1.957
PC-02	PB-02 & PB-03	Foundation Soils	16.3	27.8	6.7	0.075	28.500	1.125	1.1	7.0	100	21	40.5	47.5	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.047	1.964
PC-02	PB-02 & PB-03	Foundation Soils	16.4	27.8	6.9	0.083	28.250	1.197	1.1	7.3	100	21	40.5	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.047	1.964
PC-02	PB-02 & PB-03	Foundation Soils	16.5	27.7	8.6	0.068	15.530	0.793	1.1	9.0	87	21	40.6	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.047	1.987
PC-02	PB-02 & PB-03	Foundation Soils	16.6	27.6	7.8	0.046	15.380	0.587	1.1	8.2	86	21	40.4	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.047	1.968
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.5	7.2	0.041	16.010	0.571	1.1	7.5	90	21	40.4	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.047	1.952
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.4	6.5	0.044	19.960	0.677	1.1	6.8	96	21	40.3	47.1	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.047	1.936
PC-02	PB-02 & PB-03	Foundation Soils	16.8	27.4	6.1	0.052	28.770	0.846	1.1	6.4	100	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.048	1.926
PC-02	PB-02 & PB-03	Foundation Soils	16.9	27.3	5.9	0.046	31.640	0.775	1.1	6.2	100	21	40.3	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.048	1.918
PC-02	PB-02 & PB-03	Foundation Soils	17.0	27.2	5.9	0.044	32.490	0.749	1.1	6.1	100	21	40.3	46.4	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.048	1.912
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.1	5.8	0.049	35.130	0.851	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.048	1.906
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.0	5.8	0.048	34.540	0.834	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.048	1.901
PC-02	PB-02 & PB-03	Foundation Soils	17.2	26.9	5.5	0.045	34.970	0.817	1.1	5.7	100	21	40.2	45.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.048	1.893
PC-02	PB-02 & PB-03	Foundation Soils	17.3	26.9	5.2	0.045	40.740	0.871	1.1	5.3	100	21	40.1	45.4	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.048	1.882
PC-02	PB-02 & PB-03	Foundation Soils	17.4	26.8	4.8	0.047	41.690	0.977	1.1	5.0	100	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.048	1.871
PC-02	PB-02 & PB-03	Foundation Soils	17.5	26.7	5.5	0.049	48.220	0.897	1.1	5.6	100	21	40.2	45.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.048	1.880
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.6	6.4	0.043	46.120	0.671	1.1	6.6	97	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.048	1.892
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.5	6.4	0.042	40.740	0.653	1.1	6.6	97	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.049	1.889
PC-02	PB-02 & PB-03	Foundation Soils	17.7	26.4	5.8	0.047	35.650	0.804	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.049	1.875
PC-02	PB-02 & PB-03	Foundation Soils	17.8	26.4	5.3	0.071	35.640	1.349	1.1	5.4	100	21	40.1	45.5	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.049	1.860
PC-02	PB-02 & PB-03	Foundation Soils	17.9	26.3	5.7	0.092	35.550	1.622	1.1	5.8	100	21	40.2	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.049	1.864
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.2	8.5	0.094	39.500	1.101	1.1	8.7	94	21	40.7	49.4	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.049	1.911

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.1	13.4	0.068	37.190	0.509	1.1	13.6	65	21	40.7	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.049	1.980
PC-02	PB-02 & PB-03	Foundation Soils	18.1	26.0	19.1	0.107	33.690	0.561	1.1	19.3	55	21	41.0	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.049	2.071
PC-02	PB-02 & PB-03	Foundation Soils	18.2	26.0	24.0	0.135	23.670	0.562	1.1	24.3	48	21	41.1	65.3	1.0	-0.3	0.0	0.9	0.104	1.009	0.106	0.049	2.148
PC-02	PB-02 & PB-03	Foundation Soils	18.3	25.9	29.1	0.184	10.290	0.633	1.1	29.2	44	21	41.3	70.6	1.0	-0.3	0.0	0.9	0.108	1.010	0.110	0.049	2.232
PC-02	PB-02 & PB-03	Foundation Soils	18.4	25.8	42.5	0.235	10.120	0.553	1.1	42.6	29	21	38.7	81.3	1.0	-0.3	0.0	0.9	0.117	1.012	0.120	0.049	2.426
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.7	65.2	0.319	10.010	0.489	1.1	65.1	14	21	21.7	86.8	1.0	-0.3	0.0	0.9	0.122	1.014	0.125	0.049	2.536
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.6	79.1	0.411	9.590	0.519	1.1	78.9	10	21	9.0	87.9	1.0	-0.3	0.0	0.9	0.123	1.014	0.126	0.049	2.555
PC-02	PB-02 & PB-03	Foundation Soils	18.6	25.5	91.4	0.485	7.150	0.530	1.1	91.0	6	21	0.9	91.8	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.050	2.640
PC-02	PB-02 & PB-03	Foundation Soils	18.7	25.5	94.0	0.563	5.600	0.599	1.1	93.3	7	21	3.2	96.5	1.0	-0.3	0.0	0.9	0.133	1.017	0.136	0.050	2.750
PC-02	PB-02 & PB-03	Foundation Soils	18.8	25.4	95.3	0.633	5.670	0.664	1.0	94.4	9	21	7.4	101.8	1.0	-0.3	0.0	0.9	0.140	1.018	0.144	0.050	2.892
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.3	94.0	0.651	6.180	0.692	1.0	92.9	10	21	11.2	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.147	0.050	2.957
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.2	91.9	0.653	6.620	0.711	1.0	90.6	11	21	15.0	105.7	1.0	-0.3	0.0	0.9	0.145	1.020	0.150	0.050	3.000
PC-02	PB-02 & PB-03	Foundation Soils	19.0	25.1	88.7	0.653	6.910	0.736	1.0	87.4	13	21	20.2	107.5	1.0	-0.3	0.0	0.9	0.148	1.021	0.153	0.050	3.055
PC-02	PB-02 & PB-03	Foundation Soils	19.1	25.1	85.8	0.643	7.340	0.750	1.0	84.4	14	21	23.7	108.1	1.0	-0.3	0.0	0.9	0.149	1.021	0.153	0.050	3.068
PC-02	PB-02 & PB-03	Foundation Soils	19.2	25.0	84.4	0.614	7.230	0.727	1.0	83.0	14	21	23.3	106.2	1.0	-0.3	0.0	0.9	0.146	1.020	0.150	0.050	3.001
PC-02	PB-02 & PB-03	Foundation Soils	19.3	24.9	81.8	0.594	6.770	0.726	1.0	80.3	15	21	25.3	105.6	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.050	2.976
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.8	80.5	0.586	6.670	0.728	1.0	78.9	16	21	26.5	105.4	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.050	2.965
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.7	75.5	0.563	5.960	0.746	1.0	73.9	18	21	30.9	104.8	1.0	-0.3	0.0	0.9	0.144	1.020	0.148	0.050	2.941
PC-02	PB-02 & PB-03	Foundation Soils	19.5	24.6	69.9	0.498	6.370	0.713	1.0	68.4	20	21	32.6	101.0	1.0	-0.3	0.0	0.9	0.139	1.018	0.142	0.050	2.823
PC-02	PB-02 & PB-03	Foundation Soils	19.6	24.6	66.6	0.491	6.240	0.737	1.0	65.1	22	21	35.2	100.3	1.0	-0.3	0.0	0.9	0.138	1.018	0.141	0.050	2.799
PC-02	PB-02 & PB-03	Foundation Soils	19.7	24.5	65.7	0.464	6.380	0.706	1.0	64.2	21	21	34.5	98.7	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.051	2.751
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.4	65.3	0.438	4.680	0.671	1.0	63.7	20	21	33.4	97.2	1.0	-0.3	0.0	0.9	0.134	1.017	0.137	0.051	2.705
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.3	65.3	0.424	4.000	0.649	1.0	63.6	20	21	32.6	96.2	1.0	-0.3	0.0	0.9	0.133	1.016	0.136	0.051	2.677
PC-02	PB-02 & PB-03	Foundation Soils	19.9	24.2	61.5	0.419	5.040	0.681	1.0	59.8	23	21	35.7	95.5	1.0	-0.3	0.0	0.9	0.132	1.016	0.135	0.051	2.655
PC-02	PB-02 & PB-03	Foundation Soils	20.0	24.2	53.2	0.432	4.050	0.811	1.0	51.8	30	21	40.8	92.6	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.051	2.579
PC-02	PB-02 & PB-03	Foundation Soils	20.1	24.1	44.3	0.464	4.040	1.047	1.0	43.1	41	21	43.4	86.5	1.0	-0.4	0.0	0.9	0.122	1.014	0.124	0.051	2.441
PC-02	PB-02 & PB-03	Foundation Soils	20.2	24.0	39.9	0.530	4.340	1.327	1.0	38.8	48	21	44.2	83.0	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.051	2.368
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.9	31.6	0.595	5.540	1.885	1.0	30.6	62	21	44.2	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.051	2.213
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.8	23.9	0.646	6.530	2.705	1.0	23.2	79	21	43.5	66.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.051	2.075
PC-02	PB-02 & PB-03	Foundation Soils	20.4	23.7	17.0	0.587	4.380	3.458	1.0	16.5	95	21	42.5	59.0	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.051	1.953
PC-02	PB-02 & PB-03	Foundation Soils	20.5	23.7	11.9	0.491	7.340	4.124	1.0	11.6	100	21	41.5	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.051	1.863
PC-02	PB-02 & PB-03	Foundation Soils	20.6	23.6	10.3	0.457	18.910	4.416	1.0	10.0	100	21	41.2	51.2	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.051	1.834
PC-02	PB-02 & PB-03	Foundation Soils	20.7	23.5	17.3	0.457	22.250	2.645	1.0	16.7	89	21	42.4	59.1	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.051	1.946
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.4	26.6	0.417	22.250	1.569	1.0	25.6	64	21	43.2	68.8	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.051	2.093
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.3	25.0	0.315	3.000	1.260	1.0	24.1	61	21	42.7	66.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.052	2.057
PC-02	PB-02 & PB-03	Foundation Soils	20.9	23.2	18.4	0.279	-9.410	1.520	1.0	17.7	76	21	42.2	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.052	1.948
PC-02	PB-02 & PB-03	Foundation Soils	21.0	23.2	27.4	0.268	-2.760	0.978	1.0	26.3	54	21	42.4	68.7	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.052	2.082
PC-02	PB-02 & PB-03	Foundation Soils	21.1	23.1	33.8	0.288	-0.180	0.851	1.0	32.5	45	21	42.3	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.052	2.179
PC-02	PB-02 & PB-03	Foundation Soils	21.2	23.0	16.9	0.351	0.510	2.075	1.0	16.2	85	21	42.2	58.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.052	1.918
PC-02	PB-02 & PB-03	Foundation Soils	21.2	22.9	11.4	0.315	-2.100	2.757	1.0	11.0	100	21	41.4	52.3	1.0	-0.4	0.0	0.9	0.094	1.008	0.095	0.052	1.828
PC-02	PB-02 & PB-03	Foundation Soils	21.3	22.8	8.8	0.256	-0.140	2.909	1.0	8.4	100	21	40.8	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.052	1.782
PC-02	PB-02 & PB-03	Foundation Soils	21.4	22.8	7.4	0.225	3.480	3.061	1.0	7.0	100	21	40.5	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.091	0.052	1.757
PC-02	PB-02 & PB-03	Foundation Soils	21.5	22.7	5.9	0.166	12.070	2.816	1.0	5.6	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.052	1.731
PC-02	PB-02 & PB-03	Foundation Soils	21.6	22.6	5.9	0.123	43.880	2.069	1.0	5.7	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.052	1.729
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.5	6.7	0.050	67.180	0.743	1.0	6.4	100	21	40.3	46.8	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.052	1.739
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.4	10.5	0.035	69.200	0.334	1.0	10.0	75	21	40.4	50.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.052	1.786
PC-02	PB-02 & PB-03	Foundation Soils	21.8	22.3	10.8	0.033	59.370	0.305	1.0	10.3	73	21	40.4	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.052	1.787
PC-02	PB-02 & PB-03	Foundation Soils	21.9	22.3	8.5	0.032	40.400	0.378	1.0	8.0	85	21	40.3	48.4	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.052	1.754
PC-02	PB-02 & PB-03	Foundation Soils	22.0	22.2	6.5	0.037	54.700	0.573	1.0	6.1	100	21	40.3	46.4	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.052	1.725
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.1	6.1	0.059	63.480	0.974	1.0	5.7	100	21	40.2	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.053	1.716
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.0	5.2	0.047	73.330	0.897	1.0	5.0	100	21	40.0	45.0	1.0	-0.4	0.0	0.9	0.089	1.007	0.089	0.053	1.701
PC-02	PB-02 & PB-03	Foundation Soils	22.2	21.9	5.5	0.053	77.660	0.959	1.0	5.2	100	21	40.1	45.3	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.053	1.703
PC-02	PB-02 & PB-03	Foundation Soils	22.3	21.9	6.3	0.037	82.430	0.586	1.0	6.0	100	21	40.2	46.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.053	1.713
PC-02	PB-02 & PB-03	Foundation Soils	22.4	21.8	12.1	0.025	77.760	0.207	1.0	11.4	61	21	39.9	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.053	1.780
PC-02	PB-02 & PB-03	Foundation Soils	22.5	21.7	25.3	0.020	65.940	0.079	1.0	23.8	31	21	35.9	59.7	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.053	1.895
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.6	31.7	0.022	38.970	0.069	1.0	29.8	22	21	30.9	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.053	1.908
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.5	28.7	0.042	21.140	0.146	1.0	26.9	29	21	35.7	62.6	1.0	-0.4	0.0	0.9	0.101	1.009	0.102	0.053	1.932
PC-02	PB-02 & PB-03	Foundation Soils	22.7	21.4	25.9	0.088	20.390	0.340	1.0	24.2	41	21	39.7	63.9	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.053	1.949
PC-02	PB-02 & PB-03	Foundation Soils	22.8	21.4	22.6	0.091	24.010	0.403	1.0	21.1	47	21	40.4	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.053	1.912
PC-02	PB-02 & PB-03	Foundation Soils	22.9	21.3	22.0	0.119	26.540	0.542	1.0	20.5	52	21	41.0	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.053	1.909
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.2	24.0	0.103	22.930	0.430	1.0	22.4	46	21	40.5	62.8	1.0	-0.4	0.0	0.9	0.102	1.009	0.102	0.053	1.926
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.1	28.7	0.065	5.620	0.227	1.0	26.7	33	21	37.6	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.104	0.053	1.945

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-02	PB-02 & PB-03	Foundation Soils	23.1	21.0	33.0	0.075	7.100	0.227	1.0	30.7	28	21	35.8	66.5	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.053	1.977
PC-02	PB-02 & PB-03	Foundation Soils	23.2	21.0	51.7	0.087	8.900	0.168	1.0	48.0	10	21	10.1	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.053	1.852
PC-02	PB-02 & PB-03	Foundation Soils	23.3	20.9	70.9	0.105	10.150	0.148	1.0	65.9	0	21	0.0	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.053	1.962
PC-02	PB-02 & PB-03	Foundation Soils	23.4	20.8	81.0	0.142	9.430	0.175	1.0	75.2	0	21	0.0	75.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.113	0.053	2.105
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.7	86.9	0.145	8.380	0.167	1.0	80.5	0	21	0.0	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.117	0.053	2.194
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.6	89.5	0.161	12.650	0.180	1.0	82.9	0	21	0.0	82.9	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.054	2.234
PC-02	PB-02 & PB-03	Foundation Soils	23.6	20.5	87.6	0.169	10.050	0.193	1.0	81.1	0	21	0.0	81.1	1.0	-0.4	0.0	0.9	0.117	1.012	0.118	0.054	2.198
PC-02	PB-02 & PB-03	Foundation Soils	23.7	20.5	81.3	0.195	13.820	0.240	1.0	75.0	0	21	0.0	75.0	1.0	-0.4	0.0	0.9	0.111	1.011	0.112	0.054	2.093
PC-02	PB-02 & PB-03	Foundation Soils	23.8	20.4	78.6	0.170	14.390	0.216	1.0	72.5	0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.110	0.054	2.050
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.3	86.1	0.186	17.260	0.216	1.0	79.3	0	21	0.0	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.116	0.054	2.160
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.2	103.6	0.142	8.670	0.137	1.0	95.5	0	21	0.0	95.5	1.0	-0.4	0.1	0.9	0.132	1.016	0.133	0.054	2.476
PC-02	PB-02 & PB-03	Foundation Soils	24.0	20.1	117.4	0.118	5.380	0.101	1.0	108.2	0	21	0.0	108.2	1.0	-0.4	0.1	0.9	0.149	1.021	0.151	0.054	2.812
PC-02	PB-02 & PB-03	Foundation Soils	24.1	20.1	127.1	0.156	-3.420	0.123	1.0	117.2	0	21	0.0	117.2	1.0	-0.4	0.1	0.9	0.165	1.025	0.168	0.054	3.124
PC-02	PB-02 & PB-03	Foundation Soils	24.2	20.0	135.1	0.189	-3.760	0.140	1.0	124.5	0	21	0.0	124.5	1.0	-0.5	0.1	0.9	0.182	1.029	0.186	0.054	3.447
PC-02	PB-02 & PB-03	Foundation Soils	24.3	19.9	146.4	0.192	-3.760	0.131	1.0	135.0	0	21	0.0	135.0	1.0	-0.5	0.1	0.9	0.214	1.035	0.220	0.054	4.072
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.8	163.4	0.182	-3.650	0.111	1.0	150.7	0	21	0.0	150.7	1.0	-0.5	0.1	0.9	0.293	1.046	0.304	0.054	5.621
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.7	174.4	0.140	-4.190	0.080	1.0	160.8	0	21	0.0	160.8	1.0	-0.5	0.1	0.9	0.379	1.055	0.396	0.054	7.322
PC-02	PB-02 & PB-03	Foundation Soils	24.5	19.6	176.6	0.133	-5.670	0.075	1.0	162.7	0	21	0.0	162.7	1.0	-0.5	0.1	0.9	0.401	1.056	0.419	0.054	7.741
PC-02	PB-02 & PB-03	Foundation Soils	24.6	19.6	173.1	0.150	-6.720	0.087	1.0	159.3	0	21	0.0	159.3	1.0	-0.5	0.1	0.9	0.365	1.053	0.380	0.054	7.009
PC-02	PB-02 & PB-03	Foundation Soils	24.7	19.5	168.6	0.191	-7.250	0.113	1.0	155.0	0	21	0.0	155.0	1.0	-0.5	0.1	0.9	0.325	1.049	0.337	0.054	6.222
PC-02	PB-02 & PB-03	Foundation Soils	24.8	19.4	159.7	0.195	-7.770	0.122	1.0	146.5	0	21	0.0	146.5	1.0	-0.5	0.1	0.9	0.267	1.043	0.275	0.054	5.076
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.3	155.2	0.216	-7.290	0.139	1.0	142.2	0	21	0.0	142.2	1.0	-0.5	0.1	0.9	0.244	1.040	0.251	0.054	4.630
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.2	147.9	0.246	-7.480	0.166	1.0	135.2	0	21	0.0	135.2	1.0	-0.5	0.1	0.9	0.215	1.035	0.220	0.054	4.053
PC-03	PB-03 & PB-04	Foundation Soils	10.0	34.4	49.2	0.414	-7.290	0.842	1.3	61.4	26	25	41.6	103.0	1.1	-0.1	0.0	1.0	0.141	1.019	0.153	0.045	3.436
PC-03	PB-03 & PB-04	Foundation Soils	10.1	34.3	53.0	0.470	-1.810	0.886	1.3	65.8	25	25	41.2	107.0	1.1	-0.1	0.0	1.0	0.147	1.020	0.160	0.045	3.575
PC-03	PB-03 & PB-04	Foundation Soils	10.2	34.2	56.9	0.502	1.290	0.882	1.3	70.3	22	25	39.5	109.8	1.1	-0.1	0.0	1.0	0.152	1.022	0.165	0.045	3.674
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	59.9	0.563	1.480	0.941	1.3	73.4	22	25	40.0	113.4	1.1	-0.1	0.0	1.0	0.158	1.023	0.172	0.045	3.824
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	60.6	0.637	1.950	1.052	1.3	73.9	25	25	42.6	116.5	1.1	-0.1	0.0	1.0	0.164	1.025	0.179	0.045	3.963
PC-03	PB-03 & PB-04	Foundation Soils	10.4	34.0	61.7	0.674	3.830	1.092	1.3	75.0	25	25	43.2	118.2	1.1	-0.1	0.0	1.0	0.167	1.025	0.183	0.045	4.037
PC-03	PB-03 & PB-04	Foundation Soils	10.5	33.9	62.2	0.701	5.430	1.127	1.3	75.4	25	25	43.8	119.2	1.1	-0.1	0.0	1.0	0.170	1.026	0.186	0.046	4.076
PC-03	PB-03 & PB-04	Foundation Soils	10.6	33.8	61.7	0.712	6.340	1.153	1.3	74.7	26	25	44.5	119.2	1.1	-0.1	0.0	1.0	0.169	1.026	0.185	0.046	4.056
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	63.3	0.748	9.100	1.181	1.3	76.4	26	25	44.7	121.0	1.1	-0.1	0.0	1.0	0.174	1.027	0.190	0.046	4.144
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	67.0	0.779	9.300	1.162	1.3	80.4	24	25	43.4	123.8	1.1	-0.2	0.0	1.0	0.180	1.028	0.198	0.046	4.299
PC-03	PB-03 & PB-04	Foundation Soils	10.8	33.6	71.6	0.803	8.340	1.122	1.3	85.5	22	25	40.9	126.4	1.1	-0.2	0.0	1.0	0.187	1.030	0.206	0.046	4.454
PC-03	PB-03 & PB-04	Foundation Soils	10.9	33.5	75.9	0.828	8.340	1.091	1.3	90.3	20	25	38.1	128.4	1.1	-0.2	0.0	1.0	0.193	1.031	0.212	0.046	4.579
PC-03	PB-03 & PB-04	Foundation Soils	11.0	33.4	83.0	0.881	8.100	1.061	1.3	98.4	17	25	32.7	131.1	1.1	-0.2	0.0	1.0	0.201	1.032	0.222	0.047	4.773
PC-03	PB-03 & PB-04	Foundation Soils	11.1	33.3	93.4	0.956	7.880	1.024	1.3	110.3	13	25	22.5	132.8	1.1	-0.2	0.0	1.0	0.206	1.033	0.229	0.047	4.893
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	99.1	1.103	7.910	1.113	1.2	116.0	13	25	24.5	140.5	1.1	-0.2	0.0	1.0	0.237	1.038	0.264	0.047	5.639
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	108.2	1.240	8.290	1.147	1.2	125.8	12	25	19.9	145.7	1.1	-0.2	0.0	1.0	0.263	1.042	0.295	0.047	6.282
PC-03	PB-03 & PB-04	Foundation Soils	11.3	33.1	118.6	1.255	7.990	1.058	1.2	138.1	8	25	5.1	143.2	1.1	-0.2	0.0	1.0	0.249	1.040	0.279	0.047	5.919
PC-03	PB-03 & PB-04	Foundation Soils	11.4	33.0	125.9	1.457	7.720	1.157	1.2	145.2	8	25	7.6	152.7	1.1	-0.2	0.0	1.0	0.308	1.048	0.349	0.047	7.374
PC-03	PB-03 & PB-04	Foundation Soils	11.5	32.9	142.4	1.616	8.770	1.134	1.2	162.6	5	25	0.4	163.0	1.1	-0.2	0.0	1.0	0.405	1.057	0.466	0.047	9.820
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	173.4	1.945	10.040	1.122	1.2	193.4	0	25	0.0	193.4	1.1	-0.2	0.0	1.0	1.325	1.082	1.577	0.048	33.114
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	184.6	2.062	3.480	1.117	1.2	204.2	0	25	0.0	204.2	1.1	-0.2	0.0	1.0	2.413	1.082	2.871	0.048	60.104
PC-03	PB-03 & PB-04	Foundation Soils	11.7	32.7	183.8	2.072	0.380	1.128	1.2	203.1	0	25	0.0	203.1	1.1	-0.2	0.0	1.0	2.263	1.082	2.692	0.048	56.180
PC-03	PB-03 & PB-04	Foundation Soils	11.8	32.6	181.5	2.026	0.670	1.116	1.2	200.7	0	25	0.0	200.7	1.1	-0.2	0.0	1.0	1.967	1.082	2.340	0.048	48.693
PC-03	PB-03 & PB-04	Foundation Soils	11.9	32.5	173.1	1.917	-4.170	1.107	1.2	192.2	0	25	0.0	192.2	1.1	-0.2	0.0	1.0	1.253	1.082	1.491	0.048	30.925
PC-03	PB-03 & PB-04	Foundation Soils	12.0	32.4	181.8	1.886	-17.440	1.037	1.2	200.5	0	25	0.0	200.5	1.1	-0.2	0.0	1.0	1.947	1.082	2.316	0.048	47.913
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	190.6	1.745	-16.720	0.916	1.2	208.9	0	25	0.0	208.9	1.1	-0.2	0.0	1.0	3.238	1.082	3.852	0.048	79.456
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	193.5	1.473	-16.390	0.761	1.2	211.5	0	25	0.0	211.5	1.1	-0.2	0.0	1.0	3.854	1.082	4.585	0.049	94.305
PC-03	PB-03 & PB-04	Foundation Soils	12.2	32.2	191.7	1.540	-16.600	0.803	1.2	209.6	0	25	0.0	209.6	1.1	-0.2	0.0	1.0	3.383	1.082	4.025	0.049	82.536
PC-03	PB-03 & PB-04	Foundation Soils	12.3	32.1	187.3	1.574	-13.340	0.840	1.2	205.0	0	25	0.0	205.0	1.1	-0.2	0.0	1.0	2.536	1.082	3.017	0.049	61.701
PC-03	PB-03 & PB-04	Foundation Soils	12.4	32.0	177.9	1.643	-10.040	0.924	1.2	195.6	0	25	0.0	195.6	1.1	-0.2	0.0	1.0	1.486	1.082	1.768	0.049	36.056
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.9	168.3	1.784	-7.290	1.060	1.2	186.0	0	25	0.0	186.0	1.1	-0.2	0.0	1.0	0.934	1.081	1.111	0.049	22.587
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.8	161.5	1.843	-3.270	1.141	1.2	179.0	3	25	0.0	179.0	1.1	-0.2	0.0	1.0	0.697	1.073	0.818	0.049	16.589
PC-03	PB-03 & PB-04	Foundation Soils	12.6	31.8	152.0	1.832	1.330	1.205	1.2	169.2	5	25	1.0	170.2	1.1	-0.2	0.0	1.0	0.507	1.064	0.585	0.049	11.835
PC-03	PB-03 & PB-04	Foundation Soils	12.7	31.7	145.9	1.811	3.580	1.241	1.2	162.6	7	25	4.5	167.0	1.1	-0.2	0.0	1.0	0.457	1.060	0.525	0.050	10.591
PC-03	PB-03 & PB-04	Foundation Soils	12.8	31.6	138.7	1.713	6.240	1.235	1.2	154.8	8	25	8.0	162.8	1.1	-0.2	0.0	1.0	0.402	1.056	0.458	0.050	9.208
PC-03	PB-03 & PB-04	Foundation Soils	12.9	31.5	139.3	1.298	6.580	0.932	1.2	155.9	1	25	0.0	155.9	1.1	-0.2	0.0	1.0	0.332	1.050	0.375	0.050	7.520
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	137.3	1.293	5.810	0.942	1.2	153.6	2	25	0.0	153.6	1.1	-0.2	0.0	1.0	0.315	1.048	0.353	0.050	7.071
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	126.8	1.281	5.170	1.010	1.2	142.7	6	25	1.3	144.0	1.1	-0.2	0.0	1.0	0.254	1.041	0.281	0.050	5.614
PC-03	PB-03 & PB-04	Foundation Soils	13.1	31.3	120.2	1.272	4.670	1.059	1.2	135.2	8	25	7.4	142.6	1.1	-0.2	0.0	1.0	0.246	1.040	0.272	0.050	5.428

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	13.2	31.2	106.0	1.239	-4.000	1.169	1.2	118.7	14	25	27.0	145.8	1.1	-0.2	0.0	1.0	0.263	1.042	0.292	0.050	5.798
PC-03	PB-03 & PB-04	Foundation Soils	13.3	31.1	104.9	1.261	-4.900	1.202	1.2	117.3	15	25	29.9	147.2	1.1	-0.2	0.0	1.0	0.271	1.043	0.301	0.050	5.971
PC-03	PB-03 & PB-04	Foundation Soils	13.4	31.0	103.6	1.263	-1.330	1.220	1.2	115.6	16	25	31.9	147.5	1.1	-0.2	0.0	1.0	0.273	1.043	0.303	0.051	5.990
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	100.5	1.245	5.360	1.238	1.2	112.1	17	25	34.7	146.8	1.1	-0.2	0.0	1.0	0.269	1.043	0.298	0.051	5.877
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	97.0	1.212	5.520	1.249	1.2	108.1	18	25	37.0	145.1	1.1	-0.2	0.0	1.0	0.260	1.042	0.287	0.051	5.651
PC-03	PB-03 & PB-04	Foundation Soils	13.6	30.8	93.9	1.191	5.100	1.268	1.2	104.6	19	25	39.2	143.8	1.1	-0.2	0.0	1.0	0.253	1.041	0.279	0.051	5.476
PC-03	PB-03 & PB-04	Foundation Soils	13.7	30.7	90.9	1.158	4.290	1.275	1.2	101.2	20	25	40.7	141.9	1.1	-0.2	0.0	1.0	0.243	1.039	0.267	0.051	5.240
PC-03	PB-03 & PB-04	Foundation Soils	13.8	30.6	83.7	1.043	4.840	1.246	1.2	93.5	22	25	42.3	135.8	1.1	-0.2	0.0	1.0	0.217	1.035	0.237	0.051	4.638
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	79.2	0.991	6.680	1.252	1.2	88.5	23	25	43.8	132.2	1.1	-0.2	0.0	1.0	0.205	1.033	0.223	0.051	4.343
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	76.6	0.934	6.770	1.219	1.2	85.6	24	25	43.7	129.4	1.1	-0.2	0.0	1.0	0.195	1.031	0.212	0.051	4.127
PC-03	PB-03 & PB-04	Foundation Soils	14.0	30.4	74.4	0.912	7.000	1.225	1.2	83.2	25	25	44.4	127.6	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.052	4.001
PC-03	PB-03 & PB-04	Foundation Soils	14.1	30.3	72.7	0.889	7.450	1.223	1.2	81.2	25	25	44.8	126.0	1.0	-0.2	0.0	1.0	0.186	1.029	0.201	0.052	3.891
PC-03	PB-03 & PB-04	Foundation Soils	14.2	30.2	71.4	0.876	7.720	1.227	1.2	79.7	26	25	45.1	124.8	1.0	-0.2	0.0	1.0	0.183	1.029	0.197	0.052	3.814
PC-03	PB-03 & PB-04	Foundation Soils	14.3	30.1	69.7	0.860	7.860	1.234	1.2	77.8	27	25	45.6	123.4	1.0	-0.2	0.0	1.0	0.179	1.028	0.193	0.052	3.723
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	68.8	0.846	7.960	1.230	1.2	76.7	27	25	45.7	122.4	1.0	-0.2	0.0	1.0	0.177	1.027	0.190	0.052	3.660
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	67.4	0.839	7.960	1.245	1.2	75.1	28	25	46.2	121.3	1.0	-0.2	0.0	1.0	0.174	1.027	0.187	0.052	3.592
PC-03	PB-03 & PB-04	Foundation Soils	14.5	29.9	65.8	0.844	8.240	1.282	1.2	73.3	29	25	46.9	120.2	1.0	-0.2	0.0	1.0	0.172	1.026	0.184	0.052	3.530
PC-03	PB-03 & PB-04	Foundation Soils	14.6	29.8	64.4	0.844	8.530	1.310	1.2	71.7	30	25	47.4	119.1	1.0	-0.2	0.0	1.0	0.169	1.026	0.181	0.052	3.468
PC-03	PB-03 & PB-04	Foundation Soils	14.7	29.7	62.1	0.839	8.580	1.352	1.2	69.1	32	25	48.0	117.0	1.0	-0.2	0.0	1.0	0.165	1.025	0.176	0.052	3.367
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	58.2	0.824	8.810	1.417	1.2	64.8	35	25	48.6	113.4	1.0	-0.2	0.0	1.0	0.158	1.023	0.168	0.052	3.207
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	55.4	0.794	8.720	1.434	1.2	61.7	37	25	48.7	110.4	1.0	-0.2	0.0	1.0	0.153	1.022	0.162	0.053	3.088
PC-03	PB-03 & PB-04	Foundation Soils	14.9	29.5	53.1	0.761	8.720	1.433	1.2	59.2	38	25	48.7	107.9	1.0	-0.2	0.0	1.0	0.149	1.021	0.158	0.053	2.991
PC-03	PB-03 & PB-04	Foundation Soils	15.0	29.4	51.8	0.674	8.580	1.301	1.2	57.8	36	25	47.8	105.6	1.0	-0.2	0.0	1.0	0.145	1.020	0.154	0.053	2.909
PC-03	PB-03 & PB-04	Foundation Soils	15.1	29.3	51.5	0.612	8.270	1.187	1.2	57.4	35	25	47.0	104.4	1.0	-0.2	0.0	1.0	0.143	1.019	0.152	0.053	2.866
PC-03	PB-03 & PB-04	Foundation Soils	15.2	29.2	51.9	0.570	8.200	1.099	1.2	57.7	33	25	46.2	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.053	2.843
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	51.7	0.586	7.640	1.134	1.2	57.4	34	25	46.5	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.053	2.839
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	49.1	0.637	7.000	1.299	1.2	54.5	38	25	47.8	102.3	1.0	-0.2	0.0	1.0	0.140	1.019	0.148	0.053	2.783
PC-03	PB-03 & PB-04	Foundation Soils	15.4	29.0	42.9	0.710	6.540	1.655	1.2	47.8	47	25	48.8	96.6	1.0	-0.2	0.0	1.0	0.133	1.017	0.140	0.053	2.624
PC-03	PB-03 & PB-04	Foundation Soils	15.5	28.9	32.0	0.756	7.770	2.364	1.2	35.9	63	25	48.3	84.2	1.0	-0.2	0.0	1.0	0.120	1.013	0.125	0.053	2.340
PC-03	PB-03 & PB-04	Foundation Soils	15.6	28.8	21.3	0.793	10.330	3.722	1.2	24.2	82	25	46.6	70.8	1.0	-0.2	0.0	1.0	0.108	1.010	0.112	0.053	2.093
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.7	15.4	0.708	10.580	4.608	1.2	17.5	96	25	45.5	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.054	1.965
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.6	11.6	0.512	12.140	4.396	1.2	13.3	100	25	44.6	57.9	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.054	1.884
PC-03	PB-03 & PB-04	Foundation Soils	15.8	28.6	10.8	0.354	13.100	3.280	1.2	12.3	100	25	44.3	56.7	1.0	-0.3	0.0	1.0	0.097	1.008	0.100	0.054	1.863
PC-03	PB-03 & PB-04	Foundation Soils	15.9	28.5	11.3	0.268	20.120	2.368	1.2	12.9	92	25	44.3	57.2	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.054	1.866
PC-03	PB-03 & PB-04	Foundation Soils	16.0	28.4	20.7	0.194	50.790	0.936	1.2	23.4	58	25	44.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.110	0.054	2.030
PC-03	PB-03 & PB-04	Foundation Soils	16.1	28.3	34.9	0.173	47.490	0.496	1.2	38.8	31	25	41.4	80.2	1.0	-0.3	0.0	1.0	0.116	1.012	0.121	0.054	2.231
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	48.2	0.147	25.820	0.305	1.2	53.8	14	25	20.5	74.3	1.0	-0.3	0.0	1.0	0.111	1.011	0.115	0.054	2.122
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	49.9	0.122	14.380	0.244	1.2	56.1	10	25	9.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.054	1.980
PC-03	PB-03 & PB-04	Foundation Soils	16.3	28.1	48.3	0.201	13.960	0.416	1.2	53.4	18	25	30.1	83.6	1.0	-0.3	0.0	1.0	0.119	1.013	0.124	0.054	2.281
PC-03	PB-03 & PB-04	Foundation Soils	16.4	28.0	46.0	0.284	12.050	0.618	1.2	50.5	26	25	40.1	90.6	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.054	2.421
PC-03	PB-03 & PB-04	Foundation Soils	16.5	27.9	41.4	0.362	6.040	0.874	1.2	45.4	36	25	44.9	90.4	1.0	-0.3	0.0	1.0	0.126	1.015	0.131	0.055	2.411
PC-03	PB-03 & PB-04	Foundation Soils	16.6	27.8	37.4	0.446	8.200	1.192	1.2	41.0	45	25	46.8	87.8	1.0	-0.3	0.0	1.0	0.123	1.014	0.129	0.055	2.353
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	29.0	0.482	9.590	1.660	1.2	32.0	59	25	47.0	79.0	1.0	-0.3	0.0	1.0	0.115	1.012	0.119	0.055	2.179
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	22.8	0.495	10.720	2.169	1.2	25.3	70	25	46.3	71.6	1.0	-0.3	0.0	1.0	0.109	1.010	0.112	0.055	2.049
PC-03	PB-03 & PB-04	Foundation Soils	16.8	27.6	12.8	0.506	13.190	3.949	1.2	14.3	99	25	44.8	59.1	1.0	-0.3	0.0	1.0	0.099	1.009	0.102	0.055	1.856
PC-03	PB-03 & PB-04	Foundation Soils	16.9	27.5	8.0	0.476	22.820	5.919	1.2	9.0	100	25	43.6	52.6	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.055	1.760
PC-03	PB-03 & PB-04	Foundation Soils	17.0	27.4	6.6	0.383	36.240	5.789	1.2	7.4	100	25	43.2	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.095	0.055	1.730
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	6.0	0.272	54.600	4.525	1.2	6.7	100	25	43.0	49.8	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.055	1.715
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	6.4	0.153	69.980	2.392	1.2	7.2	100	25	43.1	50.3	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.055	1.719
PC-03	PB-03 & PB-04	Foundation Soils	17.2	27.2	5.5	0.067	66.180	1.229	1.2	6.1	100	25	42.9	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.055	1.699
PC-03	PB-03 & PB-04	Foundation Soils	17.3	27.1	4.7	0.101	71.040	2.143	1.2	5.3	100	25	42.7	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.055	1.682
PC-03	PB-03 & PB-04	Foundation Soils	17.4	27.0	4.6	0.050	79.520	1.078	1.2	5.2	100	25	42.6	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.056	1.677
PC-03	PB-03 & PB-04	Foundation Soils	17.5	26.9	7.6	0.028	86.520	0.371	1.2	8.4	80	25	42.8	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.056	1.720
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	25.6	0.038	67.370	0.148	1.2	28.0	29	25	37.8	65.9	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.056	1.925
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	38.3	0.075	44.400	0.196	1.2	41.8	17	25	26.8	68.6	1.0	-0.3	0.0	1.0	0.106	1.010	0.109	0.056	1.963
PC-03	PB-03 & PB-04	Foundation Soils	17.7	26.7	45.0	0.139	16.090	0.309	1.1	48.8	17	25	27.4	76.1	1.0	-0.3	0.0	0.9	0.112	1.011	0.116	0.056	2.080
PC-03	PB-03 & PB-04	Foundation Soils	17.8	26.6	45.8	0.247	16.690	0.539	1.1	49.2	25	25	38.5	87.7	1.0	-0.3	0.0	0.9	0.123	1.014	0.128	0.056	2.287
PC-03	PB-03 & PB-04	Foundation Soils	17.9	26.5	44.5	0.275	18.010	0.618	1.1	47.7	28	25	41.0	88.7	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.056	2.305
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	42.2	0.334	18.800	0.791	1.1	45.2	34	25	44.2	89.3	1.0	-0.3	0.0	0.9	0.125	1.014	0.130	0.056	2.313
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	41.5	0.390	19.980	0.939	1.1	44.4	38	25	45.5	89.9	1.0	-0.3	0.0	0.9	0.125	1.015	0.130	0.056	2.321
PC-03	PB-03 & PB-04	Foundation Soils	18.1	26.3	42.5	0.475	20.39	1.117193	1.1	45.3	40	25	46.6	91.9	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.056	2.359
PC-03	PB-03 & PB-04	Foundation Soils	18.2	26.2	42.4	0.629	19.730	1.484	1.1	45.0	46	25	48.1	93.1	1.0	-0.3	0.0	0.9	0.129	1.016	0.134	0.056	2.382

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	18.3	26.1	37.8	0.677	18.480	1.789	1.1	40.2	54	25	48.2	88.5	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.056	2.281
PC-03	PB-03 & PB-04	Foundation Soils	18.4	26.0	27.9	0.697	19.360	2.499	1.1	30.0	70	15	38.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.109	0.056	1.931
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	21.2	0.717	20.230	3.378	1.1	22.9	82	15	37.5	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.056	1.814
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	17.7	0.694	21.060	3.916	1.1	19.2	91	15	37.0	56.2	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.057	1.752
PC-03	PB-03 & PB-04	Foundation Soils	18.6	25.8	22.0	0.679	21.330	3.090	1.1	23.6	80	15	37.6	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.057	1.819
PC-03	PB-03 & PB-04	Foundation Soils	18.7	25.7	20.1	0.612	18.060	3.050	1.1	21.6	82	15	37.3	58.9	1.0	-0.3	0.0	0.9	0.099	1.008	0.101	0.057	1.783
PC-03	PB-03 & PB-04	Foundation Soils	18.8	25.6	12.1	0.534	19.870	4.412	1.1	13.1	100	15	36.1	49.1	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.057	1.651
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	8.7	0.446	28.490	5.151	1.1	9.4	100	15	35.3	44.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.057	1.592
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	8.2	0.372	36.240	4.555	1.1	8.8	100	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.057	1.581
PC-03	PB-03 & PB-04	Foundation Soils	19.0	25.4	7.0	0.240	57.460	3.434	1.1	7.6	100	15	35.0	42.6	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.057	1.560
PC-03	PB-03 & PB-04	Foundation Soils	19.1	25.3	6.4	0.156	69.080	2.429	1.1	6.9	100	15	34.9	41.8	1.0	-0.3	0.0	0.9	0.087	1.007	0.088	0.057	1.548
PC-03	PB-03 & PB-04	Foundation Soils	19.2	25.2	5.7	0.107	77.480	1.869	1.1	6.2	100	15	34.7	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.057	1.535
PC-03	PB-03 & PB-04	Foundation Soils	19.3	25.1	5.8	0.054	85.620	0.934	1.1	6.2	100	15	34.7	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.057	1.533
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	6.3	0.029	75.090	0.463	1.1	6.8	93	15	34.7	41.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.057	1.537
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	6.7	0.057	31.020	0.845	1.1	7.2	98	15	34.9	42.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.057	1.543
PC-03	PB-03 & PB-04	Foundation Soils	19.5	24.9	7.5	0.078	31.020	1.039	1.1	8.0	97	15	35.0	43.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.057	1.553
PC-03	PB-03 & PB-04	Foundation Soils	19.6	24.8	8.3	0.080	30.970	0.968	1.1	8.8	92	15	35.1	43.9	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.058	1.561
PC-03	PB-03 & PB-04	Foundation Soils	19.7	24.7	9.0	0.162	30.870	1.797	1.1	9.6	99	15	35.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.058	1.572
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.6	9.7	0.186	23.180	1.913	1.1	10.4	98	15	35.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.058	1.581
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.5	9.6	0.200	34.300	2.087	1.1	10.2	100	15	35.5	45.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.058	1.577
PC-03	PB-03 & PB-04	Foundation Soils	19.9	24.5	8.3	0.178	39.460	2.143	1.1	8.8	100	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.058	1.555
PC-03	PB-03 & PB-04	Foundation Soils	20.0	24.4	6.0	0.128	49.230	2.131	1.1	6.4	100	15	34.8	41.1	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.058	1.517
PC-03	PB-03 & PB-04	Foundation Soils	20.1	24.3	5.3	0.108	71.480	2.035	1.1	5.6	100	15	34.6	40.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.058	1.504
PC-03	PB-03 & PB-04	Foundation Soils	20.2	24.2	12.0	0.166	86.760	1.389	1.1	12.6	85	15	35.6	48.2	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.058	1.601
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	18.0	0.193	83.870	1.075	1.1	18.8	67	15	36.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.058	1.684
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	11.3	0.166	17.530	1.465	1.1	11.9	88	15	35.6	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.058	1.587
PC-03	PB-03 & PB-04	Foundation Soils	20.4	24.0	8.3	0.161	20.150	1.943	1.1	8.7	100	15	35.2	43.9	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.058	1.541
PC-03	PB-03 & PB-04	Foundation Soils	20.5	23.9	6.0	0.152	26.870	2.522	1.1	6.4	100	15	34.7	41.1	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.058	1.505
PC-03	PB-03 & PB-04	Foundation Soils	20.6	23.8	5.2	0.183	56.390	3.525	1.1	5.5	100	15	34.6	40.0	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.058	1.490
PC-03	PB-03 & PB-04	Foundation Soils	20.7	23.7	5.5	0.153	83.900	2.785	1.1	5.8	100	15	34.6	40.4	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.058	1.493
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	6.1	0.103	96.720	1.676	1.1	6.4	100	15	34.8	41.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.058	1.500
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	7.4	0.097	88.620	1.307	1.1	7.8	100	15	35.0	42.8	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.059	1.517
PC-03	PB-03 & PB-04	Foundation Soils	20.9	23.5	7.3	0.112	85.580	1.533	1.1	7.6	100	15	35.0	42.6	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.059	1.514
PC-03	PB-03 & PB-04	Foundation Soils	21.0	23.4	6.7	0.142	98.390	2.109	1.1	7.0	100	15	34.9	41.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.088	0.059	1.503
PC-03	PB-03 & PB-04	Foundation Soils	21.1	23.3	9.1	0.145	96.290	1.586	1.1	9.5	98	15	35.3	44.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.059	1.537
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	13.4	0.166	77.120	1.240	1.1	13.9	80	15	35.7	49.6	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.059	1.594
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	16.7	0.135	63.960	0.808	1.1	17.3	65	15	35.7	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.059	1.634
PC-03	PB-03 & PB-04	Foundation Soils	21.3	23.1	18.6	0.143	73.800	0.770	1.1	19.1	61	15	35.8	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.059	1.657
PC-03	PB-03 & PB-04	Foundation Soils	21.4	23.0	20.7	0.149	83.050	0.719	1.1	21.3	56	15	35.8	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.059	1.683
PC-03	PB-03 & PB-04	Foundation Soils	21.5	22.9	24.0	0.202	92.780	0.842	1.1	24.6	54	15	36.2	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.059	1.730
PC-03	PB-03 & PB-04	Foundation Soils	21.6	22.8	26.6	0.233	89.000	0.876	1.1	27.1	52	15	36.4	63.6	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.059	1.766
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	27.3	0.296	100.820	1.085	1.1	27.8	55	15	36.9	64.7	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.059	1.779
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	28.2	0.364	102.720	1.292	1.1	28.7	57	15	37.3	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.106	0.059	1.794
PC-03	PB-03 & PB-04	Foundation Soils	21.8	22.6	34.2	0.445	95.080	1.300	1.1	34.7	51	15	37.8	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.112	0.059	1.886
PC-03	PB-03 & PB-04	Foundation Soils	21.9	22.5	37.9	0.356	91.530	0.939	1.1	38.3	42	15	36.9	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.059	1.925
PC-03	PB-03 & PB-04	Foundation Soils	22.0	22.4	43.5	0.273	77.850	0.627	1.1	43.9	31	15	34.2	78.1	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.059	1.967
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	54.2	0.210	76.040	0.387	1.1	54.6	16	15	21.6	76.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.115	0.059	1.935
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	73.9	0.220	36.250	0.298	1.1	74.4	3	15	0.0	74.4	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.059	1.906
PC-03	PB-03 & PB-04	Foundation Soils	22.2	22.2	81.8	0.178	39.070	0.218	1.1	82.0	0	15	0.0	82.0	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.059	2.025
PC-03	PB-03 & PB-04	Foundation Soils	22.3	22.1	91.5	0.139	25.660	0.152	1.1	91.4	0	15	0.0	91.4	1.0	-0.4	0.0	0.9	0.127	1.015	0.130	0.059	2.192
PC-03	PB-03 & PB-04	Foundation Soils	22.4	22.0	109.2	0.142	19.220	0.130	1.1	108.5	0	15	0.0	108.5	1.0	-0.4	0.0	0.9	0.150	1.021	0.155	0.060	2.596
PC-03	PB-03 & PB-04	Foundation Soils	22.5	21.9	123.9	0.171	13.020	0.138	1.0	122.6	0	15	0.0	122.6	1.0	-0.4	0.0	0.9	0.177	1.028	0.185	0.060	3.097
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	134.0	0.203	0.140	0.151	1.0	132.2	0	15	0.0	132.2	1.0	-0.4	0.0	0.9	0.204	1.033	0.214	0.060	3.590
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	135.8	0.320	4.360	0.236	1.0	133.7	0	15	0.0	133.7	1.0	-0.4	0.0	0.9	0.210	1.034	0.220	0.060	3.683
PC-03	PB-03 & PB-04	Foundation Soils	22.7	21.7	135.7	0.323	13.290	0.238	1.0	133.5	0	15	0.0	133.5	1.0	-0.4	0.0	0.9	0.209	1.034	0.219	0.060	3.664
PC-03	PB-03 & PB-04	Foundation Soils	22.8	21.6	136.4	0.326	0.340	0.239	1.0	134.0	0	15	0.0	134.0	1.0	-0.4	0.0	0.9	0.211	1.034	0.221	0.060	3.691
PC-03	PB-03 & PB-04	Foundation Soils	22.9	21.5	135.5	0.431	-8.480	0.318	1.0	133.0	0	15	0.0	133.0	1.0	-0.4	0.0	0.9	0.207	1.034	0.217	0.060	3.626
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.4	132.3	0.477	-18.770	0.361	1.0	129.7	0	15	0.0	129.7	1.0	-0.4	0.0	0.9	0.197	1.032	0.205	0.060	3.430
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.3	136.0	0.420	-15.930	0.309	1.0	133.1	0	15	0.0	133.1	1.0	-0.4	0.0	0.9	0.208	1.034	0.217	0.060	3.626
PC-03	PB-03 & PB-04	Foundation Soils	23.1	21.3	139.6	0.297	-20.850	0.213	1.0	136.5	0	15	0.0	136.5	1.0	-0.4	0.0	0.9	0.220	1.036	0.230	0.060	3.844
PC-03	PB-03 & PB-04	Foundation Soils	23.2	21.2	139.1	0.232	-22.110	0.167	1.0	135.9	0	15	0.0	135.9	1.0	-0.4	0.0	0.9	0.218	1.035	0.228	0.060	3.799
PC-03	PB-03 & PB-04	Foundation Soils	23.3	21.1	132.1	0.258	-23.250	0.195	1.0	129.0	0	15	0.0	129.0	1.0	-0.4	0.0	0.9	0.194	1.031	0.203	0.060	3.376

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	23.4	21.0	120.5	0.328	-20.820	0.272	1.0	117.8	0	15	0.0	117.8	1.0	-0.4	0.0	0.9	0.166	1.025	0.172	0.060	2.868
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	105.2	0.397	-9.910	0.377	1.0	102.9	0	15	0.0	102.9	1.0	-0.4	0.0	0.9	0.141	1.019	0.145	0.060	2.413
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	106.2	0.496	-4.860	0.467	1.0	103.7	0	15	0.0	103.7	1.0	-0.4	0.0	0.9	0.142	1.019	0.146	0.060	2.431
PC-03	PB-03 & PB-04	Foundation Soils	23.6	20.8	118.4	0.484	-6.380	0.409	1.0	115.3	0	15	0.0	115.3	1.0	-0.4	0.0	0.9	0.161	1.024	0.167	0.060	2.771
PC-03	PB-03 & PB-04	Foundation Soils	23.7	20.7	142.3	0.428	-16.840	0.301	1.0	138.0	0	15	0.0	138.0	1.0	-0.4	0.0	0.9	0.226	1.037	0.236	0.060	3.926
PC-03	PB-03 & PB-04	Foundation Soils	23.8	20.6	157.5	0.341	-19.680	0.216	1.0	152.4	0	15	0.0	152.4	1.0	-0.4	0.0	0.9	0.305	1.047	0.323	0.060	5.361
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.5	170.2	0.241	-19.300	0.142	1.0	164.3	0	15	0.0	164.3	1.0	-0.4	0.0	0.9	0.420	1.058	0.450	0.060	7.458
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.4	168.5	0.210	-18.300	0.125	1.0	162.5	0	15	0.0	162.5	1.0	-0.4	0.1	0.9	0.399	1.056	0.426	0.060	7.055
PC-03	PB-03 & PB-04	Foundation Soils	24.0	20.4	161.1	0.217	-16.820	0.135	1.0	155.3	0	15	0.0	155.3	1.0	-0.4	0.1	0.9	0.328	1.050	0.347	0.060	5.756
PC-03	PB-03 & PB-04	Foundation Soils	24.1	20.3	152.5	0.272	-13.200	0.178	1.0	147.0	0	15	0.0	147.0	1.0	-0.4	0.1	0.9	0.270	1.043	0.284	0.060	4.703
PC-03	PB-03 & PB-04	Foundation Soils	24.2	20.2	139.3	0.347	-10.790	0.249	1.0	134.3	0	15	0.0	134.3	1.0	-0.5	0.1	0.9	0.212	1.034	0.220	0.060	3.646
PC-03	PB-03 & PB-04	Foundation Soils	24.3	20.1	126.5	0.444	-9.530	0.351	1.0	122.0	0	15	0.0	122.0	1.0	-0.5	0.1	0.9	0.176	1.027	0.182	0.060	3.004
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	112.0	0.465	-7.930	0.415	1.0	108.0	0	15	0.0	108.0	1.0	-0.5	0.1	0.9	0.149	1.021	0.153	0.061	2.524
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	104.7	0.374	-7.620	0.357	1.0	100.9	0	15	0.0	100.9	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.061	2.339
PC-03	PB-03 & PB-04	Foundation Soils	24.5	19.9	96.8	0.346	-13.170	0.358	1.0	93.2	0	15	0.0	93.2	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.061	2.173
PC-03	PB-03 & PB-04	Foundation Soils	24.6	19.8	89.5	0.289	-16.300	0.323	1.0	86.2	0	15	0.0	86.2	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.061	2.041
PC-03	PB-03 & PB-04	Foundation Soils	24.7	19.7	85.9	0.242	-17.250	0.282	1.0	82.6	0	15	0.0	82.6	1.0	-0.5	0.1	0.9	0.118	1.013	0.120	0.061	1.980
PC-03	PB-03 & PB-04	Foundation Soils	24.8	19.6	78.1	0.247	-13.530	0.316	1.0	75.0	3	15	0.0	75.0	1.0	-0.5	0.1	0.9	0.111	1.011	0.113	0.061	1.862
UC-01	UB-02	Foundation Soils	9.5	31.8	31.7	0.228	-9.670	0.718	1.7	50.1	32	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.055	1.798
UC-01	UB-02	Foundation Soils	9.6	31.7	34.9	0.131	-0.330	0.376	1.6	54.2	19	0	0.4	54.6	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.055	1.851
UC-01	UB-02	Foundation Soils	9.7	31.7	34.5	0.135	1.430	0.391	1.6	53.6	20	0	0.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.055	1.835
UC-01	UB-02	Foundation Soils	9.8	31.6	33.3	0.179	1.670	0.538	1.6	51.8	26	0	0.5	52.2	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.055	1.804
UC-01	UB-02	Foundation Soils	9.8	31.5	31.5	0.207	2.290	0.657	1.7	49.2	31	0	0.5	49.7	1.1	-0.1	0.0	1.0	0.092	1.008	0.098	0.056	1.761
UC-01	UB-02	Foundation Soils	9.9	31.4	30.8	0.213	0.770	0.692	1.7	48.1	33	0	0.5	48.6	1.1	-0.1	0.0	1.0	0.091	1.007	0.097	0.056	1.739
UC-01	UB-02	Foundation Soils	10.0	31.3	29.0	0.231	-1.240	0.797	1.7	45.5	37	0	0.5	46.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.095	0.056	1.697
UC-01	UB-02	Foundation Soils	10.1	31.2	27.4	0.272	-0.100	0.992	1.7	43.2	43	0	0.5	43.7	1.1	-0.1	0.0	1.0	0.088	1.007	0.093	0.056	1.660
UC-01	UB-02	Foundation Soils	10.2	31.2	28.4	0.375	-1.290	1.319	1.7	44.4	48	0	0.5	45.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.094	0.056	1.672
UC-01	UB-02	Foundation Soils	10.3	31.1	32.7	0.448	-3.480	1.372	1.6	50.1	45	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.056	1.746
UC-01	UB-02	Foundation Soils	10.3	31.0	42.0	0.497	-13.290	1.182	1.6	62.3	34	0	0.5	62.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.057	1.922
UC-01	UB-02	Foundation Soils	10.4	30.9	49.9	0.468	-20.580	0.938	1.5	72.1	25	0	0.5	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.118	0.057	2.074
UC-01	UB-02	Foundation Soils	10.5	30.8	55.2	0.418	-22.080	0.757	1.5	78.5	18	0	0.4	78.9	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.057	2.179
UC-01	UB-02	Foundation Soils	10.6	30.8	60.1	0.312	-23.600	0.519	1.5	84.3	8	0	0.1	84.4	1.1	-0.1	0.0	1.0	0.120	1.013	0.130	0.057	2.279
UC-01	UB-02	Foundation Soils	10.7	30.7	62.4	0.233	-24.250	0.373	1.5	87.0	1	0	0.0	87.0	1.1	-0.1	0.0	1.0	0.122	1.014	0.133	0.057	2.326
UC-01	UB-02	Foundation Soils	10.7	30.6	60.7	0.182	-23.300	0.300	1.5	84.6	0	0	0.0	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.130	0.057	2.271
UC-01	UB-02	Foundation Soils	10.8	30.5	57.5	0.236	-21.630	0.410	1.5	80.7	6	0	0.0	80.7	1.1	-0.2	0.0	1.0	0.116	1.012	0.126	0.057	2.187
UC-01	UB-02	Foundation Soils	10.9	30.4	50.6	0.317	-19.110	0.626	1.5	72.0	17	0	0.3	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.117	0.058	2.033
UC-01	UB-02	Foundation Soils	11.0	30.3	47.6	0.330	-17.720	0.694	1.5	68.0	21	0	0.4	68.4	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.058	1.964
UC-01	UB-02	Foundation Soils	11.1	30.3	42.0	0.317	-13.480	0.755	1.5	60.8	26	0	0.5	61.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.058	1.849
UC-01	UB-02	Foundation Soils	11.2	30.2	40.6	0.279	-9.950	0.687	1.5	58.8	25	0	0.5	59.3	1.1	-0.2	0.0	1.0	0.099	1.009	0.105	0.058	1.815
UC-01	UB-02	Foundation Soils	11.2	30.1	43.0	0.248	-7.960	0.576	1.5	61.8	21	0	0.4	62.2	1.1	-0.2	0.0	1.0	0.101	1.009	0.108	0.058	1.853
UC-01	UB-02	Foundation Soils	11.3	30.0	44.0	0.238	-5.050	0.541	1.5	62.9	19	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.058	1.864
UC-01	UB-02	Foundation Soils	11.4	29.9	44.1	0.230	-1.570	0.521	1.5	62.8	18	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.058	1.858
UC-01	UB-02	Foundation Soils	11.5	29.8	45.5	0.252	2.100	0.554	1.5	64.4	19	0	0.4	64.8	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.059	1.877
UC-01	UB-02	Foundation Soils	11.6	29.8	48.1	0.285	2.620	0.592	1.5	67.5	18	0	0.4	67.9	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.059	1.920
UC-01	UB-02	Foundation Soils	11.6	29.7	50.3	0.319	2.190	0.634	1.5	70.0	18	0	0.4	70.4	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.059	1.955
UC-01	UB-02	Foundation Soils	11.7	29.6	54.9	0.353	1.980	0.643	1.5	75.5	16	0	0.3	75.8	1.1	-0.2	0.0	1.0	0.112	1.011	0.120	0.059	2.038
UC-01	UB-02	Foundation Soils	11.8	29.5	58.7	0.402	1.520	0.684	1.4	79.9	15	0	0.3	80.2	1.1	-0.2	0.0	1.0	0.116	1.012	0.125	0.059	2.110
UC-01	UB-02	Foundation Soils	11.9	29.4	63.2	0.440	1.190	0.696	1.4	85.0	13	0	0.2	85.3	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.059	2.200
UC-01	UB-02	Foundation Soils	12.0	29.4	66.1	0.477	1.240	0.722	1.4	88.2	13	0	0.2	88.5	1.1	-0.2	0.0	1.0	0.124	1.014	0.134	0.059	2.257
UC-01	UB-02	Foundation Soils	12.1	29.3	68.0	0.507	1.300	0.745	1.4	90.3	13	0	0.2	90.5	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.059	2.294
UC-01	UB-02	Foundation Soils	12.1	29.2	70.0	0.518	1.190	0.740	1.4	92.4	12	0	0.2	92.6	1.1	-0.2	0.0	1.0	0.128	1.015	0.139	0.060	2.333
UC-01	UB-02	Foundation Soils	12.2	29.1	71.5	0.535	1.380	0.749	1.4	93.9	12	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.060	2.361
UC-01	UB-02	Foundation Soils	12.3	29.0	72.6	0.528	1.380	0.727	1.4	95.0	11	0	0.2	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.060	2.381
UC-01	UB-02	Foundation Soils	12.4	28.9	72.8	0.523	1.520	0.718	1.4	95.0	10	0	0.1	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.060	2.376
UC-01	UB-02	Foundation Soils	12.5	28.9	72.0	0.518	1.570	0.719	1.4	94.0	11	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.060	2.346
UC-01	UB-02	Foundation Soils	12.5	28.8	70.6	0.504	1.680	0.713	1.4	92.2	11	0	0.2	92.4	1.1	-0.2	0.0	1.0	0.128	1.015	0.138	0.060	2.302
UC-01	UB-02	Foundation Soils	12.6	28.7	69.4	0.482	1.720	0.695	1.4	90.5	11	0	0.2	90.7	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.060	2.261
UC-01	UB-02	Foundation Soils	12.7	28.6	67.5	0.464	2.020	0.687	1.4	88.2	12	0	0.2	88.4	1.1	-0.2	0.0	1.0	0.124	1.014	0.133	0.060	2.210
UC-01	UB-02	Foundation Soils	12.8	28.5	66.0	0.436	2.050	0.660	1.4	86.3	12	0	0.2	86.5	1.1	-0.2	0.0	1.0	0.122	1.014	0.131	0.060	2.168
UC-01	UB-02	Foundation Soils	12.9	28.5	65.4	0.411	2.150	0.629	1.4	85.4	11	0	0.2	85.5	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.061	2.145
UC-01	UB-02	Foundation Soils	13.0	28.4	64.7	0.379	2.380	0.586	1.4	84.4	10	0	0.1	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.129	0.061	2.122
UC-01	UB-02	Foundation Soils	13.0	28.3	64.5	0.375	2.430	0.582	1.4	84.0	10	0	0.1	84.1	1.1	-0.2	0.0	1.0	0.120	1.013	0.128	0.061	2.109

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	13.1	28.2	64.3	0.364	2.480	0.566	1.4	83.6	10	0	0.1	83.7	1.1	-0.2	0.0	1.0	0.119	1.013	0.128	0.061	2.097
UC-01	UB-02	Foundation Soils	13.2	28.1	60.0	0.361	6.380	0.601	1.4	78.5	13	0	0.2	78.7	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.061	2.006
UC-01	UB-02	Foundation Soils	13.3	28.0	62.8	0.370	2.380	0.589	1.4	81.5	11	0	0.2	81.7	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.061	2.053
UC-01	UB-02	Foundation Soils	13.4	28.0	62.4	0.366	2.330	0.587	1.4	80.9	12	0	0.2	81.0	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.061	2.037
UC-01	UB-02	Foundation Soils	13.5	27.9	61.4	0.358	2.540	0.583	1.4	79.6	12	0	0.2	79.8	1.1	-0.2	0.0	1.0	0.116	1.012	0.123	0.061	2.012
UC-01	UB-02	Foundation Soils	13.5	27.8	59.9	0.346	2.720	0.578	1.4	77.6	13	0	0.2	77.9	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.061	1.976
UC-01	UB-02	Foundation Soils	13.6	27.7	58.8	0.347	2.940	0.590	1.4	76.3	14	0	0.3	76.5	1.1	-0.2	0.0	1.0	0.113	1.011	0.120	0.061	1.950
UC-01	UB-02	Foundation Soils	13.7	27.6	58.3	0.374	3.050	0.641	1.4	75.5	16	0	0.3	75.8	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.062	1.936
UC-01	UB-02	Foundation Soils	13.8	27.6	58.1	0.458	3.150	0.789	1.4	75.1	20	0	0.4	75.5	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.062	1.926
UC-01	UB-02	Foundation Soils	13.9	27.5	57.4	0.517	3.150	0.900	1.4	74.2	23	0	0.5	74.6	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.062	1.909
UC-01	UB-02	Foundation Soils	13.9	27.4	56.0	0.548	3.190	0.978	1.4	72.4	25	0	0.5	72.9	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.062	1.879
UC-01	UB-02	Foundation Soils	14.0	27.3	53.2	0.477	3.330	0.896	1.4	69.0	25	0	0.5	69.5	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.062	1.824
UC-01	UB-02	Foundation Soils	14.1	27.2	50.5	0.465	3.780	0.920	1.4	65.7	27	0	0.5	66.1	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.062	1.773
UC-01	UB-02	Foundation Soils	14.2	27.1	55.0	0.458	4.340	0.832	1.4	70.8	23	0	0.4	71.2	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.062	1.844
UC-01	UB-02	Foundation Soils	14.3	27.1	70.2	0.457	4.220	0.651	1.3	88.0	11	0	0.2	88.1	1.1	-0.2	0.0	1.0	0.124	1.014	0.132	0.062	2.123
UC-01	UB-02	Foundation Soils	14.4	27.0	79.7	0.492	2.890	0.617	1.3	98.4	6	0	0.0	98.4	1.1	-0.2	0.0	1.0	0.135	1.017	0.145	0.062	2.336
UC-01	UB-02	Foundation Soils	14.4	26.9	75.4	0.530	2.150	0.703	1.3	93.4	10	0	0.1	93.5	1.1	-0.2	0.0	1.0	0.129	1.016	0.139	0.062	2.223
UC-01	UB-02	Foundation Soils	14.5	26.8	65.5	0.555	0.710	0.847	1.3	82.2	18	0	0.4	82.5	1.0	-0.2	0.0	1.0	0.118	1.013	0.125	0.062	2.011
UC-01	UB-02	Foundation Soils	14.6	26.7	54.3	0.587	0.620	1.080	1.4	69.2	29	0	0.5	69.7	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.062	1.807
UC-01	UB-02	Foundation Soils	14.7	26.6	37.4	0.621	2.050	1.659	1.4	49.2	48	0	0.6	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.063	1.538
UC-01	UB-02	Foundation Soils	14.8	26.6	25.5	0.658	3.850	2.578	1.4	34.5	69	0	0.5	35.1	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.063	1.361
UC-01	UB-02	Foundation Soils	14.8	26.5	15.7	0.640	6.340	4.087	1.5	21.9	88	0	0.5	22.4	1.0	-0.2	0.0	1.0	0.074	1.006	0.076	0.063	1.219
UC-01	UB-02	Foundation Soils	14.9	26.4	10.4	0.555	8.790	5.339	1.5	14.6	100	0	0.5	15.1	1.0	-0.2	0.0	1.0	0.069	1.006	0.072	0.063	1.140
UC-01	UB-02	Foundation Soils	15.0	26.3	8.7	0.457	9.480	5.235	1.5	12.2	100	0	0.5	12.7	1.0	-0.2	0.0	1.0	0.068	1.006	0.070	0.063	1.114
UC-01	UB-02	Foundation Soils	15.1	26.2	7.3	0.404	9.200	5.567	1.5	10.1	100	0	0.5	10.6	1.0	-0.2	0.0	1.0	0.067	1.006	0.069	0.063	1.091
UC-01	UB-02	Foundation Soils	15.2	26.2	6.8	0.295	12.530	4.314	1.5	9.5	100	0	0.5	10.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.063	1.083
UC-01	UB-02	Foundation Soils	15.3	26.1	6.2	0.225	29.660	3.655	1.5	8.6	100	0	0.5	9.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.063	1.072
UC-01	UB-02	Foundation Soils	15.3	26.0	3.9	0.135	59.460	3.425	1.5	5.5	100	0	0.5	5.9	1.0	-0.2	0.0	1.0	0.064	1.006	0.066	0.063	1.040
UC-01	UB-02	Foundation Soils	15.4	25.9	3.3	0.057	77.330	1.736	1.5	4.5	100	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.063	1.029
UC-01	UB-02	Foundation Soils	15.5	25.8	3.2	0.044	80.420	1.357	1.5	4.5	100	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.063	1.027
UC-01	UB-02	Foundation Soils	15.6	25.7	3.2	0.027	80.950	0.848	1.5	4.4	100	0	0.5	4.9	1.0	-0.2	0.0	1.0	0.063	1.006	0.065	0.064	1.024
UC-01	UB-02	Foundation Soils	15.7	25.7	3.2	0.023	79.850	0.724	1.5	4.4	100	0	0.5	4.8	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.064	1.023
UC-01	UB-02	Foundation Soils	15.7	25.6	3.1	0.025	80.950	0.802	1.5	4.3	100	0	0.5	4.7	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.064	1.020
UC-01	UB-02	Foundation Soils	15.8	25.5	3.5	0.017	85.770	0.492	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.064	1.023
UC-01	UB-02	Foundation Soils	15.9	25.4	11.1	0.017	88.220	0.154	1.4	15.1	54	0	0.5	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.064	1.123
UC-01	UB-02	Foundation Soils	16.0	25.3	23.1	0.066	70.800	0.286	1.4	30.5	34	0	0.5	31.0	1.0	-0.3	0.0	1.0	0.079	1.006	0.082	0.064	1.284
UC-01	UB-02	Foundation Soils	16.1	25.3	25.9	0.094	16.520	0.363	1.4	33.8	34	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.084	0.064	1.319
UC-01	UB-02	Foundation Soils	16.2	25.2	18.8	0.171	10.290	0.909	1.4	25.1	58	0	0.5	25.6	1.0	-0.3	0.0	1.0	0.076	1.006	0.078	0.064	1.222
UC-01	UB-02	Foundation Soils	16.2	25.1	16.1	0.230	18.480	1.430	1.4	21.6	71	0	0.5	22.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.076	0.064	1.184
UC-01	UB-02	Foundation Soils	16.3	25.0	15.3	0.310	22.870	2.024	1.4	20.6	75	0	0.5	21.1	1.0	-0.3	0.0	1.0	0.073	1.006	0.075	0.064	1.172
UC-01	UB-02	Foundation Soils	16.4	24.9	11.9	0.287	25.020	2.421	1.4	15.9	87	0	0.5	16.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.064	1.123
UC-01	UB-02	Foundation Soils	16.5	24.8	9.2	0.263	11.650	2.849	1.4	12.4	98	0	0.5	12.9	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.064	1.086
UC-01	UB-02	Foundation Soils	16.6	24.8	10.2	0.261	30.940	2.563	1.4	13.6	93	0	0.5	14.1	1.0	-0.3	0.0	1.0	0.069	1.006	0.071	0.065	1.097
UC-01	UB-02	Foundation Soils	16.7	24.7	11.7	0.244	21.440	2.090	1.4	15.6	85	0	0.5	16.1	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.065	1.115
UC-01	UB-02	Foundation Soils	16.7	24.6	8.9	0.208	26.560	2.338	1.4	11.8	96	0	0.5	12.3	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.065	1.076
UC-01	UB-02	Foundation Soils	16.8	24.5	5.5	0.155	36.080	2.810	1.4	7.3	100	0	0.5	7.8	1.0	-0.3	0.0	1.0	0.065	1.006	0.067	0.065	1.031
UC-01	UB-02	Foundation Soils	16.9	24.4	4.1	0.138	51.740	3.331	1.4	5.5	100	0	0.5	6.0	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.065	1.013
UC-01	UB-02	Foundation Soils	17.0	24.4	3.9	0.096	62.650	2.461	1.4	5.2	100	0	0.5	5.6	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.065	1.008
UC-01	UB-02	Foundation Soils	17.1	24.3	3.8	0.083	71.180	2.187	1.4	5.0	100	0	0.5	5.5	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.065	1.006
UC-01	UB-02	Foundation Soils	17.1	24.2	3.6	0.057	66.940	1.580	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.065	1.002
UC-01	UB-02	Foundation Soils	17.2	24.1	3.6	0.016	70.700	0.441	1.4	4.8	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.065	1.001
UC-01	UB-02	Foundation Soils	17.3	24.0	3.6	0.020	77.710	0.555	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.065	0.999
UC-01	UB-02	Foundation Soils	17.4	23.9	4.4	0.021	79.710	0.473	1.4	5.8	100	0	0.5	6.3	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.065	1.008
UC-01	UB-02	Foundation Soils	17.5	23.9	7.7	0.039	82.140	0.506	1.4	10.0	78	0	0.5	10.5	1.0	-0.3	0.0	1.0	0.067	1.006	0.068	0.065	1.047
UC-01	UB-02	Foundation Soils	17.6	23.8	10.3	0.121	26.730	1.175	1.4	13.4	79	0	0.5	13.9	1.0	-0.3	0.0	1.0	0.069	1.006	0.070	0.065	1.078
UC-01	UB-02	Foundation Soils	17.6	23.7	11.8	0.168	19.730	1.426	1.4	15.3	78	0	0.5	15.8	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.065	1.095
UC-01	UB-02	Foundation Soils	17.7	23.6	6.7	0.177	9.510	2.646	1.4	8.7	100	0	0.5	9.1	1.0	-0.3	0.0	0.9	0.066	1.006	0.068	0.066	1.030
UC-01	UB-02	Foundation Soils	17.8	23.5	5.3	0.169	22.960	3.187	1.4	6.8	100	0	0.5	7.3	1.0	-0.3	0.0	0.9	0.065	1.006	0.066	0.066	1.012
UC-01	UB-02	Foundation Soils	17.9	23.5	4.6	0.160	27.560	3.462	1.4	6.0	100	0	0.5	6.4	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.066	1.002
UC-01	UB-02	Foundation Soils	18.0	23.4	4.2	0.108	40.740	2.569	1.4	5.4	100	0	0.5	5.9	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.066	0.996
UC-01	UB-02	Foundation Soils	18.0	23.3	3.9	0.095	59.000	2.443	1.3	4.8	100	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.066	1.331
UC-01	UB-02	Foundation Soils	18.1	23.2	4.6	0.075	69.130	1.616	1.3	5.7	100	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.066	1.341

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	18.2	23.1	5.6	0.078	66.510	1.404	1.3	6.8	100	15	34.8	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.066	1.354
UC-01	UB-02	Foundation Soils	18.3	23.0	5.3	0.076	8.950	1.435	1.3	6.5	100	15	34.8	41.2	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.066	1.348
UC-01	UB-02	Foundation Soils	18.4	23.0	4.8	0.077	29.940	1.595	1.3	5.9	100	15	34.7	40.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.066	1.339
UC-01	UB-02	Foundation Soils	18.5	22.9	4.1	0.069	41.450	1.663	1.3	5.1	100	15	34.5	39.6	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.066	1.327
UC-01	UB-02	Foundation Soils	18.5	22.8	3.8	0.052	51.870	1.385	1.3	4.6	100	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.066	1.319
UC-01	UB-02	Foundation Soils	18.6	22.7	3.6	0.038	62.470	1.061	1.3	4.4	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.066	1.315
UC-01	UB-02	Foundation Soils	18.7	22.6	3.6	0.028	71.900	0.785	1.3	4.3	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.066	1.313
UC-01	UB-02	Foundation Soils	18.8	22.5	3.6	0.035	71.280	0.982	1.3	4.3	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.066	1.311
UC-01	UB-02	Foundation Soils	18.9	22.5	3.5	0.028	72.820	0.794	1.3	4.3	100	15	34.3	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.087	0.066	1.309
UC-01	UB-02	Foundation Soils	18.9	22.4	3.8	0.018	76.870	0.475	1.3	4.6	100	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.067	1.312
UC-01	UB-02	Foundation Soils	19.0	22.3	4.2	0.023	74.230	0.552	1.3	5.0	100	15	34.5	39.5	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.067	1.316
UC-01	UB-02	Foundation Soils	19.1	22.2	5.1	0.019	68.390	0.369	1.3	6.2	94	15	34.6	40.8	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.067	1.328
UC-01	UB-02	Foundation Soils	19.2	22.1	5.8	0.025	56.600	0.435	1.3	6.9	91	15	34.7	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.067	1.335
UC-01	UB-02	Foundation Soils	19.3	22.1	4.8	0.027	43.120	0.563	1.3	5.7	100	15	34.6	40.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.067	1.321
UC-01	UB-02	Foundation Soils	19.4	22.0	4.0	0.023	56.410	0.578	1.3	4.8	100	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.067	1.307
UC-01	UB-02	Foundation Soils	19.4	21.9	4.1	0.051	73.490	1.253	1.3	4.9	100	15	34.5	39.3	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.067	1.307
UC-01	UB-02	Foundation Soils	19.5	21.8	4.5	0.076	73.980	1.684	1.3	5.4	100	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.067	1.312
UC-01	UB-02	Foundation Soils	19.6	21.7	4.8	0.175	71.040	3.666	1.3	5.7	100	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.067	1.315
UC-01	UB-02	Foundation Soils	19.7	21.6	4.5	0.123	65.130	2.742	1.3	5.3	100	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.067	1.309
UC-01	UB-02	Foundation Soils	19.8	21.6	4.6	0.094	59.750	2.025	1.3	5.5	100	15	34.6	40.1	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.067	1.310
UC-01	UB-02	Foundation Soils	19.8	21.5	13.4	0.063	83.310	0.470	1.2	15.6	61	15	35.2	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.067	1.426
UC-01	UB-02	Foundation Soils	19.9	21.4	54.2	0.063	98.530	0.116	1.2	62.2	0	0	0.0	62.2	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.067	1.558
UC-01	UB-02	Foundation Soils	20.0	21.3	62.0	0.090	-0.200	0.145	1.2	70.5	0	0	0.0	70.5	1.0	-0.3	0.0	0.9	0.108	1.010	0.112	0.067	1.662
UC-01	UB-02	Foundation Soils	20.1	21.2	47.1	0.135	0.380	0.287	1.2	54.3	13	0	0.2	54.5	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.067	1.465
UC-01	UB-02	Foundation Soils	20.2	21.2	37.1	0.171	6.730	0.461	1.2	43.2	28	0	0.4	43.7	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.067	1.343
UC-01	UB-02	Foundation Soils	20.3	21.1	22.4	0.256	18.200	1.145	1.3	26.7	59	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.067	1.170
UC-01	UB-02	Foundation Soils	20.3	21.0	20.1	0.344	25.510	1.708	1.3	24.1	70	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.067	1.144
UC-01	UB-02	Foundation Soils	20.4	20.9	27.8	0.416	26.820	1.498	1.2	32.6	58	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.067	1.229
UC-01	UB-02	Foundation Soils	20.5	20.8	30.6	0.384	26.520	1.257	1.2	35.7	52	0	0.5	36.2	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.067	1.260
UC-01	UB-02	Foundation Soils	20.6	20.7	16.4	0.277	16.910	1.686	1.3	19.7	74	0	0.5	20.2	1.0	-0.4	0.0	0.9	0.073	1.006	0.074	0.068	1.098
UC-01	UB-02	Foundation Soils	20.7	20.7	13.2	0.210	18.250	1.593	1.3	15.7	80	0	0.5	16.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.068	1.060
UC-01	UB-02	Foundation Soils	20.8	20.6	23.7	0.132	21.150	0.558	1.2	27.8	45	0	0.5	28.3	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.068	1.176
UC-01	UB-02	Foundation Soils	20.8	20.5	48.4	0.112	21.720	0.231	1.2	54.8	10	0	0.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.068	1.459
UC-01	UB-02	Foundation Soils	20.9	20.4	72.9	0.114	11.480	0.156	1.2	80.6	0	0	0.0	80.6	1.0	-0.4	0.0	0.9	0.116	1.012	0.121	0.068	1.787
UC-01	UB-02	Foundation Soils	21.0	20.3	75.9	0.151	9.770	0.199	1.2	83.6	0	0	0.0	83.6	1.0	-0.4	0.0	0.9	0.119	1.013	0.124	0.068	1.830
UC-01	UB-02	Foundation Soils	21.1	20.3	51.3	0.300	8.910	0.584	1.2	57.7	22	0	0.4	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.068	1.492
UC-01	UB-02	Foundation Soils	21.2	20.2	33.3	0.354	8.580	1.064	1.2	38.1	46	0	0.5	38.6	1.0	-0.4	0.0	0.9	0.084	1.007	0.087	0.068	1.277
UC-01	UB-02	Foundation Soils	21.2	20.1	19.5	0.345	14.680	1.766	1.2	22.8	70	0	0.5	23.3	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.068	1.122
UC-01	UB-02	Foundation Soils	21.3	20.0	15.2	0.444	15.910	2.927	1.2	17.8	89	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.068	1.073
UC-01	UB-02	Foundation Soils	21.4	19.9	15.7	0.417	30.110	2.658	1.2	18.3	86	0	0.5	18.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.068	1.078
UC-01	UB-02	Foundation Soils	21.5	19.8	37.5	0.279	22.870	0.745	1.2	42.4	36	0	0.5	42.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.090	0.068	1.318
UC-01	UB-02	Foundation Soils	21.6	19.8	41.6	0.307	13.390	0.738	1.2	46.7	33	0	0.5	47.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.093	0.068	1.363
UC-01	UB-02	Foundation Soils	21.7	19.7	34.9	0.300	18.800	0.861	1.2	39.4	41	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.068	1.285
UC-01	UB-02	Foundation Soils	21.7	19.6	35.3	0.224	20.160	0.635	1.2	39.7	35	0	0.5	40.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.068	1.287
UC-01	UB-02	Foundation Soils	21.8	19.5	35.0	0.294	20.890	0.841	1.2	39.3	41	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.068	1.283
UC-01	UB-02	Foundation Soils	21.9	19.4	39.5	0.503	17.960	1.273	1.2	44.1	45	0	0.5	44.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.068	1.333
UC-01	UB-02	Foundation Soils	22.0	19.3	52.4	0.449	19.850	0.857	1.2	57.7	29	0	0.5	58.2	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.068	1.481
UC-01	UB-02	Foundation Soils	22.1	19.3	65.8	0.600	16.480	0.912	1.2	71.6	24	0	0.5	72.0	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.068	1.649
UC-01	UB-02	Foundation Soils	22.1	19.2	73.2	0.433	17.530	0.592	1.1	79.1	12	0	0.2	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.119	0.068	1.747
UC-01	UB-02	Foundation Soils	22.2	19.1	70.7	0.376	7.340	0.532	1.1	76.4	11	0	0.2	76.5	1.0	-0.4	0.0	0.9	0.113	1.011	0.116	0.068	1.707
UC-01	UB-02	Foundation Soils	22.3	19.0	70.4	0.290	24.020	0.412	1.1	76.0	7	0	0.0	76.1	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.068	1.700
UC-01	UB-02	Foundation Soils	22.4	18.9	71.9	0.378	13.870	0.526	1.1	77.4	11	0	0.1	77.6	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.068	1.719
UC-01	UB-02	Foundation Soils	22.5	18.9	68.5	0.469	11.860	0.685	1.1	73.7	17	0	0.3	74.1	1.0	-0.4	0.0	0.9	0.111	1.011	0.114	0.068	1.671
UC-01	UB-02	Foundation Soils	22.6	18.8	64.2	0.485	20.770	0.756	1.1	69.2	21	0	0.4	69.6	1.0	-0.4	0.0	0.9	0.107	1.010	0.110	0.068	1.612
UC-01	UB-02	Foundation Soils	22.6	18.7	56.6	0.443	19.700	0.783	1.1	61.3	25	0	0.5	61.7	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.068	1.515
UC-01	UB-02	Foundation Soils	22.7	18.6	52.8	0.304	22.390	0.576	1.1	57.2	22	0	0.4	57.6	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.068	1.466
UC-01	UB-02	Foundation Soils	22.8	18.5	58.4	0.300	22.060	0.514	1.1	62.9	17	0	0.3	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.068	1.531
UC-01	UB-02	Foundation Soils	22.9	18.4	76.4	0.354	16.510	0.463	1.1	81.3	7	0	0.0	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.068	1.766
UC-01	UB-02	Foundation Soils	23.0	18.4	76.7	0.356	16.320	0.464	1.1	81.4	7	0	0.0	81.4	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.068	1.767
UC-01	UB-02	Foundation Soils	23.0	18.3	73.0	0.362	17.010	0.496	1.1	77.6	10	0	0.1	77.7	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.068	1.712
UC-01	UB-02	Foundation Soils	23.1	18.2	75.4	0.386	19.210	0.512	1.1	79.9	9	0	0.1	80.0	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.068	1.744
UC-01	UB-02	Foundation Soils	23.2	18.1	80.6	0.379	19.300	0.470	1.1	85.0	6	0	0.0	85.0	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.069	1.818

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	23.3	18.0	81.6	0.411	22.390	0.504	1.1	85.9	7	0	0.0	85.9	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.069	1.830
UC-01	UB-02	Foundation Soils	23.4	18.0	80.6	0.515	23.110	0.639	1.1	84.8	11	0	0.2	85.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.069	1.814
UC-01	UB-02	Foundation Soils	23.5	17.9	78.0	0.561	22.910	0.719	1.1	82.0	15	0	0.3	82.3	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.069	1.773
UC-01	UB-02	Foundation Soils	23.5	17.8	76.3	0.586	24.350	0.768	1.1	80.2	17	0	0.3	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.120	0.069	1.746
UC-01	UB-02	Foundation Soils	23.6	17.7	73.2	0.566	24.060	0.773	1.1	76.9	18	0	0.4	77.3	1.0	-0.4	0.0	0.9	0.113	1.011	0.117	0.069	1.700
UC-01	UB-02	Foundation Soils	23.7	17.6	77.4	0.574	23.420	0.742	1.1	81.0	16	0	0.3	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.069	1.756
UC-01	UB-02	Foundation Soils	23.8	17.5	82.8	0.632	19.680	0.763	1.1	86.3	14	0	0.3	86.6	1.0	-0.4	0.0	0.9	0.122	1.014	0.126	0.069	1.835
UC-01	UB-02	Foundation Soils	23.9	17.5	81.7	0.653	15.390	0.799	1.1	85.0	16	0	0.3	85.4	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.069	1.815
UC-01	UB-02	Foundation Soils	23.9	17.4	78.7	0.592	17.120	0.752	1.1	81.9	16	0	0.3	82.3	1.0	-0.4	0.1	0.9	0.118	1.013	0.121	0.069	1.767
UC-01	UB-02	Foundation Soils	24.0	17.3	77.0	0.581	20.020	0.755	1.1	80.1	16	0	0.3	80.4	1.0	-0.4	0.1	0.9	0.116	1.012	0.120	0.069	1.740
UC-01	UB-02	Foundation Soils	24.1	17.2	90.4	0.558	20.490	0.617	1.1	93.4	8	0	0.1	93.4	1.0	-0.4	0.1	0.9	0.129	1.016	0.134	0.069	1.946
UC-01	UB-02	Foundation Soils	24.2	17.1	102.2	0.491	18.960	0.480	1.1	105.0	0	0	0.0	105.0	1.0	-0.5	0.1	0.9	0.144	1.020	0.150	0.069	2.179
UC-01	UB-02	Foundation Soils	24.3	17.1	101.9	0.487	17.410	0.478	1.1	104.5	0	0	0.0	104.5	1.0	-0.5	0.1	0.9	0.143	1.019	0.149	0.069	2.167
UC-01	UB-02	Foundation Soils	24.4	17.0	97.3	0.500	17.960	0.514	1.1	99.9	2	0	0.0	99.9	1.0	-0.5	0.1	0.9	0.137	1.018	0.142	0.069	2.065
UC-01	UB-02	Foundation Soils	24.4	16.9	91.8	0.498	20.490	0.543	1.1	94.2	5	0	0.0	94.2	1.0	-0.5	0.1	0.9	0.130	1.016	0.135	0.069	1.956
UC-01	UB-02	Foundation Soils	24.5	16.8	84.8	0.445	20.630	0.525	1.1	87.1	7	0	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.126	0.069	1.835
UC-01	UB-02	Foundation Soils	24.6	16.7	80.8	0.435	21.060	0.538	1.1	83.1	9	0	0.1	83.2	1.0	-0.5	0.1	0.9	0.119	1.013	0.122	0.069	1.774
UC-01	UB-02	Foundation Soils	24.7	16.6	71.3	0.463	22.540	0.649	1.1	73.5	16	0	0.3	73.8	1.0	-0.5	0.1	0.9	0.110	1.011	0.113	0.069	1.643
UC-01	UB-02	Foundation Soils	24.8	16.6	63.9	0.492	21.150	0.770	1.1	65.9	23	0	0.4	66.4	1.0	-0.5	0.1	0.9	0.104	1.010	0.107	0.069	1.550
UC-01	UB-02	Foundation Soils	24.9	16.5	49.9	0.523	22.730	1.048	1.1	51.8	36	0	0.5	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.069	1.390
UC-01	UB-02	Foundation Soils	24.9	16.4	42.5	0.513	27.350	1.206	1.1	44.3	43	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.069	1.309
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.7	21.2	0.217	-0.090	1.023	1.6	32.9	49	20	42.3	75.2	1.1	-0.1	0.0	1.0	0.112	1.011	0.122	0.045	2.696
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.6	20.7	0.205	-0.110	0.989	1.6	32.1	49	20	42.2	74.3	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.045	2.660
UC-02A	UB-02 & UB-03	Foundation Soils	7.2	34.5	19.8	0.184	-0.050	0.931	1.6	30.7	50	20	42.0	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.119	0.046	2.607
UC-02A	UB-02 & UB-03	Foundation Soils	7.3	34.5	19.1	0.158	-0.050	0.829	1.6	29.6	49	20	41.6	71.2	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.046	2.561
UC-02A	UB-02 & UB-03	Foundation Soils	7.4	34.4	19.1	0.139	-0.240	0.727	1.6	29.6	47	20	41.3	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.046	2.539
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.3	19.5	0.124	-0.100	0.636	1.6	30.1	44	20	40.8	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.046	2.527
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.2	19.8	0.117	-0.050	0.590	1.6	30.5	43	20	40.6	71.1	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.047	2.516
UC-02A	UB-02 & UB-03	Foundation Soils	7.6	34.1	19.7	0.110	-0.100	0.560	1.6	30.2	42	20	40.4	70.6	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.047	2.493
UC-02A	UB-02 & UB-03	Foundation Soils	7.7	34.0	19.3	0.099	-0.010	0.513	1.6	29.6	42	20	40.1	69.7	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.047	2.462
UC-02A	UB-02 & UB-03	Foundation Soils	7.8	34.0	18.7	0.105	-0.050	0.562	1.6	28.6	44	20	40.5	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.047	2.437
UC-02A	UB-02 & UB-03	Foundation Soils	7.9	33.9	18.5	0.112	-0.050	0.604	1.6	28.3	45	20	40.7	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.047	2.423
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.8	18.0	0.112	-0.050	0.621	1.6	27.5	47	20	40.8	68.3	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.048	2.396
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.7	17.5	0.119	0.000	0.679	1.6	26.7	49	20	41.0	67.7	1.1	-0.1	0.0	1.0	0.105	1.010	0.114	0.048	2.373
UC-02A	UB-02 & UB-03	Foundation Soils	8.1	33.6	17.1	0.127	-0.050	0.741	1.6	26.1	51	20	41.2	67.3	1.1	-0.1	0.0	1.0	0.105	1.010	0.113	0.048	2.352
UC-02A	UB-02 & UB-03	Foundation Soils	8.2	33.5	16.3	0.129	-0.330	0.791	1.6	24.8	54	20	41.3	66.1	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.048	2.318
UC-02A	UB-02 & UB-03	Foundation Soils	8.3	33.5	15.8	0.124	0.000	0.786	1.6	24.0	55	20	41.2	65.2	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.049	2.291
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.4	15.4	0.119	-0.140	0.775	1.6	23.3	56	20	41.2	64.5	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.049	2.267
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.3	15.0	0.114	0.000	0.761	1.6	22.7	56	20	41.1	63.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.049	2.244
UC-02A	UB-02 & UB-03	Foundation Soils	8.5	33.2	14.9	0.110	0.000	0.741	1.6	22.4	56	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.049	2.228
UC-02A	UB-02 & UB-03	Foundation Soils	8.6	33.1	14.9	0.109	0.000	0.731	1.6	22.5	56	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.049	2.218
UC-02A	UB-02 & UB-03	Foundation Soils	8.7	33.1	14.8	0.112	-0.190	0.757	1.6	22.2	57	20	41.1	63.3	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.050	2.205
UC-02A	UB-02 & UB-03	Foundation Soils	8.8	33.0	14.3	0.117	0.000	0.816	1.6	21.5	59	20	41.1	62.7	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.050	2.184
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.9	13.8	0.110	-0.290	0.799	1.6	20.7	60	20	41.0	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.108	0.050	2.158
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.8	13.3	0.088	0.000	0.662	1.6	19.9	58	20	40.7	60.7	1.1	-0.1	0.0	1.0	0.100	1.009	0.107	0.050	2.131
UC-02A	UB-02 & UB-03	Foundation Soils	9.0	32.7	12.6	0.082	-0.050	0.653	1.6	18.8	60	20	40.6	59.5	1.1	-0.1	0.0	1.0	0.099	1.009	0.106	0.050	2.102
UC-02A	UB-02 & UB-03	Foundation Soils	9.1	32.6	11.5	0.081	0.000	0.702	1.6	17.3	64	20	40.6	57.9	1.1	-0.1	0.0	1.0	0.098	1.008	0.105	0.051	2.067
UC-02A	UB-02 & UB-03	Foundation Soils	9.2	32.6	11.0	0.080	-0.190	0.725	1.6	16.5	66	20	40.6	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.051	2.045
UC-02A	UB-02 & UB-03	Foundation Soils	9.3	32.5	11.2	0.081	1.750	0.726	1.6	16.7	66	20	40.6	57.3	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.051	2.040
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.4	11.2	0.089	2.570	0.792	1.6	16.7	67	20	40.7	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.051	2.034
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.3	11.2	0.103	4.510	0.922	1.6	16.6	70	20	40.8	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.051	2.026
UC-02A	UB-02 & UB-03	Foundation Soils	9.5	32.2	11.0	0.121	5.490	1.102	1.6	16.3	69	20	40.7	57.0	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.051	2.011
UC-02A	UB-02 & UB-03	Foundation Soils	9.6	32.2	10.4	0.124	6.200	1.192	1.6	15.4	72	20	40.7	56.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.103	0.052	1.989
UC-02A	UB-02 & UB-03	Foundation Soils	9.7	32.1	9.7	0.134	5.340	1.378	1.6	14.4	72	20	40.5	54.9	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.052	1.963
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	32.0	9.0	0.141	4.820	1.565	1.6	13.4	77	20	40.5	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.052	1.939
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	31.9	8.2	0.133	3.760	1.613	1.6	12.2	81	20	40.4	52.6	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.052	1.913
UC-02A	UB-02 & UB-03	Foundation Soils	9.9	31.8	9.3	0.119	2.420	1.283	1.6	13.7	73	20	40.3	54.0	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.052	1.928
UC-02A	UB-02 & UB-03	Foundation Soils	10.0	31.7	10.1	0.117	-2.520	1.157	1.6	14.8	73	20	40.6	55.4	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.053	1.943
UC-02A	UB-02 & UB-03	Foundation Soils	10.1	31.7	9.7	0.114	-3.380	1.173	1.6	14.2	74	20	40.5	54.8	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.053	1.926
UC-02A	UB-02 & UB-03	Foundation Soils	10.2	31.6	9.6	0.108	1.650	1.128	1.5	14.0	74	20	40.5	54.5	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.053	1.914
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.5	9.3	0.095	5.250	1.026	1.5	13.5	74	20	40.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.053	1.899
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.4	9.2	0.098	4.910	1.064	1.5	13.4	75	20	40.4	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.053	1.891

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	10.4	31.3	9.3	0.101	2.070	1.092	1.5	13.4	71	20	40.2	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.053	1.883
UC-02A	UB-02 & UB-03	Foundation Soils	10.5	31.3	9.4	0.122	1.720	1.292	1.5	13.7	74	20	40.4	54.1	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.054	1.882
UC-02A	UB-02 & UB-03	Foundation Soils	10.6	31.2	9.2	0.131	3.220	1.425	1.5	13.3	76	20	40.4	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.054	1.871
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.1	8.4	0.132	5.190	1.575	1.5	12.1	81	20	40.4	52.5	1.0	-0.1	0.0	1.0	0.094	1.008	0.099	0.054	1.847
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.0	8.1	0.133	8.160	1.640	1.5	11.7	83	20	40.3	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.054	1.834
UC-02A	UB-02 & UB-03	Foundation Soils	10.8	30.9	9.4	0.124	8.860	1.316	1.5	13.5	75	20	40.4	53.9	1.0	-0.2	0.0	1.0	0.095	1.008	0.101	0.054	1.856
UC-02A	UB-02 & UB-03	Foundation Soils	10.9	30.8	10.7	0.112	3.690	1.044	1.5	15.3	70	20	40.6	55.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.102	0.054	1.879
UC-02A	UB-02 & UB-03	Foundation Soils	11.0	30.8	12.6	0.121	0.330	0.963	1.5	17.7	68	20	41.0	58.7	1.1	-0.2	0.0	1.0	0.099	1.008	0.104	0.054	1.917
UC-02A	UB-02 & UB-03	Foundation Soils	11.1	30.7	13.4	0.139	-0.450	1.036	1.5	18.8	67	20	41.1	60.0	1.1	-0.2	0.0	1.0	0.100	1.009	0.105	0.055	1.931
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.6	13.7	0.137	1.240	0.999	1.5	19.2	66	20	41.1	60.3	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.055	1.931
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.5	13.7	0.127	4.670	0.925	1.5	19.2	65	20	41.1	60.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.055	1.923
UC-02A	UB-02 & UB-03	Foundation Soils	11.3	30.4	14.4	0.135	5.860	0.939	1.5	20.0	64	20	41.2	61.1	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.055	1.932
UC-02A	UB-02 & UB-03	Foundation Soils	11.4	30.4	15.9	0.149	1.200	0.935	1.5	22.0	60	20	41.3	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.055	1.960
UC-02A	UB-02 & UB-03	Foundation Soils	11.5	30.3	16.7	0.172	0.240	1.030	1.5	22.9	61	20	41.6	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.055	1.973
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.2	16.8	0.201	0.670	1.199	1.5	23.0	63	20	41.8	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.055	1.971
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.1	17.1	0.240	3.110	1.405	1.4	23.3	66	20	42.0	65.3	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.056	1.975
UC-02A	UB-02 & UB-03	Foundation Soils	11.7	30.0	17.8	0.231	4.750	1.298	1.4	24.2	63	20	42.0	66.2	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.056	1.984
UC-02A	UB-02 & UB-03	Foundation Soils	11.8	29.9	18.6	0.228	5.380	1.227	1.4	25.1	61	20	42.0	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.111	0.056	1.994
UC-02A	UB-02 & UB-03	Foundation Soils	11.9	29.9	19.9	0.240	5.960	1.204	1.4	26.8	59	20	42.2	69.0	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.056	2.018
UC-02A	UB-02 & UB-03	Foundation Soils	12.0	29.8	21.2	0.218	5.650	1.030	1.4	28.3	54	20	42.0	70.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.114	0.056	2.034
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.7	22.2	0.198	3.430	0.892	1.4	29.6	50	20	41.7	71.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.056	2.046
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.6	23.2	0.188	3.290	0.812	1.4	30.8	47	20	41.5	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.116	0.056	2.056
UC-02A	UB-02 & UB-03	Foundation Soils	12.2	29.5	24.1	0.194	5.270	0.804	1.4	31.9	46	20	41.5	73.4	1.1	-0.2	0.0	1.0	0.110	1.011	0.117	0.057	2.070
UC-02A	UB-02 & UB-03	Foundation Soils	12.3	29.4	24.6	0.238	5.880	0.967	1.4	32.4	48	20	42.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.057	2.083
UC-02A	UB-02 & UB-03	Foundation Soils	12.4	29.4	24.6	0.261	6.190	1.062	1.4	32.3	50	20	42.3	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.057	2.080
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.3	24.0	0.356	7.190	1.483	1.4	31.5	58	20	43.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.057	2.073
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.2	24.1	0.350	7.880	1.450	1.4	31.6	57	20	43.0	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.057	2.069
UC-02A	UB-02 & UB-03	Foundation Soils	12.6	29.1	27.9	0.344	10.290	1.235	1.4	36.1	50	20	43.0	79.1	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.057	2.143
UC-02A	UB-02 & UB-03	Foundation Soils	12.7	29.0	27.1	0.335	17.770	1.235	1.4	35.1	50	20	43.0	78.1	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.057	2.119
UC-02A	UB-02 & UB-03	Foundation Soils	12.8	29.0	24.3	0.335	6.170	1.378	1.4	31.6	56	20	42.9	74.5	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.057	2.053
UC-02A	UB-02 & UB-03	Foundation Soils	12.9	28.9	23.2	0.288	3.910	1.239	1.4	30.2	55	20	42.6	72.8	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.058	2.019
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.8	21.7	0.259	6.670	1.193	1.4	28.3	57	20	42.3	70.6	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.058	1.978
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.7	20.7	0.331	9.480	1.598	1.4	26.9	64	20	42.6	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.058	1.958
UC-02A	UB-02 & UB-03	Foundation Soils	13.1	28.6	18.1	0.380	9.600	2.096	1.4	23.7	70	20	42.4	66.0	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.058	1.899
UC-02A	UB-02 & UB-03	Foundation Soils	13.2	28.5	15.2	0.398	3.020	2.617	1.4	20.0	77	20	41.9	61.8	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.058	1.832
UC-02A	UB-02 & UB-03	Foundation Soils	13.3	28.5	13.2	0.263	5.340	1.989	1.4	17.4	76	20	41.3	58.7	1.0	-0.2	0.0	1.0	0.099	1.008	0.104	0.058	1.783
UC-02A	UB-02 & UB-03	Foundation Soils	13.4	28.4	12.1	0.197	11.400	1.627	1.4	16.0	75	20	40.9	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.058	1.754
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.3	17.8	0.135	20.680	0.759	1.4	23.1	55	20	41.1	64.2	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.058	1.854
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.2	20.5	0.061	7.310	0.297	1.4	26.6	38	20	38.5	65.1	1.0	-0.2	0.0	1.0	0.103	1.009	0.109	0.058	1.863
UC-02A	UB-02 & UB-03	Foundation Soils	13.6	28.1	17.6	0.041	-5.620	0.233	1.4	22.9	40	20	38.5	61.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.059	1.806
UC-02A	UB-02 & UB-03	Foundation Soils	13.7	28.1	15.4	0.049	-2.530	0.319	1.4	20.0	48	20	39.5	59.5	1.0	-0.2	0.0	1.0	0.099	1.009	0.104	0.059	1.775
UC-02A	UB-02 & UB-03	Foundation Soils	13.8	28.0	12.5	0.049	2.140	0.392	1.4	16.3	58	20	39.9	56.2	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.059	1.725
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.9	10.5	0.070	22.000	0.665	1.4	13.8	70	20	40.2	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.059	1.692
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.8	9.6	0.091	26.680	0.948	1.4	12.5	74	20	40.1	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.059	1.671
UC-02A	UB-02 & UB-03	Foundation Soils	14.0	27.7	10.1	0.101	27.490	0.999	1.4	13.2	73	20	40.2	53.4	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.059	1.677
UC-02A	UB-02 & UB-03	Foundation Soils	14.1	27.6	11.9	0.122	20.960	1.023	1.4	15.4	70	20	40.6	56.0	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.059	1.709
UC-02A	UB-02 & UB-03	Foundation Soils	14.2	27.6	12.6	0.109	14.850	0.864	1.4	16.3	69	20	40.7	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.059	1.718
UC-02A	UB-02 & UB-03	Foundation Soils	14.3	27.5	12.3	0.122	8.720	0.992	1.4	15.8	69	20	40.6	56.4	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.059	1.708
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.4	13.3	0.124	11.770	0.935	1.4	17.0	69	20	40.8	57.8	1.0	-0.2	0.0	1.0	0.098	1.008	0.102	0.059	1.723
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.3	18.4	0.139	9.710	0.757	1.3	23.2	55	20	41.1	64.3	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.060	1.810
UC-02A	UB-02 & UB-03	Foundation Soils	14.5	27.2	22.2	0.170	9.370	0.767	1.3	27.8	49	20	41.3	69.0	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.060	1.877
UC-02A	UB-02 & UB-03	Foundation Soils	14.6	27.2	31.1	0.212	10.390	0.682	1.3	38.4	37	20	40.5	78.9	1.0	-0.2	0.0	1.0	0.115	1.012	0.121	0.060	2.030
UC-02A	UB-02 & UB-03	Foundation Soils	14.7	27.1	39.3	0.271	8.340	0.690	1.3	47.9	30	20	39.2	87.0	1.0	-0.2	0.0	1.0	0.123	1.014	0.130	0.060	2.172
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	27.0	47.7	0.379	7.770	0.794	1.3	57.5	27	20	38.6	96.1	1.0	-0.2	0.0	1.0	0.132	1.016	0.141	0.060	2.358
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	26.9	59.4	0.426	6.920	0.718	1.3	70.9	19	20	30.6	101.6	1.1	-0.2	0.0	1.0	0.139	1.018	0.149	0.060	2.486
UC-02A	UB-02 & UB-03	Foundation Soils	14.9	26.8	67.3	0.479	6.960	0.712	1.3	80.1	15	20	23.8	103.9	1.1	-0.2	0.0	1.0	0.143	1.019	0.153	0.060	2.542
UC-02A	UB-02 & UB-03	Foundation Soils	15.0	26.7	76.0	0.511	6.640	0.672	1.3	90.4	10	20	11.4	101.8	1.1	-0.2	0.0	1.0	0.140	1.018	0.149	0.060	2.483
UC-02A	UB-02 & UB-03	Foundation Soils	15.1	26.7	85.4	0.607	6.480	0.711	1.3	101.0	8	20	5.4	106.4	1.1	-0.2	0.0	1.0	0.146	1.020	0.157	0.060	2.604
UC-02A	UB-02 & UB-03	Foundation Soils	15.2	26.6	91.2	0.740	6.220	0.811	1.2	106.8	9	20	8.4	115.2	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.060	2.887
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.5	94.9	0.739	5.860	0.779	1.2	110.9	7	20	3.4	114.3	1.1	-0.2	0.0	1.0	0.160	1.024	0.172	0.060	2.851
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.4	94.5	0.755	5.620	0.799	1.2	110.2	8	20	5.1	115.3	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.061	2.881
UC-02A	UB-02 & UB-03	Foundation Soils	15.4	26.3	86.7	0.827	5.380	0.954	1.2	100.2	14	20	23.9	124.1	1.1	-0.2	0.0	1.0	0.181	1.028	0.197	0.061	3.248

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	15.5	26.2	73.3	0.829	5.530	1.132	1.2	84.6	23	20	38.6	123.1	1.1	-0.2	0.0	1.0	0.179	1.028	0.194	0.061	3.197
UC-02A	UB-02 & UB-03	Foundation Soils	15.6	26.2	58.6	0.792	5.720	1.351	1.2	68.2	33	20	44.3	112.4	1.1	-0.2	0.0	1.0	0.156	1.023	0.168	0.061	2.765
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.1	43.3	0.722	6.420	1.669	1.2	51.0	46	20	45.3	96.3	1.0	-0.3	0.0	1.0	0.133	1.017	0.141	0.061	2.318
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.0	34.8	0.651	7.190	1.868	1.3	41.4	54	20	44.7	86.2	1.0	-0.3	0.0	1.0	0.122	1.014	0.128	0.061	2.108
UC-02A	UB-02 & UB-03	Foundation Soils	15.8	25.9	29.6	0.637	8.000	2.155	1.3	35.3	62	20	44.3	79.6	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.061	1.989
UC-02A	UB-02 & UB-03	Foundation Soils	15.9	25.8	20.9	0.617	8.400	2.955	1.3	25.3	74	20	42.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.111	0.061	1.810
UC-02A	UB-02 & UB-03	Foundation Soils	16.0	25.8	15.6	0.534	9.180	3.432	1.3	19.0	86	20	42.0	61.0	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.061	1.707
UC-02A	UB-02 & UB-03	Foundation Soils	16.1	25.7	10.4	0.479	9.340	4.615	1.3	12.8	100	20	41.0	53.7	1.0	-0.3	0.0	1.0	0.095	1.008	0.099	0.061	1.610
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.6	9.5	0.280	14.770	2.940	1.3	11.7	99	20	40.7	52.4	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.061	1.591
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.5	7.7	0.182	37.600	2.375	1.3	9.4	100	20	40.2	49.7	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.061	1.554
UC-02A	UB-02 & UB-03	Foundation Soils	16.3	25.4	8.2	0.161	74.090	1.970	1.3	10.0	96	20	40.3	50.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.062	1.560
UC-02A	UB-02 & UB-03	Foundation Soils	16.4	25.3	15.6	0.116	90.430	0.743	1.3	18.9	61	20	40.7	59.6	1.0	-0.3	0.0	1.0	0.099	1.009	0.103	0.062	1.676
UC-02A	UB-02 & UB-03	Foundation Soils	16.5	25.3	18.6	0.092	18.490	0.495	1.3	22.4	49	20	40.2	62.6	1.0	-0.3	0.0	1.0	0.101	1.009	0.106	0.062	1.713
UC-02A	UB-02 & UB-03	Foundation Soils	16.6	25.2	16.7	0.108	15.440	0.645	1.3	20.1	57	20	40.6	60.8	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.062	1.686
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.1	20.4	0.171	47.000	0.838	1.3	24.4	55	20	41.3	65.6	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.062	1.749
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.0	20.2	0.221	36.780	1.095	1.3	24.0	60	20	41.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.062	1.748
UC-02A	UB-02 & UB-03	Foundation Soils	16.8	24.9	13.9	0.232	14.530	1.673	1.3	16.7	76	20	41.1	57.8	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.062	1.640
UC-02A	UB-02 & UB-03	Foundation Soils	16.9	24.9	9.6	0.236	23.160	2.447	1.3	11.7	96	20	40.6	52.3	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.062	1.568
UC-02A	UB-02 & UB-03	Foundation Soils	17.0	24.8	7.7	0.188	58.390	2.450	1.3	9.3	100	20	40.2	49.5	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.062	1.531
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.7	9.6	0.142	69.470	1.477	1.3	11.6	86	20	40.4	52.0	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.062	1.559
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.6	10.8	0.122	62.770	1.130	1.3	12.9	78	20	40.4	53.3	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.062	1.574
UC-02A	UB-02 & UB-03	Foundation Soils	17.2	24.5	10.6	0.118	41.470	1.113	1.3	12.7	78	20	40.4	53.1	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.062	1.568
UC-02A	UB-02 & UB-03	Foundation Soils	17.3	24.4	9.0	0.108	42.400	1.198	1.3	10.8	85	20	40.2	51.0	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.062	1.541
UC-02A	UB-02 & UB-03	Foundation Soils	17.4	24.4	7.1	0.108	28.680	1.515	1.3	8.6	98	20	40.0	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.063	1.509
UC-02A	UB-02 & UB-03	Foundation Soils	17.5	24.3	5.5	0.112	37.470	2.020	1.3	6.7	100	20	39.6	46.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.063	1.480
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.2	5.2	0.117	51.120	2.268	1.3	6.2	100	20	39.5	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.063	1.471
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.1	4.6	0.136	64.690	2.929	1.3	5.6	100	20	39.4	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.063	1.460
UC-02A	UB-02 & UB-03	Foundation Soils	17.7	24.0	4.8	0.112	72.470	2.342	1.3	5.7	100	20	39.4	45.2	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.063	1.460
UC-02A	UB-02 & UB-03	Foundation Soils	17.8	24.0	5.6	0.085	76.690	1.529	1.3	6.6	100	20	39.6	46.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.063	1.471
UC-02A	UB-02 & UB-03	Foundation Soils	17.9	23.9	6.3	0.071	59.080	1.127	1.3	7.5	99	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.063	1.481
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.8	10.8	0.065	52.980	0.603	1.3	12.7	69	20	39.9	52.7	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.063	1.544
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.7	16.6	0.061	36.500	0.367	1.2	19.4	50	20	39.7	59.1	1.0	-0.3	0.0	0.9	0.099	1.009	0.102	0.063	1.622
UC-02A	UB-02 & UB-03	Foundation Soils	18.1	23.6	13.1	0.064	6.850	0.490	1.2	15.3	62	20	40.0	55.3	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.063	1.573
UC-02A	UB-02 & UB-03	Foundation Soils	18.2	23.5	8.8	0.071	-6.620	0.805	1.2	10.4	81	20	40.0	50.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.063	1.510
UC-02A	UB-02 & UB-03	Foundation Soils	18.3	23.5	7.0	0.071	1.190	1.012	1.2	8.3	94	20	39.9	48.1	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.063	1.482
UC-02A	UB-02 & UB-03	Foundation Soils	18.4	23.4	6.4	0.078	41.980	1.222	1.2	7.5	100	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.063	1.471
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.3	9.7	0.067	59.910	0.688	1.2	11.4	75	20	40.0	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.063	1.517
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.2	11.6	0.067	48.450	0.578	1.2	13.5	69	20	40.1	53.5	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.064	1.541
UC-02A	UB-02 & UB-03	Foundation Soils	18.6	23.1	14.5	0.072	30.590	0.495	1.2	16.8	59	20	40.1	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.064	1.581
UC-02A	UB-02 & UB-03	Foundation Soils	18.7	23.1	16.7	0.053	16.560	0.318	1.2	19.2	49	20	39.5	58.7	1.0	-0.3	0.0	0.9	0.099	1.008	0.102	0.064	1.601
UC-02A	UB-02 & UB-03	Foundation Soils	18.8	23.0	12.9	0.063	11.670	0.488	1.2	14.9	63	20	40.0	54.9	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.064	1.553
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.9	11.2	0.096	15.150	0.854	1.2	13.0	74	20	40.2	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.064	1.531
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.8	11.0	0.115	21.090	1.046	1.2	12.7	78	20	40.4	53.0	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.064	1.526
UC-02A	UB-02 & UB-03	Foundation Soils	19.0	22.7	7.4	0.126	19.660	1.704	1.2	8.6	100	20	40.0	48.6	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.064	1.472
UC-02A	UB-02 & UB-03	Foundation Soils	19.1	22.6	5.6	0.123	30.300	2.213	1.2	6.4	100	20	39.6	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.064	1.440
UC-02A	UB-02 & UB-03	Foundation Soils	19.2	22.6	4.7	0.117	44.640	2.469	1.2	5.5	100	20	39.4	44.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.064	1.425
UC-02A	UB-02 & UB-03	Foundation Soils	19.3	22.5	4.5	0.071	62.910	1.570	1.2	5.2	100	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.064	1.420
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.4	4.5	0.057	73.750	1.275	1.2	5.2	100	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.064	1.418
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.3	4.8	0.082	83.050	1.691	1.2	5.6	100	20	39.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.064	1.422
UC-02A	UB-02 & UB-03	Foundation Soils	19.5	22.2	5.4	0.088	82.660	1.622	1.2	6.2	100	20	39.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.064	1.429
UC-02A	UB-02 & UB-03	Foundation Soils	19.6	22.1	5.6	0.084	72.530	1.513	1.2	6.4	100	20	39.6	45.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.064	1.429
UC-02A	UB-02 & UB-03	Foundation Soils	19.7	22.1	6.9	0.068	69.660	0.981	1.2	7.9	96	20	39.8	47.7	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.064	1.449
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	22.0	9.9	0.091	6.340	0.923	1.2	11.2	81	20	40.1	51.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.064	1.489
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	21.9	8.7	0.100	14.720	1.152	1.2	9.9	90	20	40.1	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.095	0.064	1.471
UC-02A	UB-02 & UB-03	Foundation Soils	19.9	21.8	7.3	0.078	23.250	1.062	1.2	8.3	95	20	39.9	48.2	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.065	1.450
UC-02A	UB-02 & UB-03	Foundation Soils	20.0	21.7	6.1	0.066	44.340	1.077	1.2	7.0	100	20	39.7	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.065	1.430
UC-02A	UB-02 & UB-03	Foundation Soils	20.1	21.7	10.4	0.059	62.940	0.567	1.2	12.2	72	0	0.5	12.7	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.065	1.073
UC-02A	UB-02 & UB-03	Foundation Soils	20.2	21.6	22.2	0.151	71.950	0.681	1.2	25.8	51	0	0.5	26.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.065	1.207
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.5	18.7	0.237	21.870	1.264	1.2	21.9	67	0	0.5	22.4	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.065	1.166
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.4	13.8	0.198	22.930	1.437	1.2	16.1	78	0	0.5	16.6	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.065	1.107
UC-02A	UB-02 & UB-03	Foundation Soils	20.4	21.3	9.4	0.182	42.210	1.942	1.2	10.9	97	0	0.5	11.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.065	1.056
UC-02A	UB-02 & UB-03	Foundation Soils	20.5	21.2	15.3	0.215	64.950	1.407	1.2	17.8	74	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.065	1.122

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	20.6	21.2	57.1	0.254	87.190	0.445	1.2	63.1	14	0	0.3	63.3	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.065	1.618
UC-02A	UB-02 & UB-03	Foundation Soils	20.7	21.1	65.0	0.497	22.660	0.765	1.2	71.2	20	0	0.4	71.6	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.065	1.725
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	21.0	47.0	0.755	7.290	1.608	1.2	52.2	45	0	0.6	52.7	1.0	-0.4	0.0	0.9	0.094	1.008	0.097	0.065	1.487
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	20.9	30.0	0.683	13.100	2.274	1.2	34.0	65	0	0.5	34.5	1.0	-0.4	0.0	0.9	0.082	1.007	0.084	0.065	1.284
UC-02A	UB-02 & UB-03	Foundation Soils	20.9	20.8	25.1	0.659	21.010	2.631	1.2	28.5	72	0	0.5	29.0	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.065	1.225
UC-02A	UB-02 & UB-03	Foundation Soils	21.0	20.8	90.9	0.761	39.020	0.837	1.1	97.4	13	0	0.2	97.6	1.0	-0.4	0.0	0.9	0.134	1.017	0.140	0.065	2.149
UC-02A	UB-02 & UB-03	Foundation Soils	21.1	20.7	218.9	0.883	37.450	0.403	1.1	222.5	0	0	0.0	222.5	1.1	-0.4	0.0	0.9	8.684	1.082	10.094	0.065	154.733
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.6	259.1	1.050	18.530	0.405	1.1	260.8	0	0	0.0	260.8	1.1	-0.4	0.0	0.9	518.132	1.082	601.719	0.065	9218.484
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.5	275.3	1.167	14.110	0.424	1.1	276.9	0	0	0.0	276.9	1.1	-0.4	0.0	0.9	5888.862	1.082	6832.903	0.065	########
UC-02A	UB-02 & UB-03	Foundation Soils	21.3	20.4	280.1	1.218	12.250	0.435	1.1	281.5	0	0	0.0	281.5	1.1	-0.4	0.0	0.9	12926.975	1.082	14985.879	0.065	########
UC-02A	UB-02 & UB-03	Foundation Soils	21.4	20.3	278.3	1.250	8.960	0.449	1.1	279.4	0	0	0.0	279.4	1.1	-0.4	0.0	0.9	8958.875	1.082	10376.732	0.065	########
UC-02A	UB-02 & UB-03	Foundation Soils	21.5	20.3	270.5	1.224	11.000	0.453	1.1	271.3	0	0	0.0	271.3	1.1	-0.4	0.0	0.9	2397.744	1.082	2774.867	0.065	42420.040
UC-02A	UB-02 & UB-03	Foundation Soils	21.6	20.2	252.6	1.148	13.660	0.454	1.1	253.3	0	0	0.0	253.3	1.1	-0.4	0.0	0.9	193.153	1.082	223.344	0.065	3412.442
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.1	240.0	1.038	11.670	0.433	1.1	241.2	0	0	0.0	241.2	1.1	-0.4	0.0	0.9	48.660	1.082	56.218	0.065	858.487
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.0	224.9	0.949	14.050	0.422	1.1	226.7	0	0	0.0	226.7	1.1	-0.4	0.0	0.9	12.292	1.082	14.189	0.066	216.560
UC-02A	UB-02 & UB-03	Foundation Soils	21.8	19.9	214.8	0.852	12.430	0.397	1.1	216.9	0	0	0.0	216.9	1.1	-0.4	0.0	0.9	5.661	1.082	6.529	0.066	99.602
UC-02A	UB-02 & UB-03	Foundation Soils	21.9	19.9	197.3	0.787	12.840	0.399	1.1	200.0	0	0	0.0	200.0	1.1	-0.4	0.0	0.9	1.890	1.082	2.161	0.066	32.947
UC-02A	UB-02 & UB-03	Foundation Soils	22.0	19.8	173.5	0.732	12.820	0.422	1.1	176.9	0	0	0.0	176.9	1.0	-0.4	0.0	0.9	0.643	1.071	0.719	0.066	10.956
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.7	146.4	0.676	12.290	0.462	1.1	150.4	0	0	0.0	150.4	1.0	-0.4	0.0	0.9	0.291	1.046	0.315	0.066	4.795
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.6	118.5	0.704	12.780	0.594	1.1	122.9	0	0	0.0	122.9	1.0	-0.4	0.0	0.9	0.178	1.028	0.188	0.066	2.857
UC-02A	UB-02 & UB-03	Foundation Soils	22.2	19.5	98.6	0.561	13.150	0.569	1.1	103.0	3	0	0.0	103.0	1.0	-0.4	0.0	0.9	0.141	1.019	0.147	0.066	2.240
UC-02A	UB-02 & UB-03	Foundation Soils	22.3	19.4	78.7	0.530	13.530	0.673	1.1	82.9	13	0	0.2	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.122	0.066	1.863
UC-02A	UB-02 & UB-03	Foundation Soils	22.4	19.4	64.9	0.557	14.390	0.858	1.1	68.7	24	0	0.5	69.2	1.0	-0.4	0.0	0.9	0.107	1.010	0.109	0.066	1.664
UC-02A	UB-02 & UB-03	Foundation Soils	22.5	19.3	52.6	0.576	15.800	1.094	1.1	56.1	35	0	0.5	56.6	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.066	1.508
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.2	40.6	0.579	14.910	1.425	1.1	43.6	47	0	0.5	44.1	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.066	1.367
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.1	34.8	0.600	16.300	1.722	1.1	37.5	56	0	0.5	38.0	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.066	1.301
UC-02A	UB-02 & UB-03	Foundation Soils	22.7	19.0	28.6	0.447	18.620	1.565	1.1	30.9	60	0	0.5	31.4	1.0	-0.4	0.0	0.9	0.080	1.006	0.081	0.066	1.231
UC-02A	UB-02 & UB-03	Foundation Soils	22.8	18.9	24.8	0.421	19.280	1.697	1.1	26.9	65	0	0.5	27.4	1.0	-0.4	0.0	0.9	0.077	1.006	0.078	0.066	1.189
UC-02A	UB-02 & UB-03	Foundation Soils	22.9	18.9	15.9	0.332	31.920	2.083	1.2	17.4	83	0	0.5	17.9	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.066	1.095
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.8	13.3	0.284	41.160	2.142	1.2	14.4	90	0	0.5	14.9	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.066	1.066
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.7	17.2	0.213	17.500	1.236	1.2	18.7	71	0	0.5	19.2	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.066	1.106
UC-02A	UB-02 & UB-03	Foundation Soils	23.1	18.6	30.6	0.145	48.030	0.474	1.1	32.7	37	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.082	0.066	1.244
UC-02A	UB-02 & UB-03	Foundation Soils	23.2	18.5	44.4	0.131	20.440	0.295	1.1	46.9	18	0	0.3	47.3	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.066	1.393
UC-02A	UB-02 & UB-03	Foundation Soils	23.3	18.5	49.8	0.140	10.100	0.281	1.1	52.4	14	0	0.2	52.6	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.066	1.452
UC-02A	UB-02 & UB-03	Foundation Soils	23.4	18.4	48.0	0.159	9.740	0.331	1.1	50.4	17	0	0.3	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.066	1.429
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.3	41.1	0.197	15.960	0.479	1.1	43.3	28	0	0.4	43.8	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.066	1.353
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.2	38.0	0.203	19.580	0.534	1.1	40.1	32	0	0.5	40.5	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.066	1.317
UC-02A	UB-02 & UB-03	Foundation Soils	23.6	18.1	35.0	0.214	23.650	0.612	1.1	36.8	37	0	0.5	37.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.066	1.283
UC-02A	UB-02 & UB-03	Foundation Soils	23.7	18.0	34.5	0.210	26.440	0.609	1.1	36.3	37	0	0.5	36.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.066	1.276
UC-02A	UB-02 & UB-03	Foundation Soils	23.8	18.0	35.7	0.193	24.200	0.541	1.1	37.4	34	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.066	1.287
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.9	36.6	0.172	25.350	0.470	1.1	38.3	31	0	0.5	38.8	1.0	-0.4	0.0	0.9	0.085	1.007	0.086	0.066	1.296
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.8	37.6	0.175	24.820	0.465	1.1	39.3	30	0	0.5	39.7	1.0	-0.4	0.1	0.9	0.085	1.007	0.087	0.066	1.305
UC-02A	UB-02 & UB-03	Foundation Soils	24.0	17.7	39.2	0.203	24.260	0.518	1.1	40.8	31	0	0.5	41.3	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.066	1.321
UC-02A	UB-02 & UB-03	Foundation Soils	24.1	17.6	39.5	0.231	22.770	0.585	1.1	41.0	32	0	0.5	41.5	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.066	1.322
UC-02A	UB-02 & UB-03	Foundation Soils	24.2	17.6	39.5	0.238	24.920	0.602	1.1	41.0	33	0	0.5	41.5	1.0	-0.5	0.1	0.9	0.086	1.007	0.088	0.066	1.321
UC-02A	UB-02 & UB-03	Foundation Soils	24.3	17.5	42.9	0.243	27.440	0.566	1.1	44.4	29	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.066	1.356
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.4	46.3	0.237	26.300	0.511	1.1	47.7	25	0	0.4	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.067	1.392
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.3	49.4	0.238	22.960	0.482	1.1	50.7	22	0	0.4	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.095	0.067	1.423
UC-02A	UB-02 & UB-03	Foundation Soils	24.5	17.2	49.1	0.278	22.460	0.567	1.1	50.3	25	0	0.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.094	0.067	1.418
UC-02A	UB-02 & UB-03	Foundation Soils	24.6	17.1	46.6	0.312	22.220	0.670	1.1	47.8	30	0	0.5	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.067	1.390
UC-02A	UB-02 & UB-03	Foundation Soils	24.7	17.1	43.2	0.337	23.350	0.779	1.1	44.3	35	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.067	1.352
UC-02A	UB-02 & UB-03	Foundation Soils	24.8	17.0	39.2	0.333	23.250	0.849	1.1	40.2	39	0	0.5	40.7	1.0	-0.5	0.1	0.9	0.086	1.007	0.087	0.067	1.308
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.9	35.2	0.330	24.090	0.937	1.1	36.1	44	0	0.5	36.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.067	1.265
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.8	34.3	0.342	24.850	0.996	1.1	35.2	46	0	0.5	35.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.067	1.255
UC-03	UB-03	Foundation Soils	6.1	36.1	32.7	0.402	-3.290	1.228	1.7	51.7	38	30	49.9	101.7	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.045	3.446
UC-03	UB-03	Foundation Soils	6.2	36.0	33.3	0.388	-1.020	1.165	1.7	52.4	37	30	49.5	101.9	1.1	-0.1	0.0	1.0	0.140	1.018	0.157	0.046	3.432
UC-03	UB-03	Foundation Soils	6.2	35.9	33.9	0.388	-1.050	1.144	1.7	53.1	36	30	49.3	102.4	1.1	-0.1	0.0	1.0	0.141	1.019	0.157	0.046	3.429
UC-03	UB-03	Foundation Soils	6.3	35.8	34.3	0.340	-1.100	0.990	1.7	53.7	33	30	47.8	101.6	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.046	3.379
UC-03	UB-03	Foundation Soils	6.4	35.8	33.8	0.342	-0.910	1.011	1.7	52.9	34	30	48.1	101.0	1.1	-0.1	0.0	1.0	0.139	1.018	0.155	0.046	3.339
UC-03	UB-03	Foundation Soils	6.5	35.7	31.1	0.356	-0.950	1.145	1.7	48.7	39	30	49.5	98.2	1.1	-0.1	0.0	1.0	0.135	1.017	0.151	0.047	3.229
UC-03	UB-03	Foundation Soils	6.6	35.6	29.7	0.380	-1.000	1.280	1.7	46.5	42	30	50.1	96.7	1.1	-0.1	0.0	1.0	0.133	1.017	0.149	0.047	3.165
UC-03	UB-03	Foundation Soils	6.6	35.5	27.3	0.388	-1.180	1.422	1.7	43.0	47	30	50.5	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.145	0.047	3.054

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	6.7	35.4	27.5	0.370	-0.620	1.347	1.7	43.1	46	30	50.2	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.144	0.048	3.035
UC-03	UB-03	Foundation Soils	6.8	35.4	27.8	0.363	-0.330	1.304	1.7	43.5	45	30	50.1	93.7	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.048	3.025
UC-03	UB-03	Foundation Soils	6.9	35.3	28.7	0.365	-0.670	1.270	1.6	44.7	43	30	50.0	94.7	1.1	-0.1	0.0	1.0	0.131	1.016	0.146	0.048	3.040
UC-03	UB-03	Foundation Soils	7.0	35.2	28.5	0.361	-1.740	1.266	1.6	44.2	44	30	50.0	94.2	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.048	3.007
UC-03	UB-03	Foundation Soils	7.1	35.1	24.1	0.345	-1.750	1.434	1.7	37.8	51	30	50.0	87.8	1.1	-0.1	0.0	1.0	0.123	1.014	0.137	0.049	2.812
UC-03	UB-03	Foundation Soils	7.1	35.0	20.6	0.340	-1.670	1.647	1.7	32.7	58	30	49.8	82.5	1.1	-0.1	0.0	1.0	0.118	1.013	0.130	0.049	2.667
UC-03	UB-03	Foundation Soils	7.2	34.9	14.3	0.349	-1.240	2.445	1.7	22.9	72	30	48.5	71.4	1.1	-0.1	0.0	1.0	0.108	1.010	0.118	0.049	2.411
UC-03	UB-03	Foundation Soils	7.3	34.9	11.1	0.350	-1.160	3.167	1.7	17.7	78	30	47.6	65.3	1.1	-0.1	0.0	1.0	0.104	1.009	0.113	0.049	2.280
UC-03	UB-03	Foundation Soils	7.4	34.8	8.1	0.332	-0.620	4.101	1.7	13.0	93	30	46.9	59.9	1.1	-0.1	0.0	1.0	0.099	1.009	0.108	0.050	2.170
UC-03	UB-03	Foundation Soils	7.5	34.7	6.6	0.309	-0.190	4.661	1.7	10.6	100	30	46.5	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.105	0.050	2.110
UC-03	UB-03	Foundation Soils	7.5	34.6	5.3	0.269	-0.050	5.028	1.7	8.6	100	30	46.0	54.5	1.1	-0.1	0.0	1.0	0.096	1.008	0.103	0.050	2.056
UC-03	UB-03	Foundation Soils	7.6	34.5	4.4	0.230	9.740	5.214	1.7	7.1	100	30	45.6	52.7	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.050	2.014
UC-03	UB-03	Foundation Soils	7.7	34.5	4.0	0.210	13.670	5.283	1.7	6.4	100	30	45.4	51.8	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.051	1.989
UC-03	UB-03	Foundation Soils	7.8	34.4	3.3	0.193	14.150	5.887	1.7	5.3	100	30	45.1	50.4	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.051	1.957
UC-03	UB-03	Foundation Soils	7.9	34.3	2.8	0.167	34.730	5.908	1.7	4.5	100	30	44.9	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.051	1.933
UC-03	UB-03	Foundation Soils	8.0	34.2	2.8	0.178	37.590	6.257	1.7	4.6	100	30	45.0	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.051	1.924
UC-03	UB-03	Foundation Soils	8.0	34.1	3.2	0.182	34.920	5.656	1.7	5.2	100	30	45.1	50.3	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.051	1.927
UC-03	UB-03	Foundation Soils	8.1	34.0	3.9	0.203	31.540	5.209	1.7	6.2	100	30	45.4	51.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.052	1.940
UC-03	UB-03	Foundation Soils	8.2	34.0	3.7	0.229	29.760	6.213	1.7	5.9	100	30	45.3	51.2	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.052	1.925
UC-03	UB-03	Foundation Soils	8.3	33.9	4.0	0.225	35.830	5.564	1.7	6.5	100	30	45.4	51.9	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.052	1.927
UC-03	UB-03	Foundation Soils	8.4	33.8	5.3	0.215	46.980	4.085	1.7	8.4	100	30	45.9	54.4	1.1	-0.1	0.0	1.0	0.095	1.008	0.102	0.052	1.958
UC-03	UB-03	Foundation Soils	8.4	33.7	9.4	0.169	50.500	1.805	1.7	15.0	74	30	46.7	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.109	0.053	2.069
UC-03	UB-03	Foundation Soils	8.5	33.6	19.1	0.156	14.610	0.817	1.6	29.3	49	30	47.6	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.053	2.337
UC-03	UB-03	Foundation Soils	8.6	33.6	22.0	0.178	-0.140	0.809	1.6	33.4	44	30	47.7	81.0	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.053	2.410
UC-03	UB-03	Foundation Soils	8.7	33.5	22.4	0.181	-0.660	0.807	1.6	33.9	44	30	47.7	81.5	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.053	2.410
UC-03	UB-03	Foundation Soils	8.8	33.4	21.4	0.203	-0.990	0.949	1.6	32.3	48	30	48.2	80.5	1.1	-0.1	0.0	1.0	0.116	1.012	0.127	0.053	2.379
UC-03	UB-03	Foundation Soils	8.9	33.3	19.7	0.206	-0.730	1.048	1.6	29.8	53	30	48.4	78.1	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.054	2.321
UC-03	UB-03	Foundation Soils	8.9	33.2	18.7	0.251	-0.950	1.344	1.6	28.3	59	30	48.8	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.054	2.291
UC-03	UB-03	Foundation Soils	9.0	33.1	17.2	0.272	-2.240	1.580	1.6	26.1	65	30	48.8	74.9	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.054	2.241
UC-03	UB-03	Foundation Soils	9.1	33.1	14.4	0.253	-1.130	1.763	1.6	22.0	67	30	48.0	70.0	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.054	2.142
UC-03	UB-03	Foundation Soils	9.2	33.0	11.8	0.198	-0.150	1.680	1.6	18.2	72	30	47.4	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.054	2.059
UC-03	UB-03	Foundation Soils	9.3	32.9	11.9	0.180	-0.670	1.511	1.6	18.3	70	30	47.3	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.055	2.052
UC-03	UB-03	Foundation Soils	9.4	32.8	15.6	0.172	-0.800	1.099	1.6	23.6	61	30	47.9	71.5	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.055	2.146
UC-03	UB-03	Foundation Soils	9.4	32.7	18.7	0.161	-0.670	0.862	1.6	27.9	51	30	47.7	75.6	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.055	2.212
UC-03	UB-03	Foundation Soils	9.5	32.6	21.6	0.174	-1.470	0.804	1.6	31.9	46	30	47.6	79.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.125	0.055	2.279
UC-03	UB-03	Foundation Soils	9.6	32.6	22.0	0.120	-1.380	0.546	1.6	32.4	39	30	45.9	78.4	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.055	2.247
UC-03	UB-03	Foundation Soils	9.7	32.5	22.0	0.129	-1.290	0.587	1.6	32.3	40	30	46.3	78.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.055	2.244
UC-03	UB-03	Foundation Soils	9.8	32.4	21.4	0.163	-1.190	0.761	1.6	31.4	45	30	47.4	78.8	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.056	2.240
UC-03	UB-03	Foundation Soils	9.8	32.3	17.1	0.198	-1.050	1.156	1.6	25.3	59	30	48.2	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.056	2.135
UC-03	UB-03	Foundation Soils	9.9	32.2	19.4	0.222	-0.950	1.146	1.6	28.4	56	30	48.5	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.056	2.188
UC-03	UB-03	Foundation Soils	10.0	32.2	18.4	0.229	-0.710	1.248	1.6	26.9	59	30	48.5	75.4	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.056	2.154
UC-03	UB-03	Foundation Soils	10.1	32.1	17.1	0.245	-0.180	1.435	1.6	25.0	64	30	48.5	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.056	2.114
UC-03	UB-03	Foundation Soils	10.2	32.0	16.0	0.301	1.430	1.880	1.6	23.5	67	30	48.3	71.8	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.056	2.078
UC-03	UB-03	Foundation Soils	10.3	31.9	15.4	0.262	1.520	1.705	1.6	22.5	71	30	48.4	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.057	2.056
UC-03	UB-03	Foundation Soils	10.3	31.8	14.3	0.265	3.200	1.848	1.6	21.1	70	30	48.0	69.0	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.057	2.018
UC-03	UB-03	Foundation Soils	10.4	31.7	15.5	0.288	3.950	1.864	1.5	22.6	68	30	48.2	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.057	2.040
UC-03	UB-03	Foundation Soils	10.5	31.7	19.3	0.304	1.430	1.574	1.5	27.8	62	30	49.0	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.057	2.138
UC-03	UB-03	Foundation Soils	10.6	31.6	22.7	0.278	-3.810	1.223	1.5	32.3	53	30	49.0	81.3	1.1	-0.1	0.0	1.0	0.117	1.012	0.127	0.057	2.215
UC-03	UB-03	Foundation Soils	10.7	31.5	18.4	0.319	-4.320	1.736	1.5	26.4	66	30	49.0	75.3	1.1	-0.1	0.0	1.0	0.112	1.011	0.120	0.057	2.099
UC-03	UB-03	Foundation Soils	10.7	31.4	13.2	0.315	-2.570	2.391	1.5	19.2	74	30	47.7	66.9	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.057	1.953
UC-03	UB-03	Foundation Soils	10.8	31.3	9.7	0.327	12.580	3.372	1.6	14.3	90	30	47.2	61.4	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.058	1.863
UC-03	UB-03	Foundation Soils	10.9	31.3	10.6	0.303	22.510	2.864	1.6	15.5	84	30	47.3	62.7	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.058	1.877
UC-03	UB-03	Foundation Soils	11.0	31.2	9.9	0.245	8.610	2.464	1.6	14.6	83	30	47.0	61.5	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.058	1.854
UC-03	UB-03	Foundation Soils	11.1	31.1	9.5	0.179	4.050	1.879	1.6	13.9	79	30	46.7	60.6	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.058	1.835
UC-03	UB-03	Foundation Soils	11.2	31.0	7.4	0.175	5.700	2.376	1.6	10.8	92	30	46.4	57.2	1.1	-0.2	0.0	1.0	0.097	1.008	0.104	0.058	1.780
UC-03	UB-03	Foundation Soils	11.2	30.9	5.2	0.177	8.480	3.376	1.6	7.8	100	30	45.8	53.5	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.058	1.723
UC-03	UB-03	Foundation Soils	11.3	30.8	3.9	0.192	18.680	4.953	1.6	5.8	100	30	45.3	51.0	1.1	-0.2	0.0	1.0	0.093	1.008	0.099	0.059	1.684
UC-03	UB-03	Foundation Soils	11.4	30.8	4.5	0.184	31.450	4.120	1.6	6.6	100	30	45.5	52.1	1.1	-0.2	0.0	1.0	0.094	1.008	0.099	0.059	1.694
UC-03	UB-03	Foundation Soils	11.5	30.7	5.4	0.166	22.440	3.091	1.6	7.9	100	30	45.8	53.7	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.059	1.711
UC-03	UB-03	Foundation Soils	11.6	30.6	7.9	0.154	22.200	1.937	1.5	11.5	87	30	46.4	57.9	1.1	-0.2	0.0	1.0	0.098	1.008	0.104	0.059	1.765
UC-03	UB-03	Foundation Soils	11.6	30.5	10.5	0.153	5.100	1.460	1.5	15.0	72	30	46.6	61.7	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.059	1.815
UC-03	UB-03	Foundation Soils	11.7	30.4	11.0	0.150	2.000	1.358	1.5	15.8	73	30	46.9	62.6	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.059	1.824

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	11.8	30.4	11.6	0.146	3.100	1.263	1.5	16.5	71	30	46.9	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.059	1.830
UC-03	UB-03	Foundation Soils	11.9	30.3	11.9	0.143	4.380	1.200	1.5	16.9	69	30	46.9	63.8	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.059	1.832
UC-03	UB-03	Foundation Soils	12.0	30.2	12.1	0.154	4.860	1.268	1.5	17.2	70	30	47.0	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.060	1.832
UC-03	UB-03	Foundation Soils	12.1	30.1	12.3	0.148	4.810	1.206	1.5	17.3	68	30	46.9	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.060	1.829
UC-03	UB-03	Foundation Soils	12.1	30.0	12.4	0.164	4.910	1.318	1.5	17.5	70	30	47.1	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.060	1.829
UC-03	UB-03	Foundation Soils	12.2	29.9	12.8	0.157	5.050	1.223	1.5	18.0	67	30	47.0	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.060	1.832
UC-03	UB-03	Foundation Soils	12.3	29.9	13.4	0.155	4.510	1.153	1.5	18.7	69	30	47.3	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.060	1.843
UC-03	UB-03	Foundation Soils	12.4	29.8	13.2	0.158	3.860	1.196	1.5	18.4	70	30	47.3	65.7	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.060	1.834
UC-03	UB-03	Foundation Soils	12.5	29.7	12.5	0.166	4.030	1.331	1.5	17.4	70	30	47.1	64.4	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.060	1.811
UC-03	UB-03	Foundation Soils	12.5	29.6	12.3	0.177	4.190	1.436	1.5	17.1	72	30	47.1	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.060	1.804
UC-03	UB-03	Foundation Soils	12.6	29.5	12.3	0.183	4.900	1.494	1.5	17.0	73	30	47.1	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.061	1.798
UC-03	UB-03	Foundation Soils	12.7	29.4	12.7	0.200	5.290	1.581	1.5	17.5	73	30	47.3	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.061	1.803
UC-03	UB-03	Foundation Soils	12.8	29.4	13.5	0.240	5.880	1.778	1.5	18.6	74	30	47.6	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.061	1.818
UC-03	UB-03	Foundation Soils	12.9	29.3	14.2	0.300	6.150	2.106	1.5	19.5	72	30	47.7	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.061	1.830
UC-03	UB-03	Foundation Soils	13.0	29.2	14.2	0.353	7.950	2.486	1.4	19.4	76	30	47.9	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.061	1.827
UC-03	UB-03	Foundation Soils	13.0	29.1	12.6	0.440	8.620	3.488	1.5	17.3	87	30	47.8	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.061	1.791
UC-03	UB-03	Foundation Soils	13.1	29.0	9.7	0.479	11.930	4.961	1.5	13.3	100	30	47.2	60.5	1.0	-0.2	0.0	1.0	0.100	1.009	0.106	0.061	1.723
UC-03	UB-03	Foundation Soils	13.2	29.0	7.7	0.508	6.100	6.608	1.5	10.6	100	30	46.5	57.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.103	0.061	1.674
UC-03	UB-03	Foundation Soils	13.3	28.9	6.2	0.515	14.190	8.282	1.5	8.6	100	30	46.0	54.6	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.062	1.637
UC-03	UB-03	Foundation Soils	13.4	28.8	4.7	0.522	36.640	11.133	1.5	6.5	100	30	45.5	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.062	1.599
UC-03	UB-03	Foundation Soils	13.5	28.7	4.1	0.497	34.830	12.100	1.5	5.7	100	30	45.2	51.0	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.062	1.583
UC-03	UB-03	Foundation Soils	13.5	28.6	3.6	0.419	42.500	11.494	1.5	5.1	100	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.062	1.570
UC-03	UB-03	Foundation Soils	13.6	28.5	3.4	0.406	49.020	11.955	1.5	4.7	100	30	45.0	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.062	1.561
UC-03	UB-03	Foundation Soils	13.7	28.5	3.1	0.399	50.170	12.816	1.5	4.3	100	30	44.9	49.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.062	1.552
UC-03	UB-03	Foundation Soils	13.8	28.4	3.5	0.381	50.690	10.866	1.5	4.8	100	30	45.0	49.9	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.062	1.557
UC-03	UB-03	Foundation Soils	13.9	28.3	3.7	0.360	21.150	9.724	1.5	5.1	100	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.062	1.558
UC-03	UB-03	Foundation Soils	13.9	28.2	3.1	0.328	9.560	10.685	1.5	4.2	100	30	44.9	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.096	0.062	1.541
UC-03	UB-03	Foundation Soils	14.0	28.1	2.2	0.298	10.050	13.347	1.5	3.1	100	30	44.6	47.7	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.062	1.521
UC-03	UB-03	Foundation Soils	14.1	28.1	1.4	0.250	27.490	17.342	1.5	2.0	100	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.063	1.501
UC-03	UB-03	Foundation Soils	14.2	28.0	1.4	0.193	36.070	13.448	1.5	2.0	100	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.063	1.498
UC-03	UB-03	Foundation Soils	14.3	27.9	1.3	0.339	49.690	25.874	1.5	1.8	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.063	1.493
UC-03	UB-03	Foundation Soils	14.4	27.8	1.3	0.338	55.840	25.063	1.5	1.8	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.063	1.491
UC-03	UB-03	Foundation Soils	14.4	27.7	1.4	0.369	57.410	27.164	1.4	1.9	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.063	1.489
UC-03	UB-03	Foundation Soils	14.5	27.6	1.4	0.370	53.730	26.515	1.4	1.9	100	30	44.3	46.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.063	1.487
UC-03	UB-03	Foundation Soils	14.6	27.6	4.4	0.395	-0.820	8.988	1.4	5.9	100	30	45.3	51.2	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.063	1.546
UC-03	UB-03	Foundation Soils	14.7	27.5	4.4	0.433	12.910	9.953	1.4	5.8	100	30	45.3	51.1	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.063	1.542
UC-03	UB-03	Foundation Soils	14.8	27.4	4.6	0.447	27.110	9.719	1.4	6.1	100	30	45.4	51.5	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.063	1.544
UC-03	UB-03	Foundation Soils	14.8	27.3	5.1	0.408	26.390	7.946	1.4	6.8	100	30	45.5	52.4	1.0	-0.2	0.0	1.0	0.094	1.008	0.098	0.063	1.552
UC-03	UB-03	Foundation Soils	14.9	27.2	6.0	0.375	17.150	6.284	1.4	7.9	100	30	45.8	53.7	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.064	1.566
UC-03	UB-03	Foundation Soils	15.0	27.2	7.2	0.355	7.050	4.942	1.4	9.5	100	30	46.2	55.7	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.064	1.588
UC-03	UB-03	Foundation Soils	15.1	27.1	10.7	0.301	3.260	2.813	1.4	13.9	90	30	47.1	61.0	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.064	1.654
UC-03	UB-03	Foundation Soils	15.2	27.0	17.4	0.267	-8.530	1.534	1.4	22.3	69	30	48.2	70.5	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.064	1.781
UC-03	UB-03	Foundation Soils	15.3	26.9	21.6	0.237	-8.770	1.096	1.3	27.4	56	30	48.2	75.6	1.0	-0.2	0.0	1.0	0.112	1.011	0.118	0.064	1.855
UC-03	UB-03	Foundation Soils	15.3	26.8	22.6	0.253	-5.720	1.120	1.3	28.5	55	30	48.4	76.9	1.0	-0.2	0.0	1.0	0.113	1.011	0.120	0.064	1.871
UC-03	UB-03	Foundation Soils	15.4	26.7	24.1	0.266	5.140	1.103	1.3	30.3	53	30	48.5	78.8	1.0	-0.2	0.0	1.0	0.115	1.012	0.122	0.064	1.898
UC-03	UB-03	Foundation Soils	15.5	26.7	25.1	0.268	6.670	1.068	1.3	31.4	51	30	48.5	79.9	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.064	1.913
UC-03	UB-03	Foundation Soils	15.6	26.6	25.7	0.259	6.860	1.006	1.3	32.1	49	30	48.4	80.5	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.064	1.919
UC-03	UB-03	Foundation Soils	15.7	26.5	25.5	0.252	6.620	0.989	1.3	31.8	49	30	48.3	80.1	1.0	-0.3	0.0	1.0	0.116	1.012	0.123	0.064	1.909
UC-03	UB-03	Foundation Soils	15.7	26.4	24.5	0.244	6.230	0.997	1.3	30.5	51	30	48.2	78.7	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.064	1.885
UC-03	UB-03	Foundation Soils	15.8	26.3	20.4	0.230	6.240	1.129	1.3	25.5	59	30	48.1	73.6	1.0	-0.3	0.0	1.0	0.110	1.011	0.116	0.064	1.805
UC-03	UB-03	Foundation Soils	15.9	26.3	18.1	0.211	6.500	1.166	1.3	22.7	63	30	47.8	70.6	1.0	-0.3	0.0	1.0	0.108	1.010	0.113	0.064	1.758
UC-03	UB-03	Foundation Soils	16.0	26.2	13.8	0.192	6.960	1.390	1.3	17.5	72	30	47.2	64.6	1.0	-0.3	0.0	1.0	0.103	1.009	0.108	0.065	1.674
UC-03	UB-03	Foundation Soils	16.1	26.1	8.6	0.183	7.590	2.139	1.4	10.9	94	30	46.4	57.3	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.065	1.578
UC-03	UB-03	Foundation Soils	16.2	26.0	6.7	0.133	7.720	1.992	1.4	8.5	100	30	46.0	54.5	1.0	-0.3	0.0	1.0	0.095	1.008	0.100	0.065	1.541
UC-03	UB-03	Foundation Soils	16.2	25.9	4.6	0.139	8.120	3.034	1.4	5.9	100	30	45.3	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.065	1.498
UC-03	UB-03	Foundation Soils	16.3	25.8	3.3	0.132	8.240	3.998	1.4	4.2	100	30	44.9	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.096	0.065	1.471
UC-03	UB-03	Foundation Soils	16.4	25.8	2.6	0.125	8.560	4.783	1.4	3.4	100	30	44.7	48.0	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.065	1.456
UC-03	UB-03	Foundation Soils	16.5	25.7	2.2	0.112	7.080	5.175	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.065	1.445
UC-03	UB-03	Foundation Soils	16.6	25.6	2.2	0.106	10.480	4.895	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.065	1.442
UC-03	UB-03	Foundation Soils	16.7	25.5	2.2	0.097	15.970	4.410	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.065	1.440
UC-03	UB-03	Foundation Soils	16.7	25.4	2.5	0.092	17.580	3.637	1.4	3.2	100	30	44.6	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.066	1.443
UC-03	UB-03	Foundation Soils	16.8	25.3	3.9	0.107	17.120	2.767	1.4	4.9	100	30	45.0	50.0	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.066	1.465

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	16.9	25.3	7.0	0.139	14.390	1.974	1.3	8.9	100	30	46.0	55.0	1.0	-0.3	0.0	1.0	0.096	1.008	0.100	0.066	1.522
UC-03	UB-03	Foundation Soils	17.0	25.2	20.6	0.167	6.100	0.809	1.4	27.5	53	0	0.5	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.080	0.066	1.218
UC-03	UB-03	Foundation Soils	17.1	25.1	27.3	0.203	7.050	0.745	1.4	35.6	43	0	0.5	36.1	1.0	-0.3	0.0	1.0	0.083	1.007	0.086	0.066	1.303
UC-03	UB-03	Foundation Soils	17.1	25.0	29.2	0.273	6.380	0.936	1.4	37.8	45	0	0.5	38.3	1.0	-0.3	0.0	1.0	0.084	1.007	0.087	0.066	1.325
UC-03	UB-03	Foundation Soils	17.2	24.9	30.1	0.277	8.000	0.919	1.4	38.8	44	0	0.5	39.4	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.066	1.335
UC-03	UB-03	Foundation Soils	17.3	24.9	30.6	0.282	8.240	0.922	1.4	39.3	43	0	0.5	39.8	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.066	1.339
UC-03	UB-03	Foundation Soils	17.4	24.8	31.8	0.270	8.430	0.849	1.4	40.6	41	0	0.5	41.2	1.0	-0.3	0.0	1.0	0.086	1.007	0.089	0.066	1.352
UC-03	UB-03	Foundation Soils	17.5	24.7	36.4	0.263	9.010	0.722	1.3	46.0	34	0	0.5	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.066	1.411
UC-03	UB-03	Foundation Soils	17.6	24.6	40.7	0.253	8.910	0.621	1.3	50.9	28	0	0.5	51.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.066	1.465
UC-03	UB-03	Foundation Soils	17.6	24.5	44.9	0.260	8.410	0.580	1.3	55.5	24	0	0.4	56.0	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.066	1.518
UC-03	UB-03	Foundation Soils	17.7	24.4	49.6	0.303	8.750	0.611	1.3	60.8	22	0	0.4	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.105	0.066	1.580
UC-03	UB-03	Foundation Soils	17.8	24.4	53.9	0.351	8.850	0.651	1.3	65.6	20	0	0.4	66.0	1.0	-0.3	0.0	0.9	0.104	1.009	0.109	0.066	1.639
UC-03	UB-03	Foundation Soils	17.9	24.3	57.6	0.392	8.580	0.681	1.3	69.5	19	0	0.4	69.9	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.066	1.689
UC-03	UB-03	Foundation Soils	18.0	24.2	58.1	0.421	8.310	0.725	1.3	69.9	20	0	0.4	70.3	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.066	1.692
UC-03	UB-03	Foundation Soils	18.0	24.1	56.3	0.443	8.240	0.786	1.3	67.8	23	0	0.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.067	1.664
UC-03	UB-03	Foundation Soils	18.1	24.0	53.7	0.449	8.240	0.837	1.3	64.7	25	0	0.5	65.2	1.0	-0.3	0.0	0.9	0.103	1.009	0.108	0.067	1.622
UC-03	UB-03	Foundation Soils	18.2	24.0	50.7	0.451	8.380	0.890	1.3	61.2	28	0	0.5	61.7	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.067	1.577
UC-03	UB-03	Foundation Soils	18.3	23.9	47.8	0.442	8.650	0.925	1.3	57.9	31	0	0.5	58.4	1.0	-0.3	0.0	0.9	0.098	1.008	0.102	0.067	1.534
UC-03	UB-03	Foundation Soils	18.4	23.8	45.4	0.435	8.810	0.959	1.3	55.1	33	0	0.5	55.6	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.067	1.499
UC-03	UB-03	Foundation Soils	18.5	23.7	45.0	0.470	8.960	1.045	1.3	54.5	35	0	0.5	55.1	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.067	1.492
UC-03	UB-03	Foundation Soils	18.5	23.6	46.7	0.477	9.290	1.021	1.3	56.4	34	0	0.5	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.067	1.512
UC-03	UB-03	Foundation Soils	18.6	23.5	48.6	0.417	9.500	0.859	1.3	58.3	29	0	0.5	58.8	1.0	-0.3	0.0	0.9	0.099	1.008	0.103	0.067	1.533
UC-03	UB-03	Foundation Soils	18.7	23.5	53.2	0.447	9.910	0.841	1.3	63.3	26	0	0.5	63.8	1.0	-0.3	0.0	0.9	0.102	1.009	0.107	0.067	1.593
UC-03	UB-03	Foundation Soils	18.8	23.4	58.5	0.469	10.050	0.802	1.3	69.1	22	0	0.4	69.5	1.0	-0.3	0.0	0.9	0.107	1.010	0.111	0.067	1.665
UC-03	UB-03	Foundation Soils	18.9	23.3	64.5	0.502	9.460	0.778	1.2	75.5	19	0	0.4	75.9	1.0	-0.3	0.0	0.9	0.112	1.011	0.117	0.067	1.751
UC-03	UB-03	Foundation Soils	18.9	23.2	68.1	0.516	9.020	0.757	1.2	79.3	17	0	0.3	79.6	1.0	-0.3	0.0	0.9	0.115	1.012	0.121	0.067	1.803
UC-03	UB-03	Foundation Soils	19.0	23.1	66.1	0.528	9.200	0.799	1.2	76.9	19	0	0.4	77.3	1.0	-0.3	0.0	0.9	0.113	1.011	0.119	0.067	1.768
UC-03	UB-03	Foundation Soils	19.1	23.1	64.0	0.512	9.340	0.799	1.2	74.6	20	0	0.4	75.0	1.0	-0.3	0.0	0.9	0.111	1.011	0.116	0.067	1.733
UC-03	UB-03	Foundation Soils	19.2	23.0	61.0	0.494	9.790	0.810	1.2	71.1	22	0	0.4	71.6	1.0	-0.3	0.0	0.9	0.109	1.010	0.113	0.067	1.684
UC-03	UB-03	Foundation Soils	19.3	22.9	58.7	0.474	9.840	0.807	1.2	68.6	23	0	0.4	69.0	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.067	1.649
UC-03	UB-03	Foundation Soils	19.4	22.8	56.5	0.469	9.960	0.830	1.2	66.0	24	0	0.5	66.5	1.0	-0.3	0.0	0.9	0.104	1.010	0.109	0.067	1.615
UC-03	UB-03	Foundation Soils	19.4	22.7	53.9	0.427	10.010	0.793	1.2	63.0	25	0	0.5	63.4	1.0	-0.3	0.0	0.9	0.102	1.009	0.106	0.067	1.575
UC-03	UB-03	Foundation Soils	19.5	22.6	51.1	0.385	10.110	0.754	1.2	59.8	26	0	0.5	60.3	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.067	1.535
UC-03	UB-03	Foundation Soils	19.6	22.6	48.4	0.381	10.200	0.786	1.2	56.8	28	0	0.5	57.3	1.0	-0.3	0.0	0.9	0.098	1.008	0.101	0.067	1.499
UC-03	UB-03	Foundation Soils	19.7	22.5	45.8	0.373	10.150	0.814	1.2	53.8	30	0	0.5	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.099	0.067	1.463
UC-03	UB-03	Foundation Soils	19.8	22.4	40.7	0.368	8.760	0.905	1.3	48.0	36	0	0.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.067	1.396
UC-03	UB-03	Foundation Soils	19.8	22.3	39.0	0.400	9.770	1.026	1.3	46.1	40	0	0.5	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.068	1.374
UC-03	UB-03	Foundation Soils	19.9	22.2	37.2	0.442	9.670	1.188	1.3	44.0	44	0	0.5	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.068	1.350
UC-03	UB-03	Foundation Soils	20.0	22.2	31.0	0.487	9.560	1.569	1.3	37.0	55	0	0.5	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.086	0.068	1.274
UC-03	UB-03	Foundation Soils	20.1	22.1	22.1	0.542	9.960	2.458	1.3	26.7	72	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.068	1.167
UC-03	UB-03	Foundation Soils	20.2	22.0	14.9	0.529	10.290	3.561	1.3	18.2	92	0	0.5	18.7	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.068	1.083
UC-03	UB-03	Foundation Soils	20.3	21.9	10.8	0.483	11.100	4.456	1.3	13.2	100	0	0.5	13.7	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.068	1.036
UC-03	UB-03	Foundation Soils	20.3	21.8	8.9	0.379	11.530	4.262	1.3	10.8	100	0	0.5	11.3	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.068	1.012
UC-03	UB-03	Foundation Soils	20.4	21.7	7.2	0.284	12.290	3.968	1.3	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.068	0.992
UC-03	UB-03	Foundation Soils	20.5	21.7	6.0	0.215	24.770	3.575	1.3	7.3	100	0	0.5	7.8	1.0	-0.4	0.0	0.9	0.065	1.006	0.066	0.068	0.979
UC-03	UB-03	Foundation Soils	20.6	21.6	6.2	0.148	56.980	2.404	1.3	7.5	100	0	0.5	7.9	1.0	-0.4	0.0	0.9	0.065	1.006	0.067	0.068	0.979
UC-03	UB-03	Foundation Soils	20.7	21.5	7.2	0.087	93.900	1.209	1.3	8.7	97	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.068	0.990
UC-03	UB-03	Foundation Soils	20.8	21.4	20.8	0.083	68.890	0.400	1.3	24.8	45	0	0.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.068	1.140
UC-03	UB-03	Foundation Soils	20.8	21.3	30.1	0.124	67.850	0.412	1.2	35.3	33	0	0.5	35.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.068	1.245
UC-03	UB-03	Foundation Soils	20.9	21.2	22.4	0.188	8.100	0.839	1.3	26.6	53	0	0.5	27.1	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.068	1.156
UC-03	UB-03	Foundation Soils	21.0	21.2	14.3	0.249	14.320	1.744	1.3	17.1	79	0	0.5	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.068	1.064
UC-03	UB-03	Foundation Soils	21.1	21.1	9.5	0.257	31.490	2.703	1.3	11.4	100	0	0.5	11.9	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.068	1.010
UC-03	UB-03	Foundation Soils	21.2	21.0	7.3	0.213	57.890	2.905	1.3	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.068	0.986
UC-03	UB-03	Foundation Soils	21.2	20.9	6.8	0.214	66.020	3.155	1.3	8.1	100	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.068	0.979
UC-03	UB-03	Foundation Soils	21.3	20.8	19.3	0.218	96.300	1.127	1.3	22.9	63	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.068	1.115
UC-03	UB-03	Foundation Soils	21.4	20.8	28.6	0.285	103.870	0.998	1.2	33.1	49	0	0.5	33.7	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.068	1.216
UC-03	UB-03	Foundation Soils	21.5	20.7	20.5	0.338	7.150	1.648	1.2	24.1	69	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.068	1.126
UC-03	UB-03	Foundation Soils	21.6	20.6	12.3	0.277	3.670	2.248	1.3	14.5	90	0	0.5	15.0	1.0	-0.4	0.0	0.9	0.069	1.006	0.071	0.068	1.035
UC-03	UB-03	Foundation Soils	21.7	20.5	9.6	0.254	22.110	2.655	1.2	11.3	100	0	0.5	11.8	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.068	1.004
UC-03	UB-03	Foundation Soils	21.7	20.4	7.4	0.236	40.070	3.193	1.2	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.069	0.980
UC-03	UB-03	Foundation Soils	21.8	20.3	8.5	0.239	52.080	2.827	1.2	9.9	100	0	0.5	10.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.069	0.990
UC-03	UB-03	Foundation Soils	21.9	20.3	33.1	0.224	96.480	0.676	1.2	37.8	38	0	0.5	38.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.069	1.257

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	22.0	20.2	58.9	0.187	48.600	0.318	1.2	65.2	8	0	0.1	65.3	1.0	-0.4	0.0	0.9	0.104	1.009	0.107	0.069	1.556
UC-03	UB-03	Foundation Soils	22.1	20.1	68.6	0.184	7.000	0.268	1.2	75.3	1	0	0.0	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.069	1.683
UC-03	UB-03	Foundation Soils	22.1	20.0	77.2	0.223	-3.030	0.289	1.2	84.0	0	0	0.0	84.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.069	1.807
UC-03	UB-03	Foundation Soils	22.2	19.9	64.5	0.302	2.860	0.468	1.2	70.8	12	0	0.2	70.9	1.0	-0.4	0.0	0.9	0.108	1.010	0.112	0.069	1.623
UC-03	UB-03	Foundation Soils	22.3	19.9	54.8	0.378	4.920	0.690	1.2	60.5	23	0	0.4	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.069	1.500
UC-03	UB-03	Foundation Soils	22.4	19.8	36.4	0.467	7.130	1.285	1.2	40.8	48	0	0.5	41.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.069	1.285
UC-03	UB-03	Foundation Soils	22.5	19.7	25.7	0.602	9.620	2.347	1.2	29.1	70	0	0.5	29.7	1.0	-0.4	0.0	0.9	0.079	1.006	0.080	0.069	1.166
UC-03	UB-03	Foundation Soils	22.6	19.6	18.2	0.668	12.150	3.663	1.2	20.9	89	0	0.5	21.5	1.0	-0.4	0.0	0.9	0.073	1.006	0.075	0.069	1.086
UC-03	UB-03	Foundation Soils	22.6	19.5	14.4	0.575	14.140	4.005	1.2	16.5	98	0	0.5	17.0	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.069	1.044
UC-03	UB-03	Foundation Soils	22.7	19.4	11.3	0.317	15.720	2.801	1.2	13.0	99	0	0.5	13.5	1.0	-0.4	0.0	0.9	0.068	1.006	0.070	0.069	1.011
UC-03	UB-03	Foundation Soils	22.8	19.4	8.5	0.248	21.170	2.913	1.2	9.7	100	0	0.5	10.2	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.069	0.982
UC-03	UB-03	Foundation Soils	22.9	19.3	7.1	0.234	55.510	3.293	1.2	8.1	100	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.069	0.967
UC-03	UB-03	Foundation Soils	23.0	19.2	19.6	0.163	75.800	0.830	1.2	22.3	59	0	0.5	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.069	1.095
UC-03	UB-03	Foundation Soils	23.0	19.1	41.3	0.140	61.130	0.339	1.2	45.5	21	0	0.4	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.092	0.069	1.325
UC-03	UB-03	Foundation Soils	23.1	19.0	44.5	0.156	6.770	0.351	1.2	48.7	19	0	0.4	49.1	1.0	-0.4	0.0	0.9	0.092	1.007	0.094	0.069	1.359
UC-03	UB-03	Foundation Soils	23.2	19.0	41.2	0.260	10.590	0.631	1.2	45.3	31	0	0.5	45.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.069	1.322
UC-03	UB-03	Foundation Soils	23.3	18.9	30.1	0.378	14.180	1.255	1.2	33.4	53	0	0.5	33.9	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.069	1.201
UC-03	UB-03	Foundation Soils	23.4	18.8	25.3	0.540	16.910	2.131	1.2	28.2	69	0	0.5	28.7	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.069	1.149
UC-03	UB-03	Foundation Soils	23.5	18.7	17.0	0.564	21.180	3.325	1.2	19.1	90	0	0.5	19.6	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.069	1.062
UC-03	UB-03	Foundation Soils	23.5	18.6	11.9	0.475	27.310	3.995	1.2	13.3	100	0	0.5	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.069	1.009
UC-03	UB-03	Foundation Soils	23.6	18.5	9.4	0.389	32.780	4.119	1.2	10.6	100	0	0.5	11.1	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.069	0.984
UC-03	UB-03	Foundation Soils	23.7	18.5	7.4	0.344	56.980	4.670	1.2	8.2	100	0	0.5	8.7	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.069	0.963
UC-03	UB-03	Foundation Soils	23.8	18.4	11.5	0.319	98.280	2.785	1.2	12.8	99	0	0.5	13.3	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.069	1.002
UC-03	UB-03	Foundation Soils	23.9	18.3	25.3	0.319	86.250	1.261	1.2	27.9	59	0	0.5	28.4	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.069	1.141
UC-03	UB-03	Foundation Soils	23.9	18.2	31.0	0.265	23.770	0.855	1.2	33.9	45	0	0.5	34.4	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.069	1.199
UC-03	UB-03	Foundation Soils	24.0	18.1	34.9	0.210	23.960	0.601	1.2	38.0	36	0	0.5	38.4	1.0	-0.4	0.1	0.9	0.084	1.007	0.086	0.069	1.240
UC-03	UB-03	Foundation Soils	24.1	18.0	44.9	0.130	20.610	0.290	1.1	48.2	17	0	0.3	48.5	1.0	-0.4	0.1	0.9	0.091	1.007	0.093	0.069	1.343
UC-03	UB-03	Foundation Soils	24.2	18.0	55.2	0.097	15.340	0.176	1.1	58.8	5	0	0.0	58.8	1.0	-0.5	0.1	0.9	0.099	1.008	0.101	0.069	1.455
UC-03	UB-03	Foundation Soils	24.3	17.9	63.0	0.119	-2.570	0.189	1.1	66.6	1	0	0.0	66.6	1.0	-0.5	0.1	0.9	0.105	1.010	0.107	0.069	1.544
UC-03	UB-03	Foundation Soils	24.4	17.8	57.3	0.151	2.140	0.263	1.1	60.8	8	0	0.1	60.8	1.0	-0.5	0.1	0.9	0.100	1.009	0.103	0.069	1.476
UC-03	UB-03	Foundation Soils	24.4	17.7	48.3	0.231	11.010	0.478	1.1	51.4	22	0	0.4	51.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.069	1.376
UC-03	UB-03	Foundation Soils	24.5	17.6	39.5	0.276	16.630	0.699	1.1	42.2	35	0	0.5	42.7	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.070	1.280
UC-03	UB-03	Foundation Soils	24.6	17.6	32.6	0.327	18.130	1.002	1.1	35.0	47	0	0.5	35.6	1.0	-0.5	0.1	0.9	0.082	1.007	0.084	0.070	1.207
UC-03	UB-03	Foundation Soils	24.7	17.5	28.9	0.371	20.490	1.282	1.1	31.1	55	0	0.5	31.7	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.070	1.168
UC-03	UB-03	Foundation Soils	24.8	17.4	25.8	0.408	22.710	1.582	1.1	27.8	63	0	0.5	28.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.079	0.070	1.135
UC-03	UB-03	Foundation Soils	24.9	17.3	24.4	0.365	25.010	1.494	1.1	26.3	64	0	0.5	26.8	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.070	1.121
UC-03	UB-03	Foundation Soils	24.9	17.2	24.9	0.266	26.360	1.070	1.1	26.7	57	0	0.5	27.2	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.070	1.124
UC-03	UB-03	Foundation Soils	25.0	17.1	27.5	0.209	24.110	0.760	1.1	29.4	48	0	0.5	29.9	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.070	1.149
UC-03	UB-03	Foundation Soils	25.1	17.1	29.2	0.178	9.310	0.610	1.1	31.1	42	0	0.5	31.6	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.070	1.165
UC-03	UB-03	Foundation Soils	25.2	17.0	28.1	0.205	0.910	0.729	1.1	29.9	46	0	0.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.070	1.154
UC-03	UB-03	Foundation Soils	25.3	16.9	23.1	0.243	0.380	1.050	1.1	24.7	59	0	0.5	25.2	1.0	-0.5	0.1	0.9	0.076	1.006	0.077	0.070	1.103
UC-03	UB-03	Foundation Soils	25.3	16.8	19.8	0.245	13.460	1.240	1.1	21.1	67	0	0.5	21.6	1.0	-0.5	0.1	0.9	0.073	1.006	0.075	0.070	1.070
UC-03	UB-03	Foundation Soils	25.4	16.7	16.7	0.273	31.210	1.639	1.1	17.8	78	0	0.5	18.3	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.070	1.039
UC-03	UB-03	Foundation Soils	25.5	16.7	14.7	0.266	35.160	1.811	1.1	15.7	84	0	0.5	16.2	1.0	-0.5	0.1	0.9	0.070	1.006	0.071	0.070	1.019
UC-03	UB-03	Foundation Soils	25.6	16.6	11.9	0.276	51.840	2.319	1.1	12.7	97	0	0.5	13.2	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.070	0.992
UC-03	UB-03	Foundation Soils	25.7	16.5	10.2	0.280	74.370	2.757	1.1	10.8	100	0	0.5	11.3	1.0	-0.5	0.1	0.9	0.067	1.006	0.068	0.070	0.975
UC-03	UB-03	Foundation Soils	25.8	16.4	11.2	0.278	110.440	2.480	1.1	11.9	100	0	0.5	12.4	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.070	0.984
UC-03	UB-03	Foundation Soils	25.8	16.3	13.8	0.252	84.050	1.828	1.1	14.6	87	0	0.5	15.1	1.0	-0.5	0.1	0.9	0.069	1.006	0.070	0.070	1.008
UC-03	UB-03	Foundation Soils	25.9	16.2	16.1	0.226	69.620	1.406	1.1	17.0	77	0	0.5	17.5	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.070	1.029
UC-03	UB-03	Foundation Soils	26.0	16.2	21.9	0.272	60.510	1.241	1.1	23.1	64	0	0.5	23.6	1.0	-0.5	0.1	0.9	0.075	1.006	0.076	0.070	1.084
UC-03	UB-03	Foundation Soils	26.1	16.1	30.2	0.305	28.400	1.010	1.1	31.5	50	0	0.5	32.0	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.070	1.163
UC-03	UB-03	Foundation Soils	26.2	16.0	35.3	0.283	24.820	0.802	1.1	36.6	41	0	0.5	37.1	1.0	-0.5	0.1	0.9	0.083	1.007	0.085	0.070	1.212
UC-03	UB-03	Foundation Soils	26.2	15.9	40.7	0.265	19.820	0.650	1.1	42.1	33	0	0.5	42.5	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.070	1.266
UC-03	UB-03	Foundation Soils	26.3	15.8	53.0	0.260	1.330	0.490	1.1	54.3	20	0	0.4	54.7	1.0	-0.5	0.1	0.9	0.096	1.008	0.097	0.070	1.392
UC-03	UB-03	Foundation Soils	26.4	15.8	70.6	0.280	6.430	0.397	1.1	71.7	8	0	0.1	71.8	1.0	-0.5	0.1	0.9	0.109	1.010	0.111	0.070	1.588
UC-03	UB-03	Foundation Soils	26.5	15.7	85.8	0.336	7.900	0.392	1.1	86.5	2	0	0.0	86.5	1.0	-0.5	0.1	0.9	0.122	1.014	0.125	0.070	1.790
UC-03	UB-03	Foundation Soils	26.6	15.6	94.2	0.378	12.770	0.401	1.1	94.6	0	0	0.0	94.6	1.0	-0.5	0.1	0.9	0.131	1.016	0.134	0.070	1.923
UC-03	UB-03	Foundation Soils	26.7	15.5	96.0	0.458	9.100	0.477	1.1	96.4	2	0	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.070	1.953
UC-03	UB-03	Foundation Soils	26.7	15.4	97.4	0.528	14.270	0.542	1.1	97.6	4	0	0.0	97.6	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.070	1.975
UC-03	UB-03	Foundation Soils	26.8	15.3	97.6	0.543	18.140	0.556	1.1	97.6	4	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.070	1.976
UC-03	UB-03	Foundation Soils	26.9	15.3	97.8	0.575	19.110	0.588	1.1	97.7	6	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.070	1.976
UC-03	UB-03	Foundation Soils	27.0	15.2	101.0	0.601	21.540	0.595	1.1	100.6	5	0	0.0	100.6	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.070	2.033

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	27.1	15.1	108.8	0.630	19.680	0.579	1.1	108.1	2	0	0.0	108.1	1.0	-0.5	0.1	0.9	0.149	1.021	0.154	0.070	2.199
UC-03	UB-03	Foundation Soils	27.1	15.0	112.0	0.680	19.930	0.607	1.1	111.0	2	0	0.0	111.0	1.0	-0.5	0.1	0.9	0.154	1.022	0.159	0.070	2.272
UC-03	UB-03	Foundation Soils	27.2	14.9	109.6	0.702	19.580	0.640	1.1	108.6	4	0	0.0	108.6	1.0	-0.5	0.1	0.9	0.150	1.021	0.155	0.070	2.210
UC-03	UB-03	Foundation Soils	27.3	14.9	105.3	0.718	18.030	0.682	1.1	104.3	7	0	0.0	104.4	1.0	-0.5	0.1	0.9	0.143	1.019	0.148	0.070	2.109
UC-03	UB-03	Foundation Soils	27.4	14.8	98.1	0.717	21.520	0.731	1.1	97.2	10	0	0.1	97.4	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.070	1.965
UC-03	UB-03	Foundation Soils	27.5	14.7	96.2	0.675	22.590	0.702	1.0	95.2	10	0	0.1	95.3	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.070	1.928
UC-03	UB-03	Foundation Soils	27.6	14.6	97.6	0.678	23.870	0.695	1.0	96.5	9	0	0.1	96.6	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.070	1.949
UC-03	UB-03	Foundation Soils	27.6	14.5	96.9	0.692	23.110	0.714	1.0	95.7	10	0	0.1	95.8	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.070	1.934
UC-03	UB-03	Foundation Soils	27.7	14.4	93.6	0.698	18.630	0.746	1.0	92.3	12	0	0.2	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.070	1.876
UC-03	UB-03	Foundation Soils	27.8	14.4	90.0	0.652	24.590	0.724	1.0	88.8	12	0	0.2	89.0	1.0	-0.5	0.1	0.9	0.125	1.014	0.127	0.070	1.818
UC-03	UB-03	Foundation Soils	27.9	14.3	91.5	0.618	23.110	0.676	1.0	90.1	11	0	0.2	90.2	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.070	1.837
UC-03	UB-03	Foundation Soils	28.0	14.2	95.0	0.644	22.520	0.678	1.0	93.3	10	0	0.1	93.5	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.070	1.891
UC-03	UB-03	Foundation Soils	28.1	14.1	95.8	0.665	20.490	0.694	1.0	94.0	10	0	0.1	94.1	1.0	-0.6	0.1	0.9	0.130	1.016	0.133	0.070	1.901
UC-03	UB-03	Foundation Soils	28.1	14.0	92.5	0.677	22.220	0.732	1.0	90.7	12	0	0.2	90.9	1.0	-0.6	0.1	0.9	0.127	1.015	0.129	0.070	1.847
UC-03	UB-03	Foundation Soils	28.2	13.9	90.0	0.681	25.300	0.757	1.0	88.1	14	0	0.3	88.4	1.0	-0.6	0.1	0.9	0.124	1.014	0.127	0.070	1.806
UC-03	UB-03	Foundation Soils	28.3	13.9	91.0	0.666	25.600	0.732	1.0	89.0	13	0	0.2	89.2	1.0	-0.6	0.1	0.9	0.125	1.014	0.127	0.070	1.819
UC-03	UB-03	Foundation Soils	28.4	13.8	95.1	0.636	25.540	0.669	1.0	92.8	10	0	0.1	92.9	1.0	-0.6	0.1	0.9	0.129	1.015	0.132	0.070	1.879
UC-03	UB-03	Foundation Soils	28.5	13.7	101.4	0.625	23.100	0.616	1.0	98.8	6	0	0.0	98.8	1.0	-0.6	0.1	0.9	0.136	1.017	0.139	0.070	1.984
UC-03	UB-03	Foundation Soils	28.5	13.6	108.9	0.613	17.630	0.563	1.0	105.8	2	0	0.0	105.8	1.0	-0.6	0.1	0.9	0.145	1.020	0.149	0.070	2.130
UC-03	UB-03	Foundation Soils	28.6	13.5	109.8	0.617	20.340	0.562	1.0	106.6	2	0	0.0	106.6	1.0	-0.6	0.1	0.9	0.147	1.020	0.150	0.070	2.148
UC-03	UB-03	Foundation Soils	28.7	13.5	105.7	0.642	19.680	0.608	1.0	102.5	5	0	0.0	102.5	1.0	-0.6	0.1	0.9	0.141	1.019	0.144	0.070	2.057
UC-03	UB-03	Foundation Soils	28.8	13.4	101.0	0.636	21.620	0.630	1.0	97.9	7	0	0.0	97.9	1.0	-0.6	0.1	0.9	0.135	1.017	0.138	0.070	1.966
UC-03	UB-03	Foundation Soils	28.9	13.3	98.8	0.599	22.920	0.606	1.0	95.7	7	0	0.0	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.070	1.924
UC-03	UB-03	Foundation Soils	29.0	13.2	100.0	0.583	24.870	0.583	1.0	96.6	6	0	0.0	96.7	1.0	-0.6	0.1	0.9	0.133	1.017	0.136	0.070	1.941
UC-03	UB-03	Foundation Soils	29.0	13.1	101.3	0.623	23.350	0.615	1.0	97.8	6	0	0.0	97.8	1.0	-0.6	0.1	0.9	0.135	1.017	0.137	0.070	1.962
UC-03	UB-03	Foundation Soils	29.1	13.0	99.2	0.657	18.890	0.663	1.0	95.7	9	0	0.1	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.070	1.923
UC-03	UB-03	Foundation Soils	29.2	13.0	90.5	0.773	20.110	0.854	1.0	87.3	16	0	0.3	87.6	1.0	-0.6	0.1	0.9	0.123	1.014	0.125	0.070	1.788
UC-03	UB-03	Foundation Soils	29.3	12.9	84.3	0.704	21.200	0.835	1.0	81.2	18	0	0.4	81.6	1.0	-0.6	0.1	0.9	0.117	1.012	0.119	0.070	1.700
UC-03	UB-03	Foundation Soils	29.4	12.8	65.0	0.845	21.730	1.301	1.0	62.6	35	0	0.5	63.2	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.070	1.471
UC-03	UB-03	Foundation Soils	29.4	12.7	52.4	0.962	23.540	1.835	1.0	50.5	48	0	0.6	51.1	1.0	-0.6	0.1	0.9	0.093	1.008	0.094	0.070	1.341
UC-03	UB-03	Foundation Soils	29.5	12.6	39.7	0.955	27.350	2.406	1.0	38.3	62	0	0.5	38.8	1.0	-0.6	0.1	0.9	0.085	1.007	0.085	0.070	1.217
UC-03	UB-03	Foundation Soils	29.6	12.6	32.1	0.811	13.190	2.529	1.0	30.9	69	0	0.5	31.4	1.0	-0.6	0.1	0.9	0.080	1.006	0.080	0.070	1.146
UC-03	UB-03	Foundation Soils	29.7	12.5	34.8	0.618	35.260	1.774	1.0	33.5	59	0	0.5	34.0	1.0	-0.6	0.1	0.9	0.081	1.007	0.082	0.070	1.171
UC-03	UB-03	Foundation Soils	29.8	12.4	41.6	0.505	40.640	1.213	1.0	39.9	46	0	0.5	40.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.070	1.233
UC-03	UB-03	Foundation Soils	29.9	12.3	70.5	0.446	28.740	0.633	1.0	67.4	18	0	0.4	67.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.107	0.070	1.521
UC-03	UB-03	Foundation Soils	29.9	12.2	83.7	0.466	18.150	0.557	1.0	79.9	10	0	0.1	80.0	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.070	1.675
UC-03	UB-03	Foundation Soils	30.0	12.1	84.4	0.511	8.67	0.605134	1.0	80.4	12	0	0.2	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.118	0.070	1.683
UC-03	UB-03	Foundation Soils	30.1	12.1	80.9	0.543	15.340	0.671	1.0	77.0	15	0	0.3	77.3	1.0	-0.6	0.1	0.9	0.113	1.011	0.115	0.070	1.638
UC-03	UB-03	Foundation Soils	30.2	12.0	77.2	0.548	18.410	0.710	1.0	73.3	18	0	0.4	73.7	1.0	-0.6	0.1	0.9	0.110	1.011	0.112	0.070	1.592
UC-03	UB-03	Foundation Soils	30.3	11.9	73.8	0.563	21.250	0.763	1.0	70.1	20	0	0.4	70.5	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.070	1.552
UC-03	UB-03	Foundation Soils	30.3	11.8	74.5	0.573	24.250	0.769	1.0	70.6	20	0	0.4	71.0	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.070	1.558
UC-03	UB-03	Foundation Soils	30.4	11.7	78.4	0.583	24.920	0.744	1.0	74.2	18	0	0.4	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.070	1.602
UC-03	UB-03	Foundation Soils	30.5	11.7	77.8	0.579	25.610	0.744	1.0	73.6	18	0	0.4	74.0	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.070	1.594
UC-03	UB-03	Foundation Soils	30.6	11.6	76.3	0.558	26.630	0.732	1.0	72.0	19	0	0.4	72.4	1.0	-0.6	0.1	0.9	0.109	1.011	0.110	0.070	1.574
UC-03	UB-03	Foundation Soils	30.7	11.5	74.7	0.522	27.790	0.698	1.0	70.4	18	0	0.4	70.8	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.070	1.555
UC-03	UB-03	Foundation Soils	30.8	11.4	77.8	0.460	28.400	0.591	1.0	73.2	14	0	0.3	73.5	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.070	1.588
UC-03	UB-03	Foundation Soils	30.8	11.3	83.1	0.378	26.690	0.455	1.0	78.1	8	0	0.0	78.2	1.0	-0.6	0.1	0.9	0.114	1.012	0.115	0.070	1.647
UC-03	UB-03	Foundation Soils	30.9	11.2	90.1	0.319	23.250	0.354	1.0	84.7	1	0	0.0	84.7	1.0	-0.6	0.1	0.9	0.120	1.013	0.122	0.070	1.736
UC-03	UB-03	Foundation Soils	31.0	11.2	95.8	0.211	17.170	0.220	1.0	89.9	0	0	0.0	89.9	1.0	-0.6	0.1	0.9	0.125	1.015	0.127	0.070	1.814
UC-03	UB-03	Foundation Soils	31.1	11.1	98.9	0.159	13.440	0.161	1.0	92.6	0	0	0.0	92.6	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.070	1.859
UC-03	UB-03	Foundation Soils	31.2	11.0	98.5	0.124	11.990	0.126	1.0	92.2	0	0	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.070	1.851
UC-03	UB-03	Foundation Soils	31.2	10.9	96.7	0.121	14.630	0.125	1.0	90.3	0	0	0.0	90.3	1.0	-0.6	0.1	0.9	0.126	1.015	0.128	0.070	1.820
UC-03	UB-03	Foundation Soils	31.3	10.8	92.4	0.115	13.570	0.124	1.0	86.2	0	0	0.0	86.2	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.070	1.757
UC-03	UB-03	Foundation Soils	31.4	10.7	87.9	0.113	15.200	0.129	1.0	81.9	0	0	0.0	81.9	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.070	1.695
UC-03	UB-03	Foundation Soils	31.5	10.7	80.4	0.129	18.770	0.161	1.0	74.8	0	0	0.0	74.8	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.070	1.601
UC-03	UB-03	Foundation Soils	31.6	10.6	73.5	0.202	24.770	0.275	1.0	68.2	4	0	0.0	68.2	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.070	1.522
UC-03	UB-03	Foundation Soils	31.7	10.5	66.8	0.259	27.140	0.388	1.0	61.9	12	0	0.2	62.1	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.070	1.453
UC-03	UB-03	Foundation Soils	31.7	10.4	57.1	0.296	29.300	0.518	1.0	52.8	22	0	0.4	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.095	0.070	1.357
UC-03	UB-03	Foundation Soils	31.8	10.3	49.6	0.306	38.090	0.616	1.0	45.8	29	0	0.5	46.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.090	0.070	1.287
UC-03	UB-03	Foundation Soils	31.9	10.3	43.4	0.363	62.560	0.836	1.0	40.0	39	0	0.5	40.5	1.0	-0.7	0.1	0.9	0.086	1.007	0.086	0.070	1.229
UC-03	UB-03	Foundation Soils	32.0	10.2	41.2	0.341	95.400	0.828	1.0	37.8	40	0	0.5	38.3	1.0	-0.7	0.1	0.9	0.084	1.007	0.085	0.070	1.208
UC-03	UB-03	Foundation Soils	32.1	10.1	42.5	0.237	93.480	0.558	1.0	39.0	32	0	0.5	39.4	1.0	-0.7	0.1	0.9	0.085	1.007	0.085	0.070	1.219

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	32.2	10.0	48.0	0.231	83.270	0.481	1.0	44.1	26	0	0.4	44.5	1.0	-0.7	0.1	0.9	0.088	1.007	0.089	0.070	1.268
UC-03	UB-03	Foundation Soils	32.2	9.9	57.7	0.101	46.160	0.175	1.0	52.9	7	0	0.0	52.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.095	0.070	1.353
UC-03	UB-03	Foundation Soils	32.3	9.8	63.8	0.150	42.530	0.235	1.0	58.5	7	0	0.0	58.5	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.070	1.413
UC-03	UB-03	Foundation Soils	32.4	9.8	63.4	0.208	59.030	0.328	1.0	58.0	12	0	0.2	58.2	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.070	1.409
UC-03	UB-03	Foundation Soils	32.5	9.7	60.0	0.301	69.240	0.502	1.0	54.8	20	0	0.4	55.2	1.0	-0.7	0.1	0.9	0.096	1.008	0.096	0.070	1.377
UC-03	UB-03	Foundation Soils	32.6	9.6	55.9	0.267	84.710	0.477	1.0	51.0	21	0	0.4	51.4	1.0	-0.7	0.1	0.9	0.093	1.008	0.094	0.070	1.337
UC-03	UB-03	Foundation Soils	32.6	9.5	53.3	0.244	85.000	0.458	1.0	48.5	22	0	0.4	48.9	1.0	-0.7	0.1	0.9	0.092	1.007	0.092	0.070	1.312
UC-03	UB-03	Foundation Soils	32.7	9.4	56.6	0.279	78.760	0.493	1.0	51.5	22	0	0.4	51.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.094	0.070	1.342
UC-03	UB-03	Foundation Soils	32.8	9.4	64.7	0.259	64.370	0.400	1.0	58.8	14	0	0.2	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.070	1.417
UC-03	UB-03	Foundation Soils	32.9	9.3	74.4	0.216	37.740	0.290	1.0	67.7	5	0	0.0	67.7	1.0	-0.7	0.1	0.9	0.105	1.010	0.106	0.070	1.513
UC-03	UB-03	Foundation Soils	33.0	9.2	79.2	0.182	53.930	0.230	1.0	72.0	0	0	0.0	72.0	1.0	-0.7	0.1	0.9	0.109	1.010	0.109	0.070	1.563
UC-03	UB-03	Foundation Soils	33.1	9.1	82.8	0.244	58.460	0.295	1.0	75.2	2	0	0.0	75.2	1.0	-0.7	0.1	0.9	0.112	1.011	0.112	0.070	1.603
UC-03	UB-03	Foundation Soils	33.1	9.0	84.9	0.228	56.720	0.269	1.0	77.0	0	0	0.0	77.0	1.0	-0.7	0.1	0.9	0.113	1.011	0.114	0.070	1.626
UC-03	UB-03	Foundation Soils	33.2	8.9	87.3	0.217	63.030	0.248	1.0	79.2	0	0	0.0	79.2	1.0	-0.7	0.1	0.9	0.115	1.012	0.116	0.070	1.654
UC-03	UB-03	Foundation Soils	33.3	8.9	94.4	0.169	53.270	0.179	1.0	85.6	0	0	0.0	85.6	1.0	-0.7	0.1	0.9	0.121	1.013	0.122	0.070	1.742
UC-03	UB-03	Foundation Soils	33.4	8.8	109.2	0.157	20.090	0.144	1.0	99.2	0	0	0.0	99.2	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.070	1.966
UC-03	UB-03	Foundation Soils	33.5	8.7	117.6	0.312	33.640	0.265	1.0	106.8	0	0	0.0	106.8	1.0	-0.7	0.1	0.9	0.147	1.020	0.149	0.070	2.125
UC-03	UB-03	Foundation Soils	33.5	8.6	114.4	0.453	47.070	0.396	1.0	103.7	0	0	0.0	103.7	1.0	-0.7	0.1	0.9	0.142	1.019	0.144	0.070	2.056
UC-03	UB-03	Foundation Soils	33.6	8.5	109.1	0.498	53.120	0.457	1.0	98.7	1	0	0.0	98.7	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.070	1.956
UC-03	UB-03	Foundation Soils	33.7	8.5	98.5	0.689	61.770	0.700	1.0	88.8	12	0	0.2	89.0	1.0	-0.7	0.1	0.9	0.125	1.014	0.125	0.070	1.792
UC-03	UB-03	Foundation Soils	33.8	8.4	95.9	0.802	51.980	0.836	1.0	86.4	16	0	0.3	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.123	0.070	1.758
UC-03	UB-03	Foundation Soils	33.9	8.3	103.9	0.901	39.120	0.867	1.0	93.7	15	0	0.3	94.0	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.070	1.871
UC-03	UB-03	Foundation Soils	34.0	8.2	113.2	1.077	34.070	0.951	1.0	102.1	14	0	0.3	102.4	1.0	-0.7	0.1	0.9	0.140	1.019	0.142	0.070	2.027
UC-03	UB-03	Foundation Soils	34.0	8.1	137.2	1.015	11.630	0.740	1.0	124.1	4	0	0.0	124.1	1.0	-0.7	0.1	0.9	0.181	1.028	0.184	0.070	2.631
UC-03	UB-03	Foundation Soils	34.1	8.0	175.6	0.929	-1.910	0.529	1.0	159.6	0	0	0.0	159.6	1.0	-0.7	0.1	0.9	0.368	1.053	0.381	0.070	5.449
UC-03	UB-03	Foundation Soils	34.2	8.0	217.0	0.913	-8.130	0.421	1.0	198.1	0	0	0.0	198.1	1.0	-0.7	0.1	0.9	1.703	1.082	1.795	0.070	25.696
UC-03	UB-03	Foundation Soils	34.3	7.9	223.5	0.779	2.950	0.348	1.0	204.1	0	0	0.0	204.1	1.0	-0.7	0.1	0.9	2.404	1.082	2.528	0.070	36.193
UC-03	UB-03	Foundation Soils	34.4	7.8	220.7	0.718	5.820	0.325	1.0	201.3	0	0	0.0	201.3	1.0	-0.7	0.1	0.9	2.037	1.082	2.142	0.070	30.680
UC-03	UB-03	Foundation Soils	34.4	7.7	198.7	0.681	32.640	0.343	1.0	180.6	0	0	0.0	180.6	1.0	-0.7	0.1	0.9	0.743	1.075	0.780	0.070	11.174
UC-03	UB-03	Foundation Soils	34.5	7.6	190.2	0.585	47.960	0.308	1.0	172.5	0	0	0.0	172.5	1.0	-0.7	0.1	0.9	0.548	1.066	0.572	0.070	8.193
UC-03	UB-03	Foundation Soils	34.6	7.6	171.6	0.490	34.020	0.286	1.0	155.0	0	0	0.0	155.0	1.0	-0.7	0.1	0.9	0.325	1.049	0.335	0.070	4.803
UC-03	UB-03	Foundation Soils	34.7	7.5	152.6	0.435	15.900	0.285	1.0	137.3	0	0	0.0	137.3	1.0	-0.7	0.1	0.9	0.223	1.036	0.227	0.070	3.259
UC-03	UB-03	Foundation Soils	34.8	7.4	149.6	0.480	-10.340	0.321	1.0	134.4	0	0	0.0	134.4	1.0	-0.7	0.1	0.9	0.212	1.034	0.216	0.070	3.093
UC-03	UB-03	Foundation Soils	34.9	7.3	150.2	0.367	-13.350	0.244	1.0	134.9	0	0	0.0	134.9	1.0	-0.7	0.1	0.9	0.214	1.035	0.217	0.070	3.117
UC-03	UB-03	Foundation Soils	34.9	7.2	149.4	0.373	22.850	0.250	1.0	134.0	0	0	0.0	134.0	1.0	-0.7	0.1	0.9	0.211	1.034	0.214	0.070	3.070
UC-03	UB-03	Foundation Soils	35.0	7.1	135.4	0.384	34.900	0.284	0.9	121.0	0	0	0.0	121.0	1.0	-0.7	0.1	0.9	0.173	1.027	0.175	0.070	2.515
UC-03	UB-03	Foundation Soils	35.1	7.1	120.0	0.420	35.400	0.350	0.9	106.7	0	0	0.0	106.7	1.0	-0.7	0.1	0.9	0.147	1.020	0.148	0.070	2.118
UC-03	UB-03	Foundation Soils	35.2	7.0	118.2	0.369	40.180	0.312	0.9	104.9	0	0	0.0	104.9	1.0	-0.7	0.1	0.9	0.144	1.020	0.145	0.070	2.078
UC-03	UB-03	Foundation Soils	35.3	6.9	116.9	0.290	27.020	0.248	0.9	103.7	0	0	0.0	103.7	1.0	-0.8	0.1	0.9	0.142	1.019	0.143	0.070	2.052
UC-03	UB-03	Foundation Soils	35.4	6.8	118.3	0.273	28.680	0.231	0.9	104.9	0	0	0.0	104.9	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.070	2.077
UC-03	UB-03	Foundation Soils	35.4	6.7	118.7	0.186	2.810	0.157	0.9	105.1	0	0	0.0	105.1	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.070	2.081
UC-03	UB-03	Foundation Soils	35.5	6.6	114.3	0.334	23.510	0.292	0.9	101.0	0	0	0.0	101.0	1.0	-0.8	0.1	0.9	0.139	1.018	0.139	0.070	1.997
UC-03	UB-03	Foundation Soils	35.6	6.6	109.1	0.344	22.340	0.315	0.9	96.1	0	0	0.0	96.1	1.0	-0.8	0.1	0.9	0.132	1.016	0.133	0.070	1.906
UC-03	UB-03	Foundation Soils	35.7	6.5	103.5	0.389	17.680	0.376	0.9	90.9	0	0	0.0	90.9	1.0	-0.8	0.1	0.9	0.127	1.015	0.127	0.070	1.819
UC-03	UB-03	Foundation Soils	35.8	6.4	102.1	0.360	24.250	0.352	0.9	89.6	0	0	0.0	89.6	1.0	-0.8	0.1	0.9	0.125	1.014	0.125	0.070	1.798
UC-03	UB-03	Foundation Soils	35.8	6.3	103.2	0.286	30.890	0.277	0.9	90.5	0	0	0.0	90.5	1.0	-0.8	0.1	0.9	0.126	1.015	0.126	0.070	1.812
UC-03	UB-03	Foundation Soils	35.9	6.2	112.5	0.211	33.590	0.188	0.9	98.8	0	0	0.0	98.8	1.0	-0.8	0.1	0.9	0.136	1.017	0.136	0.070	1.954
UC-03	UB-03	Foundation Soils	36.0	6.2	110.8	0.238	33.490	0.215	0.9	97.2	0	0	0.0	97.2	1.0	-0.8	0.1	0.9	0.134	1.017	0.134	0.070	1.924
UC-03	UB-03	Foundation Soils	36.1	6.1	117.2	0.228	34.970	0.194	0.9	102.9	0	0	0.0	102.9	1.0	-0.8	0.1	0.9	0.141	1.019	0.142	0.070	2.034
UC-03	UB-03	Foundation Soils	36.2	6.0	114.6	0.175	27.790	0.153	0.9	100.3	0	0	0.0	100.3	1.0	-0.8	0.1	0.9	0.138	1.018	0.138	0.070	1.983
UC-03	UB-03	Foundation Soils	36.3	5.9	111.9	0.149	26.060	0.133	0.9	97.8	0	0	0.0	97.8	1.0	-0.8	0.1	0.9	0.135	1.017	0.135	0.070	1.936
UC-03	UB-03	Foundation Soils	36.3	5.8	102.1	0.138	26.110	0.135	0.9	88.9	0	0	0.0	88.9	1.0	-0.8	0.1	0.9	0.124	1.014	0.124	0.070	1.787
UC-03	UB-03	Foundation Soils	36.4	5.7	96.3	0.111	35.260	0.115	0.9	83.6	0	0	0.0	83.6	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.070	1.710
UC-03	UB-03	Foundation Soils	36.5	5.7	96.2	0.106	16.580	0.110	0.9	83.4	0	0	0.0	83.4	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.070	1.707
UC-03	UB-03	Foundation Soils	36.6	5.6	95.9	0.083	19.390	0.087	0.9	83.0	0	0	0.0	83.0	1.0	-0.8	0.1	0.9	0.119	1.013	0.118	0.070	1.702
UC-03	UB-03	Foundation Soils	36.7	5.5	92.7	0.053	28.630	0.057	0.9	80.1	0	0	0.0	80.1	1.0	-0.8	0.1	0.9	0.116	1.012	0.116	0.070	1.662
UC-03	UB-03	Foundation Soils	36.7	5.4	89.0	0.115	29.640	0.129	0.9	76.7	0	0	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.113	0.069	1.619
UC-03	UB-03	Foundation Soils	36.8	5.3	90.8	0.151	27.090	0.166	0.9	78.2	0	0	0.0	78.2	1.0	-0.8	0.1	0.9	0.114	1.012	0.114	0.069	1.638
UC-03	UB-03	Foundation Soils	36.9	5.3	85.5	0.149	32.880	0.174	0.9	73.4	0	0	0.0	73.4	1.0	-0.8	0.1	0.9	0.110	1.011	0.110	0.069	1.578
UC-03	UB-03	Foundation Soils	37.0	5.2	84.2	0.136	28.120	0.162	0.9	72.2	0	0	0.0	72.2	1.0	-0.8	0.1	0.9	0.109	1.010	0.109	0.069	1.563
UC-03	UB-03	Foundation Soils	37.1	5.1	82.9	0.110	31.350	0.133	0.9	70.9	0	0	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.108	0.069	1.548
UC-03	UB-03	Foundation Soils	37.2	5.0	82.4	0.062	21.150	0.075	0.9	70.3	0	0	0.0	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.069	1.542

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	37.2	4.9	81.8	0.088	13.200	0.108	0.9	69.8	0	0	0.0	69.8	1.0	-0.8	0.1	0.9	0.107	1.010	0.107	0.069	1.535
UC-03	UB-03	Foundation Soils	37.3	4.8	80.0	0.092	19.270	0.115	0.9	68.1	0	0	0.0	68.1	1.0	-0.8	0.1	0.9	0.106	1.010	0.105	0.069	1.516
UC-03	UB-03	Foundation Soils	37.4	4.8	77.9	0.068	25.200	0.087	0.9	66.1	0	0	0.0	66.1	1.0	-0.8	0.1	0.9	0.104	1.009	0.104	0.069	1.494
UC-03	UB-03	Foundation Soils	37.5	4.7	76.5	0.109	27.560	0.143	0.9	64.8	0	0	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.103	0.069	1.479
UC-03	UB-03	Foundation Soils	37.6	4.6	74.2	0.127	41.640	0.171	0.9	62.8	1	0	0.0	62.8	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.069	1.456
UC-03	UB-03	Foundation Soils	37.6	4.5	74.1	0.122	43.090	0.165	0.9	62.6	1	0	0.0	62.6	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.069	1.455
UC-03	UB-03	Foundation Soils	37.7	4.4	70.9	0.117	44.070	0.165	0.9	59.7	2	0	0.0	59.7	1.0	-0.8	0.1	0.9	0.099	1.009	0.099	0.069	1.424
UC-03	UB-03	Foundation Soils	37.8	4.4	70.5	0.116	41.110	0.165	0.9	59.3	3	0	0.0	59.3	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.069	1.419
UC-03	UB-03	Foundation Soils	37.9	4.3	72.5	0.144	37.690	0.199	0.9	61.0	3	0	0.0	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.100	0.069	1.437
UC-03	UB-03	Foundation Soils	38.0	4.2	73.1	0.186	59.350	0.255	0.9	61.4	6	0	0.0	61.4	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.069	1.442
UC-03	UB-03	Foundation Soils	38.1	4.1	71.8	0.223	59.170	0.311	0.9	60.2	9	0	0.1	60.3	1.0	-0.8	0.1	0.9	0.100	1.009	0.099	0.069	1.431
UC-03	UB-03	Foundation Soils	38.1	4.0	68.6	0.239	58.990	0.348	0.9	57.3	12	0	0.2	57.5	1.0	-0.8	0.1	0.9	0.098	1.008	0.097	0.069	1.401
UC-03	UB-03	Foundation Soils	38.2	3.9	61.9	0.194	57.330	0.314	0.9	51.4	14	0	0.2	51.7	1.0	-0.8	0.1	0.9	0.093	1.008	0.093	0.069	1.341
UC-03	UB-03	Foundation Soils	38.3	3.9	58.2	0.273	55.330	0.469	0.9	48.2	22	0	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.091	0.069	1.310
UC-03	UB-03	Foundation Soils	38.4	3.8	51.3	0.233	78.710	0.454	0.9	42.3	26	0	0.4	42.7	1.0	-0.8	0.1	0.9	0.087	1.007	0.087	0.069	1.252
UC-03	UB-03	Foundation Soils	38.5	3.7	49.5	0.208	75.320	0.420	0.9	40.7	26	0	0.4	41.1	1.0	-0.8	0.1	0.9	0.086	1.007	0.086	0.069	1.237
UC-03	UB-03	Foundation Soils	38.5	3.6	47.0	0.184	85.090	0.392	0.9	38.5	26	0	0.4	38.9	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.069	1.216
UC-03	UB-03	Foundation Soils	38.6	3.5	47.2	0.149	77.040	0.316	0.9	38.6	23	0	0.4	39.0	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.069	1.217
UC-03	UB-03	Foundation Soils	38.7	3.4	47.8	0.135	65.080	0.282	0.9	39.1	22	0	0.4	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.069	1.221
UC-03	UB-03	Foundation Soils	38.8	3.4	49.5	0.120	50.970	0.243	0.9	40.4	19	0	0.3	40.8	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.069	1.234
UC-03	UB-03	Foundation Soils	38.9	3.3	49.0	0.093	65.080	0.190	0.9	40.0	17	0	0.3	40.3	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.069	1.229
UC-03	UB-03	Foundation Soils	39.0	3.2	48.1	0.112	70.420	0.233	0.9	39.2	19	0	0.3	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.069	1.222
UC-03	UB-03	Foundation Soils	39.0	3.1	47.4	0.166	84.880	0.350	0.9	38.5	25	0	0.4	38.9	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.069	1.216
UC-03	UB-03	Foundation Soils	39.1	3.0	47.9	0.253	80.690	0.528	0.9	38.9	31	0	0.5	39.3	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.069	1.221
UC-03	UB-03	Foundation Soils	39.2	3.0	45.9	0.237	90.720	0.516	0.9	37.2	32	0	0.5	37.7	1.0	-0.9	0.1	0.9	0.084	1.007	0.083	0.069	1.204
UC-03	UB-03	Foundation Soils	39.3	2.9	42.9	0.234	90.140	0.546	0.9	34.6	35	0	0.5	35.1	1.0	-0.9	0.1	0.9	0.082	1.007	0.081	0.069	1.180
UC-03	UB-03	Foundation Soils	39.4	2.8	44.5	0.231	75.430	0.519	0.9	35.9	33	0	0.5	36.3	1.0	-0.9	0.1	0.9	0.083	1.007	0.082	0.069	1.192
UC-03	UB-03	Foundation Soils	39.5	2.7	52.7	0.200	2.480	0.379	0.9	42.8	23	0	0.4	43.1	1.0	-0.9	0.1	0.9	0.088	1.007	0.087	0.069	1.258
UC-03	UB-03	Foundation Soils	39.5	2.6	57.2	0.209	69.510	0.366	0.9	46.4	20	0	0.4	46.8	1.0	-0.9	0.1	0.8	0.090	1.007	0.089	0.069	1.294
UC-03	UB-03	Foundation Soils	39.6	2.5	63.1	0.283	54.790	0.449	0.9	51.4	19	0	0.4	51.8	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.069	1.343
UC-03	UB-03	Foundation Soils	39.7	2.5	61.6	0.402	56.140	0.653	0.9	50.1	27	0	0.5	50.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.069	1.331
UC-03	UB-03	Foundation Soils	39.8	2.4	59.2	0.589	66.510	0.995	0.9	48.0	36	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.069	1.311
UC-03	UB-03	Foundation Soils	39.9	2.3	59.2	0.628	73.620	1.061	0.9	47.9	37	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.069	1.311
UC-03	UB-03	Foundation Soils	39.9	2.2	64.2	0.586	51.450	0.913	0.9	52.1	32	0	0.5	52.6	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.069	1.352
UC-03	UB-03	Foundation Soils	40.0	2.1	69.6	0.534	-7.200	0.767	0.9	56.6	26	0	0.5	57.1	1.0	-0.9	0.1	0.8	0.097	1.008	0.096	0.069	1.399
UC-03	UB-03	Foundation Soils	40.1	2.1	71.4	0.474	-20.490	0.664	0.9	58.1	23	0	0.4	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.069	1.414
UC-03	UB-03	Foundation Soils	40.2	2.0	70.1	0.436	-8.210	0.622	0.9	57.0	22	0	0.4	57.4	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.069	1.402
UC-03	UB-03	Foundation Soils	40.3	1.9	66.3	0.426	32.880	0.643	0.9	53.6	24	0	0.4	54.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.069	1.368
UC-03	UB-03	Foundation Soils	40.4	1.8	64.2	0.493	27.110	0.768	0.9	51.8	28	0	0.5	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.069	1.350
UC-03	UB-03	Foundation Soils	40.4	1.7	63.3	0.593	-1.330	0.937	0.9	51.0	33	0	0.5	51.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.069	1.342
UC-03	UB-03	Foundation Soils	40.5	1.6	61.7	0.616	-4.760	0.998	0.9	49.6	35	0	0.5	50.1	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.069	1.328
UC-03	UB-03	Foundation Soils	40.6	1.6	59.2	0.578	-19.060	0.976	0.8	47.4	36	0	0.5	47.9	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.069	1.306
UC-03	UB-03	Foundation Soils	40.7	1.5	60.9	0.466	-21.200	0.766	0.8	48.8	30	0	0.5	49.2	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.069	1.319
UC-03	UB-03	Foundation Soils	40.8	1.4	68.1	0.397	31.350	0.583	0.9	54.8	22	0	0.4	55.2	1.0	-0.9	0.1	0.8	0.096	1.008	0.095	0.069	1.380
UC-03	UB-03	Foundation Soils	40.8	1.3	83.6	0.409	17.050	0.489	0.9	67.9	13	0	0.2	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.069	1.519
UC-03	UB-03	Foundation Soils	40.9	1.2	94.5	0.254	1.910	0.269	0.9	77.2	0	0	0.0	77.2	1.0	-0.9	0.1	0.8	0.113	1.011	0.112	0.069	1.628
UC-03	UB-03	Foundation Soils	41.0	1.2	103.8	0.196	20.200	0.189	0.9	85.1	0	0	0.0	85.1	1.0	-0.9	0.1	0.8	0.121	1.013	0.119	0.069	1.734
UC-03	UB-03	Foundation Soils	41.1	1.1	118.7	0.125	6.910	0.105	0.9	98.0	0	0	0.0	98.0	1.0	-0.9	0.1	0.8	0.135	1.017	0.133	0.069	1.940
UC-03	UB-03	Foundation Soils	41.2	1.0	128.9	0.143	13.830	0.111	0.9	106.9	0	0	0.0	106.9	1.0	-0.9	0.1	0.8	0.147	1.020	0.146	0.069	2.120
UC-03	UB-03	Foundation Soils	41.3	0.9	131.4	0.243	31.780	0.185	0.9	109.0	0	0	0.0	109.0	1.0	-0.9	0.1	0.8	0.150	1.021	0.149	0.069	2.168
UC-03	UB-03	Foundation Soils	41.3	0.8	123.7	0.233	32.680	0.188	0.9	102.1	0	0	0.0	102.1	1.0	-0.9	0.1	0.8	0.140	1.019	0.139	0.069	2.018
UC-03	UB-03	Foundation Soils	41.4	0.7	95.3	0.205	34.090	0.215	0.9	77.4	0	0	0.0	77.4	1.0	-0.9	0.1	0.8	0.113	1.012	0.112	0.069	1.631
UC-03	UB-03	Foundation Soils	41.5	0.7	77.3	0.224	36.020	0.290	0.8	62.0	7	0	0.0	62.0	1.0	-0.9	0.1	0.8	0.101	1.009	0.100	0.069	1.453
UC-03	UB-03	Foundation Soils	41.6	0.6	65.6	0.215	34.830	0.328	0.8	52.0	14	0	0.2	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.069	1.352
UC-03	UB-03	Foundation Soils	41.7	0.5	56.3	0.194	36.780	0.344	0.8	44.3	20	0	0.4	44.6	1.0	-0.9	0.1	0.8	0.089	1.007	0.088	0.069	1.276
UC-03	UB-03	Foundation Soils	41.7	0.4	55.0	0.236	34.600	0.429	0.8	43.2	24	0	0.4	43.6	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.069	1.266
UC-03	UB-03	Foundation Soils	41.8	0.3	52.5	0.241	33.490	0.459	0.8	41.0	26	0	0.4	41.4	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.069	1.245
UC-03	UB-03	Foundation Soils	41.9	0.3	51.7	0.217	36.350	0.420	0.8	40.3	26	0	0.4	40.8	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.069	1.239
UC-03	UB-03	Foundation Soils	42.0	0.2	53.0	0.169	28.310	0.319	0.8	41.4	21	0	0.4	41.7	1.0	-0.9	0.1	0.8	0.087	1.007	0.086	0.069	1.248
UC-03	UB-03	Foundation Soils	42.1	0.1	56.0	0.135	34.490	0.241	0.8	43.7	16	0	0.3	44.0	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.068	1.271
UC-03	UB-03	Foundation Soils	42.2	0.0	58.3	0.092	23.060	0.158	0.8	45.5	10	0	0.1	45.7	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.068	1.287
UC-03	UB-03	Foundation Soils	42.2	-0.1	57.0	0.064	30.150	0.112	0.8	44.4	9	0	0.1	44.5	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.068	1.276

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	42.3	-0.2	51.0	0.111	35.810	0.218	0.8	39.5	18	0	0.3	39.8	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.068	1.230
UC-03	UB-03	Foundation Soils	42.4	-0.2	50.2	0.124	33.690	0.247	0.8	38.8	20	0	0.3	39.1	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.068	1.224
UC-03	UB-03	Foundation Soils	42.5	-0.3	52.9	0.122	35.400	0.230	0.8	40.9	17	0	0.3	41.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.068	1.245
UC-03	UB-03	Foundation Soils	42.6	-0.4	55.7	0.099	32.300	0.178	0.8	43.2	13	0	0.2	43.4	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.068	1.266
UC-03	UB-03	Foundation Soils	42.7	-0.5	57.9	0.065	38.010	0.112	0.8	44.9	8	0	0.1	44.9	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.068	1.281
UC-03	UB-03	Foundation Soils	42.7	-0.6	62.1	0.064	26.970	0.103	0.8	48.3	6	0	0.0	48.3	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.068	1.315
UC-03	UB-03	Foundation Soils	42.8	-0.7	65.6	0.061	29.610	0.093	0.8	51.1	3	0	0.0	51.1	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.068	1.343
UC-03	UB-03	Foundation Soils	42.9	-0.7	66.1	0.061	33.380	0.092	0.8	51.4	3	0	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.068	1.346
UC-03	UB-03	Foundation Soils	43.0	-0.8	67.0	0.045	36.210	0.067	0.8	52.1	2	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.068	1.353
UC-03	UB-03	Foundation Soils	43.1	-0.9	67.0	0.042	33.880	0.063	0.8	52.1	2	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.068	1.353
UC-03	UB-03	Foundation Soils	43.1	-1.0	63.8	0.014	34.930	0.022	0.8	49.4	7	0	0.0	49.4	1.0	-1.0	0.1	0.8	0.092	1.008	0.091	0.068	1.327
UC-03	UB-03	Foundation Soils	43.2	-1.1	63.1	0.017	32.400	0.027	0.8	48.8	6	0	0.0	48.8	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.068	1.321
UC-03	UB-03	Foundation Soils	43.3	-1.1	59.1	0.074	36.300	0.125	0.8	45.5	9	0	0.1	45.5	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.068	1.288
UC-03	UB-03	Foundation Soils	43.4	-1.2	60.7	0.090	41.310	0.148	0.8	46.7	9	0	0.1	46.8	1.0	-1.0	0.1	0.8	0.090	1.007	0.089	0.068	1.301
UC-03	UB-03	Foundation Soils	43.5	-1.3	59.3	0.137	37.920	0.231	0.8	45.5	14	0	0.2	45.8	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.068	1.291
UC-03	UB-03	Foundation Soils	43.6	-1.4	57.4	0.168	37.640	0.293	0.8	43.9	18	0	0.3	44.2	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.068	1.276
UC-03	UB-03	Foundation Soils	43.6	-1.5	52.6	0.143	36.120	0.272	0.8	39.9	20	0	0.3	40.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.084	0.068	1.239
UC-03	UB-03	Foundation Soils	43.7	-1.6	43.6	0.195	36.280	0.447	0.8	32.7	33	0	0.5	33.2	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.068	1.172
UC-03	UB-03	Foundation Soils	43.8	-1.6	44.3	0.188	35.260	0.424	0.8	33.3	31	0	0.5	33.7	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.068	1.177
UC-03	UB-03	Foundation Soils	43.9	-1.7	48.3	0.194	33.970	0.402	0.8	36.4	28	0	0.4	36.8	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.068	1.206
UC-03	UB-03	Foundation Soils	44.0	-1.8	54.2	0.160	25.950	0.295	0.8	41.1	20	0	0.4	41.5	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.068	1.251
UC-03	UB-03	Foundation Soils	44.0	-1.9	69.3	0.124	20.340	0.179	0.8	53.3	6	0	0.0	53.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.068	1.368
UC-03	UB-03	Foundation Soils	44.1	-2.0	87.9	0.086	26.260	0.098	0.8	68.6	0	0	0.0	68.6	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.068	1.532
UC-03	UB-03	Foundation Soils	44.2	-2.0	99.8	0.077	32.400	0.077	0.8	78.5	0	0	0.0	78.5	1.0	-1.0	0.1	0.8	0.114	1.012	0.112	0.068	1.652
UC-03	UB-03	Foundation Soils	44.3	-2.1	101.5	0.065	36.950	0.064	0.8	79.9	0	0	0.0	79.9	1.0	-1.0	0.1	0.8	0.116	1.012	0.114	0.068	1.670
UC-03	UB-03	Foundation Soils	44.4	-2.2	96.3	0.056	38.880	0.058	0.8	75.4	0	0	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.110	0.068	1.613
UC-03	UB-03	Foundation Soils	44.5	-2.3	93.1	0.086	39.130	0.092	0.8	72.6	0	0	0.0	72.6	1.0	-1.0	0.1	0.8	0.109	1.011	0.107	0.068	1.580
UC-03	UB-03	Foundation Soils	44.5	-2.4	92.3	0.094	37.310	0.102	0.8	71.8	0	0	0.0	71.8	1.0	-1.0	0.1	0.8	0.109	1.010	0.107	0.068	1.572
UC-03	UB-03	Foundation Soils	44.6	-2.5	87.7	0.094	36.280	0.107	0.8	67.9	0	0	0.0	67.9	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.068	1.527
UC-03	UB-03	Foundation Soils	44.7	-2.5	84.0	0.035	34.830	0.042	0.8	64.8	0	0	0.0	64.8	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.068	1.492
UC-03	UB-03	Foundation Soils	44.8	-2.6	79.6	0.035	34.400	0.044	0.8	61.1	0	0	0.0	61.1	1.0	-1.0	0.1	0.8	0.100	1.009	0.099	0.068	1.452
UC-03	UB-03	Foundation Soils	44.9	-2.7	78.3	0.031	31.060	0.040	0.8	60.0	0	0	0.0	60.0	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.068	1.440
UC-03	UB-03	Foundation Soils	44.9	-2.8	77.8	0.029	31.800	0.037	0.8	59.6	0	0	0.0	59.6	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.068	1.436
UC-03	UB-03	Foundation Soils	45.0	-2.9	75.2	0.010	34.540	0.013	0.8	57.4	8	0	0.0	57.4	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.068	1.413
UC-03	UB-03	Foundation Soils	45.1	-2.9	73.5	0.027	36.090	0.037	0.8	55.9	0	0	0.0	55.9	1.0	-1.0	0.1	0.8	0.097	1.008	0.095	0.068	1.398
UC-03	UB-03	Foundation Soils	45.2	-3.0	68.9	0.045	34.210	0.065	0.8	52.1	1	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.068	1.359
UC-03	UB-03	Foundation Soils	45.3	-3.1	60.4	0.051	35.360	0.085	0.8	45.2	7	0	0.0	45.2	1.0	-1.0	0.1	0.8	0.089	1.007	0.087	0.068	1.290
UC-03	UB-03	Foundation Soils	45.4	-3.2	52.9	0.070	36.540	0.132	0.8	39.2	13	0	0.2	39.4	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.068	1.235
UC-03	UB-03	Foundation Soils	45.4	-3.3	48.5	0.142	36.850	0.293	0.8	35.7	24	0	0.4	36.1	1.0	-1.0	0.1	0.8	0.083	1.007	0.081	0.068	1.203
UC-03	UB-03	Foundation Soils	45.5	-3.4	49.1	0.084	37.920	0.171	0.8	36.1	18	0	0.3	36.4	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.068	1.207
UC-03	UB-03	Foundation Soils	45.6	-3.4	56.1	0.026	39.630	0.046	0.8	41.6	9	0	0.1	41.7	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.068	1.257
UC-03	UB-03	Foundation Soils	45.7	-3.5	56.6	0.072	37.780	0.127	0.8	42.0	11	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.068	1.262
UC-03	UB-03	Foundation Soils	45.8	-3.6	53.8	0.228	35.530	0.424	0.8	39.7	26	0	0.4	40.1	1.0	-1.1	0.1	0.8	0.085	1.007	0.084	0.068	1.242
UC-03	UB-03	Foundation Soils	45.8	-3.7	52.6	0.301	39.120	0.572	0.8	38.8	31	0	0.5	39.2	1.0	-1.1	0.1	0.8	0.085	1.007	0.083	0.068	1.234
UC-03	UB-03	Foundation Soils	45.9	-3.8	55.9	0.488	37.730	0.873	0.8	41.3	37	0	0.5	41.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.068	1.259
UC-03	UB-03	Foundation Soils	46.0	-3.9	74.0	0.404	40.020	0.546	0.8	55.7	20	0	0.4	56.0	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.068	1.402
UC-03	UB-03	Foundation Soils	46.1	-3.9	74.5	0.281	35.070	0.377	0.8	56.0	14	0	0.2	56.3	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.068	1.404
UC-03	UB-03	Foundation Soils	46.2	-4.0	55.0	0.242	34.150	0.440	0.8	40.4	26	0	0.4	40.8	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.068	1.250
UC-03	UB-03	Foundation Soils	46.3	-4.1	48.0	0.155	38.780	0.323	0.8	34.9	26	0	0.4	35.3	1.0	-1.1	0.1	0.8	0.082	1.007	0.081	0.068	1.198
UC-03	UB-03	Foundation Soils	46.3	-4.2	56.3	0.059	48.650	0.105	0.8	41.3	10	0	0.1	41.4	1.0	-1.1	0.1	0.8	0.086	1.007	0.085	0.067	1.257
UC-03	UB-03	Foundation Soils	46.4	-4.3	70.1	0.045	38.550	0.064	0.8	52.2	1	0	0.0	52.2	1.0	-1.1	0.1	0.8	0.094	1.008	0.092	0.067	1.364
UC-03	UB-03	Foundation Soils	46.5	-4.3	65.3	0.066	33.400	0.101	0.8	48.4	5	0	0.0	48.4	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.067	1.325
UC-03	UB-03	Foundation Soils	46.6	-4.4	57.5	0.039	34.920	0.068	0.8	42.1	8	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.067	1.265
UC-03	UB-03	Foundation Soils	46.7	-4.5	50.7	0.043	36.690	0.085	0.8	36.8	13	0	0.2	37.0	1.0	-1.1	0.1	0.8	0.083	1.007	0.082	0.067	1.215
UC-03	UB-03	Foundation Soils	46.8	-4.6	55.7	0.062	39.450	0.111	0.8	40.6	11	0	0.1	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.067	1.252
UC-03	UB-03	Foundation Soils	46.8	-4.7	76.6	0.059	35.400	0.077	0.8	57.2	0	0	0.0	57.2	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.067	1.416
UC-03	UB-03	Foundation Soils	46.9	-4.8	86.4	0.095	29.490	0.110	0.8	65.0	0	0	0.0	65.0	1.0	-1.1	0.1	0.8	0.103	1.009	0.101	0.067	1.500
UC-03	UB-03	Foundation Soils	47.0	-4.8	92.5	0.064	31.780	0.069	0.8	69.9	0	0	0.0	69.9	1.0	-1.1	0.1	0.8	0.107	1.010	0.105	0.067	1.556
UC-03	UB-03	Foundation Soils	47.1	-4.9	97.4	0.087	32.540	0.089	0.8	73.8	0	0	0.0	73.8	1.0	-1.1	0.1	0.8	0.110	1.011	0.108	0.067	1.603
UC-03	UB-03	Foundation Soils	47.2	-5.0	102.4	0.135	25.910	0.132	0.8	77.9	0	0	0.0	77.9	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.067	1.654
UC-03	UB-03	Foundation Soils	47.2	-5.1	114.4	0.166	1.760	0.145	0.8	87.9	0	0	0.0	87.9	1.0	-1.1	0.1	0.8	0.123	1.014	0.120	0.067	1.790
UC-03	UB-03	Foundation Soils	47.3	-5.2	121.1	0.155	18.160	0.128	0.8	93.4	0	0	0.0	93.4	1.0	-1.1	0.1	0.8	0.129	1.016	0.126	0.067	1.876

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	47.4	-5.2	128.0	0.130	17.900	0.102	0.8	99.1	0	0	0.0	99.1	1.0	-1.1	0.1	0.8	0.136	1.017	0.133	0.067	1.975
UC-03	UB-03	Foundation Soils	47.5	-5.3	130.4	0.136	28.780	0.104	0.8	101.1	0	0	0.0	101.1	1.0	-1.1	0.1	0.8	0.139	1.018	0.135	0.067	2.013
UC-03	UB-03	Foundation Soils	47.6	-5.4	116.6	0.146	32.260	0.125	0.8	89.3	0	0	0.0	89.3	1.0	-1.1	0.1	0.8	0.125	1.014	0.122	0.067	1.813
UC-03	UB-03	Foundation Soils	47.7	-5.5	116.2	0.133	28.650	0.114	0.8	88.9	0	0	0.0	88.9	1.0	-1.1	0.1	0.8	0.124	1.014	0.121	0.067	1.807
UC-03	UB-03	Foundation Soils	47.7	-5.6	108.7	0.016	27.010	0.015	0.8	82.6	0	0	0.0	82.6	1.0	-1.1	0.1	0.8	0.118	1.013	0.115	0.067	1.717
UC-03	UB-03	Foundation Soils	47.8	-5.7	110.1	0.010	24.010	0.009	0.8	83.7	2	0	0.0	83.7	1.0	-1.1	0.1	0.8	0.119	1.013	0.116	0.067	1.732
UC-03	UB-03	Foundation Soils	47.9	-5.7	100.9	0.010	29.420	0.010	0.8	76.1	3	0	0.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.110	0.067	1.633
UC-03	UB-03	Foundation Soils	48.0	-5.8	91.1	0.046	30.030	0.050	0.8	68.0	0	0	0.0	68.0	1.0	-1.1	0.1	0.8	0.106	1.010	0.103	0.067	1.538
UC-03	UB-03	Foundation Soils	48.1	-5.9	79.6	0.032	34.450	0.040	0.8	58.7	0	0	0.0	58.7	1.0	-1.1	0.1	0.8	0.099	1.008	0.096	0.067	1.436
UC-03	UB-03	Foundation Soils	48.1	-6.0	66.5	0.045	27.300	0.068	0.8	48.2	4	0	0.0	48.2	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.067	1.330
UC-03	UB-03	Foundation Soils	48.2	-6.1	63.0	0.027	30.330	0.043	0.8	45.4	6	0	0.0	45.4	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.067	1.302
UC-03	UB-03	Foundation Soils	48.3	-6.1	59.5	0.047	35.890	0.079	0.8	42.7	8	0	0.0	42.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.067	1.276
UC-03	UB-03	Foundation Soils	48.4	-6.2	56.3	0.052	31.400	0.092	0.8	40.1	10	0	0.1	40.3	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.067	1.252
UC-03	UB-03	Foundation Soils	48.5	-6.3	56.5	0.172	39.020	0.304	0.8	40.3	20	0	0.4	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.067	1.256
UC-03	UB-03	Foundation Soils	48.6	-6.4	62.1	0.226	39.000	0.364	0.8	44.5	20	0	0.4	44.9	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.067	1.298
UC-03	UB-03	Foundation Soils	48.6	-6.5	69.6	0.186	38.020	0.267	0.8	50.3	12	0	0.2	50.5	1.0	-1.1	0.1	0.8	0.093	1.008	0.091	0.067	1.354
UC-03	UB-03	Foundation Soils	48.7	-6.6	79.3	0.150	38.160	0.189	0.8	57.9	4	0	0.0	57.9	1.0	-1.1	0.1	0.8	0.098	1.008	0.096	0.067	1.430
UC-03	UB-03	Foundation Soils	48.8	-6.6	96.4	0.119	38.730	0.123	0.8	71.6	0	0	0.0	71.6	1.0	-1.1	0.1	0.8	0.109	1.010	0.106	0.067	1.582
UC-03	UB-03	Foundation Soils	48.9	-6.7	115.2	0.085	39.940	0.074	0.8	87.0	0	0	0.0	87.0	1.0	-1.1	0.1	0.8	0.122	1.014	0.119	0.067	1.783
UC-03	UB-03	Foundation Soils	49.0	-6.8	115.4	0.082	31.490	0.071	0.8	87.1	0	0	0.0	87.1	1.0	-1.1	0.1	0.8	0.123	1.014	0.119	0.067	1.784
UC-03	UB-03	Foundation Soils	49.0	-6.9	111.0	0.091	39.020	0.082	0.8	83.3	0	0	0.0	83.3	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.067	1.731
UC-03	UB-03	Foundation Soils	49.1	-7.0	107.0	0.047	34.880	0.044	0.8	80.0	0	0	0.0	80.0	1.0	-1.2	0.1	0.8	0.116	1.012	0.113	0.067	1.687
UC-03	UB-03	Foundation Soils	49.2	-7.0	113.6	0.064	36.470	0.056	0.8	85.3	0	0	0.0	85.3	1.0	-1.2	0.1	0.8	0.121	1.013	0.117	0.067	1.760
UC-03	UB-03	Foundation Soils	49.3	-7.1	104.2	0.065	43.170	0.062	0.8	77.5	0	0	0.0	77.5	1.0	-1.2	0.1	0.8	0.114	1.012	0.111	0.067	1.657
UC-03	UB-03	Foundation Soils	49.4	-7.2	112.9	0.091	43.690	0.081	0.8	84.6	0	0	0.0	84.6	1.0	-1.2	0.1	0.8	0.120	1.013	0.117	0.067	1.750
UC-03	UB-03	Foundation Soils	49.5	-7.3	111.6	0.079	40.400	0.071	0.8	83.4	0	0	0.0	83.4	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.067	1.735
UC-03	UB-03	Foundation Soils	49.5	-7.4	115.6	0.063	38.500	0.054	0.8	86.7	0	0	0.0	86.7	1.0	-1.2	0.1	0.8	0.122	1.014	0.119	0.067	1.781
UC-03	UB-03	Foundation Soils	49.6	-7.5	117.2	0.102	40.220	0.087	0.8	87.9	0	0	0.0	87.9	1.0	-1.2	0.1	0.8	0.123	1.014	0.120	0.067	1.799
UC-03	UB-03	Foundation Soils	49.7	-7.5	118.8	0.094	29.250	0.079	0.8	89.1	0	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.067	1.818
UC-03	UB-03	Foundation Soils	49.8	-7.6	118.9	0.095	34.000	0.080	0.8	89.1	0	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.067	1.818
UC-03	UB-03	Foundation Soils	49.9	-7.7	118.7	0.048	28.210	0.040	0.8	88.9	0	0	0.0	88.9	1.0	-1.2	0.1	0.8	0.124	1.014	0.121	0.067	1.816
UC-03	UB-03	Foundation Soils	50.0	-7.8	104.8	0.071	21.990	0.068	0.8	77.4	0	0	0.0	77.4	1.0	-1.2	0.1	0.8	0.113	1.012	0.110	0.067	1.658
UC-03	UB-03	Foundation Soils	50.0	-7.9	93.8	0.149	29.450	0.159	0.8	68.5	0	0	0.0	68.5	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.066	1.551
UC-03	UB-03	Foundation Soils	50.1	-8.0	86.3	0.120	24.980	0.139	0.8	62.5	0	0	0.0	62.5	1.0	-1.2	0.1	0.8	0.101	1.009	0.099	0.066	1.485
UC-03	UB-03	Foundation Soils	50.2	-8.0	76.6	0.163	24.250	0.213	0.8	54.7	7	0	0.0	54.8	1.0	-1.2	0.1	0.8	0.096	1.008	0.093	0.066	1.403
UC-03	UB-03	Foundation Soils	50.3	-8.1	84.3	0.183	30.550	0.217	0.8	60.7	4	0	0.0	60.7	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.066	1.466
UC-03	UB-03	Foundation Soils	50.4	-8.2	92.3	0.181	37.350	0.196	0.8	67.0	0	0	0.0	67.0	1.0	-1.2	0.1	0.8	0.105	1.010	0.102	0.066	1.536
UC-03	UB-03	Foundation Soils	50.4	-8.3	71.8	0.167	36.360	0.233	0.8	50.9	10	0	0.1	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.066	1.366
UC-03	UB-03	Foundation Soils	50.5	-8.4	65.0	0.086	36.730	0.132	0.7	45.6	8	0	0.1	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.066	1.313
UC-03	UB-03	Foundation Soils	50.6	-8.4	60.9	0.108	38.880	0.177	0.7	42.4	13	0	0.2	42.6	1.0	-1.2	0.1	0.8	0.087	1.007	0.085	0.066	1.283
UC-03	UB-03	Foundation Soils	50.7	-8.5	67.4	0.259	33.590	0.384	0.7	47.4	19	0	0.3	47.7	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.066	1.334
UC-03	UB-03	Foundation Soils	50.8	-8.6	75.1	0.289	21.320	0.385	0.8	53.2	15	0	0.3	53.5	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.066	1.393
UC-03	UB-03	Foundation Soils	50.9	-8.7	75.5	0.201	31.730	0.266	0.8	53.5	10	0	0.1	53.6	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.066	1.394
UC-03	UB-03	Foundation Soils	50.9	-8.8	73.2	0.153	34.160	0.209	0.7	51.6	8	0	0.1	51.7	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.066	1.375
UC-03	UB-03	Foundation Soils	51.0	-8.9	79.2	0.106	37.690	0.134	0.8	56.2	2	0	0.0	56.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.066	1.422
UC-03	UB-03	Foundation Soils	51.1	-8.9	89.5	0.122	39.020	0.136	0.8	64.2	0	0	0.0	64.2	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.066	1.508
UC-03	UB-03	Foundation Soils	51.2	-9.0	90.2	0.092	32.350	0.102	0.8	64.7	0	0	0.0	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.066	1.514
UC-03	UB-03	Foundation Soils	51.3	-9.1	84.2	0.112	41.200	0.133	0.8	60.0	0	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.099	1.009	0.097	0.066	1.463
UC-03	UB-03	Foundation Soils	51.3	-9.2	82.9	0.168	45.020	0.203	0.8	58.8	4	0	0.0	58.8	1.0	-1.2	0.1	0.8	0.099	1.008	0.096	0.066	1.451
UC-03	UB-03	Foundation Soils	51.4	-9.3	84.5	0.169	38.140	0.200	0.8	60.0	3	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.066	1.464
UC-03	UB-03	Foundation Soils	51.5	-9.3	87.4	0.087	26.970	0.100	0.8	62.3	0	0	0.0	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.066	1.489
UC-03	UB-03	Foundation Soils	51.6	-9.4	71.1	0.078	36.150	0.110	0.7	49.6	4	0	0.0	49.6	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.066	1.356
UC-03	UB-03	Foundation Soils	51.7	-9.5	68.5	0.054	32.830	0.079	0.7	47.6	4	0	0.0	47.6	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.066	1.337
UC-03	UB-03	Foundation Soils	51.8	-9.6	64.4	0.106	38.350	0.165	0.7	44.4	11	0	0.1	44.5	1.0	-1.2	0.1	0.8	0.088	1.007	0.086	0.066	1.307
UC-03	UB-03	Foundation Soils	51.8	-9.7	66.2	0.065	34.590	0.098	0.7	45.7	6	0	0.0	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.066	1.319
UC-03	UB-03	Foundation Soils	51.9	-9.8	71.6	0.102	39.840	0.142	0.7	49.8	6	0	0.0	49.8	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.066	1.360
UC-03	UB-03	Foundation Soils	52.0	-9.8	70.5	0.164	42.310	0.233	0.7	48.9	11	0	0.1	49.0	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.066	1.353
UC-03	UB-03	Foundation Soils	52.1	-9.9	70.6	0.124	41.450	0.176	0.7	48.9	8	0	0.1	48.9	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.066	1.352
UC-03	UB-03	Foundation Soils	52.2	-10.0	68.4	0.036	44.930	0.053	0.7	47.1	4	0	0.0	47.1	1.0	-1.2	0.1	0.8	0.090	1.007	0.088	0.066	1.334
UC-03	UB-03	Foundation Soils	52.2	-10.1	65.6	0.043	42.590	0.066	0.7	45.0	6	0	0.0	45.0	1.0	-1.2	0.1	0.8	0.089	1.007	0.086	0.066	1.314
UC-03	UB-03	Foundation Soils	52.3	-10.2	71.7	0.053	42.260	0.074	0.7	49.5	3	0	0.0	49.5	1.0	-1.2	0.1	0.8	0.092	1.008	0.089	0.066	1.359
UC-03	UB-03	Foundation Soils	52.4	-10.2	72.5	0.036	41.310	0.050	0.7	50.1	2	0	0.0	50.1	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.066	1.365

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	52.5	-10.3	72.9	0.032	40.450	0.044	0.7	50.3	2	0	0.0	50.3	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.066	1.368
UC-03	UB-03	Foundation Soils	52.6	-10.4	75.4	0.012	37.590	0.016	0.7	52.2	8	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.066	1.388
UC-03	UB-03	Foundation Soils	52.7	-10.5	72.0	0.012	32.930	0.017	0.7	49.6	9	0	0.1	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.090	0.066	1.362
UC-03	UB-03	Foundation Soils	52.7	-10.6	59.3	0.019	29.210	0.032	0.7	40.1	10	0	0.1	40.2	1.0	-1.3	0.1	0.8	0.086	1.007	0.083	0.066	1.269
UC-03	UB-03	Foundation Soils	52.8	-10.7	55.5	0.010	27.970	0.018	0.7	37.2	17	0	0.3	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.066	1.243
UC-03	UB-03	Foundation Soils	52.9	-10.7	54.0	0.041	37.730	0.076	0.7	36.1	13	0	0.2	36.3	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.066	1.232
UC-03	UB-03	Foundation Soils	53.0	-10.8	50.8	0.064	38.930	0.126	0.7	33.8	17	0	0.3	34.1	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.066	1.211
UC-03	UB-03	Foundation Soils	53.1	-10.9	51.3	0.085	44.450	0.166	0.7	34.1	19	0	0.3	34.4	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.066	1.214
UC-03	UB-03	Foundation Soils	53.1	-11.0	55.7	0.082	42.83	0.147171	0.7	37.2	15	0	0.2	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.066	1.244
UC-03	UB-03	Foundation Soils	53.2	-11.1	63.8	0.034	42.260	0.053	0.7	43.1	7	0	0.0	43.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.085	0.066	1.299
UC-03	UB-03	Foundation Soils	53.3	-11.2	68.1	0.080	36.020	0.118	0.7	46.3	7	0	0.0	46.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.066	1.331
UC-03	UB-03	Foundation Soils	53.4	-11.2	66.6	0.098	37.210	0.147	0.7	45.1	9	0	0.1	45.2	1.0	-1.3	0.1	0.8	0.089	1.007	0.087	0.066	1.320
UC-03	UB-03	Foundation Soils	53.5	-11.3	69.4	0.129	34.100	0.186	0.7	47.2	10	0	0.1	47.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.065	1.341
UC-03	UB-03	Foundation Soils	53.6	-11.4	69.0	0.066	28.820	0.096	0.7	46.8	5	0	0.0	46.8	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.065	1.337
UC-03	UB-03	Foundation Soils	53.6	-11.5	78.2	0.067	31.100	0.086	0.7	53.7	0	0	0.0	53.7	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.065	1.407
UC-03	UB-03	Foundation Soils	53.7	-11.6	88.9	0.108	14.150	0.121	0.7	61.9	0	0	0.0	61.9	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.065	1.494
UC-03	UB-03	Foundation Soils	53.8	-11.6	88.6	0.085	12.080	0.096	0.7	61.6	0	0	0.0	61.6	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.065	1.491
UC-03	UB-03	Foundation Soils	53.9	-11.7	86.3	0.137	-6.720	0.159	0.7	59.7	1	0	0.0	59.7	1.0	-1.3	0.1	0.8	0.099	1.009	0.096	0.065	1.472
UC-03	UB-03	Foundation Soils	54.0	-11.8	81.7	0.184	18.580	0.225	0.7	56.1	6	0	0.0	56.2	1.0	-1.3	0.1	0.8	0.097	1.008	0.094	0.065	1.434
UC-03	UB-03	Foundation Soils	54.1	-11.9	78.5	0.124	1.910	0.158	0.7	53.6	4	0	0.0	53.6	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.065	1.409
UC-03	UB-03	Foundation Soils	54.1	-12.0	76.7	0.146	19.050	0.190	0.7	52.2	7	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.065	1.395
UC-03	UB-03	Foundation Soils	54.2	-12.1	70.6	0.124	2.050	0.176	0.7	47.6	9	0	0.1	47.7	1.0	-1.3	0.1	0.8	0.091	1.007	0.088	0.065	1.349
UC-03	UB-03	Foundation Soils	54.3	-12.1	68.3	0.119	-16.340	0.174	0.7	45.9	10	0	0.1	46.0	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.065	1.332
UC-03	UB-03	Foundation Soils	54.4	-12.2	71.9	0.057	11.270	0.079	0.7	48.5	3	0	0.0	48.5	1.0	-1.3	0.1	0.8	0.091	1.007	0.089	0.065	1.358
UC-03	UB-03	Foundation Soils	54.5	-12.3	80.4	0.073	28.650	0.091	0.7	54.9	0	0	0.0	54.9	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.065	1.423
UC-03	UB-03	Foundation Soils	54.5	-12.4	75.1	0.029	18.770	0.039	0.7	50.8	2	0	0.0	50.8	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.065	1.382
UC-03	UB-03	Foundation Soils	54.6	-12.5	62.6	0.070	19.150	0.112	0.7	41.5	10	0	0.1	41.6	1.0	-1.3	0.1	0.8	0.086	1.007	0.084	0.065	1.290
UC-03	UB-03	Foundation Soils	54.7	-12.5	55.2	0.147	25.680	0.266	0.7	36.1	22	0	0.4	36.5	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.065	1.241
UC-03	UB-03	Foundation Soils	54.8	-12.6	51.5	0.130	24.820	0.253	0.7	33.4	23	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.065	1.216
UC-03	UB-03	Foundation Soils	54.9	-12.7	48.6	0.044	38.450	0.090	0.7	31.4	17	0	0.3	31.7	1.0	-1.3	0.1	0.8	0.080	1.006	0.078	0.065	1.196
UC-03	UB-03	Foundation Soils	55.0	-12.8	49.9	0.017	35.450	0.034	0.7	32.3	17	0	0.3	32.5	1.0	-1.3	0.1	0.8	0.080	1.007	0.078	0.065	1.205
UC-03	UB-03	Foundation Soils	55.0	-12.9	58.5	0.011	39.090	0.019	0.7	38.3	15	0	0.3	38.6	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.065	1.263
UC-03	UB-03	Foundation Soils	55.1	-13.0	66.4	0.013	36.500	0.020	0.7	44.0	11	0	0.1	44.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.086	0.065	1.317
UC-03	UB-03	Foundation Soils	55.2	-13.0	54.7	0.034	40.590	0.062	0.7	35.6	13	0	0.2	35.7	1.0	-1.3	0.1	0.8	0.083	1.007	0.080	0.065	1.236
UC-03	UB-03	Foundation Soils	55.3	-13.1	51.8	0.107	41.330	0.207	0.7	33.5	21	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.065	1.218
UC-03	UB-03	Foundation Soils	55.4	-13.2	47.1	0.033	45.200	0.070	0.7	30.1	18	0	0.3	30.4	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.065	1.186
UC-03	UB-03	Foundation Soils	55.4	-13.3	43.2	0.010	44.500	0.023	0.7	27.4	24	0	0.4	27.7	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.065	1.161
UC-03	UB-03	Foundation Soils	55.5	-13.4	47.7	0.016	42.550	0.034	0.7	30.5	18	0	0.3	30.8	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.065	1.190
UC-03	UB-03	Foundation Soils	55.6	-13.4	54.2	0.051	42.710	0.094	0.7	35.0	14	0	0.2	35.2	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.065	1.233
UC-03	UB-03	Foundation Soils	55.7	-13.5	48.3	0.058	44.680	0.120	0.7	30.8	19	0	0.3	31.1	1.0	-1.3	0.1	0.8	0.080	1.006	0.077	0.065	1.194
UC-03	UB-03	Foundation Soils	55.8	-13.6	43.8	0.073	46.170	0.167	0.7	27.6	25	0	0.4	28.0	1.0	-1.3	0.1	0.8	0.078	1.006	0.076	0.065	1.166
UC-03	UB-03	Foundation Soils	55.9	-13.7	42.3	0.170	46.650	0.402	0.7	26.6	36	0	0.5	27.1	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.065	1.157
UC-03	UB-03	Foundation Soils	55.9	-13.8	46.5	0.119	46.880	0.256	0.7	29.5	27	0	0.4	29.9	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.065	1.184
UC-03	UB-03	Foundation Soils	56.0	-13.9	53.4	0.195	43.050	0.365	0.7	34.3	27	0	0.4	34.7	1.0	-1.4	0.1	0.8	0.082	1.007	0.080	0.065	1.230
UC-03	UB-03	Foundation Soils	56.1	-13.9	65.7	0.354	46.450	0.538	0.7	43.1	26	0	0.4	43.5	1.0	-1.4	0.1	0.8	0.088	1.007	0.085	0.065	1.315
UC-03	UB-03	Foundation Soils	56.2	-14.0	84.9	0.539	35.100	0.634	0.7	57.2	21	0	0.4	57.6	1.0	-1.4	0.1	0.8	0.098	1.008	0.094	0.065	1.460
UC-03	UB-03	Foundation Soils	56.3	-14.1	85.9	0.707	41.400	0.823	0.7	57.9	26	0	0.5	58.3	1.0	-1.4	0.1	0.8	0.098	1.008	0.095	0.065	1.468
UC-03	UB-03	Foundation Soils	56.3	-14.2	108.1	0.475	28.800	0.439	0.7	74.8	7	0	0.0	74.9	1.0	-1.4	0.1	0.8	0.111	1.011	0.107	0.065	1.656
UC-03	UB-03	Foundation Soils	56.4	-14.3	107.6	0.173	28.640	0.161	0.7	74.3	0	0	0.0	74.3	1.0	-1.4	0.2	0.8	0.111	1.011	0.107	0.065	1.650
UC-03	UB-03	Foundation Soils	56.5	-14.3	119.5	0.175	16.300	0.146	0.7	83.7	0	0	0.0	83.7	0.9	-1.4	0.2	0.8	0.119	1.013	0.114	0.065	1.772
UC-03	UB-03	Foundation Soils	56.6	-14.4	127.6	0.209	-14.390	0.164	0.7	90.0	0	0	0.0	90.0	0.9	-1.4	0.2	0.8	0.126	1.015	0.120	0.065	1.865
UC-03	UB-03	Foundation Soils	56.7	-14.5	118.7	0.252	13.940	0.212	0.7	82.9	0	0	0.0	82.9	0.9	-1.4	0.2	0.8	0.118	1.013	0.114	0.065	1.762
UC-03	UB-03	Foundation Soils	56.8	-14.6	106.5	0.337	36.450	0.316	0.7	73.2	3	0	0.0	73.2	1.0	-1.4	0.2	0.8	0.110	1.011	0.106	0.065	1.638
UC-03	UB-03	Foundation Soils	56.8	-14.7	88.2	0.395	33.880	0.448	0.7	59.2	14	0	0.2	59.4	1.0	-1.4	0.2	0.8	0.099	1.009	0.096	0.065	1.483
UC-03	UB-03	Foundation Soils	56.9	-14.8	69.6	0.136	28.920	0.195	0.7	45.4	11	0	0.1	45.5	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.064	1.339
UC-03	UB-03	Foundation Soils	57.0	-14.8	60.2	0.064	8.160	0.106	0.7	38.6	11	0	0.1	38.7	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.064	1.273
UC-03	UB-03	Foundation Soils	57.1	-14.9	58.2	0.063	16.630	0.108	0.7	37.2	13	0	0.2	37.4	1.0	-1.4	0.2	0.8	0.084	1.007	0.081	0.064	1.260
UC-03	UB-03	Foundation Soils	57.2	-15.0	61.0	0.059	11.440	0.097	0.7	39.1	11	0	0.1	39.2	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.064	1.278
UC-03	UB-03	Foundation Soils	57.2	-15.1	54.2	0.077	26.900	0.142	0.7	34.3	17	0	0.3	34.6	1.0	-1.4	0.2	0.8	0.082	1.007	0.079	0.064	1.234
UC-03	UB-03	Foundation Soils	57.3	-15.2	53.0	0.148	36.470	0.279	0.7	33.4	24	0	0.4	33.8	1.0	-1.4	0.2	0.8	0.081	1.007	0.079	0.064	1.227
UC-03	UB-03	Foundation Soils	57.4	-15.3	77.6	0.161	48.410	0.207	0.7	51.0	8	0	0.1	51.0	1.0	-1.4	0.2	0.8	0.093	1.008	0.090	0.064	1.397
UC-03	UB-03	Foundation Soils	57.5	-15.3	90.1	0.207	44.500	0.230	0.7	60.2	4	0	0.0	60.2	1.0	-1.4	0.2	0.8	0.100	1.009	0.096	0.064	1.494

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	57.6	-15.4	103.3	0.285	37.010	0.276	0.7	70.1	2	0	0.0	70.1	1.0	-1.4	0.2	0.8	0.107	1.010	0.103	0.064	1.606
UC-03	UB-03	Foundation Soils	57.7	-15.5	104.0	0.291	34.230	0.280	0.7	70.7	2	0	0.0	70.7	1.0	-1.4	0.2	0.8	0.108	1.010	0.104	0.064	1.613
UC-03	UB-03	Foundation Soils	57.7	-15.6	89.0	0.232	34.540	0.261	0.7	59.2	6	0	0.0	59.2	1.0	-1.4	0.2	0.8	0.099	1.009	0.095	0.064	1.485
UC-03	UB-03	Foundation Soils	57.8	-15.7	79.2	0.205	14.100	0.259	0.7	51.9	10	0	0.1	52.0	1.0	-1.4	0.2	0.8	0.094	1.008	0.091	0.064	1.410
UC-03	UB-03	Foundation Soils	57.9	-15.7	75.0	0.083	18.040	0.111	0.7	48.7	4	0	0.0	48.7	1.0	-1.4	0.2	0.8	0.091	1.007	0.088	0.064	1.377
UC-03	UB-03	Foundation Soils	58.0	-15.8	82.5	0.046	26.200	0.056	0.7	54.2	0	0	0.0	54.2	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.064	1.433
UC-03	UB-03	Foundation Soils	58.1	-15.9	84.0	0.031	16.910	0.037	0.7	55.3	0	0	0.0	55.3	1.0	-1.4	0.2	0.8	0.096	1.008	0.093	0.064	1.445
UC-03	UB-03	Foundation Soils	58.2	-16.0	85.0	0.050	13.860	0.059	0.7	55.9	0	0	0.0	55.9	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.064	1.452
UC-03	UB-03	Foundation Soils	58.2	-16.1	82.1	0.185	23.110	0.225	0.7	53.8	7	0	0.0	53.8	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.064	1.430
UC-03	UB-03	Foundation Soils	58.3	-16.2	68.3	0.082	40.550	0.120	0.7	43.7	8	0	0.1	43.8	1.0	-1.4	0.2	0.8	0.088	1.007	0.085	0.064	1.329
UC-03	UB-03	Foundation Soils	58.4	-16.2	70.6	0.017	45.170	0.024	0.7	45.3	8	0	0.0	45.4	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.064	1.345
UC-03	UB-03	Foundation Soils	58.5	-16.3	73.3	0.021	47.840	0.029	0.7	47.2	5	0	0.0	47.2	1.0	-1.4	0.2	0.8	0.090	1.007	0.087	0.064	1.364
UC-03	UB-03	Foundation Soils	58.6	-16.4	85.4	0.010	46.450	0.012	0.7	56.1	9	0	0.1	56.1	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.064	1.456
UC-03	UB-03	Foundation Soils	58.6	-16.5	66.8	0.010	42.400	0.015	0.7	42.5	14	0	0.2	42.7	1.0	-1.4	0.2	0.8	0.087	1.007	0.084	0.064	1.320
UC-03	UB-03	Foundation Soils	58.7	-16.6	47.0	0.011	47.650	0.023	0.6	28.7	22	0	0.4	29.1	1.0	-1.4	0.2	0.8	0.078	1.006	0.076	0.064	1.188

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$

FS<=1.0

1.0<FS<=1.5

FS>1.5

[1]Earthquake magnitude taken as modal event for the deaggregation of the 5,000 year peak ground accleration

[2]PGA estimated from 2014 USGS seismic hazard maps for a 5,000-year return period earthquake

[3]Averaged corrected tip resistence cone tip resistance corrected for unequal end area effects. See Conetec report for additional info.

[4]Unit weight of soil based on Soil Behavior Type. See Conetec report for additional info.

[5]Equilibrium pore water pressure based on Pore Pressure Dissipation Tests. See Conetec report for additional info.

[6]$m = 1.338 - 0.249 * q_{c1Ncs}$ ^0.264 where $21 < q_{c1Ncs} < 254$ (Boulanger&Idriss, 2014, Equation 2.15b)

[7]C_N = overburden correction factor = $(1.06\ tsf/s'_{vc})^m$, where C_N <=1.7 (Boulanger&Idriss, 2014, Equation 2.15a)

[8]$q_{c1N} = C_N * qt/1.06$ tsf (Boulanger&Idriss, 2014, Equation 2.4)

[9]Values based sieve test results and boring log descriptions

[10]$Dq_{c1N} = (11.9+q_{c1N}/14.6)*\exp[1.63 - (9.7 / (FC + 2)) - (15.7 / (FC + 2))^2]$ (Boulanger&Idriss, 2014, Equation 2.22)

[11]$q_{c1Ncs} = q_{c1N} + Dq_{c1N}$ (Boulanger&Idriss, 2014, Equation 2.10)

[12]$C\sigma = 1 / (37.3 - 8.27 * q_{c1Ncs}$^0.264 where q_{C1Ncs}<=211 $K_s = 1-(C_s*\ln(s'_{vc}/106\ tsf))$ <=1.1 (Boulanger&Idriss,2014, Equations 2.16a, 2.16b)

[13]$a(z) = -1.012 - 1.126 * \sin(z / 11.73 + 5.133)$, where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14b)

[14]$b(z) = 0.106 + 0.118 * \sin(z /11.28 + 5.142)$, where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14c)

[15]r_d = shear stress reduction coefficient = exp[a(z) + b(z) * M] (Boulanger&Idriss, 2014, Equation 2.14a)

[16]$CRR_{M=7.5, \sigma'vc=1atm} = \exp((q_{c1Ncs}/113+q_{c1Ncs}/1000)^2-(q_{c1Ncs}/140)^3+(q_{c1Ncs}/137))^4-2.8)$ (Boulanger&Idriss, 2014, Equation, 2.24), say q_{c1Ncs} <= 300

[17]$MSF=1+(MSF_{max}-1)(8.64\exp(-M/4)-1.325)$ $MSF_{max}=1.09(q_{c1Ncs}/180)^2$<=2.2 (Boulanger&Idriss, Equations 2.19,2.20)

[18]$CRR_{corr.}=CRR_{M=7.5,\sigma'vc=1atm}*K_\sigma*MSF$ (Boulanger and Idriss,2014, Equation 2.7)

[19]$CSR_{M,\sigma'v} = 0.65*PHGA*(s_v/s'_{vc})*r_d$ (Boulanger and Idriss,2014, Equation 2.2)

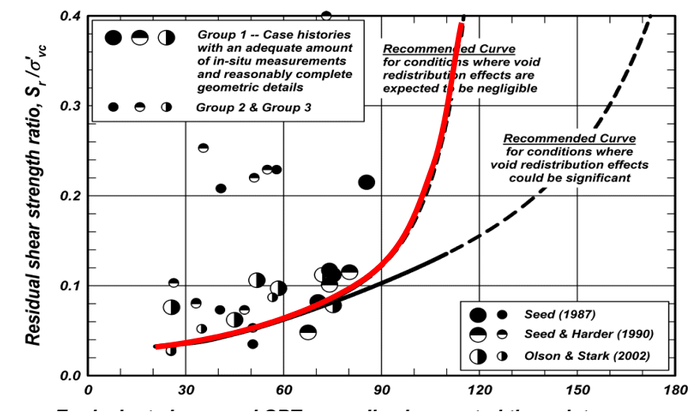
[21]State Param = state parameter index provided by Conetec and based on Been and Jefferies (1985). Positive = contractive soil, negative = dilative soil

[21]$Dq_{c1Ncs-Sr}$ is a function of fines content, values were estimated based on recommendations from Seed and Idriss, 2008

[22]$q_{c1Ncs-Sr} = q_{c1N} + Dq_{c1Ncs-Sr}$

[23]S_r/s'_{vo} estimated based on recommendations from Idriss and Boulanger, 2008, Equation 82

Idriss & Boulanger, 2008



$$\frac{S_r}{\sigma'_{vo}} = \exp\left(\frac{q_{c1Ncs-Sr}}{24.5} - \left(\frac{q_{c1Ncs-Sr}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs-Sr}}{106}\right)^3 - 4.42\right) \leq \tan\phi' \quad (82)$$

for conditions where void redistribution effects are expected to be negligible

ANALYSIS OF LIQUEFACTION POTENTIAL FOR EMBANKMENT AND FOUNDATION FOR 1250-YEAR RETURN INTERVAL

By: ZAO 1/5/2020
Checked: CDS 1/13/2020

Method: Boulanger&Idriss, CPT and SPT Based Liquefaction Triggering Procedures, April 2014
https://faculty.engineering.ucdavis.edu/boulanger/wp-content/uploads/sites/71/2014/09/Boulanger_Idriss_CPT_and_SPT_Liq_triggering_CGM-1

[1]Earthquake Magnitude, M: 7.3
[2]Peak Ground Acceleration, PHGA (g): 0.09

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	15.0	26.2	158.8	1.031	0.950	0.649	1.1	158.0	0	0	0.0	158.0	1.0	-0.2	0.0	1.0	0.351	1.052	0.378	0.056	6.733
NC-01	NB-02	Foundation Soils	15.1	26.1	149.2	1.015	0.810	0.680	1.1	148.6	0	0	0.0	148.6	1.0	-0.2	0.0	1.0	0.279	1.044	0.298	0.056	5.286
NC-01	NB-02	Foundation Soils	15.2	26.0	137.7	0.981	0.700	0.713	1.1	137.3	0	0	0.0	137.3	1.0	-0.2	0.0	1.0	0.223	1.036	0.235	0.056	4.170
NC-01	NB-02	Foundation Soils	15.3	25.9	125.6	0.934	0.910	0.743	1.1	125.5	3	0	0.0	125.5	1.0	-0.2	0.0	1.0	0.185	1.029	0.193	0.057	3.411
NC-01	NB-02	Foundation Soils	15.3	25.9	118.6	0.964	1.190	0.813	1.1	118.5	7	0	0.0	118.6	1.0	-0.2	0.0	1.0	0.168	1.026	0.175	0.057	3.085
NC-01	NB-02	Foundation Soils	15.4	25.8	99.3	1.015	1.190	1.022	1.1	99.6	16	0	0.4	100.0	1.0	-0.2	0.0	1.0	0.137	1.018	0.142	0.057	2.488
NC-01	NB-02	Foundation Soils	15.5	25.7	84.5	1.056	0.880	1.250	1.1	84.9	25	0	0.5	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.124	0.057	2.174
NC-01	NB-02	Foundation Soils	15.6	25.6	63.4	1.076	1.190	1.698	1.1	64.1	40	0	0.6	64.6	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.057	1.837
NC-01	NB-02	Foundation Soils	15.7	25.5	52.2	1.055	2.670	2.023	1.1	52.9	49	0	0.6	53.4	1.0	-0.3	0.0	1.0	0.095	1.008	0.096	0.057	1.681
NC-01	NB-02	Foundation Soils	15.7	25.4	49.3	0.967	5.540	1.962	1.1	49.9	50	0	0.6	50.5	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.057	1.639
NC-01	NB-02	Foundation Soils	15.8	25.4	48.9	0.914	7.050	1.868	1.1	49.5	49	0	0.6	50.1	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.058	1.630
NC-01	NB-02	Foundation Soils	15.9	25.3	49.6	0.812	8.620	1.636	1.1	50.1	46	0	0.6	50.7	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.058	1.634
NC-01	NB-02	Foundation Soils	16.0	25.2	49.6	0.733	12.530	1.477	1.1	50.1	44	0	0.5	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.058	1.629
NC-01	NB-02	Foundation Soils	16.1	25.1	48.2	0.571	16.320	1.185	1.1	48.6	40	0	0.5	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.058	1.606
NC-01	NB-02	Foundation Soils	16.2	25.0	47.9	0.307	18.630	0.642	1.1	48.1	28	0	0.5	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.058	1.596
NC-01	NB-02	Foundation Soils	16.2	25.0	48.4	0.228	19.450	0.471	1.1	48.6	23	0	0.4	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.058	1.598
NC-01	NB-02	Foundation Soils	16.3	24.9	47.1	0.242	15.570	0.514	1.1	47.2	25	0	0.4	47.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.058	1.577
NC-01	NB-02	Foundation Soils	16.4	24.8	42.8	0.337	18.200	0.788	1.1	42.9	36	0	0.5	43.4	1.0	-0.3	0.0	1.0	0.088	1.007	0.089	0.058	1.521
NC-01	NB-02	Foundation Soils	16.5	24.7	39.4	0.310	22.390	0.787	1.1	39.5	38	0	0.5	40.0	1.0	-0.3	0.0	1.0	0.085	1.007	0.086	0.059	1.478
NC-01	NB-02	Foundation Soils	16.6	24.6	33.7	0.274	68.340	0.814	1.1	33.8	44	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.059	1.407
NC-01	NB-02	Foundation Soils	16.7	24.5	31.8	0.232	103.200	0.729	1.1	31.9	43	0	0.5	32.4	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.059	1.383
NC-01	NB-02	Foundation Soils	16.7	24.5	31.4	0.227	95.170	0.723	1.1	31.4	44	0	0.5	31.9	1.0	-0.3	0.0	1.0	0.080	1.006	0.081	0.059	1.374
NC-01	NB-02	Foundation Soils	16.8	24.4	30.7	0.192	83.430	0.626	1.1	30.6	42	0	0.5	31.1	1.0	-0.3	0.0	1.0	0.080	1.006	0.080	0.059	1.363
NC-01	NB-02	Foundation Soils	16.9	24.3	29.4	0.182	83.430	0.619	1.1	29.3	43	0	0.5	29.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.059	1.345
NC-01	NB-02	Foundation Soils	17.0	24.2	30.4	0.203	81.570	0.668	1.1	30.3	44	0	0.5	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.059	1.353
NC-01	NB-02	Foundation Soils	17.1	24.1	31.9	0.275	72.130	0.863	1.1	31.7	47	0	0.5	32.2	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.059	1.366
NC-01	NB-02	Foundation Soils	17.1	24.0	34.4	0.182	61.270	0.529	1.1	34.1	36	0	0.5	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.059	1.390
NC-01	NB-02	Foundation Soils	17.2	24.0	35.1	0.080	57.160	0.228	1.0	34.8	25	0	0.4	35.2	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.060	1.394
NC-01	NB-02	Foundation Soils	17.3	23.9	33.6	0.063	44.640	0.187	1.0	33.2	24	0	0.4	33.6	1.0	-0.3	0.0	1.0	0.081	1.007	0.082	0.060	1.373
NC-01	NB-02	Foundation Soils	17.4	23.8	27.9	0.062	33.880	0.222	1.0	27.6	32	0	0.4	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.060	1.309
NC-01	NB-02	Foundation Soils	17.5	23.7	20.2	0.069	63.890	0.342	1.0	19.9	48	0	0.5	20.4	1.0	-0.3	0.0	1.0	0.073	1.006	0.073	0.060	1.224
NC-01	NB-02	Foundation Soils	17.6	23.6	15.8	0.104	122.090	0.660	1.0	15.6	65	0	0.5	16.0	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.060	1.177
NC-01	NB-02	Foundation Soils	17.6	23.6	16.7	0.135	150.800	0.809	1.0	16.4	66	0	0.5	16.9	1.0	-0.3	0.0	1.0	0.071	1.006	0.071	0.060	1.183
NC-01	NB-02	Foundation Soils	17.7	23.5	19.4	0.121	105.960	0.624	1.0	19.1	57	0	0.5	19.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.060	1.208
NC-01	NB-02	Foundation Soils	17.8	23.4	24.7	0.138	65.740	0.560	1.0	24.2	48	0	0.5	24.7	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.060	1.260
NC-01	NB-02	Foundation Soils	17.9	23.3	29.3	0.150	43.100	0.512	1.0	28.6	41	0	0.5	29.1	1.0	-0.3	0.0	0.9	0.078	1.006	0.079	0.060	1.305
NC-01	NB-02	Foundation Soils	18.0	23.2	31.1	0.164	37.120	0.528	1.0	30.3	40	0	0.5	30.8	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.061	1.321
NC-01	NB-02	Foundation Soils	18.0	23.1	31.7	0.190	47.830	0.600	1.0	30.8	41	0	0.5	31.3	1.0	-0.3	0.0	0.9	0.080	1.006	0.080	0.061	1.324
NC-01	NB-02	Foundation Soils	18.1	23.1	36.9	0.240	40.130	0.650	1.0	35.8	38	0	0.5	36.3	1.0	-0.3	0.0	0.9	0.083	1.007	0.084	0.061	1.377
NC-01	NB-02	Foundation Soils	18.2	23.0	41.8	0.273	30.020	0.653	1.0	40.5	34	0	0.5	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.061	1.426
NC-01	NB-02	Foundation Soils	18.3	22.9	45.9	0.314	27.250	0.685	1.0	44.3	32	0	0.5	44.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.061	1.467
NC-01	NB-02	Foundation Soils	18.4	22.8	48.6	0.336	24.610	0.691	1.0	46.9	30	0	0.5	47.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.061	1.495
NC-01	NB-02	Foundation Soils	18.5	22.7	51.4	0.353	20.150	0.686	1.0	49.5	29	0	0.5	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.061	1.522
NC-01	NB-02	Foundation Soils	18.5	22.7	53.4	0.382	18.200	0.715	1.0	51.3	28	0	0.5	51.8	1.0	-0.3	0.0	0.9	0.094	1.008	0.094	0.061	1.541
NC-01	NB-02	Foundation Soils	18.6	22.6	56.6	0.398	15.010	0.703	1.0	54.3	26	0	0.5	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.097	0.061	1.574
NC-01	NB-02	Foundation Soils	18.7	22.5	58.6	0.422	14.770	0.720	1.0	56.1	26	0	0.5	56.5	1.0	-0.3	0.0	0.9	0.097	1.008	0.098	0.062	1.592
NC-01	NB-02	Foundation Soils	18.8	22.4	60.4	0.444	15.340	0.735	1.0	57.7	25	0	0.5	58.2	1.0	-0.3	0.0	0.9	0.098	1.008	0.099	0.062	1.610
NC-01	NB-02	Foundation Soils	18.9	22.3	61.6	0.474	14.050	0.770	1.0	58.8	25	0	0.5	59.3	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.062	1.620
NC-01	NB-02	Foundation Soils	18.9	22.2	62.7	0.497	11.380	0.792	1.0	59.8	26	0	0.5	60.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.101	0.062	1.629
NC-01	NB-02	Foundation Soils	19.0	22.2	64.1	0.513	8.410	0.800	1.0	61.0	25	0	0.5	61.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.062	1.641
NC-01	NB-02	Foundation Soils	19.1	22.1	64.9	0.537	8.000	0.828	1.0	61.6	26	0	0.5	62.1	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.062	1.647
NC-01	NB-02	Foundation Soils	19.2	22.0	66.4	0.562	7.720	0.846	1.0	63.0	25	0	0.5	63.5	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.062	1.661
NC-01	NB-02	Foundation Soils	19.3	21.9	68.0	0.584	7.560	0.858	1.0	64.5	25	0	0.5	64.9	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.062	1.677

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	19.4	21.8	68.7	0.607	7.080	0.884	1.0	65.0	25	0	0.5	65.4	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.062	1.680
NC-01	NB-02	Foundation Soils	19.4	21.8	69.0	0.546	7.000	0.791	1.0	65.2	23	0	0.4	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.062	1.680
NC-01	NB-02	Foundation Soils	19.5	21.7	68.9	0.586	7.150	0.850	1.0	65.0	24	0	0.5	65.5	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.062	1.675
NC-01	NB-02	Foundation Soils	19.6	21.6	69.1	0.628	7.040	0.908	1.0	65.1	26	0	0.5	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.063	1.674
NC-01	NB-02	Foundation Soils	19.7	21.5	69.4	0.671	7.000	0.967	1.0	65.3	27	0	0.5	65.8	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.063	1.673
NC-01	NB-02	Foundation Soils	19.8	21.4	67.5	0.687	3.430	1.019	1.0	63.4	29	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.063	1.646
NC-01	NB-02	Foundation Soils	19.8	21.3	67.4	0.701	5.670	1.040	1.0	63.2	29	0	0.5	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.063	1.642
NC-01	NB-02	Foundation Soils	19.9	21.3	67.7	0.705	6.190	1.042	1.0	63.4	29	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.063	1.642
NC-01	NB-02	Foundation Soils	20.0	21.2	69.0	0.695	6.340	1.007	1.0	64.6	28	0	0.5	65.1	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.063	1.653
NC-01	NB-02	Foundation Soils	20.1	21.1	70.0	0.681	6.340	0.973	1.0	65.4	27	0	0.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.063	1.662
NC-01	NB-02	Foundation Soils	20.2	21.0	70.8	0.688	6.810	0.972	1.0	66.1	27	0	0.5	66.6	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.063	1.667
NC-01	NB-02	Foundation Soils	20.3	20.9	72.2	0.696	7.720	0.964	1.0	67.3	26	0	0.5	67.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.063	1.680
NC-01	NB-02	Foundation Soils	20.3	20.9	73.0	0.692	8.100	0.948	1.0	68.0	25	0	0.5	68.5	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.063	1.686
NC-01	NB-02	Foundation Soils	20.4	20.8	73.6	0.700	8.450	0.951	1.0	68.5	25	0	0.5	68.9	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.063	1.690
NC-01	NB-02	Foundation Soils	20.5	20.7	73.9	0.729	8.620	0.987	1.0	68.6	26	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.064	1.689
NC-01	NB-02	Foundation Soils	20.6	20.6	74.0	0.760	8.560	1.027	1.0	68.6	27	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.064	1.686
NC-01	NB-02	Foundation Soils	20.7	20.5	73.2	0.766	8.580	1.046	1.0	67.8	27	0	0.5	68.3	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.064	1.674
NC-01	NB-02	Foundation Soils	20.8	20.4	72.0	0.772	8.580	1.073	1.0	66.5	29	0	0.5	67.0	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.064	1.655
NC-01	NB-02	Foundation Soils	20.8	20.4	68.8	0.771	8.880	1.121	1.0	63.5	31	0	0.5	64.0	1.0	-0.4	0.0	0.9	0.103	1.009	0.103	0.064	1.615
NC-01	NB-02	Foundation Soils	20.9	20.3	65.4	0.785	9.420	1.200	1.0	60.3	34	0	0.5	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.064	1.574
NC-01	NB-02	Foundation Soils	21.0	20.2	63.8	0.790	9.340	1.238	1.0	58.7	35	0	0.5	59.2	1.0	-0.4	0.0	0.9	0.099	1.009	0.099	0.064	1.553
NC-01	NB-02	Foundation Soils	21.1	20.1	60.6	0.780	9.430	1.288	1.0	55.6	37	0	0.5	56.2	1.0	-0.4	0.0	0.9	0.097	1.008	0.097	0.064	1.515
NC-01	NB-02	Foundation Soils	21.2	20.0	58.6	0.743	10.050	1.269	1.0	53.7	38	0	0.5	54.3	1.0	-0.4	0.0	0.9	0.095	1.008	0.096	0.064	1.491
NC-01	NB-02	Foundation Soils	21.2	19.9	56.1	0.704	11.580	1.255	1.0	51.4	39	0	0.5	51.9	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.064	1.462
NC-01	NB-02	Foundation Soils	21.3	19.9	54.9	0.671	12.530	1.222	1.0	50.2	39	0	0.5	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.064	1.447
NC-01	NB-02	Foundation Soils	21.4	19.8	54.0	0.633	12.670	1.172	1.0	49.3	39	0	0.5	49.8	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.064	1.435
NC-01	NB-02	Foundation Soils	21.5	19.7	53.1	0.618	12.670	1.164	1.0	48.4	39	0	0.5	48.9	1.0	-0.4	0.0	0.9	0.092	1.007	0.092	0.065	1.423
NC-01	NB-02	Foundation Soils	21.6	19.6	52.9	0.616	13.440	1.165	1.0	48.1	39	0	0.5	48.6	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.065	1.418
NC-01	NB-02	Foundation Soils	21.7	19.5	53.6	0.601	13.960	1.121	1.0	48.7	38	0	0.5	49.3	1.0	-0.4	0.0	0.9	0.092	1.008	0.092	0.065	1.423
NC-01	NB-02	Foundation Soils	21.7	19.5	56.1	0.575	13.780	1.026	1.0	50.9	35	0	0.5	51.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.065	1.445
NC-01	NB-02	Foundation Soils	21.8	19.4	58.5	0.551	13.720	0.941	1.0	53.1	32	0	0.5	53.6	1.0	-0.4	0.0	0.9	0.095	1.008	0.095	0.065	1.467
NC-01	NB-02	Foundation Soils	21.9	19.3	63.0	0.559	13.570	0.887	1.0	57.2	29	0	0.5	57.7	1.0	-0.4	0.0	0.9	0.098	1.008	0.098	0.065	1.511
NC-01	NB-02	Foundation Soils	22.0	19.2	66.4	0.561	12.570	0.844	1.0	60.2	26	0	0.5	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.065	1.544
NC-01	NB-02	Foundation Soils	22.1	19.1	66.8	0.586	11.700	0.877	1.0	60.5	27	0	0.5	61.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.065	1.545
NC-01	NB-02	Foundation Soils	22.1	19.0	66.5	0.599	9.960	0.901	1.0	60.1	28	0	0.5	60.6	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.065	1.538
NC-01	NB-02	Foundation Soils	22.2	19.0	62.7	0.613	0.080	0.978	1.0	56.5	31	0	0.5	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.098	0.065	1.496
NC-01	NB-02	Foundation Soils	22.3	18.9	55.6	0.675	-1.290	1.213	1.0	50.0	39	0	0.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.065	1.422
NC-01	NB-02	Foundation Soils	22.4	18.8	47.1	0.697	3.130	1.480	0.9	42.2	48	0	0.5	42.7	1.0	-0.4	0.0	0.9	0.087	1.007	0.087	0.065	1.337
NC-01	NB-02	Foundation Soils	22.5	18.7	41.8	0.655	3.050	1.566	0.9	37.4	52	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.084	0.065	1.285
NC-01	NB-02	Foundation Soils	22.6	18.6	39.5	0.629	9.790	1.593	0.9	35.2	54	0	0.5	35.7	1.0	-0.4	0.0	0.9	0.083	1.007	0.083	0.066	1.261
NC-01	NB-02	Foundation Soils	22.6	18.6	39.4	0.593	7.100	1.506	0.9	35.0	53	0	0.5	35.6	1.0	-0.4	0.0	0.9	0.082	1.007	0.083	0.066	1.258
NC-01	NB-02	Foundation Soils	22.7	18.5	39.3	0.485	-0.820	1.235	0.9	34.9	49	0	0.5	35.4	1.0	-0.4	0.0	0.9	0.082	1.007	0.082	0.066	1.255
NC-01	NB-02	Foundation Soils	22.8	18.4	36.5	0.398	1.240	1.091	0.9	32.3	49	0	0.5	32.8	1.0	-0.4	0.0	0.9	0.081	1.007	0.081	0.066	1.228
NC-01	NB-02	Foundation Soils	22.9	18.3	33.9	0.354	4.170	1.044	0.9	30.0	51	0	0.5	30.5	1.0	-0.4	0.0	0.9	0.079	1.006	0.079	0.066	1.203
NC-01	NB-02	Foundation Soils	23.0	18.2	29.7	0.310	7.290	1.044	0.9	26.1	55	0	0.5	26.7	1.0	-0.4	0.0	0.9	0.077	1.006	0.077	0.066	1.164
NC-01	NB-02	Foundation Soils	23.0	18.1	26.5	0.300	7.120	1.131	0.9	23.3	60	0	0.5	23.8	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.066	1.135
NC-01	NB-02	Foundation Soils	23.1	18.1	24.8	0.284	8.580	1.146	0.9	21.7	62	0	0.5	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.066	1.119
NC-01	NB-02	Foundation Soils	23.2	18.0	25.7	0.270	11.890	1.049	0.9	22.5	59	0	0.5	23.0	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.066	1.125
NC-01	NB-02	Foundation Soils	23.3	17.9	27.4	0.253	11.410	0.922	0.9	24.0	55	0	0.5	24.5	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.066	1.138
NC-01	NB-02	Foundation Soils	23.4	17.8	26.9	0.249	14.010	0.925	0.9	23.5	56	0	0.5	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.066	1.132
NC-01	NB-02	Foundation Soils	23.5	17.7	26.3	0.252	16.390	0.958	0.9	22.9	57	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.066	1.125
NC-01	NB-02	Foundation Soils	23.5	17.7	25.8	0.247	18.340	0.959	0.9	22.4	58	0	0.5	22.9	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.066	1.119
NC-01	NB-02	Foundation Soils	23.6	17.6	25.1	0.252	17.880	1.004	0.9	21.8	59	0	0.5	22.3	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.066	1.112
NC-01	NB-02	Foundation Soils	23.7	17.5	24.1	0.258	18.060	1.072	0.9	20.8	62	0	0.5	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.067	1.102
NC-01	NB-02	Foundation Soils	23.8	17.4	22.9	0.263	18.490	1.147	0.9	20.3	65	30	47.4	67.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.067	1.584
NC-01	NB-02	Foundation Soils	23.9	17.3	20.9	0.264	18.540	1.265	0.9	18.4	74	30	47.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.104	0.067	1.561
NC-01	NB-02	Foundation Soils	23.9	17.2	19.3	0.262	18.720	1.358	0.9	17.0	77	30	47.4	64.4	1.0	-0.4	0.1	0.9	0.103	1.009	0.103	0.067	1.541
NC-01	NB-02	Foundation Soils	24.0	17.2	17.7	0.260	18.870	1.468	0.9	15.6	82	30	47.2	62.8	1.0	-0.4	0.1	0.9	0.102	1.009	0.102	0.067	1.521
NC-01	NB-02	Foundation Soils	24.1	17.1	15.9	0.261	19.200	1.646	0.9	13.9	88	30	47.0	60.9	1.0	-0.4	0.1	0.9	0.100	1.009	0.100	0.067	1.498
NC-01	NB-02	Foundation Soils	24.2	17.0	14.5	0.240	20.250	1.658	0.9	12.7	91	30	46.8	59.5	1.0	-0.5	0.1	0.9	0.099	1.009	0.099	0.067	1.480
NC-01	NB-02	Foundation Soils	24.3	16.9	12.8	0.205	29.540	1.601	0.9	11.2	95	30	46.5	57.7	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.067	1.459
NC-01	NB-02	Foundation Soils	24.4	16.8	12.7	0.158	35.010	1.247	0.9	11.1	91	30	46.4	57.4	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.067	1.455

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	24.4	16.7	13.2	0.115	32.350	0.871	0.9	11.5	84	30	46.3	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.067	1.457
NC-01	NB-02	Foundation Soils	24.5	16.7	13.5	0.083	31.410	0.614	0.9	11.8	78	30	46.1	57.9	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.067	1.456
NC-01	NB-02	Foundation Soils	24.6	16.6	13.6	0.068	34.690	0.500	0.9	11.8	75	30	46.0	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.067	1.454
NC-01	NB-02	Foundation Soils	24.7	16.5	13.8	0.072	32.160	0.522	0.9	12.0	75	30	46.0	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.067	1.455
NC-01	NB-02	Foundation Soils	24.8	16.4	13.8	0.076	32.590	0.551	0.9	12.0	76	30	46.1	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.067	1.453
NC-01	NB-02	Foundation Soils	24.9	16.3	13.2	0.090	32.280	0.683	0.9	11.4	81	30	46.1	57.6	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.067	1.446
NC-01	NB-02	Foundation Soils	24.9	16.3	12.8	0.114	33.260	0.893	0.9	11.1	86	30	46.2	57.3	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.067	1.442
NC-01	NB-02	Foundation Soils	25.0	16.2	12.5	0.131	29.490	1.048	0.9	10.8	89	30	46.3	57.1	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.068	1.438
NC-01	NB-02	Foundation Soils	25.1	16.1	12.8	0.085	32.160	0.663	0.9	11.1	82	30	46.1	57.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.068	1.437
NC-01	NB-02	Foundation Soils	25.2	16.0	12.1	0.066	28.230	0.543	0.9	10.5	81	30	45.9	56.4	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.068	1.428
NC-01	NB-02	Foundation Soils	25.3	15.9	11.7	0.076	22.160	0.651	0.9	10.1	85	30	45.9	56.0	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.068	1.422
NC-01	NB-02	Foundation Soils	25.3	15.8	11.9	0.071	14.240	0.596	0.9	10.3	83	30	45.9	56.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.068	1.423
NC-01	NB-02	Foundation Soils	25.4	15.8	11.3	0.070	21.920	0.620	0.9	9.7	86	30	45.9	55.6	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.068	1.415
NC-01	NB-02	Foundation Soils	25.5	15.7	10.8	0.063	27.590	0.586	0.9	9.2	87	30	45.8	55.0	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.068	1.408
NC-01	NB-02	Foundation Soils	25.6	15.6	9.6	0.057	31.400	0.592	0.9	8.2	92	15	35.0	43.2	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.068	1.284
NC-01	NB-02	Foundation Soils	25.7	15.5	8.2	0.036	30.020	0.439	0.9	7.0	95	15	34.8	41.8	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.068	1.269
NC-01	NB-02	Foundation Soils	25.8	15.4	6.0	0.040	39.550	0.661	0.9	5.1	100	15	34.5	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.068	1.247
NC-01	NB-02	Foundation Soils	25.8	15.4	4.7	0.052	52.080	1.117	0.9	3.9	100	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.068	1.231
NC-01	NB-02	Foundation Soils	25.9	15.3	4.7	0.059	71.090	1.268	0.9	3.9	100	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.068	1.230
NC-01	NB-02	Foundation Soils	26.0	15.2	9.5	0.063	62.400	0.660	0.9	8.1	94	15	35.0	43.1	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.068	1.277
NC-01	NB-02	Foundation Soils	26.1	15.1	12.9	0.071	42.450	0.551	0.9	10.9	80	15	35.2	46.1	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.068	1.306
NC-01	NB-02	Foundation Soils	26.2	15.0	15.8	0.068	29.210	0.431	0.9	13.4	63	15	34.9	48.3	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.068	1.326
NC-01	NB-02	Foundation Soils	26.2	14.9	16.7	0.075	34.860	0.449	0.9	14.2	61	15	34.9	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.068	1.334
NC-01	NB-02	Foundation Soils	26.3	14.9	19.0	0.082	15.200	0.431	0.9	16.1	57	15	34.9	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.068	1.353
NC-01	NB-02	Foundation Soils	26.4	14.8	19.3	0.071	19.520	0.368	0.9	16.3	54	15	34.7	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.069	1.352
NC-01	NB-02	Foundation Soils	26.5	14.7	19.7	0.075	16.440	0.381	0.9	16.7	54	15	34.8	51.4	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.069	1.354
NC-01	NB-02	Foundation Soils	26.6	14.6	19.7	0.065	27.060	0.330	0.9	16.6	52	15	34.6	51.2	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.069	1.351
NC-01	NB-02	Foundation Soils	26.7	14.5	19.8	0.053	34.240	0.268	0.9	16.7	50	15	34.3	51.0	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.069	1.348
NC-01	NB-02	Foundation Soils	26.7	14.5	20.4	0.057	40.350	0.280	0.9	17.2	49	15	34.4	51.5	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.069	1.351
NC-01	NB-02	Foundation Soils	26.8	14.4	20.8	0.065	37.690	0.312	0.9	17.6	50	15	34.5	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.069	1.355
NC-01	NB-02	Foundation Soils	26.9	14.3	19.7	0.060	40.280	0.304	0.9	16.6	51	15	34.5	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.069	1.344
NC-01	NB-02	Foundation Soils	27.0	14.2	18.4	0.054	51.090	0.294	0.9	15.4	54	15	34.5	49.9	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.069	1.332
NC-01	NB-02	Foundation Soils	27.1	14.1	17.5	0.047	59.890	0.269	0.9	14.6	54	15	34.4	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.069	1.322
NC-01	NB-02	Foundation Soils	27.1	14.0	17.5	0.037	55.410	0.212	0.9	14.6	52	15	34.2	48.9	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.069	1.318
NC-01	NB-02	Foundation Soils	27.2	14.0	17.8	0.034	56.190	0.191	0.9	14.9	51	15	34.1	49.0	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.069	1.319
NC-01	NB-02	Foundation Soils	27.3	13.9	19.3	0.029	52.030	0.151	0.9	16.1	46	15	33.7	49.8	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.069	1.326
NC-01	NB-02	Foundation Soils	27.4	13.8	20.9	0.027	55.220	0.129	0.9	17.4	43	15	33.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.069	1.335
NC-01	NB-02	Foundation Soils	27.5	13.7	22.9	0.026	65.750	0.113	0.9	19.1	39	15	32.8	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.069	1.345
NC-01	NB-02	Foundation Soils	27.6	13.6	24.8	0.019	69.680	0.077	0.9	20.7	35	15	31.9	52.6	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.069	1.351
NC-01	NB-02	Foundation Soils	27.6	13.6	25.2	0.021	70.420	0.083	0.9	21.0	34	15	31.9	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.069	1.353
NC-01	NB-02	Foundation Soils	27.7	13.5	25.2	0.025	71.610	0.099	0.9	21.0	35	15	32.1	53.1	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.069	1.354
NC-01	NB-02	Foundation Soils	27.8	13.4	24.7	0.026	72.470	0.105	0.9	20.6	36	15	32.3	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.069	1.350
NC-01	NB-02	Foundation Soils	27.9	13.3	23.7	0.025	76.210	0.106	0.9	19.7	37	15	32.6	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.069	1.343
NC-01	NB-02	Foundation Soils	28.0	13.2	22.9	0.023	78.140	0.101	0.9	18.9	38	15	32.7	51.7	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.069	1.336
NC-01	NB-02	Foundation Soils	28.1	13.1	21.7	0.019	81.420	0.088	0.9	17.9	40	15	32.9	50.8	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.070	1.326
NC-01	NB-02	Foundation Soils	28.1	13.1	20.7	0.015	83.330	0.073	0.9	17.1	41	15	33.0	50.1	1.0	-0.6	0.1	0.9	0.092	1.008	0.092	0.070	1.318
NC-01	NB-02	Foundation Soils	28.2	13.0	19.8	0.010	86.460	0.050	0.9	16.3	42	15	33.1	49.5	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.070	1.311
NC-01	NB-02	Foundation Soils	28.3	12.9	19.3	0.010	89.240	0.052	0.9	15.9	43	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.070	1.306
NC-01	NB-02	Foundation Soils	28.4	12.8	19.2	0.011	91.430	0.057	0.9	15.8	43	15	33.2	49.0	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.070	1.304
NC-01	NB-02	Foundation Soils	28.5	12.7	19.4	0.012	93.050	0.062	0.9	15.9	43	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.070	1.305
NC-01	NB-02	Foundation Soils	28.5	12.6	19.6	0.017	95.530	0.087	0.9	16.1	44	15	33.3	49.3	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.070	1.306
NC-01	NB-02	Foundation Soils	28.6	12.6	19.5	0.031	98.050	0.159	0.9	16.0	47	15	33.8	49.8	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.070	1.309
NC-01	NB-02	Foundation Soils	28.7	12.5	18.9	0.041	98.950	0.217	0.9	15.4	50	15	34.2	49.6	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.070	1.307
NC-01	NB-02	Foundation Soils	28.8	12.4	16.7	0.037	102.290	0.222	0.9	13.6	55	15	34.3	47.9	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.070	1.289
NC-01	NB-02	Foundation Soils	28.9	12.3	14.5	0.041	104.650	0.283	0.9	11.8	62	15	34.5	46.3	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.070	1.272
NC-01	NB-02	Foundation Soils	29.0	12.2	11.8	0.048	111.250	0.405	0.9	9.6	82	15	35.0	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.070	1.255
NC-01	NB-02	Foundation Soils	29.0	12.2	9.4	0.052	127.860	0.555	0.9	7.6	96	15	34.9	42.5	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.070	1.234
NC-01	NB-02	Foundation Soils	29.1	12.1	8.3	0.042	139.790	0.504	0.9	6.7	100	15	34.8	41.6	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.070	1.224
NC-01	NB-02	Foundation Soils	29.2	12.0	8.3	0.040	139.360	0.480	0.9	6.7	99	15	34.8	41.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.070	1.223
NC-01	NB-02	Foundation Soils	29.3	11.9	8.8	0.081	127.640	0.918	0.9	7.1	100	15	34.9	42.0	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.070	1.226
NC-01	NB-02	Foundation Soils	29.4	11.8	9.5	0.099	132.060	1.044	0.9	7.7	100	15	35.0	42.7	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.070	1.232
NC-01	NB-02	Foundation Soils	29.4	11.7	11.5	0.145	121.780	1.258	0.9	9.3	100	15	35.3	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.070	1.250

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	29.5	11.7	12.7	0.115	110.010	0.903	0.9	10.3	91	15	35.3	45.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.070	1.258
NC-01	NB-02	Foundation Soils	29.6	11.6	20.0	0.187	52.550	0.937	0.9	16.2	75	15	36.0	52.2	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.070	1.322
NC-01	NB-02	Foundation Soils	29.7	11.5	23.6	0.173	82.330	0.734	0.9	19.2	58	15	35.6	54.8	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.070	1.347
NC-01	NB-02	Foundation Soils	29.8	11.4	35.3	0.163	143.140	0.462	0.9	28.8	38	15	34.4	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.070	1.434
NC-01	NB-02	Foundation Soils	29.9	11.3	47.3	0.176	68.040	0.372	0.9	38.8	26	15	30.6	69.4	1.0	-0.6	0.1	0.9	0.107	1.010	0.106	0.070	1.500
NC-01	NB-02	Foundation Soils	29.9	11.3	53.4	0.242	-0.810	0.453	0.9	43.9	25	15	30.6	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.110	0.070	1.558
NC-01	NB-02	Foundation Soils	30.0	11.2	59.7	0.088	10.430	0.148	0.9	48.1	8	15	4.1	52.3	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.071	1.318
NC-01	NB-02	Foundation Soils	30.1	11.1	68.2	0.102	6.760	0.149	0.9	55.1	4	15	0.0	55.2	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.071	1.346
NC-01	NB-02	Foundation Soils	30.2	11.0	74.6	0.177	10.010	0.237	0.9	60.5	5	15	0.5	61.0	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.071	1.406
NC-01	NB-02	Foundation Soils	30.3	10.9	74.4	0.149	4.470	0.200	0.9	60.3	4	15	0.0	60.3	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.071	1.397
NC-01	NB-02	Foundation Soils	30.3	10.8	70.4	0.286	11.820	0.406	0.9	57.6	15	15	18.9	76.5	1.0	-0.6	0.1	0.9	0.113	1.011	0.111	0.071	1.577
NC-01	NB-02	Foundation Soils	30.4	10.8	73.1	0.271	11.650	0.371	0.9	59.7	12	15	13.4	73.1	1.0	-0.6	0.1	0.9	0.110	1.011	0.109	0.071	1.535
NC-01	NB-02	Foundation Soils	30.5	10.7	81.3	0.187	12.200	0.230	0.9	66.0	2	15	0.0	66.0	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.071	1.454
NC-01	NB-02	Foundation Soils	30.6	10.6	78.3	0.132	23.570	0.168	0.9	63.3	0	15	0.0	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.071	1.425
NC-01	NB-02	Foundation Soils	30.7	10.5	70.1	0.183	23.490	0.261	0.9	56.6	9	15	5.4	62.0	1.0	-0.6	0.1	0.9	0.101	1.009	0.100	0.071	1.410
NC-01	NB-02	Foundation Soils	30.8	10.4	70.1	0.280	20.010	0.399	0.9	57.1	15	15	18.9	75.9	1.0	-0.6	0.1	0.9	0.112	1.011	0.111	0.071	1.565
NC-01	NB-02	Foundation Soils	30.8	10.4	76.9	0.242	11.980	0.315	0.9	62.1	8	15	4.6	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.071	1.459
NC-01	NB-02	Foundation Soils	30.9	10.3	80.3	0.197	12.260	0.245	0.9	64.7	4	15	0.0	64.7	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.071	1.437
NC-01	NB-02	Foundation Soils	31.0	10.2	83.1	0.202	5.100	0.243	0.9	67.0	2	15	0.0	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.104	0.071	1.460
NC-01	NB-02	Foundation Soils	31.1	10.1	79.5	0.268	41.260	0.337	0.9	64.2	8	15	4.6	68.7	1.0	-0.6	0.1	0.9	0.106	1.010	0.105	0.071	1.478
NC-01	NB-02	Foundation Soils	31.2	10.0	74.5	0.362	14.640	0.486	0.9	60.6	16	15	21.8	82.4	1.0	-0.6	0.1	0.9	0.118	1.013	0.117	0.071	1.642
NC-01	NB-02	Foundation Soils	31.2	9.9	74.5	0.275	17.590	0.369	0.9	60.1	12	15	12.6	72.8	1.0	-0.6	0.1	0.9	0.110	1.011	0.108	0.071	1.522
NC-01	NB-02	Foundation Soils	31.3	9.9	86.3	0.255	15.440	0.295	0.9	69.5	4	15	0.0	69.5	1.0	-0.6	0.1	0.9	0.107	1.010	0.105	0.071	1.485
NC-01	NB-02	Foundation Soils	31.4	9.8	82.0	0.249	27.920	0.304	0.8	65.7	6	15	1.0	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.071	1.453
NC-01	NB-02	Foundation Soils	31.5	9.7	80.5	0.241	8.750	0.299	0.8	64.4	6	15	1.4	65.8	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.071	1.443
NC-01	NB-02	Foundation Soils	31.6	9.6	81.2	0.210	25.760	0.259	0.8	64.9	4	15	0.1	65.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.071	1.433
NC-01	NB-02	Foundation Soils	31.7	9.5	83.3	0.084	20.630	0.101	0.8	66.6	0	15	0.0	66.6	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.071	1.449
NC-01	NB-02	Foundation Soils	31.7	9.4	83.4	0.068	18.720	0.082	0.8	66.6	0	15	0.0	66.6	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.071	1.449
NC-01	NB-02	Foundation Soils	31.8	9.4	84.0	0.045	18.240	0.054	0.8	67.0	0	15	0.0	67.0	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.071	1.452
NC-01	NB-02	Foundation Soils	31.9	9.3	83.1	0.031	20.730	0.037	0.8	66.2	0	15	0.0	66.2	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.071	1.443
NC-01	NB-02	Foundation Soils	32.0	9.2	78.4	0.045	25.970	0.057	0.8	62.2	0	15	0.0	62.2	1.0	-0.7	0.1	0.9	0.101	1.009	0.100	0.071	1.400
NC-01	NB-02	Foundation Soils	32.1	9.1	72.3	0.044	18.820	0.061	0.8	57.0	0	15	0.0	57.0	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.071	1.346
NC-01	NB-02	Foundation Soils	32.2	9.0	67.2	0.057	21.620	0.085	0.8	52.6	2	15	0.0	52.6	1.0	-0.7	0.1	0.9	0.094	1.008	0.093	0.071	1.302
NC-01	NB-02	Foundation Soils	32.2	9.0	64.0	0.058	14.200	0.091	0.8	49.9	4	15	0.0	50.0	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.071	1.276
NC-01	NB-02	Foundation Soils	32.3	8.9	58.7	0.065	21.860	0.111	0.8	45.7	8	15	3.3	49.0	1.0	-0.7	0.1	0.9	0.092	1.007	0.090	0.071	1.266
NC-01	NB-02	Foundation Soils	32.4	8.8	53.2	0.056	25.050	0.105	0.8	41.5	11	15	9.8	51.3	1.0	-0.7	0.1	0.9	0.093	1.008	0.092	0.071	1.287
NC-01	NB-02	Foundation Soils	32.5	8.7	57.4	0.034	18.470	0.059	0.8	44.4	7	15	1.9	46.4	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.071	1.240
NC-01	NB-02	Foundation Soils	32.6	8.6	59.6	0.031	5.720	0.052	0.8	46.1	6	15	0.7	46.8	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.071	1.243
NC-01	NB-02	Foundation Soils	32.6	8.5	63.7	0.067	10.420	0.105	0.8	49.4	5	15	0.2	49.7	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.071	1.270
NC-01	NB-02	Foundation Soils	32.7	8.5	63.2	0.070	10.860	0.111	0.8	49.0	5	15	0.5	49.5	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.071	1.267
NC-01	NB-02	Foundation Soils	32.8	8.4	65.2	0.080	8.800	0.123	0.8	50.5	5	15	0.3	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.072	1.279
NC-01	NB-02	Foundation Soils	32.9	8.3	59.7	0.181	11.910	0.303	0.8	47.0	17	15	21.7	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.072	1.461
NC-01	NB-02	Foundation Soils	33.0	8.2	54.6	0.218	11.910	0.399	0.8	43.1	23	15	29.3	72.5	1.0	-0.7	0.1	0.9	0.109	1.011	0.107	0.072	1.502
NC-01	NB-02	Foundation Soils	33.1	8.1	57.6	0.175	33.020	0.304	0.8	45.3	18	15	23.4	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.072	1.460
NC-01	NB-02	Foundation Soils	33.1	8.1	65.7	0.191	6.580	0.291	0.8	51.6	13	15	15.3	66.8	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.072	1.438
NC-01	NB-02	Foundation Soils	33.2	8.0	72.7	0.171	21.620	0.235	0.8	56.6	7	15	2.6	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.072	1.358
NC-01	NB-02	Foundation Soils	33.3	7.9	73.8	0.181	10.280	0.245	0.8	57.4	7	15	2.6	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.072	1.367
NC-01	NB-02	Foundation Soils	33.4	7.8	70.9	0.172	20.920	0.243	0.8	55.1	9	15	4.9	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.072	1.365
NC-01	NB-02	Foundation Soils	33.5	7.7	71.3	0.261	14.390	0.366	0.8	56.0	14	15	17.0	73.0	1.0	-0.7	0.1	0.9	0.110	1.011	0.108	0.072	1.504
NC-01	NB-02	Foundation Soils	33.5	7.6	66.9	0.344	17.340	0.514	0.8	52.9	21	15	28.3	81.2	1.0	-0.7	0.1	0.9	0.117	1.012	0.115	0.072	1.601
NC-01	NB-02	Foundation Soils	33.6	7.6	65.3	0.452	27.970	0.692	0.8	51.8	27	15	33.3	85.1	1.0	-0.7	0.1	0.9	0.121	1.013	0.118	0.072	1.650
NC-01	NB-02	Foundation Soils	33.7	7.5	63.2	0.217	18.770	0.343	0.8	49.5	17	15	22.0	71.5	1.0	-0.7	0.1	0.9	0.109	1.010	0.107	0.072	1.485
NC-01	NB-02	Foundation Soils	33.8	7.4	65.6	0.211	18.490	0.321	0.8	51.2	15	15	18.5	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.072	1.464
NC-01	NB-02	Foundation Soils	33.9	7.3	68.0	0.203	4.380	0.299	0.8	52.9	13	15	14.3	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.072	1.436
NC-01	NB-02	Foundation Soils	34.0	7.2	67.1	0.210	23.160	0.313	0.8	52.2	14	15	16.6	68.8	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.072	1.453
NC-01	NB-02	Foundation Soils	34.0	7.2	59.1	0.184	18.220	0.312	0.8	45.9	18	15	23.2	69.2	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.072	1.457
NC-01	NB-02	Foundation Soils	34.1	7.1	57.7	0.175	18.490	0.303	0.8	44.8	18	15	23.7	68.6	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.072	1.449
NC-01	NB-02	Foundation Soils	34.2	7.0	59.7	0.101	18.860	0.169	0.8	45.7	11	15	9.8	55.5	1.0	-0.7	0.1	0.9	0.096	1.008	0.095	0.072	1.315
NC-01	NB-02	Foundation Soils	34.3	6.9	62.2	0.034	35.490	0.055	0.8	47.0	5	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.072	1.236
NC-01	NB-02	Foundation Soils	34.4	6.8	62.3	0.036	19.920	0.058	0.8	47.1	5	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.072	1.236
NC-01	NB-02	Foundation Soils	34.4	6.7	63.8	0.020	11.780	0.031	0.8	48.2	6	15	0.6	48.8	1.0	-0.7	0.1	0.9	0.091	1.007	0.090	0.072	1.250
NC-01	NB-02	Foundation Soils	34.5	6.7	67.0	0.025	18.870	0.037	0.8	50.8	3	15	0.0	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.072	1.267

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	34.6	6.6	70.9	0.111	16.910	0.157	0.8	53.9	5	15	0.1	54.0	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.072	1.298
NC-01	NB-02	Foundation Soils	34.7	6.5	72.0	0.055	14.220	0.076	0.8	54.7	0	15	0.0	54.7	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.072	1.304
NC-01	NB-02	Foundation Soils	34.8	6.4	71.7	0.054	18.470	0.075	0.8	54.4	0	15	0.0	54.4	1.0	-0.7	0.1	0.9	0.095	1.008	0.094	0.072	1.301
NC-01	NB-02	Foundation Soils	34.9	6.3	72.6	0.087	6.120	0.120	0.8	55.1	2	15	0.0	55.1	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.072	1.307
NC-01	NB-02	Foundation Soils	34.9	6.3	72.4	0.175	10.480	0.242	0.8	55.2	8	15	4.5	59.6	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.072	1.351
NC-01	NB-02	Foundation Soils	35.0	6.2	72.6	0.045	19.030	0.062	0.8	54.9	0	15	0.0	54.9	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.072	1.304
NC-01	NB-02	Foundation Soils	35.1	6.1	70.5	0.074	14.050	0.105	0.8	53.2	2	15	0.0	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.072	1.287
NC-01	NB-02	Foundation Soils	35.2	6.0	68.9	0.078	17.720	0.113	0.8	51.8	3	15	0.0	51.8	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.072	1.274
NC-01	NB-02	Foundation Soils	35.3	5.9	66.5	0.095	7.240	0.143	0.8	49.9	6	15	1.2	51.1	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.072	1.266
NC-01	NB-02	Foundation Soils	35.4	5.8	65.6	0.099	13.860	0.151	0.8	49.2	7	15	2.3	51.5	1.0	-0.8	0.1	0.9	0.093	1.008	0.092	0.072	1.270
NC-01	NB-02	Foundation Soils	35.4	5.8	66.0	0.079	30.730	0.120	0.8	49.4	5	15	0.4	49.8	1.0	-0.8	0.1	0.9	0.092	1.008	0.090	0.072	1.253
NC-01	NB-02	Foundation Soils	35.5	5.7	69.0	0.138	11.510	0.200	0.8	52.0	8	15	3.8	55.8	1.0	-0.8	0.1	0.9	0.096	1.008	0.095	0.072	1.310
NC-01	NB-02	Foundation Soils	35.6	5.6	63.1	0.202	15.200	0.320	0.8	48.3	17	15	21.5	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.105	0.072	1.451
NC-01	NB-02	Foundation Soils	35.7	5.5	68.5	0.176	29.720	0.257	0.8	51.9	11	15	10.6	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.072	1.376
NC-01	NB-02	Foundation Soils	35.8	5.4	71.7	0.142	11.240	0.198	0.8	53.8	7	15	1.8	55.6	1.0	-0.8	0.1	0.9	0.096	1.008	0.094	0.072	1.306
NC-01	NB-02	Foundation Soils	35.8	5.3	70.4	0.090	20.330	0.128	0.8	52.6	4	15	0.0	52.6	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.072	1.278
NC-01	NB-02	Foundation Soils	35.9	5.3	68.0	0.052	19.720	0.077	0.8	50.6	3	15	0.0	50.6	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.072	1.258
NC-01	NB-02	Foundation Soils	36.0	5.2	65.8	0.048	18.410	0.073	0.8	48.8	4	15	0.0	48.8	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.072	1.241
NC-01	NB-02	Foundation Soils	36.1	5.1	62.9	0.028	17.060	0.045	0.8	46.5	5	15	0.4	46.9	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.072	1.222
NC-01	NB-02	Foundation Soils	36.2	5.0	56.3	0.026	15.650	0.046	0.8	41.6	9	15	5.7	47.3	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.072	1.226
NC-01	NB-02	Foundation Soils	36.3	4.9	54.5	0.026	15.700	0.048	0.8	40.2	10	15	8.1	48.3	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.072	1.235
NC-01	NB-02	Foundation Soils	36.3	4.9	54.3	0.031	11.010	0.057	0.8	40.1	10	15	8.0	48.1	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.072	1.232
NC-01	NB-02	Foundation Soils	36.4	4.8	52.9	0.117	20.120	0.221	0.8	39.7	18	15	23.2	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.072	1.375
NC-01	NB-02	Foundation Soils	36.5	4.7	51.1	0.138	19.050	0.270	0.8	38.5	22	15	27.1	65.5	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.072	1.401
NC-01	NB-02	Foundation Soils	36.6	4.6	50.9	0.194	25.780	0.381	0.8	38.4	26	15	30.8	69.3	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.072	1.440
NC-01	NB-02	Foundation Soils	36.7	4.5	52.3	0.151	28.640	0.289	0.8	39.4	22	15	27.2	66.6	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.072	1.411
NC-01	NB-02	Foundation Soils	36.7	4.4	57.3	0.142	18.200	0.248	0.8	42.9	17	15	21.6	64.6	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.072	1.390
NC-01	NB-02	Foundation Soils	36.8	4.4	60.2	0.193	23.300	0.321	0.8	45.4	19	15	24.2	69.5	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.072	1.441
NC-01	NB-02	Foundation Soils	36.9	4.3	62.5	0.260	21.960	0.416	0.8	47.4	21	15	27.5	74.8	1.0	-0.8	0.1	0.9	0.111	1.011	0.109	0.072	1.499
NC-01	NB-02	Foundation Soils	37.0	4.2	74.7	0.225	16.390	0.301	0.8	56.0	11	15	10.0	65.9	1.0	-0.8	0.1	0.9	0.104	1.009	0.102	0.072	1.403
NC-01	NB-02	Foundation Soils	37.1	4.1	81.7	0.121	13.510	0.148	0.8	60.7	0	15	0.0	60.7	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.072	1.350
NC-01	NB-02	Foundation Soils	37.2	4.0	85.0	0.103	17.870	0.121	0.8	63.4	0	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.072	1.376
NC-01	NB-02	Foundation Soils	37.2	4.0	85.1	0.087	30.300	0.102	0.8	63.4	0	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.073	1.375
NC-01	NB-02	Foundation Soils	37.3	3.9	82.9	0.097	29.160	0.117	0.8	61.5	0	15	0.0	61.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.073	1.356
NC-01	NB-02	Foundation Soils	37.4	3.8	72.5	0.113	28.030	0.156	0.8	53.2	5	15	0.2	53.3	1.0	-0.8	0.1	0.9	0.095	1.008	0.093	0.073	1.277
NC-01	NB-02	Foundation Soils	37.5	3.7	78.7	0.275	21.960	0.349	0.8	58.9	11	15	11.4	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.073	1.447
NC-01	NB-02	Foundation Soils	37.6	3.6	83.3	0.144	24.820	0.173	0.8	61.7	1	15	0.0	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.073	1.357
NC-01	NB-02	Foundation Soils	37.6	3.5	82.6	0.211	31.100	0.256	0.8	61.1	6	15	0.6	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.073	1.356
NC-01	NB-02	Foundation Soils	37.7	3.5	77.9	0.317	22.480	0.407	0.8	58.5	14	15	17.6	76.1	1.0	-0.8	0.1	0.9	0.112	1.011	0.110	0.073	1.509
NC-01	NB-02	Foundation Soils	37.8	3.4	65.2	0.279	19.440	0.428	0.8	49.0	20	15	27.0	75.9	1.0	-0.8	0.1	0.9	0.112	1.011	0.109	0.073	1.506
NC-01	NB-02	Foundation Soils	37.9	3.3	59.9	0.172	15.340	0.287	0.8	44.5	18	15	22.8	67.3	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.073	1.412
NC-01	NB-02	Foundation Soils	38.0	3.2	53.3	0.136	24.590	0.255	0.8	39.5	20	15	25.4	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.073	1.387
NC-01	NB-02	Foundation Soils	38.1	3.1	52.8	0.103	12.340	0.195	0.8	38.8	18	15	22.2	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.073	1.348
NC-01	NB-02	Foundation Soils	38.1	3.1	54.2	0.104	9.670	0.192	0.8	39.8	17	15	20.8	60.6	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.073	1.343
NC-01	NB-02	Foundation Soils	38.2	3.0	57.2	0.118	28.590	0.206	0.8	42.0	16	15	19.1	61.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.073	1.348
NC-01	NB-02	Foundation Soils	38.3	2.9	66.3	0.188	30.780	0.284	0.8	49.0	14	15	17.4	66.3	1.0	-0.8	0.1	0.9	0.104	1.010	0.102	0.073	1.400
NC-01	NB-02	Foundation Soils	38.4	2.8	79.5	0.199	26.200	0.250	0.8	58.1	7	15	1.9	60.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.097	0.073	1.337
NC-01	NB-02	Foundation Soils	38.5	2.7	87.4	0.217	28.320	0.248	0.8	64.3	4	15	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.100	0.073	1.379
NC-01	NB-02	Foundation Soils	38.5	2.6	91.1	0.279	24.210	0.306	0.8	67.1	5	15	0.4	67.5	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.073	1.411
NC-01	NB-02	Foundation Soils	38.6	2.6	87.5	0.354	36.750	0.405	0.8	65.0	11	15	9.8	74.9	1.0	-0.8	0.1	0.9	0.111	1.011	0.108	0.073	1.490
NC-01	NB-02	Foundation Soils	38.7	2.5	84.1	0.363	32.540	0.431	0.8	62.7	13	15	15.2	77.9	1.0	-0.9	0.1	0.9	0.114	1.012	0.111	0.073	1.524
NC-01	NB-02	Foundation Soils	38.8	2.4	87.3	0.320	21.670	0.366	0.8	64.5	9	15	6.4	70.9	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.073	1.446
NC-01	NB-02	Foundation Soils	38.9	2.3	100.5	0.359	1.810	0.357	0.8	74.5	4	15	0.1	74.6	1.0	-0.9	0.1	0.9	0.111	1.011	0.108	0.073	1.486
NC-01	NB-02	Foundation Soils	39.0	2.2	110.1	0.239	-8.370	0.217	0.8	82.3	0	15	0.0	82.3	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.073	1.576
NC-01	NB-02	Foundation Soils	39.0	2.1	117.4	0.242	21.060	0.206	0.8	88.2	0	15	0.0	88.2	1.0	-0.9	0.1	0.9	0.124	1.014	0.120	0.073	1.652
NC-01	NB-02	Foundation Soils	39.1	2.1	115.4	0.178	19.950	0.154	0.8	86.5	0	15	0.0	86.5	1.0	-0.9	0.1	0.9	0.122	1.014	0.118	0.073	1.628
NC-01	NB-02	Foundation Soils	39.2	2.0	110.7	0.206	25.200	0.186	0.8	82.6	0	15	0.0	82.6	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.073	1.578
NC-01	NB-02	Foundation Soils	39.3	1.9	102.5	0.170	28.110	0.166	0.8	75.8	0	15	0.0	75.8	1.0	-0.9	0.1	0.9	0.112	1.011	0.109	0.073	1.498
NC-01	NB-02	Foundation Soils	39.4	1.8	99.4	0.138	25.350	0.139	0.8	73.2	0	15	0.0	73.2	1.0	-0.9	0.1	0.9	0.110	1.011	0.107	0.073	1.468
NC-01	NB-02	Foundation Soils	39.5	1.7	96.8	0.092	11.600	0.095	0.8	71.0	0	15	0.0	71.0	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.073	1.444
NC-01	NB-02	Foundation Soils	39.5	1.7	92.5	0.073	25.700	0.079	0.8	67.5	0	15	0.0	67.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.102	0.073	1.407
NC-01	NB-02	Foundation Soils	39.6	1.6	93.4	0.109	28.300	0.117	0.8	68.1	0	15	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.073	1.413

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	39.698	1.5	96.578	0.057	23.630	0.059	0.8	70.6	0	15	0.0	70.6	1.0	-0.9	0.1	0.8	0.108	1.010	0.105	0.073	1.439
NC-01	NB-02	Foundation Soils	39.8	1.4	104.0	0.127	15.750	0.122	0.8	76.6	0	15	0.0	76.6	1.0	-0.9	0.1	0.8	0.113	1.011	0.110	0.073	1.504
NC-01	NB-02	Foundation Soils	39.9	1.3	108.4	0.173	15.390	0.160	0.8	80.0	0	15	0.0	80.0	1.0	-0.9	0.1	0.8	0.116	1.012	0.112	0.073	1.544
NC-01	NB-02	Foundation Soils	39.9	1.2	115.5	0.261	12.150	0.226	0.8	85.8	0	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.073	1.616
NC-01	NB-02	Foundation Soils	40.0	1.2	113.4	0.267	27.250	0.235	0.8	84.0	0	15	0.0	84.0	1.0	-0.9	0.1	0.8	0.120	1.013	0.116	0.073	1.592
NC-01	NB-02	Foundation Soils	40.1	1.1	111.8	0.199	29.020	0.178	0.8	82.6	0	15	0.0	82.6	1.0	-0.9	0.1	0.8	0.118	1.013	0.115	0.073	1.574
NC-01	NB-02	Foundation Soils	40.2	1.0	115.9	0.133	18.300	0.115	0.8	85.8	0	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.073	1.615
NC-01	NB-02	Foundation Soils	40.3	0.9	130.9	0.200	15.230	0.153	0.8	98.2	0	15	0.0	98.2	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.073	1.795
NC-01	NB-02	Foundation Soils	40.4	0.8	143.2	0.430	15.680	0.300	0.8	108.4	0	15	0.0	108.4	0.9	-0.9	0.1	0.8	0.149	1.021	0.145	0.073	1.986
NC-01	NB-02	Foundation Soils	40.4	0.8	144.3	0.379	17.220	0.263	0.8	109.3	0	15	0.0	109.3	0.9	-0.9	0.1	0.8	0.151	1.021	0.146	0.073	2.004
NC-01	NB-02	Foundation Soils	40.5	0.7	131.5	0.651	18.250	0.495	0.8	98.5	2	15	0.0	98.5	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.073	1.799
NC-01	NB-02	Foundation Soils	40.6	0.6	127.3	0.879	31.250	0.690	0.8	95.8	9	15	8.2	104.0	0.9	-0.9	0.1	0.8	0.143	1.019	0.138	0.073	1.895
NC-01	NB-02	Foundation Soils	40.7	0.5	132.1	0.589	31.620	0.446	0.8	98.8	0	15	0.0	98.8	1.0	-0.9	0.1	0.8	0.136	1.017	0.131	0.073	1.803
NC-01	NB-02	Foundation Soils	40.8	0.4	136.0	0.581	20.020	0.427	0.8	102.0	0	15	0.0	102.0	0.9	-0.9	0.1	0.8	0.140	1.018	0.135	0.073	1.857
NC-01	NB-02	Foundation Soils	40.8	0.3	137.4	0.478	10.910	0.348	0.8	103.1	0	15	0.0	103.1	0.9	-0.9	0.1	0.8	0.141	1.019	0.137	0.073	1.877
NC-01	NB-02	Foundation Soils	40.9	0.3	134.9	0.419	-4.900	0.311	0.8	100.9	0	15	0.0	100.9	0.9	-0.9	0.1	0.8	0.138	1.018	0.134	0.073	1.837
NC-01	NB-02	Foundation Soils	41.0	0.2	120.1	0.516	4.280	0.430	0.8	88.5	2	15	0.0	88.5	1.0	-0.9	0.1	0.8	0.124	1.014	0.120	0.073	1.647
NC-01	NB-02	Foundation Soils	41.1	0.1	97.6	0.525	30.530	0.538	0.8	71.8	13	15	15.5	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.119	0.073	1.630
NC-01	NB-02	Foundation Soils	41.2	0.0	89.3	0.394	25.490	0.441	0.8	64.9	12	15	13.6	78.5	1.0	-0.9	0.1	0.8	0.114	1.012	0.111	0.073	1.521
NC-01	NB-02	Foundation Soils	41.3	-0.1	93.7	0.400	20.300	0.427	0.8	67.9	10	15	8.8	76.7	1.0	-0.9	0.1	0.8	0.113	1.011	0.109	0.073	1.500
NC-01	NB-02	Foundation Soils	41.3	-0.1	87.4	0.297	23.350	0.340	0.8	62.6	9	15	5.5	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.073	1.407
NC-01	NB-02	Foundation Soils	41.4	-0.2	83.7	0.192	26.160	0.229	0.7	59.1	5	15	0.3	59.4	1.0	-0.9	0.1	0.8	0.099	1.009	0.096	0.073	1.321
NC-01	NB-02	Foundation Soils	41.5	-0.3	80.3	0.191	20.150	0.238	0.7	56.6	7	15	1.9	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.073	1.312
NC-01	NB-02	Foundation Soils	41.6	-0.4	79.6	0.114	19.110	0.143	0.7	55.8	2	15	0.0	55.8	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.073	1.286
NC-01	NB-02	Foundation Soils	41.7	-0.5	81.1	0.072	17.490	0.089	0.7	56.9	0	15	0.0	56.9	1.0	-0.9	0.1	0.8	0.097	1.008	0.094	0.073	1.296
NC-01	NB-02	Foundation Soils	41.7	-0.6	79.6	0.067	4.070	0.084	0.7	55.7	0	15	0.0	55.7	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.073	1.284
NC-01	NB-02	Foundation Soils	41.8	-0.6	76.3	0.045	17.910	0.059	0.7	53.1	0	15	0.0	53.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.092	0.073	1.260
NC-01	NB-02	Foundation Soils	41.9	-0.7	74.4	0.034	24.100	0.046	0.7	51.6	1	15	0.0	51.6	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.073	1.246
NC-01	NB-02	Foundation Soils	42.0	-0.8	74.5	0.046	22.680	0.062	0.7	51.7	1	15	0.0	51.7	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.073	1.246
NC-01	NB-02	Foundation Soils	42.1	-0.9	76.2	0.068	18.360	0.089	0.7	52.9	1	15	0.0	52.9	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.073	1.258
NC-01	NB-02	Foundation Soils	42.2	-1.0	77.4	0.061	24.110	0.079	0.7	53.8	0	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.073	1.265
NC-01	NB-02	Foundation Soils	42.2	-1.0	77.6	0.086	26.290	0.111	0.7	53.8	2	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.073	1.266
NC-01	NB-02	Foundation Soils	42.3	-1.1	78.9	0.066	21.490	0.084	0.7	54.8	0	15	0.0	54.8	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.073	1.275
NC-01	NB-02	Foundation Soils	42.4	-1.2	79.3	0.075	22.020	0.095	0.7	55.0	0	15	0.0	55.0	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.073	1.277
NC-01	NB-02	Foundation Soils	42.5	-1.3	81.3	0.059	12.960	0.073	0.7	56.5	0	15	0.0	56.5	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.073	1.290
NC-01	NB-02	Foundation Soils	42.6	-1.4	83.1	0.055	8.120	0.066	0.7	57.8	0	15	0.0	57.8	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.073	1.303
NC-01	NB-02	Foundation Soils	42.7	-1.5	83.7	0.075	7.340	0.090	0.7	58.2	0	15	0.0	58.2	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.073	1.306
NC-01	NB-02	Foundation Soils	42.7	-1.5	81.2	0.091	-7.150	0.112	0.7	56.2	0	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.073	1.287
NC-01	NB-02	Foundation Soils	42.8	-1.6	78.7	0.112	-0.430	0.142	0.7	54.3	3	15	0.0	54.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.073	1.269
NC-01	NB-02	Foundation Soils	42.9	-1.7	78.5	0.110	2.100	0.140	0.7	54.1	3	15	0.0	54.1	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.073	1.267
NC-01	NB-02	Foundation Soils	43.0	-1.8	78.2	0.127	-5.290	0.162	0.7	53.8	4	15	0.1	53.9	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.073	1.265
NC-01	NB-02	Foundation Soils	43.1	-1.9	81.4	0.106	1.050	0.130	0.7	56.2	1	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.073	1.287
NC-01	NB-02	Foundation Soils	43.1	-2.0	90.7	0.234	3.570	0.258	0.7	63.3	4	15	0.1	63.4	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.073	1.355
NC-01	NB-02	Foundation Soils	43.2	-2.0	96.5	0.315	2.950	0.326	0.7	67.8	6	15	0.6	68.4	1.0	-1.0	0.1	0.8	0.106	1.010	0.103	0.073	1.406
NC-01	NB-02	Foundation Soils	43.3	-2.1	107.2	0.396	18.430	0.369	0.8	76.1	4	15	0.1	76.2	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.073	1.488
NC-02	NB-02 & NB-03	Foundation Soils	15.0	25.6	48.6	0.952	2.220	1.961	1.1	49.6	50	4	14.2	63.8	1.0	-0.2	0.0	1.0	0.102	1.009	0.104	0.056	1.858
NC-02	NB-02 & NB-03	Foundation Soils	15.1	25.5	47.6	0.843	9.170	1.769	1.1	48.6	48	4	14.0	62.6	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.056	1.837
NC-02	NB-02 & NB-03	Foundation Soils	15.2	25.4	46.8	0.733	64.700	1.566	1.1	47.7	46	4	13.8	61.5	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.056	1.817
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.3	50.5	0.684	3.660	1.353	1.1	51.4	41	4	13.7	65.0	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.057	1.861
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.2	61.4	0.657	6.910	1.071	1.1	62.0	31	4	13.0	75.0	1.0	-0.2	0.0	1.0	0.111	1.011	0.114	0.057	2.007
NC-02	NB-02 & NB-03	Foundation Soils	15.4	25.2	76.6	0.644	-1.760	0.841	1.1	77.0	19	4	10.2	87.2	1.0	-0.2	0.0	1.0	0.123	1.014	0.126	0.057	2.213
NC-02	NB-02 & NB-03	Foundation Soils	15.5	25.1	86.2	0.674	-4.910	0.782	1.1	86.4	15	4	7.4	93.8	1.0	-0.2	0.0	1.0	0.130	1.016	0.133	0.057	2.340
NC-02	NB-02 & NB-03	Foundation Soils	15.6	25.0	93.2	0.702	-1.980	0.753	1.1	93.2	12	4	5.0	98.2	1.0	-0.2	0.0	1.0	0.135	1.017	0.139	0.057	2.432
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.9	102.8	0.698	0.950	0.679	1.1	102.5	7	4	0.8	103.4	1.0	-0.3	0.0	1.0	0.142	1.019	0.146	0.057	2.555
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.8	108.7	0.707	1.140	0.650	1.1	108.2	4	4	0.0	108.2	1.0	-0.3	0.0	1.0	0.149	1.021	0.154	0.057	2.686
NC-02	NB-02 & NB-03	Foundation Soils	15.8	24.8	114.9	0.726	1.330	0.632	1.1	114.1	2	4	0.0	114.1	1.0	-0.3	0.0	1.0	0.159	1.023	0.165	0.058	2.867
NC-02	NB-02 & NB-03	Foundation Soils	15.9	24.7	120.4	0.732	1.160	0.608	1.0	119.2	0	4	0.0	119.2	1.0	-0.3	0.0	1.0	0.169	1.026	0.176	0.058	3.054
NC-02	NB-02 & NB-03	Foundation Soils	16.0	24.6	123.0	0.734	1.100	0.597	1.0	121.6	0	4	0.0	121.6	1.0	-0.3	0.0	1.0	0.175	1.027	0.182	0.058	3.148
NC-02	NB-02 & NB-03	Foundation Soils	16.1	24.5	125.1	0.731	1.000	0.584	1.0	123.4	0	4	0.0	123.4	1.0	-0.3	0.0	1.0	0.179	1.028	0.187	0.058	3.223
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.4	125.4	0.653	0.890	0.521	1.0	123.6	0	4	0.0	123.6	1.0	-0.3	0.0	1.0	0.180	1.028	0.187	0.058	3.223
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.3	124.1	0.634	0.640	0.511	1.0	122.2	0	4	0.0	122.2	1.0	-0.3	0.0	1.0	0.176	1.027	0.183	0.058	3.152
NC-02	NB-02 & NB-03	Foundation Soils	16.3	24.3	120.1	0.614	0.380	0.511	1.0	118.2	0	4	0.0	118.2	1.0	-0.3	0.0	1.0	0.167	1.025	0.174	0.058	2.978

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-02	NB-02 & NB-03	Foundation Soils	16.4	24.2	115.6	0.592	0.040	0.512	1.0	113.8	0	4	0.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.164	0.058	2.808
NC-02	NB-02 & NB-03	Foundation Soils	16.5	24.1	95.4	0.554	-5.290	0.581	1.0	94.1	6	4	0.5	94.6	1.0	-0.3	0.0	1.0	0.131	1.016	0.134	0.059	2.289
NC-02	NB-02 & NB-03	Foundation Soils	16.6	24.0	90.1	0.529	-5.380	0.587	1.0	88.8	8	4	1.7	90.5	1.0	-0.3	0.0	1.0	0.126	1.015	0.129	0.059	2.201
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	70.5	0.502	-3.480	0.712	1.0	69.6	19	4	9.7	79.3	1.0	-0.3	0.0	1.0	0.115	1.012	0.117	0.059	1.998
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	60.8	0.522	-2.690	0.858	1.0	60.0	27	4	12.1	72.2	1.0	-0.3	0.0	1.0	0.109	1.010	0.111	0.059	1.884
NC-02	NB-02 & NB-03	Foundation Soils	16.8	23.8	44.2	0.521	-1.430	1.178	1.0	43.7	43	4	13.3	57.1	1.0	-0.3	0.0	1.0	0.097	1.008	0.099	0.059	1.674
NC-02	NB-02 & NB-03	Foundation Soils	16.9	23.7	37.6	0.519	-0.860	1.381	1.0	37.2	51	4	13.4	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.059	1.588
NC-02	NB-02 & NB-03	Foundation Soils	17.0	23.6	28.3	0.515	0.050	1.820	1.0	28.0	64	4	13.2	41.3	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.059	1.473
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.5	21.8	0.496	1.430	2.274	1.1	21.6	77	4	13.0	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.059	1.394
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.4	18.1	0.444	1.860	2.460	1.0	17.9	85	4	12.9	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.059	1.347
NC-02	NB-02 & NB-03	Foundation Soils	17.2	23.4	15.6	0.402	3.240	2.582	1.0	15.4	90	4	12.8	28.2	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.060	1.316
NC-02	NB-02 & NB-03	Foundation Soils	17.3	23.3	13.5	0.308	4.940	2.275	1.0	13.4	92	4	12.6	26.0	1.0	-0.3	0.0	1.0	0.076	1.006	0.077	0.060	1.290
NC-02	NB-02 & NB-03	Foundation Soils	17.4	23.2	11.2	0.257	10.390	2.285	1.0	11.1	99	4	12.5	23.6	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.060	1.261
NC-02	NB-02 & NB-03	Foundation Soils	17.5	23.1	10.8	0.204	18.200	1.897	1.0	10.6	97	4	12.5	23.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.060	1.253
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	10.4	0.175	22.060	1.683	1.0	10.2	96	4	12.4	22.7	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.060	1.246
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	9.6	0.144	27.870	1.496	1.0	9.5	97	4	12.4	21.9	1.0	-0.3	0.0	1.0	0.074	1.006	0.074	0.060	1.235
NC-02	NB-02 & NB-03	Foundation Soils	17.7	22.9	9.8	0.113	29.340	1.149	1.0	9.7	92	4	12.4	22.0	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.060	1.234
NC-02	NB-02 & NB-03	Foundation Soils	17.8	22.8	10.3	0.081	31.160	0.785	1.0	10.1	84	4	12.3	22.5	1.0	-0.3	0.0	0.9	0.074	1.006	0.075	0.060	1.237
NC-02	NB-02 & NB-03	Foundation Soils	17.9	22.7	11.6	0.191	32.210	1.645	1.0	11.4	92	4	12.5	23.9	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.060	1.249
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.6	12.8	1.007	37.000	7.848	1.0	12.5	100	4	12.6	25.2	1.0	-0.3	0.0	0.9	0.076	1.006	0.076	0.061	1.260
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.5	13.7	1.240	43.930	9.081	1.0	13.3	100	4	12.7	26.0	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.061	1.267
NC-02	NB-02 & NB-03	Foundation Soils	18.1	22.5	13.2	1.385	57.950	10.515	1.0	12.8	100	4	12.6	25.5	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.061	1.259
NC-02	NB-02 & NB-03	Foundation Soils	18.2	22.4	36.8	1.505	90.670	4.095	1.0	35.6	76	4	14.0	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.061	1.526
NC-02	NB-02 & NB-03	Foundation Soils	18.3	22.3	122.2	1.745	76.740	1.428	1.0	117.2	20	4	12.1	129.3	1.0	-0.3	0.0	0.9	0.195	1.031	0.202	0.061	3.318
NC-02	NB-02 & NB-03	Foundation Soils	18.4	22.2	166.1	1.841	179.340	1.109	1.0	158.8	6	4	0.6	159.4	1.0	-0.3	0.0	0.9	0.365	1.053	0.387	0.061	6.338
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.1	169.7	2.012	130.830	1.185	1.0	162.2	7	4	1.4	163.6	1.0	-0.3	0.0	0.9	0.411	1.057	0.437	0.061	7.140
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.0	154.9	1.950	13.350	1.259	1.0	147.9	11	4	5.3	153.3	1.0	-0.3	0.0	0.9	0.312	1.048	0.328	0.061	5.354
NC-02	NB-02 & NB-03	Foundation Soils	18.6	22.0	143.4	1.633	13.850	1.139	1.0	136.9	11	4	4.6	141.5	1.0	-0.3	0.0	0.9	0.241	1.039	0.252	0.061	4.095
NC-02	NB-02 & NB-03	Foundation Soils	18.7	21.9	105.2	1.349	27.730	1.282	1.0	100.5	21	4	12.1	112.6	1.0	-0.3	0.0	0.9	0.156	1.023	0.161	0.062	2.609
NC-02	NB-02 & NB-03	Foundation Soils	18.8	21.8	81.5	0.961	37.950	1.179	1.0	77.8	26	4	12.8	90.7	1.0	-0.3	0.0	0.9	0.126	1.015	0.128	0.062	2.084
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.7	67.7	0.923	25.640	1.363	1.0	64.6	35	4	13.8	78.4	1.0	-0.3	0.0	0.9	0.114	1.012	0.116	0.062	1.878
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.6	64.6	1.005	20.060	1.555	1.0	61.6	39	4	14.1	75.7	1.0	-0.3	0.0	0.9	0.112	1.011	0.113	0.062	1.835
NC-02	NB-02 & NB-03	Foundation Soils	19.0	21.6	62.6	0.933	18.340	1.491	1.0	59.6	39	4	14.0	73.5	1.0	-0.3	0.0	0.9	0.110	1.011	0.112	0.062	1.801
NC-02	NB-02 & NB-03	Foundation Soils	19.1	21.5	55.3	0.883	10.040	1.597	1.0	52.6	44	4	14.0	66.6	1.0	-0.3	0.0	0.9	0.105	1.010	0.106	0.062	1.703
NC-02	NB-02 & NB-03	Foundation Soils	19.2	21.4	47.7	0.817	1.520	1.711	1.0	45.4	49	4	13.8	59.2	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.062	1.608
NC-02	NB-02 & NB-03	Foundation Soils	19.3	21.3	41.6	0.719	4.530	1.726	1.0	39.5	53	4	13.7	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.095	0.062	1.533
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.2	35.6	0.672	3.480	1.889	1.0	33.7	60	4	13.5	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.062	1.461
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.1	29.3	0.497	3.670	1.698	1.0	27.7	63	4	13.2	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.062	1.388
NC-02	NB-02 & NB-03	Foundation Soils	19.5	21.1	26.0	0.389	3.960	1.498	1.0	24.5	64	4	13.0	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.084	0.062	1.349
NC-02	NB-02 & NB-03	Foundation Soils	19.6	21.0	21.4	0.283	1.760	1.325	1.0	20.2	68	4	12.8	32.9	1.0	-0.3	0.0	0.9	0.081	1.007	0.081	0.063	1.298
NC-02	NB-02 & NB-03	Foundation Soils	19.7	20.9	15.7	0.244	2.620	1.555	1.0	14.8	83	4	12.6	27.4	1.0	-0.3	0.0	0.9	0.077	1.006	0.078	0.063	1.238
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.8	9.5	0.156	-1.950	1.634	1.0	9.0	100	4	12.4	21.4	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.063	1.174
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.7	8.4	0.103	0.830	1.233	1.0	7.8	100	4	12.3	20.2	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.063	1.160
NC-02	NB-02 & NB-03	Foundation Soils	19.9	20.7	6.3	0.057	1.000	0.902	1.0	5.9	100	4	12.2	18.1	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.063	1.138
NC-02	NB-02 & NB-03	Foundation Soils	20.0	20.6	4.8	0.038	0.140	0.795	1.0	4.5	100	4	12.1	16.6	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.063	1.121
NC-02	NB-02 & NB-03	Foundation Soils	20.1	20.5	2.3	0.023	3.860	0.994	1.0	2.2	100	4	11.9	14.1	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.063	1.096
NC-02	NB-02 & NB-03	Foundation Soils	20.2	20.4	1.2	0.011	1.690	0.887	1.0	1.2	100	4	11.9	13.0	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.063	1.084
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.3	1.0	0.010	4.340	0.974	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.063	1.080
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.2	1.0	0.010	4.090	0.975	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.063	1.079
NC-02	NB-02 & NB-03	Foundation Soils	20.4	20.2	1.0	0.010	4.090	0.975	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.077
NC-02	NB-02 & NB-03	Foundation Soils	20.5	20.1	1.0	0.010	4.790	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.075
NC-02	NB-02 & NB-03	Foundation Soils	20.6	20.0	1.0	0.010	4.810	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.074
NC-02	NB-02 & NB-03	Foundation Soils	20.7	19.9	1.0	0.010	4.740	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.072
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	1.0	0.010	5.690	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.071
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	1.0	0.010	5.610	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.069
NC-02	NB-02 & NB-03	Foundation Soils	20.9	19.7	1.0	0.010	5.670	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.068
NC-02	NB-02 & NB-03	Foundation Soils	21.0	19.6	1.0	0.010	5.800	0.965	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.066
NC-02	NB-02 & NB-03	Foundation Soils	21.1	19.5	1.0	0.010	5.960	0.964	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.065
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.4	1.0	0.010	6.100	0.963	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.063
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.3	1.0	0.010	6.050	0.964	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.062
NC-02	NB-02 & NB-03	Foundation Soils	21.3	19.3	1.0	0.010	6.260	0.962	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.064	1.060
NC-02	NB-02 & NB-03	Foundation Soils	21.4	19.2	1.0	0.010	6.050	0.964	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.065	1.059

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-02	NB-02 & NB-03	Foundation Soils	21.5	19.1	1.0	0.010	6.190	0.963	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.065	1.057
NC-02	NB-02 & NB-03	Foundation Soils	21.6	19.0	1.0	0.010	6.460	0.961	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.065	1.056
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	1.0	0.010	6.610	0.960	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.065	1.054
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	1.0	0.010	6.620	0.960	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.065	1.053
NC-02	NB-02 & NB-03	Foundation Soils	21.8	18.8	1.4	0.010	6.530	0.724	1.0	1.2	100	4	11.9	13.1	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.065	1.055
NC-02	NB-02 & NB-03	Foundation Soils	21.9	18.7	1.6	0.010	6.460	0.610	1.0	1.5	100	4	11.9	13.4	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.065	1.055
NC-02	NB-02 & NB-03	Foundation Soils	22.0	18.6	2.1	0.010	5.790	0.470	1.0	1.9	100	4	11.9	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.065	1.058
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.5	2.6	0.010	7.000	0.386	1.0	2.3	100	4	11.9	14.3	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.065	1.061
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.4	3.0	0.010	7.910	0.336	1.0	2.7	100	4	12.0	14.6	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.065	1.063
NC-02	NB-02 & NB-03	Foundation Soils	22.2	18.4	3.6	0.010	9.280	0.278	1.0	3.2	100	4	12.0	15.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.065	1.067
NC-02	NB-02 & NB-03	Foundation Soils	22.3	18.3	4.1	0.011	10.720	0.270	1.0	3.7	100	4	12.0	15.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.065	1.070
NC-02	NB-02 & NB-03	Foundation Soils	22.4	18.2	5.2	0.013	8.430	0.252	0.9	4.6	100	4	12.1	16.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.071	0.066	1.078
NC-02	NB-02 & NB-03	Foundation Soils	22.5	18.1	5.6	0.018	9.030	0.321	0.9	5.0	100	4	12.1	17.1	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.066	1.080
NC-02	NB-02 & NB-03	Foundation Soils	22.6	18.0	6.1	0.020	8.580	0.326	0.9	5.5	100	4	12.1	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.066	1.084
NC-02	NB-02 & NB-03	Foundation Soils	22.6	17.9	7.1	0.021	6.910	0.298	0.9	6.3	94	4	12.2	18.5	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.066	1.090
NC-02	NB-02 & NB-03	Foundation Soils	22.7	17.9	7.7	0.024	9.480	0.311	0.9	6.9	90	4	12.2	19.0	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.066	1.094
NC-02	NB-02 & NB-03	Foundation Soils	22.8	17.8	8.5	0.032	9.650	0.375	0.9	7.6	88	4	12.2	19.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.066	1.100
NC-02	NB-02 & NB-03	Foundation Soils	22.9	17.7	9.8	0.060	9.960	0.615	0.9	8.7	89	4	12.3	20.9	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.066	1.109
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.6	10.1	0.071	10.290	0.701	0.9	9.0	89	4	12.3	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.066	1.111
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.5	11.1	0.078	9.240	0.703	0.9	9.8	86	4	12.3	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.066	1.118
NC-02	NB-02 & NB-03	Foundation Soils	23.1	17.5	11.8	0.087	9.900	0.737	0.9	10.4	84	4	12.4	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.066	1.123
NC-02	NB-02 & NB-03	Foundation Soils	23.2	17.4	13.0	0.094	9.040	0.725	0.9	11.5	80	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.066	1.131
NC-02	NB-02 & NB-03	Foundation Soils	23.3	17.3	13.2	0.103	10.310	0.782	0.9	11.6	81	4	12.4	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.066	1.132
NC-02	NB-02 & NB-03	Foundation Soils	23.4	17.2	13.3	0.113	10.200	0.848	0.9	11.7	82	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.066	1.132
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.1	13.0	0.114	10.060	0.877	0.9	11.4	83	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.066	1.127
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.0	13.4	0.118	11.200	0.881	0.9	11.8	82	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.067	1.129
NC-02	NB-02 & NB-03	Foundation Soils	23.6	17.0	14.6	0.130	10.240	0.891	0.9	12.8	79	4	12.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.067	1.138
NC-02	NB-02 & NB-03	Foundation Soils	23.7	16.9	15.4	0.138	9.910	0.898	0.9	13.5	78	4	12.5	26.0	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.067	1.144
NC-02	NB-02 & NB-03	Foundation Soils	23.8	16.8	14.9	0.137	10.710	0.917	0.9	13.1	79	4	12.5	25.6	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.067	1.139
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.7	14.5	0.131	10.720	0.906	0.9	12.7	80	4	12.5	25.1	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.067	1.133
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.6	13.8	0.124	9.430	0.897	0.9	12.1	82	4	12.5	24.5	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.067	1.126
NC-02	NB-02 & NB-03	Foundation Soils	24.0	16.6	13.5	0.112	10.060	0.831	0.9	11.7	82	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.067	1.121
NC-02	NB-02 & NB-03	Foundation Soils	24.1	16.5	13.6	0.105	9.600	0.774	0.9	11.8	80	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.067	1.121
NC-02	NB-02 & NB-03	Foundation Soils	24.2	16.4	14.1	0.108	9.960	0.767	0.9	12.2	79	4	12.4	24.7	1.0	-0.5	0.1	0.9	0.075	1.006	0.075	0.067	1.124
NC-02	NB-02 & NB-03	Foundation Soils	24.3	16.3	14.5	0.119	10.960	0.822	0.9	12.6	79	4	12.5	25.0	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.067	1.126
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.2	15.2	0.120	11.300	0.789	0.9	13.2	77	4	12.5	25.7	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.067	1.130
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.1	16.3	0.122	11.430	0.750	0.9	14.1	74	4	12.5	26.6	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.067	1.138
NC-02	NB-02 & NB-03	Foundation Soils	24.5	16.1	17.5	0.136	11.390	0.778	0.9	15.1	72	4	12.5	27.7	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.067	1.147
NC-02	NB-02 & NB-03	Foundation Soils	24.6	16.0	19.5	0.142	11.670	0.730	0.9	16.9	62	4	12.5	29.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.078	0.067	1.161
NC-02	NB-02 & NB-03	Foundation Soils	24.7	15.9	20.6	0.145	11.210	0.703	0.9	17.9	60	4	12.5	30.3	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.067	1.170
NC-02	NB-02 & NB-03	Foundation Soils	24.8	15.8	20.7	0.154	11.200	0.743	0.9	17.9	61	4	12.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.068	1.169
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	21.7	0.172	11.670	0.793	0.9	18.7	60	4	12.5	31.3	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.068	1.176
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	22.4	0.181	11.570	0.808	0.9	19.3	60	4	12.6	31.9	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.068	1.181
NC-03	NB-03	Foundation Soils	14.0	26.0	6.5	0.033	85.940	0.510	1.2	7.2	90	4	12.2	19.4	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.056	1.298
NC-03	NB-03	Foundation Soils	14.1	25.9	16.3	0.060	85.580	0.368	1.2	17.9	53	4	12.3	30.1	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.057	1.419
NC-03	NB-03	Foundation Soils	14.2	25.8	28.3	0.119	23.250	0.421	1.1	30.5	37	4	12.0	42.6	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.057	1.567
NC-03	NB-03	Foundation Soils	14.3	25.7	27.2	0.189	6.150	0.695	1.1	29.3	46	4	12.6	42.0	1.0	-0.2	0.0	1.0	0.087	1.007	0.088	0.057	1.555
NC-03	NB-03	Foundation Soils	14.4	25.7	23.0	0.241	9.850	1.049	1.1	24.8	58	4	12.9	37.7	1.0	-0.2	0.0	1.0	0.084	1.007	0.085	0.057	1.498
NC-03	NB-03	Foundation Soils	14.4	25.6	16.0	0.341	12.340	2.129	1.2	17.4	81	4	12.8	30.2	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.057	1.405
NC-03	NB-03	Foundation Soils	14.5	25.5	10.8	0.415	13.700	3.826	1.2	11.8	100	4	12.6	24.4	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.057	1.334
NC-03	NB-03	Foundation Soils	14.6	25.4	7.2	0.372	15.390	5.184	1.2	7.9	100	4	12.3	20.2	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.057	1.282
NC-03	NB-03	Foundation Soils	14.7	25.3	5.8	0.313	18.750	5.362	1.2	6.4	100	4	12.2	18.6	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.058	1.262
NC-03	NB-03	Foundation Soils	14.8	25.3	9.0	0.299	25.350	3.338	1.2	9.8	100	4	12.4	22.2	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.058	1.298
NC-03	NB-03	Foundation Soils	14.8	25.2	10.2	0.289	25.440	2.825	1.2	11.1	100	4	12.5	23.6	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.058	1.311
NC-03	NB-03	Foundation Soils	14.9	25.1	9.4	0.307	27.590	3.262	1.1	10.2	100	4	12.5	22.7	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.058	1.297
NC-03	NB-03	Foundation Soils	15.0	25.0	7.8	0.290	33.810	3.698	1.1	8.5	100	4	12.4	20.9	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.058	1.274
NC-03	NB-03	Foundation Soils	15.1	24.9	7.5	0.243	37.880	3.237	1.1	8.1	100	4	12.3	20.5	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.058	1.266
NC-03	NB-03	Foundation Soils	15.2	24.8	6.1	0.201	43.450	3.311	1.1	6.6	100	4	12.2	18.8	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.058	1.245
NC-03	NB-03	Foundation Soils	15.3	24.8	4.4	0.160	31.950	3.604	1.1	4.8	100	4	12.1	16.9	1.0	-0.2	0.0	1.0	0.071	1.006	0.072	0.059	1.222
NC-03	NB-03	Foundation Soils	15.3	24.7	3.6	0.149	40.900	4.167	1.1	3.9	100	4	12.0	15.9	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.059	1.208
NC-03	NB-03	Foundation Soils	15.4	24.6	4.4	0.168	65.560	3.854	1.1	4.7	100	4	12.1	16.8	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.059	1.214
NC-03	NB-03	Foundation Soils	15.5	24.5	6.5	0.151	67.990	2.307	1.1	7.0	100	4	12.3	19.3	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.059	1.238

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-03	NB-03	Foundation Soils	15.6	24.4	5.8	0.119	38.600	2.051	1.1	6.2	100	4	12.2	18.4	1.0	-0.2	0.0	1.0	0.071	1.006	0.073	0.059	1.226
NC-03	NB-03	Foundation Soils	15.7	24.4	3.9	0.112	39.880	2.836	1.1	4.2	100	4	12.1	16.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.059	1.201
NC-03	NB-03	Foundation Soils	15.7	24.3	3.1	0.110	47.450	3.553	1.1	3.3	100	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.059	1.188
NC-03	NB-03	Foundation Soils	15.8	24.2	3.1	0.108	70.750	3.460	1.1	3.3	100	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.060	1.185
NC-03	NB-03	Foundation Soils	15.9	24.1	3.2	0.062	75.560	1.930	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.060	1.183
NC-03	NB-03	Foundation Soils	16.0	24.0	3.2	0.042	77.420	1.328	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.060	1.180
NC-03	NB-03	Foundation Soils	16.1	23.9	3.2	0.052	79.900	1.636	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.060	1.177
NC-03	NB-03	Foundation Soils	16.2	23.9	3.4	0.110	81.590	3.236	1.1	3.6	100	4	12.0	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.060	1.177
NC-03	NB-03	Foundation Soils	16.2	23.8	4.8	0.119	79.760	2.485	1.1	5.1	100	4	12.1	17.2	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.060	1.191
NC-03	NB-03	Foundation Soils	16.3	23.7	5.1	0.131	60.030	2.571	1.1	5.4	100	4	12.1	17.5	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.060	1.192
NC-03	NB-03	Foundation Soils	16.4	23.6	4.4	0.129	47.550	2.947	1.1	4.6	100	4	12.1	16.7	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.060	1.181
NC-03	NB-03	Foundation Soils	16.5	23.5	7.1	0.142	17.530	2.011	1.1	7.4	100	4	12.3	19.7	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.061	1.209
NC-03	NB-03	Foundation Soils	16.6	23.4	6.3	0.131	20.040	2.091	1.1	6.6	100	4	12.2	18.8	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.061	1.197
NC-03	NB-03	Foundation Soils	16.7	23.4	7.3	0.108	56.650	1.479	1.1	7.7	100	4	12.3	20.0	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.061	1.207
NC-03	NB-03	Foundation Soils	16.7	23.3	10.4	0.117	54.270	1.122	1.1	10.9	86	4	12.4	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.061	1.239
NC-03	NB-03	Foundation Soils	16.8	23.2	25.1	0.124	41.740	0.495	1.1	25.9	44	4	12.3	38.2	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.061	1.400
NC-03	NB-03	Foundation Soils	16.9	23.1	36.7	0.191	29.720	0.520	1.1	37.6	33	4	12.0	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.061	1.529
NC-03	NB-03	Foundation Soils	17.0	23.0	35.3	0.275	-3.050	0.779	1.1	36.1	41	4	12.7	48.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.061	1.517
NC-03	NB-03	Foundation Soils	17.1	23.0	26.9	0.415	7.100	1.545	1.1	27.5	62	4	13.2	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.061	1.419
NC-03	NB-03	Foundation Soils	17.1	22.9	21.2	0.442	10.290	2.088	1.1	21.7	75	4	13.0	34.8	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.062	1.350
NC-03	NB-03	Foundation Soils	17.2	22.8	14.4	0.470	16.020	3.271	1.1	14.8	96	4	12.8	27.6	1.0	-0.3	0.0	1.0	0.077	1.006	0.078	0.062	1.269
NC-03	NB-03	Foundation Soils	17.3	22.7	10.9	0.451	22.300	4.134	1.1	11.2	100	4	12.5	23.8	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.062	1.227
NC-03	NB-03	Foundation Soils	17.4	22.6	10.5	0.387	17.060	3.687	1.1	10.8	100	4	12.5	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.062	1.219
NC-03	NB-03	Foundation Soils	17.5	22.5	11.7	0.361	22.250	3.075	1.1	12.1	100	4	12.6	24.7	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.062	1.231
NC-03	NB-03	Foundation Soils	17.6	22.5	10.2	0.262	26.410	2.567	1.1	10.5	100	4	12.5	23.0	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.062	1.211
NC-03	NB-03	Foundation Soils	17.6	22.4	7.1	0.251	40.260	3.520	1.1	7.3	100	4	12.3	19.6	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.062	1.174
NC-03	NB-03	Foundation Soils	17.7	22.3	6.2	0.230	54.510	3.710	1.1	6.4	100	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.062	1.161
NC-03	NB-03	Foundation Soils	17.8	22.2	5.9	0.189	63.560	3.216	1.1	6.0	100	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.062	1.155
NC-03	NB-03	Foundation Soils	17.9	22.1	4.6	0.135	83.260	2.929	1.1	4.7	100	4	12.1	16.8	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.063	1.139
NC-03	NB-03	Foundation Soils	18.0	22.1	4.5	0.103	88.430	2.288	1.1	4.6	100	4	12.1	16.7	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.063	1.136
NC-03	NB-03	Foundation Soils	18.0	22.0	5.3	0.076	93.780	1.443	1.1	5.4	100	4	12.1	17.5	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.063	1.142
NC-03	NB-03	Foundation Soils	18.1	21.9	5.9	0.064	75.140	1.076	1.1	6.0	100	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.063	1.147
NC-03	NB-03	Foundation Soils	18.2	21.8	6.2	0.071	68.590	1.144	1.1	6.3	100	4	12.2	18.5	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.063	1.148
NC-03	NB-03	Foundation Soils	18.3	21.7	6.3	0.080	54.310	1.264	1.1	6.4	100	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.063	1.147
NC-03	NB-03	Foundation Soils	18.4	21.6	5.6	0.084	42.550	1.496	1.1	5.7	100	4	12.2	17.8	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.063	1.137
NC-03	NB-03	Foundation Soils	18.5	21.6	4.2	0.083	55.510	1.959	1.1	4.3	100	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.063	1.120
NC-03	NB-03	Foundation Soils	18.5	21.5	3.9	0.077	67.420	1.959	1.1	4.0	100	4	12.0	16.0	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.063	1.115
NC-03	NB-03	Foundation Soils	18.6	21.4	4.2	0.067	79.190	1.597	1.1	4.2	100	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.064	1.116
NC-03	NB-03	Foundation Soils	18.7	21.3	4.4	0.047	81.920	1.080	1.1	4.4	100	4	12.1	16.4	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.064	1.115
NC-03	NB-03	Foundation Soils	18.8	21.2	4.4	0.029	92.050	0.660	1.1	4.4	100	4	12.1	16.5	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.064	1.114
NC-03	NB-03	Foundation Soils	18.9	21.2	5.1	0.048	88.520	0.944	1.1	5.1	100	4	12.1	17.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.071	0.064	1.119
NC-03	NB-03	Foundation Soils	18.9	21.1	9.4	0.084	58.460	0.892	1.1	9.4	89	4	12.3	21.8	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.064	1.161
NC-03	NB-03	Foundation Soils	19.0	21.0	11.7	0.164	15.340	1.405	1.1	11.6	89	4	12.5	24.1	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.064	1.183
NC-03	NB-03	Foundation Soils	19.1	20.9	11.6	0.191	2.190	1.653	1.1	11.5	92	4	12.5	24.0	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.064	1.180
NC-03	NB-03	Foundation Soils	19.2	20.8	9.1	0.163	5.530	1.782	1.1	9.1	100	4	12.4	21.5	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.064	1.153
NC-03	NB-03	Foundation Soils	19.3	20.7	8.1	0.160	16.960	1.981	1.1	8.0	100	4	12.3	20.3	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.064	1.140
NC-03	NB-03	Foundation Soils	19.4	20.7	6.9	0.161	28.510	2.334	1.1	6.8	100	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.064	1.126
NC-03	NB-03	Foundation Soils	19.4	20.6	5.8	0.246	45.070	4.226	1.0	5.8	100	4	12.2	17.9	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.065	1.113
NC-03	NB-03	Foundation Soils	19.5	20.5	7.0	0.325	75.090	4.664	1.0	6.9	100	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.065	1.122
NC-03	NB-03	Foundation Soils	19.6	20.4	17.9	0.379	71.630	2.116	1.0	17.6	82	4	12.8	30.5	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.065	1.233
NC-03	NB-03	Foundation Soils	19.7	20.3	25.9	0.580	71.720	2.237	1.0	25.4	72	4	13.2	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.085	0.065	1.316
NC-03	NB-03	Foundation Soils	19.8	20.3	37.6	0.676	-11.820	1.798	1.0	36.7	56	4	13.6	50.3	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.065	1.440
NC-03	NB-03	Foundation Soils	19.8	20.2	49.9	0.870	-14.840	1.744	1.0	48.5	48	4	14.0	62.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.103	0.065	1.580
NC-03	NB-03	Foundation Soils	19.9	20.1	69.0	0.926	-14.480	1.342	1.0	66.9	33	4	13.7	80.6	1.0	-0.3	0.0	0.9	0.116	1.012	0.118	0.065	1.816
NC-03	NB-03	Foundation Soils	20.0	20.0	88.7	1.161	-18.530	1.308	1.0	85.7	26	4	13.2	98.9	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.065	2.129
NC-03	NB-03	Foundation Soils	20.1	19.9	91.1	1.337	-18.530	1.468	1.0	87.8	28	4	13.8	101.7	1.0	-0.4	0.0	0.9	0.140	1.018	0.143	0.065	2.185
NC-03	NB-03	Foundation Soils	20.2	19.8	92.9	1.590	-18.680	1.711	1.0	89.5	31	4	14.6	104.1	1.0	-0.4	0.0	0.9	0.143	1.019	0.146	0.065	2.237
NC-03	NB-03	Foundation Soils	20.3	19.8	92.7	1.793	-18.340	1.933	1.0	89.2	34	4	15.1	104.3	1.0	-0.4	0.0	0.9	0.143	1.019	0.147	0.065	2.239
NC-03	NB-03	Foundation Soils	20.3	19.7	85.2	1.856	-18.770	2.179	1.0	81.9	39	4	15.4	97.2	1.0	-0.4	0.0	0.9	0.134	1.017	0.137	0.066	2.082
NC-03	NB-03	Foundation Soils	20.4	19.6	81.7	1.853	-18.440	2.269	1.0	78.4	41	4	15.4	93.8	1.0	-0.4	0.0	0.9	0.130	1.016	0.132	0.066	2.014
NC-03	NB-03	Foundation Soils	20.5	19.5	86.5	1.743	-18.510	2.014	1.0	83.0	37	4	15.2	98.2	1.0	-0.4	0.0	0.9	0.135	1.017	0.138	0.066	2.094
NC-03	NB-03	Foundation Soils	20.6	19.4	92.4	1.623	-18.530	1.756	1.0	88.5	32	4	14.7	103.2	1.0	-0.4	0.0	0.9	0.142	1.019	0.145	0.066	2.199

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-03	NB-03	Foundation Soils	20.7	19.3	100.3	1.406	-16.900	1.401	1.0	95.9	25	4	13.2	109.2	1.0	-0.4	0.0	0.9	0.151	1.021	0.154	0.066	2.340
NC-03	NB-03	Foundation Soils	20.8	19.3	105.4	1.124	-17.930	1.067	1.0	100.6	17	4	9.7	110.3	1.0	-0.4	0.0	0.9	0.153	1.022	0.156	0.066	2.368
NC-03	NB-03	Foundation Soils	20.8	19.2	104.0	0.998	-19.270	0.960	1.0	99.2	15	4	8.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.066	2.288
NC-03	NB-03	Foundation Soils	20.9	19.1	101.2	1.061	-19.300	1.048	1.0	96.4	18	4	10.1	106.5	1.0	-0.4	0.0	0.9	0.146	1.020	0.150	0.066	2.262
NC-03	NB-03	Foundation Soils	21.0	19.0	95.6	1.133	-18.840	1.185	1.0	91.0	22	4	12.1	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.066	2.179
NC-03	NB-03	Foundation Soils	21.1	18.9	94.0	1.205	-18.200	1.282	1.0	89.4	24	4	12.9	102.2	1.0	-0.4	0.0	0.9	0.140	1.019	0.143	0.066	2.157
NC-03	NB-03	Foundation Soils	21.2	18.9	98.2	1.189	-18.340	1.210	1.0	93.3	22	4	12.1	105.4	1.0	-0.4	0.0	0.9	0.145	1.020	0.148	0.066	2.225
NC-03	NB-03	Foundation Soils	21.2	18.8	102.9	1.017	-18.250	0.988	1.0	97.6	16	4	9.0	106.6	1.0	-0.4	0.0	0.9	0.147	1.020	0.150	0.067	2.251
NC-03	NB-03	Foundation Soils	21.3	18.7	106.8	0.944	-18.550	0.884	1.0	101.2	13	4	6.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.067	2.268
NC-03	NB-03	Foundation Soils	21.4	18.6	106.8	0.961	-18.680	0.900	1.0	101.0	13	4	6.6	107.7	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.067	2.270
NC-03	NB-03	Foundation Soils	21.5	18.5	105.4	1.004	-18.440	0.952	1.0	99.6	15	4	8.0	107.6	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.067	2.267
NC-03	NB-03	Foundation Soils	21.6	18.4	109.4	1.136	-17.960	1.038	1.0	103.3	16	4	8.9	112.2	1.0	-0.4	0.0	0.9	0.156	1.023	0.159	0.067	2.383
NC-03	NB-03	Foundation Soils	21.7	18.4	116.7	1.146	-17.950	0.982	1.0	110.1	13	4	6.5	116.6	1.0	-0.4	0.0	0.9	0.164	1.025	0.168	0.067	2.511
NC-03	NB-03	Foundation Soils	21.7	18.3	118.5	1.091	-18.390	0.921	1.0	111.6	11	4	4.7	116.3	1.0	-0.4	0.0	0.9	0.163	1.024	0.167	0.067	2.499
NC-03	NB-03	Foundation Soils	21.8	18.2	119.6	1.011	-18.380	0.845	1.0	112.5	9	4	2.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.067	2.458
NC-03	NB-03	Foundation Soils	21.9	18.1	121.9	0.933	-18.340	0.766	1.0	114.5	6	4	0.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.067	2.455
NC-03	NB-03	Foundation Soils	22.0	18.0	126.9	0.808	-18.300	0.637	1.0	119.1	1	4	0.0	119.1	1.0	-0.4	0.0	0.9	0.169	1.026	0.173	0.067	2.579
NC-03	NB-03	Foundation Soils	22.1	18.0	138.5	0.562	-18.010	0.406	1.0	129.9	0	4	0.0	129.9	1.0	-0.4	0.0	0.9	0.197	1.032	0.203	0.067	3.018
NC-03	NB-03	Foundation Soils	22.1	17.9	146.4	0.509	-18.320	0.348	1.0	137.2	0	4	0.0	137.2	1.0	-0.4	0.0	0.9	0.223	1.036	0.230	0.067	3.418
NC-03	NB-03	Foundation Soils	22.2	17.8	148.6	0.592	-18.870	0.398	1.0	139.2	0	4	0.0	139.2	1.0	-0.4	0.0	0.9	0.231	1.038	0.239	0.067	3.541
NC-03	NB-03	Foundation Soils	22.3	17.7	142.9	0.649	-19.090	0.454	1.0	133.6	0	4	0.0	133.6	1.0	-0.4	0.0	0.9	0.209	1.034	0.216	0.068	3.196
NC-03	NB-03	Foundation Soils	22.4	17.6	130.9	0.756	-18.720	0.578	1.0	122.2	0	4	0.0	122.2	1.0	-0.4	0.0	0.9	0.176	1.027	0.181	0.068	2.672
NC-03	NB-03	Foundation Soils	22.5	17.5	124.2	0.867	-18.000	0.698	1.0	115.8	4	4	0.0	115.9	1.0	-0.4	0.0	0.9	0.163	1.024	0.166	0.068	2.454
NC-03	NB-03	Foundation Soils	22.6	17.5	114.3	0.943	-16.440	0.825	1.0	106.5	10	4	3.5	110.0	1.0	-0.4	0.0	0.9	0.152	1.022	0.155	0.068	2.285
NC-03	NB-03	Foundation Soils	22.6	17.4	110.8	0.975	-15.210	0.880	1.0	103.1	12	4	5.7	108.8	1.0	-0.4	0.0	0.9	0.150	1.021	0.153	0.068	2.252
NC-03	NB-03	Foundation Soils	22.7	17.3	107.9	0.801	-14.580	0.742	1.0	100.2	9	4	2.9	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.068	2.116
NC-03	NB-03	Foundation Soils	22.8	17.2	102.7	0.822	-14.060	0.800	1.0	95.3	12	4	5.7	101.0	1.0	-0.4	0.0	0.9	0.139	1.018	0.141	0.068	2.069
NC-03	NB-03	Foundation Soils	22.9	17.1	98.3	0.906	-14.250	0.922	1.0	91.0	17	4	9.1	100.1	1.0	-0.4	0.0	0.9	0.137	1.018	0.139	0.068	2.049
NC-03	NB-03	Foundation Soils	23.0	17.1	93.5	0.966	-14.100	1.033	1.0	86.5	21	4	11.1	97.7	1.0	-0.4	0.0	0.9	0.134	1.017	0.136	0.068	1.999
NC-03	NB-03	Foundation Soils	23.0	17.0	90.4	1.015	-8.030	1.123	1.0	83.5	23	4	12.2	95.7	1.0	-0.4	0.0	0.9	0.132	1.016	0.134	0.068	1.959
NC-03	NB-03	Foundation Soils	23.1	16.9	85.4	1.094	-15.680	1.281	1.0	78.8	28	4	13.3	92.1	1.0	-0.4	0.0	0.9	0.128	1.015	0.129	0.068	1.895
NC-03	NB-03	Foundation Soils	23.2	16.8	80.3	1.133	-16.910	1.412	1.0	73.9	32	4	13.8	87.8	1.0	-0.4	0.0	0.9	0.123	1.014	0.124	0.068	1.822
NC-03	NB-03	Foundation Soils	23.3	16.7	77.3	1.183	-16.340	1.530	1.0	71.1	35	4	14.1	85.3	1.0	-0.4	0.0	0.9	0.121	1.013	0.122	0.068	1.782
NC-03	NB-03	Foundation Soils	23.4	16.6	72.5	1.198	-16.830	1.653	1.0	66.5	38	4	14.3	80.9	1.0	-0.4	0.0	0.9	0.117	1.012	0.117	0.068	1.717
NC-03	NB-03	Foundation Soils	23.5	16.6	64.0	1.266	-16.820	1.978	1.0	58.6	46	4	14.5	73.1	1.0	-0.4	0.0	0.9	0.110	1.011	0.110	0.068	1.613
NC-03	NB-03	Foundation Soils	23.5	16.5	61.3	1.308	-17.250	2.133	1.0	56.1	48	4	14.5	70.6	1.0	-0.4	0.0	0.9	0.108	1.010	0.108	0.069	1.581
NC-03	NB-03	Foundation Soils	23.6	16.4	54.2	1.234	-17.200	2.277	1.0	49.5	53	4	14.3	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.069	1.499
NC-03	NB-03	Foundation Soils	23.7	16.3	49.0	1.033	-16.970	2.109	1.0	44.6	54	4	14.0	58.6	1.0	-0.4	0.0	0.9	0.099	1.008	0.099	0.069	1.440
NC-03	NB-03	Foundation Soils	23.8	16.2	42.5	0.938	-16.630	2.205	1.0	38.6	59	4	13.8	52.4	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.069	1.372
NC-03	NB-03	Foundation Soils	23.9	16.1	35.5	0.827	-15.820	2.332	1.0	32.1	65	4	13.5	45.6	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.069	1.301
NC-03	NB-03	Foundation Soils	23.9	16.1	28.3	0.751	-14.580	2.657	1.0	25.5	77	4	13.3	38.8	1.0	-0.4	0.1	0.9	0.085	1.007	0.085	0.069	1.231
NC-03	NB-03	Foundation Soils	24.0	16.0	24.2	0.783	-10.680	3.238	1.0	21.8	86	4	13.1	34.9	1.0	-0.4	0.1	0.9	0.082	1.007	0.082	0.069	1.192
NC-03	NB-03	Foundation Soils	24.1	15.9	24.9	0.769	-6.100	3.083	1.0	22.4	84	4	13.2	35.6	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.069	1.198
NC-03	NB-03	Foundation Soils	24.2	15.8	27.7	0.638	-2.380	2.302	1.0	24.9	75	4	13.2	38.1	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.069	1.221
NC-03	NB-03	Foundation Soils	24.3	15.7	32.3	0.532	0.760	1.645	1.0	29.1	61	4	13.2	42.3	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.069	1.260
NC-03	NB-03	Foundation Soils	24.4	15.7	35.3	0.377	-0.240	1.067	1.0	31.7	50	4	13.0	44.7	1.0	-0.5	0.1	0.9	0.089	1.007	0.089	0.069	1.283
NC-03	NB-03	Foundation Soils	24.4	15.6	34.7	0.297	-0.330	0.855	1.0	31.2	46	4	12.8	43.9	1.0	-0.5	0.1	0.9	0.088	1.007	0.088	0.069	1.274
NC-03	NB-03	Foundation Soils	24.5	15.5	33.6	0.310	1.550	0.921	0.9	30.1	49	4	12.8	43.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.088	0.069	1.263
NC-03	NB-03	Foundation Soils	24.6	15.4	32.5	0.366	6.400	1.127	0.9	29.0	53	4	13.0	42.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.069	1.252
NC-03	NB-03	Foundation Soils	24.7	15.3	29.9	0.437	21.820	1.461	0.9	26.7	61	4	13.1	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.069	1.229
NC-03	NB-03	Foundation Soils	24.8	15.2	26.7	0.409	67.320	1.530	0.9	23.8	65	4	13.0	36.8	1.0	-0.5	0.1	0.9	0.083	1.007	0.083	0.070	1.199
NC-03	NB-03	Foundation Soils	24.9	15.2	33.1	0.424	134.790	1.281	0.9	29.5	55	4	13.1	42.6	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.070	1.254
NC-03	NB-03	Foundation Soils	24.9	15.1	44.2	0.532	67.620	1.204	0.9	39.4	46	4	13.3	52.7	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.070	1.355
PC-01	PB-01 & PB-02	Foundation Soils	11.1	33.4	4.9	0.079	40.120	1.612	1.4	6.5	100	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.057	1.641
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.4	5.1	0.078	42.040	1.517	1.4	6.7	100	21	40.4	47.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.057	1.640
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.3	5.3	0.087	44.450	1.636	1.4	7.0	100	21	40.5	47.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.058	1.637
PC-01	PB-01 & PB-02	Foundation Soils	11.3	33.2	5.2	0.087	44.310	1.661	1.4	6.8	100	21	40.4	47.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.058	1.629
PC-01	PB-01 & PB-02	Foundation Soils	11.4	33.1	5.1	0.097	43.590	1.897	1.4	6.7	100	21	40.4	47.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.058	1.620
PC-01	PB-01 & PB-02	Foundation Soils	11.5	33.0	5.0	0.110	40.690	2.211	1.4	6.5	100	21	40.4	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.058	1.611
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	5.0	0.106	39.070	2.110	1.4	6.5	100	21	40.4	46.9	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.058	1.605
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	5.4	0.101	40.310	1.856	1.4	7.1	100	21	40.5	47.5	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.059	1.608
PC-01	PB-01 & PB-02	Foundation Soils	11.7	32.8	6.1	0.099	44.740	1.613	1.4	7.9	99	21	40.7	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.059	1.616

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	11.8	32.7	6.2	0.092	40.500	1.488	1.4	8.0	97	21	40.6	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.059	1.610
PC-01	PB-01 & PB-02	Foundation Soils	11.9	32.6	5.7	0.087	25.590	1.526	1.4	7.3	100	21	40.5	47.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.059	1.595
PC-01	PB-01 & PB-02	Foundation Soils	12.0	32.5	4.9	0.077	20.260	1.576	1.4	6.3	100	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.059	1.573
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.5	4.4	0.076	17.630	1.712	1.4	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.060	1.559
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.4	4.2	0.080	20.950	1.900	1.4	5.4	100	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.060	1.549
PC-01	PB-01 & PB-02	Foundation Soils	12.2	32.3	4.1	0.084	24.880	2.071	1.4	5.2	100	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.060	1.540
PC-01	PB-01 & PB-02	Foundation Soils	12.3	32.2	4.0	0.085	27.280	2.130	1.4	5.1	100	21	40.0	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.060	1.534
PC-01	PB-01 & PB-02	Foundation Soils	12.4	32.1	3.9	0.092	29.540	2.368	1.4	5.0	100	21	40.0	45.0	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.060	1.527
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	3.7	0.091	28.410	2.468	1.4	4.7	100	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.061	1.518
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	3.7	0.088	29.060	2.384	1.4	4.7	100	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.061	1.513
PC-01	PB-01 & PB-02	Foundation Soils	12.6	31.9	3.6	0.085	29.970	2.343	1.3	4.6	100	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.061	1.506
PC-01	PB-01 & PB-02	Foundation Soils	12.7	31.8	3.6	0.083	31.160	2.284	1.3	4.6	100	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.061	1.502
PC-01	PB-01 & PB-02	Foundation Soils	12.8	31.7	3.6	0.080	30.400	2.235	1.3	4.5	100	21	39.9	44.5	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.061	1.496
PC-01	PB-01 & PB-02	Foundation Soils	12.9	31.6	3.9	0.076	32.880	1.946	1.3	4.9	100	21	40.0	44.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.062	1.497
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.6	4.2	0.073	34.640	1.752	1.3	5.3	100	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.062	1.497
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.5	4.4	0.074	37.140	1.666	1.3	5.6	100	21	40.2	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.062	1.497
PC-01	PB-01 & PB-02	Foundation Soils	13.1	31.4	4.6	0.098	39.210	2.142	1.3	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.062	1.495
PC-01	PB-01 & PB-02	Foundation Soils	13.2	31.3	4.9	0.164	39.160	3.351	1.3	6.1	100	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.062	1.496
PC-01	PB-01 & PB-02	Foundation Soils	13.3	31.2	4.9	0.447	39.160	9.133	1.3	6.1	100	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.062	1.491
PC-01	PB-01 & PB-02	Foundation Soils	13.4	31.1	10.1	0.757	49.220	7.527	1.3	12.4	100	21	41.7	54.1	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.063	1.581
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.1	16.1	0.888	51.500	5.525	1.3	19.5	96	21	43.2	62.7	1.0	-0.2	0.0	1.0	0.102	1.009	0.106	0.063	1.687
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.0	20.9	0.787	25.490	3.759	1.3	25.2	79	21	43.9	69.1	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.063	1.770
PC-01	PB-01 & PB-02	Foundation Soils	13.6	30.9	45.9	0.739	14.630	1.609	1.2	53.4	43	21	46.2	99.5	1.0	-0.2	0.0	1.0	0.137	1.018	0.145	0.063	2.302
PC-01	PB-01 & PB-02	Foundation Soils	13.7	30.8	86.2	0.879	16.250	1.020	1.2	97.6	16	21	29.8	127.4	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.063	3.257
PC-01	PB-01 & PB-02	Foundation Soils	13.8	30.7	102.1	0.973	23.110	0.953	1.2	115.4	10	21	12.9	128.3	1.1	-0.2	0.0	1.0	0.192	1.031	0.209	0.063	3.297
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.7	75.6	1.027	2.100	1.358	1.2	85.3	26	21	43.7	129.0	1.1	-0.2	0.0	1.0	0.194	1.031	0.211	0.064	3.323
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.6	66.8	1.048	-1.760	1.568	1.2	75.7	33	21	46.7	122.4	1.1	-0.2	0.0	1.0	0.177	1.027	0.191	0.064	2.995
PC-01	PB-01 & PB-02	Foundation Soils	14.0	30.5	41.3	1.138	12.420	2.754	1.2	47.8	59	21	47.5	95.3	1.0	-0.2	0.0	1.0	0.131	1.016	0.139	0.064	2.176
PC-01	PB-01 & PB-02	Foundation Soils	14.1	30.4	27.6	1.122	5.340	4.060	1.2	32.4	74	21	45.3	77.8	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.064	1.861
PC-01	PB-01 & PB-02	Foundation Soils	14.2	30.3	22.8	0.952	1.950	4.170	1.3	27.0	80	21	44.4	71.3	1.0	-0.2	0.0	1.0	0.108	1.010	0.113	0.064	1.761
PC-01	PB-01 & PB-02	Foundation Soils	14.3	30.2	16.3	0.758	3.570	4.658	1.3	19.4	92	21	43.1	62.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.105	0.064	1.638
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.2	18.7	0.591	7.330	3.156	1.3	22.2	80	21	43.3	65.5	1.0	-0.2	0.0	1.0	0.104	1.009	0.108	0.065	1.673
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.1	26.7	0.590	18.300	2.210	1.2	31.2	66	21	44.5	75.7	1.0	-0.2	0.0	1.0	0.112	1.011	0.117	0.065	1.811
PC-01	PB-01 & PB-02	Foundation Soils	14.5	30.0	35.0	0.556	20.490	1.589	1.2	40.4	51	21	45.0	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.127	0.065	1.958
PC-01	PB-01 & PB-02	Foundation Soils	14.6	29.9	41.3	0.531	13.880	1.285	1.2	47.4	42	21	44.6	92.1	1.0	-0.2	0.0	1.0	0.128	1.015	0.135	0.065	2.072
PC-01	PB-01 & PB-02	Foundation Soils	14.7	29.8	47.5	0.547	4.880	1.151	1.2	54.1	36	21	44.0	98.1	1.0	-0.2	0.0	1.0	0.135	1.017	0.143	0.065	2.189
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.8	51.4	0.540	1.380	1.050	1.2	58.4	32	21	42.8	101.2	1.0	-0.2	0.0	1.0	0.139	1.018	0.147	0.065	2.252
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.7	52.3	0.550	1.460	1.052	1.2	59.2	31	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.065	2.264
PC-01	PB-01 & PB-02	Foundation Soils	14.9	29.6	52.8	0.564	2.290	1.068	1.2	59.6	31	21	42.9	102.6	1.0	-0.2	0.0	1.0	0.141	1.019	0.149	0.066	2.273
PC-01	PB-01 & PB-02	Foundation Soils	15.0	29.5	53.1	0.574	3.460	1.081	1.2	59.9	32	21	43.0	102.9	1.0	-0.2	0.0	1.0	0.141	1.019	0.150	0.066	2.275
PC-01	PB-01 & PB-02	Foundation Soils	15.1	29.4	52.5	0.551	4.140	1.050	1.2	59.1	31	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.066	2.246
PC-01	PB-01 & PB-02	Foundation Soils	15.2	29.3	49.5	0.551	4.880	1.114	1.2	55.7	34	21	43.6	99.4	1.0	-0.2	0.0	1.0	0.136	1.018	0.144	0.066	2.183
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.3	45.0	0.580	5.180	1.289	1.2	50.8	40	21	44.8	95.6	1.0	-0.2	0.0	1.0	0.132	1.016	0.139	0.066	2.099
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.2	36.7	0.632	5.760	1.723	1.2	41.6	52	21	45.4	87.0	1.0	-0.2	0.0	1.0	0.122	1.014	0.128	0.066	1.936
PC-01	PB-01 & PB-02	Foundation Soils	15.4	29.1	28.7	0.722	6.620	2.519	1.2	32.7	67	21	45.0	77.7	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.066	1.786
PC-01	PB-01 & PB-02	Foundation Soils	15.5	29.0	22.3	0.768	7.450	3.441	1.2	25.6	78	21	44.0	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.067	1.670
PC-01	PB-01 & PB-02	Foundation Soils	15.6	28.9	15.7	0.599	9.050	3.821	1.2	18.1	90	21	42.7	60.9	1.0	-0.2	0.0	1.0	0.100	1.009	0.104	0.067	1.556
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	13.2	0.528	11.710	4.008	1.2	15.3	97	21	42.3	57.5	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.067	1.512
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	11.6	0.498	13.670	4.310	1.2	13.4	100	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.067	1.482
PC-01	PB-01 & PB-02	Foundation Soils	15.8	28.7	20.7	0.324	29.210	1.567	1.2	23.7	67	21	43.0	66.6	1.0	-0.3	0.0	1.0	0.105	1.010	0.108	0.067	1.616
PC-01	PB-01 & PB-02	Foundation Soils	15.9	28.6	59.1	0.261	49.980	0.441	1.2	66.6	12	21	16.2	82.8	1.0	-0.3	0.0	1.0	0.118	1.013	0.124	0.067	1.837
PC-01	PB-01 & PB-02	Foundation Soils	16.0	28.5	79.1	0.237	29.920	0.300	1.2	88.5	0	21	0.0	88.5	1.0	-0.3	0.0	1.0	0.124	1.014	0.130	0.067	1.926
PC-01	PB-01 & PB-02	Foundation Soils	16.1	28.4	80.8	0.273	6.770	0.338	1.2	90.2	0	21	0.0	90.2	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.067	1.950
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.4	78.2	0.410	6.330	0.524	1.2	87.2	7	21	2.5	89.6	1.0	-0.3	0.0	1.0	0.125	1.015	0.131	0.068	1.937
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.3	77.4	0.422	9.010	0.545	1.2	86.1	8	21	4.7	90.8	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.068	1.953
PC-01	PB-01 & PB-02	Foundation Soils	16.3	28.2	76.3	0.498	10.270	0.653	1.2	84.1	12	21	16.2	100.2	1.0	-0.3	0.0	1.0	0.138	1.018	0.145	0.068	2.132
PC-01	PB-01 & PB-02	Foundation Soils	16.4	28.1	75.3	0.621	10.480	0.824	1.2	82.3	17	21	29.3	111.6	1.0	-0.3	0.0	1.0	0.155	1.022	0.164	0.068	2.411
PC-01	PB-01 & PB-02	Foundation Soils	16.5	28.0	73.2	0.657	11.180	0.897	1.2	79.8	19	21	34.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.168	0.068	2.470
PC-01	PB-01 & PB-02	Foundation Soils	16.6	27.9	74.0	0.711	8.910	0.961	1.2	80.3	21	21	36.1	116.4	1.0	-0.3	0.0	1.0	0.164	1.024	0.174	0.068	2.547
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.9	72.5	0.785	8.290	1.082	1.1	78.5	24	21	40.0	118.5	1.0	-0.3	0.0	1.0	0.168	1.025	0.179	0.068	2.613
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.8	69.1	0.826	6.750	1.195	1.1	74.7	27	21	42.8	117.6	1.0	-0.3	0.0	1.0	0.166	1.025	0.176	0.068	2.575
PC-01	PB-01 & PB-02	Foundation Soils	16.8	27.7	58.6	0.890	5.000	1.519	1.2	63.6	37	21	46.3	109.9	1.0	-0.3	0.0	1.0	0.152	1.022	0.160	0.069	2.339

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	16.9	27.6	44.6	0.907	3.720	2.032	1.2	48.8	51	21	46.8	95.6	1.0	-0.3	0.0	1.0	0.132	1.016	0.138	0.069	2.008
PC-01	PB-01 & PB-02	Foundation Soils	17.0	27.5	27.9	0.968	3.750	3.469	1.2	30.9	73	21	44.9	75.8	1.0	-0.3	0.0	1.0	0.112	1.011	0.116	0.069	1.689
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.5	17.7	0.907	6.430	5.124	1.2	19.8	95	21	43.2	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.069	1.523
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.4	11.9	0.782	15.340	6.579	1.2	13.4	100	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.069	1.431
PC-01	PB-01 & PB-02	Foundation Soils	17.2	27.3	11.1	0.656	19.680	5.919	1.2	12.4	100	21	41.7	54.1	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.069	1.416
PC-01	PB-01 & PB-02	Foundation Soils	17.3	27.2	8.9	0.431	23.490	4.828	1.2	10.0	100	21	41.2	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.069	1.381
PC-01	PB-01 & PB-02	Foundation Soils	17.4	27.1	7.3	0.340	35.350	4.657	1.2	8.2	100	21	40.7	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.069	1.354
PC-01	PB-01 & PB-02	Foundation Soils	17.5	27.0	7.0	0.292	95.530	4.150	1.2	7.9	100	21	40.7	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.070	1.348
PC-01	PB-01 & PB-02	Foundation Soils	17.6	27.0	24.0	0.243	115.300	1.010	1.2	26.5	55	21	42.6	69.1	1.0	-0.3	0.0	1.0	0.107	1.010	0.110	0.070	1.579
PC-01	PB-01 & PB-02	Foundation Soils	17.6	26.9	92.7	0.270	88.090	0.291	1.1	99.9	0	21	0.0	99.9	1.0	-0.3	0.0	1.0	0.137	1.018	0.144	0.070	2.057
PC-01	PB-01 & PB-02	Foundation Soils	17.7	26.8	97.0	0.353	34.020	0.364	1.1	104.1	0	21	0.0	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.150	0.070	2.144
PC-01	PB-01 & PB-02	Foundation Soils	17.8	26.7	82.2	0.439	-0.340	0.534	1.1	88.8	7	21	2.0	90.9	1.0	-0.3	0.0	0.9	0.126	1.015	0.132	0.070	1.882
PC-01	PB-01 & PB-02	Foundation Soils	17.9	26.6	61.6	0.583	-2.920	0.946	1.1	65.9	26	21	40.2	106.1	1.0	-0.3	0.0	0.9	0.146	1.020	0.153	0.070	2.183
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.6	43.3	0.711	-2.580	1.642	1.1	46.6	48	21	45.7	92.3	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.070	1.899
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.5	27.3	0.765	-0.330	2.798	1.2	29.7	71	21	44.5	74.2	1.0	-0.3	0.0	0.9	0.111	1.011	0.114	0.070	1.628
PC-01	PB-01 & PB-02	Foundation Soils	18.1	26.4	18.7	0.780	1.810	4.166	1.2	20.5	90	21	43.3	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.070	1.496
PC-01	PB-01 & PB-02	Foundation Soils	18.2	26.3	11.8	0.667	6.790	5.651	1.2	13.0	100	21	41.8	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.098	0.071	1.393
PC-01	PB-01 & PB-02	Foundation Soils	18.3	26.2	10.2	0.558	13.010	5.497	1.2	11.2	100	21	41.4	52.6	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.071	1.367
PC-01	PB-01 & PB-02	Foundation Soils	18.4	26.1	8.8	0.463	15.820	5.244	1.2	9.7	100	21	41.1	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.071	1.345
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.1	6.6	0.375	23.040	5.696	1.2	7.3	100	21	40.5	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.071	1.312
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.0	5.9	0.269	42.830	4.531	1.2	6.5	100	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.071	1.300
PC-01	PB-01 & PB-02	Foundation Soils	18.6	25.9	5.9	0.256	69.320	4.330	1.2	6.5	100	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.071	1.298
PC-01	PB-01 & PB-02	Foundation Soils	18.7	25.8	6.1	0.305	84.240	4.971	1.2	6.7	100	21	40.4	47.1	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.071	1.299
PC-01	PB-01 & PB-02	Foundation Soils	18.8	25.7	13.2	0.312	94.870	2.356	1.2	14.4	89	21	41.9	56.3	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.071	1.393
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	19.2	0.299	71.230	1.554	1.1	20.8	70	21	42.6	63.3	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.071	1.469
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	11.0	0.253	32.120	2.302	1.2	11.9	95	21	41.5	53.4	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.071	1.358
PC-01	PB-01 & PB-02	Foundation Soils	19.0	25.5	7.7	0.237	25.440	3.062	1.2	8.4	100	21	40.8	49.2	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.072	1.311
PC-01	PB-01 & PB-02	Foundation Soils	19.1	25.4	7.5	0.173	39.150	2.296	1.2	8.2	100	21	40.7	48.9	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.072	1.306
PC-01	PB-01 & PB-02	Foundation Soils	19.2	25.3	6.2	0.089	66.420	1.432	1.2	6.8	100	21	40.4	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.072	1.286
PC-01	PB-01 & PB-02	Foundation Soils	19.3	25.2	5.7	0.038	84.530	0.670	1.2	6.2	100	21	40.3	46.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.072	1.277
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.2	5.8	0.033	103.340	0.568	1.1	6.3	98	21	40.3	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.072	1.276
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.1	5.9	0.044	100.290	0.751	1.1	6.3	100	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.072	1.275
PC-01	PB-01 & PB-02	Foundation Soils	19.5	25.0	5.9	0.038	95.150	0.646	1.1	6.4	99	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.072	1.274
PC-01	PB-01 & PB-02	Foundation Soils	19.6	24.9	6.9	0.036	97.350	0.523	1.1	7.4	90	21	40.3	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.072	1.283
PC-01	PB-01 & PB-02	Foundation Soils	19.7	24.8	7.5	0.048	82.570	0.643	1.1	8.0	89	21	40.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.072	1.288
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	8.4	0.058	63.310	0.688	1.1	9.0	86	21	40.6	49.6	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.072	1.298
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	8.3	0.064	66.560	0.770	1.1	8.9	88	21	40.6	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.073	1.295
PC-01	PB-01 & PB-02	Foundation Soils	19.9	24.6	9.9	0.045	86.020	0.454	1.1	10.6	74	21	40.5	51.1	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.073	1.309
PC-01	PB-01 & PB-02	Foundation Soils	20.0	24.5	10.1	0.063	81.080	0.625	1.1	10.8	78	21	40.7	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.073	1.311
PC-01	PB-01 & PB-02	Foundation Soils	20.1	24.4	26.6	0.084	62.560	0.316	1.1	28.0	36	21	38.8	66.9	1.0	-0.4	0.0	0.9	0.105	1.010	0.107	0.073	1.475
PC-01	PB-01 & PB-02	Foundation Soils	20.2	24.3	41.7	0.123	48.980	0.295	1.1	43.8	20	21	29.8	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.073	1.552
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.3	38.7	0.189	7.350	0.488	1.1	40.4	29	21	38.2	78.6	1.0	-0.4	0.0	0.9	0.115	1.012	0.118	0.073	1.615
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.2	29.9	0.250	0.760	0.836	1.1	31.2	46	21	42.3	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.073	1.548
PC-01	PB-01 & PB-02	Foundation Soils	20.4	24.1	19.0	0.338	5.500	1.777	1.1	20.0	74	21	42.5	62.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.073	1.419
PC-01	PB-01 & PB-02	Foundation Soils	20.5	24.0	14.5	0.432	8.290	2.975	1.1	15.3	93	21	42.2	57.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.073	1.362
PC-01	PB-01 & PB-02	Foundation Soils	20.6	23.9	9.6	0.411	14.080	4.269	1.1	10.1	100	21	41.2	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.073	1.297
PC-01	PB-01 & PB-02	Foundation Soils	20.7	23.8	7.7	0.340	17.200	4.423	1.1	8.1	100	21	40.7	48.8	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.073	1.270
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.8	6.3	0.282	21.770	4.508	1.1	6.6	100	21	40.4	47.0	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.074	1.250
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.7	5.0	0.207	29.680	4.119	1.1	5.3	100	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.074	1.233
PC-01	PB-01 & PB-02	Foundation Soils	20.9	23.6	5.0	0.107	46.020	2.124	1.1	5.3	100	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.074	1.231
PC-01	PB-01 & PB-02	Foundation Soils	21.0	23.5	5.4	0.053	64.460	0.987	1.1	5.6	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.074	1.234
PC-01	PB-01 & PB-02	Foundation Soils	21.1	23.4	6.8	0.034	71.180	0.499	1.1	7.1	92	21	40.3	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.074	1.248
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.4	7.8	0.031	62.650	0.398	1.1	8.1	84	21	40.3	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.074	1.257
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.3	8.5	0.038	45.780	0.449	1.1	8.8	82	21	40.4	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.074	1.263
PC-01	PB-01 & PB-02	Foundation Soils	21.3	23.2	9.7	0.040	37.120	0.411	1.1	10.1	75	21	40.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.074	1.274
PC-01	PB-01 & PB-02	Foundation Soils	21.4	23.1	10.8	0.041	31.370	0.380	1.1	11.2	69	21	40.4	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.074	1.283
PC-01	PB-01 & PB-02	Foundation Soils	21.5	23.0	9.0	0.064	26.130	0.708	1.1	9.4	85	21	40.7	50.0	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.074	1.266
PC-01	PB-01 & PB-02	Foundation Soils	21.6	22.9	7.5	0.090	24.950	1.193	1.1	7.8	100	21	40.7	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.074	1.249
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.9	6.0	0.084	28.680	1.391	1.1	6.3	100	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.074	1.229
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.8	6.1	0.070	33.890	1.157	1.1	6.3	100	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.074	1.227
PC-01	PB-01 & PB-02	Foundation Soils	21.8	22.7	7.5	0.066	35.210	0.881	1.1	7.7	96	21	40.6	48.3	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.075	1.243
PC-01	PB-01 & PB-02	Foundation Soils	21.9	22.6	10.5	0.066	33.070	0.627	1.1	10.8	78	21	40.7	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.075	1.273

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	22.0	22.5	13.8	0.070	20.770	0.506	1.1	14.2	64	21	40.7	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.075	1.305
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.5	16.8	0.073	15.480	0.435	1.1	17.2	56	21	40.7	57.8	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.075	1.333
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.4	22.2	0.098	11.290	0.442	1.1	22.6	47	21	40.6	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.075	1.388
PC-01	PB-01 & PB-02	Foundation Soils	22.2	22.3	27.2	0.150	12.240	0.552	1.1	27.6	43	21	41.0	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.075	1.445
PC-01	PB-01 & PB-02	Foundation Soils	22.3	22.2	43.7	0.147	11.200	0.336	1.1	44.2	21	21	31.4	75.7	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.075	1.526
PC-01	PB-01 & PB-02	Foundation Soils	22.4	22.1	46.4	0.093	10.960	0.200	1.1	47.0	13	21	17.2	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.075	1.395
PC-01	PB-01 & PB-02	Foundation Soils	22.5	22.0	41.7	0.110	11.150	0.263	1.1	42.2	20	21	29.2	71.4	1.0	-0.4	0.0	0.9	0.108	1.010	0.111	0.075	1.473
PC-01	PB-01 & PB-02	Foundation Soils	22.6	22.0	37.8	0.198	11.290	0.524	1.1	38.0	32	21	39.4	77.4	1.0	-0.4	0.0	0.9	0.114	1.012	0.116	0.075	1.543
PC-01	PB-01 & PB-02	Foundation Soils	22.6	21.9	43.8	0.227	13.340	0.519	1.1	43.9	28	21	37.7	81.6	1.0	-0.4	0.0	0.9	0.117	1.012	0.120	0.075	1.594
PC-01	PB-01 & PB-02	Foundation Soils	22.7	21.8	53.1	0.210	13.240	0.395	1.1	53.2	17	21	26.9	80.2	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.075	1.574
PC-01	PB-01 & PB-02	Foundation Soils	22.8	21.7	55.3	0.240	9.480	0.434	1.1	55.3	18	21	27.6	82.8	1.0	-0.4	0.0	0.9	0.118	1.013	0.121	0.075	1.607
PC-01	PB-01 & PB-02	Foundation Soils	22.9	21.6	51.0	0.232	8.380	0.455	1.1	51.0	21	21	32.1	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.075	1.608
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	49.7	0.126	9.550	0.254	1.1	49.8	14	21	18.8	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.076	1.432
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	59.6	0.052	15.680	0.087	1.1	59.8	0	21	0.0	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.076	1.337
PC-01	PB-01 & PB-02	Foundation Soils	23.1	21.4	72.7	0.084	11.620	0.116	1.1	72.5	0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.111	0.076	1.473
PC-01	PB-01 & PB-02	Foundation Soils	23.2	21.3	80.8	0.100	10.990	0.124	1.1	80.3	0	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.076	1.566
PC-01	PB-01 & PB-02	Foundation Soils	23.3	21.2	80.9	0.168	10.380	0.208	1.1	80.3	0	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.118	0.076	1.564
PC-01	PB-01 & PB-02	Foundation Soils	23.4	21.1	77.5	0.225	9.910	0.290	1.1	76.9	1	21	0.0	76.9	1.0	-0.4	0.0	0.9	0.113	1.011	0.115	0.076	1.520
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.1	71.0	0.192	9.860	0.270	1.1	70.4	3	21	0.0	70.5	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.076	1.444
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.0	65.6	0.116	10.870	0.177	1.1	65.1	1	21	0.0	65.1	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.076	1.384
PC-01	PB-01 & PB-02	Foundation Soils	23.6	20.9	64.3	0.122	10.960	0.190	1.1	63.7	2	21	0.0	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.076	1.368
PC-01	PB-01 & PB-02	Foundation Soils	23.7	20.8	72.2	0.112	12.440	0.155	1.0	71.3	0	21	0.0	71.3	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.076	1.450
PC-01	PB-01 & PB-02	Foundation Soils	23.8	20.7	85.9	0.130	12.980	0.151	1.0	84.5	0	21	0.0	84.5	1.0	-0.4	0.0	0.9	0.120	1.013	0.122	0.076	1.610
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	107.2	0.148	13.050	0.138	1.0	104.9	0	21	0.0	104.9	1.0	-0.4	0.0	0.9	0.144	1.020	0.148	0.076	1.944
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	116.4	0.161	11.720	0.138	1.0	113.6	0	21	0.0	113.6	1.0	-0.4	0.1	0.9	0.158	1.023	0.163	0.076	2.144
PC-01	PB-01 & PB-02	Foundation Soils	24.0	20.5	122.3	0.178	8.770	0.146	1.0	119.1	0	21	0.0	119.1	1.0	-0.4	0.1	0.9	0.169	1.026	0.175	0.076	2.298
PC-01	PB-01 & PB-02	Foundation Soils	24.1	20.4	127.9	0.200	6.230	0.156	1.0	124.4	0	21	0.0	124.4	1.0	-0.4	0.1	0.9	0.182	1.029	0.188	0.076	2.470
PC-01	PB-01 & PB-02	Foundation Soils	24.2	20.3	129.5	0.226	1.760	0.175	1.0	125.7	0	21	0.0	125.7	1.0	-0.5	0.1	0.9	0.185	1.029	0.192	0.076	2.517
PC-01	PB-01 & PB-02	Foundation Soils	24.3	20.2	127.6	0.237	-2.620	0.186	1.0	123.8	0	21	0.0	123.8	1.0	-0.5	0.1	0.9	0.180	1.028	0.187	0.076	2.444
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.2	119.0	0.205	-6.920	0.172	1.0	115.4	0	21	0.0	115.4	1.0	-0.5	0.1	0.9	0.162	1.024	0.167	0.076	2.181
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.1	110.2	0.156	-5.570	0.142	1.0	106.8	0	21	0.0	106.8	1.0	-0.5	0.1	0.9	0.147	1.020	0.151	0.076	1.973
PC-01	PB-01 & PB-02	Foundation Soils	24.5	20.0	102.2	0.109	-2.720	0.107	1.0	99.0	0	21	0.0	99.0	1.0	-0.5	0.1	0.9	0.136	1.017	0.139	0.077	1.819
PC-01	PB-01 & PB-02	Foundation Soils	24.6	19.9	95.4	0.128	-0.330	0.134	1.0	92.5	0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.077	1.709
PC-01	PB-01 & PB-02	Foundation Soils	24.7	19.8	90.9	0.184	2.490	0.202	1.0	88.1	0	21	0.0	88.1	1.0	-0.5	0.1	0.9	0.124	1.014	0.126	0.077	1.642
PC-01	PB-01 & PB-02	Foundation Soils	24.8	19.7	84.1	0.228	5.860	0.271	1.0	81.4	0	21	0.0	81.4	1.0	-0.5	0.1	0.9	0.117	1.012	0.119	0.077	1.552
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.7	81.6	0.233	9.950	0.286	1.0	78.9	0	21	0.0	78.9	1.0	-0.5	0.1	0.9	0.115	1.012	0.117	0.077	1.519
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.6	82.9	0.187	11.860	0.225	1.0	80.1	0	21	0.0	80.1	1.0	-0.5	0.1	0.9	0.116	1.012	0.118	0.077	1.533
PC-01	PB-01 & PB-02	Foundation Soils	25.0	19.5	89.6	0.204	8.860	0.228	1.0	86.3	0	21	0.0	86.3	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.077	1.613
PC-01	PB-01 & PB-02	Foundation Soils	25.1	19.4	93.7	0.177	7.000	0.189	1.0	90.1	0	21	0.0	90.1	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.077	1.665
PC-01	PB-01 & PB-02	Foundation Soils	25.2	19.3	94.5	0.156	8.390	0.165	1.0	90.7	0	21	0.0	90.7	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.077	1.672
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.3	96.6	0.138	6.380	0.143	1.0	92.7	0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.077	1.700
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.2	100.7	0.125	5.000	0.124	1.0	96.4	0	21	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.135	0.077	1.758
PC-01	PB-01 & PB-02	Foundation Soils	25.4	19.1	102.4	0.115	5.150	0.112	1.0	97.9	0	21	0.0	97.9	1.0	-0.5	0.1	0.9	0.135	1.017	0.137	0.077	1.782
PC-01	PB-01 & PB-02	Foundation Soils	25.5	19.0	108.3	0.104	6.190	0.096	1.0	103.4	0	21	0.0	103.4	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.077	1.880
PC-01	PB-01 & PB-02	Foundation Soils	25.6	18.9	114.7	0.119	7.360	0.104	1.0	109.3	0	21	0.0	109.3	1.0	-0.5	0.1	0.9	0.151	1.021	0.155	0.077	2.003
PC-01	PB-01 & PB-02	Foundation Soils	25.7	18.8	113.3	0.155	8.450	0.137	1.0	107.9	0	21	0.0	107.9	1.0	-0.5	0.1	0.9	0.149	1.021	0.152	0.077	1.969
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.8	108.9	0.135	12.200	0.124	1.0	103.6	0	21	0.0	103.6	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.077	1.879
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.7	106.8	0.106	15.430	0.099	1.0	101.5	0	21	0.0	101.5	1.0	-0.5	0.1	0.9	0.139	1.018	0.142	0.077	1.838
PC-01	PB-01 & PB-02	Foundation Soils	25.9	18.6	105.8	0.112	15.910	0.106	1.0	100.5	0	21	0.0	100.5	1.0	-0.5	0.1	0.9	0.138	1.018	0.141	0.077	1.818
PC-01	PB-01 & PB-02	Foundation Soils	26.0	18.5	104.3	0.136	15.720	0.130	1.0	98.9	0	21	0.0	98.9	1.0	-0.5	0.1	0.9	0.136	1.017	0.138	0.077	1.789
PC-01	PB-01 & PB-02	Foundation Soils	26.1	18.4	101.5	0.118	17.100	0.116	1.0	96.1	0	21	0.0	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.077	1.741
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	96.9	0.085	19.150	0.088	1.0	91.7	0	21	0.0	91.7	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.077	1.670
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	92.3	0.172	21.060	0.186	1.0	87.2	0	21	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.124	0.077	1.605
PC-01	PB-01 & PB-02	Foundation Soils	26.3	18.2	83.3	0.164	16.380	0.197	1.0	78.6	0	21	0.0	78.6	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.078	1.495
PC-01	PB-01 & PB-02	Foundation Soils	26.4	18.1	86.0	0.133	21.920	0.155	1.0	81.0	0	21	0.0	81.0	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.078	1.523
PC-01	PB-01 & PB-02	Foundation Soils	26.5	18.0	84.2	0.133	25.010	0.158	1.0	79.2	0	21	0.0	79.2	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.078	1.500
PC-01	PB-01 & PB-02	Foundation Soils	26.6	17.9	83.1	0.155	25.440	0.187	1.0	78.1	0	21	0.0	78.1	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.078	1.486
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.9	81.0	0.150	35.970	0.185	1.0	76.1	0	21	0.0	76.1	1.0	-0.5	0.1	0.9	0.112	1.011	0.114	0.078	1.461
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.8	82.1	0.129	36.020	0.157	1.0	76.9	0	21	0.0	76.9	1.0	-0.5	0.1	0.9	0.113	1.011	0.114	0.078	1.470
PC-01	PB-01 & PB-02	Foundation Soils	26.8	17.7	82.7	0.100	29.830	0.121	1.0	77.5	0	21	0.0	77.5	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.078	1.475
PC-01	PB-01 & PB-02	Foundation Soils	26.9	17.6	83.6	0.098	26.800	0.117	1.0	78.2	0	21	0.0	78.2	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.078	1.482
PC-01	PB-01 & PB-02	Foundation Soils	27.0	17.5	85.9	0.087	29.040	0.101	1.0	80.2	0	21	0.0	80.2	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.078	1.506

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	93.3	0.036	21.110	0.039	1.0	87.0	0	21	0.0	87.0	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.078	1.592
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	97.0	0.025	16.200	0.026	1.0	90.4	0	21	0.0	90.4	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.078	1.638
PC-01	PB-01 & PB-02	Foundation Soils	27.2	17.3	99.3	0.061	17.680	0.061	1.0	92.5	0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.130	0.078	1.666
PC-01	PB-01 & PB-02	Foundation Soils	27.3	17.2	99.7	0.233	21.540	0.234	1.0	92.7	0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.129	1.015	0.130	0.078	1.669
PC-01	PB-01 & PB-02	Foundation Soils	27.4	17.1	95.9	0.263	36.200	0.274	1.0	89.1	0	21	0.0	89.1	1.0	-0.5	0.1	0.9	0.125	1.014	0.126	0.078	1.615
PC-01	PB-01 & PB-02	Foundation Soils	27.5	17.0	87.5	0.370	40.590	0.423	1.0	81.1	5	21	0.4	81.5	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.078	1.516
PC-01	PB-01 & PB-02	Foundation Soils	27.6	17.0	76.0	0.439	42.830	0.577	1.0	70.5	15	21	23.4	93.9	1.0	-0.5	0.1	0.9	0.130	1.016	0.131	0.078	1.683
PC-01	PB-01 & PB-02	Foundation Soils	27.6	16.9	66.1	0.445	39.640	0.673	1.0	61.2	22	21	34.9	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.134	0.078	1.717
PC-01	PB-01 & PB-02	Foundation Soils	27.7	16.8	54.8	0.435	55.420	0.793	1.0	50.7	31	21	40.8	91.5	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.078	1.645
PC-01	PB-01 & PB-02	Foundation Soils	27.8	16.7	50.1	0.448	42.450	0.894	1.0	46.3	35	21	42.3	88.6	1.0	-0.5	0.1	0.9	0.124	1.014	0.125	0.078	1.603
PC-01	PB-01 & PB-02	Foundation Soils	27.9	16.6	47.2	0.398	45.120	0.843	1.0	43.5	36	21	42.1	85.6	1.0	-0.5	0.1	0.9	0.121	1.013	0.122	0.078	1.562
PC-01	PB-01 & PB-02	Foundation Soils	28.0	16.5	41.0	0.400	89.670	0.976	1.0	37.7	43	21	43.0	80.7	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.078	1.499
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.5	32.6	0.404	119.270	1.238	1.0	30.0	55	21	43.3	73.2	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.078	1.413
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.4	26.7	0.420	150.320	1.574	1.0	24.5	65	21	43.0	67.5	1.0	-0.6	0.1	0.9	0.105	1.010	0.106	0.078	1.351
PC-01	PB-01 & PB-02	Foundation Soils	28.2	16.3	22.6	0.430	244.700	1.906	1.0	20.6	77	21	42.9	63.5	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.078	1.310
PC-01	PB-01 & PB-02	Foundation Soils	28.3	16.2	26.3	0.388	223.410	1.474	1.0	24.1	65	21	42.9	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.078	1.344
PC-01	PB-01 & PB-02	Foundation Soils	28.4	16.1	29.9	0.342	149.050	1.146	1.0	27.3	56	21	42.8	70.1	1.0	-0.6	0.1	0.9	0.107	1.010	0.108	0.078	1.376
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.1	28.8	0.299	110.970	1.038	1.0	26.3	55	21	42.5	68.8	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.078	1.362
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.0	23.6	0.333	146.170	1.411	1.0	21.5	67	21	42.5	64.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.103	0.079	1.312
PC-01	PB-01 & PB-02	Foundation Soils	28.6	15.9	21.5	0.406	204.300	1.884	1.0	19.6	79	21	42.7	62.3	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.079	1.294
PC-01	PB-01 & PB-02	Foundation Soils	28.7	15.8	26.3	0.414	291.590	1.572	1.0	23.9	66	21	43.0	66.9	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.079	1.339
PC-01	PB-01 & PB-02	Foundation Soils	28.8	15.7	39.6	0.384	198.630	0.969	1.0	36.1	44	21	42.9	79.0	1.0	-0.6	0.1	0.9	0.115	1.012	0.116	0.079	1.469
PC-01	PB-01 & PB-02	Foundation Soils	28.9	15.6	64.0	0.358	49.030	0.559	1.0	58.3	20	21	31.9	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.127	0.079	1.612
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.6	81.4	0.299	-17.440	0.367	1.0	73.9	6	21	0.8	74.7	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.079	1.419
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.5	88.9	0.258	-15.530	0.290	1.0	80.6	0	21	0.0	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.079	1.486
PC-01	PB-01 & PB-02	Foundation Soils	29.1	15.4	95.9	0.245	-16.820	0.256	1.0	87.0	0	21	0.0	87.0	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.079	1.565
PC-01	PB-01 & PB-02	Foundation Soils	29.2	15.3	98.6	0.271	-17.050	0.275	1.0	89.4	0	21	0.0	89.4	1.0	-0.6	0.1	0.9	0.125	1.014	0.126	0.079	1.597
PC-01	PB-01 & PB-02	Foundation Soils	29.3	15.2	101.8	0.254	-14.820	0.250	1.0	92.2	0	21	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.129	0.079	1.635
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.2	103.9	0.283	-10.360	0.272	1.0	94.0	0	21	0.0	94.0	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.079	1.662
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.1	103.9	0.439	-11.960	0.423	1.0	93.9	1	21	0.0	93.9	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.079	1.659
PC-01	PB-01 & PB-02	Foundation Soils	29.5	15.0	101.5	0.482	-15.170	0.475	1.0	91.6	3	21	0.0	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.079	1.625
PC-01	PB-01 & PB-02	Foundation Soils	29.6	14.9	92.4	0.560	-4.210	0.606	1.0	83.4	11	21	12.8	96.2	1.0	-0.6	0.1	0.9	0.133	1.016	0.134	0.079	1.693
PC-01	PB-01 & PB-02	Foundation Soils	29.7	14.8	89.4	0.672	-16.150	0.751	1.0	80.8	16	21	27.0	107.8	1.0	-0.6	0.1	0.9	0.149	1.021	0.150	0.079	1.901
PC-01	PB-01 & PB-02	Foundation Soils	29.8	14.7	84.1	0.700	-19.150	0.833	1.0	75.9	20	21	34.0	110.0	1.0	-0.6	0.1	0.9	0.152	1.022	0.154	0.079	1.945
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.7	82.3	0.681	-20.110	0.828	1.0	74.2	20	21	34.6	108.9	1.0	-0.6	0.1	0.9	0.150	1.021	0.152	0.079	1.920
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.6	79.5	0.581	-20.960	0.730	1.0	71.6	19	21	31.9	103.5	1.0	-0.6	0.1	0.9	0.142	1.019	0.143	0.079	1.812
PC-01	PB-01 & PB-02	Foundation Soils	30.0	14.5	73.0	0.556	-21.060	0.762	1.0	65.6	22	21	36.0	101.6	1.0	-0.6	0.1	0.9	0.139	1.018	0.140	0.079	1.778
PC-01	PB-01 & PB-02	Foundation Soils	30.1	14.4	68.1	0.516	-21.440	0.757	1.0	61.1	24	21	37.5	98.7	1.0	-0.6	0.1	0.9	0.136	1.017	0.136	0.079	1.727
PC-01	PB-01 & PB-02	Foundation Soils	30.2	14.3	64.9	0.542	-21.110	0.835	0.9	58.1	28	21	40.1	98.2	1.0	-0.6	0.1	0.9	0.135	1.017	0.136	0.079	1.718
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	60.4	0.800	-20.750	1.326	0.9	54.0	39	21	45.1	99.2	1.0	-0.6	0.1	0.9	0.136	1.017	0.137	0.079	1.733
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	54.7	0.873	-13.820	1.597	0.9	48.8	46	21	45.8	94.7	1.0	-0.6	0.1	0.9	0.131	1.016	0.131	0.079	1.661
PC-01	PB-01 & PB-02	Foundation Soils	30.4	14.1	48.4	0.864	-14.390	1.785	0.9	43.1	52	21	45.7	88.8	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.079	1.576
PC-01	PB-01 & PB-02	Foundation Soils	30.5	14.0	41.6	0.921	-8.960	2.216	0.9	36.9	61	21	45.4	82.3	1.0	-0.6	0.1	0.9	0.118	1.013	0.118	0.079	1.493
PC-01	PB-01 & PB-02	Foundation Soils	30.6	13.9	35.8	0.809	-3.060	2.258	0.9	31.7	65	21	44.6	76.4	1.0	-0.6	0.1	0.9	0.113	1.011	0.113	0.079	1.423
PC-01	PB-01 & PB-02	Foundation Soils	30.7	13.8	39.1	0.790	-0.240	2.022	0.9	34.6	61	21	44.9	79.5	1.0	-0.6	0.1	0.9	0.115	1.012	0.115	0.079	1.458
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.8	43.0	0.682	8.850	1.586	0.9	38.1	53	21	44.7	82.8	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.079	1.497
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.7	50.2	0.578	-8.200	1.151	0.9	44.5	42	21	44.0	88.5	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.079	1.568
PC-01	PB-01 & PB-02	Foundation Soils	30.9	13.6	53.8	0.502	-4.380	0.934	0.9	47.6	35	21	42.6	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.126	0.079	1.591
PC-01	PB-01 & PB-02	Foundation Soils	31.0	13.5	51.9	0.517	-4.910	0.996	0.9	45.9	38	21	43.1	89.1	1.0	-0.6	0.1	0.9	0.125	1.014	0.125	0.079	1.574
PC-01	PB-01 & PB-02	Foundation Soils	31.1	13.4	54.5	0.394	-5.240	0.723	0.9	48.2	30	21	40.2	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.079	1.564
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	54.8	0.411	0.480	0.751	0.9	48.3	31	21	40.5	88.9	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.079	1.571
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	50.8	0.538	11.070	1.059	0.9	44.8	40	21	43.5	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.079	1.562
PC-01	PB-01 & PB-02	Foundation Soils	31.3	13.2	56.9	0.476	-4.290	0.837	0.9	50.2	32	21	41.4	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.079	1.606
PC-01	PB-01 & PB-02	Foundation Soils	31.4	13.1	62.4	0.472	-2.460	0.757	0.9	55.0	27	21	39.3	94.3	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.079	1.645
PC-01	PB-01 & PB-02	Foundation Soils	31.5	13.0	76.3	0.472	1.760	0.619	0.9	67.2	17	21	28.9	96.1	1.0	-0.6	0.1	0.9	0.132	1.016	0.133	0.079	1.672
PC-01	PB-01 & PB-02	Foundation Soils	31.6	12.9	84.7	0.470	2.520	0.555	0.9	74.5	12	21	17.3	91.8	1.0	-0.6	0.1	0.9	0.128	1.015	0.128	0.079	1.607
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.9	77.0	0.500	6.100	0.649	0.9	67.8	18	21	30.2	98.0	1.0	-0.6	0.1	0.9	0.135	1.017	0.135	0.079	1.699
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.8	74.8	0.446	6.080	0.596	0.9	65.7	18	21	28.8	94.4	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.079	1.643
PC-01	PB-01 & PB-02	Foundation Soils	31.8	12.7	71.5	0.383	13.870	0.536	0.9	62.6	17	21	27.4	90.0	1.0	-0.7	0.1	0.9	0.126	1.015	0.126	0.080	1.581
PC-01	PB-01 & PB-02	Foundation Soils	31.9	12.6	66.9	0.323	19.150	0.483	0.9	58.5	17	21	27.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.080	1.527
PC-01	PB-01 & PB-02	Foundation Soils	32.0	12.5	56.7	0.388	19.190	0.685	0.9	49.5	28	21	39.3	88.8	1.0	-0.7	0.1	0.9	0.124	1.014	0.124	0.080	1.562
PC-01	PB-01 & PB-02	Foundation Soils	32.1	12.4	48.9	0.450	22.250	0.921	0.9	42.6	38	21	42.7	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.080	1.516

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.4	39.1	0.470	27.920	1.203	0.9	33.9	50	21	43.5	77.4	1.0	-0.7	0.1	0.9	0.113	1.012	0.113	0.080	1.423
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.3	33.6	0.524	72.900	1.560	0.9	29.1	60	21	43.6	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.080	1.372
PC-01	PB-01 & PB-02	Foundation Soils	32.3	12.2	28.3	0.556	104.150	1.965	0.9	24.4	74	21	43.5	68.0	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.080	1.323
PC-01	PB-01 & PB-02	Foundation Soils	32.4	12.1	28.3	0.472	130.310	1.670	0.9	24.4	67	21	43.1	67.5	1.0	-0.7	0.1	0.9	0.105	1.010	0.105	0.080	1.317
PC-01	PB-01 & PB-02	Foundation Soils	32.5	12.0	31.2	0.321	124.400	1.030	0.9	26.9	54	21	42.6	69.4	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.080	1.336
PC-01	PB-01 & PB-02	Foundation Soils	32.6	12.0	34.0	0.227	113.000	0.669	0.9	29.2	44	21	41.5	70.7	1.0	-0.7	0.1	0.9	0.108	1.010	0.107	0.080	1.349
PC-01	PB-01 & PB-02	Foundation Soils	32.6	11.9	45.5	0.126	37.390	0.277	0.9	39.1	22	21	32.0	71.1	1.0	-0.7	0.1	0.9	0.108	1.010	0.108	0.080	1.352
PC-01	PB-01 & PB-02	Foundation Soils	32.7	11.8	52.6	0.160	26.590	0.304	0.9	45.2	19	21	28.1	73.3	1.0	-0.7	0.1	0.9	0.110	1.011	0.110	0.080	1.374
PC-01	PB-01 & PB-02	Foundation Soils	32.8	11.7	56.4	0.230	35.450	0.408	0.9	48.6	20	21	31.2	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.080	1.446
PC-01	PB-01 & PB-02	Foundation Soils	32.9	11.6	53.7	0.229	25.850	0.426	0.9	46.2	23	21	33.6	79.9	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.080	1.446
PC-01	PB-01 & PB-02	Foundation Soils	33.0	11.5	48.5	0.243	62.400	0.501	0.9	41.7	28	21	37.9	79.5	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.080	1.441
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.5	48.7	0.239	56.130	0.490	0.9	41.8	28	21	37.6	79.4	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.080	1.440
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.4	53.2	0.268	49.790	0.504	0.9	45.6	26	21	36.5	82.1	1.0	-0.7	0.1	0.9	0.118	1.013	0.117	0.080	1.471
PC-01	PB-01 & PB-02	Foundation Soils	33.2	11.3	54.6	0.300	56.690	0.550	0.9	46.9	26	21	37.2	84.1	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.080	1.493
PC-01	PB-01 & PB-02	Foundation Soils	33.3	11.2	59.6	0.347	26.540	0.582	0.9	51.2	25	21	36.4	87.6	1.0	-0.7	0.1	0.9	0.123	1.014	0.123	0.080	1.537
PC-01	PB-01 & PB-02	Foundation Soils	33.4	11.1	60.5	0.328	35.590	0.543	0.9	51.9	23	21	34.9	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.122	0.080	1.525
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	58.3	0.317	50.220	0.544	0.9	49.9	24	21	35.8	85.7	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.080	1.512
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	57.8	0.297	45.710	0.514	0.9	49.4	24	21	35.1	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.080	1.496
PC-01	PB-01 & PB-02	Foundation Soils	33.6	10.9	60.3	0.307	39.400	0.509	0.9	51.6	22	21	33.8	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.120	0.080	1.506
PC-01	PB-01 & PB-02	Foundation Soils	33.7	10.8	64.0	0.301	24.870	0.470	0.9	54.6	19	21	29.9	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.080	1.496
PC-01	PB-01 & PB-02	Foundation Soils	33.8	10.7	62.7	0.317	11.110	0.506	0.9	53.5	21	21	32.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.080	1.513
PC-01	PB-01 & PB-02	Foundation Soils	33.9	10.6	54.9	0.298	26.370	0.542	0.9	46.8	26	21	37.0	83.8	1.0	-0.7	0.1	0.9	0.119	1.013	0.119	0.080	1.486
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.6	48.1	0.398	25.350	0.827	0.9	40.9	38	21	42.1	83.0	1.0	-0.7	0.1	0.9	0.119	1.013	0.118	0.080	1.476
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.5	43.0	0.469	22.870	1.090	0.9	36.5	46	21	43.4	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.080	1.439
PC-01	PB-01 & PB-02	Foundation Soils	34.1	10.4	32.1	0.349	46.910	1.088	0.9	27.0	55	21	42.7	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.080	1.330
PC-01	PB-01 & PB-02	Foundation Soils	34.2	10.3	27.7	0.336	55.600	1.214	0.9	23.2	62	21	42.5	65.7	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.080	1.291
PC-01	PB-01 & PB-02	Foundation Soils	34.3	10.2	35.6	0.345	43.070	0.968	0.9	30.0	50	21	42.6	72.6	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.080	1.359
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	52.0	0.227	22.620	0.437	0.9	43.9	25	21	35.3	79.1	1.0	-0.7	0.1	0.9	0.115	1.012	0.114	0.080	1.429
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	66.6	0.126	4.240	0.189	0.9	55.4	6	21	1.1	56.5	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.080	1.203
PC-01	PB-01 & PB-02	Foundation Soils	34.5	10.0	71.8	0.047	11.340	0.065	0.9	59.8	0	21	0.0	59.8	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.080	1.233
PC-01	PB-01 & PB-02	Foundation Soils	34.6	9.9	76.0	0.079	15.660	0.104	0.9	63.3	0	21	0.0	63.3	1.0	-0.7	0.1	0.9	0.102	1.009	0.101	0.080	1.266
PC-01	PB-01 & PB-02	Foundation Soils	34.7	9.8	77.0	0.153	16.100	0.199	0.9	64.2	2	21	0.0	64.2	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.080	1.274
PC-01	PB-01 & PB-02	Foundation Soils	34.8	9.7	77.6	0.164	18.080	0.211	0.9	64.6	2	21	0.0	64.6	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.080	1.277
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.7	80.6	0.130	17.390	0.161	0.9	67.1	0	21	0.0	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.104	0.080	1.302
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.6	87.1	0.106	17.220	0.122	0.9	72.7	0	21	0.0	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.080	1.357
PC-01	PB-01 & PB-02	Foundation Soils	35.0	9.5	83.7	0.148	17.340	0.177	0.9	69.6	0	21	0.0	69.6	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.080	1.326
PC-01	PB-01 & PB-02	Foundation Soils	35.1	9.4	86.1	0.197	18.530	0.229	0.9	71.7	0	21	0.0	71.7	1.0	-0.7	0.1	0.9	0.109	1.010	0.108	0.080	1.346
PC-01	PB-01 & PB-02	Foundation Soils	35.2	9.3	81.8	0.245	18.200	0.300	0.9	67.8	5	21	0.4	68.2	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.080	1.311
PC-01	PB-01 & PB-02	Foundation Soils	35.3	9.2	76.2	0.183	19.830	0.240	0.9	62.9	4	21	0.1	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.080	1.261
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.2	73.6	0.210	23.350	0.285	0.9	60.8	8	21	4.2	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.080	1.278
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.1	67.1	0.120	23.390	0.179	0.9	55.0	6	21	0.7	55.7	1.0	-0.8	0.1	0.9	0.096	1.008	0.096	0.080	1.193
PC-01	PB-01 & PB-02	Foundation Soils	35.5	9.0	60.7	0.054	24.350	0.089	0.9	49.4	4	21	0.1	49.6	1.0	-0.8	0.1	0.9	0.092	1.008	0.091	0.080	1.139
PC-01	PB-01 & PB-02	Foundation Soils	35.6	8.9	56.3	0.052	24.860	0.092	0.9	45.7	7	21	2.8	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.080	1.130
PC-01	PB-01 & PB-02	Foundation Soils	35.7	8.8	59.4	0.050	22.770	0.084	0.9	48.2	5	21	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.080	1.130
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.8	70.0	0.045	20.300	0.064	0.9	57.1	0	21	0.0	57.1	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.080	1.205
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.7	78.1	0.030	18.910	0.038	0.9	64.1	0	21	0.0	64.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.080	1.268
PC-01	PB-01 & PB-02	Foundation Soils	35.9	8.6	84.6	0.034	22.370	0.040	0.9	69.6	0	21	0.0	69.6	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.080	1.321
PC-01	PB-01 & PB-02	Foundation Soils	36.0	8.5	87.3	0.063	25.730	0.072	0.9	71.8	0	21	0.0	71.8	1.0	-0.8	0.1	0.9	0.109	1.010	0.108	0.080	1.344
PC-01	PB-01 & PB-02	Foundation Soils	36.1	8.4	86.3	0.079	24.030	0.092	0.9	70.9	0	21	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.080	1.334
PC-01	PB-01 & PB-02	Foundation Soils	36.2	8.3	85.1	0.114	24.900	0.134	0.9	69.7	0	21	0.0	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.080	1.322
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.3	79.1	0.136	24.390	0.172	0.9	64.5	0	21	0.0	64.5	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.080	1.271
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.2	77.5	0.175	24.300	0.226	0.9	63.1	4	21	0.0	63.1	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.080	1.258
PC-01	PB-01 & PB-02	Foundation Soils	36.4	8.1	77.4	0.243	21.410	0.314	0.9	63.2	8	21	4.3	67.4	1.0	-0.8	0.1	0.9	0.105	1.010	0.104	0.080	1.299
PC-01	PB-01 & PB-02	Foundation Soils	36.5	8.0	78.3	0.134	21.060	0.171	0.9	63.7	0	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.080	1.263
PC-01	PB-01 & PB-02	Foundation Soils	36.6	7.9	78.2	0.080	26.060	0.102	0.9	63.5	0	21	0.0	63.5	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.080	1.261
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.9	78.6	0.076	17.220	0.097	0.9	63.7	0	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.080	1.263
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.8	79.9	0.056	18.460	0.070	0.9	64.8	0	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.080	1.273
PC-01	PB-01 & PB-02	Foundation Soils	36.8	7.7	80.4	0.063	16.250	0.078	0.9	65.1	0	21	0.0	65.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.080	1.276
PC-01	PB-01 & PB-02	Foundation Soils	36.9	7.6	76.6	0.081	19.770	0.106	0.9	61.8	0	21	0.0	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.080	1.244
PC-01	PB-01 & PB-02	Foundation Soils	37.0	7.5	73.9	0.054	24.010	0.073	0.9	59.5	0	21	0.0	59.5	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.080	1.223
PC-01	PB-01 & PB-02	Foundation Soils	37.1	7.4	78.0	0.061	23.440	0.078	0.9	62.9	0	21	0.0	62.9	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.080	1.254
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.4	89.4	0.159	23.200	0.178	0.9	72.6	0	21	0.0	72.6	1.0	-0.8	0.1	0.9	0.109	1.011	0.108	0.080	1.348

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.3	91.1	0.150	20.440	0.165	0.9	73.9	0	21	0.0	73.9	1.0	-0.8	0.1	0.9	0.110	1.011	0.109	0.080	1.361
PC-01	PB-01 & PB-02	Foundation Soils	37.3	7.2	94.8	0.176	23.850	0.186	0.9	77.0	0	21	0.0	77.0	1.0	-0.8	0.1	0.9	0.113	1.011	0.112	0.080	1.393
PC-01	PB-01 & PB-02	Foundation Soils	37.4	7.1	106.5	0.131	22.680	0.123	0.9	87.0	0	21	0.0	87.0	1.0	-0.8	0.1	0.9	0.123	1.014	0.121	0.080	1.509
PC-01	PB-01 & PB-02	Foundation Soils	37.5	7.0	113.8	0.184	23.060	0.162	0.9	93.3	0	21	0.0	93.3	1.0	-0.8	0.1	0.9	0.129	1.016	0.128	0.080	1.591
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	114.8	0.228	20.490	0.199	0.9	94.0	0	21	0.0	94.0	1.0	-0.8	0.1	0.9	0.130	1.016	0.128	0.080	1.602
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	109.5	0.201	17.480	0.184	0.9	89.4	0	21	0.0	89.4	1.0	-0.8	0.1	0.9	0.125	1.014	0.123	0.080	1.538
PC-01	PB-01 & PB-02	Foundation Soils	37.7	6.8	95.0	0.168	22.580	0.177	0.9	76.7	0	21	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.111	0.080	1.390
PC-01	PB-01 & PB-02	Foundation Soils	37.8	6.7	81.0	0.051	25.200	0.063	0.8	64.8	0	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.080	1.270
PC-01	PB-01 & PB-02	Foundation Soils	37.9	6.6	80.5	0.060	23.820	0.075	0.8	64.3	0	21	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.080	1.265
PC-01	PB-01 & PB-02	Foundation Soils	38.0	6.5	78.5	0.074	25.770	0.094	0.8	62.5	0	21	0.0	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.080	1.248
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.5	72.3	0.078	22.250	0.108	0.8	57.3	0	21	0.0	57.3	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.080	1.200
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.4	68.7	0.085	22.740	0.124	0.8	54.1	3	21	0.0	54.1	1.0	-0.8	0.1	0.9	0.095	1.008	0.094	0.080	1.172
PC-01	PB-01 & PB-02	Foundation Soils	38.2	6.3	67.3	0.059	20.450	0.088	0.8	52.9	2	21	0.0	52.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.093	0.080	1.161
PC-01	PB-01 & PB-02	Foundation Soils	38.3	6.2	66.1	0.046	22.280	0.070	0.8	51.9	2	21	0.0	51.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.080	1.153
PC-01	PB-01 & PB-02	Foundation Soils	38.4	6.1	62.3	0.047	28.210	0.075	0.8	48.6	4	21	0.1	48.7	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.080	1.125
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	58.5	0.031	22.290	0.053	0.8	45.6	6	21	1.2	46.8	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.080	1.109
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	54.9	0.010	24.060	0.018	0.8	43.4	14	21	18.5	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.080	1.241
PC-01	PB-01 & PB-02	Foundation Soils	38.6	5.9	55.4	0.010	23.440	0.018	0.8	43.7	14	21	18.1	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.080	1.240
PC-01	PB-01 & PB-02	Foundation Soils	38.7	5.8	56.3	0.038	27.780	0.068	0.8	43.7	8	21	3.5	47.2	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.080	1.112
PC-01	PB-01 & PB-02	Foundation Soils	38.8	5.7	59.2	0.063	22.760	0.107	0.8	46.0	7	21	3.1	49.1	1.0	-0.9	0.1	0.9	0.092	1.007	0.090	0.080	1.128
PC-01	PB-01 & PB-02	Foundation Soils	38.9	5.6	60.1	0.035	23.060	0.058	0.8	46.5	5	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.080	1.110
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.6	60.1	0.037	24.540	0.062	0.8	46.5	5	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.080	1.110
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.5	64.7	0.027	23.160	0.042	0.8	50.2	3	21	0.0	50.2	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.080	1.137
PC-01	PB-01 & PB-02	Foundation Soils	39.1	5.4	62.5	0.015	24.390	0.024	0.8	48.5	7	21	3.0	51.5	1.0	-0.9	0.1	0.9	0.093	1.008	0.092	0.080	1.148
PC-01	PB-01 & PB-02	Foundation Soils	39.2	5.3	64.8	0.015	25.350	0.023	0.8	50.2	6	21	1.6	51.8	1.0	-0.9	0.1	0.9	0.094	1.008	0.092	0.080	1.151
PC-01	PB-01 & PB-02	Foundation Soils	39.3	5.2	64.5	0.043	25.490	0.067	0.8	49.9	3	21	0.0	49.9	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.080	1.134
PC-01	PB-01 & PB-02	Foundation Soils	39.4	5.1	65.2	0.062	26.010	0.095	0.8	50.3	4	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.080	1.138
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.1	65.3	0.055	27.690	0.084	0.8	50.4	3	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.080	1.138
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.0	67.4	0.064	25.380	0.095	0.8	52.0	3	21	0.0	52.0	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.080	1.152
PC-01	PB-01 & PB-02	Foundation Soils	39.6	4.9	73.9	0.118	29.680	0.160	0.8	57.3	3	21	0.0	57.3	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.080	1.198
PC-01	PB-01 & PB-02	Foundation Soils	39.7	4.8	78.1	0.131	28.680	0.168	0.8	60.8	1	21	0.0	60.8	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.080	1.229
PC-01	PB-01 & PB-02	Foundation Soils	39.8	4.7	77.8	0.068	25.680	0.087	0.8	60.4	0	21	0.0	60.4	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.080	1.226
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.7	76.5	0.050	27.300	0.065	0.8	59.3	0	21	0.0	59.3	1.0	-0.9	0.1	0.8	0.099	1.009	0.097	0.080	1.216
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.6	78.8	0.077	27.400	0.098	0.8	61.1	0	21	0.0	61.1	1.0	-0.9	0.1	0.8	0.100	1.009	0.099	0.080	1.232
PC-01	PB-01 & PB-02	Foundation Soils	40.0	4.5	87.0	0.098	30.350	0.113	0.8	67.9	0	21	0.0	67.9	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.080	1.295
PC-01	PB-01 & PB-02	Foundation Soils	40.1	4.4	85.5	0.131	20.670	0.153	0.8	66.5	0	21	0.0	66.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.080	1.282
PC-01	PB-01 & PB-02	Foundation Soils	40.2	4.3	83.7	0.236	20.110	0.282	0.8	65.0	5	21	0.5	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.080	1.272
PC-01	PB-01 & PB-02	Foundation Soils	40.3	4.2	80.3	0.170	33.460	0.212	0.8	62.0	3	21	0.0	62.1	1.0	-0.9	0.1	0.8	0.101	1.009	0.099	0.080	1.240
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.2	81.1	0.152	27.820	0.187	0.8	62.7	1	21	0.0	62.7	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.080	1.246
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.1	88.4	0.131	28.780	0.148	0.8	68.6	0	21	0.0	68.6	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.080	1.302
PC-01	PB-01 & PB-02	Foundation Soils	40.5	4.0	89.7	0.134	18.820	0.149	0.8	69.6	0	21	0.0	69.6	1.0	-0.9	0.1	0.8	0.107	1.010	0.105	0.080	1.312
PC-01	PB-01 & PB-02	Foundation Soils	40.6	3.9	87.9	0.164	24.530	0.187	0.8	68.1	0	21	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.080	1.297
PC-01	PB-01 & PB-02	Foundation Soils	40.7	3.8	94.2	0.263	27.680	0.279	0.8	73.3	1	21	0.0	73.3	1.0	-0.9	0.1	0.8	0.110	1.011	0.108	0.080	1.347
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	84.9	0.211	21.760	0.248	0.8	65.5	3	21	0.0	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.080	1.272
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	83.5	0.245	23.300	0.294	0.8	64.3	6	21	1.2	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.080	1.272
PC-01	PB-01 & PB-02	Foundation Soils	40.9	3.6	81.9	0.243	26.230	0.297	0.8	63.1	7	21	2.3	65.3	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.080	1.270
PC-01	PB-01 & PB-02	Foundation Soils	41.0	3.5	81.2	0.233	24.010	0.287	0.8	62.4	7	21	2.1	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.080	1.261
PC-01	PB-01 & PB-02	Foundation Soils	41.1	3.4	83.8	0.156	25.150	0.186	0.8	64.3	1	21	0.0	64.3	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.080	1.260
PC-01	PB-01 & PB-02	Foundation Soils	41.2	3.3	95.6	0.124	24.540	0.130	0.8	74.0	0	21	0.0	74.0	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.080	1.354
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.3	106.6	0.146	20.320	0.137	0.8	83.1	0	21	0.0	83.1	1.0	-0.9	0.1	0.8	0.119	1.013	0.116	0.080	1.453
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.2	118.9	0.082	16.390	0.069	0.8	93.5	0	21	0.0	93.5	1.0	-0.9	0.1	0.8	0.129	1.016	0.127	0.080	1.584
PC-01	PB-01 & PB-02	Foundation Soils	41.4	3.1	111.7	0.071	20.770	0.064	0.8	87.3	0	21	0.0	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.120	0.080	1.503
PC-01	PB-01 & PB-02	Foundation Soils	41.5	3.0	96.1	0.086	31.400	0.090	0.8	74.1	0	21	0.0	74.1	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.080	1.355
PC-01	PB-01 & PB-02	Foundation Soils	41.6	2.9	87.2	0.094	30.460	0.108	0.8	66.7	0	21	0.0	66.7	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.080	1.282
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	84.5	0.129	30.250	0.153	0.8	64.4	0	21	0.0	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.080	1.260
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	83.5	0.203	29.160	0.243	0.8	63.5	4	21	0.0	63.5	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.080	1.252
PC-01	PB-01 & PB-02	Foundation Soils	41.8	2.7	76.1	0.158	34.160	0.208	0.8	57.4	5	21	0.5	57.9	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.080	1.201
PC-01	PB-01 & PB-02	Foundation Soils	41.9	2.6	73.6	0.101	33.670	0.137	0.8	55.3	3	21	0.0	55.3	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.080	1.179
PC-01	PB-01 & PB-02	Foundation Soils	42.0	2.5	73.3	0.118	25.490	0.161	0.8	55.0	4	21	0.1	55.1	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.080	1.177
PC-01	PB-01 & PB-02	Foundation Soils	42.1	2.4	72.1	0.121	18.070	0.168	0.8	54.0	5	21	0.3	54.4	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.080	1.170
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.4	69.5	0.105	24.970	0.151	0.8	51.9	5	21	0.6	52.4	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.080	1.154
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.3	67.3	0.113	23.350	0.168	0.8	50.2	7	21	3.2	53.4	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.080	1.162

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	42.3	2.2	65.4	0.087	15.060	0.133	0.8	48.6	7	21	1.7	50.3	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.080	1.136
PC-01	PB-01 & PB-02	Foundation Soils	42.4	2.1	63.4	0.119	17.770	0.188	0.8	47.5	10	21	10.4	58.0	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.080	1.202
PC-01	PB-01 & PB-02	Foundation Soils	42.5	2.0	61.7	0.115	21.200	0.186	0.8	46.3	11	21	12.7	59.0	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.080	1.211
PC-01	PB-01 & PB-02	Foundation Soils	42.6	1.9	63.2	0.085	20.250	0.135	0.8	46.8	8	21	4.1	50.9	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.080	1.141
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.9	69.4	0.069	28.870	0.099	0.8	51.4	3	21	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.080	1.145
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.8	82.5	0.059	-3.630	0.072	0.8	61.9	0	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.080	1.237
PC-01	PB-01 & PB-02	Foundation Soils	42.8	1.7	88.9	0.067	-12.150	0.075	0.8	67.0	0	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.080	1.285
PC-01	PB-01 & PB-02	Foundation Soils	42.9	1.6	88.9	0.071	12.670	0.080	0.8	67.0	0	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.080	1.284
PC-01	PB-01 & PB-02	Foundation Soils	43.0	1.5	82.7	0.054	24.110	0.065	0.8	61.9	0	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.080	1.236
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.5	81.0	0.071	26.040	0.088	0.8	60.4	0	21	0.0	60.4	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.080	1.223
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.4	80.2	0.080	26.350	0.100	0.8	59.7	0	21	0.0	59.7	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.080	1.217
PC-01	PB-01 & PB-02	Foundation Soils	43.2	1.3	84.2	0.083	22.110	0.099	0.8	62.9	0	21	0.0	62.9	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.080	1.246
PC-01	PB-01 & PB-02	Foundation Soils	43.3	1.2	94.9	0.159	22.540	0.168	0.8	71.5	0	21	0.0	71.5	1.0	-1.0	0.1	0.8	0.109	1.010	0.106	0.080	1.328
PC-01	PB-01 & PB-02	Foundation Soils	43.4	1.1	99.7	0.203	20.730	0.204	0.8	75.4	0	21	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.080	1.367
PC-01	PB-01 & PB-02	Foundation Soils	43.5	1.0	101.6	0.278	26.820	0.274	0.8	76.9	0	21	0.0	76.9	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.080	1.382
PC-01	PB-01 & PB-02	Foundation Soils	43.6	1.0	101.0	0.456	31.490	0.452	0.8	76.6	8	21	3.8	80.4	1.0	-1.0	0.1	0.8	0.116	1.012	0.113	0.080	1.421
PC-01	PB-01 & PB-02	Foundation Soils	43.6	0.9	98.3	0.358	25.660	0.364	0.8	74.0	5	21	0.3	74.3	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.080	1.356
PC-01	PB-01 & PB-02	Foundation Soils	43.7	0.8	96.5	0.378	29.880	0.392	0.8	72.6	7	21	2.1	74.7	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.080	1.360
PC-01	PB-01 & PB-02	Foundation Soils	43.8	0.7	87.7	0.456	25.630	0.520	0.8	67.0	14	21	21.9	88.9	1.0	-1.0	0.1	0.8	0.124	1.014	0.121	0.080	1.520
PC-01	PB-01 & PB-02	Foundation Soils	43.9	0.6	82.8	0.362	25.870	0.437	0.8	62.7	13	21	18.8	81.5	1.0	-1.0	0.1	0.8	0.117	1.012	0.114	0.080	1.432
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.6	84.2	0.267	24.500	0.317	0.8	62.6	8	21	4.3	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.102	0.080	1.284
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.5	101.8	0.295	23.200	0.290	0.8	76.5	1	21	0.0	76.5	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.080	1.379
PC-01	PB-01 & PB-02	Foundation Soils	44.1	0.4	114.7	0.382	21.390	0.333	0.8	87.1	0	21	0.0	87.1	1.0	-1.0	0.1	0.8	0.123	1.014	0.119	0.080	1.498
PC-01	PB-01 & PB-02	Foundation Soils	44.2	0.3	127.1	0.226	17.870	0.178	0.8	97.4	0	21	0.0	97.4	1.0	-1.0	0.1	0.8	0.134	1.017	0.130	0.080	1.637
PC-01	PB-01 & PB-02	Foundation Soils	44.3	0.2	143.1	0.109	14.800	0.076	0.8	110.9	0	21	0.0	110.9	1.0	-1.0	0.1	0.8	0.154	1.022	0.149	0.080	1.875
PC-01	PB-01 & PB-02	Foundation Soils	44.4	0.1	163.0	0.128	18.580	0.079	0.8	128.0	0	21	0.0	128.0	0.9	-1.0	0.1	0.8	0.192	1.031	0.187	0.080	2.342
PC-01	PB-01 & PB-02	Foundation Soils	44.5	0.1	181.4	0.133	1.410	0.073	0.8	144.1	0	21	0.0	144.1	0.9	-1.0	0.1	0.8	0.254	1.041	0.247	0.080	3.108
PC-01	PB-01 & PB-02	Foundation Soils	44.5	-0.0	166.9	0.088	17.580	0.053	0.8	131.2	0	21	0.0	131.2	0.9	-1.0	0.1	0.8	0.201	1.032	0.196	0.080	2.460
PC-01	PB-01 & PB-02	Foundation Soils	44.6	-0.1	120.8	0.130	26.960	0.108	0.8	91.7	0	21	0.0	91.7	1.0	-1.0	0.1	0.8	0.127	1.015	0.124	0.080	1.557
PC-01	PB-01 & PB-02	Foundation Soils	44.7	-0.2	105.8	0.152	23.390	0.144	0.8	79.2	0	21	0.0	79.2	1.0	-1.0	0.1	0.8	0.115	1.012	0.112	0.080	1.407
PC-01	PB-01 & PB-02	Foundation Soils	44.8	-0.3	93.1	0.114	16.600	0.122	0.8	68.8	0	21	0.0	68.8	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.080	1.301
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	88.5	0.092	-1.360	0.104	0.8	65.0	0	21	0.0	65.0	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.080	1.266
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	89.1	0.122	-6.630	0.137	0.8	65.4	0	21	0.0	65.4	1.0	-1.0	0.1	0.8	0.104	1.009	0.101	0.080	1.270
PC-01	PB-01 & PB-02	Foundation Soils	45.0	-0.5	88.8	0.112	-0.670	0.126	0.8	65.1	0	21	0.0	65.1	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.080	1.267
PC-01	PB-01 & PB-02	Foundation Soils	45.1	-0.6	86.3	0.153	9.030	0.177	0.8	63.1	0	21	0.0	63.1	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.080	1.248
PC-01	PB-01 & PB-02	Foundation Soils	45.2	-0.7	84.4	0.157	11.520	0.186	0.8	61.5	2	21	0.0	61.5	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.080	1.234
PC-01	PB-01 & PB-02	Foundation Soils	45.3	-0.8	86.1	0.155	13.050	0.180	0.8	62.8	1	21	0.0	62.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.080	1.246
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.8	86.1	0.168	21.250	0.195	0.8	62.7	2	21	0.0	62.7	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.079	1.245
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.9	78.0	0.203	28.460	0.260	0.8	56.7	8	21	4.9	61.6	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.079	1.235
PC-01	PB-01 & PB-02	Foundation Soils	45.5	-1.0	73.2	0.192	12.290	0.262	0.8	53.3	10	21	10.5	63.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.100	0.079	1.255
PC-01	PB-01 & PB-02	Foundation Soils	45.6	-1.1	66.7	0.178	20.080	0.267	0.8	48.8	14	21	18.9	67.6	1.0	-1.1	0.1	0.8	0.105	1.010	0.103	0.079	1.291
PC-01	PB-01 & PB-02	Foundation Soils	45.7	-1.2	59.8	0.238	15.910	0.398	0.8	44.2	23	21	33.4	77.6	1.0	-1.1	0.1	0.8	0.114	1.012	0.110	0.079	1.390
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	55.6	0.553	13.660	0.995	0.8	41.4	41	21	43.1	84.5	1.0	-1.1	0.1	0.8	0.120	1.013	0.117	0.079	1.467
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	49.1	2.187	18.150	4.452	0.8	36.5	85	21	46.6	83.2	1.0	-1.1	0.1	0.8	0.119	1.013	0.115	0.079	1.452
PC-01	PB-01 & PB-02	Foundation Soils	45.9	-1.4	51.8	3.372	14.250	6.507	0.8	38.6	92	21	47.4	86.0	1.0	-1.1	0.1	0.8	0.121	1.014	0.118	0.079	1.484
PC-01	PB-01 & PB-02	Foundation Soils	46.0	-1.5	78.8	3.907	16.420	4.957	0.8	60.2	75	21	51.4	111.7	0.9	-1.1	0.1	0.8	0.155	1.022	0.150	0.079	1.890
PC-01	PB-01 & PB-02	Foundation Soils	46.1	-1.6	137.9	4.454	22.440	3.229	0.8	110.1	44	21	57.9	168.0	0.9	-1.1	0.1	0.8	0.471	1.061	0.458	0.079	5.771
PC-01	PB-01 & PB-02	Foundation Soils	46.2	-1.7	257.6	2.926	69.300	1.136	0.9	211.0	2	21	0.0	211.0	0.9	-1.1	0.1	0.8	3.724	1.082	3.485	0.079	43.897
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.7	252.0	2.349	34.800	0.932	0.9	205.7	0	21	0.0	205.7	0.9	-1.1	0.1	0.8	2.650	1.082	2.503	0.079	31.537
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.8	188.8	1.966	-6.240	1.041	0.8	149.0	8	21	5.5	154.5	0.9	-1.1	0.1	0.8	0.321	1.049	0.312	0.079	3.928
PC-01	PB-01 & PB-02	Foundation Soils	46.4	-1.9	189.3	1.102	-17.800	0.582	0.8	148.6	0	21	0.0	148.6	0.9	-1.1	0.1	0.8	0.280	1.044	0.271	0.079	3.420
PC-01	PB-01 & PB-02	Foundation Soils	46.5	-2.0	145.8	0.768	-19.200	0.527	0.8	110.9	0	21	0.0	110.9	0.9	-1.1	0.1	0.8	0.153	1.022	0.149	0.079	1.873
PC-01	PB-01 & PB-02	Foundation Soils	46.6	-2.1	136.6	0.633	-18.770	0.463	0.8	103.0	0	21	0.0	103.0	1.0	-1.1	0.1	0.8	0.141	1.019	0.137	0.079	1.725
PC-01	PB-01 & PB-02	Foundation Soils	46.7	-2.2	125.6	0.497	-18.580	0.396	0.8	93.7	0	21	0.0	93.7	1.0	-1.1	0.1	0.8	0.130	1.016	0.126	0.079	1.584
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.2	108.3	0.426	-16.160	0.394	0.8	79.4	4	21	0.1	79.5	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.079	1.411
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.3	100.3	0.407	-1.630	0.406	0.8	73.2	7	21	2.5	75.8	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.079	1.371
PC-01	PB-01 & PB-02	Foundation Soils	46.9	-2.4	94.7	0.414	-6.710	0.437	0.8	69.3	10	21	10.0	79.3	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.079	1.409
PC-01	PB-01 & PB-02	Foundation Soils	47.0	-2.5	82.8	0.242	-14.340	0.292	0.8	59.4	8	21	5.0	64.4	1.0	-1.1	0.1	0.8	0.103	1.009	0.100	0.079	1.262
PC-01	PB-01 & PB-02	Foundation Soils	47.1	-2.6	74.6	0.288	-3.150	0.386	0.8	54.5	16	21	23.5	78.0	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.079	1.395
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.6	67.4	0.268	-15.940	0.398	0.8	49.2	19	21	29.6	78.9	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.079	1.404
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.7	51.6	0.175	-18.010	0.339	0.8	37.3	26	21	35.1	72.5	1.0	-1.1	0.1	0.8	0.109	1.011	0.106	0.079	1.338
PC-01	PB-01 & PB-02	Foundation Soils	47.3	-2.8	53.7	0.196	4.160	0.365	0.8	38.9	25	21	35.2	74.1	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.079	1.354

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	47.4	-2.9	44.7	0.199	6.720	0.446	0.8	32.2	34	21	39.2	71.4	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.079	1.328
PC-01	PB-01 & PB-02	Foundation Soils	47.5	-3.0	45.1	0.118	7.720	0.262	0.8	32.4	27	21	35.3	67.7	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.079	1.292
PC-01	PB-01 & PB-02	Foundation Soils	47.6	-3.1	48.2	0.240	19.150	0.498	0.8	34.8	34	21	39.4	74.2	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.079	1.356
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.1	45.7	0.431	22.490	0.943	0.8	33.1	46	21	42.6	75.7	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.079	1.372
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.2	45.7	0.483	25.970	1.058	0.8	33.1	48	21	43.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.079	1.375
PC-01	PB-01 & PB-02	Foundation Soils	47.8	-3.3	53.4	0.412	33.480	0.772	0.8	38.8	38	21	41.7	80.5	1.0	-1.1	0.1	0.8	0.116	1.012	0.113	0.079	1.423
PC-01	PB-01 & PB-02	Foundation Soils	47.9	-3.4	76.3	0.358	32.100	0.469	0.8	55.7	18	21	28.7	84.3	1.0	-1.1	0.1	0.8	0.120	1.013	0.116	0.079	1.466
PC-01	PB-01 & PB-02	Foundation Soils	48.0	-3.5	104.8	0.337	-9.430	0.322	0.8	75.6	2	21	0.0	75.6	1.0	-1.1	0.1	0.8	0.112	1.011	0.108	0.079	1.371
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.5	64.0	0.313	-0.570	0.489	0.8	46.5	24	21	35.4	81.9	1.0	-1.1	0.1	0.8	0.118	1.013	0.114	0.079	1.439
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.6	59.9	0.291	-0.730	0.486	0.8	43.4	26	21	36.7	80.1	1.0	-1.1	0.1	0.8	0.116	1.012	0.112	0.079	1.418
PC-01	PB-01 & PB-02	Foundation Soils	48.2	-3.7	52.5	0.382	7.340	0.728	0.8	38.0	37	21	41.4	79.4	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.079	1.411
PC-01	PB-01 & PB-02	Foundation Soils	48.3	-3.8	44.2	0.350	-0.330	0.791	0.8	31.7	44	21	42.0	73.7	1.0	-1.1	0.1	0.8	0.110	1.011	0.107	0.079	1.352
PC-01	PB-01 & PB-02	Foundation Soils	48.4	-3.9	38.4	0.338	14.770	0.879	0.8	27.4	50	21	42.2	69.6	1.0	-1.1	0.1	0.8	0.107	1.010	0.104	0.079	1.311
PC-01	PB-01 & PB-02	Foundation Soils	48.5	-4.0	36.1	0.089	-3.890	0.247	0.7	25.5	34	21	37.9	63.3	1.0	-1.1	0.1	0.8	0.102	1.009	0.099	0.079	1.253
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.0	52.2	0.156	-4.960	0.299	0.8	37.2	24	21	33.7	70.9	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.079	1.324
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.1	66.4	0.118	-5.060	0.178	0.7	46.3	10	21	10.1	56.4	1.0	-1.1	0.1	0.8	0.097	1.008	0.094	0.079	1.191
PC-01	PB-01 & PB-02	Foundation Soils	48.7	-4.2	94.5	0.081	11.120	0.086	0.8	66.9	0	21	0.0	66.9	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.079	1.286
PC-01	PB-01 & PB-02	Foundation Soils	48.8	-4.3	67.9	0.247	-3.050	0.364	0.8	48.6	18	21	27.9	76.6	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.079	1.381
PC-01	PB-01 & PB-02	Foundation Soils	48.9	-4.4	51.0	0.302	-5.150	0.592	0.8	36.5	35	21	40.2	76.8	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.079	1.384
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	46.0	0.188	3.410	0.409	0.8	32.7	33	21	38.5	71.2	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.079	1.327
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	43.5	0.173	9.220	0.397	0.8	30.8	34	21	38.8	69.6	1.0	-1.2	0.1	0.8	0.107	1.010	0.104	0.079	1.312
PC-01	PB-01 & PB-02	Foundation Soils	49.1	-4.6	50.5	0.130	11.560	0.258	0.7	35.7	24	21	33.0	68.7	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.079	1.303
PC-01	PB-01 & PB-02	Foundation Soils	49.2	-4.7	61.2	0.097	14.910	0.158	0.7	42.5	12	21	15.0	57.5	1.0	-1.2	0.1	0.8	0.098	1.008	0.095	0.079	1.201
PC-01	PB-01 & PB-02	Foundation Soils	49.3	-4.8	40.2	0.096	18.110	0.239	0.7	28.2	31	21	36.7	64.9	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.079	1.268
PC-01	PB-01 & PB-02	Foundation Soils	49.4	-4.9	27.8	0.272	29.060	0.979	0.7	19.4	74	21	42.4	61.8	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.079	1.240
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-4.9	21.7	0.152	29.830	0.700	0.7	15.0	78	21	41.7	56.7	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.079	1.195
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-5.0	18.6	0.084	33.990	0.451	0.7	12.8	78	21	41.2	54.0	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.079	1.171
PC-01	PB-01 & PB-02	Foundation Soils	49.6	-5.1	21.9	0.140	33.450	0.638	0.7	15.1	77	21	41.6	56.8	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.079	1.195
PC-01	PB-01 & PB-02	Foundation Soils	49.7	-5.2	43.4	0.330	35.490	0.760	0.7	30.7	44	21	41.8	72.5	1.0	-1.2	0.1	0.8	0.109	1.011	0.106	0.079	1.341
PC-01	PB-01 & PB-02	Foundation Soils	49.8	-5.3	66.5	0.527	40.450	0.792	0.8	48.1	32	21	41.1	89.2	1.0	-1.2	0.1	0.8	0.125	1.014	0.120	0.079	1.526
PC-01	PB-01 & PB-02	Foundation Soils	49.9	-5.4	80.5	0.664	22.790	0.825	0.8	58.8	27	21	39.9	98.6	0.9	-1.2	0.1	0.8	0.136	1.017	0.130	0.079	1.657
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.4	80.2	0.700	9.910	0.873	0.8	58.5	28	21	40.8	99.3	0.9	-1.2	0.1	0.8	0.136	1.018	0.131	0.079	1.667
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.5	84.9	0.388	-14.150	0.457	0.8	60.7	15	21	22.8	83.5	1.0	-1.2	0.1	0.8	0.119	1.013	0.115	0.079	1.458
PC-01	PB-01 & PB-02	Foundation Soils	50.1	-5.6	90.0	0.269	-18.580	0.299	0.7	62.6	7	21	2.1	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.079	1.267
PC-01	PB-01 & PB-02	Foundation Soils	50.2	-5.7	94.6	0.207	-19.400	0.219	0.7	65.9	1	21	0.0	65.9	1.0	-1.2	0.1	0.8	0.104	1.009	0.101	0.079	1.278
PC-01	PB-01 & PB-02	Foundation Soils	50.3	-5.8	83.3	0.435	-23.200	0.522	0.8	59.8	18	21	28.6	88.5	0.9	-1.2	0.1	0.8	0.124	1.014	0.119	0.079	1.518
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.8	74.8	0.638	-21.960	0.853	0.8	54.2	30	21	41.1	95.3	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.079	1.608
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.9	70.2	0.595	-20.060	0.848	0.8	50.6	32	21	41.5	92.1	0.9	-1.2	0.1	0.8	0.128	1.015	0.123	0.079	1.564
PC-01	PB-01 & PB-02	Foundation Soils	50.5	-6.0	58.3	0.517	-14.980	0.887	0.8	41.6	38	21	42.4	84.0	1.0	-1.2	0.1	0.8	0.120	1.013	0.115	0.079	1.464
PC-01	PB-01 & PB-02	Foundation Soils	50.6	-6.1	57.2	0.280	-11.240	0.490	0.7	40.4	29	21	37.8	78.2	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.079	1.401
PC-01	PB-01 & PB-02	Foundation Soils	50.7	-6.2	56.9	0.161	-9.350	0.283	0.7	39.7	21	21	31.0	70.7	1.0	-1.2	0.1	0.8	0.108	1.010	0.104	0.079	1.325
PC-01	PB-01 & PB-02	Foundation Soils	50.8	-6.3	58.5	0.207	-6.620	0.354	0.7	41.1	23	21	33.4	74.5	1.0	-1.2	0.1	0.8	0.111	1.011	0.107	0.079	1.362
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.3	60.3	0.261	0.630	0.433	0.7	42.5	25	21	35.5	78.0	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.079	1.399
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.4	64.4	0.193	-1.190	0.300	0.7	44.9	18	21	26.9	71.8	1.0	-1.2	0.1	0.8	0.109	1.010	0.105	0.079	1.336
PC-01	PB-01 & PB-02	Foundation Soils	51.0	-6.5	63.5	0.128	-11.920	0.202	0.7	43.6	14	21	18.7	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.079	1.247
PC-01	PB-01 & PB-02	Foundation Soils	51.1	-6.6	42.3	0.151	-17.720	0.357	0.7	29.3	34	21	38.5	67.8	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.078	1.298
PC-01	PB-01 & PB-02	Foundation Soils	51.2	-6.7	35.5	0.203	-14.680	0.572	0.7	24.5	47	21	40.9	65.4	1.0	-1.2	0.1	0.8	0.104	1.009	0.100	0.078	1.275
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.7	32.4	0.252	-2.290	0.779	0.7	22.2	55	21	41.6	63.8	1.0	-1.2	0.1	0.8	0.102	1.009	0.099	0.078	1.261
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.8	29.1	0.148	12.150	0.509	0.7	19.9	51	21	40.7	60.6	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.078	1.232
PC-01	PB-01 & PB-02	Foundation Soils	51.4	-6.9	28.1	0.152	25.060	0.540	0.7	19.2	53	21	40.8	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.096	0.078	1.227
PC-01	PB-01 & PB-02	Foundation Soils	51.5	-7.0	30.9	0.242	30.770	0.784	0.7	21.1	56	21	41.6	62.7	1.0	-1.2	0.1	0.8	0.102	1.009	0.098	0.078	1.251
PC-01	PB-01 & PB-02	Foundation Soils	51.6	-7.1	40.4	0.226	31.260	0.559	0.7	27.9	42	21	40.7	68.6	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.078	1.307
PC-01	PB-01 & PB-02	Foundation Soils	51.7	-7.2	48.8	0.362	17.370	0.741	0.7	34.1	41	21	41.7	75.7	1.0	-1.2	0.1	0.8	0.112	1.011	0.108	0.078	1.376
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.2	62.4	0.289	9.960	0.463	0.7	43.7	25	21	35.8	79.6	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.078	1.417
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.3	72.5	0.112	-3.700	0.155	0.7	48.4	7	21	2.6	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.090	0.078	1.150
PC-01	PB-01 & PB-02	Foundation Soils	51.9	-7.4	60.2	0.088	3.190	0.146	0.7	40.6	13	21	16.6	57.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.078	1.203
PC-01	PB-01 & PB-02	Foundation Soils	52.0	-7.5	57.3	0.330	19.240	0.576	0.7	40.0	32	21	39.4	79.4	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.078	1.416
PC-01	PB-01 & PB-02	Foundation Soils	52.1	-7.6	63.2	0.251	19.250	0.397	0.7	44.0	23	21	33.3	77.3	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.078	1.394
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	70.4	0.260	30.170	0.370	0.7	48.9	18	21	27.9	76.8	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.078	1.389
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	77.3	0.610	28.190	0.789	0.8	55.0	28	21	40.0	95.0	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.078	1.607
PC-01	PB-01 & PB-02	Foundation Soils	52.3	-7.8	95.0	0.893	23.390	0.940	0.8	68.8	26	21	40.2	109.0	0.9	-1.2	0.1	0.8	0.150	1.021	0.144	0.078	1.839
PC-01	PB-01 & PB-02	Foundation Soils	52.4	-7.9	85.1	0.607	4.340	0.713	0.8	60.7	23	21	36.6	97.3	0.9	-1.2	0.1	0.8	0.134	1.017	0.128	0.078	1.641

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	52.5	-8.0	70.3	0.302	14.090	0.430	0.7	49.0	21	21	31.5	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.078	1.429
PC-01	PB-01 & PB-02	Foundation Soils	52.6	-8.1	60.0	0.290	-11.580	0.484	0.7	41.7	27	21	37.2	78.9	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.078	1.411
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.1	68.9	0.311	-1.020	0.451	0.7	48.0	22	21	33.1	81.2	0.9	-1.3	0.1	0.8	0.117	1.012	0.112	0.078	1.436
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.2	71.7	0.266	-7.620	0.371	0.7	49.6	18	21	27.3	76.9	1.0	-1.3	0.1	0.8	0.113	1.011	0.109	0.078	1.391
PC-01	PB-01 & PB-02	Foundation Soils	52.8	-8.3	80.3	0.336	-11.190	0.419	0.7	55.8	16	21	24.7	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.078	1.429
PC-01	PB-01 & PB-02	Foundation Soils	52.9	-8.4	91.9	0.293	2.950	0.319	0.7	62.4	8	21	3.9	66.3	1.0	-1.3	0.1	0.8	0.104	1.010	0.100	0.078	1.287
PC-01	PB-01 & PB-02	Foundation Soils	53.0	-8.5	116.1	0.315	-1.000	0.271	0.7	80.5	0	21	0.0	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.078	1.430
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	140.4	0.234	-0.910	0.167	0.8	100.0	0	21	0.0	100.0	0.9	-1.3	0.1	0.8	0.137	1.018	0.131	0.078	1.682
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	124.7	0.110	-17.610	0.088	0.7	87.2	0	21	0.0	87.2	0.9	-1.3	0.1	0.8	0.123	1.014	0.118	0.078	1.508
PC-01	PB-01 & PB-02	Foundation Soils	53.2	-8.7	93.1	0.105	-21.680	0.113	0.7	62.6	0	21	0.0	62.6	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.078	1.254
PC-01	PB-01 & PB-02	Foundation Soils	53.3	-8.8	88.5	0.173	-22.340	0.195	0.7	59.1	3	21	0.0	59.1	1.0	-1.3	0.1	0.8	0.099	1.009	0.095	0.078	1.223
PC-01	PB-01 & PB-02	Foundation Soils	53.4	-8.9	84.9	0.201	-19.560	0.237	0.7	56.6	7	21	1.8	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.078	1.216
PC-01	PB-01 & PB-02	Foundation Soils	53.5	-9.0	71.5	0.141	-17.940	0.197	0.7	47.5	10	21	9.9	57.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.078	1.208
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.0	60.3	0.480	-14.770	0.796	0.7	41.8	36	21	41.7	83.5	0.9	-1.3	0.1	0.8	0.119	1.013	0.114	0.078	1.465
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.1	61.9	0.223	-10.860	0.360	0.7	42.3	22	21	32.8	75.1	0.9	-1.3	0.1	0.8	0.111	1.011	0.107	0.078	1.374
PC-01	PB-01 & PB-02	Foundation Soils	53.7	-9.2	70.8	0.098	-10.480	0.138	0.7	46.2	8	21	3.5	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.089	0.078	1.143
PC-01	PB-01 & PB-02	Foundation Soils	53.8	-9.3	71.1	0.122	-12.480	0.172	0.7	46.8	9	21	7.2	54.0	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.078	1.179
PC-01	PB-01 & PB-02	Foundation Soils	53.9	-9.4	55.1	0.094	-9.010	0.171	0.7	36.8	18	21	25.9	62.8	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.078	1.257
PC-01	PB-01 & PB-02	Foundation Soils	54.0	-9.5	41.5	0.067	-10.800	0.162	0.7	27.7	27	21	34.6	62.3	1.0	-1.3	0.1	0.8	0.101	1.009	0.097	0.078	1.253
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.5	32.0	0.050	-7.000	0.156	0.7	21.2	36	21	37.7	58.9	1.0	-1.3	0.1	0.8	0.099	1.008	0.095	0.078	1.223
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.6	28.6	0.077	-2.190	0.269	0.7	18.9	45	21	39.5	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.078	1.219
PC-01	PB-01 & PB-02	Foundation Soils	54.2	-9.7	20.7	0.153	13.050	0.738	0.7	13.6	84	21	41.6	55.2	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.078	1.190
PC-01	PB-01 & PB-02	Foundation Soils	54.3	-9.8	20.5	0.320	24.960	1.564	0.7	13.4	97	21	41.8	55.3	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.078	1.192
PC-01	PB-01 & PB-02	Foundation Soils	54.4	-9.9	24.6	0.331	34.880	1.347	0.7	16.2	87	21	42.2	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.078	1.219
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-9.9	39.2	0.253	37.070	0.646	0.7	26.3	46	21	41.3	67.5	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.078	1.302
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-10.0	63.3	0.236	34.190	0.373	0.7	43.0	22	21	32.8	75.9	0.9	-1.3	0.1	0.8	0.112	1.011	0.108	0.078	1.384
PC-01	PB-01 & PB-02	Foundation Soils	54.6	-10.1	87.3	0.251	25.700	0.287	0.7	58.1	8	21	5.3	63.4	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.078	1.264
PC-01	PB-01 & PB-02	Foundation Soils	54.7	-10.2	56.2	0.172	14.340	0.306	0.7	37.9	24	21	33.4	71.2	0.9	-1.3	0.1	0.8	0.108	1.010	0.104	0.078	1.338
PC-01	PB-01 & PB-02	Foundation Soils	54.8	-10.3	45.1	0.124	17.100	0.275	0.7	30.1	30	21	36.6	66.7	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.078	1.295
PC-01	PB-01 & PB-02	Foundation Soils	54.9	-10.4	28.9	0.031	20.620	0.107	0.7	18.9	37	21	37.7	56.6	1.0	-1.3	0.1	0.8	0.097	1.008	0.093	0.078	1.205
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.4	22.5	0.061	23.440	0.271	0.7	14.7	53	21	39.9	54.5	1.0	-1.3	0.1	0.8	0.096	1.008	0.092	0.078	1.187
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.5	17.5	0.218	34.540	1.247	0.7	11.3	100	21	41.4	52.8	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.078	1.172
PC-01	PB-01 & PB-02	Foundation Soils	55.1	-10.6	16.9	0.157	37.590	0.930	0.7	10.9	97	21	41.3	52.2	1.0	-1.3	0.1	0.8	0.094	1.008	0.090	0.078	1.167
PC-01	PB-01 & PB-02	Foundation Soils	55.2	-10.7	19.2	0.068	39.830	0.355	0.7	12.4	78	21	41.1	53.5	1.0	-1.3	0.1	0.8	0.095	1.008	0.091	0.078	1.178
PC-01	PB-01 & PB-02	Foundation Soils	55.3	-10.8	24.2	0.181	41.310	0.749	0.7	15.8	79	21	41.8	57.6	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.078	1.214
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.8	51.2	0.241	39.160	0.471	0.7	34.4	33	21	39.0	73.4	0.9	-1.3	0.1	0.8	0.110	1.011	0.105	0.078	1.361
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.9	49.7	0.203	36.260	0.409	0.7	33.3	32	21	38.3	71.5	0.9	-1.3	0.1	0.8	0.109	1.010	0.104	0.077	1.343
PC-01	PB-01 & PB-02	Foundation Soils	55.5	-11.0	45.8	0.719	25.010	1.571	0.7	30.8	58	21	43.8	74.6	0.9	-1.3	0.1	0.8	0.111	1.011	0.106	0.077	1.373
PC-01	PB-01 & PB-02	Foundation Soils	55.6	-11.1	47.0	0.685	31.870	1.458	0.7	31.6	56	21	43.7	75.4	0.9	-1.3	0.1	0.8	0.112	1.011	0.107	0.077	1.381
PC-01	PB-01 & PB-02	Foundation Soils	55.7	-11.2	51.9	0.702	37.090	1.352	0.7	35.2	51	21	43.9	79.1	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.077	1.420
PC-01	PB-01 & PB-02	Foundation Soils	55.8	-11.3	96.1	0.996	40.550	1.036	0.7	67.9	28	21	42.2	110.1	0.9	-1.3	0.1	0.8	0.152	1.022	0.145	0.077	1.868
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.3	214.9	0.990	40.590	0.461	0.8	160.2	0	21	0.0	160.2	0.9	-1.3	0.1	0.8	0.374	1.054	0.352	0.077	4.549
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.4	258.4	0.789	34.690	0.305	0.8	199.3	0	21	0.0	199.3	0.8	-1.3	0.1	0.8	1.819	1.082	1.655	0.077	21.392
PC-01	PB-01 & PB-02	Foundation Soils	56.0	-11.5	209.6	0.636	-10.490	0.303	0.8	155.5	0	21	0.0	155.5	0.9	-1.4	0.1	0.8	0.329	1.050	0.310	0.077	4.013
PC-01	PB-01 & PB-02	Foundation Soils	56.1	-11.6	164.3	0.553	-6.810	0.337	0.8	116.8	0	21	0.0	116.8	0.9	-1.4	0.1	0.8	0.164	1.025	0.156	0.077	2.018
PC-01	PB-01 & PB-02	Foundation Soils	56.2	-11.7	129.5	0.438	14.960	0.338	0.7	88.6	0	21	0.0	88.6	0.9	-1.4	0.1	0.8	0.124	1.014	0.118	0.077	1.532
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	65.0	0.470	-0.300	0.723	0.7	44.2	33	21	40.7	84.9	0.9	-1.4	0.1	0.8	0.120	1.013	0.115	0.077	1.487
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	57.0	0.132	-0.170	0.232	0.7	37.6	20	21	29.6	67.2	0.9	-1.4	0.1	0.8	0.105	1.010	0.101	0.077	1.303
PC-01	PB-01 & PB-02	Foundation Soils	56.4	-11.9	49.1	0.237	-4.720	0.483	0.7	32.6	35	21	39.5	72.1	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.077	1.351
PC-01	PB-01 & PB-02	Foundation Soils	56.5	-12.0	40.3	0.103	20.870	0.256	0.7	26.4	33	21	37.6	64.0	1.0	-1.4	0.2	0.8	0.103	1.009	0.098	0.077	1.274
PC-01	PB-01 & PB-02	Foundation Soils	56.6	-12.1	39.4	0.150	25.390	0.381	0.7	25.8	39	21	39.5	65.3	0.9	-1.4	0.2	0.8	0.104	1.009	0.099	0.077	1.286
PC-01	PB-01 & PB-02	Foundation Soils	56.7	-12.2	44.8	0.393	36.940	0.878	0.7	29.7	48	21	42.2	71.9	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.077	1.350
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.2	62.2	0.389	34.490	0.626	0.7	41.9	32	21	39.8	81.6	0.9	-1.4	0.2	0.8	0.117	1.012	0.112	0.077	1.451
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.3	75.0	0.451	43.690	0.602	0.7	51.0	25	21	36.9	87.9	0.9	-1.4	0.2	0.8	0.123	1.014	0.118	0.077	1.524
PC-01	PB-01 & PB-02	Foundation Soils	56.9	-12.4	78.5	0.147	38.780	0.187	0.7	50.1	8	21	3.4	53.5	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.077	1.182
PC-01	PB-01 & PB-02	Foundation Soils	57.0	-12.5	74.3	0.106	37.870	0.143	0.7	47.0	7	21	2.5	49.4	1.0	-1.4	0.2	0.8	0.092	1.008	0.088	0.077	1.148
PC-01	PB-01 & PB-02	Foundation Soils	57.1	-12.6	84.4	0.147	41.070	0.174	0.7	53.8	4	21	0.1	54.0	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.077	1.187
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	98.4	0.209	38.100	0.212	0.7	64.0	1	21	0.0	64.0	0.9	-1.4	0.2	0.8	0.103	1.009	0.098	0.077	1.276
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	90.8	0.809	42.640	0.891	0.7	62.9	27	21	40.4	103.3	0.9	-1.4	0.2	0.8	0.142	1.019	0.135	0.077	1.747
PC-01	PB-01 & PB-02	Foundation Soils	57.3	-12.8	83.5	0.655	31.330	0.785	0.7	57.3	27	21	39.4	96.7	0.9	-1.4	0.2	0.8	0.133	1.017	0.127	0.077	1.644
PC-01	PB-01 & PB-02	Foundation Soils	57.4	-12.9	88.9	0.504	36.120	0.567	0.7	60.5	19	21	30.8	91.2	0.9	-1.4	0.2	0.8	0.127	1.015	0.121	0.077	1.568
PC-01	PB-01 & PB-02	Foundation Soils	57.5	-13.0	100.6	0.381	33.640	0.379	0.7	66.3	9	21	5.9	72.2	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.077	1.355

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	57.6	-13.1	162.8	0.242	37.350	0.149	0.7	114.2	0	21	0.0	114.2	0.9	-1.4	0.2	0.8	0.159	1.023	0.151	0.077	1.960
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.1	146.1	0.151	12.390	0.103	0.7	100.5	0	21	0.0	100.5	0.9	-1.4	0.2	0.8	0.138	1.018	0.131	0.077	1.702
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.2	117.6	0.228	9.390	0.194	0.7	78.2	0	21	0.0	78.2	0.9	-1.4	0.2	0.8	0.114	1.012	0.109	0.077	1.416
PC-01	PB-01 & PB-02	Foundation Soils	57.8	-13.3	96.9	0.244	22.070	0.252	0.7	62.5	4	21	0.1	62.6	0.9	-1.4	0.2	0.8	0.101	1.009	0.097	0.077	1.265
PC-01	PB-01 & PB-02	Foundation Soils	57.9	-13.4	102.7	0.366	25.490	0.356	0.7	67.1	7	21	2.6	69.8	0.9	-1.4	0.2	0.8	0.107	1.010	0.102	0.077	1.332
PC-01	PB-01 & PB-02	Foundation Soils	58.0	-13.5	103.7	0.437	33.070	0.421	0.7	68.6	9	21	8.2	76.8	0.9	-1.4	0.2	0.8	0.113	1.011	0.108	0.077	1.403
PC-01	PB-01 & PB-02	Foundation Soils	58.1	-13.6	101.1	0.572	20.540	0.566	0.7	68.6	15	21	24.2	92.8	0.9	-1.4	0.2	0.8	0.129	1.015	0.122	0.077	1.591
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.6	96.7	0.788	22.770	0.815	0.7	66.7	23	21	37.7	104.4	0.9	-1.4	0.2	0.8	0.143	1.019	0.136	0.077	1.768
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.7	82.9	1.156	17.820	1.394	0.7	57.0	39	21	45.7	102.7	0.9	-1.4	0.2	0.8	0.141	1.019	0.134	0.077	1.740
PC-01	PB-01 & PB-02	Foundation Soils	58.3	-13.8	82.1	2.773	28.300	3.379	0.7	56.6	60	21	49.6	106.2	0.9	-1.4	0.2	0.8	0.146	1.020	0.138	0.077	1.801
PC-01	PB-01 & PB-02	Foundation Soils	58.4	-13.9	91.2	1.602	33.110	1.757	0.7	63.3	42	21	47.8	111.1	0.9	-1.4	0.2	0.8	0.154	1.022	0.145	0.077	1.896
PC-01	PB-01 & PB-02	Foundation Soils	58.5	-14.0	83.1	1.846	49.790	2.221	0.7	57.2	50	21	48.3	105.5	0.9	-1.4	0.2	0.8	0.145	1.020	0.137	0.077	1.790
PC-01	PB-01 & PB-02	Foundation Soils	58.6	-14.0	129.6	3.065	33.350	2.365	0.8	93.8	40	21	53.3	147.2	0.9	-1.4	0.2	0.8	0.271	1.043	0.254	0.077	3.313
PC-02	PB-02 & PB-03	Foundation Soils	14.0	30.1	7.1	0.076	33.550	1.067	1.2	7.8	95	21	40.6	48.4	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.056	1.653
PC-02	PB-02 & PB-03	Foundation Soils	14.1	30.1	7.5	0.075	35.070	0.994	1.2	8.3	92	21	40.6	48.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.057	1.655
PC-02	PB-02 & PB-03	Foundation Soils	14.2	30.0	7.7	0.073	37.340	0.953	1.2	8.4	91	21	40.6	49.0	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.057	1.651
PC-02	PB-02 & PB-03	Foundation Soils	14.3	29.9	7.7	0.089	38.160	1.156	1.2	8.4	94	21	40.7	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.057	1.648
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.8	9.2	0.080	46.120	0.869	1.2	10.0	83	21	40.7	50.7	1.0	-0.2	0.0	1.0	0.093	1.008	0.095	0.057	1.665
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.7	10.8	0.101	43.070	0.931	1.1	11.8	79	21	40.9	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.057	1.686
PC-02	PB-02 & PB-03	Foundation Soils	14.5	29.6	12.1	0.116	24.590	0.962	1.1	13.0	75	21	41.1	54.2	1.0	-0.2	0.0	1.0	0.095	1.008	0.098	0.057	1.701
PC-02	PB-02 & PB-03	Foundation Soils	14.6	29.6	12.1	0.091	23.540	0.754	1.1	13.0	72	21	40.9	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.097	0.058	1.693
PC-02	PB-02 & PB-03	Foundation Soils	14.7	29.5	10.6	0.082	14.530	0.773	1.1	11.5	77	21	40.8	52.3	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.058	1.667
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.4	7.9	0.080	7.530	1.014	1.1	8.5	92	21	40.6	49.2	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.058	1.622
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.3	6.7	0.084	10.830	1.252	1.1	7.2	100	21	40.5	47.8	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.058	1.600
PC-02	PB-02 & PB-03	Foundation Soils	14.9	29.2	5.9	0.089	14.340	1.496	1.1	6.4	100	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.058	1.583
PC-02	PB-02 & PB-03	Foundation Soils	15.0	29.2	5.8	0.098	16.940	1.682	1.1	6.3	100	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.058	1.577
PC-02	PB-02 & PB-03	Foundation Soils	15.1	29.1	5.5	0.088	19.770	1.608	1.1	5.9	100	21	40.2	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.091	0.058	1.567
PC-02	PB-02 & PB-03	Foundation Soils	15.2	29.0	5.3	0.085	19.180	1.610	1.1	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.059	1.560
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.9	5.2	0.085	19.680	1.627	1.1	5.6	100	21	40.2	45.8	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.059	1.555
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.8	5.1	0.085	20.750	1.651	1.1	5.5	100	21	40.1	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.059	1.549
PC-02	PB-02 & PB-03	Foundation Soils	15.4	28.7	5.0	0.081	21.870	1.605	1.1	5.4	100	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.059	1.544
PC-02	PB-02 & PB-03	Foundation Soils	15.5	28.7	5.0	0.077	23.040	1.545	1.1	5.3	100	21	40.1	45.4	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.059	1.539
PC-02	PB-02 & PB-03	Foundation Soils	15.6	28.6	4.8	0.077	22.680	1.607	1.1	5.1	100	21	40.1	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.059	1.532
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.5	4.7	0.075	23.120	1.605	1.1	5.0	100	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.059	1.526
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.4	4.5	0.068	23.200	1.496	1.1	4.8	100	21	40.0	44.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.059	1.520
PC-02	PB-02 & PB-03	Foundation Soils	15.8	28.3	4.6	0.064	24.540	1.387	1.1	4.9	100	21	40.0	44.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.060	1.518
PC-02	PB-02 & PB-03	Foundation Soils	15.9	28.3	4.8	0.064	25.060	1.332	1.1	5.1	100	21	40.0	45.1	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.060	1.517
PC-02	PB-02 & PB-03	Foundation Soils	16.0	28.2	4.9	0.069	25.950	1.408	1.1	5.2	100	21	40.1	45.3	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.060	1.515
PC-02	PB-02 & PB-03	Foundation Soils	16.1	28.1	5.2	0.073	28.780	1.399	1.1	5.5	100	21	40.1	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.060	1.516
PC-02	PB-02 & PB-03	Foundation Soils	16.2	28.0	5.5	0.064	29.400	1.169	1.1	5.8	100	21	40.2	46.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.060	1.516
PC-02	PB-02 & PB-03	Foundation Soils	16.2	27.9	6.1	0.071	26.710	1.165	1.1	6.4	100	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.060	1.522
PC-02	PB-02 & PB-03	Foundation Soils	16.3	27.8	6.7	0.075	28.500	1.125	1.1	7.0	100	21	40.5	47.5	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.060	1.527
PC-02	PB-02 & PB-03	Foundation Soils	16.4	27.8	6.9	0.083	28.250	1.197	1.1	7.3	100	21	40.5	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.061	1.528
PC-02	PB-02 & PB-03	Foundation Soils	16.5	27.7	8.6	0.068	15.530	0.793	1.1	9.0	87	21	40.6	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.061	1.546
PC-02	PB-02 & PB-03	Foundation Soils	16.6	27.6	7.8	0.046	15.380	0.587	1.1	8.2	86	21	40.4	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.061	1.530
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.5	7.2	0.041	16.010	0.571	1.1	7.5	90	21	40.4	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.061	1.518
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.4	6.5	0.044	19.960	0.677	1.1	6.8	96	21	40.3	47.1	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.061	1.506
PC-02	PB-02 & PB-03	Foundation Soils	16.8	27.4	6.1	0.052	28.770	0.846	1.1	6.4	100	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.061	1.498
PC-02	PB-02 & PB-03	Foundation Soils	16.9	27.3	5.9	0.046	31.640	0.775	1.1	6.2	100	21	40.3	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.061	1.492
PC-02	PB-02 & PB-03	Foundation Soils	17.0	27.2	5.9	0.044	32.490	0.749	1.1	6.1	100	21	40.3	46.4	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.061	1.487
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.1	5.8	0.049	35.130	0.851	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.062	1.482
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.0	5.8	0.048	34.540	0.834	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.062	1.479
PC-02	PB-02 & PB-03	Foundation Soils	17.2	26.9	5.5	0.045	34.970	0.817	1.1	5.7	100	21	40.2	45.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.062	1.472
PC-02	PB-02 & PB-03	Foundation Soils	17.3	26.9	5.2	0.045	40.740	0.871	1.1	5.3	100	21	40.1	45.4	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.062	1.464
PC-02	PB-02 & PB-03	Foundation Soils	17.4	26.8	4.8	0.047	41.690	0.977	1.1	5.0	100	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.062	1.456
PC-02	PB-02 & PB-03	Foundation Soils	17.5	26.7	5.5	0.049	48.220	0.897	1.1	5.6	100	21	40.2	45.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.062	1.462
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.6	6.4	0.043	46.120	0.671	1.1	6.6	97	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.062	1.472
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.5	6.4	0.042	40.740	0.653	1.1	6.6	97	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.062	1.469
PC-02	PB-02 & PB-03	Foundation Soils	17.7	26.4	5.8	0.047	35.650	0.804	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.062	1.458
PC-02	PB-02 & PB-03	Foundation Soils	17.8	26.4	5.3	0.071	35.640	1.349	1.1	5.4	100	21	40.1	45.5	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.063	1.447
PC-02	PB-02 & PB-03	Foundation Soils	17.9	26.3	5.7	0.092	35.550	1.622	1.1	5.8	100	21	40.2	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.063	1.450
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.2	8.5	0.094	39.500	1.101	1.1	8.7	94	21	40.7	49.4	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.063	1.486

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.1	13.4	0.068	37.190	0.509	1.1	13.6	65	21	40.7	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.063	1.540
PC-02	PB-02 & PB-03	Foundation Soils	18.1	26.0	19.1	0.107	33.690	0.561	1.1	19.3	55	21	41.0	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.063	1.611
PC-02	PB-02 & PB-03	Foundation Soils	18.2	26.0	24.0	0.135	23.670	0.562	1.1	24.3	48	21	41.1	65.3	1.0	-0.3	0.0	0.9	0.104	1.009	0.106	0.063	1.671
PC-02	PB-02 & PB-03	Foundation Soils	18.3	25.9	29.1	0.184	10.290	0.633	1.1	29.2	44	21	41.3	70.6	1.0	-0.3	0.0	0.9	0.108	1.010	0.110	0.063	1.736
PC-02	PB-02 & PB-03	Foundation Soils	18.4	25.8	42.5	0.235	10.120	0.553	1.1	42.6	29	21	38.7	81.3	1.0	-0.3	0.0	0.9	0.117	1.012	0.120	0.063	1.887
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.7	65.2	0.319	10.010	0.489	1.1	65.1	14	21	21.7	86.8	1.0	-0.3	0.0	0.9	0.122	1.014	0.125	0.063	1.972
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.6	79.1	0.411	9.590	0.519	1.1	78.9	10	21	9.0	87.9	1.0	-0.3	0.0	0.9	0.123	1.014	0.126	0.064	1.987
PC-02	PB-02 & PB-03	Foundation Soils	18.6	25.5	91.4	0.485	7.150	0.530	1.1	91.0	6	21	0.9	91.8	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.064	2.053
PC-02	PB-02 & PB-03	Foundation Soils	18.7	25.5	94.0	0.563	5.600	0.599	1.1	93.3	7	21	3.2	96.5	1.0	-0.3	0.0	0.9	0.133	1.017	0.136	0.064	2.139
PC-02	PB-02 & PB-03	Foundation Soils	18.8	25.4	95.3	0.633	5.670	0.664	1.0	94.4	9	21	7.4	101.8	1.0	-0.3	0.0	0.9	0.140	1.018	0.144	0.064	2.249
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.3	94.0	0.651	6.180	0.692	1.0	92.9	10	21	11.2	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.147	0.064	2.300
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.2	91.9	0.653	6.620	0.711	1.0	90.6	11	21	15.0	105.7	1.0	-0.3	0.0	0.9	0.145	1.020	0.150	0.064	2.333
PC-02	PB-02 & PB-03	Foundation Soils	19.0	25.1	88.7	0.653	6.910	0.736	1.0	87.4	13	21	20.2	107.5	1.0	-0.3	0.0	0.9	0.148	1.021	0.153	0.064	2.376
PC-02	PB-02 & PB-03	Foundation Soils	19.1	25.1	85.8	0.643	7.340	0.750	1.0	84.4	14	21	23.7	108.1	1.0	-0.3	0.0	0.9	0.149	1.021	0.153	0.064	2.386
PC-02	PB-02 & PB-03	Foundation Soils	19.2	25.0	84.4	0.614	7.230	0.727	1.0	83.0	14	21	23.3	106.2	1.0	-0.3	0.0	0.9	0.146	1.020	0.150	0.064	2.334
PC-02	PB-02 & PB-03	Foundation Soils	19.3	24.9	81.8	0.594	6.770	0.726	1.0	80.3	15	21	25.3	105.6	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.065	2.315
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.8	80.5	0.586	6.670	0.728	1.0	78.9	16	21	26.5	105.4	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.065	2.306
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.7	75.5	0.563	5.960	0.746	1.0	73.9	18	21	30.9	104.8	1.0	-0.3	0.0	0.9	0.144	1.020	0.148	0.065	2.287
PC-02	PB-02 & PB-03	Foundation Soils	19.5	24.6	69.9	0.498	6.370	0.713	1.0	68.4	20	21	32.6	101.0	1.0	-0.3	0.0	0.9	0.139	1.018	0.142	0.065	2.195
PC-02	PB-02 & PB-03	Foundation Soils	19.6	24.6	66.6	0.491	6.240	0.737	1.0	65.1	22	21	35.2	100.3	1.0	-0.3	0.0	0.9	0.138	1.018	0.141	0.065	2.177
PC-02	PB-02 & PB-03	Foundation Soils	19.7	24.5	65.7	0.464	6.380	0.706	1.0	64.2	21	21	34.5	98.7	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.065	2.139
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.4	65.3	0.438	4.680	0.671	1.0	63.7	20	21	33.4	97.2	1.0	-0.3	0.0	0.9	0.134	1.017	0.137	0.065	2.104
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.3	65.3	0.424	4.000	0.649	1.0	63.6	20	21	32.6	96.2	1.0	-0.3	0.0	0.9	0.133	1.016	0.136	0.065	2.082
PC-02	PB-02 & PB-03	Foundation Soils	19.9	24.2	61.5	0.419	5.040	0.681	1.0	59.8	23	21	35.7	95.5	1.0	-0.3	0.0	0.9	0.132	1.016	0.135	0.065	2.065
PC-02	PB-02 & PB-03	Foundation Soils	20.0	24.2	53.2	0.432	4.050	0.811	1.0	51.8	30	21	40.8	92.6	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.065	2.006
PC-02	PB-02 & PB-03	Foundation Soils	20.1	24.1	44.3	0.464	4.040	1.047	1.0	43.1	41	21	43.4	86.5	1.0	-0.4	0.0	0.9	0.122	1.014	0.124	0.065	1.899
PC-02	PB-02 & PB-03	Foundation Soils	20.2	24.0	39.9	0.530	4.340	1.327	1.0	38.8	48	21	44.2	83.0	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.066	1.841
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.9	31.6	0.595	5.540	1.885	1.0	30.6	62	21	44.2	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.066	1.721
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.8	23.9	0.646	6.530	2.705	1.0	23.2	79	21	43.5	66.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.066	1.614
PC-02	PB-02 & PB-03	Foundation Soils	20.4	23.7	17.0	0.587	4.380	3.458	1.0	16.5	95	21	42.5	59.0	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.066	1.519
PC-02	PB-02 & PB-03	Foundation Soils	20.5	23.7	11.9	0.491	7.340	4.124	1.0	11.6	100	21	41.5	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.066	1.449
PC-02	PB-02 & PB-03	Foundation Soils	20.6	23.6	10.3	0.457	18.910	4.416	1.0	10.0	100	21	41.2	51.2	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.066	1.426
PC-02	PB-02 & PB-03	Foundation Soils	20.7	23.5	17.3	0.457	22.250	2.645	1.0	16.7	89	21	42.4	59.1	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.066	1.513
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.4	26.6	0.417	22.250	1.569	1.0	25.6	64	21	43.2	68.8	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.066	1.628
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.3	25.0	0.315	3.000	1.260	1.0	24.1	61	21	42.7	66.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.066	1.600
PC-02	PB-02 & PB-03	Foundation Soils	20.9	23.2	18.4	0.279	-9.410	1.520	1.0	17.7	76	21	42.2	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.066	1.515
PC-02	PB-02 & PB-03	Foundation Soils	21.0	23.2	27.4	0.268	-2.760	0.978	1.0	26.3	54	21	42.4	68.7	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.066	1.620
PC-02	PB-02 & PB-03	Foundation Soils	21.1	23.1	33.8	0.288	-0.180	0.851	1.0	32.5	45	21	42.3	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.067	1.695
PC-02	PB-02 & PB-03	Foundation Soils	21.2	23.0	16.9	0.351	0.510	2.075	1.0	16.2	85	21	42.2	58.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.067	1.492
PC-02	PB-02 & PB-03	Foundation Soils	21.2	22.9	11.4	0.315	-2.100	2.757	1.0	11.0	100	21	41.4	52.3	1.0	-0.4	0.0	0.9	0.094	1.008	0.095	0.067	1.422
PC-02	PB-02 & PB-03	Foundation Soils	21.3	22.8	8.8	0.256	-0.140	2.909	1.0	8.4	100	21	40.8	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.067	1.386
PC-02	PB-02 & PB-03	Foundation Soils	21.4	22.8	7.4	0.225	3.480	3.061	1.0	7.0	100	21	40.5	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.091	0.067	1.366
PC-02	PB-02 & PB-03	Foundation Soils	21.5	22.7	5.9	0.166	12.070	2.816	1.0	5.6	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.067	1.346
PC-02	PB-02 & PB-03	Foundation Soils	21.6	22.6	5.9	0.123	43.880	2.069	1.0	5.7	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.067	1.345
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.5	6.7	0.050	67.180	0.743	1.0	6.4	100	21	40.3	46.8	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.067	1.352
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.4	10.5	0.035	69.200	0.334	1.0	10.0	75	21	40.4	50.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.067	1.389
PC-02	PB-02 & PB-03	Foundation Soils	21.8	22.3	10.8	0.033	59.370	0.305	1.0	10.3	73	21	40.4	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.067	1.390
PC-02	PB-02 & PB-03	Foundation Soils	21.9	22.3	8.5	0.032	40.400	0.378	1.0	8.0	85	21	40.3	48.4	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.067	1.364
PC-02	PB-02 & PB-03	Foundation Soils	22.0	22.2	6.5	0.037	54.700	0.573	1.0	6.1	100	21	40.3	46.4	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.067	1.341
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.1	6.1	0.059	63.480	0.974	1.0	5.7	100	21	40.2	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.068	1.335
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.0	5.2	0.047	73.330	0.897	1.0	5.0	100	21	40.0	45.0	1.0	-0.4	0.0	0.9	0.089	1.007	0.089	0.068	1.323
PC-02	PB-02 & PB-03	Foundation Soils	22.2	21.9	5.5	0.053	77.660	0.959	1.0	5.2	100	21	40.1	45.3	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.068	1.324
PC-02	PB-02 & PB-03	Foundation Soils	22.3	21.9	6.3	0.037	82.430	0.586	1.0	6.0	100	21	40.2	46.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.068	1.332
PC-02	PB-02 & PB-03	Foundation Soils	22.4	21.8	12.1	0.025	77.760	0.207	1.0	11.4	61	21	39.9	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.068	1.384
PC-02	PB-02 & PB-03	Foundation Soils	22.5	21.7	25.3	0.020	65.940	0.079	1.0	23.8	31	21	35.9	59.7	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.068	1.474
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.6	31.7	0.022	38.970	0.069	1.0	29.8	22	21	30.9	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.068	1.484
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.5	28.7	0.042	21.140	0.146	1.0	26.9	29	21	35.7	62.6	1.0	-0.4	0.0	0.9	0.101	1.009	0.102	0.068	1.503
PC-02	PB-02 & PB-03	Foundation Soils	22.7	21.4	25.9	0.088	20.390	0.340	1.0	24.2	41	21	39.7	63.9	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.068	1.516
PC-02	PB-02 & PB-03	Foundation Soils	22.8	21.4	22.6	0.091	24.010	0.403	1.0	21.1	47	21	40.4	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.068	1.487
PC-02	PB-02 & PB-03	Foundation Soils	22.9	21.3	22.0	0.119	26.540	0.542	1.0	20.5	52	21	41.0	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.068	1.485
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.2	24.0	0.103	22.930	0.430	1.0	22.4	46	21	40.5	62.8	1.0	-0.4	0.0	0.9	0.102	1.009	0.102	0.068	1.498
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.1	28.7	0.065	5.620	0.227	1.0	26.7	33	21	37.6	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.104	0.068	1.513

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-02	PB-02 & PB-03	Foundation Soils	23.1	21.0	33.0	0.075	7.100	0.227	1.0	30.7	28	21	35.8	66.5	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.069	1.537
PC-02	PB-02 & PB-03	Foundation Soils	23.2	21.0	51.7	0.087	8.900	0.168	1.0	48.0	10	21	10.1	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.069	1.440
PC-02	PB-02 & PB-03	Foundation Soils	23.3	20.9	70.9	0.105	10.150	0.148	1.0	65.9	0	21	0.0	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.069	1.526
PC-02	PB-02 & PB-03	Foundation Soils	23.4	20.8	81.0	0.142	9.430	0.175	1.0	75.2	0	21	0.0	75.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.113	0.069	1.637
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.7	86.9	0.145	8.380	0.167	1.0	80.5	0	21	0.0	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.117	0.069	1.707
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.6	89.5	0.161	12.650	0.180	1.0	82.9	0	21	0.0	82.9	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.069	1.737
PC-02	PB-02 & PB-03	Foundation Soils	23.6	20.5	87.6	0.169	10.050	0.193	1.0	81.1	0	21	0.0	81.1	1.0	-0.4	0.0	0.9	0.117	1.012	0.118	0.069	1.710
PC-02	PB-02 & PB-03	Foundation Soils	23.7	20.5	81.3	0.195	13.820	0.240	1.0	75.0	0	21	0.0	75.0	1.0	-0.4	0.0	0.9	0.111	1.011	0.112	0.069	1.628
PC-02	PB-02 & PB-03	Foundation Soils	23.8	20.4	78.6	0.170	14.390	0.216	1.0	72.5	0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.110	0.069	1.595
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.3	86.1	0.186	17.260	0.216	1.0	79.3	0	21	0.0	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.116	0.069	1.680
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.2	103.6	0.142	8.670	0.137	1.0	95.5	0	21	0.0	95.5	1.0	-0.4	0.1	0.9	0.132	1.016	0.133	0.069	1.926
PC-02	PB-02 & PB-03	Foundation Soils	24.0	20.1	117.4	0.118	5.380	0.101	1.0	108.2	0	21	0.0	108.2	1.0	-0.4	0.1	0.9	0.149	1.021	0.151	0.069	2.187
PC-02	PB-02 & PB-03	Foundation Soils	24.1	20.1	127.1	0.156	-3.420	0.123	1.0	117.2	0	21	0.0	117.2	1.0	-0.4	0.1	0.9	0.165	1.025	0.168	0.069	2.430
PC-02	PB-02 & PB-03	Foundation Soils	24.2	20.0	135.1	0.189	-3.760	0.140	1.0	124.5	0	21	0.0	124.5	1.0	-0.5	0.1	0.9	0.182	1.029	0.186	0.069	2.681
PC-02	PB-02 & PB-03	Foundation Soils	24.3	19.9	146.4	0.192	-3.760	0.131	1.0	135.0	0	21	0.0	135.0	1.0	-0.5	0.1	0.9	0.214	1.035	0.220	0.069	3.167
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.8	163.4	0.182	-3.650	0.111	1.0	150.7	0	21	0.0	150.7	1.0	-0.5	0.1	0.9	0.293	1.046	0.304	0.069	4.372
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.7	174.4	0.140	-4.190	0.080	1.0	160.8	0	21	0.0	160.8	1.0	-0.5	0.1	0.9	0.379	1.055	0.396	0.070	5.695
PC-02	PB-02 & PB-03	Foundation Soils	24.5	19.6	176.6	0.133	-5.670	0.075	1.0	162.7	0	21	0.0	162.7	1.0	-0.5	0.1	0.9	0.401	1.056	0.419	0.070	6.021
PC-02	PB-02 & PB-03	Foundation Soils	24.6	19.6	173.1	0.150	-6.720	0.087	1.0	159.3	0	21	0.0	159.3	1.0	-0.5	0.1	0.9	0.365	1.053	0.380	0.070	5.452
PC-02	PB-02 & PB-03	Foundation Soils	24.7	19.5	168.6	0.191	-7.250	0.113	1.0	155.0	0	21	0.0	155.0	1.0	-0.5	0.1	0.9	0.325	1.049	0.337	0.070	4.840
PC-02	PB-02 & PB-03	Foundation Soils	24.8	19.4	159.7	0.195	-7.770	0.122	1.0	146.5	0	21	0.0	146.5	1.0	-0.5	0.1	0.9	0.267	1.043	0.275	0.070	3.948
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.3	155.2	0.216	-7.290	0.139	1.0	142.2	0	21	0.0	142.2	1.0	-0.5	0.1	0.9	0.244	1.040	0.251	0.070	3.601
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.2	147.9	0.246	-7.480	0.166	1.0	135.2	0	21	0.0	135.2	1.0	-0.5	0.1	0.9	0.215	1.035	0.220	0.070	3.152
PC-03	PB-03 & PB-04	Foundation Soils	10.0	34.4	49.2	0.414	-7.290	0.842	1.3	61.4	26	25	41.6	103.0	1.1	-0.1	0.0	1.0	0.141	1.019	0.153	0.057	2.672
PC-03	PB-03 & PB-04	Foundation Soils	10.1	34.3	53.0	0.470	-1.810	0.886	1.3	65.8	25	25	41.2	107.0	1.1	-0.1	0.0	1.0	0.147	1.020	0.160	0.057	2.780
PC-03	PB-03 & PB-04	Foundation Soils	10.2	34.2	56.9	0.502	1.290	0.882	1.3	70.3	22	25	39.5	109.8	1.1	-0.1	0.0	1.0	0.152	1.022	0.165	0.058	2.858
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	59.9	0.563	1.480	0.941	1.3	73.4	22	25	40.0	113.4	1.1	-0.1	0.0	1.0	0.158	1.023	0.172	0.058	2.974
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	60.6	0.637	1.950	1.052	1.3	73.9	25	25	42.6	116.5	1.1	-0.1	0.0	1.0	0.164	1.025	0.179	0.058	3.082
PC-03	PB-03 & PB-04	Foundation Soils	10.4	34.0	61.7	0.674	3.830	1.092	1.3	75.0	25	25	43.2	118.2	1.1	-0.1	0.0	1.0	0.167	1.025	0.183	0.058	3.140
PC-03	PB-03 & PB-04	Foundation Soils	10.5	33.9	62.2	0.701	5.430	1.127	1.3	75.4	25	25	43.8	119.2	1.1	-0.1	0.0	1.0	0.170	1.026	0.186	0.059	3.170
PC-03	PB-03 & PB-04	Foundation Soils	10.6	33.8	61.7	0.712	6.340	1.153	1.3	74.7	26	25	44.5	119.2	1.1	-0.1	0.0	1.0	0.169	1.026	0.185	0.059	3.155
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	63.3	0.748	9.100	1.181	1.3	76.4	26	25	44.7	121.0	1.1	-0.1	0.0	1.0	0.174	1.027	0.190	0.059	3.223
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	67.0	0.779	9.300	1.162	1.3	80.4	24	25	43.4	123.8	1.1	-0.2	0.0	1.0	0.180	1.028	0.198	0.059	3.344
PC-03	PB-03 & PB-04	Foundation Soils	10.8	33.6	71.6	0.803	8.340	1.122	1.3	85.5	22	25	40.9	126.4	1.1	-0.2	0.0	1.0	0.187	1.030	0.206	0.059	3.464
PC-03	PB-03 & PB-04	Foundation Soils	10.9	33.5	75.9	0.828	8.340	1.091	1.3	90.3	20	25	38.1	128.4	1.1	-0.2	0.0	1.0	0.193	1.031	0.212	0.060	3.561
PC-03	PB-03 & PB-04	Foundation Soils	11.0	33.4	83.0	0.881	8.100	1.061	1.3	98.4	17	25	32.7	131.1	1.1	-0.2	0.0	1.0	0.201	1.032	0.222	0.060	3.712
PC-03	PB-03 & PB-04	Foundation Soils	11.1	33.3	93.4	0.956	7.880	1.024	1.3	110.3	13	25	22.5	132.8	1.1	-0.2	0.0	1.0	0.206	1.033	0.229	0.060	3.806
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	99.1	1.103	7.910	1.113	1.2	116.0	13	25	24.5	140.5	1.1	-0.2	0.0	1.0	0.237	1.038	0.264	0.060	4.386
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	108.2	1.240	8.290	1.147	1.2	125.8	12	25	19.9	145.7	1.1	-0.2	0.0	1.0	0.263	1.042	0.295	0.060	4.886
PC-03	PB-03 & PB-04	Foundation Soils	11.3	33.1	118.6	1.255	7.990	1.058	1.2	138.1	8	25	5.1	143.2	1.1	-0.2	0.0	1.0	0.249	1.040	0.279	0.061	4.604
PC-03	PB-03 & PB-04	Foundation Soils	11.4	33.0	125.9	1.457	7.720	1.157	1.2	145.2	8	25	7.6	152.7	1.1	-0.2	0.0	1.0	0.308	1.048	0.349	0.061	5.735
PC-03	PB-03 & PB-04	Foundation Soils	11.5	32.9	142.4	1.616	8.770	1.134	1.2	162.6	5	25	0.4	163.0	1.1	-0.2	0.0	1.0	0.405	1.057	0.466	0.061	7.637
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	173.4	1.945	10.040	1.122	1.2	193.4	0	25	0.0	193.4	1.1	-0.2	0.0	1.0	1.325	1.082	1.577	0.061	25.756
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	184.6	2.062	3.480	1.117	1.2	204.2	0	25	0.0	204.2	1.1	-0.2	0.0	1.0	2.413	1.082	2.871	0.061	46.748
PC-03	PB-03 & PB-04	Foundation Soils	11.7	32.7	183.8	2.072	0.380	1.128	1.2	203.1	0	25	0.0	203.1	1.1	-0.2	0.0	1.0	2.263	1.082	2.692	0.062	43.696
PC-03	PB-03 & PB-04	Foundation Soils	11.8	32.6	181.5	2.026	0.670	1.116	1.2	200.7	0	25	0.0	200.7	1.1	-0.2	0.0	1.0	1.967	1.082	2.340	0.062	37.872
PC-03	PB-03 & PB-04	Foundation Soils	11.9	32.5	173.1	1.917	-4.170	1.107	1.2	192.2	0	25	0.0	192.2	1.1	-0.2	0.0	1.0	1.253	1.082	1.491	0.062	24.053
PC-03	PB-03 & PB-04	Foundation Soils	12.0	32.4	181.8	1.886	-17.440	1.037	1.2	200.5	0	25	0.0	200.5	1.1	-0.2	0.0	1.0	1.947	1.082	2.316	0.062	37.266
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	190.6	1.745	-16.720	0.916	1.2	208.9	0	25	0.0	208.9	1.1	-0.2	0.0	1.0	3.238	1.082	3.852	0.062	61.799
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	193.5	1.473	-16.390	0.761	1.2	211.5	0	25	0.0	211.5	1.1	-0.2	0.0	1.0	3.854	1.082	4.585	0.063	73.349
PC-03	PB-03 & PB-04	Foundation Soils	12.2	32.2	191.7	1.540	-16.600	0.803	1.2	209.6	0	25	0.0	209.6	1.1	-0.2	0.0	1.0	3.383	1.082	4.025	0.063	64.195
PC-03	PB-03 & PB-04	Foundation Soils	12.3	32.1	187.3	1.574	-13.340	0.840	1.2	205.0	0	25	0.0	205.0	1.1	-0.2	0.0	1.0	2.536	1.082	3.017	0.063	47.990
PC-03	PB-03 & PB-04	Foundation Soils	12.4	32.0	177.9	1.643	-10.040	0.924	1.2	195.6	0	25	0.0	195.6	1.1	-0.2	0.0	1.0	1.486	1.082	1.768	0.063	28.044
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.9	168.3	1.784	-7.290	1.060	1.2	186.0	0	25	0.0	186.0	1.1	-0.2	0.0	1.0	0.934	1.081	1.111	0.063	17.568
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.8	161.5	1.843	-3.270	1.141	1.2	179.0	3	25	0.0	179.0	1.1	-0.2	0.0	1.0	0.697	1.073	0.818	0.063	12.903
PC-03	PB-03 & PB-04	Foundation Soils	12.6	31.8	152.0	1.832	1.330	1.205	1.2	169.2	5	25	1.0	170.2	1.1	-0.2	0.0	1.0	0.507	1.064	0.585	0.064	9.205
PC-03	PB-03 & PB-04	Foundation Soils	12.7	31.7	145.9	1.811	3.580	1.241	1.2	162.6	7	25	4.5	167.0	1.1	-0.2	0.0	1.0	0.457	1.060	0.525	0.064	8.238
PC-03	PB-03 & PB-04	Foundation Soils	12.8	31.6	138.7	1.713	6.240	1.235	1.2	154.8	8	25	8.0	162.8	1.1	-0.2	0.0	1.0	0.402	1.056	0.458	0.064	7.162
PC-03	PB-03 & PB-04	Foundation Soils	12.9	31.5	139.3	1.298	6.580	0.932	1.2	155.9	1	25	0.0	155.9	1.1	-0.2	0.0	1.0	0.332	1.050	0.375	0.064	5.849
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	137.3	1.293	5.810	0.942	1.2	153.6	2	25	0.0	153.6	1.1	-0.2	0.0	1.0	0.315	1.048	0.353	0.064	5.500
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	126.8	1.281	5.170	1.010	1.2	142.7	6	25	1.3	144.0	1.1	-0.2	0.0	1.0	0.254	1.041	0.281	0.064	4.366
PC-03	PB-03 & PB-04	Foundation Soils	13.1	31.3	120.2	1.272	4.670	1.059	1.2	135.2	8	25	7.4	142.6	1.1	-0.2	0.0	1.0	0.246	1.040	0.272	0.065	4.222

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	13.2	31.2	106.0	1.239	-4.000	1.169	1.2	118.7	14	25	27.0	145.8	1.1	-0.2	0.0	1.0	0.263	1.042	0.292	0.065	4.509
PC-03	PB-03 & PB-04	Foundation Soils	13.3	31.1	104.9	1.261	-4.900	1.202	1.2	117.3	15	25	29.9	147.2	1.1	-0.2	0.0	1.0	0.271	1.043	0.301	0.065	4.644
PC-03	PB-03 & PB-04	Foundation Soils	13.4	31.0	103.6	1.263	-1.330	1.220	1.2	115.6	16	25	31.9	147.5	1.1	-0.2	0.0	1.0	0.273	1.043	0.303	0.065	4.659
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	100.5	1.245	5.360	1.238	1.2	112.1	17	25	34.7	146.8	1.1	-0.2	0.0	1.0	0.269	1.043	0.298	0.065	4.571
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	97.0	1.212	5.520	1.249	1.2	108.1	18	25	37.0	145.1	1.1	-0.2	0.0	1.0	0.260	1.042	0.287	0.065	4.395
PC-03	PB-03 & PB-04	Foundation Soils	13.6	30.8	93.9	1.191	5.100	1.268	1.2	104.6	19	25	39.2	143.8	1.1	-0.2	0.0	1.0	0.253	1.041	0.279	0.065	4.259
PC-03	PB-03 & PB-04	Foundation Soils	13.7	30.7	90.9	1.158	4.290	1.275	1.2	101.2	20	25	40.7	141.9	1.1	-0.2	0.0	1.0	0.243	1.039	0.267	0.066	4.076
PC-03	PB-03 & PB-04	Foundation Soils	13.8	30.6	83.7	1.043	4.840	1.246	1.2	93.5	22	25	42.3	135.8	1.1	-0.2	0.0	1.0	0.217	1.035	0.237	0.066	3.607
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	79.2	0.991	6.680	1.252	1.2	88.5	23	25	43.8	132.2	1.1	-0.2	0.0	1.0	0.205	1.033	0.223	0.066	3.378
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	76.6	0.934	6.770	1.219	1.2	85.6	24	25	43.7	129.4	1.1	-0.2	0.0	1.0	0.195	1.031	0.212	0.066	3.210
PC-03	PB-03 & PB-04	Foundation Soils	14.0	30.4	74.4	0.912	7.000	1.225	1.2	83.2	25	25	44.4	127.6	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.066	3.112
PC-03	PB-03 & PB-04	Foundation Soils	14.1	30.3	72.7	0.889	7.450	1.223	1.2	81.2	25	25	44.8	126.0	1.0	-0.2	0.0	1.0	0.186	1.029	0.201	0.066	3.026
PC-03	PB-03 & PB-04	Foundation Soils	14.2	30.2	71.4	0.876	7.720	1.227	1.2	79.7	26	25	45.1	124.8	1.0	-0.2	0.0	1.0	0.183	1.029	0.197	0.067	2.966
PC-03	PB-03 & PB-04	Foundation Soils	14.3	30.1	69.7	0.860	7.860	1.234	1.2	77.8	27	25	45.6	123.4	1.0	-0.2	0.0	1.0	0.179	1.028	0.193	0.067	2.895
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	68.8	0.846	7.960	1.230	1.2	76.7	27	25	45.7	122.4	1.0	-0.2	0.0	1.0	0.177	1.027	0.190	0.067	2.846
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	67.4	0.839	7.960	1.245	1.2	75.1	28	25	46.2	121.3	1.0	-0.2	0.0	1.0	0.174	1.027	0.187	0.067	2.794
PC-03	PB-03 & PB-04	Foundation Soils	14.5	29.9	65.8	0.844	8.240	1.282	1.2	73.3	29	25	46.9	120.2	1.0	-0.2	0.0	1.0	0.172	1.026	0.184	0.067	2.746
PC-03	PB-03 & PB-04	Foundation Soils	14.6	29.8	64.4	0.844	8.530	1.310	1.2	71.7	30	25	47.4	119.1	1.0	-0.2	0.0	1.0	0.169	1.026	0.181	0.067	2.697
PC-03	PB-03 & PB-04	Foundation Soils	14.7	29.7	62.1	0.839	8.580	1.352	1.2	69.1	32	25	48.0	117.0	1.0	-0.2	0.0	1.0	0.165	1.025	0.176	0.067	2.619
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	58.2	0.824	8.810	1.417	1.2	64.8	35	25	48.6	113.4	1.0	-0.2	0.0	1.0	0.158	1.023	0.168	0.067	2.495
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	55.4	0.794	8.720	1.434	1.2	61.7	37	25	48.7	110.4	1.0	-0.2	0.0	1.0	0.153	1.022	0.162	0.068	2.401
PC-03	PB-03 & PB-04	Foundation Soils	14.9	29.5	53.1	0.761	8.720	1.433	1.2	59.2	38	25	48.7	107.9	1.0	-0.2	0.0	1.0	0.149	1.021	0.158	0.068	2.326
PC-03	PB-03 & PB-04	Foundation Soils	15.0	29.4	51.8	0.674	8.580	1.301	1.2	57.8	36	25	47.8	105.6	1.0	-0.2	0.0	1.0	0.145	1.020	0.154	0.068	2.263
PC-03	PB-03 & PB-04	Foundation Soils	15.1	29.3	51.5	0.612	8.270	1.187	1.2	57.4	35	25	47.0	104.4	1.0	-0.2	0.0	1.0	0.143	1.019	0.152	0.068	2.229
PC-03	PB-03 & PB-04	Foundation Soils	15.2	29.2	51.9	0.570	8.200	1.099	1.2	57.7	33	25	46.2	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.068	2.212
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	51.7	0.586	7.640	1.134	1.2	57.4	34	25	46.5	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.068	2.208
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	49.1	0.637	7.000	1.299	1.2	54.5	38	25	47.8	102.3	1.0	-0.2	0.0	1.0	0.140	1.019	0.148	0.068	2.165
PC-03	PB-03 & PB-04	Foundation Soils	15.4	29.0	42.9	0.710	6.540	1.655	1.2	47.8	47	25	48.8	96.6	1.0	-0.2	0.0	1.0	0.133	1.017	0.140	0.069	2.041
PC-03	PB-03 & PB-04	Foundation Soils	15.5	28.9	32.0	0.756	7.770	2.364	1.2	35.9	63	25	48.3	84.2	1.0	-0.2	0.0	1.0	0.120	1.013	0.125	0.069	1.820
PC-03	PB-03 & PB-04	Foundation Soils	15.6	28.8	21.3	0.793	10.330	3.722	1.2	24.2	82	25	46.6	70.8	1.0	-0.2	0.0	1.0	0.108	1.010	0.112	0.069	1.628
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.7	15.4	0.708	10.580	4.608	1.2	17.5	96	25	45.5	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.069	1.528
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.6	11.6	0.512	12.140	4.396	1.2	13.3	100	25	44.6	57.9	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.069	1.466
PC-03	PB-03 & PB-04	Foundation Soils	15.8	28.6	10.8	0.354	13.100	3.280	1.2	12.3	100	25	44.3	56.7	1.0	-0.3	0.0	1.0	0.097	1.008	0.100	0.069	1.449
PC-03	PB-03 & PB-04	Foundation Soils	15.9	28.5	11.3	0.268	20.120	2.368	1.2	12.9	92	25	44.3	57.2	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.069	1.452
PC-03	PB-03 & PB-04	Foundation Soils	16.0	28.4	20.7	0.194	50.790	0.936	1.2	23.4	58	25	44.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.110	0.069	1.579
PC-03	PB-03 & PB-04	Foundation Soils	16.1	28.3	34.9	0.173	47.490	0.496	1.2	38.8	31	25	41.4	80.2	1.0	-0.3	0.0	1.0	0.116	1.012	0.121	0.070	1.735
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	48.2	0.147	25.820	0.305	1.2	53.8	14	25	20.5	74.3	1.0	-0.3	0.0	1.0	0.111	1.011	0.115	0.070	1.651
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	49.9	0.122	14.380	0.244	1.2	56.1	10	25	9.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.070	1.540
PC-03	PB-03 & PB-04	Foundation Soils	16.3	28.1	48.3	0.201	13.960	0.416	1.2	53.4	18	25	30.1	83.6	1.0	-0.3	0.0	1.0	0.119	1.013	0.124	0.070	1.774
PC-03	PB-03 & PB-04	Foundation Soils	16.4	28.0	46.0	0.284	12.050	0.618	1.2	50.5	26	25	40.1	90.6	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.070	1.883
PC-03	PB-03 & PB-04	Foundation Soils	16.5	27.9	41.4	0.362	6.040	0.874	1.2	45.4	36	25	44.9	90.4	1.0	-0.3	0.0	1.0	0.126	1.015	0.131	0.070	1.875
PC-03	PB-03 & PB-04	Foundation Soils	16.6	27.8	37.4	0.446	8.200	1.192	1.2	41.0	45	25	46.8	87.8	1.0	-0.3	0.0	1.0	0.123	1.014	0.129	0.070	1.830
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	29.0	0.482	9.590	1.660	1.2	32.0	59	25	47.0	79.0	1.0	-0.3	0.0	1.0	0.115	1.012	0.119	0.070	1.695
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	22.8	0.495	10.720	2.169	1.2	25.3	70	25	46.3	71.6	1.0	-0.3	0.0	1.0	0.109	1.010	0.112	0.070	1.594
PC-03	PB-03 & PB-04	Foundation Soils	16.8	27.6	12.8	0.506	13.190	3.949	1.2	14.3	99	25	44.8	59.1	1.0	-0.3	0.0	1.0	0.099	1.009	0.102	0.071	1.443
PC-03	PB-03 & PB-04	Foundation Soils	16.9	27.5	8.0	0.476	22.820	5.919	1.2	9.0	100	25	43.6	52.6	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.071	1.369
PC-03	PB-03 & PB-04	Foundation Soils	17.0	27.4	6.6	0.383	36.240	5.789	1.2	7.4	100	25	43.2	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.095	0.071	1.345
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	6.0	0.272	54.600	4.525	1.2	6.7	100	25	43.0	49.8	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.071	1.334
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	6.4	0.153	69.980	2.392	1.2	7.2	100	25	43.1	50.3	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.071	1.337
PC-03	PB-03 & PB-04	Foundation Soils	17.2	27.2	5.5	0.067	66.180	1.229	1.2	6.1	100	25	42.9	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.071	1.321
PC-03	PB-03 & PB-04	Foundation Soils	17.3	27.1	4.7	0.101	71.040	2.143	1.2	5.3	100	25	42.7	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.071	1.308
PC-03	PB-03 & PB-04	Foundation Soils	17.4	27.0	4.6	0.050	79.520	1.078	1.2	5.2	100	25	42.6	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.071	1.305
PC-03	PB-03 & PB-04	Foundation Soils	17.5	26.9	7.6	0.028	86.520	0.371	1.2	8.4	80	25	42.8	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.071	1.338
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	25.6	0.038	67.370	0.148	1.2	28.0	29	25	37.8	65.9	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.072	1.497
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	38.3	0.075	44.400	0.196	1.2	41.8	17	25	26.8	68.6	1.0	-0.3	0.0	1.0	0.106	1.010	0.109	0.072	1.527
PC-03	PB-03 & PB-04	Foundation Soils	17.7	26.7	45.0	0.139	16.090	0.309	1.1	48.8	17	25	27.4	76.1	1.0	-0.3	0.0	0.9	0.112	1.011	0.116	0.072	1.618
PC-03	PB-03 & PB-04	Foundation Soils	17.8	26.6	45.8	0.247	16.690	0.539	1.1	49.2	25	25	38.5	87.7	1.0	-0.3	0.0	0.9	0.123	1.014	0.128	0.072	1.779
PC-03	PB-03 & PB-04	Foundation Soils	17.9	26.5	44.5	0.275	18.010	0.618	1.1	47.7	28	25	41.0	88.7	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.072	1.793
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	42.2	0.334	18.800	0.791	1.1	45.2	34	25	44.2	89.3	1.0	-0.3	0.0	0.9	0.125	1.014	0.130	0.072	1.799
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	41.5	0.390	19.980	0.939	1.1	44.4	38	25	45.5	89.9	1.0	-0.3	0.0	0.9	0.125	1.015	0.130	0.072	1.805
PC-03	PB-03 & PB-04	Foundation Soils	18.1	26.3	42.5	0.475	20.39	1.117193	1.1	45.3	40	25	46.6	91.9	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.072	1.835
PC-03	PB-03 & PB-04	Foundation Soils	18.2	26.2	42.4	0.629	19.730	1.484	1.1	45.0	46	25	48.1	93.1	1.0	-0.3	0.0	0.9	0.129	1.016	0.134	0.072	1.853

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	18.3	26.1	37.8	0.677	18.480	1.789	1.1	40.2	54	25	48.2	88.5	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.072	1.774
PC-03	PB-03 & PB-04	Foundation Soils	18.4	26.0	27.9	0.697	19.360	2.499	1.1	30.0	70	15	38.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.109	0.073	1.502
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	21.2	0.717	20.230	3.378	1.1	22.9	82	15	37.5	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.073	1.411
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	17.7	0.694	21.060	3.916	1.1	19.2	91	15	37.0	56.2	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.073	1.363
PC-03	PB-03 & PB-04	Foundation Soils	18.6	25.8	22.0	0.679	21.330	3.090	1.1	23.6	80	15	37.6	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.073	1.415
PC-03	PB-03 & PB-04	Foundation Soils	18.7	25.7	20.1	0.612	18.060	3.050	1.1	21.6	82	15	37.3	58.9	1.0	-0.3	0.0	0.9	0.099	1.008	0.101	0.073	1.387
PC-03	PB-03 & PB-04	Foundation Soils	18.8	25.6	12.1	0.534	19.870	4.412	1.1	13.1	100	15	36.1	49.1	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.073	1.284
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	8.7	0.446	28.490	5.151	1.1	9.4	100	15	35.3	44.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.073	1.238
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	8.2	0.372	36.240	4.555	1.1	8.8	100	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.073	1.230
PC-03	PB-03 & PB-04	Foundation Soils	19.0	25.4	7.0	0.240	57.460	3.434	1.1	7.6	100	15	35.0	42.6	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.073	1.213
PC-03	PB-03 & PB-04	Foundation Soils	19.1	25.3	6.4	0.156	69.080	2.429	1.1	6.9	100	15	34.9	41.8	1.0	-0.3	0.0	0.9	0.087	1.007	0.088	0.073	1.204
PC-03	PB-03 & PB-04	Foundation Soils	19.2	25.2	5.7	0.107	77.480	1.869	1.1	6.2	100	15	34.7	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.074	1.194
PC-03	PB-03 & PB-04	Foundation Soils	19.3	25.1	5.8	0.054	85.620	0.934	1.1	6.2	100	15	34.7	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.074	1.193
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	6.3	0.029	75.090	0.463	1.1	6.8	93	15	34.7	41.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.074	1.195
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	6.7	0.057	31.020	0.845	1.1	7.2	98	15	34.9	42.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.074	1.200
PC-03	PB-03 & PB-04	Foundation Soils	19.5	24.9	7.5	0.078	31.020	1.039	1.1	8.0	97	15	35.0	43.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.074	1.208
PC-03	PB-03 & PB-04	Foundation Soils	19.6	24.8	8.3	0.080	30.970	0.968	1.1	8.8	92	15	35.1	43.9	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.074	1.214
PC-03	PB-03 & PB-04	Foundation Soils	19.7	24.7	9.0	0.162	30.870	1.797	1.1	9.6	99	15	35.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.074	1.223
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.6	9.7	0.186	23.180	1.913	1.1	10.4	98	15	35.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.074	1.230
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.5	9.6	0.200	34.300	2.087	1.1	10.2	100	15	35.5	45.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.074	1.226
PC-03	PB-03 & PB-04	Foundation Soils	19.9	24.5	8.3	0.178	39.460	2.143	1.1	8.8	100	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.074	1.209
PC-03	PB-03 & PB-04	Foundation Soils	20.0	24.4	6.0	0.128	49.230	2.131	1.1	6.4	100	15	34.8	41.1	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.074	1.180
PC-03	PB-03 & PB-04	Foundation Soils	20.1	24.3	5.3	0.108	71.480	2.035	1.1	5.6	100	15	34.6	40.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.075	1.170
PC-03	PB-03 & PB-04	Foundation Soils	20.2	24.2	12.0	0.166	86.760	1.389	1.1	12.6	85	15	35.6	48.2	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.075	1.245
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	18.0	0.193	83.870	1.075	1.1	18.8	67	15	36.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.075	1.310
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	11.3	0.166	17.530	1.465	1.1	11.9	88	15	35.6	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.075	1.234
PC-03	PB-03 & PB-04	Foundation Soils	20.4	24.0	8.3	0.161	20.150	1.943	1.1	8.7	100	15	35.2	43.9	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.075	1.199
PC-03	PB-03 & PB-04	Foundation Soils	20.5	23.9	6.0	0.152	26.870	2.522	1.1	6.4	100	15	34.7	41.1	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.075	1.170
PC-03	PB-03 & PB-04	Foundation Soils	20.6	23.8	5.2	0.183	56.390	3.525	1.1	5.5	100	15	34.6	40.0	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.075	1.159
PC-03	PB-03 & PB-04	Foundation Soils	20.7	23.7	5.5	0.153	83.900	2.785	1.1	5.8	100	15	34.6	40.4	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.075	1.161
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	6.1	0.103	96.720	1.676	1.1	6.4	100	15	34.8	41.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.075	1.167
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	7.4	0.097	88.620	1.307	1.1	7.8	100	15	35.0	42.8	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.075	1.180
PC-03	PB-03 & PB-04	Foundation Soils	20.9	23.5	7.3	0.112	85.580	1.533	1.1	7.6	100	15	35.0	42.6	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.075	1.177
PC-03	PB-03 & PB-04	Foundation Soils	21.0	23.4	6.7	0.142	98.390	2.109	1.1	7.0	100	15	34.9	41.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.088	0.075	1.169
PC-03	PB-03 & PB-04	Foundation Soils	21.1	23.3	9.1	0.145	96.290	1.586	1.1	9.5	98	15	35.3	44.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.075	1.195
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	13.4	0.166	77.120	1.240	1.1	13.9	80	15	35.7	49.6	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.076	1.239
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	16.7	0.135	63.960	0.808	1.1	17.3	65	15	35.7	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.076	1.271
PC-03	PB-03 & PB-04	Foundation Soils	21.3	23.1	18.6	0.143	73.800	0.770	1.1	19.1	61	15	35.8	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.076	1.289
PC-03	PB-03 & PB-04	Foundation Soils	21.4	23.0	20.7	0.149	83.050	0.719	1.1	21.3	56	15	35.8	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.076	1.309
PC-03	PB-03 & PB-04	Foundation Soils	21.5	22.9	24.0	0.202	92.780	0.842	1.1	24.6	54	15	36.2	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.076	1.345
PC-03	PB-03 & PB-04	Foundation Soils	21.6	22.8	26.6	0.233	89.000	0.876	1.1	27.1	52	15	36.4	63.6	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.076	1.373
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	27.3	0.296	100.820	1.085	1.1	27.8	55	15	36.9	64.7	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.076	1.383
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	28.2	0.364	102.720	1.292	1.1	28.7	57	15	37.3	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.106	0.076	1.395
PC-03	PB-03 & PB-04	Foundation Soils	21.8	22.6	34.2	0.445	95.080	1.300	1.1	34.7	51	15	37.8	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.112	0.076	1.467
PC-03	PB-03 & PB-04	Foundation Soils	21.9	22.5	37.9	0.356	91.530	0.939	1.1	38.3	42	15	36.9	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.076	1.497
PC-03	PB-03 & PB-04	Foundation Soils	22.0	22.4	43.5	0.273	77.850	0.627	1.1	43.9	31	15	34.2	78.1	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.076	1.530
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	54.2	0.210	76.040	0.387	1.1	54.6	16	15	21.6	76.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.115	0.076	1.505
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	73.9	0.220	36.250	0.298	1.1	74.4	3	15	0.0	74.4	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.076	1.482
PC-03	PB-03 & PB-04	Foundation Soils	22.2	22.2	81.8	0.178	39.070	0.218	1.1	82.0	0	15	0.0	82.0	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.076	1.575
PC-03	PB-03 & PB-04	Foundation Soils	22.3	22.1	91.5	0.139	25.660	0.152	1.1	91.4	0	15	0.0	91.4	1.0	-0.4	0.0	0.9	0.127	1.015	0.130	0.076	1.705
PC-03	PB-03 & PB-04	Foundation Soils	22.4	22.0	109.2	0.142	19.220	0.130	1.1	108.5	0	15	0.0	108.5	1.0	-0.4	0.0	0.9	0.150	1.021	0.155	0.077	2.019
PC-03	PB-03 & PB-04	Foundation Soils	22.5	21.9	123.9	0.171	13.020	0.138	1.0	122.6	0	15	0.0	122.6	1.0	-0.4	0.0	0.9	0.177	1.028	0.185	0.077	2.409
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	134.0	0.203	0.140	0.151	1.0	132.2	0	15	0.0	132.2	1.0	-0.4	0.0	0.9	0.204	1.033	0.214	0.077	2.793
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	135.8	0.320	4.360	0.236	1.0	133.7	0	15	0.0	133.7	1.0	-0.4	0.0	0.9	0.210	1.034	0.220	0.077	2.864
PC-03	PB-03 & PB-04	Foundation Soils	22.7	21.7	135.7	0.323	13.290	0.238	1.0	133.5	0	15	0.0	133.5	1.0	-0.4	0.0	0.9	0.209	1.034	0.219	0.077	2.850
PC-03	PB-03 & PB-04	Foundation Soils	22.8	21.6	136.4	0.326	0.340	0.239	1.0	134.0	0	15	0.0	134.0	1.0	-0.4	0.0	0.9	0.211	1.034	0.221	0.077	2.871
PC-03	PB-03 & PB-04	Foundation Soils	22.9	21.5	135.5	0.431	-8.480	0.318	1.0	133.0	0	15	0.0	133.0	1.0	-0.4	0.0	0.9	0.207	1.034	0.217	0.077	2.820
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.4	132.3	0.477	-18.770	0.361	1.0	129.7	0	15	0.0	129.7	1.0	-0.4	0.0	0.9	0.197	1.032	0.205	0.077	2.667
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.3	136.0	0.420	-15.930	0.309	1.0	133.1	0	15	0.0	133.1	1.0	-0.4	0.0	0.9	0.208	1.034	0.217	0.077	2.820
PC-03	PB-03 & PB-04	Foundation Soils	23.1	21.3	139.6	0.297	-20.850	0.213	1.0	136.5	0	15	0.0	136.5	1.0	-0.4	0.0	0.9	0.220	1.036	0.230	0.077	2.990
PC-03	PB-03 & PB-04	Foundation Soils	23.2	21.2	139.1	0.232	-22.110	0.167	1.0	135.9	0	15	0.0	135.9	1.0	-0.4	0.0	0.9	0.218	1.035	0.228	0.077	2.955
PC-03	PB-03 & PB-04	Foundation Soils	23.3	21.1	132.1	0.258	-23.250	0.195	1.0	129.0	0	15	0.0	129.0	1.0	-0.4	0.0	0.9	0.194	1.031	0.203	0.077	2.625

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	23.4	21.0	120.5	0.328	-20.820	0.272	1.0	117.8	0	15	0.0	117.8	1.0	-0.4	0.0	0.9	0.166	1.025	0.172	0.077	2.231
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	105.2	0.397	-9.910	0.377	1.0	102.9	0	15	0.0	102.9	1.0	-0.4	0.0	0.9	0.141	1.019	0.145	0.077	1.877
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	106.2	0.496	-4.860	0.467	1.0	103.7	0	15	0.0	103.7	1.0	-0.4	0.0	0.9	0.142	1.019	0.146	0.077	1.890
PC-03	PB-03 & PB-04	Foundation Soils	23.6	20.8	118.4	0.484	-6.380	0.409	1.0	115.3	0	15	0.0	115.3	1.0	-0.4	0.0	0.9	0.161	1.024	0.167	0.077	2.155
PC-03	PB-03 & PB-04	Foundation Soils	23.7	20.7	142.3	0.428	-16.840	0.301	1.0	138.0	0	15	0.0	138.0	1.0	-0.4	0.0	0.9	0.226	1.037	0.236	0.077	3.053
PC-03	PB-03 & PB-04	Foundation Soils	23.8	20.6	157.5	0.341	-19.680	0.216	1.0	152.4	0	15	0.0	152.4	1.0	-0.4	0.0	0.9	0.305	1.047	0.323	0.077	4.170
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.5	170.2	0.241	-19.300	0.142	1.0	164.3	0	15	0.0	164.3	1.0	-0.4	0.0	0.9	0.420	1.058	0.450	0.078	5.801
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.4	168.5	0.210	-18.300	0.125	1.0	162.5	0	15	0.0	162.5	1.0	-0.4	0.1	0.9	0.399	1.056	0.426	0.078	5.487
PC-03	PB-03 & PB-04	Foundation Soils	24.0	20.4	161.1	0.217	-16.820	0.135	1.0	155.3	0	15	0.0	155.3	1.0	-0.4	0.1	0.9	0.328	1.050	0.347	0.078	4.477
PC-03	PB-03 & PB-04	Foundation Soils	24.1	20.3	152.5	0.272	-13.200	0.178	1.0	147.0	0	15	0.0	147.0	1.0	-0.4	0.1	0.9	0.270	1.043	0.284	0.078	3.658
PC-03	PB-03 & PB-04	Foundation Soils	24.2	20.2	139.3	0.347	-10.790	0.249	1.0	134.3	0	15	0.0	134.3	1.0	-0.5	0.1	0.9	0.212	1.034	0.220	0.078	2.836
PC-03	PB-03 & PB-04	Foundation Soils	24.3	20.1	126.5	0.444	-9.530	0.351	1.0	122.0	0	15	0.0	122.0	1.0	-0.5	0.1	0.9	0.176	1.027	0.182	0.078	2.337
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	112.0	0.465	-7.930	0.415	1.0	108.0	0	15	0.0	108.0	1.0	-0.5	0.1	0.9	0.149	1.021	0.153	0.078	1.963
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	104.7	0.374	-7.620	0.357	1.0	100.9	0	15	0.0	100.9	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.078	1.819
PC-03	PB-03 & PB-04	Foundation Soils	24.5	19.9	96.8	0.346	-13.170	0.358	1.0	93.2	0	15	0.0	93.2	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.078	1.690
PC-03	PB-03 & PB-04	Foundation Soils	24.6	19.8	89.5	0.289	-16.300	0.323	1.0	86.2	0	15	0.0	86.2	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.078	1.588
PC-03	PB-03 & PB-04	Foundation Soils	24.7	19.7	85.9	0.242	-17.250	0.282	1.0	82.6	0	15	0.0	82.6	1.0	-0.5	0.1	0.9	0.118	1.013	0.120	0.078	1.540
PC-03	PB-03 & PB-04	Foundation Soils	24.8	19.6	78.1	0.247	-13.530	0.316	1.0	75.0	3	15	0.0	75.0	1.0	-0.5	0.1	0.9	0.111	1.011	0.113	0.078	1.448
UC-01	UB-02	Foundation Soils	9.5	31.8	31.7	0.228	-9.670	0.718	1.7	50.1	32	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.071	1.399
UC-01	UB-02	Foundation Soils	9.6	31.7	34.9	0.131	-0.330	0.376	1.6	54.2	19	0	0.4	54.6	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.071	1.440
UC-01	UB-02	Foundation Soils	9.7	31.7	34.5	0.135	1.430	0.391	1.6	53.6	20	0	0.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.071	1.427
UC-01	UB-02	Foundation Soils	9.8	31.6	33.3	0.179	1.670	0.538	1.6	51.8	26	0	0.5	52.2	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.071	1.403
UC-01	UB-02	Foundation Soils	9.8	31.5	31.5	0.207	2.290	0.657	1.7	49.2	31	0	0.5	49.7	1.1	-0.1	0.0	1.0	0.092	1.008	0.098	0.072	1.370
UC-01	UB-02	Foundation Soils	9.9	31.4	30.8	0.213	0.770	0.692	1.7	48.1	33	0	0.5	48.6	1.1	-0.1	0.0	1.0	0.091	1.007	0.097	0.072	1.353
UC-01	UB-02	Foundation Soils	10.0	31.3	29.0	0.231	-1.240	0.797	1.7	45.5	37	0	0.5	46.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.095	0.072	1.320
UC-01	UB-02	Foundation Soils	10.1	31.2	27.4	0.272	-0.100	0.992	1.7	43.2	43	0	0.5	43.7	1.1	-0.1	0.0	1.0	0.088	1.007	0.093	0.072	1.291
UC-01	UB-02	Foundation Soils	10.2	31.2	28.4	0.375	-1.290	1.319	1.7	44.4	48	0	0.5	45.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.094	0.072	1.301
UC-01	UB-02	Foundation Soils	10.3	31.1	32.7	0.448	-3.480	1.372	1.6	50.1	45	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.073	1.358
UC-01	UB-02	Foundation Soils	10.3	31.0	42.0	0.497	-13.290	1.182	1.6	62.3	34	0	0.5	62.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.073	1.495
UC-01	UB-02	Foundation Soils	10.4	30.9	49.9	0.468	-20.580	0.938	1.5	72.1	25	0	0.5	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.118	0.073	1.613
UC-01	UB-02	Foundation Soils	10.5	30.8	55.2	0.418	-22.080	0.757	1.5	78.5	18	0	0.4	78.9	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.073	1.695
UC-01	UB-02	Foundation Soils	10.6	30.8	60.1	0.312	-23.600	0.519	1.5	84.3	8	0	0.1	84.4	1.1	-0.1	0.0	1.0	0.120	1.013	0.130	0.073	1.773
UC-01	UB-02	Foundation Soils	10.7	30.7	62.4	0.233	-24.250	0.373	1.5	87.0	1	0	0.0	87.0	1.1	-0.1	0.0	1.0	0.122	1.014	0.133	0.074	1.809
UC-01	UB-02	Foundation Soils	10.7	30.6	60.7	0.182	-23.300	0.300	1.5	84.6	0	0	0.0	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.130	0.074	1.766
UC-01	UB-02	Foundation Soils	10.8	30.5	57.5	0.236	-21.630	0.410	1.5	80.7	6	0	0.0	80.7	1.1	-0.2	0.0	1.0	0.116	1.012	0.126	0.074	1.701
UC-01	UB-02	Foundation Soils	10.9	30.4	50.6	0.317	-19.110	0.626	1.5	72.0	17	0	0.3	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.117	0.074	1.581
UC-01	UB-02	Foundation Soils	11.0	30.3	47.6	0.330	-17.720	0.694	1.5	68.0	21	0	0.4	68.4	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.074	1.527
UC-01	UB-02	Foundation Soils	11.1	30.3	42.0	0.317	-13.480	0.755	1.5	60.8	26	0	0.5	61.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.074	1.438
UC-01	UB-02	Foundation Soils	11.2	30.2	40.6	0.279	-9.950	0.687	1.5	58.8	25	0	0.5	59.3	1.1	-0.2	0.0	1.0	0.099	1.009	0.105	0.075	1.412
UC-01	UB-02	Foundation Soils	11.2	30.1	43.0	0.248	-7.960	0.576	1.5	61.8	21	0	0.4	62.2	1.1	-0.2	0.0	1.0	0.101	1.009	0.108	0.075	1.441
UC-01	UB-02	Foundation Soils	11.3	30.0	44.0	0.238	-5.050	0.541	1.5	62.9	19	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.075	1.450
UC-01	UB-02	Foundation Soils	11.4	29.9	44.1	0.230	-1.570	0.521	1.5	62.8	18	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.075	1.445
UC-01	UB-02	Foundation Soils	11.5	29.8	45.5	0.252	2.100	0.554	1.5	64.4	19	0	0.4	64.8	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.075	1.460
UC-01	UB-02	Foundation Soils	11.6	29.8	48.1	0.285	2.620	0.592	1.5	67.5	18	0	0.4	67.9	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.075	1.493
UC-01	UB-02	Foundation Soils	11.6	29.7	50.3	0.319	2.190	0.634	1.5	70.0	18	0	0.4	70.4	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.076	1.520
UC-01	UB-02	Foundation Soils	11.7	29.6	54.9	0.353	1.980	0.643	1.5	75.5	16	0	0.3	75.8	1.1	-0.2	0.0	1.0	0.112	1.011	0.120	0.076	1.585
UC-01	UB-02	Foundation Soils	11.8	29.5	58.7	0.402	1.520	0.684	1.4	79.9	15	0	0.3	80.2	1.1	-0.2	0.0	1.0	0.116	1.012	0.125	0.076	1.641
UC-01	UB-02	Foundation Soils	11.9	29.4	63.2	0.440	1.190	0.696	1.4	85.0	13	0	0.2	85.3	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.076	1.711
UC-01	UB-02	Foundation Soils	12.0	29.4	66.1	0.477	1.240	0.722	1.4	88.2	13	0	0.2	88.5	1.1	-0.2	0.0	1.0	0.124	1.014	0.134	0.076	1.756
UC-01	UB-02	Foundation Soils	12.1	29.3	68.0	0.507	1.300	0.745	1.4	90.3	13	0	0.2	90.5	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.076	1.784
UC-01	UB-02	Foundation Soils	12.1	29.2	70.0	0.518	1.190	0.740	1.4	92.4	12	0	0.2	92.6	1.1	-0.2	0.0	1.0	0.128	1.015	0.139	0.077	1.815
UC-01	UB-02	Foundation Soils	12.2	29.1	71.5	0.535	1.380	0.749	1.4	93.9	12	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.077	1.837
UC-01	UB-02	Foundation Soils	12.3	29.0	72.6	0.528	1.380	0.727	1.4	95.0	11	0	0.2	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.077	1.852
UC-01	UB-02	Foundation Soils	12.4	28.9	72.8	0.523	1.520	0.718	1.4	95.0	10	0	0.1	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.077	1.848
UC-01	UB-02	Foundation Soils	12.5	28.9	72.0	0.518	1.570	0.719	1.4	94.0	11	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.077	1.825
UC-01	UB-02	Foundation Soils	12.5	28.8	70.6	0.504	1.680	0.713	1.4	92.2	11	0	0.2	92.4	1.1	-0.2	0.0	1.0	0.128	1.015	0.138	0.077	1.790
UC-01	UB-02	Foundation Soils	12.6	28.7	69.4	0.482	1.720	0.695	1.4	90.5	11	0	0.2	90.7	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.077	1.759
UC-01	UB-02	Foundation Soils	12.7	28.6	67.5	0.464	2.020	0.687	1.4	88.2	12	0	0.2	88.4	1.1	-0.2	0.0	1.0	0.124	1.014	0.133	0.078	1.719
UC-01	UB-02	Foundation Soils	12.8	28.5	66.0	0.436	2.050	0.660	1.4	86.3	12	0	0.2	86.5	1.1	-0.2	0.0	1.0	0.122	1.014	0.131	0.078	1.686
UC-01	UB-02	Foundation Soils	12.9	28.5	65.4	0.411	2.150	0.629	1.4	85.4	11	0	0.2	85.5	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.078	1.668
UC-01	UB-02	Foundation Soils	13.0	28.4	64.7	0.379	2.380	0.586	1.4	84.4	10	0	0.1	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.129	0.078	1.650
UC-01	UB-02	Foundation Soils	13.0	28.3	64.5	0.375	2.430	0.582	1.4	84.0	10	0	0.1	84.1	1.1	-0.2	0.0	1.0	0.120	1.013	0.128	0.078	1.640

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	13.1	28.2	64.3	0.364	2.480	0.566	1.4	83.6	10	0	0.1	83.7	1.1	-0.2	0.0	1.0	0.119	1.013	0.128	0.078	1.631
UC-01	UB-02	Foundation Soils	13.2	28.1	60.0	0.361	6.380	0.601	1.4	78.5	13	0	0.2	78.7	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.078	1.560
UC-01	UB-02	Foundation Soils	13.3	28.0	62.8	0.370	2.380	0.589	1.4	81.5	11	0	0.2	81.7	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.078	1.597
UC-01	UB-02	Foundation Soils	13.4	28.0	62.4	0.366	2.330	0.587	1.4	80.9	12	0	0.2	81.0	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.079	1.585
UC-01	UB-02	Foundation Soils	13.5	27.9	61.4	0.358	2.540	0.583	1.4	79.6	12	0	0.2	79.8	1.1	-0.2	0.0	1.0	0.116	1.012	0.123	0.079	1.565
UC-01	UB-02	Foundation Soils	13.5	27.8	59.9	0.346	2.720	0.578	1.4	77.6	13	0	0.2	77.9	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.079	1.537
UC-01	UB-02	Foundation Soils	13.6	27.7	58.8	0.347	2.940	0.590	1.4	76.3	14	0	0.3	76.5	1.1	-0.2	0.0	1.0	0.113	1.011	0.120	0.079	1.517
UC-01	UB-02	Foundation Soils	13.7	27.6	58.3	0.374	3.050	0.641	1.4	75.5	16	0	0.3	75.8	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.079	1.506
UC-01	UB-02	Foundation Soils	13.8	27.6	58.1	0.458	3.150	0.789	1.4	75.1	20	0	0.4	75.5	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.079	1.498
UC-01	UB-02	Foundation Soils	13.9	27.5	57.4	0.517	3.150	0.900	1.4	74.2	23	0	0.5	74.6	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.079	1.485
UC-01	UB-02	Foundation Soils	13.9	27.4	56.0	0.548	3.190	0.978	1.4	72.4	25	0	0.5	72.9	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.079	1.461
UC-01	UB-02	Foundation Soils	14.0	27.3	53.2	0.477	3.330	0.896	1.4	69.0	25	0	0.5	69.5	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.080	1.419
UC-01	UB-02	Foundation Soils	14.1	27.2	50.5	0.465	3.780	0.920	1.4	65.7	27	0	0.5	66.1	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.080	1.379
UC-01	UB-02	Foundation Soils	14.2	27.1	55.0	0.458	4.340	0.832	1.4	70.8	23	0	0.4	71.2	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.080	1.434
UC-01	UB-02	Foundation Soils	14.3	27.1	70.2	0.457	4.220	0.651	1.3	88.0	11	0	0.2	88.1	1.1	-0.2	0.0	1.0	0.124	1.014	0.132	0.080	1.651
UC-01	UB-02	Foundation Soils	14.4	27.0	79.7	0.492	2.890	0.617	1.3	98.4	6	0	0.0	98.4	1.1	-0.2	0.0	1.0	0.135	1.017	0.145	0.080	1.817
UC-01	UB-02	Foundation Soils	14.4	26.9	75.4	0.530	2.150	0.703	1.3	93.4	10	0	0.1	93.5	1.1	-0.2	0.0	1.0	0.129	1.016	0.139	0.080	1.729
UC-01	UB-02	Foundation Soils	14.5	26.8	65.5	0.555	0.710	0.847	1.3	82.2	18	0	0.4	82.5	1.0	-0.2	0.0	1.0	0.118	1.013	0.125	0.080	1.564
UC-01	UB-02	Foundation Soils	14.6	26.7	54.3	0.587	0.620	1.080	1.4	69.2	29	0	0.5	69.7	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.080	1.405
UC-01	UB-02	Foundation Soils	14.7	26.6	37.4	0.621	2.050	1.659	1.4	49.2	48	0	0.6	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.080	1.196
UC-01	UB-02	Foundation Soils	14.8	26.6	25.5	0.658	3.850	2.578	1.4	34.5	69	0	0.5	35.1	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.081	1.059
UC-01	UB-02	Foundation Soils	14.8	26.5	15.7	0.640	6.340	4.087	1.5	21.9	88	0	0.5	22.4	1.0	-0.2	0.0	1.0	0.074	1.006	0.076	0.081	0.948
UC-01	UB-02	Foundation Soils	14.9	26.4	10.4	0.555	8.790	5.339	1.5	14.6	100	0	0.5	15.1	1.0	-0.2	0.0	1.0	0.069	1.006	0.072	0.081	0.886
UC-01	UB-02	Foundation Soils	15.0	26.3	8.7	0.457	9.480	5.235	1.5	12.2	100	0	0.5	12.7	1.0	-0.2	0.0	1.0	0.068	1.006	0.070	0.081	0.866
UC-01	UB-02	Foundation Soils	15.1	26.2	7.3	0.404	9.200	5.567	1.5	10.1	100	0	0.5	10.6	1.0	-0.2	0.0	1.0	0.067	1.006	0.069	0.081	0.848
UC-01	UB-02	Foundation Soils	15.2	26.2	6.8	0.295	12.530	4.314	1.5	9.5	100	0	0.5	10.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.081	0.842
UC-01	UB-02	Foundation Soils	15.3	26.1	6.2	0.225	29.660	3.655	1.5	8.6	100	0	0.5	9.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.081	0.833
UC-01	UB-02	Foundation Soils	15.3	26.0	3.9	0.135	59.460	3.425	1.5	5.5	100	0	0.5	5.9	1.0	-0.2	0.0	1.0	0.064	1.006	0.066	0.081	0.809
UC-01	UB-02	Foundation Soils	15.4	25.9	3.3	0.057	77.330	1.736	1.5	4.5	100	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.082	0.800
UC-01	UB-02	Foundation Soils	15.5	25.8	3.2	0.044	80.420	1.357	1.5	4.5	100	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.082	0.799
UC-01	UB-02	Foundation Soils	15.6	25.7	3.2	0.027	80.950	0.848	1.5	4.4	100	0	0.5	4.9	1.0	-0.2	0.0	1.0	0.063	1.006	0.065	0.082	0.797
UC-01	UB-02	Foundation Soils	15.7	25.7	3.2	0.023	79.850	0.724	1.5	4.4	100	0	0.5	4.8	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.082	0.795
UC-01	UB-02	Foundation Soils	15.7	25.6	3.1	0.025	80.950	0.802	1.5	4.3	100	0	0.5	4.7	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.082	0.793
UC-01	UB-02	Foundation Soils	15.8	25.5	3.5	0.017	85.770	0.492	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.082	0.796
UC-01	UB-02	Foundation Soils	15.9	25.4	11.1	0.017	88.220	0.154	1.4	15.1	54	0	0.5	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.082	0.874
UC-01	UB-02	Foundation Soils	16.0	25.3	23.1	0.066	70.800	0.286	1.4	30.5	34	0	0.5	31.0	1.0	-0.3	0.0	1.0	0.079	1.006	0.082	0.082	0.998
UC-01	UB-02	Foundation Soils	16.1	25.3	25.9	0.094	16.520	0.363	1.4	33.8	34	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.084	0.082	1.026
UC-01	UB-02	Foundation Soils	16.2	25.2	18.8	0.171	10.290	0.909	1.4	25.1	58	0	0.5	25.6	1.0	-0.3	0.0	1.0	0.076	1.006	0.078	0.082	0.951
UC-01	UB-02	Foundation Soils	16.2	25.1	16.1	0.230	18.480	1.430	1.4	21.6	71	0	0.5	22.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.076	0.083	0.921
UC-01	UB-02	Foundation Soils	16.3	25.0	15.3	0.310	22.870	2.024	1.4	20.6	75	0	0.5	21.1	1.0	-0.3	0.0	1.0	0.073	1.006	0.075	0.083	0.912
UC-01	UB-02	Foundation Soils	16.4	24.9	11.9	0.287	25.020	2.421	1.4	15.9	87	0	0.5	16.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.083	0.873
UC-01	UB-02	Foundation Soils	16.5	24.8	9.2	0.263	11.650	2.849	1.4	12.4	98	0	0.5	12.9	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.083	0.845
UC-01	UB-02	Foundation Soils	16.6	24.8	10.2	0.261	30.940	2.563	1.4	13.6	93	0	0.5	14.1	1.0	-0.3	0.0	1.0	0.069	1.006	0.071	0.083	0.853
UC-01	UB-02	Foundation Soils	16.7	24.7	11.7	0.244	21.440	2.090	1.4	15.6	85	0	0.5	16.1	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.083	0.867
UC-01	UB-02	Foundation Soils	16.7	24.6	8.9	0.208	26.560	2.338	1.4	11.8	96	0	0.5	12.3	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.083	0.837
UC-01	UB-02	Foundation Soils	16.8	24.5	5.5	0.155	36.080	2.810	1.4	7.3	100	0	0.5	7.8	1.0	-0.3	0.0	1.0	0.065	1.006	0.067	0.083	0.802
UC-01	UB-02	Foundation Soils	16.9	24.4	4.1	0.138	51.740	3.331	1.4	5.5	100	0	0.5	6.0	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.083	0.788
UC-01	UB-02	Foundation Soils	17.0	24.4	3.9	0.096	62.650	2.461	1.4	5.2	100	0	0.5	5.6	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.083	0.784
UC-01	UB-02	Foundation Soils	17.1	24.3	3.8	0.083	71.180	2.187	1.4	5.0	100	0	0.5	5.5	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.084	0.782
UC-01	UB-02	Foundation Soils	17.1	24.2	3.6	0.057	66.940	1.580	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.084	0.779
UC-01	UB-02	Foundation Soils	17.2	24.1	3.6	0.016	70.700	0.441	1.4	4.8	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.084	0.778
UC-01	UB-02	Foundation Soils	17.3	24.0	3.6	0.020	77.710	0.555	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.084	0.777
UC-01	UB-02	Foundation Soils	17.4	23.9	4.4	0.021	79.710	0.473	1.4	5.8	100	0	0.5	6.3	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.084	0.784
UC-01	UB-02	Foundation Soils	17.5	23.9	7.7	0.039	82.140	0.506	1.4	10.0	78	0	0.5	10.5	1.0	-0.3	0.0	1.0	0.067	1.006	0.068	0.084	0.814
UC-01	UB-02	Foundation Soils	17.6	23.8	10.3	0.121	26.730	1.175	1.4	13.4	79	0	0.5	13.9	1.0	-0.3	0.0	1.0	0.069	1.006	0.070	0.084	0.838
UC-01	UB-02	Foundation Soils	17.6	23.7	11.8	0.168	19.730	1.426	1.4	15.3	78	0	0.5	15.8	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.084	0.852
UC-01	UB-02	Foundation Soils	17.7	23.6	6.7	0.177	9.510	2.646	1.4	8.7	100	0	0.5	9.1	1.0	-0.3	0.0	0.9	0.066	1.006	0.068	0.084	0.801
UC-01	UB-02	Foundation Soils	17.8	23.5	5.3	0.169	22.960	3.187	1.4	6.8	100	0	0.5	7.3	1.0	-0.3	0.0	0.9	0.065	1.006	0.066	0.084	0.787
UC-01	UB-02	Foundation Soils	17.9	23.5	4.6	0.160	27.560	3.462	1.4	6.0	100	0	0.5	6.4	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.084	0.780
UC-01	UB-02	Foundation Soils	18.0	23.4	4.2	0.108	40.740	2.569	1.4	5.4	100	0	0.5	5.9	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.085	0.775
UC-01	UB-02	Foundation Soils	18.0	23.3	3.9	0.095	59.000	2.443	1.3	4.8	100	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.085	1.035
UC-01	UB-02	Foundation Soils	18.1	23.2	4.6	0.075	69.130	1.616	1.3	5.7	100	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.085	1.043

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	18.2	23.1	5.6	0.078	66.510	1.404	1.3	6.8	100	15	34.8	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.085	1.053
UC-01	UB-02	Foundation Soils	18.3	23.0	5.3	0.076	8.950	1.435	1.3	6.5	100	15	34.8	41.2	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.085	1.049
UC-01	UB-02	Foundation Soils	18.4	23.0	4.8	0.077	29.940	1.595	1.3	5.9	100	15	34.7	40.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.085	1.042
UC-01	UB-02	Foundation Soils	18.5	22.9	4.1	0.069	41.450	1.663	1.3	5.1	100	15	34.5	39.6	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.085	1.032
UC-01	UB-02	Foundation Soils	18.5	22.8	3.8	0.052	51.870	1.385	1.3	4.6	100	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.085	1.026
UC-01	UB-02	Foundation Soils	18.6	22.7	3.6	0.038	62.470	1.061	1.3	4.4	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.085	1.022
UC-01	UB-02	Foundation Soils	18.7	22.6	3.6	0.028	71.900	0.785	1.3	4.3	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.085	1.021
UC-01	UB-02	Foundation Soils	18.8	22.5	3.6	0.035	71.280	0.982	1.3	4.3	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.085	1.020
UC-01	UB-02	Foundation Soils	18.9	22.5	3.5	0.028	72.820	0.794	1.3	4.3	100	15	34.3	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.087	0.085	1.018
UC-01	UB-02	Foundation Soils	18.9	22.4	3.8	0.018	76.870	0.475	1.3	4.6	100	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.086	1.020
UC-01	UB-02	Foundation Soils	19.0	22.3	4.2	0.023	74.230	0.552	1.3	5.0	100	15	34.5	39.5	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.086	1.023
UC-01	UB-02	Foundation Soils	19.1	22.2	5.1	0.019	68.390	0.369	1.3	6.2	94	15	34.6	40.8	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.086	1.033
UC-01	UB-02	Foundation Soils	19.2	22.1	5.8	0.025	56.600	0.435	1.3	6.9	91	15	34.7	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.086	1.038
UC-01	UB-02	Foundation Soils	19.3	22.1	4.8	0.027	43.120	0.563	1.3	5.7	100	15	34.6	40.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.086	1.027
UC-01	UB-02	Foundation Soils	19.4	22.0	4.0	0.023	56.410	0.578	1.3	4.8	100	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.086	1.017
UC-01	UB-02	Foundation Soils	19.4	21.9	4.1	0.051	73.490	1.253	1.3	4.9	100	15	34.5	39.3	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.086	1.016
UC-01	UB-02	Foundation Soils	19.5	21.8	4.5	0.076	73.980	1.684	1.3	5.4	100	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.086	1.021
UC-01	UB-02	Foundation Soils	19.6	21.7	4.8	0.175	71.040	3.666	1.3	5.7	100	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.086	1.022
UC-01	UB-02	Foundation Soils	19.7	21.6	4.5	0.123	65.130	2.742	1.3	5.3	100	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.086	1.018
UC-01	UB-02	Foundation Soils	19.8	21.6	4.6	0.094	59.750	2.025	1.3	5.5	100	15	34.6	40.1	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.086	1.019
UC-01	UB-02	Foundation Soils	19.8	21.5	13.4	0.063	83.310	0.470	1.2	15.6	61	15	35.2	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.086	1.109
UC-01	UB-02	Foundation Soils	19.9	21.4	54.2	0.063	98.530	0.116	1.2	62.2	0	0	0.0	62.2	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.086	1.212
UC-01	UB-02	Foundation Soils	20.0	21.3	62.0	0.090	-0.200	0.145	1.2	70.5	0	0	0.0	70.5	1.0	-0.3	0.0	0.9	0.108	1.010	0.112	0.086	1.292
UC-01	UB-02	Foundation Soils	20.1	21.2	47.1	0.135	0.380	0.287	1.2	54.3	13	0	0.2	54.5	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.087	1.139
UC-01	UB-02	Foundation Soils	20.2	21.2	37.1	0.171	6.730	0.461	1.2	43.2	28	0	0.4	43.7	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.087	1.045
UC-01	UB-02	Foundation Soils	20.3	21.1	22.4	0.256	18.200	1.145	1.3	26.7	59	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.087	0.910
UC-01	UB-02	Foundation Soils	20.3	21.0	20.1	0.344	25.510	1.708	1.3	24.1	70	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.087	0.890
UC-01	UB-02	Foundation Soils	20.4	20.9	27.8	0.416	26.820	1.498	1.2	32.6	58	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.087	0.956
UC-01	UB-02	Foundation Soils	20.5	20.8	30.6	0.384	26.520	1.257	1.2	35.7	52	0	0.5	36.2	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.087	0.980
UC-01	UB-02	Foundation Soils	20.6	20.7	16.4	0.277	16.910	1.686	1.3	19.7	74	0	0.5	20.2	1.0	-0.4	0.0	0.9	0.073	1.006	0.074	0.087	0.854
UC-01	UB-02	Foundation Soils	20.7	20.7	13.2	0.210	18.250	1.593	1.3	15.7	80	0	0.5	16.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.087	0.824
UC-01	UB-02	Foundation Soils	20.8	20.6	23.7	0.132	21.150	0.558	1.2	27.8	45	0	0.5	28.3	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.087	0.915
UC-01	UB-02	Foundation Soils	20.8	20.5	48.4	0.112	21.720	0.231	1.2	54.8	10	0	0.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.087	1.135
UC-01	UB-02	Foundation Soils	20.9	20.4	72.9	0.114	11.480	0.156	1.2	80.6	0	0	0.0	80.6	1.0	-0.4	0.0	0.9	0.116	1.012	0.121	0.087	1.390
UC-01	UB-02	Foundation Soils	21.0	20.3	75.9	0.151	9.770	0.199	1.2	83.6	0	0	0.0	83.6	1.0	-0.4	0.0	0.9	0.119	1.013	0.124	0.087	1.424
UC-01	UB-02	Foundation Soils	21.1	20.3	51.3	0.300	8.910	0.584	1.2	57.7	22	0	0.4	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.087	1.160
UC-01	UB-02	Foundation Soils	21.2	20.2	33.3	0.354	8.580	1.064	1.2	38.1	46	0	0.5	38.6	1.0	-0.4	0.0	0.9	0.084	1.007	0.087	0.087	0.993
UC-01	UB-02	Foundation Soils	21.2	20.1	19.5	0.345	14.680	1.766	1.2	22.8	70	0	0.5	23.3	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.087	0.873
UC-01	UB-02	Foundation Soils	21.3	20.0	15.2	0.444	15.910	2.927	1.2	17.8	89	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.087	0.835
UC-01	UB-02	Foundation Soils	21.4	19.9	15.7	0.417	30.110	2.658	1.2	18.3	86	0	0.5	18.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.087	0.838
UC-01	UB-02	Foundation Soils	21.5	19.8	37.5	0.279	22.870	0.745	1.2	42.4	36	0	0.5	42.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.090	0.087	1.025
UC-01	UB-02	Foundation Soils	21.6	19.8	41.6	0.307	13.390	0.738	1.2	46.7	33	0	0.5	47.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.093	0.087	1.060
UC-01	UB-02	Foundation Soils	21.7	19.7	34.9	0.300	18.800	0.861	1.2	39.4	41	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.087	0.999
UC-01	UB-02	Foundation Soils	21.7	19.6	35.3	0.224	20.160	0.635	1.2	39.7	35	0	0.5	40.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.087	1.001
UC-01	UB-02	Foundation Soils	21.8	19.5	35.0	0.294	20.890	0.841	1.2	39.3	41	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.088	0.998
UC-01	UB-02	Foundation Soils	21.9	19.4	39.5	0.503	17.960	1.273	1.2	44.1	45	0	0.5	44.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.088	1.036
UC-01	UB-02	Foundation Soils	22.0	19.3	52.4	0.449	19.850	0.857	1.2	57.7	29	0	0.5	58.2	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.088	1.152
UC-01	UB-02	Foundation Soils	22.1	19.3	65.8	0.600	16.480	0.912	1.2	71.6	24	0	0.5	72.0	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.088	1.283
UC-01	UB-02	Foundation Soils	22.1	19.2	73.2	0.433	17.530	0.592	1.1	79.1	12	0	0.2	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.119	0.088	1.359
UC-01	UB-02	Foundation Soils	22.2	19.1	70.7	0.376	7.340	0.532	1.1	76.4	11	0	0.2	76.5	1.0	-0.4	0.0	0.9	0.113	1.011	0.116	0.088	1.328
UC-01	UB-02	Foundation Soils	22.3	19.0	70.4	0.290	24.020	0.412	1.1	76.0	7	0	0.0	76.1	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.088	1.322
UC-01	UB-02	Foundation Soils	22.4	18.9	71.9	0.378	13.870	0.526	1.1	77.4	11	0	0.1	77.6	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.088	1.337
UC-01	UB-02	Foundation Soils	22.5	18.9	68.5	0.469	11.860	0.685	1.1	73.7	17	0	0.3	74.1	1.0	-0.4	0.0	0.9	0.111	1.011	0.114	0.088	1.299
UC-01	UB-02	Foundation Soils	22.6	18.8	64.2	0.485	20.770	0.756	1.1	69.2	21	0	0.4	69.6	1.0	-0.4	0.0	0.9	0.107	1.010	0.110	0.088	1.254
UC-01	UB-02	Foundation Soils	22.6	18.7	56.6	0.443	19.700	0.783	1.1	61.3	25	0	0.5	61.7	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.088	1.178
UC-01	UB-02	Foundation Soils	22.7	18.6	52.8	0.304	22.390	0.576	1.1	57.2	22	0	0.4	57.6	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.088	1.141
UC-01	UB-02	Foundation Soils	22.8	18.5	58.4	0.300	22.060	0.514	1.1	62.9	17	0	0.3	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.088	1.191
UC-01	UB-02	Foundation Soils	22.9	18.4	76.4	0.354	16.510	0.463	1.1	81.3	7	0	0.0	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.088	1.373
UC-01	UB-02	Foundation Soils	23.0	18.4	76.7	0.356	16.320	0.464	1.1	81.4	7	0	0.0	81.4	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.088	1.374
UC-01	UB-02	Foundation Soils	23.0	18.3	73.0	0.362	17.010	0.496	1.1	77.6	10	0	0.1	77.7	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.088	1.332
UC-01	UB-02	Foundation Soils	23.1	18.2	75.4	0.386	19.210	0.512	1.1	79.9	9	0	0.1	80.0	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.088	1.356
UC-01	UB-02	Foundation Soils	23.2	18.1	80.6	0.379	19.300	0.470	1.1	85.0	6	0	0.0	85.0	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.088	1.414

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	23.3	18.0	81.6	0.411	22.390	0.504	1.1	85.9	7	0	0.0	85.9	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.088	1.423
UC-01	UB-02	Foundation Soils	23.4	18.0	80.6	0.515	23.110	0.639	1.1	84.8	11	0	0.2	85.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.088	1.411
UC-01	UB-02	Foundation Soils	23.5	17.9	78.0	0.561	22.910	0.719	1.1	82.0	15	0	0.3	82.3	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.088	1.379
UC-01	UB-02	Foundation Soils	23.5	17.8	76.3	0.586	24.350	0.768	1.1	80.2	17	0	0.3	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.120	0.088	1.358
UC-01	UB-02	Foundation Soils	23.6	17.7	73.2	0.566	24.060	0.773	1.1	76.9	18	0	0.4	77.3	1.0	-0.4	0.0	0.9	0.113	1.011	0.117	0.088	1.322
UC-01	UB-02	Foundation Soils	23.7	17.6	77.4	0.574	23.420	0.742	1.1	81.0	16	0	0.3	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.088	1.366
UC-01	UB-02	Foundation Soils	23.8	17.5	82.8	0.632	19.680	0.763	1.1	86.3	14	0	0.3	86.6	1.0	-0.4	0.0	0.9	0.122	1.014	0.126	0.088	1.427
UC-01	UB-02	Foundation Soils	23.9	17.5	81.7	0.653	15.390	0.799	1.1	85.0	16	0	0.3	85.4	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.088	1.412
UC-01	UB-02	Foundation Soils	23.9	17.4	78.7	0.592	17.120	0.752	1.1	81.9	16	0	0.3	82.3	1.0	-0.4	0.1	0.9	0.118	1.013	0.121	0.088	1.374
UC-01	UB-02	Foundation Soils	24.0	17.3	77.0	0.581	20.020	0.755	1.1	80.1	16	0	0.3	80.4	1.0	-0.4	0.1	0.9	0.116	1.012	0.120	0.088	1.353
UC-01	UB-02	Foundation Soils	24.1	17.2	90.4	0.558	20.490	0.617	1.1	93.4	8	0	0.1	93.4	1.0	-0.4	0.1	0.9	0.129	1.016	0.134	0.088	1.513
UC-01	UB-02	Foundation Soils	24.2	17.1	102.2	0.491	18.960	0.480	1.1	105.0	0	0	0.0	105.0	1.0	-0.5	0.1	0.9	0.144	1.020	0.150	0.088	1.695
UC-01	UB-02	Foundation Soils	24.3	17.1	101.9	0.487	17.410	0.478	1.1	104.5	0	0	0.0	104.5	1.0	-0.5	0.1	0.9	0.143	1.019	0.149	0.088	1.685
UC-01	UB-02	Foundation Soils	24.4	17.0	97.3	0.500	17.960	0.514	1.1	99.9	2	0	0.0	99.9	1.0	-0.5	0.1	0.9	0.137	1.018	0.142	0.088	1.606
UC-01	UB-02	Foundation Soils	24.4	16.9	91.8	0.498	20.490	0.543	1.1	94.2	5	0	0.0	94.2	1.0	-0.5	0.1	0.9	0.130	1.016	0.135	0.088	1.521
UC-01	UB-02	Foundation Soils	24.5	16.8	84.8	0.445	20.630	0.525	1.1	87.1	7	0	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.126	0.088	1.427
UC-01	UB-02	Foundation Soils	24.6	16.7	80.8	0.435	21.060	0.538	1.1	83.1	9	0	0.1	83.2	1.0	-0.5	0.1	0.9	0.119	1.013	0.122	0.088	1.379
UC-01	UB-02	Foundation Soils	24.7	16.6	71.3	0.463	22.540	0.649	1.1	73.5	16	0	0.3	73.8	1.0	-0.5	0.1	0.9	0.110	1.011	0.113	0.089	1.278
UC-01	UB-02	Foundation Soils	24.8	16.6	63.9	0.492	21.150	0.770	1.1	65.9	23	0	0.4	66.4	1.0	-0.5	0.1	0.9	0.104	1.010	0.107	0.089	1.205
UC-01	UB-02	Foundation Soils	24.9	16.5	49.9	0.523	22.730	1.048	1.1	51.8	36	0	0.5	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.089	1.081
UC-01	UB-02	Foundation Soils	24.9	16.4	42.5	0.513	27.350	1.206	1.1	44.3	43	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.089	1.018
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.7	21.2	0.217	-0.090	1.023	1.6	32.9	49	20	42.3	75.2	1.1	-0.1	0.0	1.0	0.112	1.011	0.122	0.058	2.097
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.6	20.7	0.205	-0.110	0.989	1.6	32.1	49	20	42.2	74.3	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.058	2.069
UC-02A	UB-02 & UB-03	Foundation Soils	7.2	34.5	19.8	0.184	-0.050	0.931	1.6	30.7	50	20	42.0	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.119	0.059	2.027
UC-02A	UB-02 & UB-03	Foundation Soils	7.3	34.5	19.1	0.158	-0.050	0.829	1.6	29.6	49	20	41.6	71.2	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.059	1.992
UC-02A	UB-02 & UB-03	Foundation Soils	7.4	34.4	19.1	0.139	-0.240	0.727	1.6	29.6	47	20	41.3	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.059	1.975
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.3	19.5	0.124	-0.100	0.636	1.6	30.1	44	20	40.8	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.060	1.966
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.2	19.8	0.117	-0.050	0.590	1.6	30.5	43	20	40.6	71.1	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.060	1.957
UC-02A	UB-02 & UB-03	Foundation Soils	7.6	34.1	19.7	0.110	-0.100	0.560	1.6	30.2	42	20	40.4	70.6	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.060	1.939
UC-02A	UB-02 & UB-03	Foundation Soils	7.7	34.0	19.3	0.099	-0.010	0.513	1.6	29.6	42	20	40.1	69.7	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.060	1.915
UC-02A	UB-02 & UB-03	Foundation Soils	7.8	34.0	18.7	0.105	-0.050	0.562	1.6	28.6	44	20	40.5	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.061	1.895
UC-02A	UB-02 & UB-03	Foundation Soils	7.9	33.9	18.5	0.112	-0.050	0.604	1.6	28.3	45	20	40.7	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.061	1.884
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.8	18.0	0.112	-0.050	0.621	1.6	27.5	47	20	40.8	68.3	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.061	1.864
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.7	17.5	0.119	0.000	0.679	1.6	26.7	49	20	41.0	67.7	1.1	-0.1	0.0	1.0	0.105	1.010	0.114	0.062	1.845
UC-02A	UB-02 & UB-03	Foundation Soils	8.1	33.6	17.1	0.127	-0.050	0.741	1.6	26.1	51	20	41.2	67.3	1.1	-0.1	0.0	1.0	0.105	1.010	0.113	0.062	1.830
UC-02A	UB-02 & UB-03	Foundation Soils	8.2	33.5	16.3	0.129	-0.330	0.791	1.6	24.8	54	20	41.3	66.1	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.062	1.803
UC-02A	UB-02 & UB-03	Foundation Soils	8.3	33.5	15.8	0.124	0.000	0.786	1.6	24.0	55	20	41.2	65.2	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.062	1.782
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.4	15.4	0.119	-0.140	0.775	1.6	23.3	56	20	41.2	64.5	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.063	1.763
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.3	15.0	0.114	0.000	0.761	1.6	22.7	56	20	41.1	63.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.063	1.745
UC-02A	UB-02 & UB-03	Foundation Soils	8.5	33.2	14.9	0.110	0.000	0.741	1.6	22.4	56	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.063	1.733
UC-02A	UB-02 & UB-03	Foundation Soils	8.6	33.1	14.9	0.109	0.000	0.731	1.6	22.5	56	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.064	1.725
UC-02A	UB-02 & UB-03	Foundation Soils	8.7	33.1	14.8	0.112	-0.190	0.757	1.6	22.2	57	20	41.1	63.3	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.064	1.715
UC-02A	UB-02 & UB-03	Foundation Soils	8.8	33.0	14.3	0.117	0.000	0.816	1.6	21.5	59	20	41.1	62.7	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.064	1.699
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.9	13.8	0.110	-0.290	0.799	1.6	20.7	60	20	41.0	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.108	0.064	1.678
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.8	13.3	0.088	0.000	0.662	1.6	19.9	58	20	40.7	60.7	1.1	-0.1	0.0	1.0	0.100	1.009	0.107	0.065	1.657
UC-02A	UB-02 & UB-03	Foundation Soils	9.0	32.7	12.6	0.082	-0.050	0.653	1.6	18.8	60	20	40.6	59.5	1.1	-0.1	0.0	1.0	0.099	1.009	0.106	0.065	1.635
UC-02A	UB-02 & UB-03	Foundation Soils	9.1	32.6	11.5	0.081	0.000	0.702	1.6	17.3	64	20	40.6	57.9	1.1	-0.1	0.0	1.0	0.098	1.008	0.105	0.065	1.608
UC-02A	UB-02 & UB-03	Foundation Soils	9.2	32.6	11.0	0.080	-0.190	0.725	1.6	16.5	66	20	40.6	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.065	1.591
UC-02A	UB-02 & UB-03	Foundation Soils	9.3	32.5	11.2	0.081	1.750	0.726	1.6	16.7	66	20	40.6	57.3	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.065	1.586
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.4	11.2	0.089	2.570	0.792	1.6	16.7	67	20	40.7	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.066	1.582
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.3	11.2	0.103	4.510	0.922	1.6	16.6	70	20	40.8	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.066	1.576
UC-02A	UB-02 & UB-03	Foundation Soils	9.5	32.2	11.0	0.121	5.490	1.102	1.6	16.3	69	20	40.7	57.0	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.066	1.564
UC-02A	UB-02 & UB-03	Foundation Soils	9.6	32.2	10.4	0.124	6.200	1.192	1.6	15.4	72	20	40.7	56.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.103	0.066	1.547
UC-02A	UB-02 & UB-03	Foundation Soils	9.7	32.1	9.7	0.134	5.340	1.378	1.6	14.4	72	20	40.5	54.9	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.067	1.527
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	32.0	9.0	0.141	4.820	1.565	1.6	13.4	77	20	40.5	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.067	1.508
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	31.9	8.2	0.133	3.760	1.613	1.6	12.2	81	20	40.4	52.6	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.067	1.488
UC-02A	UB-02 & UB-03	Foundation Soils	9.9	31.8	9.3	0.119	2.420	1.283	1.6	13.7	73	20	40.3	54.0	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.067	1.500
UC-02A	UB-02 & UB-03	Foundation Soils	10.0	31.7	10.1	0.117	-2.520	1.157	1.6	14.8	73	20	40.6	55.4	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.068	1.511
UC-02A	UB-02 & UB-03	Foundation Soils	10.1	31.7	9.7	0.114	-3.380	1.173	1.6	14.2	74	20	40.5	54.8	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.068	1.498
UC-02A	UB-02 & UB-03	Foundation Soils	10.2	31.6	9.6	0.108	1.650	1.128	1.5	14.0	74	20	40.5	54.5	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.068	1.489
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.5	9.3	0.095	5.250	1.026	1.5	13.5	74	20	40.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.068	1.477
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.4	9.2	0.098	4.910	1.064	1.5	13.4	75	20	40.4	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.068	1.471

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	10.4	31.3	9.3	0.101	2.070	1.092	1.5	13.4	71	20	40.2	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.069	1.464
UC-02A	UB-02 & UB-03	Foundation Soils	10.5	31.3	9.4	0.122	1.720	1.292	1.5	13.7	74	20	40.4	54.1	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.069	1.464
UC-02A	UB-02 & UB-03	Foundation Soils	10.6	31.2	9.2	0.131	3.220	1.425	1.5	13.3	76	20	40.4	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.069	1.455
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.1	8.4	0.132	5.190	1.575	1.5	12.1	81	20	40.4	52.5	1.0	-0.1	0.0	1.0	0.094	1.008	0.099	0.069	1.436
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.0	8.1	0.133	8.160	1.640	1.5	11.7	83	20	40.3	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.069	1.427
UC-02A	UB-02 & UB-03	Foundation Soils	10.8	30.9	9.4	0.124	8.860	1.316	1.5	13.5	75	20	40.4	53.9	1.0	-0.2	0.0	1.0	0.095	1.008	0.101	0.070	1.444
UC-02A	UB-02 & UB-03	Foundation Soils	10.9	30.8	10.7	0.112	3.690	1.044	1.5	15.3	70	20	40.6	55.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.102	0.070	1.462
UC-02A	UB-02 & UB-03	Foundation Soils	11.0	30.8	12.6	0.121	0.330	0.963	1.5	17.7	68	20	41.0	58.7	1.1	-0.2	0.0	1.0	0.099	1.008	0.104	0.070	1.491
UC-02A	UB-02 & UB-03	Foundation Soils	11.1	30.7	13.4	0.139	-0.450	1.036	1.5	18.8	67	20	41.1	60.0	1.1	-0.2	0.0	1.0	0.100	1.009	0.105	0.070	1.502
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.6	13.7	0.137	1.240	0.999	1.5	19.2	66	20	41.1	60.3	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.070	1.502
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.5	13.7	0.127	4.670	0.925	1.5	19.2	65	20	41.1	60.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.071	1.496
UC-02A	UB-02 & UB-03	Foundation Soils	11.3	30.4	14.4	0.135	5.860	0.939	1.5	20.0	64	20	41.2	61.1	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.071	1.503
UC-02A	UB-02 & UB-03	Foundation Soils	11.4	30.4	15.9	0.149	1.200	0.935	1.5	22.0	60	20	41.3	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.071	1.525
UC-02A	UB-02 & UB-03	Foundation Soils	11.5	30.3	16.7	0.172	0.240	1.030	1.5	22.9	61	20	41.6	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.071	1.535
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.2	16.8	0.201	0.670	1.199	1.5	23.0	63	20	41.8	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.071	1.533
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.1	17.1	0.240	3.110	1.405	1.4	23.3	66	20	42.0	65.3	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.072	1.536
UC-02A	UB-02 & UB-03	Foundation Soils	11.7	30.0	17.8	0.231	4.750	1.298	1.4	24.2	63	20	42.0	66.2	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.072	1.543
UC-02A	UB-02 & UB-03	Foundation Soils	11.8	29.9	18.6	0.228	5.380	1.227	1.4	25.1	61	20	42.0	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.111	0.072	1.551
UC-02A	UB-02 & UB-03	Foundation Soils	11.9	29.9	19.9	0.240	5.960	1.204	1.4	26.8	59	20	42.2	69.0	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.072	1.569
UC-02A	UB-02 & UB-03	Foundation Soils	12.0	29.8	21.2	0.218	5.650	1.030	1.4	28.3	54	20	42.0	70.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.114	0.072	1.582
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.7	22.2	0.198	3.430	0.892	1.4	29.6	50	20	41.7	71.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.072	1.591
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.6	23.2	0.188	3.290	0.812	1.4	30.8	47	20	41.5	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.116	0.073	1.599
UC-02A	UB-02 & UB-03	Foundation Soils	12.2	29.5	24.1	0.194	5.270	0.804	1.4	31.9	46	20	41.5	73.4	1.1	-0.2	0.0	1.0	0.110	1.011	0.117	0.073	1.610
UC-02A	UB-02 & UB-03	Foundation Soils	12.3	29.4	24.6	0.238	5.880	0.967	1.4	32.4	48	20	42.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.073	1.620
UC-02A	UB-02 & UB-03	Foundation Soils	12.4	29.4	24.6	0.261	6.190	1.062	1.4	32.3	50	20	42.3	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.073	1.618
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.3	24.0	0.356	7.190	1.483	1.4	31.5	58	20	43.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.073	1.612
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.2	24.1	0.350	7.880	1.450	1.4	31.6	57	20	43.0	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.073	1.609
UC-02A	UB-02 & UB-03	Foundation Soils	12.6	29.1	27.9	0.344	10.290	1.235	1.4	36.1	50	20	43.0	79.1	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.073	1.667
UC-02A	UB-02 & UB-03	Foundation Soils	12.7	29.0	27.1	0.335	17.770	1.235	1.4	35.1	50	20	43.0	78.1	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.074	1.648
UC-02A	UB-02 & UB-03	Foundation Soils	12.8	29.0	24.3	0.335	6.170	1.378	1.4	31.6	56	20	42.9	74.5	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.074	1.596
UC-02A	UB-02 & UB-03	Foundation Soils	12.9	28.9	23.2	0.288	3.910	1.239	1.4	30.2	55	20	42.6	72.8	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.074	1.570
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.8	21.7	0.259	6.670	1.193	1.4	28.3	57	20	42.3	70.6	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.074	1.539
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.7	20.7	0.331	9.480	1.598	1.4	26.9	64	20	42.6	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.074	1.523
UC-02A	UB-02 & UB-03	Foundation Soils	13.1	28.6	18.1	0.380	9.600	2.096	1.4	23.7	70	20	42.4	66.0	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.074	1.477
UC-02A	UB-02 & UB-03	Foundation Soils	13.2	28.5	15.2	0.398	3.020	2.617	1.4	20.0	77	20	41.9	61.8	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.075	1.425
UC-02A	UB-02 & UB-03	Foundation Soils	13.3	28.5	13.2	0.263	5.340	1.989	1.4	17.4	76	20	41.3	58.7	1.0	-0.2	0.0	1.0	0.099	1.008	0.104	0.075	1.387
UC-02A	UB-02 & UB-03	Foundation Soils	13.4	28.4	12.1	0.197	11.400	1.627	1.4	16.0	75	20	40.9	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.075	1.364
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.3	17.8	0.135	20.680	0.759	1.4	23.1	55	20	41.1	64.2	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.075	1.442
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.2	20.5	0.061	7.310	0.297	1.4	26.6	38	20	38.5	65.1	1.0	-0.2	0.0	1.0	0.103	1.009	0.109	0.075	1.449
UC-02A	UB-02 & UB-03	Foundation Soils	13.6	28.1	17.6	0.041	-5.620	0.233	1.4	22.9	40	20	38.5	61.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.075	1.405
UC-02A	UB-02 & UB-03	Foundation Soils	13.7	28.1	15.4	0.049	-2.530	0.319	1.4	20.0	48	20	39.5	59.5	1.0	-0.2	0.0	1.0	0.099	1.009	0.104	0.075	1.381
UC-02A	UB-02 & UB-03	Foundation Soils	13.8	28.0	12.5	0.049	2.140	0.392	1.4	16.3	58	20	39.9	56.2	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.076	1.342
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.9	10.5	0.070	22.000	0.665	1.4	13.8	70	20	40.2	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.076	1.316
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.8	9.6	0.091	26.680	0.948	1.4	12.5	74	20	40.1	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.076	1.300
UC-02A	UB-02 & UB-03	Foundation Soils	14.0	27.7	10.1	0.101	27.490	0.999	1.4	13.2	73	20	40.2	53.4	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.076	1.305
UC-02A	UB-02 & UB-03	Foundation Soils	14.1	27.6	11.9	0.122	20.960	1.023	1.4	15.4	70	20	40.6	56.0	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.076	1.329
UC-02A	UB-02 & UB-03	Foundation Soils	14.2	27.6	12.6	0.109	14.850	0.864	1.4	16.3	69	20	40.7	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.076	1.336
UC-02A	UB-02 & UB-03	Foundation Soils	14.3	27.5	12.3	0.122	8.720	0.992	1.4	15.8	69	20	40.6	56.4	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.076	1.328
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.4	13.3	0.124	11.770	0.935	1.4	17.0	69	20	40.8	57.8	1.0	-0.2	0.0	1.0	0.098	1.008	0.102	0.076	1.340
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.3	18.4	0.139	9.710	0.757	1.3	23.2	55	20	41.1	64.3	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.077	1.408
UC-02A	UB-02 & UB-03	Foundation Soils	14.5	27.2	22.2	0.170	9.370	0.767	1.3	27.8	49	20	41.3	69.0	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.077	1.460
UC-02A	UB-02 & UB-03	Foundation Soils	14.6	27.2	31.1	0.212	10.390	0.682	1.3	38.4	37	20	40.5	78.9	1.0	-0.2	0.0	1.0	0.115	1.012	0.121	0.077	1.579
UC-02A	UB-02 & UB-03	Foundation Soils	14.7	27.1	39.3	0.271	8.340	0.690	1.3	47.9	30	20	39.2	87.0	1.0	-0.2	0.0	1.0	0.123	1.014	0.130	0.077	1.690
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	27.0	47.7	0.379	7.770	0.794	1.3	57.5	27	20	38.6	96.1	1.0	-0.2	0.0	1.0	0.132	1.016	0.141	0.077	1.834
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	26.9	59.4	0.426	6.920	0.718	1.3	70.9	19	20	30.6	101.6	1.1	-0.2	0.0	1.0	0.139	1.018	0.149	0.077	1.934
UC-02A	UB-02 & UB-03	Foundation Soils	14.9	26.8	67.3	0.479	6.960	0.712	1.3	80.1	15	20	23.8	103.9	1.1	-0.2	0.0	1.0	0.143	1.019	0.153	0.077	1.977
UC-02A	UB-02 & UB-03	Foundation Soils	15.0	26.7	76.0	0.511	6.640	0.672	1.3	90.4	10	20	11.4	101.8	1.1	-0.2	0.0	1.0	0.140	1.018	0.149	0.077	1.931
UC-02A	UB-02 & UB-03	Foundation Soils	15.1	26.7	85.4	0.607	6.480	0.711	1.3	101.0	8	20	5.4	106.4	1.1	-0.2	0.0	1.0	0.146	1.020	0.157	0.078	2.026
UC-02A	UB-02 & UB-03	Foundation Soils	15.2	26.6	91.2	0.740	6.220	0.811	1.2	106.8	9	20	8.4	115.2	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.078	2.246
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.5	94.9	0.739	5.860	0.779	1.2	110.9	7	20	3.4	114.3	1.1	-0.2	0.0	1.0	0.160	1.024	0.172	0.078	2.217
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.4	94.5	0.755	5.620	0.799	1.2	110.2	8	20	5.1	115.3	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.078	2.241
UC-02A	UB-02 & UB-03	Foundation Soils	15.4	26.3	86.7	0.827	5.380	0.954	1.2	100.2	14	20	23.9	124.1	1.1	-0.2	0.0	1.0	0.181	1.028	0.197	0.078	2.526

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	15.5	26.2	73.3	0.829	5.530	1.132	1.2	84.6	23	20	38.6	123.1	1.1	-0.2	0.0	1.0	0.179	1.028	0.194	0.078	2.486
UC-02A	UB-02 & UB-03	Foundation Soils	15.6	26.2	58.6	0.792	5.720	1.351	1.2	68.2	33	20	44.3	112.4	1.1	-0.2	0.0	1.0	0.156	1.023	0.168	0.078	2.150
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.1	43.3	0.722	6.420	1.669	1.2	51.0	46	20	45.3	96.3	1.0	-0.3	0.0	1.0	0.133	1.017	0.141	0.078	1.803
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.0	34.8	0.651	7.190	1.868	1.3	41.4	54	20	44.7	86.2	1.0	-0.3	0.0	1.0	0.122	1.014	0.128	0.078	1.639
UC-02A	UB-02 & UB-03	Foundation Soils	15.8	25.9	29.6	0.637	8.000	2.155	1.3	35.3	62	20	44.3	79.6	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.078	1.547
UC-02A	UB-02 & UB-03	Foundation Soils	15.9	25.8	20.9	0.617	8.400	2.955	1.3	25.3	74	20	42.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.111	0.079	1.408
UC-02A	UB-02 & UB-03	Foundation Soils	16.0	25.8	15.6	0.534	9.180	3.432	1.3	19.0	86	20	42.0	61.0	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.079	1.328
UC-02A	UB-02 & UB-03	Foundation Soils	16.1	25.7	10.4	0.479	9.340	4.615	1.3	12.8	100	20	41.0	53.7	1.0	-0.3	0.0	1.0	0.095	1.008	0.099	0.079	1.252
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.6	9.5	0.280	14.770	2.940	1.3	11.7	99	20	40.7	52.4	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.079	1.237
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.5	7.7	0.182	37.600	2.375	1.3	9.4	100	20	40.2	49.7	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.079	1.209
UC-02A	UB-02 & UB-03	Foundation Soils	16.3	25.4	8.2	0.161	74.090	1.970	1.3	10.0	96	20	40.3	50.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.079	1.213
UC-02A	UB-02 & UB-03	Foundation Soils	16.4	25.3	15.6	0.116	90.430	0.743	1.3	18.9	61	20	40.7	59.6	1.0	-0.3	0.0	1.0	0.099	1.009	0.103	0.079	1.303
UC-02A	UB-02 & UB-03	Foundation Soils	16.5	25.3	18.6	0.092	18.490	0.495	1.3	22.4	49	20	40.2	62.6	1.0	-0.3	0.0	1.0	0.101	1.009	0.106	0.079	1.332
UC-02A	UB-02 & UB-03	Foundation Soils	16.6	25.2	16.7	0.108	15.440	0.645	1.3	20.1	57	20	40.6	60.8	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.079	1.311
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.1	20.4	0.171	47.000	0.838	1.3	24.4	55	20	41.3	65.6	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.080	1.361
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.0	20.2	0.221	36.780	1.095	1.3	24.0	60	20	41.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.080	1.360
UC-02A	UB-02 & UB-03	Foundation Soils	16.8	24.9	13.9	0.232	14.530	1.673	1.3	16.7	76	20	41.1	57.8	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.080	1.275
UC-02A	UB-02 & UB-03	Foundation Soils	16.9	24.9	9.6	0.236	23.160	2.447	1.3	11.7	96	20	40.6	52.3	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.080	1.219
UC-02A	UB-02 & UB-03	Foundation Soils	17.0	24.8	7.7	0.188	58.390	2.450	1.3	9.3	100	20	40.2	49.5	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.080	1.191
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.7	9.6	0.142	69.470	1.477	1.3	11.6	86	20	40.4	52.0	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.080	1.213
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.6	10.8	0.122	62.770	1.130	1.3	12.9	78	20	40.4	53.3	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.080	1.224
UC-02A	UB-02 & UB-03	Foundation Soils	17.2	24.5	10.6	0.118	41.470	1.113	1.3	12.7	78	20	40.4	53.1	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.080	1.220
UC-02A	UB-02 & UB-03	Foundation Soils	17.3	24.4	9.0	0.108	42.400	1.198	1.3	10.8	85	20	40.2	51.0	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.080	1.198
UC-02A	UB-02 & UB-03	Foundation Soils	17.4	24.4	7.1	0.108	28.680	1.515	1.3	8.6	98	20	40.0	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.080	1.174
UC-02A	UB-02 & UB-03	Foundation Soils	17.5	24.3	5.5	0.112	37.470	2.020	1.3	6.7	100	20	39.6	46.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.081	1.151
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.2	5.2	0.117	51.120	2.268	1.3	6.2	100	20	39.5	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.081	1.144
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.1	4.6	0.136	64.690	2.929	1.3	5.6	100	20	39.4	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.081	1.136
UC-02A	UB-02 & UB-03	Foundation Soils	17.7	24.0	4.8	0.112	72.470	2.342	1.3	5.7	100	20	39.4	45.2	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.081	1.136
UC-02A	UB-02 & UB-03	Foundation Soils	17.8	24.0	5.6	0.085	76.690	1.529	1.3	6.6	100	20	39.6	46.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.081	1.144
UC-02A	UB-02 & UB-03	Foundation Soils	17.9	23.9	6.3	0.071	59.080	1.127	1.3	7.5	99	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.081	1.152
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.8	10.8	0.065	52.980	0.603	1.3	12.7	69	20	39.9	52.7	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.081	1.201
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.7	16.6	0.061	36.500	0.367	1.2	19.4	50	20	39.7	59.1	1.0	-0.3	0.0	0.9	0.099	1.009	0.102	0.081	1.262
UC-02A	UB-02 & UB-03	Foundation Soils	18.1	23.6	13.1	0.064	6.850	0.490	1.2	15.3	62	20	40.0	55.3	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.081	1.223
UC-02A	UB-02 & UB-03	Foundation Soils	18.2	23.5	8.8	0.071	-6.620	0.805	1.2	10.4	81	20	40.0	50.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.081	1.175
UC-02A	UB-02 & UB-03	Foundation Soils	18.3	23.5	7.0	0.071	1.190	1.012	1.2	8.3	94	20	39.9	48.1	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.081	1.153
UC-02A	UB-02 & UB-03	Foundation Soils	18.4	23.4	6.4	0.078	41.980	1.222	1.2	7.5	100	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.081	1.144
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.3	9.7	0.067	59.910	0.688	1.2	11.4	75	20	40.0	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.082	1.180
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.2	11.6	0.067	48.450	0.578	1.2	13.5	69	20	40.1	53.5	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.082	1.199
UC-02A	UB-02 & UB-03	Foundation Soils	18.6	23.1	14.5	0.072	30.590	0.495	1.2	16.8	59	20	40.1	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.082	1.229
UC-02A	UB-02 & UB-03	Foundation Soils	18.7	23.1	16.7	0.053	16.560	0.318	1.2	19.2	49	20	39.5	58.7	1.0	-0.3	0.0	0.9	0.099	1.008	0.102	0.082	1.245
UC-02A	UB-02 & UB-03	Foundation Soils	18.8	23.0	12.9	0.063	11.670	0.488	1.2	14.9	63	20	40.0	54.9	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.082	1.208
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.9	11.2	0.096	15.150	0.854	1.2	13.0	74	20	40.2	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.082	1.190
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.8	11.0	0.115	21.090	1.046	1.2	12.7	78	20	40.4	53.0	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.082	1.187
UC-02A	UB-02 & UB-03	Foundation Soils	19.0	22.7	7.4	0.126	19.660	1.704	1.2	8.6	100	20	40.0	48.6	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.082	1.145
UC-02A	UB-02 & UB-03	Foundation Soils	19.1	22.6	5.6	0.123	30.300	2.213	1.2	6.4	100	20	39.6	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.082	1.120
UC-02A	UB-02 & UB-03	Foundation Soils	19.2	22.6	4.7	0.117	44.640	2.469	1.2	5.5	100	20	39.4	44.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.082	1.109
UC-02A	UB-02 & UB-03	Foundation Soils	19.3	22.5	4.5	0.071	62.910	1.570	1.2	5.2	100	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.082	1.105
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.4	4.5	0.057	73.750	1.275	1.2	5.2	100	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.082	1.103
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.3	4.8	0.082	83.050	1.691	1.2	5.6	100	20	39.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.083	1.106
UC-02A	UB-02 & UB-03	Foundation Soils	19.5	22.2	5.4	0.088	82.660	1.622	1.2	6.2	100	20	39.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.083	1.112
UC-02A	UB-02 & UB-03	Foundation Soils	19.6	22.1	5.6	0.084	72.530	1.513	1.2	6.4	100	20	39.6	45.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.083	1.112
UC-02A	UB-02 & UB-03	Foundation Soils	19.7	22.1	6.9	0.068	69.660	0.981	1.2	7.9	96	20	39.8	47.7	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.083	1.127
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	22.0	9.9	0.091	6.340	0.923	1.2	11.2	81	20	40.1	51.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.083	1.158
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	21.9	8.7	0.100	14.720	1.152	1.2	9.9	90	20	40.1	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.095	0.083	1.144
UC-02A	UB-02 & UB-03	Foundation Soils	19.9	21.8	7.3	0.078	23.250	1.062	1.2	8.3	95	20	39.9	48.2	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.083	1.128
UC-02A	UB-02 & UB-03	Foundation Soils	20.0	21.7	6.1	0.066	44.340	1.077	1.2	7.0	100	20	39.7	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.083	1.112
UC-02A	UB-02 & UB-03	Foundation Soils	20.1	21.7	10.4	0.059	62.940	0.567	1.2	12.2	72	0	0.5	12.7	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.083	0.834
UC-02A	UB-02 & UB-03	Foundation Soils	20.2	21.6	22.2	0.151	71.950	0.681	1.2	25.8	51	0	0.5	26.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.083	0.938
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.5	18.7	0.237	21.870	1.264	1.2	21.9	67	0	0.5	22.4	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.083	0.907
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.4	13.8	0.198	22.930	1.437	1.2	16.1	78	0	0.5	16.6	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.083	0.861
UC-02A	UB-02 & UB-03	Foundation Soils	20.4	21.3	9.4	0.182	42.210	1.942	1.2	10.9	97	0	0.5	11.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.083	0.822
UC-02A	UB-02 & UB-03	Foundation Soils	20.5	21.2	15.3	0.215	64.950	1.407	1.2	17.8	74	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.083	0.872

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	20.6	21.2	57.1	0.254	87.190	0.445	1.2	63.1	14	0	0.3	63.3	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.084	1.259
UC-02A	UB-02 & UB-03	Foundation Soils	20.7	21.1	65.0	0.497	22.660	0.765	1.2	71.2	20	0	0.4	71.6	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.084	1.342
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	21.0	47.0	0.755	7.290	1.608	1.2	52.2	45	0	0.6	52.7	1.0	-0.4	0.0	0.9	0.094	1.008	0.097	0.084	1.157
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	20.9	30.0	0.683	13.100	2.274	1.2	34.0	65	0	0.5	34.5	1.0	-0.4	0.0	0.9	0.082	1.007	0.084	0.084	0.998
UC-02A	UB-02 & UB-03	Foundation Soils	20.9	20.8	25.1	0.659	21.010	2.631	1.2	28.5	72	0	0.5	29.0	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.084	0.953
UC-02A	UB-02 & UB-03	Foundation Soils	21.0	20.8	90.9	0.761	39.020	0.837	1.1	97.4	13	0	0.2	97.6	1.0	-0.4	0.0	0.9	0.134	1.017	0.140	0.084	1.672
UC-02A	UB-02 & UB-03	Foundation Soils	21.1	20.7	218.9	0.883	37.450	0.403	1.1	222.5	0	0	0.0	222.5	1.1	-0.4	0.0	0.9	8.684	1.082	10.094	0.084	120.348
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.6	259.1	1.050	18.530	0.405	1.1	260.8	0	0	0.0	260.8	1.1	-0.4	0.0	0.9	518.132	1.082	601.719	0.084	7169.932
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.5	275.3	1.167	14.110	0.424	1.1	276.9	0	0	0.0	276.9	1.1	-0.4	0.0	0.9	5888.862	1.082	6832.903	0.084	81374.376
UC-02A	UB-02 & UB-03	Foundation Soils	21.3	20.4	280.1	1.218	12.250	0.435	1.1	281.5	0	0	0.0	281.5	1.1	-0.4	0.0	0.9	12926.975	1.082	14985.879	0.084	########
UC-02A	UB-02 & UB-03	Foundation Soils	21.4	20.3	278.3	1.250	8.960	0.449	1.1	279.4	0	0	0.0	279.4	1.1	-0.4	0.0	0.9	8958.875	1.082	10376.732	0.084	########
UC-02A	UB-02 & UB-03	Foundation Soils	21.5	20.3	270.5	1.224	11.000	0.453	1.1	271.3	0	0	0.0	271.3	1.1	-0.4	0.0	0.9	2397.744	1.082	2774.867	0.084	32993.364
UC-02A	UB-02 & UB-03	Foundation Soils	21.6	20.2	252.6	1.148	13.660	0.454	1.1	253.3	0	0	0.0	253.3	1.1	-0.4	0.0	0.9	193.153	1.082	223.344	0.084	2654.122
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.1	240.0	1.038	11.670	0.433	1.1	241.2	0	0	0.0	241.2	1.1	-0.4	0.0	0.9	48.660	1.082	56.218	0.084	667.712
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.0	224.9	0.949	14.050	0.422	1.1	226.7	0	0	0.0	226.7	1.1	-0.4	0.0	0.9	12.292	1.082	14.189	0.084	168.435
UC-02A	UB-02 & UB-03	Foundation Soils	21.8	19.9	214.8	0.852	12.430	0.397	1.1	216.9	0	0	0.0	216.9	1.1	-0.4	0.0	0.9	5.661	1.082	6.529	0.084	77.469
UC-02A	UB-02 & UB-03	Foundation Soils	21.9	19.9	197.3	0.787	12.840	0.399	1.1	200.0	0	0	0.0	200.0	1.1	-0.4	0.0	0.9	1.890	1.082	2.161	0.084	25.626
UC-02A	UB-02 & UB-03	Foundation Soils	22.0	19.8	173.5	0.732	12.820	0.422	1.1	176.9	0	0	0.0	176.9	1.0	-0.4	0.0	0.9	0.643	1.071	0.719	0.084	8.521
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.7	146.4	0.676	12.290	0.462	1.1	150.4	0	0	0.0	150.4	1.0	-0.4	0.0	0.9	0.291	1.046	0.315	0.084	3.730
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.6	118.5	0.704	12.780	0.594	1.1	122.9	0	0	0.0	122.9	1.0	-0.4	0.0	0.9	0.178	1.028	0.188	0.084	2.222
UC-02A	UB-02 & UB-03	Foundation Soils	22.2	19.5	98.6	0.561	13.150	0.569	1.1	103.0	3	0	0.0	103.0	1.0	-0.4	0.0	0.9	0.141	1.019	0.147	0.084	1.742
UC-02A	UB-02 & UB-03	Foundation Soils	22.3	19.4	78.7	0.530	13.530	0.673	1.1	82.9	13	0	0.2	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.122	0.085	1.449
UC-02A	UB-02 & UB-03	Foundation Soils	22.4	19.4	64.9	0.557	14.390	0.858	1.1	68.7	24	0	0.5	69.2	1.0	-0.4	0.0	0.9	0.107	1.010	0.109	0.085	1.294
UC-02A	UB-02 & UB-03	Foundation Soils	22.5	19.3	52.6	0.576	15.800	1.094	1.1	56.1	35	0	0.5	56.6	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.085	1.173
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.2	40.6	0.579	14.910	1.425	1.1	43.6	47	0	0.5	44.1	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.085	1.063
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.1	34.8	0.600	16.300	1.722	1.1	37.5	56	0	0.5	38.0	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.085	1.012
UC-02A	UB-02 & UB-03	Foundation Soils	22.7	19.0	28.6	0.447	18.620	1.565	1.1	30.9	60	0	0.5	31.4	1.0	-0.4	0.0	0.9	0.080	1.006	0.081	0.085	0.957
UC-02A	UB-02 & UB-03	Foundation Soils	22.8	18.9	24.8	0.421	19.280	1.697	1.1	26.9	65	0	0.5	27.4	1.0	-0.4	0.0	0.9	0.077	1.006	0.078	0.085	0.925
UC-02A	UB-02 & UB-03	Foundation Soils	22.9	18.9	15.9	0.332	31.920	2.083	1.2	17.4	83	0	0.5	17.9	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.085	0.851
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.8	13.3	0.284	41.160	2.142	1.2	14.4	90	0	0.5	14.9	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.085	0.829
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.7	17.2	0.213	17.500	1.236	1.2	18.7	71	0	0.5	19.2	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.085	0.860
UC-02A	UB-02 & UB-03	Foundation Soils	23.1	18.6	30.6	0.145	48.030	0.474	1.1	32.7	37	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.082	0.085	0.968
UC-02A	UB-02 & UB-03	Foundation Soils	23.2	18.5	44.4	0.131	20.440	0.295	1.1	46.9	18	0	0.3	47.3	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.085	1.083
UC-02A	UB-02 & UB-03	Foundation Soils	23.3	18.5	49.8	0.140	10.100	0.281	1.1	52.4	14	0	0.2	52.6	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.085	1.129
UC-02A	UB-02 & UB-03	Foundation Soils	23.4	18.4	48.0	0.159	9.740	0.331	1.1	50.4	17	0	0.3	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.085	1.112
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.3	41.1	0.197	15.960	0.479	1.1	43.3	28	0	0.4	43.8	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.085	1.052
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.2	38.0	0.203	19.580	0.534	1.1	40.1	32	0	0.5	40.5	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.085	1.025
UC-02A	UB-02 & UB-03	Foundation Soils	23.6	18.1	35.0	0.214	23.650	0.612	1.1	36.8	37	0	0.5	37.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.085	0.998
UC-02A	UB-02 & UB-03	Foundation Soils	23.7	18.0	34.5	0.210	26.440	0.609	1.1	36.3	37	0	0.5	36.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.085	0.993
UC-02A	UB-02 & UB-03	Foundation Soils	23.8	18.0	35.7	0.193	24.200	0.541	1.1	37.4	34	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.085	1.001
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.9	36.6	0.172	25.350	0.470	1.1	38.3	31	0	0.5	38.8	1.0	-0.4	0.0	0.9	0.085	1.007	0.086	0.085	1.008
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.8	37.6	0.175	24.820	0.465	1.1	39.3	30	0	0.5	39.7	1.0	-0.4	0.1	0.9	0.085	1.007	0.087	0.085	1.015
UC-02A	UB-02 & UB-03	Foundation Soils	24.0	17.7	39.2	0.203	24.260	0.518	1.1	40.8	31	0	0.5	41.3	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.085	1.027
UC-02A	UB-02 & UB-03	Foundation Soils	24.1	17.6	39.5	0.231	22.770	0.585	1.1	41.0	32	0	0.5	41.5	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.085	1.028
UC-02A	UB-02 & UB-03	Foundation Soils	24.2	17.6	39.5	0.238	24.920	0.602	1.1	41.0	33	0	0.5	41.5	1.0	-0.5	0.1	0.9	0.086	1.007	0.088	0.085	1.028
UC-02A	UB-02 & UB-03	Foundation Soils	24.3	17.5	42.9	0.243	27.440	0.566	1.1	44.4	29	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.085	1.055
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.4	46.3	0.237	26.300	0.511	1.1	47.7	25	0	0.4	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.086	1.082
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.3	49.4	0.238	22.960	0.482	1.1	50.7	22	0	0.4	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.095	0.086	1.107
UC-02A	UB-02 & UB-03	Foundation Soils	24.5	17.2	49.1	0.278	22.460	0.567	1.1	50.3	25	0	0.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.094	0.086	1.103
UC-02A	UB-02 & UB-03	Foundation Soils	24.6	17.1	46.6	0.312	22.220	0.670	1.1	47.8	30	0	0.5	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.086	1.081
UC-02A	UB-02 & UB-03	Foundation Soils	24.7	17.1	43.2	0.337	23.350	0.779	1.1	44.3	35	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.086	1.052
UC-02A	UB-02 & UB-03	Foundation Soils	24.8	17.0	39.2	0.333	23.250	0.849	1.1	40.2	39	0	0.5	40.7	1.0	-0.5	0.1	0.9	0.086	1.007	0.087	0.086	1.017
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.9	35.2	0.330	24.090	0.937	1.1	36.1	44	0	0.5	36.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.086	0.984
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.8	34.3	0.342	24.850	0.996	1.1	35.2	46	0	0.5	35.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.086	0.976
UC-03	UB-03	Foundation Soils	6.1	36.1	32.7	0.402	-3.290	1.228	1.7	51.7	38	30	49.9	101.7	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.058	2.680
UC-03	UB-03	Foundation Soils	6.2	36.0	33.3	0.388	-1.020	1.165	1.7	52.4	37	30	49.5	101.9	1.1	-0.1	0.0	1.0	0.140	1.018	0.157	0.059	2.670
UC-03	UB-03	Foundation Soils	6.2	35.9	33.9	0.388	-1.050	1.144	1.7	53.1	36	30	49.3	102.4	1.1	-0.1	0.0	1.0	0.141	1.019	0.157	0.059	2.667
UC-03	UB-03	Foundation Soils	6.3	35.8	34.3	0.340	-1.100	0.990	1.7	53.7	33	30	47.8	101.6	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.059	2.628
UC-03	UB-03	Foundation Soils	6.4	35.8	33.8	0.342	-0.910	1.011	1.7	52.9	34	30	48.1	101.0	1.1	-0.1	0.0	1.0	0.139	1.018	0.155	0.060	2.597
UC-03	UB-03	Foundation Soils	6.5	35.7	31.1	0.356	-0.950	1.145	1.7	48.7	39	30	49.5	98.2	1.1	-0.1	0.0	1.0	0.135	1.017	0.151	0.060	2.511
UC-03	UB-03	Foundation Soils	6.6	35.6	29.7	0.380	-1.000	1.280	1.7	46.5	42	30	50.1	96.7	1.1	-0.1	0.0	1.0	0.133	1.017	0.149	0.060	2.462
UC-03	UB-03	Foundation Soils	6.6	35.5	27.3	0.388	-1.180	1.422	1.7	43.0	47	30	50.5	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.145	0.061	2.375

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	6.7	35.4	27.5	0.370	-0.620	1.347	1.7	43.1	46	30	50.2	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.144	0.061	2.360
UC-03	UB-03	Foundation Soils	6.8	35.4	27.8	0.363	-0.330	1.304	1.7	43.5	45	30	50.1	93.7	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.062	2.353
UC-03	UB-03	Foundation Soils	6.9	35.3	28.7	0.365	-0.670	1.270	1.6	44.7	43	30	50.0	94.7	1.1	-0.1	0.0	1.0	0.131	1.016	0.146	0.062	2.364
UC-03	UB-03	Foundation Soils	7.0	35.2	28.5	0.361	-1.740	1.266	1.6	44.2	44	30	50.0	94.2	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.062	2.339
UC-03	UB-03	Foundation Soils	7.1	35.1	24.1	0.345	-1.750	1.434	1.7	37.8	51	30	50.0	87.8	1.1	-0.1	0.0	1.0	0.123	1.014	0.137	0.063	2.187
UC-03	UB-03	Foundation Soils	7.1	35.0	20.6	0.340	-1.670	1.647	1.7	32.7	58	30	49.8	82.5	1.1	-0.1	0.0	1.0	0.118	1.013	0.130	0.063	2.074
UC-03	UB-03	Foundation Soils	7.2	34.9	14.3	0.349	-1.240	2.445	1.7	22.9	72	30	48.5	71.4	1.1	-0.1	0.0	1.0	0.108	1.010	0.118	0.063	1.876
UC-03	UB-03	Foundation Soils	7.3	34.9	11.1	0.350	-1.160	3.167	1.7	17.7	78	30	47.6	65.3	1.1	-0.1	0.0	1.0	0.104	1.009	0.113	0.063	1.774
UC-03	UB-03	Foundation Soils	7.4	34.8	8.1	0.332	-0.620	4.101	1.7	13.0	93	30	46.9	59.9	1.1	-0.1	0.0	1.0	0.099	1.009	0.108	0.064	1.688
UC-03	UB-03	Foundation Soils	7.5	34.7	6.6	0.309	-0.190	4.661	1.7	10.6	100	30	46.5	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.105	0.064	1.641
UC-03	UB-03	Foundation Soils	7.5	34.6	5.3	0.269	-0.050	5.028	1.7	8.6	100	30	46.0	54.5	1.1	-0.1	0.0	1.0	0.096	1.008	0.103	0.064	1.599
UC-03	UB-03	Foundation Soils	7.6	34.5	4.4	0.230	9.740	5.214	1.7	7.1	100	30	45.6	52.7	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.065	1.566
UC-03	UB-03	Foundation Soils	7.7	34.5	4.0	0.210	13.670	5.283	1.7	6.4	100	30	45.4	51.8	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.065	1.547
UC-03	UB-03	Foundation Soils	7.8	34.4	3.3	0.193	14.150	5.887	1.7	5.3	100	30	45.1	50.4	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.065	1.522
UC-03	UB-03	Foundation Soils	7.9	34.3	2.8	0.167	34.730	5.908	1.7	4.5	100	30	44.9	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.066	1.503
UC-03	UB-03	Foundation Soils	8.0	34.2	2.8	0.178	37.590	6.257	1.7	4.6	100	30	45.0	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.066	1.497
UC-03	UB-03	Foundation Soils	8.0	34.1	3.2	0.182	34.920	5.656	1.7	5.2	100	30	45.1	50.3	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.066	1.499
UC-03	UB-03	Foundation Soils	8.1	34.0	3.9	0.203	31.540	5.209	1.7	6.2	100	30	45.4	51.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.066	1.509
UC-03	UB-03	Foundation Soils	8.2	34.0	3.7	0.229	29.760	6.213	1.7	5.9	100	30	45.3	51.2	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.067	1.497
UC-03	UB-03	Foundation Soils	8.3	33.9	4.0	0.225	35.830	5.564	1.7	6.5	100	30	45.4	51.9	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.067	1.499
UC-03	UB-03	Foundation Soils	8.4	33.8	5.3	0.215	46.980	4.085	1.7	8.4	100	30	45.9	54.4	1.1	-0.1	0.0	1.0	0.095	1.008	0.102	0.067	1.523
UC-03	UB-03	Foundation Soils	8.4	33.7	9.4	0.169	50.500	1.805	1.7	15.0	74	30	46.7	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.109	0.068	1.609
UC-03	UB-03	Foundation Soils	8.5	33.6	19.1	0.156	14.610	0.817	1.6	29.3	49	30	47.6	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.068	1.818
UC-03	UB-03	Foundation Soils	8.6	33.6	22.0	0.178	-0.140	0.809	1.6	33.4	44	30	47.7	81.0	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.068	1.874
UC-03	UB-03	Foundation Soils	8.7	33.5	22.4	0.181	-0.660	0.807	1.6	33.9	44	30	47.7	81.5	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.068	1.875
UC-03	UB-03	Foundation Soils	8.8	33.4	21.4	0.203	-0.990	0.949	1.6	32.3	48	30	48.2	80.5	1.1	-0.1	0.0	1.0	0.116	1.012	0.127	0.069	1.850
UC-03	UB-03	Foundation Soils	8.9	33.3	19.7	0.206	-0.730	1.048	1.6	29.8	53	30	48.4	78.1	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.069	1.805
UC-03	UB-03	Foundation Soils	8.9	33.2	18.7	0.251	-0.950	1.344	1.6	28.3	59	30	48.8	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.069	1.782
UC-03	UB-03	Foundation Soils	9.0	33.1	17.2	0.272	-2.240	1.580	1.6	26.1	65	30	48.8	74.9	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.069	1.743
UC-03	UB-03	Foundation Soils	9.1	33.1	14.4	0.253	-1.130	1.763	1.6	22.0	67	30	48.0	70.0	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.070	1.666
UC-03	UB-03	Foundation Soils	9.2	33.0	11.8	0.198	-0.150	1.680	1.6	18.2	72	30	47.4	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.070	1.601
UC-03	UB-03	Foundation Soils	9.3	32.9	11.9	0.180	-0.670	1.511	1.6	18.3	70	30	47.3	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.070	1.596
UC-03	UB-03	Foundation Soils	9.4	32.8	15.6	0.172	-0.800	1.099	1.6	23.6	61	30	47.9	71.5	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.070	1.669
UC-03	UB-03	Foundation Soils	9.4	32.7	18.7	0.161	-0.670	0.862	1.6	27.9	51	30	47.7	75.6	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.071	1.720
UC-03	UB-03	Foundation Soils	9.5	32.6	21.6	0.174	-1.470	0.804	1.6	31.9	46	30	47.6	79.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.125	0.071	1.772
UC-03	UB-03	Foundation Soils	9.6	32.6	22.0	0.120	-1.380	0.546	1.6	32.4	39	30	45.9	78.4	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.071	1.748
UC-03	UB-03	Foundation Soils	9.7	32.5	22.0	0.129	-1.290	0.587	1.6	32.3	40	30	46.3	78.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.071	1.746
UC-03	UB-03	Foundation Soils	9.8	32.4	21.4	0.163	-1.190	0.761	1.6	31.4	45	30	47.4	78.8	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.071	1.742
UC-03	UB-03	Foundation Soils	9.8	32.3	17.1	0.198	-1.050	1.156	1.6	25.3	59	30	48.2	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.072	1.660
UC-03	UB-03	Foundation Soils	9.9	32.2	19.4	0.222	-0.950	1.146	1.6	28.4	56	30	48.5	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.072	1.702
UC-03	UB-03	Foundation Soils	10.0	32.2	18.4	0.229	-0.710	1.248	1.6	26.9	59	30	48.5	75.4	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.072	1.675
UC-03	UB-03	Foundation Soils	10.1	32.1	17.1	0.245	-0.180	1.435	1.6	25.0	64	30	48.5	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.072	1.644
UC-03	UB-03	Foundation Soils	10.2	32.0	16.0	0.301	1.430	1.880	1.6	23.5	67	30	48.3	71.8	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.072	1.616
UC-03	UB-03	Foundation Soils	10.3	31.9	15.4	0.262	1.520	1.705	1.6	22.5	71	30	48.4	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.073	1.599
UC-03	UB-03	Foundation Soils	10.3	31.8	14.3	0.265	3.200	1.848	1.6	21.1	70	30	48.0	69.0	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.073	1.569
UC-03	UB-03	Foundation Soils	10.4	31.7	15.5	0.288	3.950	1.864	1.5	22.6	68	30	48.2	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.073	1.587
UC-03	UB-03	Foundation Soils	10.5	31.7	19.3	0.304	1.430	1.574	1.5	27.8	62	30	49.0	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.073	1.663
UC-03	UB-03	Foundation Soils	10.6	31.6	22.7	0.278	-3.810	1.223	1.5	32.3	53	30	49.0	81.3	1.1	-0.1	0.0	1.0	0.117	1.012	0.127	0.074	1.723
UC-03	UB-03	Foundation Soils	10.7	31.5	18.4	0.319	-4.320	1.736	1.5	26.4	66	30	49.0	75.3	1.1	-0.1	0.0	1.0	0.112	1.011	0.120	0.074	1.633
UC-03	UB-03	Foundation Soils	10.7	31.4	13.2	0.315	-2.570	2.391	1.5	19.2	74	30	47.7	66.9	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.074	1.519
UC-03	UB-03	Foundation Soils	10.8	31.3	9.7	0.327	12.580	3.372	1.6	14.3	90	30	47.2	61.4	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.074	1.449
UC-03	UB-03	Foundation Soils	10.9	31.3	10.6	0.303	22.510	2.864	1.6	15.5	84	30	47.3	62.7	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.074	1.460
UC-03	UB-03	Foundation Soils	11.0	31.2	9.9	0.245	8.610	2.464	1.6	14.6	83	30	47.0	61.5	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.074	1.442
UC-03	UB-03	Foundation Soils	11.1	31.1	9.5	0.179	4.050	1.879	1.6	13.9	79	30	46.7	60.6	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.075	1.427
UC-03	UB-03	Foundation Soils	11.2	31.0	7.4	0.175	5.700	2.376	1.6	10.8	92	30	46.4	57.2	1.1	-0.2	0.0	1.0	0.097	1.008	0.104	0.075	1.384
UC-03	UB-03	Foundation Soils	11.2	30.9	5.2	0.177	8.480	3.376	1.6	7.8	100	30	45.8	53.5	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.075	1.340
UC-03	UB-03	Foundation Soils	11.3	30.8	3.9	0.192	18.680	4.953	1.6	5.8	100	30	45.3	51.0	1.1	-0.2	0.0	1.0	0.093	1.008	0.099	0.075	1.310
UC-03	UB-03	Foundation Soils	11.4	30.8	4.5	0.184	31.450	4.120	1.6	6.6	100	30	45.5	52.1	1.1	-0.2	0.0	1.0	0.094	1.008	0.099	0.075	1.317
UC-03	UB-03	Foundation Soils	11.5	30.7	5.4	0.166	22.440	3.091	1.6	7.9	100	30	45.8	53.7	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.076	1.331
UC-03	UB-03	Foundation Soils	11.6	30.6	7.9	0.154	22.200	1.937	1.5	11.5	87	30	46.4	57.9	1.1	-0.2	0.0	1.0	0.098	1.008	0.104	0.076	1.373
UC-03	UB-03	Foundation Soils	11.6	30.5	10.5	0.153	5.100	1.460	1.5	15.0	72	30	46.6	61.7	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.076	1.411
UC-03	UB-03	Foundation Soils	11.7	30.4	11.0	0.150	2.000	1.358	1.5	15.8	73	30	46.9	62.6	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.076	1.419

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	11.8	30.4	11.6	0.146	3.100	1.263	1.5	16.5	71	30	46.9	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.076	1.423
UC-03	UB-03	Foundation Soils	11.9	30.3	11.9	0.143	4.380	1.200	1.5	16.9	69	30	46.9	63.8	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.076	1.425
UC-03	UB-03	Foundation Soils	12.0	30.2	12.1	0.154	4.860	1.268	1.5	17.2	70	30	47.0	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.077	1.425
UC-03	UB-03	Foundation Soils	12.1	30.1	12.3	0.148	4.810	1.206	1.5	17.3	68	30	46.9	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.077	1.423
UC-03	UB-03	Foundation Soils	12.1	30.0	12.4	0.164	4.910	1.318	1.5	17.5	70	30	47.1	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.077	1.423
UC-03	UB-03	Foundation Soils	12.2	29.9	12.8	0.157	5.050	1.223	1.5	18.0	67	30	47.0	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.077	1.425
UC-03	UB-03	Foundation Soils	12.3	29.9	13.4	0.155	4.510	1.153	1.5	18.7	69	30	47.3	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.077	1.434
UC-03	UB-03	Foundation Soils	12.4	29.8	13.2	0.158	3.860	1.196	1.5	18.4	70	30	47.3	65.7	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.077	1.426
UC-03	UB-03	Foundation Soils	12.5	29.7	12.5	0.166	4.030	1.331	1.5	17.4	70	30	47.1	64.4	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.078	1.408
UC-03	UB-03	Foundation Soils	12.5	29.6	12.3	0.177	4.190	1.436	1.5	17.1	72	30	47.1	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.078	1.403
UC-03	UB-03	Foundation Soils	12.6	29.5	12.3	0.183	4.900	1.494	1.5	17.0	73	30	47.1	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.078	1.398
UC-03	UB-03	Foundation Soils	12.7	29.4	12.7	0.200	5.290	1.581	1.5	17.5	73	30	47.3	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.078	1.402
UC-03	UB-03	Foundation Soils	12.8	29.4	13.5	0.240	5.880	1.778	1.5	18.6	74	30	47.6	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.078	1.414
UC-03	UB-03	Foundation Soils	12.9	29.3	14.2	0.300	6.150	2.106	1.5	19.5	72	30	47.7	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.078	1.423
UC-03	UB-03	Foundation Soils	13.0	29.2	14.2	0.353	7.950	2.486	1.4	19.4	76	30	47.9	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.079	1.421
UC-03	UB-03	Foundation Soils	13.0	29.1	12.6	0.440	8.620	3.488	1.5	17.3	87	30	47.8	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.079	1.393
UC-03	UB-03	Foundation Soils	13.1	29.0	9.7	0.479	11.930	4.961	1.5	13.3	100	30	47.2	60.5	1.0	-0.2	0.0	1.0	0.100	1.009	0.106	0.079	1.340
UC-03	UB-03	Foundation Soils	13.2	29.0	7.7	0.508	6.100	6.608	1.5	10.6	100	30	46.5	57.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.103	0.079	1.302
UC-03	UB-03	Foundation Soils	13.3	28.9	6.2	0.515	14.190	8.282	1.5	8.6	100	30	46.0	54.6	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.079	1.273
UC-03	UB-03	Foundation Soils	13.4	28.8	4.7	0.522	36.640	11.133	1.5	6.5	100	30	45.5	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.079	1.244
UC-03	UB-03	Foundation Soils	13.5	28.7	4.1	0.497	34.830	12.100	1.5	5.7	100	30	45.2	51.0	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.079	1.231
UC-03	UB-03	Foundation Soils	13.5	28.6	3.6	0.419	42.500	11.494	1.5	5.1	100	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.080	1.221
UC-03	UB-03	Foundation Soils	13.6	28.5	3.4	0.406	49.020	11.955	1.5	4.7	100	30	45.0	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.080	1.214
UC-03	UB-03	Foundation Soils	13.7	28.5	3.1	0.399	50.170	12.816	1.5	4.3	100	30	44.9	49.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.080	1.207
UC-03	UB-03	Foundation Soils	13.8	28.4	3.5	0.381	50.690	10.866	1.5	4.8	100	30	45.0	49.9	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.080	1.211
UC-03	UB-03	Foundation Soils	13.9	28.3	3.7	0.360	21.150	9.724	1.5	5.1	100	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.080	1.212
UC-03	UB-03	Foundation Soils	13.9	28.2	3.1	0.328	9.560	10.685	1.5	4.2	100	30	44.9	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.096	0.080	1.199
UC-03	UB-03	Foundation Soils	14.0	28.1	2.2	0.298	10.050	13.347	1.5	3.1	100	30	44.6	47.7	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.080	1.183
UC-03	UB-03	Foundation Soils	14.1	28.1	1.4	0.250	27.490	17.342	1.5	2.0	100	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.080	1.168
UC-03	UB-03	Foundation Soils	14.2	28.0	1.4	0.193	36.070	13.448	1.5	2.0	100	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.081	1.165
UC-03	UB-03	Foundation Soils	14.3	27.9	1.3	0.339	49.690	25.874	1.5	1.8	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.081	1.161
UC-03	UB-03	Foundation Soils	14.4	27.8	1.3	0.338	55.840	25.063	1.5	1.8	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.081	1.160
UC-03	UB-03	Foundation Soils	14.4	27.7	1.4	0.369	57.410	27.164	1.4	1.9	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.081	1.158
UC-03	UB-03	Foundation Soils	14.5	27.6	1.4	0.370	53.730	26.515	1.4	1.9	100	30	44.3	46.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.081	1.156
UC-03	UB-03	Foundation Soils	14.6	27.6	4.4	0.395	-0.820	8.988	1.4	5.9	100	30	45.3	51.2	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.081	1.202
UC-03	UB-03	Foundation Soils	14.7	27.5	4.4	0.433	12.910	9.953	1.4	5.8	100	30	45.3	51.1	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.081	1.199
UC-03	UB-03	Foundation Soils	14.8	27.4	4.6	0.447	27.110	9.719	1.4	6.1	100	30	45.4	51.5	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.081	1.201
UC-03	UB-03	Foundation Soils	14.8	27.3	5.1	0.408	26.390	7.946	1.4	6.8	100	30	45.5	52.4	1.0	-0.2	0.0	1.0	0.094	1.008	0.098	0.082	1.207
UC-03	UB-03	Foundation Soils	14.9	27.2	6.0	0.375	17.150	6.284	1.4	7.9	100	30	45.8	53.7	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.082	1.218
UC-03	UB-03	Foundation Soils	15.0	27.2	7.2	0.355	7.050	4.942	1.4	9.5	100	30	46.2	55.7	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.082	1.235
UC-03	UB-03	Foundation Soils	15.1	27.1	10.7	0.301	3.260	2.813	1.4	13.9	90	30	47.1	61.0	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.082	1.287
UC-03	UB-03	Foundation Soils	15.2	27.0	17.4	0.267	-8.530	1.534	1.4	22.3	69	30	48.2	70.5	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.082	1.385
UC-03	UB-03	Foundation Soils	15.3	26.9	21.6	0.237	-8.770	1.096	1.3	27.4	56	30	48.2	75.6	1.0	-0.2	0.0	1.0	0.112	1.011	0.118	0.082	1.442
UC-03	UB-03	Foundation Soils	15.3	26.8	22.6	0.253	-5.720	1.120	1.3	28.5	55	30	48.4	76.9	1.0	-0.2	0.0	1.0	0.113	1.011	0.120	0.082	1.455
UC-03	UB-03	Foundation Soils	15.4	26.7	24.1	0.266	5.140	1.103	1.3	30.3	53	30	48.5	78.8	1.0	-0.2	0.0	1.0	0.115	1.012	0.122	0.082	1.476
UC-03	UB-03	Foundation Soils	15.5	26.7	25.1	0.268	6.670	1.068	1.3	31.4	51	30	48.5	79.9	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.082	1.488
UC-03	UB-03	Foundation Soils	15.6	26.6	25.7	0.259	6.860	1.006	1.3	32.1	49	30	48.4	80.5	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.083	1.493
UC-03	UB-03	Foundation Soils	15.7	26.5	25.5	0.252	6.620	0.989	1.3	31.8	49	30	48.3	80.1	1.0	-0.3	0.0	1.0	0.116	1.012	0.123	0.083	1.485
UC-03	UB-03	Foundation Soils	15.7	26.4	24.5	0.244	6.230	0.997	1.3	30.5	51	30	48.2	78.7	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.083	1.466
UC-03	UB-03	Foundation Soils	15.8	26.3	20.4	0.230	6.240	1.129	1.3	25.5	59	30	48.1	73.6	1.0	-0.3	0.0	1.0	0.110	1.011	0.116	0.083	1.404
UC-03	UB-03	Foundation Soils	15.9	26.3	18.1	0.211	6.500	1.166	1.3	22.7	63	30	47.8	70.6	1.0	-0.3	0.0	1.0	0.108	1.010	0.113	0.083	1.367
UC-03	UB-03	Foundation Soils	16.0	26.2	13.8	0.192	6.960	1.390	1.3	17.5	72	30	47.2	64.6	1.0	-0.3	0.0	1.0	0.103	1.009	0.108	0.083	1.302
UC-03	UB-03	Foundation Soils	16.1	26.1	8.6	0.183	7.590	2.139	1.4	10.9	94	30	46.4	57.3	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.083	1.227
UC-03	UB-03	Foundation Soils	16.2	26.0	6.7	0.133	7.720	1.992	1.4	8.5	100	30	46.0	54.5	1.0	-0.3	0.0	1.0	0.095	1.008	0.100	0.083	1.198
UC-03	UB-03	Foundation Soils	16.2	25.9	4.6	0.139	8.120	3.034	1.4	5.9	100	30	45.3	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.083	1.165
UC-03	UB-03	Foundation Soils	16.3	25.8	3.3	0.132	8.240	3.998	1.4	4.2	100	30	44.9	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.096	0.083	1.144
UC-03	UB-03	Foundation Soils	16.4	25.8	2.6	0.125	8.560	4.783	1.4	3.4	100	30	44.7	48.0	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.084	1.132
UC-03	UB-03	Foundation Soils	16.5	25.7	2.2	0.112	7.080	5.175	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.084	1.124
UC-03	UB-03	Foundation Soils	16.6	25.6	2.2	0.106	10.480	4.895	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.084	1.121
UC-03	UB-03	Foundation Soils	16.7	25.5	2.2	0.097	15.970	4.410	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.084	1.120
UC-03	UB-03	Foundation Soils	16.7	25.4	2.5	0.092	17.580	3.637	1.4	3.2	100	30	44.6	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.084	1.122
UC-03	UB-03	Foundation Soils	16.8	25.3	3.9	0.107	17.120	2.767	1.4	4.9	100	30	45.0	50.0	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.084	1.140

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	16.9	25.3	7.0	0.139	14.390	1.974	1.3	8.9	100	30	46.0	55.0	1.0	-0.3	0.0	1.0	0.096	1.008	0.100	0.084	1.184
UC-03	UB-03	Foundation Soils	17.0	25.2	20.6	0.167	6.100	0.809	1.4	27.5	53	0	0.5	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.080	0.085	0.948
UC-03	UB-03	Foundation Soils	17.1	25.1	27.3	0.203	7.050	0.745	1.4	35.6	43	0	0.5	36.1	1.0	-0.3	0.0	1.0	0.083	1.007	0.086	0.085	1.013
UC-03	UB-03	Foundation Soils	17.1	25.0	29.2	0.273	6.380	0.936	1.4	37.8	45	0	0.5	38.3	1.0	-0.3	0.0	1.0	0.084	1.007	0.087	0.085	1.031
UC-03	UB-03	Foundation Soils	17.2	24.9	30.1	0.277	8.000	0.919	1.4	38.8	44	0	0.5	39.4	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.085	1.039
UC-03	UB-03	Foundation Soils	17.3	24.9	30.6	0.282	8.240	0.922	1.4	39.3	43	0	0.5	39.8	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.085	1.041
UC-03	UB-03	Foundation Soils	17.4	24.8	31.8	0.270	8.430	0.849	1.4	40.6	41	0	0.5	41.2	1.0	-0.3	0.0	1.0	0.086	1.007	0.089	0.085	1.052
UC-03	UB-03	Foundation Soils	17.5	24.7	36.4	0.263	9.010	0.722	1.3	46.0	34	0	0.5	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.085	1.097
UC-03	UB-03	Foundation Soils	17.6	24.6	40.7	0.253	8.910	0.621	1.3	50.9	28	0	0.5	51.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.085	1.139
UC-03	UB-03	Foundation Soils	17.6	24.5	44.9	0.260	8.410	0.580	1.3	55.5	24	0	0.4	56.0	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.085	1.181
UC-03	UB-03	Foundation Soils	17.7	24.4	49.6	0.303	8.750	0.611	1.3	60.8	22	0	0.4	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.105	0.085	1.229
UC-03	UB-03	Foundation Soils	17.8	24.4	53.9	0.351	8.850	0.651	1.3	65.6	20	0	0.4	66.0	1.0	-0.3	0.0	0.9	0.104	1.009	0.109	0.085	1.275
UC-03	UB-03	Foundation Soils	17.9	24.3	57.6	0.392	8.580	0.681	1.3	69.5	19	0	0.4	69.9	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.085	1.314
UC-03	UB-03	Foundation Soils	18.0	24.2	58.1	0.421	8.310	0.725	1.3	69.9	20	0	0.4	70.3	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.085	1.316
UC-03	UB-03	Foundation Soils	18.0	24.1	56.3	0.443	8.240	0.786	1.3	67.8	23	0	0.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.086	1.294
UC-03	UB-03	Foundation Soils	18.1	24.0	53.7	0.449	8.240	0.837	1.3	64.7	25	0	0.5	65.2	1.0	-0.3	0.0	0.9	0.103	1.009	0.108	0.086	1.262
UC-03	UB-03	Foundation Soils	18.2	24.0	50.7	0.451	8.380	0.890	1.3	61.2	28	0	0.5	61.7	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.086	1.227
UC-03	UB-03	Foundation Soils	18.3	23.9	47.8	0.442	8.650	0.925	1.3	57.9	31	0	0.5	58.4	1.0	-0.3	0.0	0.9	0.098	1.008	0.102	0.086	1.193
UC-03	UB-03	Foundation Soils	18.4	23.8	45.4	0.435	8.810	0.959	1.3	55.1	33	0	0.5	55.6	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.086	1.166
UC-03	UB-03	Foundation Soils	18.5	23.7	45.0	0.470	8.960	1.045	1.3	54.5	35	0	0.5	55.1	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.086	1.160
UC-03	UB-03	Foundation Soils	18.5	23.6	46.7	0.477	9.290	1.021	1.3	56.4	34	0	0.5	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.086	1.176
UC-03	UB-03	Foundation Soils	18.6	23.5	48.6	0.417	9.500	0.859	1.3	58.3	29	0	0.5	58.8	1.0	-0.3	0.0	0.9	0.099	1.008	0.103	0.086	1.192
UC-03	UB-03	Foundation Soils	18.7	23.5	53.2	0.447	9.910	0.841	1.3	63.3	26	0	0.5	63.8	1.0	-0.3	0.0	0.9	0.102	1.009	0.107	0.086	1.239
UC-03	UB-03	Foundation Soils	18.8	23.4	58.5	0.469	10.050	0.802	1.3	69.1	22	0	0.4	69.5	1.0	-0.3	0.0	0.9	0.107	1.010	0.111	0.086	1.295
UC-03	UB-03	Foundation Soils	18.9	23.3	64.5	0.502	9.460	0.778	1.2	75.5	19	0	0.4	75.9	1.0	-0.3	0.0	0.9	0.112	1.011	0.117	0.086	1.362
UC-03	UB-03	Foundation Soils	18.9	23.2	68.1	0.516	9.020	0.757	1.2	79.3	17	0	0.3	79.6	1.0	-0.3	0.0	0.9	0.115	1.012	0.121	0.086	1.402
UC-03	UB-03	Foundation Soils	19.0	23.1	66.1	0.528	9.200	0.799	1.2	76.9	19	0	0.4	77.3	1.0	-0.3	0.0	0.9	0.113	1.011	0.119	0.086	1.375
UC-03	UB-03	Foundation Soils	19.1	23.1	64.0	0.512	9.340	0.799	1.2	74.6	20	0	0.4	75.0	1.0	-0.3	0.0	0.9	0.111	1.011	0.116	0.086	1.348
UC-03	UB-03	Foundation Soils	19.2	23.0	61.0	0.494	9.790	0.810	1.2	71.1	22	0	0.4	71.6	1.0	-0.3	0.0	0.9	0.109	1.010	0.113	0.086	1.310
UC-03	UB-03	Foundation Soils	19.3	22.9	58.7	0.474	9.840	0.807	1.2	68.6	23	0	0.4	69.0	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.086	1.282
UC-03	UB-03	Foundation Soils	19.4	22.8	56.5	0.469	9.960	0.830	1.2	66.0	24	0	0.5	66.5	1.0	-0.3	0.0	0.9	0.104	1.010	0.109	0.086	1.256
UC-03	UB-03	Foundation Soils	19.4	22.7	53.9	0.427	10.010	0.793	1.2	63.0	25	0	0.5	63.4	1.0	-0.3	0.0	0.9	0.102	1.009	0.106	0.087	1.225
UC-03	UB-03	Foundation Soils	19.5	22.6	51.1	0.385	10.110	0.754	1.2	59.8	26	0	0.5	60.3	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.087	1.194
UC-03	UB-03	Foundation Soils	19.6	22.6	48.4	0.381	10.200	0.786	1.2	56.8	28	0	0.5	57.3	1.0	-0.3	0.0	0.9	0.098	1.008	0.101	0.087	1.166
UC-03	UB-03	Foundation Soils	19.7	22.5	45.8	0.373	10.150	0.814	1.2	53.8	30	0	0.5	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.099	0.087	1.138
UC-03	UB-03	Foundation Soils	19.8	22.4	40.7	0.368	8.760	0.905	1.3	48.0	36	0	0.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.087	1.086
UC-03	UB-03	Foundation Soils	19.8	22.3	39.0	0.400	9.770	1.026	1.3	46.1	40	0	0.5	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.087	1.068
UC-03	UB-03	Foundation Soils	19.9	22.2	37.2	0.442	9.670	1.188	1.3	44.0	44	0	0.5	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.087	1.050
UC-03	UB-03	Foundation Soils	20.0	22.2	31.0	0.487	9.560	1.569	1.3	37.0	55	0	0.5	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.086	0.087	0.991
UC-03	UB-03	Foundation Soils	20.1	22.1	22.1	0.542	9.960	2.458	1.3	26.7	72	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.087	0.908
UC-03	UB-03	Foundation Soils	20.2	22.0	14.9	0.529	10.290	3.561	1.3	18.2	92	0	0.5	18.7	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.087	0.842
UC-03	UB-03	Foundation Soils	20.3	21.9	10.8	0.483	11.100	4.456	1.3	13.2	100	0	0.5	13.7	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.087	0.805
UC-03	UB-03	Foundation Soils	20.3	21.8	8.9	0.379	11.530	4.262	1.3	10.8	100	0	0.5	11.3	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.087	0.787
UC-03	UB-03	Foundation Soils	20.4	21.7	7.2	0.284	12.290	3.968	1.3	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.087	0.772
UC-03	UB-03	Foundation Soils	20.5	21.7	6.0	0.215	24.770	3.575	1.3	7.3	100	0	0.5	7.8	1.0	-0.4	0.0	0.9	0.065	1.006	0.066	0.087	0.761
UC-03	UB-03	Foundation Soils	20.6	21.6	6.2	0.148	56.980	2.404	1.3	7.5	100	0	0.5	7.9	1.0	-0.4	0.0	0.9	0.065	1.006	0.067	0.087	0.762
UC-03	UB-03	Foundation Soils	20.7	21.5	7.2	0.087	93.900	1.209	1.3	8.7	97	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.087	0.770
UC-03	UB-03	Foundation Soils	20.8	21.4	20.8	0.083	68.890	0.400	1.3	24.8	45	0	0.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.087	0.887
UC-03	UB-03	Foundation Soils	20.8	21.3	30.1	0.124	67.850	0.412	1.2	35.3	33	0	0.5	35.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.088	0.968
UC-03	UB-03	Foundation Soils	20.9	21.2	22.4	0.188	8.100	0.839	1.3	26.6	53	0	0.5	27.1	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.088	0.899
UC-03	UB-03	Foundation Soils	21.0	21.2	14.3	0.249	14.320	1.744	1.3	17.1	79	0	0.5	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.088	0.828
UC-03	UB-03	Foundation Soils	21.1	21.1	9.5	0.257	31.490	2.703	1.3	11.4	100	0	0.5	11.9	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.088	0.786
UC-03	UB-03	Foundation Soils	21.2	21.0	7.3	0.213	57.890	2.905	1.3	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.088	0.767
UC-03	UB-03	Foundation Soils	21.2	20.9	6.8	0.214	66.020	3.155	1.3	8.1	100	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.088	0.761
UC-03	UB-03	Foundation Soils	21.3	20.8	19.3	0.218	96.300	1.127	1.3	22.9	63	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.088	0.868
UC-03	UB-03	Foundation Soils	21.4	20.8	28.6	0.285	103.870	0.998	1.2	33.1	49	0	0.5	33.7	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.088	0.946
UC-03	UB-03	Foundation Soils	21.5	20.7	20.5	0.338	7.150	1.648	1.2	24.1	69	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.088	0.875
UC-03	UB-03	Foundation Soils	21.6	20.6	12.3	0.277	3.670	2.248	1.3	14.5	90	0	0.5	15.0	1.0	-0.4	0.0	0.9	0.069	1.006	0.071	0.088	0.805
UC-03	UB-03	Foundation Soils	21.7	20.5	9.6	0.254	22.110	2.655	1.2	11.3	100	0	0.5	11.8	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.088	0.781
UC-03	UB-03	Foundation Soils	21.7	20.4	7.4	0.236	40.070	3.193	1.2	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.088	0.762
UC-03	UB-03	Foundation Soils	21.8	20.3	8.5	0.239	52.080	2.827	1.2	9.9	100	0	0.5	10.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.088	0.770
UC-03	UB-03	Foundation Soils	21.9	20.3	33.1	0.224	96.480	0.676	1.2	37.8	38	0	0.5	38.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.088	0.978

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	22.0	20.2	58.9	0.187	48.600	0.318	1.2	65.2	8	0	0.1	65.3	1.0	-0.4	0.0	0.9	0.104	1.009	0.107	0.088	1.210
UC-03	UB-03	Foundation Soils	22.1	20.1	68.6	0.184	7.000	0.268	1.2	75.3	1	0	0.0	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.088	1.309
UC-03	UB-03	Foundation Soils	22.1	20.0	77.2	0.223	-3.030	0.289	1.2	84.0	0	0	0.0	84.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.088	1.405
UC-03	UB-03	Foundation Soils	22.2	19.9	64.5	0.302	2.860	0.468	1.2	70.8	12	0	0.2	70.9	1.0	-0.4	0.0	0.9	0.108	1.010	0.112	0.088	1.263
UC-03	UB-03	Foundation Soils	22.3	19.9	54.8	0.378	4.920	0.690	1.2	60.5	23	0	0.4	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.088	1.167
UC-03	UB-03	Foundation Soils	22.4	19.8	36.4	0.467	7.130	1.285	1.2	40.8	48	0	0.5	41.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.088	0.999
UC-03	UB-03	Foundation Soils	22.5	19.7	25.7	0.602	9.620	2.347	1.2	29.1	70	0	0.5	29.7	1.0	-0.4	0.0	0.9	0.079	1.006	0.080	0.088	0.907
UC-03	UB-03	Foundation Soils	22.6	19.6	18.2	0.668	12.150	3.663	1.2	20.9	89	0	0.5	21.5	1.0	-0.4	0.0	0.9	0.073	1.006	0.075	0.089	0.845
UC-03	UB-03	Foundation Soils	22.6	19.5	14.4	0.575	14.140	4.005	1.2	16.5	98	0	0.5	17.0	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.089	0.812
UC-03	UB-03	Foundation Soils	22.7	19.4	11.3	0.317	15.720	2.801	1.2	13.0	99	0	0.5	13.5	1.0	-0.4	0.0	0.9	0.068	1.006	0.070	0.089	0.786
UC-03	UB-03	Foundation Soils	22.8	19.4	8.5	0.248	21.170	2.913	1.2	9.7	100	0	0.5	10.2	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.089	0.763
UC-03	UB-03	Foundation Soils	22.9	19.3	7.1	0.234	55.510	3.293	1.2	8.1	100	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.089	0.752
UC-03	UB-03	Foundation Soils	23.0	19.2	19.6	0.163	75.800	0.830	1.2	22.3	59	0	0.5	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.089	0.852
UC-03	UB-03	Foundation Soils	23.0	19.1	41.3	0.140	61.130	0.339	1.2	45.5	21	0	0.4	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.092	0.089	1.031
UC-03	UB-03	Foundation Soils	23.1	19.0	44.5	0.156	6.770	0.351	1.2	48.7	19	0	0.4	49.1	1.0	-0.4	0.0	0.9	0.092	1.007	0.094	0.089	1.057
UC-03	UB-03	Foundation Soils	23.2	19.0	41.2	0.260	10.590	0.631	1.2	45.3	31	0	0.5	45.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.089	1.028
UC-03	UB-03	Foundation Soils	23.3	18.9	30.1	0.378	14.180	1.255	1.2	33.4	53	0	0.5	33.9	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.089	0.934
UC-03	UB-03	Foundation Soils	23.4	18.8	25.3	0.540	16.910	2.131	1.2	28.2	69	0	0.5	28.7	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.089	0.894
UC-03	UB-03	Foundation Soils	23.5	18.7	17.0	0.564	21.180	3.325	1.2	19.1	90	0	0.5	19.6	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.089	0.826
UC-03	UB-03	Foundation Soils	23.5	18.6	11.9	0.475	27.310	3.995	1.2	13.3	100	0	0.5	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.089	0.785
UC-03	UB-03	Foundation Soils	23.6	18.5	9.4	0.389	32.780	4.119	1.2	10.6	100	0	0.5	11.1	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.089	0.765
UC-03	UB-03	Foundation Soils	23.7	18.5	7.4	0.344	56.980	4.670	1.2	8.2	100	0	0.5	8.7	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.089	0.749
UC-03	UB-03	Foundation Soils	23.8	18.4	11.5	0.319	98.280	2.785	1.2	12.8	99	0	0.5	13.3	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.089	0.779
UC-03	UB-03	Foundation Soils	23.9	18.3	25.3	0.319	86.250	1.261	1.2	27.9	59	0	0.5	28.4	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.089	0.888
UC-03	UB-03	Foundation Soils	23.9	18.2	31.0	0.265	23.770	0.855	1.2	33.9	45	0	0.5	34.4	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.089	0.933
UC-03	UB-03	Foundation Soils	24.0	18.1	34.9	0.210	23.960	0.601	1.2	38.0	36	0	0.5	38.4	1.0	-0.4	0.1	0.9	0.084	1.007	0.086	0.089	0.964
UC-03	UB-03	Foundation Soils	24.1	18.0	44.9	0.130	20.610	0.290	1.1	48.2	17	0	0.3	48.5	1.0	-0.4	0.1	0.9	0.091	1.007	0.093	0.089	1.045
UC-03	UB-03	Foundation Soils	24.2	18.0	55.2	0.097	15.340	0.176	1.1	58.8	5	0	0.0	58.8	1.0	-0.5	0.1	0.9	0.099	1.008	0.101	0.089	1.131
UC-03	UB-03	Foundation Soils	24.3	17.9	63.0	0.119	-2.570	0.189	1.1	66.6	1	0	0.0	66.6	1.0	-0.5	0.1	0.9	0.105	1.010	0.107	0.089	1.201
UC-03	UB-03	Foundation Soils	24.4	17.8	57.3	0.151	2.140	0.263	1.1	60.8	8	0	0.1	60.8	1.0	-0.5	0.1	0.9	0.100	1.009	0.103	0.089	1.148
UC-03	UB-03	Foundation Soils	24.4	17.7	48.3	0.231	11.010	0.478	1.1	51.4	22	0	0.4	51.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.089	1.070
UC-03	UB-03	Foundation Soils	24.5	17.6	39.5	0.276	16.630	0.699	1.1	42.2	35	0	0.5	42.7	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.089	0.995
UC-03	UB-03	Foundation Soils	24.6	17.6	32.6	0.327	18.130	1.002	1.1	35.0	47	0	0.5	35.6	1.0	-0.5	0.1	0.9	0.082	1.007	0.084	0.089	0.939
UC-03	UB-03	Foundation Soils	24.7	17.5	28.9	0.371	20.490	1.282	1.1	31.1	55	0	0.5	31.7	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.089	0.909
UC-03	UB-03	Foundation Soils	24.8	17.4	25.8	0.408	22.710	1.582	1.1	27.8	63	0	0.5	28.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.079	0.089	0.883
UC-03	UB-03	Foundation Soils	24.9	17.3	24.4	0.365	25.010	1.494	1.1	26.3	64	0	0.5	26.8	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.089	0.872
UC-03	UB-03	Foundation Soils	24.9	17.2	24.9	0.266	26.360	1.070	1.1	26.7	57	0	0.5	27.2	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.089	0.874
UC-03	UB-03	Foundation Soils	25.0	17.1	27.5	0.209	24.110	0.760	1.1	29.4	48	0	0.5	29.9	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.090	0.894
UC-03	UB-03	Foundation Soils	25.1	17.1	29.2	0.178	9.310	0.610	1.1	31.1	42	0	0.5	31.6	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.090	0.906
UC-03	UB-03	Foundation Soils	25.2	17.0	28.1	0.205	0.910	0.729	1.1	29.9	46	0	0.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.090	0.897
UC-03	UB-03	Foundation Soils	25.3	16.9	23.1	0.243	0.380	1.050	1.1	24.7	59	0	0.5	25.2	1.0	-0.5	0.1	0.9	0.076	1.006	0.077	0.090	0.858
UC-03	UB-03	Foundation Soils	25.3	16.8	19.8	0.245	13.460	1.240	1.1	21.1	67	0	0.5	21.6	1.0	-0.5	0.1	0.9	0.073	1.006	0.075	0.090	0.832
UC-03	UB-03	Foundation Soils	25.4	16.7	16.7	0.273	31.210	1.639	1.1	17.8	78	0	0.5	18.3	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.090	0.808
UC-03	UB-03	Foundation Soils	25.5	16.7	14.7	0.266	35.160	1.811	1.1	15.7	84	0	0.5	16.2	1.0	-0.5	0.1	0.9	0.070	1.006	0.071	0.090	0.793
UC-03	UB-03	Foundation Soils	25.6	16.6	11.9	0.276	51.840	2.319	1.1	12.7	97	0	0.5	13.2	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.090	0.772
UC-03	UB-03	Foundation Soils	25.7	16.5	10.2	0.280	74.370	2.757	1.1	10.8	100	0	0.5	11.3	1.0	-0.5	0.1	0.9	0.067	1.006	0.068	0.090	0.759
UC-03	UB-03	Foundation Soils	25.8	16.4	11.2	0.278	110.440	2.480	1.1	11.9	100	0	0.5	12.4	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.090	0.766
UC-03	UB-03	Foundation Soils	25.8	16.3	13.8	0.252	84.050	1.828	1.1	14.6	87	0	0.5	15.1	1.0	-0.5	0.1	0.9	0.069	1.006	0.070	0.090	0.784
UC-03	UB-03	Foundation Soils	25.9	16.2	16.1	0.226	69.620	1.406	1.1	17.0	77	0	0.5	17.5	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.090	0.800
UC-03	UB-03	Foundation Soils	26.0	16.2	21.9	0.272	60.510	1.241	1.1	23.1	64	0	0.5	23.6	1.0	-0.5	0.1	0.9	0.075	1.006	0.076	0.090	0.843
UC-03	UB-03	Foundation Soils	26.1	16.1	30.2	0.305	28.400	1.010	1.1	31.5	50	0	0.5	32.0	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.090	0.905
UC-03	UB-03	Foundation Soils	26.2	16.0	35.3	0.283	24.820	0.802	1.1	36.6	41	0	0.5	37.1	1.0	-0.5	0.1	0.9	0.083	1.007	0.085	0.090	0.943
UC-03	UB-03	Foundation Soils	26.2	15.9	40.7	0.265	19.820	0.650	1.1	42.1	33	0	0.5	42.5	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.090	0.985
UC-03	UB-03	Foundation Soils	26.3	15.8	53.0	0.260	1.330	0.490	1.1	54.3	20	0	0.4	54.7	1.0	-0.5	0.1	0.9	0.096	1.008	0.097	0.090	1.083
UC-03	UB-03	Foundation Soils	26.4	15.8	70.6	0.280	6.430	0.397	1.1	71.7	8	0	0.1	71.8	1.0	-0.5	0.1	0.9	0.109	1.010	0.111	0.090	1.235
UC-03	UB-03	Foundation Soils	26.5	15.7	85.8	0.336	7.900	0.392	1.1	86.5	2	0	0.0	86.5	1.0	-0.5	0.1	0.9	0.122	1.014	0.125	0.090	1.392
UC-03	UB-03	Foundation Soils	26.6	15.6	94.2	0.378	12.770	0.401	1.1	94.6	0	0	0.0	94.6	1.0	-0.5	0.1	0.9	0.131	1.016	0.134	0.090	1.495
UC-03	UB-03	Foundation Soils	26.7	15.5	96.0	0.458	9.100	0.477	1.1	96.4	2	0	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.090	1.519
UC-03	UB-03	Foundation Soils	26.7	15.4	97.4	0.528	14.270	0.542	1.1	97.6	4	0	0.0	97.6	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.090	1.536
UC-03	UB-03	Foundation Soils	26.8	15.3	97.6	0.543	18.140	0.556	1.1	97.6	4	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.090	1.537
UC-03	UB-03	Foundation Soils	26.9	15.3	97.8	0.575	19.110	0.588	1.1	97.7	6	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.090	1.537
UC-03	UB-03	Foundation Soils	27.0	15.2	101.0	0.601	21.540	0.595	1.1	100.6	5	0	0.0	100.6	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.090	1.581

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	27.1	15.1	108.8	0.630	19.680	0.579	1.1	108.1	2	0	0.0	108.1	1.0	-0.5	0.1	0.9	0.149	1.021	0.154	0.090	1.711
UC-03	UB-03	Foundation Soils	27.1	15.0	112.0	0.680	19.930	0.607	1.1	111.0	2	0	0.0	111.0	1.0	-0.5	0.1	0.9	0.154	1.022	0.159	0.090	1.767
UC-03	UB-03	Foundation Soils	27.2	14.9	109.6	0.702	19.580	0.640	1.1	108.6	4	0	0.0	108.6	1.0	-0.5	0.1	0.9	0.150	1.021	0.155	0.090	1.719
UC-03	UB-03	Foundation Soils	27.3	14.9	105.3	0.718	18.030	0.682	1.1	104.3	7	0	0.0	104.4	1.0	-0.5	0.1	0.9	0.143	1.019	0.148	0.090	1.640
UC-03	UB-03	Foundation Soils	27.4	14.8	98.1	0.717	21.520	0.731	1.1	97.2	10	0	0.1	97.4	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.090	1.529
UC-03	UB-03	Foundation Soils	27.5	14.7	96.2	0.675	22.590	0.702	1.0	95.2	10	0	0.1	95.3	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.090	1.499
UC-03	UB-03	Foundation Soils	27.6	14.6	97.6	0.678	23.870	0.695	1.0	96.5	9	0	0.1	96.6	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.090	1.516
UC-03	UB-03	Foundation Soils	27.6	14.5	96.9	0.692	23.110	0.714	1.0	95.7	10	0	0.1	95.8	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.090	1.505
UC-03	UB-03	Foundation Soils	27.7	14.4	93.6	0.698	18.630	0.746	1.0	92.3	12	0	0.2	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.090	1.459
UC-03	UB-03	Foundation Soils	27.8	14.4	90.0	0.652	24.590	0.724	1.0	88.8	12	0	0.2	89.0	1.0	-0.5	0.1	0.9	0.125	1.014	0.127	0.090	1.414
UC-03	UB-03	Foundation Soils	27.9	14.3	91.5	0.618	23.110	0.676	1.0	90.1	11	0	0.2	90.2	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.090	1.429
UC-03	UB-03	Foundation Soils	28.0	14.2	95.0	0.644	22.520	0.678	1.0	93.3	10	0	0.1	93.5	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.090	1.471
UC-03	UB-03	Foundation Soils	28.1	14.1	95.8	0.665	20.490	0.694	1.0	94.0	10	0	0.1	94.1	1.0	-0.6	0.1	0.9	0.130	1.016	0.133	0.090	1.479
UC-03	UB-03	Foundation Soils	28.1	14.0	92.5	0.677	22.220	0.732	1.0	90.7	12	0	0.2	90.9	1.0	-0.6	0.1	0.9	0.127	1.015	0.129	0.090	1.437
UC-03	UB-03	Foundation Soils	28.2	13.9	90.0	0.681	25.300	0.757	1.0	88.1	14	0	0.3	88.4	1.0	-0.6	0.1	0.9	0.124	1.014	0.127	0.090	1.404
UC-03	UB-03	Foundation Soils	28.3	13.9	91.0	0.666	25.600	0.732	1.0	89.0	13	0	0.2	89.2	1.0	-0.6	0.1	0.9	0.125	1.014	0.127	0.090	1.415
UC-03	UB-03	Foundation Soils	28.4	13.8	95.1	0.636	25.540	0.669	1.0	92.8	10	0	0.1	92.9	1.0	-0.6	0.1	0.9	0.129	1.015	0.132	0.090	1.461
UC-03	UB-03	Foundation Soils	28.5	13.7	101.4	0.625	23.100	0.616	1.0	98.8	6	0	0.0	98.8	1.0	-0.6	0.1	0.9	0.136	1.017	0.139	0.090	1.543
UC-03	UB-03	Foundation Soils	28.5	13.6	108.9	0.613	17.630	0.563	1.0	105.8	2	0	0.0	105.8	1.0	-0.6	0.1	0.9	0.145	1.020	0.149	0.090	1.657
UC-03	UB-03	Foundation Soils	28.6	13.5	109.8	0.617	20.340	0.562	1.0	106.6	2	0	0.0	106.6	1.0	-0.6	0.1	0.9	0.147	1.020	0.150	0.090	1.670
UC-03	UB-03	Foundation Soils	28.7	13.5	105.7	0.642	19.680	0.608	1.0	102.5	5	0	0.0	102.5	1.0	-0.6	0.1	0.9	0.141	1.019	0.144	0.090	1.600
UC-03	UB-03	Foundation Soils	28.8	13.4	101.0	0.636	21.620	0.630	1.0	97.9	7	0	0.0	97.9	1.0	-0.6	0.1	0.9	0.135	1.017	0.138	0.090	1.529
UC-03	UB-03	Foundation Soils	28.9	13.3	98.8	0.599	22.920	0.606	1.0	95.7	7	0	0.0	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.090	1.496
UC-03	UB-03	Foundation Soils	29.0	13.2	100.0	0.583	24.870	0.583	1.0	96.6	6	0	0.0	96.7	1.0	-0.6	0.1	0.9	0.133	1.017	0.136	0.090	1.509
UC-03	UB-03	Foundation Soils	29.0	13.1	101.3	0.623	23.350	0.615	1.0	97.8	6	0	0.0	97.8	1.0	-0.6	0.1	0.9	0.135	1.017	0.137	0.090	1.526
UC-03	UB-03	Foundation Soils	29.1	13.0	99.2	0.657	18.890	0.663	1.0	95.7	9	0	0.1	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.090	1.496
UC-03	UB-03	Foundation Soils	29.2	13.0	90.5	0.773	20.110	0.854	1.0	87.3	16	0	0.3	87.6	1.0	-0.6	0.1	0.9	0.123	1.014	0.125	0.090	1.390
UC-03	UB-03	Foundation Soils	29.3	12.9	84.3	0.704	21.200	0.835	1.0	81.2	18	0	0.4	81.6	1.0	-0.6	0.1	0.9	0.117	1.012	0.119	0.090	1.322
UC-03	UB-03	Foundation Soils	29.4	12.8	65.0	0.845	21.730	1.301	1.0	62.6	35	0	0.5	63.2	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.090	1.144
UC-03	UB-03	Foundation Soils	29.4	12.7	52.4	0.962	23.540	1.835	1.0	50.5	48	0	0.6	51.1	1.0	-0.6	0.1	0.9	0.093	1.008	0.094	0.090	1.043
UC-03	UB-03	Foundation Soils	29.5	12.6	39.7	0.955	27.350	2.406	1.0	38.3	62	0	0.5	38.8	1.0	-0.6	0.1	0.9	0.085	1.007	0.085	0.090	0.947
UC-03	UB-03	Foundation Soils	29.6	12.6	32.1	0.811	13.190	2.529	1.0	30.9	69	0	0.5	31.4	1.0	-0.6	0.1	0.9	0.080	1.006	0.080	0.090	0.892
UC-03	UB-03	Foundation Soils	29.7	12.5	34.8	0.618	35.260	1.774	1.0	33.5	59	0	0.5	34.0	1.0	-0.6	0.1	0.9	0.081	1.007	0.082	0.090	0.911
UC-03	UB-03	Foundation Soils	29.8	12.4	41.6	0.505	40.640	1.213	1.0	39.9	46	0	0.5	40.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.090	0.959
UC-03	UB-03	Foundation Soils	29.9	12.3	70.5	0.446	28.740	0.633	1.0	67.4	18	0	0.4	67.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.107	0.090	1.183
UC-03	UB-03	Foundation Soils	29.9	12.2	83.7	0.466	18.150	0.557	1.0	79.9	10	0	0.1	80.0	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.090	1.302
UC-03	UB-03	Foundation Soils	30.0	12.1	84.4	0.511	8.67	0.605134	1.0	80.4	12	0	0.2	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.118	0.090	1.309
UC-03	UB-03	Foundation Soils	30.1	12.1	80.9	0.543	15.340	0.671	1.0	77.0	15	0	0.3	77.3	1.0	-0.6	0.1	0.9	0.113	1.011	0.115	0.090	1.274
UC-03	UB-03	Foundation Soils	30.2	12.0	77.2	0.548	18.410	0.710	1.0	73.3	18	0	0.4	73.7	1.0	-0.6	0.1	0.9	0.110	1.011	0.112	0.090	1.238
UC-03	UB-03	Foundation Soils	30.3	11.9	73.8	0.563	21.250	0.763	1.0	70.1	20	0	0.4	70.5	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.090	1.207
UC-03	UB-03	Foundation Soils	30.3	11.8	74.5	0.573	24.250	0.769	1.0	70.6	20	0	0.4	71.0	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.090	1.212
UC-03	UB-03	Foundation Soils	30.4	11.7	78.4	0.583	24.920	0.744	1.0	74.2	18	0	0.4	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.090	1.246
UC-03	UB-03	Foundation Soils	30.5	11.7	77.8	0.579	25.610	0.744	1.0	73.6	18	0	0.4	74.0	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.090	1.240
UC-03	UB-03	Foundation Soils	30.6	11.6	76.3	0.558	26.630	0.732	1.0	72.0	19	0	0.4	72.4	1.0	-0.6	0.1	0.9	0.109	1.011	0.110	0.090	1.224
UC-03	UB-03	Foundation Soils	30.7	11.5	74.7	0.522	27.790	0.698	1.0	70.4	18	0	0.4	70.8	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.090	1.210
UC-03	UB-03	Foundation Soils	30.8	11.4	77.8	0.460	28.400	0.591	1.0	73.2	14	0	0.3	73.5	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.090	1.235
UC-03	UB-03	Foundation Soils	30.8	11.3	83.1	0.378	26.690	0.455	1.0	78.1	8	0	0.0	78.2	1.0	-0.6	0.1	0.9	0.114	1.012	0.115	0.090	1.281
UC-03	UB-03	Foundation Soils	30.9	11.2	90.1	0.319	23.250	0.354	1.0	84.7	1	0	0.0	84.7	1.0	-0.6	0.1	0.9	0.120	1.013	0.122	0.090	1.350
UC-03	UB-03	Foundation Soils	31.0	11.2	95.8	0.211	17.170	0.220	1.0	89.9	0	0	0.0	89.9	1.0	-0.6	0.1	0.9	0.125	1.015	0.127	0.090	1.411
UC-03	UB-03	Foundation Soils	31.1	11.1	98.9	0.159	13.440	0.161	1.0	92.6	0	0	0.0	92.6	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.090	1.446
UC-03	UB-03	Foundation Soils	31.2	11.0	98.5	0.124	11.990	0.126	1.0	92.2	0	0	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.090	1.439
UC-03	UB-03	Foundation Soils	31.2	10.9	96.7	0.121	14.630	0.125	1.0	90.3	0	0	0.0	90.3	1.0	-0.6	0.1	0.9	0.126	1.015	0.128	0.090	1.416
UC-03	UB-03	Foundation Soils	31.3	10.8	92.4	0.115	13.570	0.124	1.0	86.2	0	0	0.0	86.2	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.090	1.367
UC-03	UB-03	Foundation Soils	31.4	10.7	87.9	0.113	15.200	0.129	1.0	81.9	0	0	0.0	81.9	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.090	1.318
UC-03	UB-03	Foundation Soils	31.5	10.7	80.4	0.129	18.770	0.161	1.0	74.8	0	0	0.0	74.8	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.090	1.245
UC-03	UB-03	Foundation Soils	31.6	10.6	73.5	0.202	24.770	0.275	1.0	68.2	4	0	0.0	68.2	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.090	1.184
UC-03	UB-03	Foundation Soils	31.7	10.5	66.8	0.259	27.140	0.388	1.0	61.9	12	0	0.2	62.1	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.090	1.130
UC-03	UB-03	Foundation Soils	31.7	10.4	57.1	0.296	29.300	0.518	1.0	52.8	22	0	0.4	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.095	0.090	1.056
UC-03	UB-03	Foundation Soils	31.8	10.3	49.6	0.306	38.090	0.616	1.0	45.8	29	0	0.5	46.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.090	0.090	1.001
UC-03	UB-03	Foundation Soils	31.9	10.3	43.4	0.363	62.560	0.836	1.0	40.0	39	0	0.5	40.5	1.0	-0.7	0.1	0.9	0.086	1.007	0.086	0.090	0.956
UC-03	UB-03	Foundation Soils	32.0	10.2	41.2	0.341	95.400	0.828	1.0	37.8	40	0	0.5	38.3	1.0	-0.7	0.1	0.9	0.084	1.007	0.085	0.090	0.940
UC-03	UB-03	Foundation Soils	32.1	10.1	42.5	0.237	93.480	0.558	1.0	39.0	32	0	0.5	39.4	1.0	-0.7	0.1	0.9	0.085	1.007	0.085	0.090	0.948

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	32.2	10.0	48.0	0.231	83.270	0.481	1.0	44.1	26	0	0.4	44.5	1.0	-0.7	0.1	0.9	0.088	1.007	0.089	0.090	0.986
UC-03	UB-03	Foundation Soils	32.2	9.9	57.7	0.101	46.160	0.175	1.0	52.9	7	0	0.0	52.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.095	0.090	1.053
UC-03	UB-03	Foundation Soils	32.3	9.8	63.8	0.150	42.530	0.235	1.0	58.5	7	0	0.0	58.5	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.090	1.099
UC-03	UB-03	Foundation Soils	32.4	9.8	63.4	0.208	59.030	0.328	1.0	58.0	12	0	0.2	58.2	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.090	1.096
UC-03	UB-03	Foundation Soils	32.5	9.7	60.0	0.301	69.240	0.502	1.0	54.8	20	0	0.4	55.2	1.0	-0.7	0.1	0.9	0.096	1.008	0.096	0.090	1.071
UC-03	UB-03	Foundation Soils	32.6	9.6	55.9	0.267	84.710	0.477	1.0	51.0	21	0	0.4	51.4	1.0	-0.7	0.1	0.9	0.093	1.008	0.094	0.090	1.040
UC-03	UB-03	Foundation Soils	32.6	9.5	53.3	0.244	85.000	0.458	1.0	48.5	22	0	0.4	48.9	1.0	-0.7	0.1	0.9	0.092	1.007	0.092	0.090	1.020
UC-03	UB-03	Foundation Soils	32.7	9.4	56.6	0.279	78.760	0.493	1.0	51.5	22	0	0.4	51.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.094	0.090	1.044
UC-03	UB-03	Foundation Soils	32.8	9.4	64.7	0.259	64.370	0.400	1.0	58.8	14	0	0.2	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.090	1.102
UC-03	UB-03	Foundation Soils	32.9	9.3	74.4	0.216	37.740	0.290	1.0	67.7	5	0	0.0	67.7	1.0	-0.7	0.1	0.9	0.105	1.010	0.106	0.090	1.177
UC-03	UB-03	Foundation Soils	33.0	9.2	79.2	0.182	53.930	0.230	1.0	72.0	0	0	0.0	72.0	1.0	-0.7	0.1	0.9	0.109	1.010	0.109	0.090	1.216
UC-03	UB-03	Foundation Soils	33.1	9.1	82.8	0.244	58.460	0.295	1.0	75.2	2	0	0.0	75.2	1.0	-0.7	0.1	0.9	0.112	1.011	0.112	0.090	1.247
UC-03	UB-03	Foundation Soils	33.1	9.0	84.9	0.228	56.720	0.269	1.0	77.0	0	0	0.0	77.0	1.0	-0.7	0.1	0.9	0.113	1.011	0.114	0.090	1.264
UC-03	UB-03	Foundation Soils	33.2	8.9	87.3	0.217	63.030	0.248	1.0	79.2	0	0	0.0	79.2	1.0	-0.7	0.1	0.9	0.115	1.012	0.116	0.090	1.286
UC-03	UB-03	Foundation Soils	33.3	8.9	94.4	0.169	53.270	0.179	1.0	85.6	0	0	0.0	85.6	1.0	-0.7	0.1	0.9	0.121	1.013	0.122	0.090	1.355
UC-03	UB-03	Foundation Soils	33.4	8.8	109.2	0.157	20.090	0.144	1.0	99.2	0	0	0.0	99.2	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.090	1.529
UC-03	UB-03	Foundation Soils	33.5	8.7	117.6	0.312	33.640	0.265	1.0	106.8	0	0	0.0	106.8	1.0	-0.7	0.1	0.9	0.147	1.020	0.149	0.090	1.653
UC-03	UB-03	Foundation Soils	33.5	8.6	114.4	0.453	47.070	0.396	1.0	103.7	0	0	0.0	103.7	1.0	-0.7	0.1	0.9	0.142	1.019	0.144	0.090	1.599
UC-03	UB-03	Foundation Soils	33.6	8.5	109.1	0.498	53.120	0.457	1.0	98.7	1	0	0.0	98.7	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.090	1.522
UC-03	UB-03	Foundation Soils	33.7	8.5	98.5	0.689	61.770	0.700	1.0	88.8	12	0	0.2	89.0	1.0	-0.7	0.1	0.9	0.125	1.014	0.125	0.090	1.394
UC-03	UB-03	Foundation Soils	33.8	8.4	95.9	0.802	51.980	0.836	1.0	86.4	16	0	0.3	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.123	0.090	1.367
UC-03	UB-03	Foundation Soils	33.9	8.3	103.9	0.901	39.120	0.867	1.0	93.7	15	0	0.3	94.0	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.090	1.456
UC-03	UB-03	Foundation Soils	34.0	8.2	113.2	1.077	34.070	0.951	1.0	102.1	14	0	0.3	102.4	1.0	-0.7	0.1	0.9	0.140	1.019	0.142	0.090	1.577
UC-03	UB-03	Foundation Soils	34.0	8.1	137.2	1.015	11.630	0.740	1.0	124.1	4	0	0.0	124.1	1.0	-0.7	0.1	0.9	0.181	1.028	0.184	0.090	2.046
UC-03	UB-03	Foundation Soils	34.1	8.0	175.6	0.929	-1.910	0.529	1.0	159.6	0	0	0.0	159.6	1.0	-0.7	0.1	0.9	0.368	1.053	0.381	0.090	4.238
UC-03	UB-03	Foundation Soils	34.2	8.0	217.0	0.913	-8.130	0.421	1.0	198.1	0	0	0.0	198.1	1.0	-0.7	0.1	0.9	1.703	1.082	1.795	0.090	19.986
UC-03	UB-03	Foundation Soils	34.3	7.9	223.5	0.779	2.950	0.348	1.0	204.1	0	0	0.0	204.1	1.0	-0.7	0.1	0.9	2.404	1.082	2.528	0.090	28.150
UC-03	UB-03	Foundation Soils	34.4	7.8	220.7	0.718	5.820	0.325	1.0	201.3	0	0	0.0	201.3	1.0	-0.7	0.1	0.9	2.037	1.082	2.142	0.090	23.862
UC-03	UB-03	Foundation Soils	34.4	7.7	198.7	0.681	32.640	0.343	1.0	180.6	0	0	0.0	180.6	1.0	-0.7	0.1	0.9	0.743	1.075	0.780	0.090	8.691
UC-03	UB-03	Foundation Soils	34.5	7.6	190.2	0.585	47.960	0.308	1.0	172.5	0	0	0.0	172.5	1.0	-0.7	0.1	0.9	0.548	1.066	0.572	0.090	6.372
UC-03	UB-03	Foundation Soils	34.6	7.6	171.6	0.490	34.020	0.286	1.0	155.0	0	0	0.0	155.0	1.0	-0.7	0.1	0.9	0.325	1.049	0.335	0.090	3.736
UC-03	UB-03	Foundation Soils	34.7	7.5	152.6	0.435	15.900	0.285	1.0	137.3	0	0	0.0	137.3	1.0	-0.7	0.1	0.9	0.223	1.036	0.227	0.090	2.535
UC-03	UB-03	Foundation Soils	34.8	7.4	149.6	0.480	-10.340	0.321	1.0	134.4	0	0	0.0	134.4	1.0	-0.7	0.1	0.9	0.212	1.034	0.216	0.090	2.406
UC-03	UB-03	Foundation Soils	34.9	7.3	150.2	0.367	-13.350	0.244	1.0	134.9	0	0	0.0	134.9	1.0	-0.7	0.1	0.9	0.214	1.035	0.217	0.090	2.424
UC-03	UB-03	Foundation Soils	34.9	7.2	149.4	0.373	22.850	0.250	1.0	134.0	0	0	0.0	134.0	1.0	-0.7	0.1	0.9	0.211	1.034	0.214	0.090	2.388
UC-03	UB-03	Foundation Soils	35.0	7.1	135.4	0.384	34.900	0.284	0.9	121.0	0	0	0.0	121.0	1.0	-0.7	0.1	0.9	0.173	1.027	0.175	0.090	1.956
UC-03	UB-03	Foundation Soils	35.1	7.1	120.0	0.420	35.400	0.350	0.9	106.7	0	0	0.0	106.7	1.0	-0.7	0.1	0.9	0.147	1.020	0.148	0.090	1.647
UC-03	UB-03	Foundation Soils	35.2	7.0	118.2	0.369	40.180	0.312	0.9	104.9	0	0	0.0	104.9	1.0	-0.7	0.1	0.9	0.144	1.020	0.145	0.090	1.616
UC-03	UB-03	Foundation Soils	35.3	6.9	116.9	0.290	27.020	0.248	0.9	103.7	0	0	0.0	103.7	1.0	-0.8	0.1	0.9	0.142	1.019	0.143	0.090	1.596
UC-03	UB-03	Foundation Soils	35.4	6.8	118.3	0.273	28.680	0.231	0.9	104.9	0	0	0.0	104.9	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.090	1.615
UC-03	UB-03	Foundation Soils	35.4	6.7	118.7	0.186	2.810	0.157	0.9	105.1	0	0	0.0	105.1	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.090	1.619
UC-03	UB-03	Foundation Soils	35.5	6.6	114.3	0.334	23.510	0.292	0.9	101.0	0	0	0.0	101.0	1.0	-0.8	0.1	0.9	0.139	1.018	0.139	0.090	1.553
UC-03	UB-03	Foundation Soils	35.6	6.6	109.1	0.344	22.340	0.315	0.9	96.1	0	0	0.0	96.1	1.0	-0.8	0.1	0.9	0.132	1.016	0.133	0.090	1.482
UC-03	UB-03	Foundation Soils	35.7	6.5	103.5	0.389	17.680	0.376	0.9	90.9	0	0	0.0	90.9	1.0	-0.8	0.1	0.9	0.127	1.015	0.127	0.090	1.415
UC-03	UB-03	Foundation Soils	35.8	6.4	102.1	0.360	24.250	0.352	0.9	89.6	0	0	0.0	89.6	1.0	-0.8	0.1	0.9	0.125	1.014	0.125	0.090	1.399
UC-03	UB-03	Foundation Soils	35.8	6.3	103.2	0.286	30.890	0.277	0.9	90.5	0	0	0.0	90.5	1.0	-0.8	0.1	0.9	0.126	1.015	0.126	0.090	1.409
UC-03	UB-03	Foundation Soils	35.9	6.2	112.5	0.211	33.590	0.188	0.9	98.8	0	0	0.0	98.8	1.0	-0.8	0.1	0.9	0.136	1.017	0.136	0.090	1.520
UC-03	UB-03	Foundation Soils	36.0	6.2	110.8	0.238	33.490	0.215	0.9	97.2	0	0	0.0	97.2	1.0	-0.8	0.1	0.9	0.134	1.017	0.134	0.090	1.497
UC-03	UB-03	Foundation Soils	36.1	6.1	117.2	0.228	34.970	0.194	0.9	102.9	0	0	0.0	102.9	1.0	-0.8	0.1	0.9	0.141	1.019	0.142	0.089	1.582
UC-03	UB-03	Foundation Soils	36.2	6.0	114.6	0.175	27.790	0.153	0.9	100.3	0	0	0.0	100.3	1.0	-0.8	0.1	0.9	0.138	1.018	0.138	0.089	1.542
UC-03	UB-03	Foundation Soils	36.3	5.9	111.9	0.149	26.060	0.133	0.9	97.8	0	0	0.0	97.8	1.0	-0.8	0.1	0.9	0.135	1.017	0.135	0.089	1.506
UC-03	UB-03	Foundation Soils	36.3	5.8	102.1	0.138	26.110	0.135	0.9	88.9	0	0	0.0	88.9	1.0	-0.8	0.1	0.9	0.124	1.014	0.124	0.089	1.390
UC-03	UB-03	Foundation Soils	36.4	5.7	96.3	0.111	35.260	0.115	0.9	83.6	0	0	0.0	83.6	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.089	1.330
UC-03	UB-03	Foundation Soils	36.5	5.7	96.2	0.106	16.580	0.110	0.9	83.4	0	0	0.0	83.4	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.089	1.327
UC-03	UB-03	Foundation Soils	36.6	5.6	95.9	0.083	19.390	0.087	0.9	83.0	0	0	0.0	83.0	1.0	-0.8	0.1	0.9	0.119	1.013	0.118	0.089	1.323
UC-03	UB-03	Foundation Soils	36.7	5.5	92.7	0.053	28.630	0.057	0.9	80.1	0	0	0.0	80.1	1.0	-0.8	0.1	0.9	0.116	1.012	0.116	0.089	1.293
UC-03	UB-03	Foundation Soils	36.7	5.4	89.0	0.115	29.640	0.129	0.9	76.7	0	0	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.113	0.089	1.259
UC-03	UB-03	Foundation Soils	36.8	5.3	90.8	0.151	27.090	0.166	0.9	78.2	0	0	0.0	78.2	1.0	-0.8	0.1	0.9	0.114	1.012	0.114	0.089	1.274
UC-03	UB-03	Foundation Soils	36.9	5.3	85.5	0.149	32.880	0.174	0.9	73.4	0	0	0.0	73.4	1.0	-0.8	0.1	0.9	0.110	1.011	0.110	0.089	1.227
UC-03	UB-03	Foundation Soils	37.0	5.2	84.2	0.136	28.120	0.162	0.9	72.2	0	0	0.0	72.2	1.0	-0.8	0.1	0.9	0.109	1.010	0.109	0.089	1.216
UC-03	UB-03	Foundation Soils	37.1	5.1	82.9	0.110	31.350	0.133	0.9	70.9	0	0	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.108	0.089	1.204
UC-03	UB-03	Foundation Soils	37.2	5.0	82.4	0.062	21.150	0.075	0.9	70.3	0	0	0.0	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.089	1.199

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	37.2	4.9	81.8	0.088	13.200	0.108	0.9	69.8	0	0	0.0	69.8	1.0	-0.8	0.1	0.9	0.107	1.010	0.107	0.089	1.194
UC-03	UB-03	Foundation Soils	37.3	4.8	80.0	0.092	19.270	0.115	0.9	68.1	0	0	0.0	68.1	1.0	-0.8	0.1	0.9	0.106	1.010	0.105	0.089	1.179
UC-03	UB-03	Foundation Soils	37.4	4.8	77.9	0.068	25.200	0.087	0.9	66.1	0	0	0.0	66.1	1.0	-0.8	0.1	0.9	0.104	1.009	0.104	0.089	1.162
UC-03	UB-03	Foundation Soils	37.5	4.7	76.5	0.109	27.560	0.143	0.9	64.8	0	0	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.103	0.089	1.151
UC-03	UB-03	Foundation Soils	37.6	4.6	74.2	0.127	41.640	0.171	0.9	62.8	1	0	0.0	62.8	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.089	1.133
UC-03	UB-03	Foundation Soils	37.6	4.5	74.1	0.122	43.090	0.165	0.9	62.6	1	0	0.0	62.6	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.089	1.132
UC-03	UB-03	Foundation Soils	37.7	4.4	70.9	0.117	44.070	0.165	0.9	59.7	2	0	0.0	59.7	1.0	-0.8	0.1	0.9	0.099	1.009	0.099	0.089	1.107
UC-03	UB-03	Foundation Soils	37.8	4.4	70.5	0.116	41.110	0.165	0.9	59.3	3	0	0.0	59.3	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.089	1.104
UC-03	UB-03	Foundation Soils	37.9	4.3	72.5	0.144	37.690	0.199	0.9	61.0	3	0	0.0	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.100	0.089	1.118
UC-03	UB-03	Foundation Soils	38.0	4.2	73.1	0.186	59.350	0.255	0.9	61.4	6	0	0.0	61.4	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.089	1.122
UC-03	UB-03	Foundation Soils	38.1	4.1	71.8	0.223	59.170	0.311	0.9	60.2	9	0	0.1	60.3	1.0	-0.8	0.1	0.9	0.100	1.009	0.099	0.089	1.113
UC-03	UB-03	Foundation Soils	38.1	4.0	68.6	0.239	58.990	0.348	0.9	57.3	12	0	0.2	57.5	1.0	-0.8	0.1	0.9	0.098	1.008	0.097	0.089	1.090
UC-03	UB-03	Foundation Soils	38.2	3.9	61.9	0.194	57.330	0.314	0.9	51.4	14	0	0.2	51.7	1.0	-0.8	0.1	0.9	0.093	1.008	0.093	0.089	1.043
UC-03	UB-03	Foundation Soils	38.3	3.9	58.2	0.273	55.330	0.469	0.9	48.2	22	0	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.091	0.089	1.019
UC-03	UB-03	Foundation Soils	38.4	3.8	51.3	0.233	78.710	0.454	0.9	42.3	26	0	0.4	42.7	1.0	-0.8	0.1	0.9	0.087	1.007	0.087	0.089	0.974
UC-03	UB-03	Foundation Soils	38.5	3.7	49.5	0.208	75.320	0.420	0.9	40.7	26	0	0.4	41.1	1.0	-0.8	0.1	0.9	0.086	1.007	0.086	0.089	0.962
UC-03	UB-03	Foundation Soils	38.5	3.6	47.0	0.184	85.090	0.392	0.9	38.5	26	0	0.4	38.9	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.089	0.945
UC-03	UB-03	Foundation Soils	38.6	3.5	47.2	0.149	77.040	0.316	0.9	38.6	23	0	0.4	39.0	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.089	0.946
UC-03	UB-03	Foundation Soils	38.7	3.4	47.8	0.135	65.080	0.282	0.9	39.1	22	0	0.4	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.089	0.950
UC-03	UB-03	Foundation Soils	38.8	3.4	49.5	0.120	50.970	0.243	0.9	40.4	19	0	0.3	40.8	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.089	0.960
UC-03	UB-03	Foundation Soils	38.9	3.3	49.0	0.093	65.080	0.190	0.9	40.0	17	0	0.3	40.3	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.089	0.956
UC-03	UB-03	Foundation Soils	39.0	3.2	48.1	0.112	70.420	0.233	0.9	39.2	19	0	0.3	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.089	0.950
UC-03	UB-03	Foundation Soils	39.0	3.1	47.4	0.166	84.880	0.350	0.9	38.5	25	0	0.4	38.9	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.089	0.946
UC-03	UB-03	Foundation Soils	39.1	3.0	47.9	0.253	80.690	0.528	0.9	38.9	31	0	0.5	39.3	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.089	0.949
UC-03	UB-03	Foundation Soils	39.2	3.0	45.9	0.237	90.720	0.516	0.9	37.2	32	0	0.5	37.7	1.0	-0.9	0.1	0.9	0.084	1.007	0.083	0.089	0.937
UC-03	UB-03	Foundation Soils	39.3	2.9	42.9	0.234	90.140	0.546	0.9	34.6	35	0	0.5	35.1	1.0	-0.9	0.1	0.9	0.082	1.007	0.081	0.089	0.918
UC-03	UB-03	Foundation Soils	39.4	2.8	44.5	0.231	75.430	0.519	0.9	35.9	33	0	0.5	36.3	1.0	-0.9	0.1	0.9	0.083	1.007	0.082	0.089	0.927
UC-03	UB-03	Foundation Soils	39.5	2.7	52.7	0.200	2.480	0.379	0.9	42.8	23	0	0.4	43.1	1.0	-0.9	0.1	0.9	0.088	1.007	0.087	0.089	0.978
UC-03	UB-03	Foundation Soils	39.5	2.6	57.2	0.209	69.510	0.366	0.9	46.4	20	0	0.4	46.8	1.0	-0.9	0.1	0.8	0.090	1.007	0.089	0.089	1.006
UC-03	UB-03	Foundation Soils	39.6	2.5	63.1	0.283	54.790	0.449	0.9	51.4	19	0	0.4	51.8	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.089	1.045
UC-03	UB-03	Foundation Soils	39.7	2.5	61.6	0.402	56.140	0.653	0.9	50.1	27	0	0.5	50.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.089	1.035
UC-03	UB-03	Foundation Soils	39.8	2.4	59.2	0.589	66.510	0.995	0.9	48.0	36	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.089	1.019
UC-03	UB-03	Foundation Soils	39.9	2.3	59.2	0.628	73.620	1.061	0.9	47.9	37	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.089	1.019
UC-03	UB-03	Foundation Soils	39.9	2.2	64.2	0.586	51.450	0.913	0.9	52.1	32	0	0.5	52.6	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.089	1.052
UC-03	UB-03	Foundation Soils	40.0	2.1	69.6	0.534	-7.200	0.767	0.9	56.6	26	0	0.5	57.1	1.0	-0.9	0.1	0.8	0.097	1.008	0.096	0.089	1.088
UC-03	UB-03	Foundation Soils	40.1	2.1	71.4	0.474	-20.490	0.664	0.9	58.1	23	0	0.4	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.089	1.100
UC-03	UB-03	Foundation Soils	40.2	2.0	70.1	0.436	-8.210	0.622	0.9	57.0	22	0	0.4	57.4	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.089	1.090
UC-03	UB-03	Foundation Soils	40.3	1.9	66.3	0.426	32.880	0.643	0.9	53.6	24	0	0.4	54.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.089	1.064
UC-03	UB-03	Foundation Soils	40.4	1.8	64.2	0.493	27.110	0.768	0.9	51.8	28	0	0.5	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.089	1.050
UC-03	UB-03	Foundation Soils	40.4	1.7	63.3	0.593	-1.330	0.937	0.9	51.0	33	0	0.5	51.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.089	1.043
UC-03	UB-03	Foundation Soils	40.5	1.6	61.7	0.616	-4.760	0.998	0.9	49.6	35	0	0.5	50.1	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.088	1.033
UC-03	UB-03	Foundation Soils	40.6	1.6	59.2	0.578	-19.060	0.976	0.8	47.4	36	0	0.5	47.9	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.088	1.016
UC-03	UB-03	Foundation Soils	40.7	1.5	60.9	0.466	-21.200	0.766	0.8	48.8	30	0	0.5	49.2	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.088	1.026
UC-03	UB-03	Foundation Soils	40.8	1.4	68.1	0.397	31.350	0.583	0.9	54.8	22	0	0.4	55.2	1.0	-0.9	0.1	0.8	0.096	1.008	0.095	0.088	1.074
UC-03	UB-03	Foundation Soils	40.8	1.3	83.6	0.409	17.050	0.489	0.9	67.9	13	0	0.2	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.088	1.182
UC-03	UB-03	Foundation Soils	40.9	1.2	94.5	0.254	1.910	0.269	0.9	77.2	0	0	0.0	77.2	1.0	-0.9	0.1	0.8	0.113	1.011	0.112	0.088	1.267
UC-03	UB-03	Foundation Soils	41.0	1.2	103.8	0.196	20.200	0.189	0.9	85.1	0	0	0.0	85.1	1.0	-0.9	0.1	0.8	0.121	1.013	0.119	0.088	1.349
UC-03	UB-03	Foundation Soils	41.1	1.1	118.7	0.125	6.910	0.105	0.9	98.0	0	0	0.0	98.0	1.0	-0.9	0.1	0.8	0.135	1.017	0.133	0.088	1.509
UC-03	UB-03	Foundation Soils	41.2	1.0	128.9	0.143	13.830	0.111	0.9	106.9	0	0	0.0	106.9	1.0	-0.9	0.1	0.8	0.147	1.020	0.146	0.088	1.649
UC-03	UB-03	Foundation Soils	41.3	0.9	131.4	0.243	31.780	0.185	0.9	109.0	0	0	0.0	109.0	1.0	-0.9	0.1	0.8	0.150	1.021	0.149	0.088	1.686
UC-03	UB-03	Foundation Soils	41.3	0.8	123.7	0.233	32.680	0.188	0.9	102.1	0	0	0.0	102.1	1.0	-0.9	0.1	0.8	0.140	1.019	0.139	0.088	1.570
UC-03	UB-03	Foundation Soils	41.4	0.7	95.3	0.205	34.090	0.215	0.9	77.4	0	0	0.0	77.4	1.0	-0.9	0.1	0.8	0.113	1.012	0.112	0.088	1.269
UC-03	UB-03	Foundation Soils	41.5	0.7	77.3	0.224	36.020	0.290	0.8	62.0	7	0	0.0	62.0	1.0	-0.9	0.1	0.8	0.101	1.009	0.100	0.088	1.130
UC-03	UB-03	Foundation Soils	41.6	0.6	65.6	0.215	34.830	0.328	0.8	52.0	14	0	0.2	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.088	1.052
UC-03	UB-03	Foundation Soils	41.7	0.5	56.3	0.194	36.780	0.344	0.8	44.3	20	0	0.4	44.6	1.0	-0.9	0.1	0.8	0.089	1.007	0.088	0.088	0.992
UC-03	UB-03	Foundation Soils	41.7	0.4	55.0	0.236	34.600	0.429	0.8	43.2	24	0	0.4	43.6	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.088	0.985
UC-03	UB-03	Foundation Soils	41.8	0.3	52.5	0.241	33.490	0.459	0.8	41.0	26	0	0.4	41.4	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.088	0.968
UC-03	UB-03	Foundation Soils	41.9	0.3	51.7	0.217	36.350	0.420	0.8	40.3	26	0	0.4	40.8	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.088	0.964
UC-03	UB-03	Foundation Soils	42.0	0.2	53.0	0.169	28.310	0.319	0.8	41.4	21	0	0.4	41.7	1.0	-0.9	0.1	0.8	0.087	1.007	0.086	0.088	0.971
UC-03	UB-03	Foundation Soils	42.1	0.1	56.0	0.135	34.490	0.241	0.8	43.7	16	0	0.3	44.0	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.088	0.988
UC-03	UB-03	Foundation Soils	42.2	0.0	58.3	0.092	23.060	0.158	0.8	45.5	10	0	0.1	45.7	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.088	1.001
UC-03	UB-03	Foundation Soils	42.2	-0.1	57.0	0.064	30.150	0.112	0.8	44.4	9	0	0.1	44.5	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.088	0.992

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	42.3	-0.2	51.0	0.111	35.810	0.218	0.8	39.5	18	0	0.3	39.8	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.088	0.957
UC-03	UB-03	Foundation Soils	42.4	-0.2	50.2	0.124	33.690	0.247	0.8	38.8	20	0	0.3	39.1	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.088	0.952
UC-03	UB-03	Foundation Soils	42.5	-0.3	52.9	0.122	35.400	0.230	0.8	40.9	17	0	0.3	41.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.088	0.968
UC-03	UB-03	Foundation Soils	42.6	-0.4	55.7	0.099	32.300	0.178	0.8	43.2	13	0	0.2	43.4	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.088	0.984
UC-03	UB-03	Foundation Soils	42.7	-0.5	57.9	0.065	38.010	0.112	0.8	44.9	8	0	0.1	44.9	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.088	0.997
UC-03	UB-03	Foundation Soils	42.7	-0.6	62.1	0.064	26.970	0.103	0.8	48.3	6	0	0.0	48.3	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.088	1.022
UC-03	UB-03	Foundation Soils	42.8	-0.7	65.6	0.061	29.610	0.093	0.8	51.1	3	0	0.0	51.1	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.088	1.044
UC-03	UB-03	Foundation Soils	42.9	-0.7	66.1	0.061	33.380	0.092	0.8	51.4	3	0	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.088	1.047
UC-03	UB-03	Foundation Soils	43.0	-0.8	67.0	0.045	36.210	0.067	0.8	52.1	2	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.088	1.053
UC-03	UB-03	Foundation Soils	43.1	-0.9	67.0	0.042	33.880	0.063	0.8	52.1	2	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.088	1.053
UC-03	UB-03	Foundation Soils	43.1	-1.0	63.8	0.014	34.930	0.022	0.8	49.4	7	0	0.0	49.4	1.0	-1.0	0.1	0.8	0.092	1.008	0.091	0.088	1.032
UC-03	UB-03	Foundation Soils	43.2	-1.1	63.1	0.017	32.400	0.027	0.8	48.8	6	0	0.0	48.8	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.088	1.027
UC-03	UB-03	Foundation Soils	43.3	-1.1	59.1	0.074	36.300	0.125	0.8	45.5	9	0	0.1	45.5	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.088	1.002
UC-03	UB-03	Foundation Soils	43.4	-1.2	60.7	0.090	41.310	0.148	0.8	46.7	9	0	0.1	46.8	1.0	-1.0	0.1	0.8	0.090	1.007	0.089	0.088	1.012
UC-03	UB-03	Foundation Soils	43.5	-1.3	59.3	0.137	37.920	0.231	0.8	45.5	14	0	0.2	45.8	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.088	1.004
UC-03	UB-03	Foundation Soils	43.6	-1.4	57.4	0.168	37.640	0.293	0.8	43.9	18	0	0.3	44.2	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.088	0.993
UC-03	UB-03	Foundation Soils	43.6	-1.5	52.6	0.143	36.120	0.272	0.8	39.9	20	0	0.3	40.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.084	0.088	0.963
UC-03	UB-03	Foundation Soils	43.7	-1.6	43.6	0.195	36.280	0.447	0.8	32.7	33	0	0.5	33.2	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.088	0.911
UC-03	UB-03	Foundation Soils	43.8	-1.6	44.3	0.188	35.260	0.424	0.8	33.3	31	0	0.5	33.7	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.088	0.915
UC-03	UB-03	Foundation Soils	43.9	-1.7	48.3	0.194	33.970	0.402	0.8	36.4	28	0	0.4	36.8	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.088	0.938
UC-03	UB-03	Foundation Soils	44.0	-1.8	54.2	0.160	25.950	0.295	0.8	41.1	20	0	0.4	41.5	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.088	0.973
UC-03	UB-03	Foundation Soils	44.0	-1.9	69.3	0.124	20.340	0.179	0.8	53.3	6	0	0.0	53.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.087	1.064
UC-03	UB-03	Foundation Soils	44.1	-2.0	87.9	0.086	26.260	0.098	0.8	68.6	0	0	0.0	68.6	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.087	1.192
UC-03	UB-03	Foundation Soils	44.2	-2.0	99.8	0.077	32.400	0.077	0.8	78.5	0	0	0.0	78.5	1.0	-1.0	0.1	0.8	0.114	1.012	0.112	0.087	1.285
UC-03	UB-03	Foundation Soils	44.3	-2.1	101.5	0.065	36.950	0.064	0.8	79.9	0	0	0.0	79.9	1.0	-1.0	0.1	0.8	0.116	1.012	0.114	0.087	1.299
UC-03	UB-03	Foundation Soils	44.4	-2.2	96.3	0.056	38.880	0.058	0.8	75.4	0	0	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.110	0.087	1.255
UC-03	UB-03	Foundation Soils	44.5	-2.3	93.1	0.086	39.130	0.092	0.8	72.6	0	0	0.0	72.6	1.0	-1.0	0.1	0.8	0.109	1.011	0.107	0.087	1.229
UC-03	UB-03	Foundation Soils	44.5	-2.4	92.3	0.094	37.310	0.102	0.8	71.8	0	0	0.0	71.8	1.0	-1.0	0.1	0.8	0.109	1.010	0.107	0.087	1.222
UC-03	UB-03	Foundation Soils	44.6	-2.5	87.7	0.094	36.280	0.107	0.8	67.9	0	0	0.0	67.9	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.087	1.187
UC-03	UB-03	Foundation Soils	44.7	-2.5	84.0	0.035	34.830	0.042	0.8	64.8	0	0	0.0	64.8	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.087	1.161
UC-03	UB-03	Foundation Soils	44.8	-2.6	79.6	0.035	34.400	0.044	0.8	61.1	0	0	0.0	61.1	1.0	-1.0	0.1	0.8	0.100	1.009	0.099	0.087	1.129
UC-03	UB-03	Foundation Soils	44.9	-2.7	78.3	0.031	31.060	0.040	0.8	60.0	0	0	0.0	60.0	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.087	1.120
UC-03	UB-03	Foundation Soils	44.9	-2.8	77.8	0.029	31.800	0.037	0.8	59.6	0	0	0.0	59.6	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.087	1.117
UC-03	UB-03	Foundation Soils	45.0	-2.9	75.2	0.010	34.540	0.013	0.8	57.4	8	0	0.0	57.4	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.087	1.099
UC-03	UB-03	Foundation Soils	45.1	-2.9	73.5	0.027	36.090	0.037	0.8	55.9	0	0	0.0	55.9	1.0	-1.0	0.1	0.8	0.097	1.008	0.095	0.087	1.087
UC-03	UB-03	Foundation Soils	45.2	-3.0	68.9	0.045	34.210	0.065	0.8	52.1	1	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.087	1.057
UC-03	UB-03	Foundation Soils	45.3	-3.1	60.4	0.051	35.360	0.085	0.8	45.2	7	0	0.0	45.2	1.0	-1.0	0.1	0.8	0.089	1.007	0.087	0.087	1.004
UC-03	UB-03	Foundation Soils	45.4	-3.2	52.9	0.070	36.540	0.132	0.8	39.2	13	0	0.2	39.4	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.087	0.960
UC-03	UB-03	Foundation Soils	45.4	-3.3	48.5	0.142	36.850	0.293	0.8	35.7	24	0	0.4	36.1	1.0	-1.0	0.1	0.8	0.083	1.007	0.081	0.087	0.936
UC-03	UB-03	Foundation Soils	45.5	-3.4	49.1	0.084	37.920	0.171	0.8	36.1	18	0	0.3	36.4	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.087	0.938
UC-03	UB-03	Foundation Soils	45.6	-3.4	56.1	0.026	39.630	0.046	0.8	41.6	9	0	0.1	41.7	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.087	0.978
UC-03	UB-03	Foundation Soils	45.7	-3.5	56.6	0.072	37.780	0.127	0.8	42.0	11	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.087	0.981
UC-03	UB-03	Foundation Soils	45.8	-3.6	53.8	0.228	35.530	0.424	0.8	39.7	26	0	0.4	40.1	1.0	-1.1	0.1	0.8	0.085	1.007	0.084	0.087	0.966
UC-03	UB-03	Foundation Soils	45.8	-3.7	52.6	0.301	39.120	0.572	0.8	38.8	31	0	0.5	39.2	1.0	-1.1	0.1	0.8	0.085	1.007	0.083	0.087	0.960
UC-03	UB-03	Foundation Soils	45.9	-3.8	55.9	0.488	37.730	0.873	0.8	41.3	37	0	0.5	41.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.087	0.979
UC-03	UB-03	Foundation Soils	46.0	-3.9	74.0	0.404	40.020	0.546	0.8	55.7	20	0	0.4	56.0	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.087	1.090
UC-03	UB-03	Foundation Soils	46.1	-3.9	74.5	0.281	35.070	0.377	0.8	56.0	14	0	0.2	56.3	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.087	1.092
UC-03	UB-03	Foundation Soils	46.2	-4.0	55.0	0.242	34.150	0.440	0.8	40.4	26	0	0.4	40.8	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.087	0.973
UC-03	UB-03	Foundation Soils	46.3	-4.1	48.0	0.155	38.780	0.323	0.8	34.9	26	0	0.4	35.3	1.0	-1.1	0.1	0.8	0.082	1.007	0.081	0.087	0.932
UC-03	UB-03	Foundation Soils	46.3	-4.2	56.3	0.059	48.650	0.105	0.8	41.3	10	0	0.1	41.4	1.0	-1.1	0.1	0.8	0.086	1.007	0.085	0.087	0.977
UC-03	UB-03	Foundation Soils	46.4	-4.3	70.1	0.045	38.550	0.064	0.8	52.2	1	0	0.0	52.2	1.0	-1.1	0.1	0.8	0.094	1.008	0.092	0.087	1.061
UC-03	UB-03	Foundation Soils	46.5	-4.3	65.3	0.066	33.400	0.101	0.8	48.4	5	0	0.0	48.4	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.087	1.031
UC-03	UB-03	Foundation Soils	46.6	-4.4	57.5	0.039	34.920	0.068	0.8	42.1	8	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.087	0.984
UC-03	UB-03	Foundation Soils	46.7	-4.5	50.7	0.043	36.690	0.085	0.8	36.8	13	0	0.2	37.0	1.0	-1.1	0.1	0.8	0.083	1.007	0.082	0.087	0.945
UC-03	UB-03	Foundation Soils	46.8	-4.6	55.7	0.062	39.450	0.111	0.8	40.6	11	0	0.1	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.087	0.973
UC-03	UB-03	Foundation Soils	46.8	-4.7	76.6	0.059	35.400	0.077	0.8	57.2	0	0	0.0	57.2	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.087	1.102
UC-03	UB-03	Foundation Soils	46.9	-4.8	86.4	0.095	29.490	0.110	0.8	65.0	0	0	0.0	65.0	1.0	-1.1	0.1	0.8	0.103	1.009	0.101	0.087	1.167
UC-03	UB-03	Foundation Soils	47.0	-4.8	92.5	0.064	31.780	0.069	0.8	69.9	0	0	0.0	69.9	1.0	-1.1	0.1	0.8	0.107	1.010	0.105	0.087	1.210
UC-03	UB-03	Foundation Soils	47.1	-4.9	97.4	0.087	32.540	0.089	0.8	73.8	0	0	0.0	73.8	1.0	-1.1	0.1	0.8	0.110	1.011	0.108	0.087	1.247
UC-03	UB-03	Foundation Soils	47.2	-5.0	102.4	0.135	25.910	0.132	0.8	77.9	0	0	0.0	77.9	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.086	1.286
UC-03	UB-03	Foundation Soils	47.2	-5.1	114.4	0.166	1.760	0.145	0.8	87.9	0	0	0.0	87.9	1.0	-1.1	0.1	0.8	0.123	1.014	0.120	0.086	1.392
UC-03	UB-03	Foundation Soils	47.3	-5.2	121.1	0.155	18.160	0.128	0.8	93.4	0	0	0.0	93.4	1.0	-1.1	0.1	0.8	0.129	1.016	0.126	0.086	1.459

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	47.4	-5.2	128.0	0.130	17.900	0.102	0.8	99.1	0	0	0.0	99.1	1.0	-1.1	0.1	0.8	0.136	1.017	0.133	0.086	1.536
UC-03	UB-03	Foundation Soils	47.5	-5.3	130.4	0.136	28.780	0.104	0.8	101.1	0	0	0.0	101.1	1.0	-1.1	0.1	0.8	0.139	1.018	0.135	0.086	1.566
UC-03	UB-03	Foundation Soils	47.6	-5.4	116.6	0.146	32.260	0.125	0.8	89.3	0	0	0.0	89.3	1.0	-1.1	0.1	0.8	0.125	1.014	0.122	0.086	1.410
UC-03	UB-03	Foundation Soils	47.7	-5.5	116.2	0.133	28.650	0.114	0.8	88.9	0	0	0.0	88.9	1.0	-1.1	0.1	0.8	0.124	1.014	0.121	0.086	1.406
UC-03	UB-03	Foundation Soils	47.7	-5.6	108.7	0.016	27.010	0.015	0.8	82.6	0	0	0.0	82.6	1.0	-1.1	0.1	0.8	0.118	1.013	0.115	0.086	1.335
UC-03	UB-03	Foundation Soils	47.8	-5.7	110.1	0.010	24.010	0.009	0.8	83.7	2	0	0.0	83.7	1.0	-1.1	0.1	0.8	0.119	1.013	0.116	0.086	1.347
UC-03	UB-03	Foundation Soils	47.9	-5.7	100.9	0.010	29.420	0.010	0.8	76.1	3	0	0.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.110	0.086	1.270
UC-03	UB-03	Foundation Soils	48.0	-5.8	91.1	0.046	30.030	0.050	0.8	68.0	0	0	0.0	68.0	1.0	-1.1	0.1	0.8	0.106	1.010	0.103	0.086	1.196
UC-03	UB-03	Foundation Soils	48.1	-5.9	79.6	0.032	34.450	0.040	0.8	58.7	0	0	0.0	58.7	1.0	-1.1	0.1	0.8	0.099	1.008	0.096	0.086	1.117
UC-03	UB-03	Foundation Soils	48.1	-6.0	66.5	0.045	27.300	0.068	0.8	48.2	4	0	0.0	48.2	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.086	1.034
UC-03	UB-03	Foundation Soils	48.2	-6.1	63.0	0.027	30.330	0.043	0.8	45.4	6	0	0.0	45.4	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.086	1.013
UC-03	UB-03	Foundation Soils	48.3	-6.1	59.5	0.047	35.890	0.079	0.8	42.7	8	0	0.0	42.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.086	0.993
UC-03	UB-03	Foundation Soils	48.4	-6.2	56.3	0.052	31.400	0.092	0.8	40.1	10	0	0.1	40.3	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.086	0.974
UC-03	UB-03	Foundation Soils	48.5	-6.3	56.5	0.172	39.020	0.304	0.8	40.3	20	0	0.4	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.086	0.977
UC-03	UB-03	Foundation Soils	48.6	-6.4	62.1	0.226	39.000	0.364	0.8	44.5	20	0	0.4	44.9	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.086	1.009
UC-03	UB-03	Foundation Soils	48.6	-6.5	69.6	0.186	38.020	0.267	0.8	50.3	12	0	0.2	50.5	1.0	-1.1	0.1	0.8	0.093	1.008	0.091	0.086	1.053
UC-03	UB-03	Foundation Soils	48.7	-6.6	79.3	0.150	38.160	0.189	0.8	57.9	4	0	0.0	57.9	1.0	-1.1	0.1	0.8	0.098	1.008	0.096	0.086	1.113
UC-03	UB-03	Foundation Soils	48.8	-6.6	96.4	0.119	38.730	0.123	0.8	71.6	0	0	0.0	71.6	1.0	-1.1	0.1	0.8	0.109	1.010	0.106	0.086	1.230
UC-03	UB-03	Foundation Soils	48.9	-6.7	115.2	0.085	39.940	0.074	0.8	87.0	0	0	0.0	87.0	1.0	-1.1	0.1	0.8	0.122	1.014	0.119	0.086	1.387
UC-03	UB-03	Foundation Soils	49.0	-6.8	115.4	0.082	31.490	0.071	0.8	87.1	0	0	0.0	87.1	1.0	-1.1	0.1	0.8	0.123	1.014	0.119	0.086	1.388
UC-03	UB-03	Foundation Soils	49.0	-6.9	111.0	0.091	39.020	0.082	0.8	83.3	0	0	0.0	83.3	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.086	1.346
UC-03	UB-03	Foundation Soils	49.1	-7.0	107.0	0.047	34.880	0.044	0.8	80.0	0	0	0.0	80.0	1.0	-1.2	0.1	0.8	0.116	1.012	0.113	0.086	1.312
UC-03	UB-03	Foundation Soils	49.2	-7.0	113.6	0.064	36.470	0.056	0.8	85.3	0	0	0.0	85.3	1.0	-1.2	0.1	0.8	0.121	1.013	0.117	0.086	1.369
UC-03	UB-03	Foundation Soils	49.3	-7.1	104.2	0.065	43.170	0.062	0.8	77.5	0	0	0.0	77.5	1.0	-1.2	0.1	0.8	0.114	1.012	0.111	0.086	1.289
UC-03	UB-03	Foundation Soils	49.4	-7.2	112.9	0.091	43.690	0.081	0.8	84.6	0	0	0.0	84.6	1.0	-1.2	0.1	0.8	0.120	1.013	0.117	0.086	1.361
UC-03	UB-03	Foundation Soils	49.5	-7.3	111.6	0.079	40.400	0.071	0.8	83.4	0	0	0.0	83.4	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.086	1.349
UC-03	UB-03	Foundation Soils	49.5	-7.4	115.6	0.063	38.500	0.054	0.8	86.7	0	0	0.0	86.7	1.0	-1.2	0.1	0.8	0.122	1.014	0.119	0.086	1.385
UC-03	UB-03	Foundation Soils	49.6	-7.5	117.2	0.102	40.220	0.087	0.8	87.9	0	0	0.0	87.9	1.0	-1.2	0.1	0.8	0.123	1.014	0.120	0.086	1.400
UC-03	UB-03	Foundation Soils	49.7	-7.5	118.8	0.094	29.250	0.079	0.8	89.1	0	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.086	1.414
UC-03	UB-03	Foundation Soils	49.8	-7.6	118.9	0.095	34.000	0.080	0.8	89.1	0	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.086	1.414
UC-03	UB-03	Foundation Soils	49.9	-7.7	118.7	0.048	28.210	0.040	0.8	88.9	0	0	0.0	88.9	1.0	-1.2	0.1	0.8	0.124	1.014	0.121	0.086	1.412
UC-03	UB-03	Foundation Soils	50.0	-7.8	104.8	0.071	21.990	0.068	0.8	77.4	0	0	0.0	77.4	1.0	-1.2	0.1	0.8	0.113	1.012	0.110	0.086	1.289
UC-03	UB-03	Foundation Soils	50.0	-7.9	93.8	0.149	29.450	0.159	0.8	68.5	0	0	0.0	68.5	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.085	1.207
UC-03	UB-03	Foundation Soils	50.1	-8.0	86.3	0.120	24.980	0.139	0.8	62.5	0	0	0.0	62.5	1.0	-1.2	0.1	0.8	0.101	1.009	0.099	0.085	1.155
UC-03	UB-03	Foundation Soils	50.2	-8.0	76.6	0.163	24.250	0.213	0.8	54.7	7	0	0.0	54.8	1.0	-1.2	0.1	0.8	0.096	1.008	0.093	0.085	1.092
UC-03	UB-03	Foundation Soils	50.3	-8.1	84.3	0.183	30.550	0.217	0.8	60.7	4	0	0.0	60.7	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.085	1.141
UC-03	UB-03	Foundation Soils	50.4	-8.2	92.3	0.181	37.350	0.196	0.8	67.0	0	0	0.0	67.0	1.0	-1.2	0.1	0.8	0.105	1.010	0.102	0.085	1.194
UC-03	UB-03	Foundation Soils	50.4	-8.3	71.8	0.167	36.360	0.233	0.8	50.9	10	0	0.1	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.085	1.062
UC-03	UB-03	Foundation Soils	50.5	-8.4	65.0	0.086	36.730	0.132	0.7	45.6	8	0	0.1	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.085	1.021
UC-03	UB-03	Foundation Soils	50.6	-8.4	60.9	0.108	38.880	0.177	0.7	42.4	13	0	0.2	42.6	1.0	-1.2	0.1	0.8	0.087	1.007	0.085	0.085	0.998
UC-03	UB-03	Foundation Soils	50.7	-8.5	67.4	0.259	33.590	0.384	0.7	47.4	19	0	0.3	47.7	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.085	1.038
UC-03	UB-03	Foundation Soils	50.8	-8.6	75.1	0.289	21.320	0.385	0.8	53.2	15	0	0.3	53.5	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.085	1.083
UC-03	UB-03	Foundation Soils	50.9	-8.7	75.5	0.201	31.730	0.266	0.8	53.5	10	0	0.1	53.6	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.085	1.084
UC-03	UB-03	Foundation Soils	50.9	-8.8	73.2	0.153	34.160	0.209	0.7	51.6	8	0	0.1	51.7	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.085	1.069
UC-03	UB-03	Foundation Soils	51.0	-8.9	79.2	0.106	37.690	0.134	0.8	56.2	2	0	0.0	56.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.085	1.106
UC-03	UB-03	Foundation Soils	51.1	-8.9	89.5	0.122	39.020	0.136	0.8	64.2	0	0	0.0	64.2	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.085	1.173
UC-03	UB-03	Foundation Soils	51.2	-9.0	90.2	0.092	32.350	0.102	0.8	64.7	0	0	0.0	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.085	1.177
UC-03	UB-03	Foundation Soils	51.3	-9.1	84.2	0.112	41.200	0.133	0.8	60.0	0	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.099	1.009	0.097	0.085	1.138
UC-03	UB-03	Foundation Soils	51.3	-9.2	82.9	0.168	45.020	0.203	0.8	58.8	4	0	0.0	58.8	1.0	-1.2	0.1	0.8	0.099	1.008	0.096	0.085	1.129
UC-03	UB-03	Foundation Soils	51.4	-9.3	84.5	0.169	38.140	0.200	0.8	60.0	3	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.085	1.139
UC-03	UB-03	Foundation Soils	51.5	-9.3	87.4	0.087	26.970	0.100	0.8	62.3	0	0	0.0	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.085	1.158
UC-03	UB-03	Foundation Soils	51.6	-9.4	71.1	0.078	36.150	0.110	0.7	49.6	4	0	0.0	49.6	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.085	1.055
UC-03	UB-03	Foundation Soils	51.7	-9.5	68.5	0.054	32.830	0.079	0.7	47.6	4	0	0.0	47.6	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.085	1.040
UC-03	UB-03	Foundation Soils	51.8	-9.6	64.4	0.106	38.350	0.165	0.7	44.4	11	0	0.1	44.5	1.0	-1.2	0.1	0.8	0.088	1.007	0.086	0.085	1.017
UC-03	UB-03	Foundation Soils	51.8	-9.7	66.2	0.065	34.590	0.098	0.7	45.7	6	0	0.0	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.085	1.026
UC-03	UB-03	Foundation Soils	51.9	-9.8	71.6	0.102	39.840	0.142	0.7	49.8	6	0	0.0	49.8	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.085	1.058
UC-03	UB-03	Foundation Soils	52.0	-9.8	70.5	0.164	42.310	0.233	0.7	48.9	11	0	0.1	49.0	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.085	1.052
UC-03	UB-03	Foundation Soils	52.1	-9.9	70.6	0.124	41.450	0.176	0.7	48.9	8	0	0.1	48.9	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.085	1.052
UC-03	UB-03	Foundation Soils	52.2	-10.0	68.4	0.036	44.930	0.053	0.7	47.1	4	0	0.0	47.1	1.0	-1.2	0.1	0.8	0.090	1.007	0.088	0.085	1.038
UC-03	UB-03	Foundation Soils	52.2	-10.1	65.6	0.043	42.590	0.066	0.7	45.0	6	0	0.0	45.0	1.0	-1.2	0.1	0.8	0.089	1.007	0.086	0.085	1.022
UC-03	UB-03	Foundation Soils	52.3	-10.2	71.7	0.053	42.260	0.074	0.7	49.5	3	0	0.0	49.5	1.0	-1.2	0.1	0.8	0.092	1.008	0.089	0.085	1.057
UC-03	UB-03	Foundation Soils	52.4	-10.2	72.5	0.036	41.310	0.050	0.7	50.1	2	0	0.0	50.1	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.085	1.062

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	52.5	-10.3	72.9	0.032	40.450	0.044	0.7	50.3	2	0	0.0	50.3	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.085	1.064
UC-03	UB-03	Foundation Soils	52.6	-10.4	75.4	0.012	37.590	0.016	0.7	52.2	8	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.085	1.080
UC-03	UB-03	Foundation Soils	52.7	-10.5	72.0	0.012	32.930	0.017	0.7	49.6	9	0	0.1	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.090	0.085	1.059
UC-03	UB-03	Foundation Soils	52.7	-10.6	59.3	0.019	29.210	0.032	0.7	40.1	10	0	0.1	40.2	1.0	-1.3	0.1	0.8	0.086	1.007	0.083	0.084	0.987
UC-03	UB-03	Foundation Soils	52.8	-10.7	55.5	0.010	27.970	0.018	0.7	37.2	17	0	0.3	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.084	0.967
UC-03	UB-03	Foundation Soils	52.9	-10.7	54.0	0.041	37.730	0.076	0.7	36.1	13	0	0.2	36.3	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.084	0.958
UC-03	UB-03	Foundation Soils	53.0	-10.8	50.8	0.064	38.930	0.126	0.7	33.8	17	0	0.3	34.1	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.084	0.942
UC-03	UB-03	Foundation Soils	53.1	-10.9	51.3	0.085	44.450	0.166	0.7	34.1	19	0	0.3	34.4	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.084	0.944
UC-03	UB-03	Foundation Soils	53.1	-11.0	55.7	0.082	42.83	0.147171	0.7	37.2	15	0	0.2	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.084	0.968
UC-03	UB-03	Foundation Soils	53.2	-11.1	63.8	0.034	42.260	0.053	0.7	43.1	7	0	0.0	43.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.085	0.084	1.011
UC-03	UB-03	Foundation Soils	53.3	-11.2	68.1	0.080	36.020	0.118	0.7	46.3	7	0	0.0	46.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.084	1.035
UC-03	UB-03	Foundation Soils	53.4	-11.2	66.6	0.098	37.210	0.147	0.7	45.1	9	0	0.1	45.2	1.0	-1.3	0.1	0.8	0.089	1.007	0.087	0.084	1.027
UC-03	UB-03	Foundation Soils	53.5	-11.3	69.4	0.129	34.100	0.186	0.7	47.2	10	0	0.1	47.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.084	1.043
UC-03	UB-03	Foundation Soils	53.6	-11.4	69.0	0.066	28.820	0.096	0.7	46.8	5	0	0.0	46.8	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.084	1.040
UC-03	UB-03	Foundation Soils	53.6	-11.5	78.2	0.067	31.100	0.086	0.7	53.7	0	0	0.0	53.7	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.084	1.095
UC-03	UB-03	Foundation Soils	53.7	-11.6	88.9	0.108	14.150	0.121	0.7	61.9	0	0	0.0	61.9	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.084	1.162
UC-03	UB-03	Foundation Soils	53.8	-11.6	88.6	0.085	12.080	0.096	0.7	61.6	0	0	0.0	61.6	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.084	1.160
UC-03	UB-03	Foundation Soils	53.9	-11.7	86.3	0.137	-6.720	0.159	0.7	59.7	1	0	0.0	59.7	1.0	-1.3	0.1	0.8	0.099	1.009	0.096	0.084	1.145
UC-03	UB-03	Foundation Soils	54.0	-11.8	81.7	0.184	18.580	0.225	0.7	56.1	6	0	0.0	56.2	1.0	-1.3	0.1	0.8	0.097	1.008	0.094	0.084	1.116
UC-03	UB-03	Foundation Soils	54.1	-11.9	78.5	0.124	1.910	0.158	0.7	53.6	4	0	0.0	53.6	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.084	1.096
UC-03	UB-03	Foundation Soils	54.1	-12.0	76.7	0.146	19.050	0.190	0.7	52.2	7	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.084	1.085
UC-03	UB-03	Foundation Soils	54.2	-12.1	70.6	0.124	2.050	0.176	0.7	47.6	9	0	0.1	47.7	1.0	-1.3	0.1	0.8	0.091	1.007	0.088	0.084	1.049
UC-03	UB-03	Foundation Soils	54.3	-12.1	68.3	0.119	-16.340	0.174	0.7	45.9	10	0	0.1	46.0	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.084	1.036
UC-03	UB-03	Foundation Soils	54.4	-12.2	71.9	0.057	11.270	0.079	0.7	48.5	3	0	0.0	48.5	1.0	-1.3	0.1	0.8	0.091	1.007	0.089	0.084	1.056
UC-03	UB-03	Foundation Soils	54.5	-12.3	80.4	0.073	28.650	0.091	0.7	54.9	0	0	0.0	54.9	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.084	1.107
UC-03	UB-03	Foundation Soils	54.5	-12.4	75.1	0.029	18.770	0.039	0.7	50.8	2	0	0.0	50.8	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.084	1.075
UC-03	UB-03	Foundation Soils	54.6	-12.5	62.6	0.070	19.150	0.112	0.7	41.5	10	0	0.1	41.6	1.0	-1.3	0.1	0.8	0.086	1.007	0.084	0.084	1.003
UC-03	UB-03	Foundation Soils	54.7	-12.5	55.2	0.147	25.680	0.266	0.7	36.1	22	0	0.4	36.5	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.084	0.965
UC-03	UB-03	Foundation Soils	54.8	-12.6	51.5	0.130	24.820	0.253	0.7	33.4	23	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.084	0.946
UC-03	UB-03	Foundation Soils	54.9	-12.7	48.6	0.044	38.450	0.090	0.7	31.4	17	0	0.3	31.7	1.0	-1.3	0.1	0.8	0.080	1.006	0.078	0.084	0.930
UC-03	UB-03	Foundation Soils	55.0	-12.8	49.9	0.017	35.450	0.034	0.7	32.3	17	0	0.3	32.5	1.0	-1.3	0.1	0.8	0.080	1.007	0.078	0.084	0.937
UC-03	UB-03	Foundation Soils	55.0	-12.9	58.5	0.011	39.090	0.019	0.7	38.3	15	0	0.3	38.6	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.084	0.982
UC-03	UB-03	Foundation Soils	55.1	-13.0	66.4	0.013	36.500	0.020	0.7	44.0	11	0	0.1	44.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.086	0.084	1.025
UC-03	UB-03	Foundation Soils	55.2	-13.0	54.7	0.034	40.590	0.062	0.7	35.6	13	0	0.2	35.7	1.0	-1.3	0.1	0.8	0.083	1.007	0.080	0.084	0.961
UC-03	UB-03	Foundation Soils	55.3	-13.1	51.8	0.107	41.330	0.207	0.7	33.5	21	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.084	0.947
UC-03	UB-03	Foundation Soils	55.4	-13.2	47.1	0.033	45.200	0.070	0.7	30.1	18	0	0.3	30.4	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.083	0.923
UC-03	UB-03	Foundation Soils	55.4	-13.3	43.2	0.010	44.500	0.023	0.7	27.4	24	0	0.4	27.7	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.083	0.903
UC-03	UB-03	Foundation Soils	55.5	-13.4	47.7	0.016	42.550	0.034	0.7	30.5	18	0	0.3	30.8	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.083	0.926
UC-03	UB-03	Foundation Soils	55.6	-13.4	54.2	0.051	42.710	0.094	0.7	35.0	14	0	0.2	35.2	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.083	0.959
UC-03	UB-03	Foundation Soils	55.7	-13.5	48.3	0.058	44.680	0.120	0.7	30.8	19	0	0.3	31.1	1.0	-1.3	0.1	0.8	0.080	1.006	0.077	0.083	0.929
UC-03	UB-03	Foundation Soils	55.8	-13.6	43.8	0.073	46.170	0.167	0.7	27.6	25	0	0.4	28.0	1.0	-1.3	0.1	0.8	0.078	1.006	0.076	0.083	0.907
UC-03	UB-03	Foundation Soils	55.9	-13.7	42.3	0.170	46.650	0.402	0.7	26.6	36	0	0.5	27.1	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.083	0.900
UC-03	UB-03	Foundation Soils	55.9	-13.8	46.5	0.119	46.880	0.256	0.7	29.5	27	0	0.4	29.9	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.083	0.921
UC-03	UB-03	Foundation Soils	56.0	-13.9	53.4	0.195	43.050	0.365	0.7	34.3	27	0	0.4	34.7	1.0	-1.4	0.1	0.8	0.082	1.007	0.080	0.083	0.956
UC-03	UB-03	Foundation Soils	56.1	-13.9	65.7	0.354	46.450	0.538	0.7	43.1	26	0	0.4	43.5	1.0	-1.4	0.1	0.8	0.088	1.007	0.085	0.083	1.023
UC-03	UB-03	Foundation Soils	56.2	-14.0	84.9	0.539	35.100	0.634	0.7	57.2	21	0	0.4	57.6	1.0	-1.4	0.1	0.8	0.098	1.008	0.094	0.083	1.136
UC-03	UB-03	Foundation Soils	56.3	-14.1	85.9	0.707	41.400	0.823	0.7	57.9	26	0	0.5	58.3	1.0	-1.4	0.1	0.8	0.098	1.008	0.095	0.083	1.142
UC-03	UB-03	Foundation Soils	56.3	-14.2	108.1	0.475	28.800	0.439	0.7	74.8	7	0	0.0	74.9	1.0	-1.4	0.1	0.8	0.111	1.011	0.107	0.083	1.288
UC-03	UB-03	Foundation Soils	56.4	-14.3	107.6	0.173	28.640	0.161	0.7	74.3	0	0	0.0	74.3	1.0	-1.4	0.2	0.8	0.111	1.011	0.107	0.083	1.283
UC-03	UB-03	Foundation Soils	56.5	-14.3	119.5	0.175	16.300	0.146	0.7	83.7	0	0	0.0	83.7	0.9	-1.4	0.2	0.8	0.119	1.013	0.114	0.083	1.378
UC-03	UB-03	Foundation Soils	56.6	-14.4	127.6	0.209	-14.390	0.164	0.7	90.0	0	0	0.0	90.0	0.9	-1.4	0.2	0.8	0.126	1.015	0.120	0.083	1.451
UC-03	UB-03	Foundation Soils	56.7	-14.5	118.7	0.252	13.940	0.212	0.7	82.9	0	0	0.0	82.9	0.9	-1.4	0.2	0.8	0.118	1.013	0.114	0.083	1.370
UC-03	UB-03	Foundation Soils	56.8	-14.6	106.5	0.337	36.450	0.316	0.7	73.2	3	0	0.0	73.2	1.0	-1.4	0.2	0.8	0.110	1.011	0.106	0.083	1.274
UC-03	UB-03	Foundation Soils	56.8	-14.7	88.2	0.395	33.880	0.448	0.7	59.2	14	0	0.2	59.4	1.0	-1.4	0.2	0.8	0.099	1.009	0.096	0.083	1.153
UC-03	UB-03	Foundation Soils	56.9	-14.8	69.6	0.136	28.920	0.195	0.7	45.4	11	0	0.1	45.5	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.083	1.042
UC-03	UB-03	Foundation Soils	57.0	-14.8	60.2	0.064	8.160	0.106	0.7	38.6	11	0	0.1	38.7	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.083	0.990
UC-03	UB-03	Foundation Soils	57.1	-14.9	58.2	0.063	16.630	0.108	0.7	37.2	13	0	0.2	37.4	1.0	-1.4	0.2	0.8	0.084	1.007	0.081	0.083	0.980
UC-03	UB-03	Foundation Soils	57.2	-15.0	61.0	0.059	11.440	0.097	0.7	39.1	11	0	0.1	39.2	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.083	0.994
UC-03	UB-03	Foundation Soils	57.2	-15.1	54.2	0.077	26.900	0.142	0.7	34.3	17	0	0.3	34.6	1.0	-1.4	0.2	0.8	0.082	1.007	0.079	0.083	0.959
UC-03	UB-03	Foundation Soils	57.3	-15.2	53.0	0.148	36.470	0.279	0.7	33.4	24	0	0.4	33.8	1.0	-1.4	0.2	0.8	0.081	1.007	0.079	0.083	0.954
UC-03	UB-03	Foundation Soils	57.4	-15.3	77.6	0.161	48.410	0.207	0.7	51.0	8	0	0.1	51.0	1.0	-1.4	0.2	0.8	0.093	1.008	0.090	0.083	1.087
UC-03	UB-03	Foundation Soils	57.5	-15.3	90.1	0.207	44.500	0.230	0.7	60.2	4	0	0.0	60.2	1.0	-1.4	0.2	0.8	0.100	1.009	0.096	0.083	1.162

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	57.6	-15.4	103.3	0.285	37.010	0.276	0.7	70.1	2	0	0.0	70.1	1.0	-1.4	0.2	0.8	0.107	1.010	0.103	0.083	1.249
UC-03	UB-03	Foundation Soils	57.7	-15.5	104.0	0.291	34.230	0.280	0.7	70.7	2	0	0.0	70.7	1.0	-1.4	0.2	0.8	0.108	1.010	0.104	0.083	1.254
UC-03	UB-03	Foundation Soils	57.7	-15.6	89.0	0.232	34.540	0.261	0.7	59.2	6	0	0.0	59.2	1.0	-1.4	0.2	0.8	0.099	1.009	0.095	0.083	1.155
UC-03	UB-03	Foundation Soils	57.8	-15.7	79.2	0.205	14.100	0.259	0.7	51.9	10	0	0.1	52.0	1.0	-1.4	0.2	0.8	0.094	1.008	0.091	0.083	1.097
UC-03	UB-03	Foundation Soils	57.9	-15.7	75.0	0.083	18.040	0.111	0.7	48.7	4	0	0.0	48.7	1.0	-1.4	0.2	0.8	0.091	1.007	0.088	0.083	1.071
UC-03	UB-03	Foundation Soils	58.0	-15.8	82.5	0.046	26.200	0.056	0.7	54.2	0	0	0.0	54.2	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.082	1.115
UC-03	UB-03	Foundation Soils	58.1	-15.9	84.0	0.031	16.910	0.037	0.7	55.3	0	0	0.0	55.3	1.0	-1.4	0.2	0.8	0.096	1.008	0.093	0.082	1.124
UC-03	UB-03	Foundation Soils	58.2	-16.0	85.0	0.050	13.860	0.059	0.7	55.9	0	0	0.0	55.9	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.082	1.129
UC-03	UB-03	Foundation Soils	58.2	-16.1	82.1	0.185	23.110	0.225	0.7	53.8	7	0	0.0	53.8	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.082	1.113
UC-03	UB-03	Foundation Soils	58.3	-16.2	68.3	0.082	40.550	0.120	0.7	43.7	8	0	0.1	43.8	1.0	-1.4	0.2	0.8	0.088	1.007	0.085	0.082	1.033
UC-03	UB-03	Foundation Soils	58.4	-16.2	70.6	0.017	45.170	0.024	0.7	45.3	8	0	0.0	45.4	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.082	1.046
UC-03	UB-03	Foundation Soils	58.5	-16.3	73.3	0.021	47.840	0.029	0.7	47.2	5	0	0.0	47.2	1.0	-1.4	0.2	0.8	0.090	1.007	0.087	0.082	1.061
UC-03	UB-03	Foundation Soils	58.6	-16.4	85.4	0.010	46.450	0.012	0.7	56.1	9	0	0.1	56.1	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.082	1.133
UC-03	UB-03	Foundation Soils	58.6	-16.5	66.8	0.010	42.400	0.015	0.7	42.5	14	0	0.2	42.7	1.0	-1.4	0.2	0.8	0.087	1.007	0.084	0.082	1.026
UC-03	UB-03	Foundation Soils	58.7	-16.6	47.0	0.011	47.650	0.023	0.6	28.7	22	0	0.4	29.1	1.0	-1.4	0.2	0.8	0.078	1.006	0.076	0.082	0.924

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$

FS<=1.0

1.0<FS<=1.5

FS>1.5

[1]Earthquake magnitude taken as modal event for the deaggregation of the 5,000 year peak ground accleration

[2]PGA estimated from 2014 USGS seismic hazard maps for a 5,000-year return period earthquake

[3]Averaged corrected tip resistence cone tip resistance corrected for unequal end area effects. See Conetec report for additional info.

[4]Unit weight of soil based on Soil Behavior Type. See Conetec report for additional info.

[5]Equilibrium pore water pressure based on Pore Pressure Dissipation Tests. See Conetec report for additional info.

[6]$m = 1.338 - 0.249 * q_{c1Ncs}$ ^0.264 where $21 < q_{c1Ncs} < 254$ (Boulanger&Idriss, 2014, Equation 2.15b)

[7]C_N = overburden correction factor = $(1.06\ tsf/s'_{vc})^m$, where C_N <=1.7 (Boulanger&Idriss, 2014, Equation 2.15a)

[8]$q_{c1N} = C_N * qt/1.06$ tsf (Boulanger&Idriss, 2014, Equation 2.4)

[9]Values based sieve test results and boring log descriptions

[10]$Dq_{c1N} = (11.9+q_{c1N}/14.6)*\exp[1.63 - (9.7 / (FC + 2)) - (15.7 / (FC + 2))^2]$ (Boulanger&Idriss, 2014, Equation 2.22)

[11]$q_{c1Ncs} = q_{c1N} + Dq_{c1N}$ (Boulanger&Idriss, 2014, Equation 2.10)

[12]$C\sigma = 1 / (37.3 - 8.27 * q_{c1Ncs}$^0.264 where q_{C1Ncs}<=211 $K_s = 1-(C_s*\ln(s'_{vc}/106\ tsf))$ <=1.1 (Boulanger&Idriss,2014, Equations 2.16a, 2.16b)

[13]$a(z) = -1.012 - 1.126 * \sin(z / 11.73 + 5.133)$, where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14b)

[14]$b(z) = 0.106 + 0.118 * \sin(z /11.28 + 5.142)$, where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14c)

[15]r_d = shear stress reduction coefficient = exp[a(z) + b(z) * M] (Boulanger&Idriss, 2014, Equation 2.14a)

[16]$CRR_{M=7.5, \sigma'vc=1atm} = \exp((q_{c1Ncs}/113+q_{c1Ncs}/1000)^2-(q_{c1Ncs}/140)^3+(q_{c1Ncs}/137))^4-2.8)$ (Boulanger&Idriss, 2014, Equation, 2.24), say q_{c1Ncs} <= 300

[17]$MSF=1+(MSF_{max}-1)(8.64\exp(-M/4)-1.325)$ $MSF_{max}=1.09(q_{c1Ncs}/180)^2$<=2.2 (Boulanger&Idriss, Equations 2.19,2.20)

[18]$CRR_{corr.}=CRR_{M=7.5,\sigma'vc=1atm}*K_\sigma*MSF$ (Boulanger and Idriss,2014, Equation 2.7)

[19]$CSR_{M,\sigma'v} = 0.65*PHGA*(s_v/s'_{vc})*r_d$ (Boulanger and Idriss,2014, Equation 2.2)

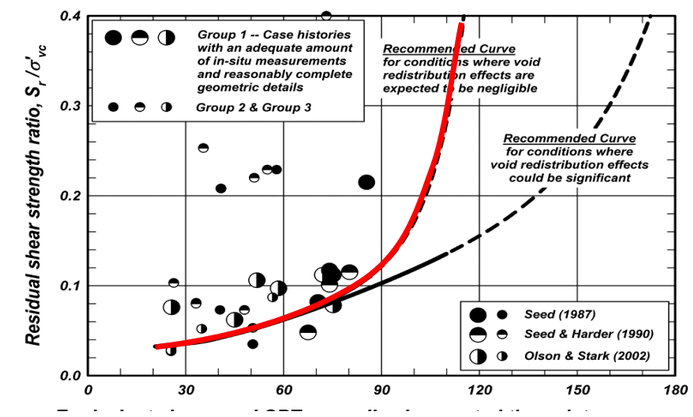
[21]State Param = state parameter index provided by Conetec and based on Been and Jefferies (1985). Positive = contractive soil, negative = dilative soil

[21]$Dq_{c1Ncs-Sr}$ is a function of fines content, values were estimated based on recommendations from Seed and Idriss, 2008

[22]$q_{c1Ncs-Sr} = q_{c1N} + Dq_{c1Ncs-Sr}$

[23]S_r/s'_{vo} estimated based on recommendations from Idriss and Boulanger, 2008, Equation 82

Idriss & Boulanger, 2008



$$\frac{S_r}{\sigma'_{vo}} = \exp\left(\frac{q_{c1Ncs-Sr}}{24.5} - \left(\frac{q_{c1Ncs-Sr}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs-Sr}}{106}\right)^3 - 4.42\right) \leq \tan\phi' \quad (82)$$

for conditions where void redistribution effects are expected to be negligible

ANALYSIS OF LIQUEFACTION POTENTIAL FOR EMBANKMENT AND FOUNDATION FOR 2500-YEAR RETURN INTERVAL

By: ZAO 1/5/2020
Checked: CDS 1/13/2020

Method: Boulanger&Idriss, CPT and SPT Based Liquefaction Triggering Procedures, April 2014
https://faculty.engineering.ucdavis.edu/boulanger/wp-content/uploads/sites/71/2014/09/Boulanger_Idriss_CPT_and_SPT_Liq_triggering_CGM-1

[1]Earthquake Magnitude, M: 7.3
[2]Peak Ground Acceleration, PHGA (g): 0.14

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	15.0	26.2	158.8	1.031	0.950	0.649	1.1	158.0	0	0	0.0	158.0	1.0	-0.2	0.0	1.0	0.351	1.052	0.378	0.087	4.328
NC-01	NB-02	Foundation Soils	15.1	26.1	149.2	1.015	0.810	0.680	1.1	148.6	0	0	0.0	148.6	1.0	-0.2	0.0	1.0	0.279	1.044	0.298	0.088	3.398
NC-01	NB-02	Foundation Soils	15.2	26.0	137.7	0.981	0.700	0.713	1.1	137.3	0	0	0.0	137.3	1.0	-0.2	0.0	1.0	0.223	1.036	0.235	0.088	2.680
NC-01	NB-02	Foundation Soils	15.3	25.9	125.6	0.934	0.910	0.743	1.1	125.5	3	0	0.0	125.5	1.0	-0.2	0.0	1.0	0.185	1.029	0.193	0.088	2.193
NC-01	NB-02	Foundation Soils	15.3	25.9	118.6	0.964	1.190	0.813	1.1	118.5	7	0	0.0	118.6	1.0	-0.2	0.0	1.0	0.168	1.026	0.175	0.088	1.984
NC-01	NB-02	Foundation Soils	15.4	25.8	99.3	1.015	1.190	1.022	1.1	99.6	16	0	0.4	100.0	1.0	-0.2	0.0	1.0	0.137	1.018	0.142	0.088	1.600
NC-01	NB-02	Foundation Soils	15.5	25.7	84.5	1.056	0.880	1.250	1.1	84.9	25	0	0.5	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.124	0.089	1.398
NC-01	NB-02	Foundation Soils	15.6	25.6	63.4	1.076	1.190	1.698	1.1	64.1	40	0	0.6	64.6	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.089	1.181
NC-01	NB-02	Foundation Soils	15.7	25.5	52.2	1.055	2.670	2.023	1.1	52.9	49	0	0.6	53.4	1.0	-0.3	0.0	1.0	0.095	1.008	0.096	0.089	1.081
NC-01	NB-02	Foundation Soils	15.7	25.4	49.3	0.967	5.540	1.962	1.1	49.9	50	0	0.6	50.5	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.089	1.054
NC-01	NB-02	Foundation Soils	15.8	25.4	48.9	0.914	7.050	1.868	1.1	49.5	49	0	0.6	50.1	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.089	1.048
NC-01	NB-02	Foundation Soils	15.9	25.3	49.6	0.812	8.620	1.636	1.1	50.1	46	0	0.6	50.7	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.090	1.050
NC-01	NB-02	Foundation Soils	16.0	25.2	49.6	0.733	12.530	1.477	1.1	50.1	44	0	0.5	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.090	1.047
NC-01	NB-02	Foundation Soils	16.1	25.1	48.2	0.571	16.320	1.185	1.1	48.6	40	0	0.5	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.090	1.032
NC-01	NB-02	Foundation Soils	16.2	25.0	47.9	0.307	18.630	0.642	1.1	48.1	28	0	0.5	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.090	1.026
NC-01	NB-02	Foundation Soils	16.2	25.0	48.4	0.228	19.450	0.471	1.1	48.6	23	0	0.4	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.090	1.027
NC-01	NB-02	Foundation Soils	16.3	24.9	47.1	0.242	15.570	0.514	1.1	47.2	25	0	0.4	47.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.091	1.014
NC-01	NB-02	Foundation Soils	16.4	24.8	42.8	0.337	18.200	0.788	1.1	42.9	36	0	0.5	43.4	1.0	-0.3	0.0	1.0	0.088	1.007	0.089	0.091	0.978
NC-01	NB-02	Foundation Soils	16.5	24.7	39.4	0.310	22.390	0.787	1.1	39.5	38	0	0.5	40.0	1.0	-0.3	0.0	1.0	0.085	1.007	0.086	0.091	0.950
NC-01	NB-02	Foundation Soils	16.6	24.6	33.7	0.274	68.340	0.814	1.1	33.8	44	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.091	0.905
NC-01	NB-02	Foundation Soils	16.7	24.5	31.8	0.232	103.200	0.729	1.1	31.9	43	0	0.5	32.4	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.091	0.889
NC-01	NB-02	Foundation Soils	16.7	24.5	31.4	0.227	95.170	0.723	1.1	31.4	44	0	0.5	31.9	1.0	-0.3	0.0	1.0	0.080	1.006	0.081	0.092	0.884
NC-01	NB-02	Foundation Soils	16.8	24.4	30.7	0.192	83.430	0.626	1.1	30.6	42	0	0.5	31.1	1.0	-0.3	0.0	1.0	0.080	1.006	0.080	0.092	0.876
NC-01	NB-02	Foundation Soils	16.9	24.3	29.4	0.182	83.430	0.619	1.1	29.3	43	0	0.5	29.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.092	0.865
NC-01	NB-02	Foundation Soils	17.0	24.2	30.4	0.203	81.570	0.668	1.1	30.3	44	0	0.5	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.092	0.870
NC-01	NB-02	Foundation Soils	17.1	24.1	31.9	0.275	72.130	0.863	1.1	31.7	47	0	0.5	32.2	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.092	0.878
NC-01	NB-02	Foundation Soils	17.1	24.0	34.4	0.182	61.270	0.529	1.1	34.1	36	0	0.5	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.093	0.894
NC-01	NB-02	Foundation Soils	17.2	24.0	35.1	0.080	57.160	0.228	1.0	34.8	25	0	0.4	35.2	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.093	0.896
NC-01	NB-02	Foundation Soils	17.3	23.9	33.6	0.063	44.640	0.187	1.0	33.2	24	0	0.4	33.6	1.0	-0.3	0.0	1.0	0.081	1.007	0.082	0.093	0.883
NC-01	NB-02	Foundation Soils	17.4	23.8	27.9	0.062	33.880	0.222	1.0	27.6	32	0	0.4	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.093	0.841
NC-01	NB-02	Foundation Soils	17.5	23.7	20.2	0.069	63.890	0.342	1.0	19.9	48	0	0.5	20.4	1.0	-0.3	0.0	1.0	0.073	1.006	0.073	0.093	0.787
NC-01	NB-02	Foundation Soils	17.6	23.6	15.8	0.104	122.090	0.660	1.0	15.6	65	0	0.5	16.0	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.756
NC-01	NB-02	Foundation Soils	17.6	23.6	16.7	0.135	150.800	0.809	1.0	16.4	66	0	0.5	16.9	1.0	-0.3	0.0	1.0	0.071	1.006	0.071	0.094	0.761
NC-01	NB-02	Foundation Soils	17.7	23.5	19.4	0.121	105.960	0.624	1.0	19.1	57	0	0.5	19.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.094	0.777
NC-01	NB-02	Foundation Soils	17.8	23.4	24.7	0.138	65.740	0.560	1.0	24.2	48	0	0.5	24.7	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.094	0.810
NC-01	NB-02	Foundation Soils	17.9	23.3	29.3	0.150	43.100	0.512	1.0	28.6	41	0	0.5	29.1	1.0	-0.3	0.0	0.9	0.078	1.006	0.079	0.094	0.839
NC-01	NB-02	Foundation Soils	18.0	23.2	31.1	0.164	37.120	0.528	1.0	30.3	40	0	0.5	30.8	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.094	0.849
NC-01	NB-02	Foundation Soils	18.0	23.1	31.7	0.190	47.830	0.600	1.0	30.8	41	0	0.5	31.3	1.0	-0.3	0.0	0.9	0.080	1.006	0.080	0.094	0.851
NC-01	NB-02	Foundation Soils	18.1	23.1	36.9	0.240	40.130	0.650	1.0	35.8	38	0	0.5	36.3	1.0	-0.3	0.0	0.9	0.083	1.007	0.084	0.095	0.885
NC-01	NB-02	Foundation Soils	18.2	23.0	41.8	0.273	30.020	0.653	1.0	40.5	34	0	0.5	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.095	0.917
NC-01	NB-02	Foundation Soils	18.3	22.9	45.9	0.314	27.250	0.685	1.0	44.3	32	0	0.5	44.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.095	0.943
NC-01	NB-02	Foundation Soils	18.4	22.8	48.6	0.336	24.610	0.691	1.0	46.9	30	0	0.5	47.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.095	0.961
NC-01	NB-02	Foundation Soils	18.5	22.7	51.4	0.353	20.150	0.686	1.0	49.5	29	0	0.5	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.095	0.979
NC-01	NB-02	Foundation Soils	18.5	22.7	53.4	0.382	18.200	0.715	1.0	51.3	28	0	0.5	51.8	1.0	-0.3	0.0	0.9	0.094	1.008	0.094	0.095	0.990
NC-01	NB-02	Foundation Soils	18.6	22.6	56.6	0.398	15.010	0.703	1.0	54.3	26	0	0.5	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.097	0.096	1.012
NC-01	NB-02	Foundation Soils	18.7	22.5	58.6	0.422	14.770	0.720	1.0	56.1	26	0	0.5	56.5	1.0	-0.3	0.0	0.9	0.097	1.008	0.098	0.096	1.024
NC-01	NB-02	Foundation Soils	18.8	22.4	60.4	0.444	15.340	0.735	1.0	57.7	25	0	0.5	58.2	1.0	-0.3	0.0	0.9	0.098	1.008	0.099	0.096	1.035
NC-01	NB-02	Foundation Soils	18.9	22.3	61.6	0.474	14.050	0.770	1.0	58.8	25	0	0.5	59.3	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.096	1.041
NC-01	NB-02	Foundation Soils	18.9	22.2	62.7	0.497	11.380	0.792	1.0	59.8	26	0	0.5	60.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.101	0.096	1.047
NC-01	NB-02	Foundation Soils	19.0	22.2	64.1	0.513	8.410	0.800	1.0	61.0	25	0	0.5	61.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.096	1.055
NC-01	NB-02	Foundation Soils	19.1	22.1	64.9	0.537	8.000	0.828	1.0	61.6	26	0	0.5	62.1	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.096	1.059
NC-01	NB-02	Foundation Soils	19.2	22.0	66.4	0.562	7.720	0.846	1.0	63.0	25	0	0.5	63.5	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.097	1.068
NC-01	NB-02	Foundation Soils	19.3	21.9	68.0	0.584	7.560	0.858	1.0	64.5	25	0	0.5	64.9	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.097	1.078

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	19.4	21.8	68.7	0.607	7.080	0.884	1.0	65.0	25	0	0.5	65.4	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.097	1.080
NC-01	NB-02	Foundation Soils	19.4	21.8	69.0	0.546	7.000	0.791	1.0	65.2	23	0	0.4	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.097	1.080
NC-01	NB-02	Foundation Soils	19.5	21.7	68.9	0.586	7.150	0.850	1.0	65.0	24	0	0.5	65.5	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.097	1.077
NC-01	NB-02	Foundation Soils	19.6	21.6	69.1	0.628	7.040	0.908	1.0	65.1	26	0	0.5	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.097	1.076
NC-01	NB-02	Foundation Soils	19.7	21.5	69.4	0.671	7.000	0.967	1.0	65.3	27	0	0.5	65.8	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.097	1.076
NC-01	NB-02	Foundation Soils	19.8	21.4	67.5	0.687	3.430	1.019	1.0	63.4	29	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.098	1.058
NC-01	NB-02	Foundation Soils	19.8	21.3	67.4	0.701	5.670	1.040	1.0	63.2	29	0	0.5	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.098	1.056
NC-01	NB-02	Foundation Soils	19.9	21.3	67.7	0.705	6.190	1.042	1.0	63.4	29	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.098	1.055
NC-01	NB-02	Foundation Soils	20.0	21.2	69.0	0.695	6.340	1.007	1.0	64.6	28	0	0.5	65.1	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.098	1.063
NC-01	NB-02	Foundation Soils	20.1	21.1	70.0	0.681	6.340	0.973	1.0	65.4	27	0	0.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.098	1.068
NC-01	NB-02	Foundation Soils	20.2	21.0	70.8	0.688	6.810	0.972	1.0	66.1	27	0	0.5	66.6	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.098	1.072
NC-01	NB-02	Foundation Soils	20.3	20.9	72.2	0.696	7.720	0.964	1.0	67.3	26	0	0.5	67.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.098	1.080
NC-01	NB-02	Foundation Soils	20.3	20.9	73.0	0.692	8.100	0.948	1.0	68.0	25	0	0.5	68.5	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.099	1.084
NC-01	NB-02	Foundation Soils	20.4	20.8	73.6	0.700	8.450	0.951	1.0	68.5	25	0	0.5	68.9	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.099	1.086
NC-01	NB-02	Foundation Soils	20.5	20.7	73.9	0.729	8.620	0.987	1.0	68.6	26	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.099	1.086
NC-01	NB-02	Foundation Soils	20.6	20.6	74.0	0.760	8.560	1.027	1.0	68.6	27	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.099	1.084
NC-01	NB-02	Foundation Soils	20.7	20.5	73.2	0.766	8.580	1.046	1.0	67.8	27	0	0.5	68.3	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.099	1.076
NC-01	NB-02	Foundation Soils	20.8	20.4	72.0	0.772	8.580	1.073	1.0	66.5	29	0	0.5	67.0	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.099	1.064
NC-01	NB-02	Foundation Soils	20.8	20.4	68.8	0.771	8.880	1.121	1.0	63.5	31	0	0.5	64.0	1.0	-0.4	0.0	0.9	0.103	1.009	0.103	0.099	1.038
NC-01	NB-02	Foundation Soils	20.9	20.3	65.4	0.785	9.420	1.200	1.0	60.3	34	0	0.5	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.100	1.012
NC-01	NB-02	Foundation Soils	21.0	20.2	63.8	0.790	9.340	1.238	1.0	58.7	35	0	0.5	59.2	1.0	-0.4	0.0	0.9	0.099	1.009	0.099	0.100	0.998
NC-01	NB-02	Foundation Soils	21.1	20.1	60.6	0.780	9.430	1.288	1.0	55.6	37	0	0.5	56.2	1.0	-0.4	0.0	0.9	0.097	1.008	0.097	0.100	0.974
NC-01	NB-02	Foundation Soils	21.2	20.0	58.6	0.743	10.050	1.269	1.0	53.7	38	0	0.5	54.3	1.0	-0.4	0.0	0.9	0.095	1.008	0.096	0.100	0.958
NC-01	NB-02	Foundation Soils	21.2	19.9	56.1	0.704	11.580	1.255	1.0	51.4	39	0	0.5	51.9	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.100	0.940
NC-01	NB-02	Foundation Soils	21.3	19.9	54.9	0.671	12.530	1.222	1.0	50.2	39	0	0.5	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.100	0.930
NC-01	NB-02	Foundation Soils	21.4	19.8	54.0	0.633	12.670	1.172	1.0	49.3	39	0	0.5	49.8	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.100	0.922
NC-01	NB-02	Foundation Soils	21.5	19.7	53.1	0.618	12.670	1.164	1.0	48.4	39	0	0.5	48.9	1.0	-0.4	0.0	0.9	0.092	1.007	0.092	0.100	0.915
NC-01	NB-02	Foundation Soils	21.6	19.6	52.9	0.616	13.440	1.165	1.0	48.1	39	0	0.5	48.6	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.101	0.911
NC-01	NB-02	Foundation Soils	21.7	19.5	53.6	0.601	13.960	1.121	1.0	48.7	38	0	0.5	49.3	1.0	-0.4	0.0	0.9	0.092	1.008	0.092	0.101	0.915
NC-01	NB-02	Foundation Soils	21.7	19.5	56.1	0.575	13.780	1.026	1.0	50.9	35	0	0.5	51.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.101	0.929
NC-01	NB-02	Foundation Soils	21.8	19.4	58.5	0.551	13.720	0.941	1.0	53.1	32	0	0.5	53.6	1.0	-0.4	0.0	0.9	0.095	1.008	0.095	0.101	0.943
NC-01	NB-02	Foundation Soils	21.9	19.3	63.0	0.559	13.570	0.887	1.0	57.2	29	0	0.5	57.7	1.0	-0.4	0.0	0.9	0.098	1.008	0.098	0.101	0.971
NC-01	NB-02	Foundation Soils	22.0	19.2	66.4	0.561	12.570	0.844	1.0	60.2	26	0	0.5	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.101	0.993
NC-01	NB-02	Foundation Soils	22.1	19.1	66.8	0.586	11.700	0.877	1.0	60.5	27	0	0.5	61.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.101	0.993
NC-01	NB-02	Foundation Soils	22.1	19.0	66.5	0.599	9.960	0.901	1.0	60.1	28	0	0.5	60.6	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.101	0.989
NC-01	NB-02	Foundation Soils	22.2	19.0	62.7	0.613	0.080	0.978	1.0	56.5	31	0	0.5	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.098	0.101	0.962
NC-01	NB-02	Foundation Soils	22.3	18.9	55.6	0.675	-1.290	1.213	1.0	50.0	39	0	0.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.102	0.914
NC-01	NB-02	Foundation Soils	22.4	18.8	47.1	0.697	3.130	1.480	0.9	42.2	48	0	0.5	42.7	1.0	-0.4	0.0	0.9	0.087	1.007	0.087	0.102	0.859
NC-01	NB-02	Foundation Soils	22.5	18.7	41.8	0.655	3.050	1.566	0.9	37.4	52	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.084	0.102	0.826
NC-01	NB-02	Foundation Soils	22.6	18.6	39.5	0.629	9.790	1.593	0.9	35.2	54	0	0.5	35.7	1.0	-0.4	0.0	0.9	0.083	1.007	0.083	0.102	0.811
NC-01	NB-02	Foundation Soils	22.6	18.6	39.4	0.593	7.100	1.506	0.9	35.0	53	0	0.5	35.6	1.0	-0.4	0.0	0.9	0.082	1.007	0.083	0.102	0.809
NC-01	NB-02	Foundation Soils	22.7	18.5	39.3	0.485	-0.820	1.235	0.9	34.9	49	0	0.5	35.4	1.0	-0.4	0.0	0.9	0.082	1.007	0.082	0.102	0.807
NC-01	NB-02	Foundation Soils	22.8	18.4	36.5	0.398	1.240	1.091	0.9	32.3	49	0	0.5	32.8	1.0	-0.4	0.0	0.9	0.081	1.007	0.081	0.102	0.789
NC-01	NB-02	Foundation Soils	22.9	18.3	33.9	0.354	4.170	1.044	0.9	30.0	51	0	0.5	30.5	1.0	-0.4	0.0	0.9	0.079	1.006	0.079	0.102	0.773
NC-01	NB-02	Foundation Soils	23.0	18.2	29.7	0.310	7.290	1.044	0.9	26.1	55	0	0.5	26.7	1.0	-0.4	0.0	0.9	0.077	1.006	0.077	0.103	0.748
NC-01	NB-02	Foundation Soils	23.0	18.1	26.5	0.300	7.120	1.131	0.9	23.3	60	0	0.5	23.8	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.730
NC-01	NB-02	Foundation Soils	23.1	18.1	24.8	0.284	8.580	1.146	0.9	21.7	62	0	0.5	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.719
NC-01	NB-02	Foundation Soils	23.2	18.0	25.7	0.270	11.890	1.049	0.9	22.5	59	0	0.5	23.0	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.723
NC-01	NB-02	Foundation Soils	23.3	17.9	27.4	0.253	11.410	0.922	0.9	24.0	55	0	0.5	24.5	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.731
NC-01	NB-02	Foundation Soils	23.4	17.8	26.9	0.249	14.010	0.925	0.9	23.5	56	0	0.5	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.728
NC-01	NB-02	Foundation Soils	23.5	17.7	26.3	0.252	16.390	0.958	0.9	22.9	57	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.723
NC-01	NB-02	Foundation Soils	23.5	17.7	25.8	0.247	18.340	0.959	0.9	22.4	58	0	0.5	22.9	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.719
NC-01	NB-02	Foundation Soils	23.6	17.6	25.1	0.252	17.880	1.004	0.9	21.8	59	0	0.5	22.3	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.715
NC-01	NB-02	Foundation Soils	23.7	17.5	24.1	0.258	18.060	1.072	0.9	20.8	62	0	0.5	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.103	0.708
NC-01	NB-02	Foundation Soils	23.8	17.4	22.9	0.263	18.490	1.147	0.9	20.3	65	30	47.4	67.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.104	1.018
NC-01	NB-02	Foundation Soils	23.9	17.3	20.9	0.264	18.540	1.265	0.9	18.4	74	30	47.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.104	0.104	1.004
NC-01	NB-02	Foundation Soils	23.9	17.2	19.3	0.262	18.720	1.358	0.9	17.0	77	30	47.4	64.4	1.0	-0.4	0.1	0.9	0.103	1.009	0.103	0.104	0.991
NC-01	NB-02	Foundation Soils	24.0	17.2	17.7	0.260	18.870	1.468	0.9	15.6	82	30	47.2	62.8	1.0	-0.4	0.1	0.9	0.102	1.009	0.102	0.104	0.978
NC-01	NB-02	Foundation Soils	24.1	17.1	15.9	0.261	19.200	1.646	0.9	13.9	88	30	47.0	60.9	1.0	-0.4	0.1	0.9	0.100	1.009	0.100	0.104	0.963
NC-01	NB-02	Foundation Soils	24.2	17.0	14.5	0.240	20.250	1.658	0.9	12.7	91	30	46.8	59.5	1.0	-0.5	0.1	0.9	0.099	1.009	0.099	0.104	0.952
NC-01	NB-02	Foundation Soils	24.3	16.9	12.8	0.205	29.540	1.601	0.9	11.2	95	30	46.5	57.7	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.104	0.938
NC-01	NB-02	Foundation Soils	24.4	16.8	12.7	0.158	35.010	1.247	0.9	11.1	91	30	46.4	57.4	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.104	0.935

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	24.4	16.7	13.2	0.115	32.350	0.871	0.9	11.5	84	30	46.3	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.104	0.936
NC-01	NB-02	Foundation Soils	24.5	16.7	13.5	0.083	31.410	0.614	0.9	11.8	78	30	46.1	57.9	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.104	0.936
NC-01	NB-02	Foundation Soils	24.6	16.6	13.6	0.068	34.690	0.500	0.9	11.8	75	30	46.0	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.105	0.935
NC-01	NB-02	Foundation Soils	24.7	16.5	13.8	0.072	32.160	0.522	0.9	12.0	75	30	46.0	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.105	0.935
NC-01	NB-02	Foundation Soils	24.8	16.4	13.8	0.076	32.590	0.551	0.9	12.0	76	30	46.1	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.105	0.934
NC-01	NB-02	Foundation Soils	24.9	16.3	13.2	0.090	32.280	0.683	0.9	11.4	81	30	46.1	57.6	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.105	0.930
NC-01	NB-02	Foundation Soils	24.9	16.3	12.8	0.114	33.260	0.893	0.9	11.1	86	30	46.2	57.3	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.105	0.927
NC-01	NB-02	Foundation Soils	25.0	16.2	12.5	0.131	29.490	1.048	0.9	10.8	89	30	46.3	57.1	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.105	0.925
NC-01	NB-02	Foundation Soils	25.1	16.1	12.8	0.085	32.160	0.663	0.9	11.1	82	30	46.1	57.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.105	0.924
NC-01	NB-02	Foundation Soils	25.2	16.0	12.1	0.066	28.230	0.543	0.9	10.5	81	30	45.9	56.4	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.105	0.918
NC-01	NB-02	Foundation Soils	25.3	15.9	11.7	0.076	22.160	0.651	0.9	10.1	85	30	45.9	56.0	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.105	0.914
NC-01	NB-02	Foundation Soils	25.3	15.8	11.9	0.071	14.240	0.596	0.9	10.3	83	30	45.9	56.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.105	0.915
NC-01	NB-02	Foundation Soils	25.4	15.8	11.3	0.070	21.920	0.620	0.9	9.7	86	30	45.9	55.6	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.106	0.910
NC-01	NB-02	Foundation Soils	25.5	15.7	10.8	0.063	27.590	0.586	0.9	9.2	87	30	45.8	55.0	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.106	0.905
NC-01	NB-02	Foundation Soils	25.6	15.6	9.6	0.057	31.400	0.592	0.9	8.2	92	15	35.0	43.2	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.106	0.825
NC-01	NB-02	Foundation Soils	25.7	15.5	8.2	0.036	30.020	0.439	0.9	7.0	95	15	34.8	41.8	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.106	0.816
NC-01	NB-02	Foundation Soils	25.8	15.4	6.0	0.040	39.550	0.661	0.9	5.1	100	15	34.5	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.106	0.801
NC-01	NB-02	Foundation Soils	25.8	15.4	4.7	0.052	52.080	1.117	0.9	3.9	100	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.106	0.792
NC-01	NB-02	Foundation Soils	25.9	15.3	4.7	0.059	71.090	1.268	0.9	3.9	100	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.106	0.791
NC-01	NB-02	Foundation Soils	26.0	15.2	9.5	0.063	62.400	0.660	0.9	8.1	94	15	35.0	43.1	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.106	0.821
NC-01	NB-02	Foundation Soils	26.1	15.1	12.9	0.071	42.450	0.551	0.9	10.9	80	15	35.2	46.1	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.106	0.839
NC-01	NB-02	Foundation Soils	26.2	15.0	15.8	0.068	29.210	0.431	0.9	13.4	63	15	34.9	48.3	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.106	0.853
NC-01	NB-02	Foundation Soils	26.2	14.9	16.7	0.075	34.860	0.449	0.9	14.2	61	15	34.9	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.106	0.857
NC-01	NB-02	Foundation Soils	26.3	14.9	19.0	0.082	15.200	0.431	0.9	16.1	57	15	34.9	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.869
NC-01	NB-02	Foundation Soils	26.4	14.8	19.3	0.071	19.520	0.368	0.9	16.3	54	15	34.7	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.869
NC-01	NB-02	Foundation Soils	26.5	14.7	19.7	0.075	16.440	0.381	0.9	16.7	54	15	34.8	51.4	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.870
NC-01	NB-02	Foundation Soils	26.6	14.6	19.7	0.065	27.060	0.330	0.9	16.6	52	15	34.6	51.2	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.868
NC-01	NB-02	Foundation Soils	26.7	14.5	19.8	0.053	34.240	0.268	0.9	16.7	50	15	34.3	51.0	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.866
NC-01	NB-02	Foundation Soils	26.7	14.5	20.4	0.057	40.350	0.280	0.9	17.2	49	15	34.4	51.5	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.869
NC-01	NB-02	Foundation Soils	26.8	14.4	20.8	0.065	37.690	0.312	0.9	17.6	50	15	34.5	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.107	0.871
NC-01	NB-02	Foundation Soils	26.9	14.3	19.7	0.060	40.280	0.304	0.9	16.6	51	15	34.5	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.107	0.864
NC-01	NB-02	Foundation Soils	27.0	14.2	18.4	0.054	51.090	0.294	0.9	15.4	54	15	34.5	49.9	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.107	0.856
NC-01	NB-02	Foundation Soils	27.1	14.1	17.5	0.047	59.890	0.269	0.9	14.6	54	15	34.4	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.107	0.850
NC-01	NB-02	Foundation Soils	27.1	14.0	17.5	0.037	55.410	0.212	0.9	14.6	52	15	34.2	48.9	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.107	0.848
NC-01	NB-02	Foundation Soils	27.2	14.0	17.8	0.034	56.190	0.191	0.9	14.9	51	15	34.1	49.0	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.107	0.848
NC-01	NB-02	Foundation Soils	27.3	13.9	19.3	0.029	52.030	0.151	0.9	16.1	46	15	33.7	49.8	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.107	0.853
NC-01	NB-02	Foundation Soils	27.4	13.8	20.9	0.027	55.220	0.129	0.9	17.4	43	15	33.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.108	0.858
NC-01	NB-02	Foundation Soils	27.5	13.7	22.9	0.026	65.750	0.113	0.9	19.1	39	15	32.8	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.108	0.865
NC-01	NB-02	Foundation Soils	27.6	13.6	24.8	0.019	69.680	0.077	0.9	20.7	35	15	31.9	52.6	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.108	0.869
NC-01	NB-02	Foundation Soils	27.6	13.6	25.2	0.021	70.420	0.083	0.9	21.0	34	15	31.9	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.108	0.870
NC-01	NB-02	Foundation Soils	27.7	13.5	25.2	0.025	71.610	0.099	0.9	21.0	35	15	32.1	53.1	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.108	0.870
NC-01	NB-02	Foundation Soils	27.8	13.4	24.7	0.026	72.470	0.105	0.9	20.6	36	15	32.3	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.108	0.868
NC-01	NB-02	Foundation Soils	27.9	13.3	23.7	0.025	76.210	0.106	0.9	19.7	37	15	32.6	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.108	0.863
NC-01	NB-02	Foundation Soils	28.0	13.2	22.9	0.023	78.140	0.101	0.9	18.9	38	15	32.7	51.7	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.108	0.859
NC-01	NB-02	Foundation Soils	28.1	13.1	21.7	0.019	81.420	0.088	0.9	17.9	40	15	32.9	50.8	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.108	0.853
NC-01	NB-02	Foundation Soils	28.1	13.1	20.7	0.015	83.330	0.073	0.9	17.1	41	15	33.0	50.1	1.0	-0.6	0.1	0.9	0.092	1.008	0.092	0.108	0.847
NC-01	NB-02	Foundation Soils	28.2	13.0	19.8	0.010	86.460	0.050	0.9	16.3	42	15	33.1	49.5	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.108	0.843
NC-01	NB-02	Foundation Soils	28.3	12.9	19.3	0.010	89.240	0.052	0.9	15.9	43	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.108	0.840
NC-01	NB-02	Foundation Soils	28.4	12.8	19.2	0.011	91.430	0.057	0.9	15.8	43	15	33.2	49.0	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.108	0.839
NC-01	NB-02	Foundation Soils	28.5	12.7	19.4	0.012	93.050	0.062	0.9	15.9	43	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.108	0.839
NC-01	NB-02	Foundation Soils	28.5	12.6	19.6	0.017	95.530	0.087	0.9	16.1	44	15	33.3	49.3	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.109	0.839
NC-01	NB-02	Foundation Soils	28.6	12.6	19.5	0.031	98.050	0.159	0.9	16.0	47	15	33.8	49.8	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.109	0.842
NC-01	NB-02	Foundation Soils	28.7	12.5	18.9	0.041	98.950	0.217	0.9	15.4	50	15	34.2	49.6	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.109	0.840
NC-01	NB-02	Foundation Soils	28.8	12.4	16.7	0.037	102.290	0.222	0.9	13.6	55	15	34.3	47.9	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.109	0.829
NC-01	NB-02	Foundation Soils	28.9	12.3	14.5	0.041	104.650	0.283	0.9	11.8	62	15	34.5	46.3	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.109	0.818
NC-01	NB-02	Foundation Soils	29.0	12.2	11.8	0.048	111.250	0.405	0.9	9.6	82	15	35.0	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.109	0.807
NC-01	NB-02	Foundation Soils	29.0	12.2	9.4	0.052	127.860	0.555	0.9	7.6	96	15	34.9	42.5	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.109	0.793
NC-01	NB-02	Foundation Soils	29.1	12.1	8.3	0.042	139.790	0.504	0.9	6.7	100	15	34.8	41.6	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.109	0.787
NC-01	NB-02	Foundation Soils	29.2	12.0	8.3	0.040	139.360	0.480	0.9	6.7	99	15	34.8	41.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.109	0.786
NC-01	NB-02	Foundation Soils	29.3	11.9	8.8	0.081	127.640	0.918	0.9	7.1	100	15	34.9	42.0	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.109	0.788
NC-01	NB-02	Foundation Soils	29.4	11.8	9.5	0.099	132.060	1.044	0.9	7.7	100	15	35.0	42.7	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.109	0.792
NC-01	NB-02	Foundation Soils	29.4	11.7	11.5	0.145	121.780	1.258	0.9	9.3	100	15	35.3	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.109	0.803

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	29.5	11.7	12.7	0.115	110.010	0.903	0.9	10.3	91	15	35.3	45.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.109	0.809
NC-01	NB-02	Foundation Soils	29.6	11.6	20.0	0.187	52.550	0.937	0.9	16.2	75	15	36.0	52.2	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.109	0.850
NC-01	NB-02	Foundation Soils	29.7	11.5	23.6	0.173	82.330	0.734	0.9	19.2	58	15	35.6	54.8	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.109	0.866
NC-01	NB-02	Foundation Soils	29.8	11.4	35.3	0.163	143.140	0.462	0.9	28.8	38	15	34.4	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.110	0.922
NC-01	NB-02	Foundation Soils	29.9	11.3	47.3	0.176	68.040	0.372	0.9	38.8	26	15	30.6	69.4	1.0	-0.6	0.1	0.9	0.107	1.010	0.106	0.110	0.964
NC-01	NB-02	Foundation Soils	29.9	11.3	53.4	0.242	-0.810	0.453	0.9	43.9	25	15	30.6	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.110	0.110	1.002
NC-01	NB-02	Foundation Soils	30.0	11.2	59.7	0.088	10.430	0.148	0.9	48.1	8	15	4.1	52.3	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.110	0.847
NC-01	NB-02	Foundation Soils	30.1	11.1	68.2	0.102	6.760	0.149	0.9	55.1	4	15	0.0	55.2	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.110	0.865
NC-01	NB-02	Foundation Soils	30.2	11.0	74.6	0.177	10.010	0.237	0.9	60.5	5	15	0.5	61.0	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.110	0.904
NC-01	NB-02	Foundation Soils	30.3	10.9	74.4	0.149	4.470	0.200	0.9	60.3	4	15	0.0	60.3	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.110	0.898
NC-01	NB-02	Foundation Soils	30.3	10.8	70.4	0.286	11.820	0.406	0.9	57.6	15	15	18.9	76.5	1.0	-0.6	0.1	0.9	0.113	1.011	0.111	0.110	1.014
NC-01	NB-02	Foundation Soils	30.4	10.8	73.1	0.271	11.650	0.371	0.9	59.7	12	15	13.4	73.1	1.0	-0.6	0.1	0.9	0.110	1.011	0.109	0.110	0.987
NC-01	NB-02	Foundation Soils	30.5	10.7	81.3	0.187	12.200	0.230	0.9	66.0	2	15	0.0	66.0	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.110	0.935
NC-01	NB-02	Foundation Soils	30.6	10.6	78.3	0.132	23.570	0.168	0.9	63.3	0	15	0.0	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.110	0.916
NC-01	NB-02	Foundation Soils	30.7	10.5	70.1	0.183	23.490	0.261	0.9	56.6	9	15	5.4	62.0	1.0	-0.6	0.1	0.9	0.101	1.009	0.100	0.110	0.907
NC-01	NB-02	Foundation Soils	30.8	10.4	70.1	0.280	20.010	0.399	0.9	57.1	15	15	18.9	75.9	1.0	-0.6	0.1	0.9	0.112	1.011	0.111	0.110	1.006
NC-01	NB-02	Foundation Soils	30.8	10.4	76.9	0.242	11.980	0.315	0.9	62.1	8	15	4.6	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.110	0.938
NC-01	NB-02	Foundation Soils	30.9	10.3	80.3	0.197	12.260	0.245	0.9	64.7	4	15	0.0	64.7	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.110	0.924
NC-01	NB-02	Foundation Soils	31.0	10.2	83.1	0.202	5.100	0.243	0.9	67.0	2	15	0.0	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.104	0.110	0.939
NC-01	NB-02	Foundation Soils	31.1	10.1	79.5	0.268	41.260	0.337	0.9	64.2	8	15	4.6	68.7	1.0	-0.6	0.1	0.9	0.106	1.010	0.105	0.110	0.950
NC-01	NB-02	Foundation Soils	31.2	10.0	74.5	0.362	14.640	0.486	0.9	60.6	16	15	21.8	82.4	1.0	-0.6	0.1	0.9	0.118	1.013	0.117	0.110	1.056
NC-01	NB-02	Foundation Soils	31.2	9.9	74.5	0.275	17.590	0.369	0.9	60.1	12	15	12.6	72.8	1.0	-0.6	0.1	0.9	0.110	1.011	0.108	0.110	0.979
NC-01	NB-02	Foundation Soils	31.3	9.9	86.3	0.255	15.440	0.295	0.9	69.5	4	15	0.0	69.5	1.0	-0.6	0.1	0.9	0.107	1.010	0.105	0.110	0.954
NC-01	NB-02	Foundation Soils	31.4	9.8	82.0	0.249	27.920	0.304	0.8	65.7	6	15	1.0	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.111	0.934
NC-01	NB-02	Foundation Soils	31.5	9.7	80.5	0.241	8.750	0.299	0.8	64.4	6	15	1.4	65.8	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.111	0.928
NC-01	NB-02	Foundation Soils	31.6	9.6	81.2	0.210	25.760	0.259	0.8	64.9	4	15	0.1	65.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.111	0.921
NC-01	NB-02	Foundation Soils	31.7	9.5	83.3	0.084	20.630	0.101	0.8	66.6	0	15	0.0	66.6	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.111	0.932
NC-01	NB-02	Foundation Soils	31.7	9.4	83.4	0.068	18.720	0.082	0.8	66.6	0	15	0.0	66.6	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.111	0.931
NC-01	NB-02	Foundation Soils	31.8	9.4	84.0	0.045	18.240	0.054	0.8	67.0	0	15	0.0	67.0	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.111	0.933
NC-01	NB-02	Foundation Soils	31.9	9.3	83.1	0.031	20.730	0.037	0.8	66.2	0	15	0.0	66.2	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.111	0.928
NC-01	NB-02	Foundation Soils	32.0	9.2	78.4	0.045	25.970	0.057	0.8	62.2	0	15	0.0	62.2	1.0	-0.7	0.1	0.9	0.101	1.009	0.100	0.111	0.900
NC-01	NB-02	Foundation Soils	32.1	9.1	72.3	0.044	18.820	0.061	0.8	57.0	0	15	0.0	57.0	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.111	0.865
NC-01	NB-02	Foundation Soils	32.2	9.0	67.2	0.057	21.620	0.085	0.8	52.6	2	15	0.0	52.6	1.0	-0.7	0.1	0.9	0.094	1.008	0.093	0.111	0.837
NC-01	NB-02	Foundation Soils	32.2	9.0	64.0	0.058	14.200	0.091	0.8	49.9	4	15	0.0	50.0	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.111	0.820
NC-01	NB-02	Foundation Soils	32.3	8.9	58.7	0.065	21.860	0.111	0.8	45.7	8	15	3.3	49.0	1.0	-0.7	0.1	0.9	0.092	1.007	0.090	0.111	0.814
NC-01	NB-02	Foundation Soils	32.4	8.8	53.2	0.056	25.050	0.105	0.8	41.5	11	15	9.8	51.3	1.0	-0.7	0.1	0.9	0.093	1.008	0.092	0.111	0.827
NC-01	NB-02	Foundation Soils	32.5	8.7	57.4	0.034	18.470	0.059	0.8	44.4	7	15	1.9	46.4	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.111	0.797
NC-01	NB-02	Foundation Soils	32.6	8.6	59.6	0.031	5.720	0.052	0.8	46.1	6	15	0.7	46.8	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.111	0.799
NC-01	NB-02	Foundation Soils	32.6	8.5	63.7	0.067	10.420	0.105	0.8	49.4	5	15	0.2	49.7	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.111	0.816
NC-01	NB-02	Foundation Soils	32.7	8.5	63.2	0.070	10.860	0.111	0.8	49.0	5	15	0.5	49.5	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.111	0.815
NC-01	NB-02	Foundation Soils	32.8	8.4	65.2	0.080	8.800	0.123	0.8	50.5	5	15	0.3	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.111	0.822
NC-01	NB-02	Foundation Soils	32.9	8.3	59.7	0.181	11.910	0.303	0.8	47.0	17	15	21.7	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.111	0.939
NC-01	NB-02	Foundation Soils	33.0	8.2	54.6	0.218	11.910	0.399	0.8	43.1	23	15	29.3	72.5	1.0	-0.7	0.1	0.9	0.109	1.011	0.107	0.111	0.965
NC-01	NB-02	Foundation Soils	33.1	8.1	57.6	0.175	33.020	0.304	0.8	45.3	18	15	23.4	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.111	0.938
NC-01	NB-02	Foundation Soils	33.1	8.1	65.7	0.191	6.580	0.291	0.8	51.6	13	15	15.3	66.8	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.111	0.925
NC-01	NB-02	Foundation Soils	33.2	8.0	72.7	0.171	21.620	0.235	0.8	56.6	7	15	2.6	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.111	0.873
NC-01	NB-02	Foundation Soils	33.3	7.9	73.8	0.181	10.280	0.245	0.8	57.4	7	15	2.6	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.111	0.879
NC-01	NB-02	Foundation Soils	33.4	7.8	70.9	0.172	20.920	0.243	0.8	55.1	9	15	4.9	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.112	0.878
NC-01	NB-02	Foundation Soils	33.5	7.7	71.3	0.261	14.390	0.366	0.8	56.0	14	15	17.0	73.0	1.0	-0.7	0.1	0.9	0.110	1.011	0.108	0.112	0.967
NC-01	NB-02	Foundation Soils	33.5	7.6	66.9	0.344	17.340	0.514	0.8	52.9	21	15	28.3	81.2	1.0	-0.7	0.1	0.9	0.117	1.012	0.115	0.112	1.029
NC-01	NB-02	Foundation Soils	33.6	7.6	65.3	0.452	27.970	0.692	0.8	51.8	27	15	33.3	85.1	1.0	-0.7	0.1	0.9	0.121	1.013	0.118	0.112	1.061
NC-01	NB-02	Foundation Soils	33.7	7.5	63.2	0.217	18.770	0.343	0.8	49.5	17	15	22.0	71.5	1.0	-0.7	0.1	0.9	0.109	1.010	0.107	0.112	0.955
NC-01	NB-02	Foundation Soils	33.8	7.4	65.6	0.211	18.490	0.321	0.8	51.2	15	15	18.5	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.112	0.941
NC-01	NB-02	Foundation Soils	33.9	7.3	68.0	0.203	4.380	0.299	0.8	52.9	13	15	14.3	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.112	0.923
NC-01	NB-02	Foundation Soils	34.0	7.2	67.1	0.210	23.160	0.313	0.8	52.2	14	15	16.6	68.8	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.112	0.934
NC-01	NB-02	Foundation Soils	34.0	7.2	59.1	0.184	18.220	0.312	0.8	45.9	18	15	23.2	69.2	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.112	0.936
NC-01	NB-02	Foundation Soils	34.1	7.1	57.7	0.175	18.490	0.303	0.8	44.8	18	15	23.7	68.6	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.112	0.932
NC-01	NB-02	Foundation Soils	34.2	7.0	59.7	0.101	18.860	0.169	0.8	45.7	11	15	9.8	55.5	1.0	-0.7	0.1	0.9	0.096	1.008	0.095	0.112	0.845
NC-01	NB-02	Foundation Soils	34.3	6.9	62.2	0.034	35.490	0.055	0.8	47.0	5	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.112	0.794
NC-01	NB-02	Foundation Soils	34.4	6.8	62.3	0.036	19.920	0.058	0.8	47.1	5	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.112	0.794
NC-01	NB-02	Foundation Soils	34.4	6.7	63.8	0.020	11.780	0.031	0.8	48.2	6	15	0.6	48.8	1.0	-0.7	0.1	0.9	0.091	1.007	0.090	0.112	0.803
NC-01	NB-02	Foundation Soils	34.5	6.7	67.0	0.025	18.870	0.037	0.8	50.8	3	15	0.0	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.112	0.815

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	34.6	6.6	70.9	0.111	16.910	0.157	0.8	53.9	5	15	0.1	54.0	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.112	0.835
NC-01	NB-02	Foundation Soils	34.7	6.5	72.0	0.055	14.220	0.076	0.8	54.7	0	15	0.0	54.7	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.112	0.839
NC-01	NB-02	Foundation Soils	34.8	6.4	71.7	0.054	18.470	0.075	0.8	54.4	0	15	0.0	54.4	1.0	-0.7	0.1	0.9	0.095	1.008	0.094	0.112	0.836
NC-01	NB-02	Foundation Soils	34.9	6.3	72.6	0.087	6.120	0.120	0.8	55.1	2	15	0.0	55.1	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.112	0.840
NC-01	NB-02	Foundation Soils	34.9	6.3	72.4	0.175	10.480	0.242	0.8	55.2	8	15	4.5	59.6	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.112	0.868
NC-01	NB-02	Foundation Soils	35.0	6.2	72.6	0.045	19.030	0.062	0.8	54.9	0	15	0.0	54.9	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.112	0.839
NC-01	NB-02	Foundation Soils	35.1	6.1	70.5	0.074	14.050	0.105	0.8	53.2	2	15	0.0	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.112	0.827
NC-01	NB-02	Foundation Soils	35.2	6.0	68.9	0.078	17.720	0.113	0.8	51.8	3	15	0.0	51.8	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.112	0.819
NC-01	NB-02	Foundation Soils	35.3	5.9	66.5	0.095	7.240	0.143	0.8	49.9	6	15	1.2	51.1	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.112	0.814
NC-01	NB-02	Foundation Soils	35.4	5.8	65.6	0.099	13.860	0.151	0.8	49.2	7	15	2.3	51.5	1.0	-0.8	0.1	0.9	0.093	1.008	0.092	0.112	0.816
NC-01	NB-02	Foundation Soils	35.4	5.8	66.0	0.079	30.730	0.120	0.8	49.4	5	15	0.4	49.8	1.0	-0.8	0.1	0.9	0.092	1.008	0.090	0.112	0.806
NC-01	NB-02	Foundation Soils	35.5	5.7	69.0	0.138	11.510	0.200	0.8	52.0	8	15	3.8	55.8	1.0	-0.8	0.1	0.9	0.096	1.008	0.095	0.112	0.842
NC-01	NB-02	Foundation Soils	35.6	5.6	63.1	0.202	15.200	0.320	0.8	48.3	17	15	21.5	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.105	0.112	0.933
NC-01	NB-02	Foundation Soils	35.7	5.5	68.5	0.176	29.720	0.257	0.8	51.9	11	15	10.6	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.112	0.884
NC-01	NB-02	Foundation Soils	35.8	5.4	71.7	0.142	11.240	0.198	0.8	53.8	7	15	1.8	55.6	1.0	-0.8	0.1	0.9	0.096	1.008	0.094	0.112	0.840
NC-01	NB-02	Foundation Soils	35.8	5.3	70.4	0.090	20.330	0.128	0.8	52.6	4	15	0.0	52.6	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.112	0.821
NC-01	NB-02	Foundation Soils	35.9	5.3	68.0	0.052	19.720	0.077	0.8	50.6	3	15	0.0	50.6	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.112	0.809
NC-01	NB-02	Foundation Soils	36.0	5.2	65.8	0.048	18.410	0.073	0.8	48.8	4	15	0.0	48.8	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.112	0.798
NC-01	NB-02	Foundation Soils	36.1	5.1	62.9	0.028	17.060	0.045	0.8	46.5	5	15	0.4	46.9	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.112	0.786
NC-01	NB-02	Foundation Soils	36.2	5.0	56.3	0.026	15.650	0.046	0.8	41.6	9	15	5.7	47.3	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.113	0.788
NC-01	NB-02	Foundation Soils	36.3	4.9	54.5	0.026	15.700	0.048	0.8	40.2	10	15	8.1	48.3	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.113	0.794
NC-01	NB-02	Foundation Soils	36.3	4.9	54.3	0.031	11.010	0.057	0.8	40.1	10	15	8.0	48.1	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.113	0.792
NC-01	NB-02	Foundation Soils	36.4	4.8	52.9	0.117	20.120	0.221	0.8	39.7	18	15	23.2	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.113	0.884
NC-01	NB-02	Foundation Soils	36.5	4.7	51.1	0.138	19.050	0.270	0.8	38.5	22	15	27.1	65.5	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.113	0.901
NC-01	NB-02	Foundation Soils	36.6	4.6	50.9	0.194	25.780	0.381	0.8	38.4	26	15	30.8	69.3	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.113	0.926
NC-01	NB-02	Foundation Soils	36.7	4.5	52.3	0.151	28.640	0.289	0.8	39.4	22	15	27.2	66.6	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.113	0.907
NC-01	NB-02	Foundation Soils	36.7	4.4	57.3	0.142	18.200	0.248	0.8	42.9	17	15	21.6	64.6	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.113	0.894
NC-01	NB-02	Foundation Soils	36.8	4.4	60.2	0.193	23.300	0.321	0.8	45.4	19	15	24.2	69.5	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.113	0.927
NC-01	NB-02	Foundation Soils	36.9	4.3	62.5	0.260	21.960	0.416	0.8	47.4	21	15	27.5	74.8	1.0	-0.8	0.1	0.9	0.111	1.011	0.109	0.113	0.964
NC-01	NB-02	Foundation Soils	37.0	4.2	74.7	0.225	16.390	0.301	0.8	56.0	11	15	10.0	65.9	1.0	-0.8	0.1	0.9	0.104	1.009	0.102	0.113	0.902
NC-01	NB-02	Foundation Soils	37.1	4.1	81.7	0.121	13.510	0.148	0.8	60.7	0	15	0.0	60.7	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.113	0.868
NC-01	NB-02	Foundation Soils	37.2	4.0	85.0	0.103	17.870	0.121	0.8	63.4	0	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.113	0.884
NC-01	NB-02	Foundation Soils	37.2	4.0	85.1	0.087	30.300	0.102	0.8	63.4	0	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.113	0.884
NC-01	NB-02	Foundation Soils	37.3	3.9	82.9	0.097	29.160	0.117	0.8	61.5	0	15	0.0	61.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.113	0.872
NC-01	NB-02	Foundation Soils	37.4	3.8	72.5	0.113	28.030	0.156	0.8	53.2	5	15	0.2	53.3	1.0	-0.8	0.1	0.9	0.095	1.008	0.093	0.113	0.821
NC-01	NB-02	Foundation Soils	37.5	3.7	78.7	0.275	21.960	0.349	0.8	58.9	11	15	11.4	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.113	0.930
NC-01	NB-02	Foundation Soils	37.6	3.6	83.3	0.144	24.820	0.173	0.8	61.7	1	15	0.0	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.113	0.872
NC-01	NB-02	Foundation Soils	37.6	3.5	82.6	0.211	31.100	0.256	0.8	61.1	6	15	0.6	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.113	0.872
NC-01	NB-02	Foundation Soils	37.7	3.5	77.9	0.317	22.480	0.407	0.8	58.5	14	15	17.6	76.1	1.0	-0.8	0.1	0.9	0.112	1.011	0.110	0.113	0.970
NC-01	NB-02	Foundation Soils	37.8	3.4	65.2	0.279	19.440	0.428	0.8	49.0	20	15	27.0	75.9	1.0	-0.8	0.1	0.9	0.112	1.011	0.109	0.113	0.968
NC-01	NB-02	Foundation Soils	37.9	3.3	59.9	0.172	15.340	0.287	0.8	44.5	18	15	22.8	67.3	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.113	0.908
NC-01	NB-02	Foundation Soils	38.0	3.2	53.3	0.136	24.590	0.255	0.8	39.5	20	15	25.4	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.113	0.892
NC-01	NB-02	Foundation Soils	38.1	3.1	52.8	0.103	12.340	0.195	0.8	38.8	18	15	22.2	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.113	0.867
NC-01	NB-02	Foundation Soils	38.1	3.1	54.2	0.104	9.670	0.192	0.8	39.8	17	15	20.8	60.6	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.113	0.863
NC-01	NB-02	Foundation Soils	38.2	3.0	57.2	0.118	28.590	0.206	0.8	42.0	16	15	19.1	61.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.113	0.867
NC-01	NB-02	Foundation Soils	38.3	2.9	66.3	0.188	30.780	0.284	0.8	49.0	14	15	17.4	66.3	1.0	-0.8	0.1	0.9	0.104	1.010	0.102	0.113	0.900
NC-01	NB-02	Foundation Soils	38.4	2.8	79.5	0.199	26.200	0.250	0.8	58.1	7	15	1.9	60.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.097	0.113	0.860
NC-01	NB-02	Foundation Soils	38.5	2.7	87.4	0.217	28.320	0.248	0.8	64.3	4	15	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.100	0.113	0.886
NC-01	NB-02	Foundation Soils	38.5	2.6	91.1	0.279	24.210	0.306	0.8	67.1	5	15	0.4	67.5	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.113	0.907
NC-01	NB-02	Foundation Soils	38.6	2.6	87.5	0.354	36.750	0.405	0.8	65.0	11	15	9.8	74.9	1.0	-0.8	0.1	0.9	0.111	1.011	0.108	0.113	0.958
NC-01	NB-02	Foundation Soils	38.7	2.5	84.1	0.363	32.540	0.431	0.8	62.7	13	15	15.2	77.9	1.0	-0.9	0.1	0.9	0.114	1.012	0.111	0.113	0.980
NC-01	NB-02	Foundation Soils	38.8	2.4	87.3	0.320	21.670	0.366	0.8	64.5	9	15	6.4	70.9	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.113	0.930
NC-01	NB-02	Foundation Soils	38.9	2.3	100.5	0.359	1.810	0.357	0.8	74.5	4	15	0.1	74.6	1.0	-0.9	0.1	0.9	0.111	1.011	0.108	0.113	0.955
NC-01	NB-02	Foundation Soils	39.0	2.2	110.1	0.239	-8.370	0.217	0.8	82.3	0	15	0.0	82.3	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.113	1.013
NC-01	NB-02	Foundation Soils	39.0	2.1	117.4	0.242	21.060	0.206	0.8	88.2	0	15	0.0	88.2	1.0	-0.9	0.1	0.9	0.124	1.014	0.120	0.113	1.062
NC-01	NB-02	Foundation Soils	39.1	2.1	115.4	0.178	19.950	0.154	0.8	86.5	0	15	0.0	86.5	1.0	-0.9	0.1	0.9	0.122	1.014	0.118	0.113	1.047
NC-01	NB-02	Foundation Soils	39.2	2.0	110.7	0.206	25.200	0.186	0.8	82.6	0	15	0.0	82.6	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.113	1.014
NC-01	NB-02	Foundation Soils	39.3	1.9	102.5	0.170	28.110	0.166	0.8	75.8	0	15	0.0	75.8	1.0	-0.9	0.1	0.9	0.112	1.011	0.109	0.113	0.963
NC-01	NB-02	Foundation Soils	39.4	1.8	99.4	0.138	25.350	0.139	0.8	73.2	0	15	0.0	73.2	1.0	-0.9	0.1	0.9	0.110	1.011	0.107	0.113	0.944
NC-01	NB-02	Foundation Soils	39.5	1.7	96.8	0.092	11.600	0.095	0.8	71.0	0	15	0.0	71.0	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.113	0.928
NC-01	NB-02	Foundation Soils	39.5	1.7	92.5	0.073	25.700	0.079	0.8	67.5	0	15	0.0	67.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.102	0.113	0.905
NC-01	NB-02	Foundation Soils	39.6	1.6	93.4	0.109	28.300	0.117	0.8	68.1	0	15	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.113	0.908

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	39.698	1.5	96.578	0.057	23.630	0.059	0.8	70.6	0	15	0.0	70.6	1.0	-0.9	0.1	0.8	0.108	1.010	0.105	0.113	0.925
NC-01	NB-02	Foundation Soils	39.8	1.4	104.0	0.127	15.750	0.122	0.8	76.6	0	15	0.0	76.6	1.0	-0.9	0.1	0.8	0.113	1.011	0.110	0.113	0.967
NC-01	NB-02	Foundation Soils	39.9	1.3	108.4	0.173	15.390	0.160	0.8	80.0	0	15	0.0	80.0	1.0	-0.9	0.1	0.8	0.116	1.012	0.112	0.113	0.993
NC-01	NB-02	Foundation Soils	39.9	1.2	115.5	0.261	12.150	0.226	0.8	85.8	0	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.113	1.039
NC-01	NB-02	Foundation Soils	40.0	1.2	113.4	0.267	27.250	0.235	0.8	84.0	0	15	0.0	84.0	1.0	-0.9	0.1	0.8	0.120	1.013	0.116	0.113	1.024
NC-01	NB-02	Foundation Soils	40.1	1.1	111.8	0.199	29.020	0.178	0.8	82.6	0	15	0.0	82.6	1.0	-0.9	0.1	0.8	0.118	1.013	0.115	0.113	1.012
NC-01	NB-02	Foundation Soils	40.2	1.0	115.9	0.133	18.300	0.115	0.8	85.8	0	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.113	1.038
NC-01	NB-02	Foundation Soils	40.3	0.9	130.9	0.200	15.230	0.153	0.8	98.2	0	15	0.0	98.2	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.113	1.154
NC-01	NB-02	Foundation Soils	40.4	0.8	143.2	0.430	15.680	0.300	0.8	108.4	0	15	0.0	108.4	0.9	-0.9	0.1	0.8	0.149	1.021	0.145	0.113	1.277
NC-01	NB-02	Foundation Soils	40.4	0.8	144.3	0.379	17.220	0.263	0.8	109.3	0	15	0.0	109.3	0.9	-0.9	0.1	0.8	0.151	1.021	0.146	0.113	1.288
NC-01	NB-02	Foundation Soils	40.5	0.7	131.5	0.651	18.250	0.495	0.8	98.5	2	15	0.0	98.5	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.113	1.156
NC-01	NB-02	Foundation Soils	40.6	0.6	127.3	0.879	31.250	0.690	0.8	95.8	9	15	8.2	104.0	0.9	-0.9	0.1	0.8	0.143	1.019	0.138	0.113	1.218
NC-01	NB-02	Foundation Soils	40.7	0.5	132.1	0.589	31.620	0.446	0.8	98.8	0	15	0.0	98.8	1.0	-0.9	0.1	0.8	0.136	1.017	0.131	0.113	1.159
NC-01	NB-02	Foundation Soils	40.8	0.4	136.0	0.581	20.020	0.427	0.8	102.0	0	15	0.0	102.0	0.9	-0.9	0.1	0.8	0.140	1.018	0.135	0.113	1.194
NC-01	NB-02	Foundation Soils	40.8	0.3	137.4	0.478	10.910	0.348	0.8	103.1	0	15	0.0	103.1	0.9	-0.9	0.1	0.8	0.141	1.019	0.137	0.113	1.207
NC-01	NB-02	Foundation Soils	40.9	0.3	134.9	0.419	-4.900	0.311	0.8	100.9	0	15	0.0	100.9	0.9	-0.9	0.1	0.8	0.138	1.018	0.134	0.113	1.181
NC-01	NB-02	Foundation Soils	41.0	0.2	120.1	0.516	4.280	0.430	0.8	88.5	2	15	0.0	88.5	1.0	-0.9	0.1	0.8	0.124	1.014	0.120	0.113	1.059
NC-01	NB-02	Foundation Soils	41.1	0.1	97.6	0.525	30.530	0.538	0.8	71.8	13	15	15.5	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.119	0.113	1.048
NC-01	NB-02	Foundation Soils	41.2	0.0	89.3	0.394	25.490	0.441	0.8	64.9	12	15	13.6	78.5	1.0	-0.9	0.1	0.8	0.114	1.012	0.111	0.113	0.978
NC-01	NB-02	Foundation Soils	41.3	-0.1	93.7	0.400	20.300	0.427	0.8	67.9	10	15	8.8	76.7	1.0	-0.9	0.1	0.8	0.113	1.011	0.109	0.113	0.964
NC-01	NB-02	Foundation Soils	41.3	-0.1	87.4	0.297	23.350	0.340	0.8	62.6	9	15	5.5	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.113	0.905
NC-01	NB-02	Foundation Soils	41.4	-0.2	83.7	0.192	26.160	0.229	0.7	59.1	5	15	0.3	59.4	1.0	-0.9	0.1	0.8	0.099	1.009	0.096	0.113	0.849
NC-01	NB-02	Foundation Soils	41.5	-0.3	80.3	0.191	20.150	0.238	0.7	56.6	7	15	1.9	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.113	0.843
NC-01	NB-02	Foundation Soils	41.6	-0.4	79.6	0.114	19.110	0.143	0.7	55.8	2	15	0.0	55.8	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.113	0.827
NC-01	NB-02	Foundation Soils	41.7	-0.5	81.1	0.072	17.490	0.089	0.7	56.9	0	15	0.0	56.9	1.0	-0.9	0.1	0.8	0.097	1.008	0.094	0.113	0.833
NC-01	NB-02	Foundation Soils	41.7	-0.6	79.6	0.067	4.070	0.084	0.7	55.7	0	15	0.0	55.7	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.113	0.826
NC-01	NB-02	Foundation Soils	41.8	-0.6	76.3	0.045	17.910	0.059	0.7	53.1	0	15	0.0	53.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.092	0.113	0.810
NC-01	NB-02	Foundation Soils	41.9	-0.7	74.4	0.034	24.100	0.046	0.7	51.6	1	15	0.0	51.6	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.113	0.801
NC-01	NB-02	Foundation Soils	42.0	-0.8	74.5	0.046	22.680	0.062	0.7	51.7	1	15	0.0	51.7	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.113	0.801
NC-01	NB-02	Foundation Soils	42.1	-0.9	76.2	0.068	18.360	0.089	0.7	52.9	1	15	0.0	52.9	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.113	0.809
NC-01	NB-02	Foundation Soils	42.2	-1.0	77.4	0.061	24.110	0.079	0.7	53.8	0	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.113	0.813
NC-01	NB-02	Foundation Soils	42.2	-1.0	77.6	0.086	26.290	0.111	0.7	53.8	2	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.113	0.814
NC-01	NB-02	Foundation Soils	42.3	-1.1	78.9	0.066	21.490	0.084	0.7	54.8	0	15	0.0	54.8	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.113	0.819
NC-01	NB-02	Foundation Soils	42.4	-1.2	79.3	0.075	22.020	0.095	0.7	55.0	0	15	0.0	55.0	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.113	0.821
NC-01	NB-02	Foundation Soils	42.5	-1.3	81.3	0.059	12.960	0.073	0.7	56.5	0	15	0.0	56.5	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.113	0.829
NC-01	NB-02	Foundation Soils	42.6	-1.4	83.1	0.055	8.120	0.066	0.7	57.8	0	15	0.0	57.8	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.113	0.838
NC-01	NB-02	Foundation Soils	42.7	-1.5	83.7	0.075	7.340	0.090	0.7	58.2	0	15	0.0	58.2	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.113	0.840
NC-01	NB-02	Foundation Soils	42.7	-1.5	81.2	0.091	-7.150	0.112	0.7	56.2	0	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.113	0.828
NC-01	NB-02	Foundation Soils	42.8	-1.6	78.7	0.112	-0.430	0.142	0.7	54.3	3	15	0.0	54.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.113	0.816
NC-01	NB-02	Foundation Soils	42.9	-1.7	78.5	0.110	2.100	0.140	0.7	54.1	3	15	0.0	54.1	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.113	0.814
NC-01	NB-02	Foundation Soils	43.0	-1.8	78.2	0.127	-5.290	0.162	0.7	53.8	4	15	0.1	53.9	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.113	0.813
NC-01	NB-02	Foundation Soils	43.1	-1.9	81.4	0.106	1.050	0.130	0.7	56.2	1	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.113	0.827
NC-01	NB-02	Foundation Soils	43.1	-2.0	90.7	0.234	3.570	0.258	0.7	63.3	4	15	0.1	63.4	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.113	0.871
NC-01	NB-02	Foundation Soils	43.2	-2.0	96.5	0.315	2.950	0.326	0.7	67.8	6	15	0.6	68.4	1.0	-1.0	0.1	0.8	0.106	1.010	0.103	0.113	0.904
NC-01	NB-02	Foundation Soils	43.3	-2.1	107.2	0.396	18.430	0.369	0.8	76.1	4	15	0.1	76.2	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.113	0.957
NC-02	NB-02 & NB-03	Foundation Soils	15.0	25.6	48.6	0.952	2.220	1.961	1.1	49.6	50	4	14.2	63.8	1.0	-0.2	0.0	1.0	0.102	1.009	0.104	0.087	1.194
NC-02	NB-02 & NB-03	Foundation Soils	15.1	25.5	47.6	0.843	9.170	1.769	1.1	48.6	48	4	14.0	62.6	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.088	1.181
NC-02	NB-02 & NB-03	Foundation Soils	15.2	25.4	46.8	0.733	64.700	1.566	1.1	47.7	46	4	13.8	61.5	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.088	1.168
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.3	50.5	0.684	3.660	1.353	1.1	51.4	41	4	13.7	65.0	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.088	1.197
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.2	61.4	0.657	6.910	1.071	1.1	62.0	31	4	13.0	75.0	1.0	-0.2	0.0	1.0	0.111	1.011	0.114	0.088	1.290
NC-02	NB-02 & NB-03	Foundation Soils	15.4	25.2	76.6	0.644	-1.760	0.841	1.1	77.0	19	4	10.2	87.2	1.0	-0.2	0.0	1.0	0.123	1.014	0.126	0.088	1.422
NC-02	NB-02 & NB-03	Foundation Soils	15.5	25.1	86.2	0.674	-4.910	0.782	1.1	86.4	15	4	7.4	93.8	1.0	-0.2	0.0	1.0	0.130	1.016	0.133	0.089	1.505
NC-02	NB-02 & NB-03	Foundation Soils	15.6	25.0	93.2	0.702	-1.980	0.753	1.1	93.2	12	4	5.0	98.2	1.0	-0.2	0.0	1.0	0.135	1.017	0.139	0.089	1.563
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.9	102.8	0.698	0.950	0.679	1.1	102.5	7	4	0.8	103.4	1.0	-0.3	0.0	1.0	0.142	1.019	0.146	0.089	1.643
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.8	108.7	0.707	1.140	0.650	1.1	108.2	4	4	0.0	108.2	1.0	-0.3	0.0	1.0	0.149	1.021	0.154	0.089	1.727
NC-02	NB-02 & NB-03	Foundation Soils	15.8	24.8	114.9	0.726	1.330	0.632	1.1	114.1	2	4	0.0	114.1	1.0	-0.3	0.0	1.0	0.159	1.023	0.165	0.089	1.843
NC-02	NB-02 & NB-03	Foundation Soils	15.9	24.7	120.4	0.732	1.160	0.608	1.0	119.2	0	4	0.0	119.2	1.0	-0.3	0.0	1.0	0.169	1.026	0.176	0.090	1.963
NC-02	NB-02 & NB-03	Foundation Soils	16.0	24.6	123.0	0.734	1.100	0.597	1.0	121.6	0	4	0.0	121.6	1.0	-0.3	0.0	1.0	0.175	1.027	0.182	0.090	2.024
NC-02	NB-02 & NB-03	Foundation Soils	16.1	24.5	125.1	0.731	1.000	0.584	1.0	123.4	0	4	0.0	123.4	1.0	-0.3	0.0	1.0	0.179	1.028	0.187	0.090	2.072
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.4	125.4	0.653	0.890	0.521	1.0	123.6	0	4	0.0	123.6	1.0	-0.3	0.0	1.0	0.180	1.028	0.187	0.090	2.072
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.3	124.1	0.634	0.640	0.511	1.0	122.2	0	4	0.0	122.2	1.0	-0.3	0.0	1.0	0.176	1.027	0.183	0.090	2.026
NC-02	NB-02 & NB-03	Foundation Soils	16.3	24.3	120.1	0.614	0.380	0.511	1.0	118.2	0	4	0.0	118.2	1.0	-0.3	0.0	1.0	0.167	1.025	0.174	0.091	1.914

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-02	NB-02 & NB-03	Foundation Soils	16.4	24.2	115.6	0.592	0.040	0.512	1.0	113.8	0	4	0.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.164	0.091	1.805
NC-02	NB-02 & NB-03	Foundation Soils	16.5	24.1	95.4	0.554	-5.290	0.581	1.0	94.1	6	4	0.5	94.6	1.0	-0.3	0.0	1.0	0.131	1.016	0.134	0.091	1.472
NC-02	NB-02 & NB-03	Foundation Soils	16.6	24.0	90.1	0.529	-5.380	0.587	1.0	88.8	8	4	1.7	90.5	1.0	-0.3	0.0	1.0	0.126	1.015	0.129	0.091	1.415
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	70.5	0.502	-3.480	0.712	1.0	69.6	19	4	9.7	79.3	1.0	-0.3	0.0	1.0	0.115	1.012	0.117	0.091	1.284
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	60.8	0.522	-2.690	0.858	1.0	60.0	27	4	12.1	72.2	1.0	-0.3	0.0	1.0	0.109	1.010	0.111	0.092	1.211
NC-02	NB-02 & NB-03	Foundation Soils	16.8	23.8	44.2	0.521	-1.430	1.178	1.0	43.7	43	4	13.3	57.1	1.0	-0.3	0.0	1.0	0.097	1.008	0.099	0.092	1.076
NC-02	NB-02 & NB-03	Foundation Soils	16.9	23.7	37.6	0.519	-0.860	1.381	1.0	37.2	51	4	13.4	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.092	1.021
NC-02	NB-02 & NB-03	Foundation Soils	17.0	23.6	28.3	0.515	0.050	1.820	1.0	28.0	64	4	13.2	41.3	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.092	0.947
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.5	21.8	0.496	1.430	2.274	1.1	21.6	77	4	13.0	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.092	0.896
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.4	18.1	0.444	1.860	2.460	1.0	17.9	85	4	12.9	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.092	0.866
NC-02	NB-02 & NB-03	Foundation Soils	17.2	23.4	15.6	0.402	3.240	2.582	1.0	15.4	90	4	12.8	28.2	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.093	0.846
NC-02	NB-02 & NB-03	Foundation Soils	17.3	23.3	13.5	0.308	4.940	2.275	1.0	13.4	92	4	12.6	26.0	1.0	-0.3	0.0	1.0	0.076	1.006	0.077	0.093	0.829
NC-02	NB-02 & NB-03	Foundation Soils	17.4	23.2	11.2	0.257	10.390	2.285	1.0	11.1	99	4	12.5	23.6	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.093	0.811
NC-02	NB-02 & NB-03	Foundation Soils	17.5	23.1	10.8	0.204	18.200	1.897	1.0	10.6	97	4	12.5	23.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.093	0.805
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	10.4	0.175	22.060	1.683	1.0	10.2	96	4	12.4	22.7	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.093	0.801
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	9.6	0.144	27.870	1.496	1.0	9.5	97	4	12.4	21.9	1.0	-0.3	0.0	1.0	0.074	1.006	0.074	0.094	0.794
NC-02	NB-02 & NB-03	Foundation Soils	17.7	22.9	9.8	0.113	29.340	1.149	1.0	9.7	92	4	12.4	22.0	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.094	0.794
NC-02	NB-02 & NB-03	Foundation Soils	17.8	22.8	10.3	0.081	31.160	0.785	1.0	10.1	84	4	12.3	22.5	1.0	-0.3	0.0	0.9	0.074	1.006	0.075	0.094	0.795
NC-02	NB-02 & NB-03	Foundation Soils	17.9	22.7	11.6	0.191	32.210	1.645	1.0	11.4	92	4	12.5	23.9	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.094	0.803
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.6	12.8	1.007	37.000	7.848	1.0	12.5	100	4	12.6	25.2	1.0	-0.3	0.0	0.9	0.076	1.006	0.076	0.094	0.810
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.5	13.7	1.240	43.930	9.081	1.0	13.3	100	4	12.7	26.0	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.094	0.814
NC-02	NB-02 & NB-03	Foundation Soils	18.1	22.5	13.2	1.385	57.950	10.515	1.0	12.8	100	4	12.6	25.5	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.095	0.809
NC-02	NB-02 & NB-03	Foundation Soils	18.2	22.4	36.8	1.505	90.670	4.095	1.0	35.6	76	4	14.0	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.095	0.981
NC-02	NB-02 & NB-03	Foundation Soils	18.3	22.3	122.2	1.745	76.740	1.428	1.0	117.2	20	4	12.1	129.3	1.0	-0.3	0.0	0.9	0.195	1.031	0.202	0.095	2.133
NC-02	NB-02 & NB-03	Foundation Soils	18.4	22.2	166.1	1.841	179.340	1.109	1.0	158.8	6	4	0.6	159.4	1.0	-0.3	0.0	0.9	0.365	1.053	0.387	0.095	4.074
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.1	169.7	2.012	130.830	1.185	1.0	162.2	7	4	1.4	163.6	1.0	-0.3	0.0	0.9	0.411	1.057	0.437	0.095	4.590
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.0	154.9	1.950	13.350	1.259	1.0	147.9	11	4	5.3	153.3	1.0	-0.3	0.0	0.9	0.312	1.048	0.328	0.095	3.442
NC-02	NB-02 & NB-03	Foundation Soils	18.6	22.0	143.4	1.633	13.850	1.139	1.0	136.9	11	4	4.6	141.5	1.0	-0.3	0.0	0.9	0.241	1.039	0.252	0.096	2.633
NC-02	NB-02 & NB-03	Foundation Soils	18.7	21.9	105.2	1.349	27.730	1.282	1.0	100.5	21	4	12.1	112.6	1.0	-0.3	0.0	0.9	0.156	1.023	0.161	0.096	1.677
NC-02	NB-02 & NB-03	Foundation Soils	18.8	21.8	81.5	0.961	37.950	1.179	1.0	77.8	26	4	12.8	90.7	1.0	-0.3	0.0	0.9	0.126	1.015	0.128	0.096	1.340
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.7	67.7	0.923	25.640	1.363	1.0	64.6	35	4	13.8	78.4	1.0	-0.3	0.0	0.9	0.114	1.012	0.116	0.096	1.207
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.6	64.6	1.005	20.060	1.555	1.0	61.6	39	4	14.1	75.7	1.0	-0.3	0.0	0.9	0.112	1.011	0.113	0.096	1.179
NC-02	NB-02 & NB-03	Foundation Soils	19.0	21.6	62.6	0.933	18.340	1.491	1.0	59.6	39	4	14.0	73.5	1.0	-0.3	0.0	0.9	0.110	1.011	0.112	0.096	1.158
NC-02	NB-02 & NB-03	Foundation Soils	19.1	21.5	55.3	0.883	10.040	1.597	1.0	52.6	44	4	14.0	66.6	1.0	-0.3	0.0	0.9	0.105	1.010	0.106	0.096	1.095
NC-02	NB-02 & NB-03	Foundation Soils	19.2	21.4	47.7	0.817	1.520	1.711	1.0	45.4	49	4	13.8	59.2	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.097	1.034
NC-02	NB-02 & NB-03	Foundation Soils	19.3	21.3	41.6	0.719	4.530	1.726	1.0	39.5	53	4	13.7	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.095	0.097	0.985
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.2	35.6	0.672	3.480	1.889	1.0	33.7	60	4	13.5	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.097	0.939
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.1	29.3	0.497	3.670	1.698	1.0	27.7	63	4	13.2	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.097	0.892
NC-02	NB-02 & NB-03	Foundation Soils	19.5	21.1	26.0	0.389	3.960	1.498	1.0	24.5	64	4	13.0	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.084	0.097	0.867
NC-02	NB-02 & NB-03	Foundation Soils	19.6	21.0	21.4	0.283	1.760	1.325	1.0	20.2	68	4	12.8	32.9	1.0	-0.3	0.0	0.9	0.081	1.007	0.081	0.097	0.834
NC-02	NB-02 & NB-03	Foundation Soils	19.7	20.9	15.7	0.244	2.620	1.555	1.0	14.8	83	4	12.6	27.4	1.0	-0.3	0.0	0.9	0.077	1.006	0.078	0.098	0.796
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.8	9.5	0.156	-1.950	1.634	1.0	9.0	100	4	12.4	21.4	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.098	0.755
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.7	8.4	0.103	0.830	1.233	1.0	7.8	100	4	12.3	20.2	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.098	0.746
NC-02	NB-02 & NB-03	Foundation Soils	19.9	20.7	6.3	0.057	1.000	0.902	1.0	5.9	100	4	12.2	18.1	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.098	0.732
NC-02	NB-02 & NB-03	Foundation Soils	20.0	20.6	4.8	0.038	0.140	0.795	1.0	4.5	100	4	12.1	16.6	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.098	0.721
NC-02	NB-02 & NB-03	Foundation Soils	20.1	20.5	2.3	0.023	3.860	0.994	1.0	2.2	100	4	11.9	14.1	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.098	0.705
NC-02	NB-02 & NB-03	Foundation Soils	20.2	20.4	1.2	0.011	1.690	0.887	1.0	1.2	100	4	11.9	13.0	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.098	0.697
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.3	1.0	0.010	4.340	0.974	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.694
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.2	1.0	0.010	4.090	0.975	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.693
NC-02	NB-02 & NB-03	Foundation Soils	20.4	20.2	1.0	0.010	4.090	0.975	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.692
NC-02	NB-02 & NB-03	Foundation Soils	20.5	20.1	1.0	0.010	4.790	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.691
NC-02	NB-02 & NB-03	Foundation Soils	20.6	20.0	1.0	0.010	4.810	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.690
NC-02	NB-02 & NB-03	Foundation Soils	20.7	19.9	1.0	0.010	4.740	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.689
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	1.0	0.010	5.690	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.099	0.688
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	1.0	0.010	5.610	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.687
NC-02	NB-02 & NB-03	Foundation Soils	20.9	19.7	1.0	0.010	5.670	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.686
NC-02	NB-02 & NB-03	Foundation Soils	21.0	19.6	1.0	0.010	5.800	0.965	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.685
NC-02	NB-02 & NB-03	Foundation Soils	21.1	19.5	1.0	0.010	5.960	0.964	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.684
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.4	1.0	0.010	6.100	0.963	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.683
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.3	1.0	0.010	6.050	0.964	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.682
NC-02	NB-02 & NB-03	Foundation Soils	21.3	19.3	1.0	0.010	6.260	0.962	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.682
NC-02	NB-02 & NB-03	Foundation Soils	21.4	19.2	1.0	0.010	6.050	0.964	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.100	0.681

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-02	NB-02 & NB-03	Foundation Soils	21.5	19.1	1.0	0.010	6.190	0.963	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.101	0.680
NC-02	NB-02 & NB-03	Foundation Soils	21.6	19.0	1.0	0.010	6.460	0.961	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.101	0.679
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	1.0	0.010	6.610	0.960	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.101	0.678
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	1.0	0.010	6.620	0.960	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.101	0.677
NC-02	NB-02 & NB-03	Foundation Soils	21.8	18.8	1.4	0.010	6.530	0.724	1.0	1.2	100	4	11.9	13.1	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.101	0.678
NC-02	NB-02 & NB-03	Foundation Soils	21.9	18.7	1.6	0.010	6.460	0.610	1.0	1.5	100	4	11.9	13.4	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.101	0.678
NC-02	NB-02 & NB-03	Foundation Soils	22.0	18.6	2.1	0.010	5.790	0.470	1.0	1.9	100	4	11.9	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.101	0.680
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.5	2.6	0.010	7.000	0.386	1.0	2.3	100	4	11.9	14.3	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.101	0.682
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.4	3.0	0.010	7.910	0.336	1.0	2.7	100	4	12.0	14.6	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.102	0.683
NC-02	NB-02 & NB-03	Foundation Soils	22.2	18.4	3.6	0.010	9.280	0.278	1.0	3.2	100	4	12.0	15.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.102	0.686
NC-02	NB-02 & NB-03	Foundation Soils	22.3	18.3	4.1	0.011	10.720	0.270	1.0	3.7	100	4	12.0	15.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.102	0.688
NC-02	NB-02 & NB-03	Foundation Soils	22.4	18.2	5.2	0.013	8.430	0.252	0.9	4.6	100	4	12.1	16.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.071	0.102	0.693
NC-02	NB-02 & NB-03	Foundation Soils	22.5	18.1	5.6	0.018	9.030	0.321	0.9	5.0	100	4	12.1	17.1	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.102	0.695
NC-02	NB-02 & NB-03	Foundation Soils	22.6	18.0	6.1	0.020	8.580	0.326	0.9	5.5	100	4	12.1	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.102	0.697
NC-02	NB-02 & NB-03	Foundation Soils	22.6	17.9	7.1	0.021	6.910	0.298	0.9	6.3	94	4	12.2	18.5	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.102	0.701
NC-02	NB-02 & NB-03	Foundation Soils	22.7	17.9	7.7	0.024	9.480	0.311	0.9	6.9	90	4	12.2	19.0	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.102	0.703
NC-02	NB-02 & NB-03	Foundation Soils	22.8	17.8	8.5	0.032	9.650	0.375	0.9	7.6	88	4	12.2	19.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.102	0.707
NC-02	NB-02 & NB-03	Foundation Soils	22.9	17.7	9.8	0.060	9.960	0.615	0.9	8.7	89	4	12.3	20.9	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.103	0.713
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.6	10.1	0.071	10.290	0.701	0.9	9.0	89	4	12.3	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.103	0.714
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.5	11.1	0.078	9.240	0.703	0.9	9.8	86	4	12.3	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.719
NC-02	NB-02 & NB-03	Foundation Soils	23.1	17.5	11.8	0.087	9.900	0.737	0.9	10.4	84	4	12.4	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.103	0.722
NC-02	NB-02 & NB-03	Foundation Soils	23.2	17.4	13.0	0.094	9.040	0.725	0.9	11.5	80	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.727
NC-02	NB-02 & NB-03	Foundation Soils	23.3	17.3	13.2	0.103	10.310	0.782	0.9	11.6	81	4	12.4	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.728
NC-02	NB-02 & NB-03	Foundation Soils	23.4	17.2	13.3	0.113	10.200	0.848	0.9	11.7	82	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.728
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.1	13.0	0.114	10.060	0.877	0.9	11.4	83	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.103	0.725
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.0	13.4	0.118	11.200	0.881	0.9	11.8	82	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.104	0.726
NC-02	NB-02 & NB-03	Foundation Soils	23.6	17.0	14.6	0.130	10.240	0.891	0.9	12.8	79	4	12.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.104	0.732
NC-02	NB-02 & NB-03	Foundation Soils	23.7	16.9	15.4	0.138	9.910	0.898	0.9	13.5	78	4	12.5	26.0	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.104	0.735
NC-02	NB-02 & NB-03	Foundation Soils	23.8	16.8	14.9	0.137	10.710	0.917	0.9	13.1	79	4	12.5	25.6	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.104	0.732
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.7	14.5	0.131	10.720	0.906	0.9	12.7	80	4	12.5	25.1	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.104	0.728
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.6	13.8	0.124	9.430	0.897	0.9	12.1	82	4	12.5	24.5	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.104	0.724
NC-02	NB-02 & NB-03	Foundation Soils	24.0	16.6	13.5	0.112	10.060	0.831	0.9	11.7	82	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.104	0.721
NC-02	NB-02 & NB-03	Foundation Soils	24.1	16.5	13.6	0.105	9.600	0.774	0.9	11.8	80	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.104	0.720
NC-02	NB-02 & NB-03	Foundation Soils	24.2	16.4	14.1	0.108	9.960	0.767	0.9	12.2	79	4	12.4	24.7	1.0	-0.5	0.1	0.9	0.075	1.006	0.075	0.104	0.722
NC-02	NB-02 & NB-03	Foundation Soils	24.3	16.3	14.5	0.119	10.960	0.822	0.9	12.6	79	4	12.5	25.0	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.104	0.724
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.2	15.2	0.120	11.300	0.789	0.9	13.2	77	4	12.5	25.7	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.105	0.727
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.1	16.3	0.122	11.430	0.750	0.9	14.1	74	4	12.5	26.6	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.105	0.732
NC-02	NB-02 & NB-03	Foundation Soils	24.5	16.1	17.5	0.136	11.390	0.778	0.9	15.1	72	4	12.5	27.7	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.105	0.737
NC-02	NB-02 & NB-03	Foundation Soils	24.6	16.0	19.5	0.142	11.670	0.730	0.9	16.9	62	4	12.5	29.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.078	0.105	0.747
NC-02	NB-02 & NB-03	Foundation Soils	24.7	15.9	20.6	0.145	11.210	0.703	0.9	17.9	60	4	12.5	30.3	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.105	0.752
NC-02	NB-02 & NB-03	Foundation Soils	24.8	15.8	20.7	0.154	11.200	0.743	0.9	17.9	61	4	12.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.105	0.752
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	21.7	0.172	11.670	0.793	0.9	18.7	60	4	12.5	31.3	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.105	0.756
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	22.4	0.181	11.570	0.808	0.9	19.3	60	4	12.6	31.9	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.105	0.759
NC-03	NB-03	Foundation Soils	14.0	26.0	6.5	0.033	85.940	0.510	1.2	7.2	90	4	12.2	19.4	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.088	0.834
NC-03	NB-03	Foundation Soils	14.1	25.9	16.3	0.060	85.580	0.368	1.2	17.9	53	4	12.3	30.1	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.088	0.912
NC-03	NB-03	Foundation Soils	14.2	25.8	28.3	0.119	23.250	0.421	1.1	30.5	37	4	12.0	42.6	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.088	1.007
NC-03	NB-03	Foundation Soils	14.3	25.7	27.2	0.189	6.150	0.695	1.1	29.3	46	4	12.6	42.0	1.0	-0.2	0.0	1.0	0.087	1.007	0.088	0.089	1.000
NC-03	NB-03	Foundation Soils	14.4	25.7	23.0	0.241	9.850	1.049	1.1	24.8	58	4	12.9	37.7	1.0	-0.2	0.0	1.0	0.084	1.007	0.085	0.089	0.963
NC-03	NB-03	Foundation Soils	14.4	25.6	16.0	0.341	12.340	2.129	1.2	17.4	81	4	12.8	30.2	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.089	0.903
NC-03	NB-03	Foundation Soils	14.5	25.5	10.8	0.415	13.700	3.826	1.2	11.8	100	4	12.6	24.4	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.089	0.858
NC-03	NB-03	Foundation Soils	14.6	25.4	7.2	0.372	15.390	5.184	1.2	7.9	100	4	12.3	20.2	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.089	0.824
NC-03	NB-03	Foundation Soils	14.7	25.3	5.8	0.313	18.750	5.362	1.2	6.4	100	4	12.2	18.6	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.090	0.811
NC-03	NB-03	Foundation Soils	14.8	25.3	9.0	0.299	25.350	3.338	1.2	9.8	100	4	12.4	22.2	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.090	0.835
NC-03	NB-03	Foundation Soils	14.8	25.2	10.2	0.289	25.440	2.825	1.2	11.1	100	4	12.5	23.6	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.090	0.843
NC-03	NB-03	Foundation Soils	14.9	25.1	9.4	0.307	27.590	3.262	1.1	10.2	100	4	12.5	22.7	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.090	0.834
NC-03	NB-03	Foundation Soils	15.0	25.0	7.8	0.290	33.810	3.698	1.1	8.5	100	4	12.4	20.9	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.091	0.819
NC-03	NB-03	Foundation Soils	15.1	24.9	7.5	0.243	37.880	3.237	1.1	8.1	100	4	12.3	20.5	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.091	0.814
NC-03	NB-03	Foundation Soils	15.2	24.8	6.1	0.201	43.450	3.311	1.1	6.6	100	4	12.2	18.8	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.091	0.800
NC-03	NB-03	Foundation Soils	15.3	24.8	4.4	0.160	31.950	3.604	1.1	4.8	100	4	12.1	16.9	1.0	-0.2	0.0	1.0	0.071	1.006	0.072	0.091	0.785
NC-03	NB-03	Foundation Soils	15.3	24.7	3.6	0.149	40.900	4.167	1.1	3.9	100	4	12.0	15.9	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.091	0.776
NC-03	NB-03	Foundation Soils	15.4	24.6	4.4	0.168	65.560	3.854	1.1	4.7	100	4	12.1	16.8	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.092	0.781
NC-03	NB-03	Foundation Soils	15.5	24.5	6.5	0.151	67.990	2.307	1.1	7.0	100	4	12.3	19.3	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.092	0.796

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-03	NB-03	Foundation Soils	15.6	24.4	5.8	0.119	38.600	2.051	1.1	6.2	100	4	12.2	18.4	1.0	-0.2	0.0	1.0	0.071	1.006	0.073	0.092	0.788
NC-03	NB-03	Foundation Soils	15.7	24.4	3.9	0.112	39.880	2.836	1.1	4.2	100	4	12.1	16.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.092	0.772
NC-03	NB-03	Foundation Soils	15.7	24.3	3.1	0.110	47.450	3.553	1.1	3.3	100	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.092	0.763
NC-03	NB-03	Foundation Soils	15.8	24.2	3.1	0.108	70.750	3.460	1.1	3.3	100	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.762
NC-03	NB-03	Foundation Soils	15.9	24.1	3.2	0.062	75.560	1.930	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.761
NC-03	NB-03	Foundation Soils	16.0	24.0	3.2	0.042	77.420	1.328	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.759
NC-03	NB-03	Foundation Soils	16.1	23.9	3.2	0.052	79.900	1.636	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.757
NC-03	NB-03	Foundation Soils	16.2	23.9	3.4	0.110	81.590	3.236	1.1	3.6	100	4	12.0	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.093	0.757
NC-03	NB-03	Foundation Soils	16.2	23.8	4.8	0.119	79.760	2.485	1.1	5.1	100	4	12.1	17.2	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.094	0.766
NC-03	NB-03	Foundation Soils	16.3	23.7	5.1	0.131	60.030	2.571	1.1	5.4	100	4	12.1	17.5	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.094	0.766
NC-03	NB-03	Foundation Soils	16.4	23.6	4.4	0.129	47.550	2.947	1.1	4.6	100	4	12.1	16.7	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.094	0.759
NC-03	NB-03	Foundation Soils	16.5	23.5	7.1	0.142	17.530	2.011	1.1	7.4	100	4	12.3	19.7	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.094	0.777
NC-03	NB-03	Foundation Soils	16.6	23.4	6.3	0.131	20.040	2.091	1.1	6.6	100	4	12.2	18.8	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.094	0.770
NC-03	NB-03	Foundation Soils	16.7	23.4	7.3	0.108	56.650	1.479	1.1	7.7	100	4	12.3	20.0	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.095	0.776
NC-03	NB-03	Foundation Soils	16.7	23.3	10.4	0.117	54.270	1.122	1.1	10.9	86	4	12.4	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.095	0.797
NC-03	NB-03	Foundation Soils	16.8	23.2	25.1	0.124	41.740	0.495	1.1	25.9	44	4	12.3	38.2	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.095	0.900
NC-03	NB-03	Foundation Soils	16.9	23.1	36.7	0.191	29.720	0.520	1.1	37.6	33	4	12.0	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.095	0.983
NC-03	NB-03	Foundation Soils	17.0	23.0	35.3	0.275	-3.050	0.779	1.1	36.1	41	4	12.7	48.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.095	0.975
NC-03	NB-03	Foundation Soils	17.1	23.0	26.9	0.415	7.100	1.545	1.1	27.5	62	4	13.2	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.096	0.912
NC-03	NB-03	Foundation Soils	17.1	22.9	21.2	0.442	10.290	2.088	1.1	21.7	75	4	13.0	34.8	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.096	0.868
NC-03	NB-03	Foundation Soils	17.2	22.8	14.4	0.470	16.020	3.271	1.1	14.8	96	4	12.8	27.6	1.0	-0.3	0.0	1.0	0.077	1.006	0.078	0.096	0.816
NC-03	NB-03	Foundation Soils	17.3	22.7	10.9	0.451	22.300	4.134	1.1	11.2	100	4	12.5	23.8	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.096	0.789
NC-03	NB-03	Foundation Soils	17.4	22.6	10.5	0.387	17.060	3.687	1.1	10.8	100	4	12.5	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.096	0.784
NC-03	NB-03	Foundation Soils	17.5	22.5	11.7	0.361	22.250	3.075	1.1	12.1	100	4	12.6	24.7	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.096	0.791
NC-03	NB-03	Foundation Soils	17.6	22.5	10.2	0.262	26.410	2.567	1.1	10.5	100	4	12.5	23.0	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.097	0.778
NC-03	NB-03	Foundation Soils	17.6	22.4	7.1	0.251	40.260	3.520	1.1	7.3	100	4	12.3	19.6	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.097	0.755
NC-03	NB-03	Foundation Soils	17.7	22.3	6.2	0.230	54.510	3.710	1.1	6.4	100	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.097	0.747
NC-03	NB-03	Foundation Soils	17.8	22.2	5.9	0.189	63.560	3.216	1.1	6.0	100	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.097	0.743
NC-03	NB-03	Foundation Soils	17.9	22.1	4.6	0.135	83.260	2.929	1.1	4.7	100	4	12.1	16.8	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.097	0.732
NC-03	NB-03	Foundation Soils	18.0	22.1	4.5	0.103	88.430	2.288	1.1	4.6	100	4	12.1	16.7	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.097	0.730
NC-03	NB-03	Foundation Soils	18.0	22.0	5.3	0.076	93.780	1.443	1.1	5.4	100	4	12.1	17.5	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.098	0.734
NC-03	NB-03	Foundation Soils	18.1	21.9	5.9	0.064	75.140	1.076	1.1	6.0	100	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.098	0.737
NC-03	NB-03	Foundation Soils	18.2	21.8	6.2	0.071	68.590	1.144	1.1	6.3	100	4	12.2	18.5	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.098	0.738
NC-03	NB-03	Foundation Soils	18.3	21.7	6.3	0.080	54.310	1.264	1.1	6.4	100	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.098	0.737
NC-03	NB-03	Foundation Soils	18.4	21.6	5.6	0.084	42.550	1.496	1.1	5.7	100	4	12.2	17.8	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.098	0.731
NC-03	NB-03	Foundation Soils	18.5	21.6	4.2	0.083	55.510	1.959	1.1	4.3	100	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.099	0.720
NC-03	NB-03	Foundation Soils	18.5	21.5	3.9	0.077	67.420	1.959	1.1	4.0	100	4	12.0	16.0	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.099	0.717
NC-03	NB-03	Foundation Soils	18.6	21.4	4.2	0.067	79.190	1.597	1.1	4.2	100	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.099	0.717
NC-03	NB-03	Foundation Soils	18.7	21.3	4.4	0.047	81.920	1.080	1.1	4.4	100	4	12.1	16.4	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.099	0.717
NC-03	NB-03	Foundation Soils	18.8	21.2	4.4	0.029	92.050	0.660	1.1	4.4	100	4	12.1	16.5	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.099	0.716
NC-03	NB-03	Foundation Soils	18.9	21.2	5.1	0.048	88.520	0.944	1.1	5.1	100	4	12.1	17.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.071	0.099	0.719
NC-03	NB-03	Foundation Soils	18.9	21.1	9.4	0.084	58.460	0.892	1.1	9.4	89	4	12.3	21.8	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.099	0.747
NC-03	NB-03	Foundation Soils	19.0	21.0	11.7	0.164	15.340	1.405	1.1	11.6	89	4	12.5	24.1	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.100	0.761
NC-03	NB-03	Foundation Soils	19.1	20.9	11.6	0.191	2.190	1.653	1.1	11.5	92	4	12.5	24.0	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.100	0.758
NC-03	NB-03	Foundation Soils	19.2	20.8	9.1	0.163	5.530	1.782	1.1	9.1	100	4	12.4	21.5	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.100	0.741
NC-03	NB-03	Foundation Soils	19.3	20.7	8.1	0.160	16.960	1.981	1.1	8.0	100	4	12.3	20.3	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.100	0.733
NC-03	NB-03	Foundation Soils	19.4	20.7	6.9	0.161	28.510	2.334	1.1	6.8	100	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.100	0.724
NC-03	NB-03	Foundation Soils	19.4	20.6	5.8	0.246	45.070	4.226	1.0	5.8	100	4	12.2	17.9	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.100	0.715
NC-03	NB-03	Foundation Soils	19.5	20.5	7.0	0.325	75.090	4.664	1.0	6.9	100	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.101	0.721
NC-03	NB-03	Foundation Soils	19.6	20.4	17.9	0.379	71.630	2.116	1.0	17.6	82	4	12.8	30.5	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.101	0.793
NC-03	NB-03	Foundation Soils	19.7	20.3	25.9	0.580	71.720	2.237	1.0	25.4	72	4	13.2	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.085	0.101	0.846
NC-03	NB-03	Foundation Soils	19.8	20.3	37.6	0.676	-11.820	1.798	1.0	36.7	56	4	13.6	50.3	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.101	0.926
NC-03	NB-03	Foundation Soils	19.8	20.2	49.9	0.870	-14.840	1.744	1.0	48.5	48	4	14.0	62.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.103	0.101	1.015
NC-03	NB-03	Foundation Soils	19.9	20.1	69.0	0.926	-14.480	1.342	1.0	66.9	33	4	13.7	80.6	1.0	-0.3	0.0	0.9	0.116	1.012	0.118	0.101	1.167
NC-03	NB-03	Foundation Soils	20.0	20.0	88.7	1.161	-18.530	1.308	1.0	85.7	26	4	13.2	98.9	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.101	1.369
NC-03	NB-03	Foundation Soils	20.1	19.9	91.1	1.337	-18.530	1.468	1.0	87.8	28	4	13.8	101.7	1.0	-0.4	0.0	0.9	0.140	1.018	0.143	0.102	1.405
NC-03	NB-03	Foundation Soils	20.2	19.8	92.9	1.590	-18.680	1.711	1.0	89.5	31	4	14.6	104.1	1.0	-0.4	0.0	0.9	0.143	1.019	0.146	0.102	1.438
NC-03	NB-03	Foundation Soils	20.3	19.8	92.7	1.793	-18.340	1.933	1.0	89.2	34	4	15.1	104.3	1.0	-0.4	0.0	0.9	0.143	1.019	0.147	0.102	1.439
NC-03	NB-03	Foundation Soils	20.3	19.7	85.2	1.856	-18.770	2.179	1.0	81.9	39	4	15.4	97.2	1.0	-0.4	0.0	0.9	0.134	1.017	0.137	0.102	1.339
NC-03	NB-03	Foundation Soils	20.4	19.6	81.7	1.853	-18.440	2.269	1.0	78.4	41	4	15.4	93.8	1.0	-0.4	0.0	0.9	0.130	1.016	0.132	0.102	1.294
NC-03	NB-03	Foundation Soils	20.5	19.5	86.5	1.743	-18.510	2.014	1.0	83.0	37	4	15.2	98.2	1.0	-0.4	0.0	0.9	0.135	1.017	0.138	0.102	1.346
NC-03	NB-03	Foundation Soils	20.6	19.4	92.4	1.623	-18.530	1.756	1.0	88.5	32	4	14.7	103.2	1.0	-0.4	0.0	0.9	0.142	1.019	0.145	0.102	1.414

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-03	NB-03	Foundation Soils	20.7	19.3	100.3	1.406	-16.900	1.401	1.0	95.9	25	4	13.2	109.2	1.0	-0.4	0.0	0.9	0.151	1.021	0.154	0.103	1.504
NC-03	NB-03	Foundation Soils	20.8	19.3	105.4	1.124	-17.930	1.067	1.0	100.6	17	4	9.7	110.3	1.0	-0.4	0.0	0.9	0.153	1.022	0.156	0.103	1.522
NC-03	NB-03	Foundation Soils	20.8	19.2	104.0	0.998	-19.270	0.960	1.0	99.2	15	4	8.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.103	1.471
NC-03	NB-03	Foundation Soils	20.9	19.1	101.2	1.061	-19.300	1.048	1.0	96.4	18	4	10.1	106.5	1.0	-0.4	0.0	0.9	0.146	1.020	0.150	0.103	1.454
NC-03	NB-03	Foundation Soils	21.0	19.0	95.6	1.133	-18.840	1.185	1.0	91.0	22	4	12.1	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.103	1.401
NC-03	NB-03	Foundation Soils	21.1	18.9	94.0	1.205	-18.200	1.282	1.0	89.4	24	4	12.9	102.2	1.0	-0.4	0.0	0.9	0.140	1.019	0.143	0.103	1.387
NC-03	NB-03	Foundation Soils	21.2	18.9	98.2	1.189	-18.340	1.210	1.0	93.3	22	4	12.1	105.4	1.0	-0.4	0.0	0.9	0.145	1.020	0.148	0.103	1.430
NC-03	NB-03	Foundation Soils	21.2	18.8	102.9	1.017	-18.250	0.988	1.0	97.6	16	4	9.0	106.6	1.0	-0.4	0.0	0.9	0.147	1.020	0.150	0.103	1.447
NC-03	NB-03	Foundation Soils	21.3	18.7	106.8	0.944	-18.550	0.884	1.0	101.2	13	4	6.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.104	1.458
NC-03	NB-03	Foundation Soils	21.4	18.6	106.8	0.961	-18.680	0.900	1.0	101.0	13	4	6.6	107.7	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.104	1.460
NC-03	NB-03	Foundation Soils	21.5	18.5	105.4	1.004	-18.440	0.952	1.0	99.6	15	4	8.0	107.6	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.104	1.457
NC-03	NB-03	Foundation Soils	21.6	18.4	109.4	1.136	-17.960	1.038	1.0	103.3	16	4	8.9	112.2	1.0	-0.4	0.0	0.9	0.156	1.023	0.159	0.104	1.532
NC-03	NB-03	Foundation Soils	21.7	18.4	116.7	1.146	-17.950	0.982	1.0	110.1	13	4	6.5	116.6	1.0	-0.4	0.0	0.9	0.164	1.025	0.168	0.104	1.614
NC-03	NB-03	Foundation Soils	21.7	18.3	118.5	1.091	-18.390	0.921	1.0	111.6	11	4	4.7	116.3	1.0	-0.4	0.0	0.9	0.163	1.024	0.167	0.104	1.606
NC-03	NB-03	Foundation Soils	21.8	18.2	119.6	1.011	-18.380	0.845	1.0	112.5	9	4	2.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.104	1.580
NC-03	NB-03	Foundation Soils	21.9	18.1	121.9	0.933	-18.340	0.766	1.0	114.5	6	4	0.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.104	1.578
NC-03	NB-03	Foundation Soils	22.0	18.0	126.9	0.808	-18.300	0.637	1.0	119.1	1	4	0.0	119.1	1.0	-0.4	0.0	0.9	0.169	1.026	0.173	0.105	1.658
NC-03	NB-03	Foundation Soils	22.1	18.0	138.5	0.562	-18.010	0.406	1.0	129.9	0	4	0.0	129.9	1.0	-0.4	0.0	0.9	0.197	1.032	0.203	0.105	1.940
NC-03	NB-03	Foundation Soils	22.1	17.9	146.4	0.509	-18.320	0.348	1.0	137.2	0	4	0.0	137.2	1.0	-0.4	0.0	0.9	0.223	1.036	0.230	0.105	2.197
NC-03	NB-03	Foundation Soils	22.2	17.8	148.6	0.592	-18.870	0.398	1.0	139.2	0	4	0.0	139.2	1.0	-0.4	0.0	0.9	0.231	1.038	0.239	0.105	2.277
NC-03	NB-03	Foundation Soils	22.3	17.7	142.9	0.649	-19.090	0.454	1.0	133.6	0	4	0.0	133.6	1.0	-0.4	0.0	0.9	0.209	1.034	0.216	0.105	2.054
NC-03	NB-03	Foundation Soils	22.4	17.6	130.9	0.756	-18.720	0.578	1.0	122.2	0	4	0.0	122.2	1.0	-0.4	0.0	0.9	0.176	1.027	0.181	0.105	1.718
NC-03	NB-03	Foundation Soils	22.5	17.5	124.2	0.867	-18.000	0.698	1.0	115.8	4	4	0.0	115.9	1.0	-0.4	0.0	0.9	0.163	1.024	0.166	0.105	1.578
NC-03	NB-03	Foundation Soils	22.6	17.5	114.3	0.943	-16.440	0.825	1.0	106.5	10	4	3.5	110.0	1.0	-0.4	0.0	0.9	0.152	1.022	0.155	0.105	1.469
NC-03	NB-03	Foundation Soils	22.6	17.4	110.8	0.975	-15.210	0.880	1.0	103.1	12	4	5.7	108.8	1.0	-0.4	0.0	0.9	0.150	1.021	0.153	0.105	1.448
NC-03	NB-03	Foundation Soils	22.7	17.3	107.9	0.801	-14.580	0.742	1.0	100.2	9	4	2.9	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.106	1.360
NC-03	NB-03	Foundation Soils	22.8	17.2	102.7	0.822	-14.060	0.800	1.0	95.3	12	4	5.7	101.0	1.0	-0.4	0.0	0.9	0.139	1.018	0.141	0.106	1.330
NC-03	NB-03	Foundation Soils	22.9	17.1	98.3	0.906	-14.250	0.922	1.0	91.0	17	4	9.1	100.1	1.0	-0.4	0.0	0.9	0.137	1.018	0.139	0.106	1.317
NC-03	NB-03	Foundation Soils	23.0	17.1	93.5	0.966	-14.100	1.033	1.0	86.5	21	4	11.1	97.7	1.0	-0.4	0.0	0.9	0.134	1.017	0.136	0.106	1.285
NC-03	NB-03	Foundation Soils	23.0	17.0	90.4	1.015	-8.030	1.123	1.0	83.5	23	4	12.2	95.7	1.0	-0.4	0.0	0.9	0.132	1.016	0.134	0.106	1.260
NC-03	NB-03	Foundation Soils	23.1	16.9	85.4	1.094	-15.680	1.281	1.0	78.8	28	4	13.3	92.1	1.0	-0.4	0.0	0.9	0.128	1.015	0.129	0.106	1.218
NC-03	NB-03	Foundation Soils	23.2	16.8	80.3	1.133	-16.910	1.412	1.0	73.9	32	4	13.8	87.8	1.0	-0.4	0.0	0.9	0.123	1.014	0.124	0.106	1.172
NC-03	NB-03	Foundation Soils	23.3	16.7	77.3	1.183	-16.340	1.530	1.0	71.1	35	4	14.1	85.3	1.0	-0.4	0.0	0.9	0.121	1.013	0.122	0.106	1.146
NC-03	NB-03	Foundation Soils	23.4	16.6	72.5	1.198	-16.830	1.653	1.0	66.5	38	4	14.3	80.9	1.0	-0.4	0.0	0.9	0.117	1.012	0.117	0.106	1.104
NC-03	NB-03	Foundation Soils	23.5	16.6	64.0	1.266	-16.820	1.978	1.0	58.6	46	4	14.5	73.1	1.0	-0.4	0.0	0.9	0.110	1.011	0.110	0.107	1.037
NC-03	NB-03	Foundation Soils	23.5	16.5	61.3	1.308	-17.250	2.133	1.0	56.1	48	4	14.5	70.6	1.0	-0.4	0.0	0.9	0.108	1.010	0.108	0.107	1.016
NC-03	NB-03	Foundation Soils	23.6	16.4	54.2	1.234	-17.200	2.277	1.0	49.5	53	4	14.3	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.107	0.963
NC-03	NB-03	Foundation Soils	23.7	16.3	49.0	1.033	-16.970	2.109	1.0	44.6	54	4	14.0	58.6	1.0	-0.4	0.0	0.9	0.099	1.008	0.099	0.107	0.926
NC-03	NB-03	Foundation Soils	23.8	16.2	42.5	0.938	-16.630	2.205	1.0	38.6	59	4	13.8	52.4	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.107	0.882
NC-03	NB-03	Foundation Soils	23.9	16.1	35.5	0.827	-15.820	2.332	1.0	32.1	65	4	13.5	45.6	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.107	0.836
NC-03	NB-03	Foundation Soils	23.9	16.1	28.3	0.751	-14.580	2.657	1.0	25.5	77	4	13.3	38.8	1.0	-0.4	0.1	0.9	0.085	1.007	0.085	0.107	0.792
NC-03	NB-03	Foundation Soils	24.0	16.0	24.2	0.783	-10.680	3.238	1.0	21.8	86	4	13.1	34.9	1.0	-0.4	0.1	0.9	0.082	1.007	0.082	0.107	0.767
NC-03	NB-03	Foundation Soils	24.1	15.9	24.9	0.769	-6.100	3.083	1.0	22.4	84	4	13.2	35.6	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.107	0.770
NC-03	NB-03	Foundation Soils	24.2	15.8	27.7	0.638	-2.380	2.302	1.0	24.9	75	4	13.2	38.1	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.107	0.785
NC-03	NB-03	Foundation Soils	24.3	15.7	32.3	0.532	0.760	1.645	1.0	29.1	61	4	13.2	42.3	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.108	0.810
NC-03	NB-03	Foundation Soils	24.4	15.7	35.3	0.377	-0.240	1.067	1.0	31.7	50	4	13.0	44.7	1.0	-0.5	0.1	0.9	0.089	1.007	0.089	0.108	0.825
NC-03	NB-03	Foundation Soils	24.4	15.6	34.7	0.297	-0.330	0.855	1.0	31.2	46	4	12.8	43.9	1.0	-0.5	0.1	0.9	0.088	1.007	0.088	0.108	0.819
NC-03	NB-03	Foundation Soils	24.5	15.5	33.6	0.310	1.550	0.921	0.9	30.1	49	4	12.8	43.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.088	0.108	0.812
NC-03	NB-03	Foundation Soils	24.6	15.4	32.5	0.366	6.400	1.127	0.9	29.0	53	4	13.0	42.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.108	0.805
NC-03	NB-03	Foundation Soils	24.7	15.3	29.9	0.437	21.820	1.461	0.9	26.7	61	4	13.1	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.108	0.790
NC-03	NB-03	Foundation Soils	24.8	15.2	26.7	0.409	67.320	1.530	0.9	23.8	65	4	13.0	36.8	1.0	-0.5	0.1	0.9	0.083	1.007	0.083	0.108	0.771
NC-03	NB-03	Foundation Soils	24.9	15.2	33.1	0.424	134.790	1.281	0.9	29.5	55	4	13.1	42.6	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.108	0.806
NC-03	NB-03	Foundation Soils	24.9	15.1	44.2	0.532	67.620	1.204	0.9	39.4	46	4	13.3	52.7	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.108	0.871
PC-01	PB-01 & PB-02	Foundation Soils	11.1	33.4	4.9	0.079	40.120	1.612	1.4	6.5	100	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.089	1.055
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.4	5.1	0.078	42.040	1.517	1.4	6.7	100	21	40.4	47.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.089	1.054
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.3	5.3	0.087	44.450	1.636	1.4	7.0	100	21	40.5	47.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.090	1.052
PC-01	PB-01 & PB-02	Foundation Soils	11.3	33.2	5.2	0.087	44.310	1.661	1.4	6.8	100	21	40.4	47.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.090	1.047
PC-01	PB-01 & PB-02	Foundation Soils	11.4	33.1	5.1	0.097	43.590	1.897	1.4	6.7	100	21	40.4	47.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.090	1.041
PC-01	PB-01 & PB-02	Foundation Soils	11.5	33.0	5.0	0.110	40.690	2.211	1.4	6.5	100	21	40.4	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.091	1.035
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	5.0	0.106	39.070	2.110	1.4	6.5	100	21	40.4	46.9	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.091	1.032
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	5.4	0.101	40.310	1.856	1.4	7.1	100	21	40.5	47.5	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.091	1.034
PC-01	PB-01 & PB-02	Foundation Soils	11.7	32.8	6.1	0.099	44.740	1.613	1.4	7.9	99	21	40.7	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.092	1.039

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	11.8	32.7	6.2	0.092	40.500	1.488	1.4	8.0	97	21	40.6	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.092	1.035
PC-01	PB-01 & PB-02	Foundation Soils	11.9	32.6	5.7	0.087	25.590	1.526	1.4	7.3	100	21	40.5	47.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.092	1.025
PC-01	PB-01 & PB-02	Foundation Soils	12.0	32.5	4.9	0.077	20.260	1.576	1.4	6.3	100	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.093	1.011
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.5	4.4	0.076	17.630	1.712	1.4	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.093	1.002
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.4	4.2	0.080	20.950	1.900	1.4	5.4	100	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.093	0.996
PC-01	PB-01 & PB-02	Foundation Soils	12.2	32.3	4.1	0.084	24.880	2.071	1.4	5.2	100	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.093	0.990
PC-01	PB-01 & PB-02	Foundation Soils	12.3	32.2	4.0	0.085	27.280	2.130	1.4	5.1	100	21	40.0	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.094	0.986
PC-01	PB-01 & PB-02	Foundation Soils	12.4	32.1	3.9	0.092	29.540	2.368	1.4	5.0	100	21	40.0	45.0	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.094	0.981
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	3.7	0.091	28.410	2.468	1.4	4.7	100	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.094	0.976
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	3.7	0.088	29.060	2.384	1.4	4.7	100	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.095	0.972
PC-01	PB-01 & PB-02	Foundation Soils	12.6	31.9	3.6	0.085	29.970	2.343	1.3	4.6	100	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.095	0.968
PC-01	PB-01 & PB-02	Foundation Soils	12.7	31.8	3.6	0.083	31.160	2.284	1.3	4.6	100	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.095	0.965
PC-01	PB-01 & PB-02	Foundation Soils	12.8	31.7	3.6	0.080	30.400	2.235	1.3	4.5	100	21	39.9	44.5	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.095	0.961
PC-01	PB-01 & PB-02	Foundation Soils	12.9	31.6	3.9	0.076	32.880	1.946	1.3	4.9	100	21	40.0	44.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.096	0.962
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.6	4.2	0.073	34.640	1.752	1.3	5.3	100	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.096	0.962
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.5	4.4	0.074	37.140	1.666	1.3	5.6	100	21	40.2	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.096	0.962
PC-01	PB-01 & PB-02	Foundation Soils	13.1	31.4	4.6	0.098	39.210	2.142	1.3	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.097	0.961
PC-01	PB-01 & PB-02	Foundation Soils	13.2	31.3	4.9	0.164	39.160	3.351	1.3	6.1	100	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.097	0.962
PC-01	PB-01 & PB-02	Foundation Soils	13.3	31.2	4.9	0.447	39.160	9.133	1.3	6.1	100	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.097	0.959
PC-01	PB-01 & PB-02	Foundation Soils	13.4	31.1	10.1	0.757	49.220	7.527	1.3	12.4	100	21	41.7	54.1	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.097	1.016
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.1	16.1	0.888	51.500	5.525	1.3	19.5	96	21	43.2	62.7	1.0	-0.2	0.0	1.0	0.102	1.009	0.106	0.098	1.085
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.0	20.9	0.787	25.490	3.759	1.3	25.2	79	21	43.9	69.1	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.098	1.138
PC-01	PB-01 & PB-02	Foundation Soils	13.6	30.9	45.9	0.739	14.630	1.609	1.2	53.4	43	21	46.2	99.5	1.0	-0.2	0.0	1.0	0.137	1.018	0.145	0.098	1.480
PC-01	PB-01 & PB-02	Foundation Soils	13.7	30.8	86.2	0.879	16.250	1.020	1.2	97.6	16	21	29.8	127.4	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.098	2.094
PC-01	PB-01 & PB-02	Foundation Soils	13.8	30.7	102.1	0.973	23.110	0.953	1.2	115.4	10	21	12.9	128.3	1.1	-0.2	0.0	1.0	0.192	1.031	0.209	0.099	2.119
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.7	75.6	1.027	2.100	1.358	1.2	85.3	26	21	43.7	129.0	1.1	-0.2	0.0	1.0	0.194	1.031	0.211	0.099	2.136
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.6	66.8	1.048	-1.760	1.568	1.2	75.7	33	21	46.7	122.4	1.1	-0.2	0.0	1.0	0.177	1.027	0.191	0.099	1.925
PC-01	PB-01 & PB-02	Foundation Soils	14.0	30.5	41.3	1.138	12.420	2.754	1.2	47.8	59	21	47.5	95.3	1.0	-0.2	0.0	1.0	0.131	1.016	0.139	0.099	1.399
PC-01	PB-01 & PB-02	Foundation Soils	14.1	30.4	27.6	1.122	5.340	4.060	1.2	32.4	74	21	45.3	77.8	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.100	1.196
PC-01	PB-01 & PB-02	Foundation Soils	14.2	30.3	22.8	0.952	1.950	4.170	1.3	27.0	80	21	44.4	71.3	1.0	-0.2	0.0	1.0	0.108	1.010	0.113	0.100	1.132
PC-01	PB-01 & PB-02	Foundation Soils	14.3	30.2	16.3	0.758	3.570	4.658	1.3	19.4	92	21	43.1	62.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.105	0.100	1.053
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.2	18.7	0.591	7.330	3.156	1.3	22.2	80	21	43.3	65.5	1.0	-0.2	0.0	1.0	0.104	1.009	0.108	0.100	1.075
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.1	26.7	0.590	18.300	2.210	1.2	31.2	66	21	44.5	75.7	1.0	-0.2	0.0	1.0	0.112	1.011	0.117	0.101	1.164
PC-01	PB-01 & PB-02	Foundation Soils	14.5	30.0	35.0	0.556	20.490	1.589	1.2	40.4	51	21	45.0	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.127	0.101	1.259
PC-01	PB-01 & PB-02	Foundation Soils	14.6	29.9	41.3	0.531	13.880	1.285	1.2	47.4	42	21	44.6	92.1	1.0	-0.2	0.0	1.0	0.128	1.015	0.135	0.101	1.332
PC-01	PB-01 & PB-02	Foundation Soils	14.7	29.8	47.5	0.547	4.880	1.151	1.2	54.1	36	21	44.0	98.1	1.0	-0.2	0.0	1.0	0.135	1.017	0.143	0.101	1.407
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.8	51.4	0.540	1.380	1.050	1.2	58.4	32	21	42.8	101.2	1.0	-0.2	0.0	1.0	0.139	1.018	0.147	0.102	1.448
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.7	52.3	0.550	1.460	1.052	1.2	59.2	31	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.102	1.455
PC-01	PB-01 & PB-02	Foundation Soils	14.9	29.6	52.8	0.564	2.290	1.068	1.2	59.6	31	21	42.9	102.6	1.0	-0.2	0.0	1.0	0.141	1.019	0.149	0.102	1.461
PC-01	PB-01 & PB-02	Foundation Soils	15.0	29.5	53.1	0.574	3.460	1.081	1.2	59.9	32	21	43.0	102.9	1.0	-0.2	0.0	1.0	0.141	1.019	0.150	0.102	1.463
PC-01	PB-01 & PB-02	Foundation Soils	15.1	29.4	52.5	0.551	4.140	1.050	1.2	59.1	31	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.102	1.444
PC-01	PB-01 & PB-02	Foundation Soils	15.2	29.3	49.5	0.551	4.880	1.114	1.2	55.7	34	21	43.6	99.4	1.0	-0.2	0.0	1.0	0.136	1.018	0.144	0.103	1.403
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.3	45.0	0.580	5.180	1.289	1.2	50.8	40	21	44.8	95.6	1.0	-0.2	0.0	1.0	0.132	1.016	0.139	0.103	1.349
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.2	36.7	0.632	5.760	1.723	1.2	41.6	52	21	45.4	87.0	1.0	-0.2	0.0	1.0	0.122	1.014	0.128	0.103	1.245
PC-01	PB-01 & PB-02	Foundation Soils	15.4	29.1	28.7	0.722	6.620	2.519	1.2	32.7	67	21	45.0	77.7	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.103	1.148
PC-01	PB-01 & PB-02	Foundation Soils	15.5	29.0	22.3	0.768	7.450	3.441	1.2	25.6	78	21	44.0	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.104	1.073
PC-01	PB-01 & PB-02	Foundation Soils	15.6	28.9	15.7	0.599	9.050	3.821	1.2	18.1	90	21	42.7	60.9	1.0	-0.2	0.0	1.0	0.100	1.009	0.104	0.104	1.000
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	13.2	0.528	11.710	4.008	1.2	15.3	97	21	42.3	57.5	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.104	0.972
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	11.6	0.498	13.670	4.310	1.2	13.4	100	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.104	0.953
PC-01	PB-01 & PB-02	Foundation Soils	15.8	28.7	20.7	0.324	29.210	1.567	1.2	23.7	67	21	43.0	66.6	1.0	-0.3	0.0	1.0	0.105	1.010	0.108	0.104	1.039
PC-01	PB-01 & PB-02	Foundation Soils	15.9	28.6	59.1	0.261	49.980	0.441	1.2	66.6	12	21	16.2	82.8	1.0	-0.3	0.0	1.0	0.118	1.013	0.124	0.105	1.181
PC-01	PB-01 & PB-02	Foundation Soils	16.0	28.5	79.1	0.237	29.920	0.300	1.2	88.5	0	21	0.0	88.5	1.0	-0.3	0.0	1.0	0.124	1.014	0.130	0.105	1.238
PC-01	PB-01 & PB-02	Foundation Soils	16.1	28.4	80.8	0.273	6.770	0.338	1.2	90.2	0	21	0.0	90.2	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.105	1.254
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.4	78.2	0.410	6.330	0.524	1.2	87.2	7	21	2.5	89.6	1.0	-0.3	0.0	1.0	0.125	1.015	0.131	0.105	1.245
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.3	77.4	0.422	9.010	0.545	1.2	86.1	8	21	4.7	90.8	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.105	1.256
PC-01	PB-01 & PB-02	Foundation Soils	16.3	28.2	76.3	0.498	10.270	0.653	1.2	84.1	12	21	16.2	100.2	1.0	-0.3	0.0	1.0	0.138	1.018	0.145	0.106	1.371
PC-01	PB-01 & PB-02	Foundation Soils	16.4	28.1	75.3	0.621	10.480	0.824	1.2	82.3	17	21	29.3	111.6	1.0	-0.3	0.0	1.0	0.155	1.022	0.164	0.106	1.550
PC-01	PB-01 & PB-02	Foundation Soils	16.5	28.0	73.2	0.657	11.180	0.897	1.2	79.8	19	21	34.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.168	0.106	1.588
PC-01	PB-01 & PB-02	Foundation Soils	16.6	27.9	74.0	0.711	8.910	0.961	1.2	80.3	21	21	36.1	116.4	1.0	-0.3	0.0	1.0	0.164	1.024	0.174	0.106	1.637
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.9	72.5	0.785	8.290	1.082	1.1	78.5	24	21	40.0	118.5	1.0	-0.3	0.0	1.0	0.168	1.025	0.179	0.106	1.680
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.8	69.1	0.826	6.750	1.195	1.1	74.7	27	21	42.8	117.6	1.0	-0.3	0.0	1.0	0.166	1.025	0.176	0.107	1.655
PC-01	PB-01 & PB-02	Foundation Soils	16.8	27.7	58.6	0.890	5.000	1.519	1.2	63.6	37	21	46.3	109.9	1.0	-0.3	0.0	1.0	0.152	1.022	0.160	0.107	1.503

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	16.9	27.6	44.6	0.907	3.720	2.032	1.2	48.8	51	21	46.8	95.6	1.0	-0.3	0.0	1.0	0.132	1.016	0.138	0.107	1.291
PC-01	PB-01 & PB-02	Foundation Soils	17.0	27.5	27.9	0.968	3.750	3.469	1.2	30.9	73	21	44.9	75.8	1.0	-0.3	0.0	1.0	0.112	1.011	0.116	0.107	1.086
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.5	17.7	0.907	6.430	5.124	1.2	19.8	95	21	43.2	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.107	0.979
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.4	11.9	0.782	15.340	6.579	1.2	13.4	100	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.107	0.920
PC-01	PB-01 & PB-02	Foundation Soils	17.2	27.3	11.1	0.656	19.680	5.919	1.2	12.4	100	21	41.7	54.1	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.108	0.910
PC-01	PB-01 & PB-02	Foundation Soils	17.3	27.2	8.9	0.431	23.490	4.828	1.2	10.0	100	21	41.2	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.108	0.888
PC-01	PB-01 & PB-02	Foundation Soils	17.4	27.1	7.3	0.340	35.350	4.657	1.2	8.2	100	21	40.7	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.108	0.871
PC-01	PB-01 & PB-02	Foundation Soils	17.5	27.0	7.0	0.292	95.530	4.150	1.2	7.9	100	21	40.7	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.108	0.866
PC-01	PB-01 & PB-02	Foundation Soils	17.6	27.0	24.0	0.243	115.300	1.010	1.2	26.5	55	21	42.6	69.1	1.0	-0.3	0.0	1.0	0.107	1.010	0.110	0.108	1.015
PC-01	PB-01 & PB-02	Foundation Soils	17.6	26.9	92.7	0.270	88.090	0.291	1.1	99.9	0	21	0.0	99.9	1.0	-0.3	0.0	1.0	0.137	1.018	0.144	0.109	1.323
PC-01	PB-01 & PB-02	Foundation Soils	17.7	26.8	97.0	0.353	34.020	0.364	1.1	104.1	0	21	0.0	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.150	0.109	1.378
PC-01	PB-01 & PB-02	Foundation Soils	17.8	26.7	82.2	0.439	-0.340	0.534	1.1	88.8	7	21	2.0	90.9	1.0	-0.3	0.0	0.9	0.126	1.015	0.132	0.109	1.210
PC-01	PB-01 & PB-02	Foundation Soils	17.9	26.6	61.6	0.583	-2.920	0.946	1.1	65.9	26	21	40.2	106.1	1.0	-0.3	0.0	0.9	0.146	1.020	0.153	0.109	1.404
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.6	43.3	0.711	-2.580	1.642	1.1	46.6	48	21	45.7	92.3	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.109	1.221
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.5	27.3	0.765	-0.330	2.798	1.2	29.7	71	21	44.5	74.2	1.0	-0.3	0.0	0.9	0.111	1.011	0.114	0.109	1.046
PC-01	PB-01 & PB-02	Foundation Soils	18.1	26.4	18.7	0.780	1.810	4.166	1.2	20.5	90	21	43.3	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.110	0.962
PC-01	PB-01 & PB-02	Foundation Soils	18.2	26.3	11.8	0.667	6.790	5.651	1.2	13.0	100	21	41.8	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.098	0.110	0.896
PC-01	PB-01 & PB-02	Foundation Soils	18.3	26.2	10.2	0.558	13.010	5.497	1.2	11.2	100	21	41.4	52.6	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.110	0.879
PC-01	PB-01 & PB-02	Foundation Soils	18.4	26.1	8.8	0.463	15.820	5.244	1.2	9.7	100	21	41.1	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.110	0.865
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.1	6.6	0.375	23.040	5.696	1.2	7.3	100	21	40.5	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.110	0.843
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.0	5.9	0.269	42.830	4.531	1.2	6.5	100	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.110	0.836
PC-01	PB-01 & PB-02	Foundation Soils	18.6	25.9	5.9	0.256	69.320	4.330	1.2	6.5	100	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.111	0.834
PC-01	PB-01 & PB-02	Foundation Soils	18.7	25.8	6.1	0.305	84.240	4.971	1.2	6.7	100	21	40.4	47.1	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.111	0.835
PC-01	PB-01 & PB-02	Foundation Soils	18.8	25.7	13.2	0.312	94.870	2.356	1.2	14.4	89	21	41.9	56.3	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.111	0.895
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	19.2	0.299	71.230	1.554	1.1	20.8	70	21	42.6	63.3	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.111	0.944
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	11.0	0.253	32.120	2.302	1.2	11.9	95	21	41.5	53.4	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.111	0.873
PC-01	PB-01 & PB-02	Foundation Soils	19.0	25.5	7.7	0.237	25.440	3.062	1.2	8.4	100	21	40.8	49.2	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.111	0.843
PC-01	PB-01 & PB-02	Foundation Soils	19.1	25.4	7.5	0.173	39.150	2.296	1.2	8.2	100	21	40.7	48.9	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.111	0.840
PC-01	PB-01 & PB-02	Foundation Soils	19.2	25.3	6.2	0.089	66.420	1.432	1.2	6.8	100	21	40.4	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.112	0.827
PC-01	PB-01 & PB-02	Foundation Soils	19.3	25.2	5.7	0.038	84.530	0.670	1.2	6.2	100	21	40.3	46.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.112	0.821
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.2	5.8	0.033	103.340	0.568	1.1	6.3	98	21	40.3	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.112	0.820
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.1	5.9	0.044	100.290	0.751	1.1	6.3	100	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.112	0.820
PC-01	PB-01 & PB-02	Foundation Soils	19.5	25.0	5.9	0.038	95.150	0.646	1.1	6.4	99	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.112	0.819
PC-01	PB-01 & PB-02	Foundation Soils	19.6	24.9	6.9	0.036	97.350	0.523	1.1	7.4	90	21	40.3	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.112	0.825
PC-01	PB-01 & PB-02	Foundation Soils	19.7	24.8	7.5	0.048	82.570	0.643	1.1	8.0	89	21	40.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.113	0.828
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	8.4	0.058	63.310	0.688	1.1	9.0	86	21	40.6	49.6	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.113	0.834
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	8.3	0.064	66.560	0.770	1.1	8.9	88	21	40.6	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.113	0.832
PC-01	PB-01 & PB-02	Foundation Soils	19.9	24.6	9.9	0.045	86.020	0.454	1.1	10.6	74	21	40.5	51.1	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.113	0.841
PC-01	PB-01 & PB-02	Foundation Soils	20.0	24.5	10.1	0.063	81.080	0.625	1.1	10.8	78	21	40.7	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.113	0.843
PC-01	PB-01 & PB-02	Foundation Soils	20.1	24.4	26.6	0.084	62.560	0.316	1.1	28.0	36	21	38.8	66.9	1.0	-0.4	0.0	0.9	0.105	1.010	0.107	0.113	0.948
PC-01	PB-01 & PB-02	Foundation Soils	20.2	24.3	41.7	0.123	48.980	0.295	1.1	43.8	20	21	29.8	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.113	0.998
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.3	38.7	0.189	7.350	0.488	1.1	40.4	29	21	38.2	78.6	1.0	-0.4	0.0	0.9	0.115	1.012	0.118	0.114	1.038
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.2	29.9	0.250	0.760	0.836	1.1	31.2	46	21	42.3	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.114	0.995
PC-01	PB-01 & PB-02	Foundation Soils	20.4	24.1	19.0	0.338	5.500	1.777	1.1	20.0	74	21	42.5	62.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.114	0.912
PC-01	PB-01 & PB-02	Foundation Soils	20.5	24.0	14.5	0.432	8.290	2.975	1.1	15.3	93	21	42.2	57.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.114	0.876
PC-01	PB-01 & PB-02	Foundation Soils	20.6	23.9	9.6	0.411	14.080	4.269	1.1	10.1	100	21	41.2	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.114	0.834
PC-01	PB-01 & PB-02	Foundation Soils	20.7	23.8	7.7	0.340	17.200	4.423	1.1	8.1	100	21	40.7	48.8	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.114	0.817
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.8	6.3	0.282	21.770	4.508	1.1	6.6	100	21	40.4	47.0	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.114	0.804
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.7	5.0	0.207	29.680	4.119	1.1	5.3	100	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.114	0.793
PC-01	PB-01 & PB-02	Foundation Soils	20.9	23.6	5.0	0.107	46.020	2.124	1.1	5.3	100	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.115	0.792
PC-01	PB-01 & PB-02	Foundation Soils	21.0	23.5	5.4	0.053	64.460	0.987	1.1	5.6	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.115	0.793
PC-01	PB-01 & PB-02	Foundation Soils	21.1	23.4	6.8	0.034	71.180	0.499	1.1	7.1	92	21	40.3	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.115	0.803
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.4	7.8	0.031	62.650	0.398	1.1	8.1	84	21	40.3	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.115	0.808
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.3	8.5	0.038	45.780	0.449	1.1	8.8	82	21	40.4	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.115	0.812
PC-01	PB-01 & PB-02	Foundation Soils	21.3	23.2	9.7	0.040	37.120	0.411	1.1	10.1	75	21	40.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.115	0.819
PC-01	PB-01 & PB-02	Foundation Soils	21.4	23.1	10.8	0.041	31.370	0.380	1.1	11.2	69	21	40.4	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.115	0.825
PC-01	PB-01 & PB-02	Foundation Soils	21.5	23.0	9.0	0.064	26.130	0.708	1.1	9.4	85	21	40.7	50.0	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.116	0.814
PC-01	PB-01 & PB-02	Foundation Soils	21.6	22.9	7.5	0.090	24.950	1.193	1.1	7.8	100	21	40.7	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.116	0.803
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.9	6.0	0.084	28.680	1.391	1.1	6.3	100	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.116	0.790
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.8	6.1	0.070	33.890	1.157	1.1	6.3	100	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.116	0.789
PC-01	PB-01 & PB-02	Foundation Soils	21.8	22.7	7.5	0.066	35.210	0.881	1.1	7.7	96	21	40.6	48.3	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.116	0.799
PC-01	PB-01 & PB-02	Foundation Soils	21.9	22.6	10.5	0.066	33.070	0.627	1.1	10.8	78	21	40.7	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.116	0.819

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	22.0	22.5	13.8	0.070	20.770	0.506	1.1	14.2	64	21	40.7	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.116	0.839
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.5	16.8	0.073	15.480	0.435	1.1	17.2	56	21	40.7	57.8	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.116	0.857
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.4	22.2	0.098	11.290	0.442	1.1	22.6	47	21	40.6	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.116	0.892
PC-01	PB-01 & PB-02	Foundation Soils	22.2	22.3	27.2	0.150	12.240	0.552	1.1	27.6	43	21	41.0	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.117	0.929
PC-01	PB-01 & PB-02	Foundation Soils	22.3	22.2	43.7	0.147	11.200	0.336	1.1	44.2	21	21	31.4	75.7	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.117	0.981
PC-01	PB-01 & PB-02	Foundation Soils	22.4	22.1	46.4	0.093	10.960	0.200	1.1	47.0	13	21	17.2	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.117	0.897
PC-01	PB-01 & PB-02	Foundation Soils	22.5	22.0	41.7	0.110	11.150	0.263	1.1	42.2	20	21	29.2	71.4	1.0	-0.4	0.0	0.9	0.108	1.010	0.111	0.117	0.947
PC-01	PB-01 & PB-02	Foundation Soils	22.6	22.0	37.8	0.198	11.290	0.524	1.1	38.0	32	21	39.4	77.4	1.0	-0.4	0.0	0.9	0.114	1.012	0.116	0.117	0.992
PC-01	PB-01 & PB-02	Foundation Soils	22.6	21.9	43.8	0.227	13.340	0.519	1.1	43.9	28	21	37.7	81.6	1.0	-0.4	0.0	0.9	0.117	1.012	0.120	0.117	1.025
PC-01	PB-01 & PB-02	Foundation Soils	22.7	21.8	53.1	0.210	13.240	0.395	1.1	53.2	17	21	26.9	80.2	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.117	1.012
PC-01	PB-01 & PB-02	Foundation Soils	22.8	21.7	55.3	0.240	9.480	0.434	1.1	55.3	18	21	27.6	82.8	1.0	-0.4	0.0	0.9	0.118	1.013	0.121	0.117	1.033
PC-01	PB-01 & PB-02	Foundation Soils	22.9	21.6	51.0	0.232	8.380	0.455	1.1	51.0	21	21	32.1	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.117	1.034
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	49.7	0.126	9.550	0.254	1.1	49.8	14	21	18.8	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.117	0.921
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	59.6	0.052	15.680	0.087	1.1	59.8	0	21	0.0	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.118	0.859
PC-01	PB-01 & PB-02	Foundation Soils	23.1	21.4	72.7	0.084	11.620	0.116	1.1	72.5	0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.111	0.118	0.947
PC-01	PB-01 & PB-02	Foundation Soils	23.2	21.3	80.8	0.100	10.990	0.124	1.1	80.3	0	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.118	1.007
PC-01	PB-01 & PB-02	Foundation Soils	23.3	21.2	80.9	0.168	10.380	0.208	1.1	80.3	0	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.118	0.118	1.005
PC-01	PB-01 & PB-02	Foundation Soils	23.4	21.1	77.5	0.225	9.910	0.290	1.1	76.9	1	21	0.0	76.9	1.0	-0.4	0.0	0.9	0.113	1.011	0.115	0.118	0.977
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.1	71.0	0.192	9.860	0.270	1.1	70.4	3	21	0.0	70.5	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.118	0.928
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.0	65.6	0.116	10.870	0.177	1.1	65.1	1	21	0.0	65.1	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.118	0.890
PC-01	PB-01 & PB-02	Foundation Soils	23.6	20.9	64.3	0.122	10.960	0.190	1.1	63.7	2	21	0.0	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.118	0.880
PC-01	PB-01 & PB-02	Foundation Soils	23.7	20.8	72.2	0.112	12.440	0.155	1.0	71.3	0	21	0.0	71.3	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.118	0.932
PC-01	PB-01 & PB-02	Foundation Soils	23.8	20.7	85.9	0.130	12.980	0.151	1.0	84.5	0	21	0.0	84.5	1.0	-0.4	0.0	0.9	0.120	1.013	0.122	0.118	1.035
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	107.2	0.148	13.050	0.138	1.0	104.9	0	21	0.0	104.9	1.0	-0.4	0.0	0.9	0.144	1.020	0.148	0.118	1.250
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	116.4	0.161	11.720	0.138	1.0	113.6	0	21	0.0	113.6	1.0	-0.4	0.1	0.9	0.158	1.023	0.163	0.119	1.378
PC-01	PB-01 & PB-02	Foundation Soils	24.0	20.5	122.3	0.178	8.770	0.146	1.0	119.1	0	21	0.0	119.1	1.0	-0.4	0.1	0.9	0.169	1.026	0.175	0.119	1.477
PC-01	PB-01 & PB-02	Foundation Soils	24.1	20.4	127.9	0.200	6.230	0.156	1.0	124.4	0	21	0.0	124.4	1.0	-0.4	0.1	0.9	0.182	1.029	0.188	0.119	1.588
PC-01	PB-01 & PB-02	Foundation Soils	24.2	20.3	129.5	0.226	1.760	0.175	1.0	125.7	0	21	0.0	125.7	1.0	-0.5	0.1	0.9	0.185	1.029	0.192	0.119	1.618
PC-01	PB-01 & PB-02	Foundation Soils	24.3	20.2	127.6	0.237	-2.620	0.186	1.0	123.8	0	21	0.0	123.8	1.0	-0.5	0.1	0.9	0.180	1.028	0.187	0.119	1.571
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.2	119.0	0.205	-6.920	0.172	1.0	115.4	0	21	0.0	115.4	1.0	-0.5	0.1	0.9	0.162	1.024	0.167	0.119	1.402
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.1	110.2	0.156	-5.570	0.142	1.0	106.8	0	21	0.0	106.8	1.0	-0.5	0.1	0.9	0.147	1.020	0.151	0.119	1.268
PC-01	PB-01 & PB-02	Foundation Soils	24.5	20.0	102.2	0.109	-2.720	0.107	1.0	99.0	0	21	0.0	99.0	1.0	-0.5	0.1	0.9	0.136	1.017	0.139	0.119	1.169
PC-01	PB-01 & PB-02	Foundation Soils	24.6	19.9	95.4	0.128	-0.330	0.134	1.0	92.5	0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.119	1.099
PC-01	PB-01 & PB-02	Foundation Soils	24.7	19.8	90.9	0.184	2.490	0.202	1.0	88.1	0	21	0.0	88.1	1.0	-0.5	0.1	0.9	0.124	1.014	0.126	0.119	1.056
PC-01	PB-01 & PB-02	Foundation Soils	24.8	19.7	84.1	0.228	5.860	0.271	1.0	81.4	0	21	0.0	81.4	1.0	-0.5	0.1	0.9	0.117	1.012	0.119	0.119	0.998
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.7	81.6	0.233	9.950	0.286	1.0	78.9	0	21	0.0	78.9	1.0	-0.5	0.1	0.9	0.115	1.012	0.117	0.119	0.977
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.6	82.9	0.187	11.860	0.225	1.0	80.1	0	21	0.0	80.1	1.0	-0.5	0.1	0.9	0.116	1.012	0.118	0.119	0.985
PC-01	PB-01 & PB-02	Foundation Soils	25.0	19.5	89.6	0.204	8.860	0.228	1.0	86.3	0	21	0.0	86.3	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.120	1.037
PC-01	PB-01 & PB-02	Foundation Soils	25.1	19.4	93.7	0.177	7.000	0.189	1.0	90.1	0	21	0.0	90.1	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.120	1.070
PC-01	PB-01 & PB-02	Foundation Soils	25.2	19.3	94.5	0.156	8.390	0.165	1.0	90.7	0	21	0.0	90.7	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.120	1.075
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.3	96.6	0.138	6.380	0.143	1.0	92.7	0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.120	1.093
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.2	100.7	0.125	5.000	0.124	1.0	96.4	0	21	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.135	0.120	1.130
PC-01	PB-01 & PB-02	Foundation Soils	25.4	19.1	102.4	0.115	5.150	0.112	1.0	97.9	0	21	0.0	97.9	1.0	-0.5	0.1	0.9	0.135	1.017	0.137	0.120	1.146
PC-01	PB-01 & PB-02	Foundation Soils	25.5	19.0	108.3	0.104	6.190	0.096	1.0	103.4	0	21	0.0	103.4	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.120	1.209
PC-01	PB-01 & PB-02	Foundation Soils	25.6	18.9	114.7	0.119	7.360	0.104	1.0	109.3	0	21	0.0	109.3	1.0	-0.5	0.1	0.9	0.151	1.021	0.155	0.120	1.287
PC-01	PB-01 & PB-02	Foundation Soils	25.7	18.8	113.3	0.155	8.450	0.137	1.0	107.9	0	21	0.0	107.9	1.0	-0.5	0.1	0.9	0.149	1.021	0.152	0.120	1.266
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.8	108.9	0.135	12.200	0.124	1.0	103.6	0	21	0.0	103.6	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.120	1.208
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.7	106.8	0.106	15.430	0.099	1.0	101.5	0	21	0.0	101.5	1.0	-0.5	0.1	0.9	0.139	1.018	0.142	0.120	1.182
PC-01	PB-01 & PB-02	Foundation Soils	25.9	18.6	105.8	0.112	15.910	0.106	1.0	100.5	0	21	0.0	100.5	1.0	-0.5	0.1	0.9	0.138	1.018	0.141	0.120	1.169
PC-01	PB-01 & PB-02	Foundation Soils	26.0	18.5	104.3	0.136	15.720	0.130	1.0	98.9	0	21	0.0	98.9	1.0	-0.5	0.1	0.9	0.136	1.017	0.138	0.120	1.150
PC-01	PB-01 & PB-02	Foundation Soils	26.1	18.4	101.5	0.118	17.100	0.116	1.0	96.1	0	21	0.0	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.120	1.119
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	96.9	0.085	19.150	0.088	1.0	91.7	0	21	0.0	91.7	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.120	1.074
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	92.3	0.172	21.060	0.186	1.0	87.2	0	21	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.124	0.121	1.032
PC-01	PB-01 & PB-02	Foundation Soils	26.3	18.2	83.3	0.164	16.380	0.197	1.0	78.6	0	21	0.0	78.6	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.121	0.961
PC-01	PB-01 & PB-02	Foundation Soils	26.4	18.1	86.0	0.133	21.920	0.155	1.0	81.0	0	21	0.0	81.0	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.121	0.979
PC-01	PB-01 & PB-02	Foundation Soils	26.5	18.0	84.2	0.133	25.010	0.158	1.0	79.2	0	21	0.0	79.2	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.121	0.964
PC-01	PB-01 & PB-02	Foundation Soils	26.6	17.9	83.1	0.155	25.440	0.187	1.0	78.1	0	21	0.0	78.1	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.121	0.955
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.9	81.0	0.150	35.970	0.185	1.0	76.1	0	21	0.0	76.1	1.0	-0.5	0.1	0.9	0.112	1.011	0.114	0.121	0.939
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.8	82.1	0.129	36.020	0.157	1.0	76.9	0	21	0.0	76.9	1.0	-0.5	0.1	0.9	0.113	1.011	0.114	0.121	0.945
PC-01	PB-01 & PB-02	Foundation Soils	26.8	17.7	82.7	0.100	29.830	0.121	1.0	77.5	0	21	0.0	77.5	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.121	0.948
PC-01	PB-01 & PB-02	Foundation Soils	26.9	17.6	83.6	0.098	26.800	0.117	1.0	78.2	0	21	0.0	78.2	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.121	0.953
PC-01	PB-01 & PB-02	Foundation Soils	27.0	17.5	85.9	0.087	29.040	0.101	1.0	80.2	0	21	0.0	80.2	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.121	0.968

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	93.3	0.036	21.110	0.039	1.0	87.0	0	21	0.0	87.0	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.121	1.023
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	97.0	0.025	16.200	0.026	1.0	90.4	0	21	0.0	90.4	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.121	1.053
PC-01	PB-01 & PB-02	Foundation Soils	27.2	17.3	99.3	0.061	17.680	0.061	1.0	92.5	0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.130	0.121	1.071
PC-01	PB-01 & PB-02	Foundation Soils	27.3	17.2	99.7	0.233	21.540	0.234	1.0	92.7	0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.129	1.015	0.130	0.121	1.073
PC-01	PB-01 & PB-02	Foundation Soils	27.4	17.1	95.9	0.263	36.200	0.274	1.0	89.1	0	21	0.0	89.1	1.0	-0.5	0.1	0.9	0.125	1.014	0.126	0.121	1.038
PC-01	PB-01 & PB-02	Foundation Soils	27.5	17.0	87.5	0.370	40.590	0.423	1.0	81.1	5	21	0.4	81.5	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.121	0.974
PC-01	PB-01 & PB-02	Foundation Soils	27.6	17.0	76.0	0.439	42.830	0.577	1.0	70.5	15	21	23.4	93.9	1.0	-0.5	0.1	0.9	0.130	1.016	0.131	0.121	1.082
PC-01	PB-01 & PB-02	Foundation Soils	27.6	16.9	66.1	0.445	39.640	0.673	1.0	61.2	22	21	34.9	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.134	0.122	1.104
PC-01	PB-01 & PB-02	Foundation Soils	27.7	16.8	54.8	0.435	55.420	0.793	1.0	50.7	31	21	40.8	91.5	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.122	1.057
PC-01	PB-01 & PB-02	Foundation Soils	27.8	16.7	50.1	0.448	42.450	0.894	1.0	46.3	35	21	42.3	88.6	1.0	-0.5	0.1	0.9	0.124	1.014	0.125	0.122	1.031
PC-01	PB-01 & PB-02	Foundation Soils	27.9	16.6	47.2	0.398	45.120	0.843	1.0	43.5	36	21	42.1	85.6	1.0	-0.5	0.1	0.9	0.121	1.013	0.122	0.122	1.004
PC-01	PB-01 & PB-02	Foundation Soils	28.0	16.5	41.0	0.400	89.670	0.976	1.0	37.7	43	21	43.0	80.7	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.122	0.964
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.5	32.6	0.404	119.270	1.238	1.0	30.0	55	21	43.3	73.2	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.122	0.908
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.4	26.7	0.420	150.320	1.574	1.0	24.5	65	21	43.0	67.5	1.0	-0.6	0.1	0.9	0.105	1.010	0.106	0.122	0.869
PC-01	PB-01 & PB-02	Foundation Soils	28.2	16.3	22.6	0.430	244.700	1.906	1.0	20.6	77	21	42.9	63.5	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.122	0.842
PC-01	PB-01 & PB-02	Foundation Soils	28.3	16.2	26.3	0.388	223.410	1.474	1.0	24.1	65	21	42.9	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.122	0.864
PC-01	PB-01 & PB-02	Foundation Soils	28.4	16.1	29.9	0.342	149.050	1.146	1.0	27.3	56	21	42.8	70.1	1.0	-0.6	0.1	0.9	0.107	1.010	0.108	0.122	0.884
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.1	28.8	0.299	110.970	1.038	1.0	26.3	55	21	42.5	68.8	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.122	0.875
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.0	23.6	0.333	146.170	1.411	1.0	21.5	67	21	42.5	64.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.103	0.122	0.843
PC-01	PB-01 & PB-02	Foundation Soils	28.6	15.9	21.5	0.406	204.300	1.884	1.0	19.6	79	21	42.7	62.3	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.122	0.832
PC-01	PB-01 & PB-02	Foundation Soils	28.7	15.8	26.3	0.414	291.590	1.572	1.0	23.9	66	21	43.0	66.9	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.122	0.861
PC-01	PB-01 & PB-02	Foundation Soils	28.8	15.7	39.6	0.384	198.630	0.969	1.0	36.1	44	21	42.9	79.0	1.0	-0.6	0.1	0.9	0.115	1.012	0.116	0.122	0.945
PC-01	PB-01 & PB-02	Foundation Soils	28.9	15.6	64.0	0.358	49.030	0.559	1.0	58.3	20	21	31.9	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.127	0.122	1.036
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.6	81.4	0.299	-17.440	0.367	1.0	73.9	6	21	0.8	74.7	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.122	0.912
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.5	88.9	0.258	-15.530	0.290	1.0	80.6	0	21	0.0	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.122	0.955
PC-01	PB-01 & PB-02	Foundation Soils	29.1	15.4	95.9	0.245	-16.820	0.256	1.0	87.0	0	21	0.0	87.0	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.122	1.006
PC-01	PB-01 & PB-02	Foundation Soils	29.2	15.3	98.6	0.271	-17.050	0.275	1.0	89.4	0	21	0.0	89.4	1.0	-0.6	0.1	0.9	0.125	1.014	0.126	0.123	1.027
PC-01	PB-01 & PB-02	Foundation Soils	29.3	15.2	101.8	0.254	-14.820	0.250	1.0	92.2	0	21	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.129	0.123	1.051
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.2	103.9	0.283	-10.360	0.272	1.0	94.0	0	21	0.0	94.0	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.123	1.068
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.1	103.9	0.439	-11.960	0.423	1.0	93.9	1	21	0.0	93.9	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.123	1.067
PC-01	PB-01 & PB-02	Foundation Soils	29.5	15.0	101.5	0.482	-15.170	0.475	1.0	91.6	3	21	0.0	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.123	1.045
PC-01	PB-01 & PB-02	Foundation Soils	29.6	14.9	92.4	0.560	-4.210	0.606	1.0	83.4	11	21	12.8	96.2	1.0	-0.6	0.1	0.9	0.133	1.016	0.134	0.123	1.088
PC-01	PB-01 & PB-02	Foundation Soils	29.7	14.8	89.4	0.672	-16.150	0.751	1.0	80.8	16	21	27.0	107.8	1.0	-0.6	0.1	0.9	0.149	1.021	0.150	0.123	1.222
PC-01	PB-01 & PB-02	Foundation Soils	29.8	14.7	84.1	0.700	-19.150	0.833	1.0	75.9	20	21	34.0	110.0	1.0	-0.6	0.1	0.9	0.152	1.022	0.154	0.123	1.251
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.7	82.3	0.681	-20.110	0.828	1.0	74.2	20	21	34.6	108.9	1.0	-0.6	0.1	0.9	0.150	1.021	0.152	0.123	1.234
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.6	79.5	0.581	-20.960	0.730	1.0	71.6	19	21	31.9	103.5	1.0	-0.6	0.1	0.9	0.142	1.019	0.143	0.123	1.165
PC-01	PB-01 & PB-02	Foundation Soils	30.0	14.5	73.0	0.556	-21.060	0.762	1.0	65.6	22	21	36.0	101.6	1.0	-0.6	0.1	0.9	0.139	1.018	0.140	0.123	1.143
PC-01	PB-01 & PB-02	Foundation Soils	30.1	14.4	68.1	0.516	-21.440	0.757	1.0	61.1	24	21	37.5	98.7	1.0	-0.6	0.1	0.9	0.136	1.017	0.136	0.123	1.110
PC-01	PB-01 & PB-02	Foundation Soils	30.2	14.3	64.9	0.542	-21.110	0.835	0.9	58.1	28	21	40.1	98.2	1.0	-0.6	0.1	0.9	0.135	1.017	0.136	0.123	1.104
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	60.4	0.800	-20.750	1.326	0.9	54.0	39	21	45.1	99.2	1.0	-0.6	0.1	0.9	0.136	1.017	0.137	0.123	1.114
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	54.7	0.873	-13.820	1.597	0.9	48.8	46	21	45.8	94.7	1.0	-0.6	0.1	0.9	0.131	1.016	0.131	0.123	1.068
PC-01	PB-01 & PB-02	Foundation Soils	30.4	14.1	48.4	0.864	-14.390	1.785	0.9	43.1	52	21	45.7	88.8	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.123	1.013
PC-01	PB-01 & PB-02	Foundation Soils	30.5	14.0	41.6	0.921	-8.960	2.216	0.9	36.9	61	21	45.4	82.3	1.0	-0.6	0.1	0.9	0.118	1.013	0.118	0.123	0.960
PC-01	PB-01 & PB-02	Foundation Soils	30.6	13.9	35.8	0.809	-3.060	2.258	0.9	31.7	65	21	44.6	76.4	1.0	-0.6	0.1	0.9	0.113	1.011	0.113	0.123	0.915
PC-01	PB-01 & PB-02	Foundation Soils	30.7	13.8	39.1	0.790	-0.240	2.022	0.9	34.6	61	21	44.9	79.5	1.0	-0.6	0.1	0.9	0.115	1.012	0.115	0.123	0.937
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.8	43.0	0.682	8.850	1.586	0.9	38.1	53	21	44.7	82.8	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.123	0.962
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.7	50.2	0.578	-8.200	1.151	0.9	44.5	42	21	44.0	88.5	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.123	1.008
PC-01	PB-01 & PB-02	Foundation Soils	30.9	13.6	53.8	0.502	-4.380	0.934	0.9	47.6	35	21	42.6	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.126	0.123	1.023
PC-01	PB-01 & PB-02	Foundation Soils	31.0	13.5	51.9	0.517	-4.910	0.996	0.9	45.9	38	21	43.1	89.1	1.0	-0.6	0.1	0.9	0.125	1.014	0.125	0.123	1.012
PC-01	PB-01 & PB-02	Foundation Soils	31.1	13.4	54.5	0.394	-5.240	0.723	0.9	48.2	30	21	40.2	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.123	1.005
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	54.8	0.411	0.480	0.751	0.9	48.3	31	21	40.5	88.9	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.123	1.010
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	50.8	0.538	11.070	1.059	0.9	44.8	40	21	43.5	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.123	1.004
PC-01	PB-01 & PB-02	Foundation Soils	31.3	13.2	56.9	0.476	-4.290	0.837	0.9	50.2	32	21	41.4	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.124	1.032
PC-01	PB-01 & PB-02	Foundation Soils	31.4	13.1	62.4	0.472	-2.460	0.757	0.9	55.0	27	21	39.3	94.3	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.124	1.057
PC-01	PB-01 & PB-02	Foundation Soils	31.5	13.0	76.3	0.472	1.760	0.619	0.9	67.2	17	21	28.9	96.1	1.0	-0.6	0.1	0.9	0.132	1.016	0.133	0.124	1.075
PC-01	PB-01 & PB-02	Foundation Soils	31.6	12.9	84.7	0.470	2.520	0.555	0.9	74.5	12	21	17.3	91.8	1.0	-0.6	0.1	0.9	0.128	1.015	0.128	0.124	1.033
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.9	77.0	0.500	6.100	0.649	0.9	67.8	18	21	30.2	98.0	1.0	-0.6	0.1	0.9	0.135	1.017	0.135	0.124	1.092
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.8	74.8	0.446	6.080	0.596	0.9	65.7	18	21	28.8	94.4	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.124	1.057
PC-01	PB-01 & PB-02	Foundation Soils	31.8	12.7	71.5	0.383	13.870	0.536	0.9	62.6	17	21	27.4	90.0	1.0	-0.7	0.1	0.9	0.126	1.015	0.126	0.124	1.016
PC-01	PB-01 & PB-02	Foundation Soils	31.9	12.6	66.9	0.323	19.150	0.483	0.9	58.5	17	21	27.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.124	0.981
PC-01	PB-01 & PB-02	Foundation Soils	32.0	12.5	56.7	0.388	19.190	0.685	0.9	49.5	28	21	39.3	88.8	1.0	-0.7	0.1	0.9	0.124	1.014	0.124	0.124	1.004
PC-01	PB-01 & PB-02	Foundation Soils	32.1	12.4	48.9	0.450	22.250	0.921	0.9	42.6	38	21	42.7	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.124	0.975

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.4	39.1	0.470	27.920	1.203	0.9	33.9	50	21	43.5	77.4	1.0	-0.7	0.1	0.9	0.113	1.012	0.113	0.124	0.915
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.3	33.6	0.524	72.900	1.560	0.9	29.1	60	21	43.6	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.124	0.882
PC-01	PB-01 & PB-02	Foundation Soils	32.3	12.2	28.3	0.556	104.150	1.965	0.9	24.4	74	21	43.5	68.0	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.124	0.850
PC-01	PB-01 & PB-02	Foundation Soils	32.4	12.1	28.3	0.472	130.310	1.670	0.9	24.4	67	21	43.1	67.5	1.0	-0.7	0.1	0.9	0.105	1.010	0.105	0.124	0.847
PC-01	PB-01 & PB-02	Foundation Soils	32.5	12.0	31.2	0.321	124.400	1.030	0.9	26.9	54	21	42.6	69.4	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.124	0.859
PC-01	PB-01 & PB-02	Foundation Soils	32.6	12.0	34.0	0.227	113.000	0.669	0.9	29.2	44	21	41.5	70.7	1.0	-0.7	0.1	0.9	0.108	1.010	0.107	0.124	0.867
PC-01	PB-01 & PB-02	Foundation Soils	32.6	11.9	45.5	0.126	37.390	0.277	0.9	39.1	22	21	32.0	71.1	1.0	-0.7	0.1	0.9	0.108	1.010	0.108	0.124	0.869
PC-01	PB-01 & PB-02	Foundation Soils	32.7	11.8	52.6	0.160	26.590	0.304	0.9	45.2	19	21	28.1	73.3	1.0	-0.7	0.1	0.9	0.110	1.011	0.110	0.124	0.884
PC-01	PB-01 & PB-02	Foundation Soils	32.8	11.7	56.4	0.230	35.450	0.408	0.9	48.6	20	21	31.2	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.124	0.929
PC-01	PB-01 & PB-02	Foundation Soils	32.9	11.6	53.7	0.229	25.850	0.426	0.9	46.2	23	21	33.6	79.9	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.124	0.929
PC-01	PB-01 & PB-02	Foundation Soils	33.0	11.5	48.5	0.243	62.400	0.501	0.9	41.7	28	21	37.9	79.5	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.124	0.927
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.5	48.7	0.239	56.130	0.490	0.9	41.8	28	21	37.6	79.4	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.124	0.925
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.4	53.2	0.268	49.790	0.504	0.9	45.6	26	21	36.5	82.1	1.0	-0.7	0.1	0.9	0.118	1.013	0.117	0.124	0.945
PC-01	PB-01 & PB-02	Foundation Soils	33.2	11.3	54.6	0.300	56.690	0.550	0.9	46.9	26	21	37.2	84.1	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.124	0.960
PC-01	PB-01 & PB-02	Foundation Soils	33.3	11.2	59.6	0.347	26.540	0.582	0.9	51.2	25	21	36.4	87.6	1.0	-0.7	0.1	0.9	0.123	1.014	0.123	0.124	0.988
PC-01	PB-01 & PB-02	Foundation Soils	33.4	11.1	60.5	0.328	35.590	0.543	0.9	51.9	23	21	34.9	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.122	0.124	0.980
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	58.3	0.317	50.220	0.544	0.9	49.9	24	21	35.8	85.7	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.124	0.972
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	57.8	0.297	45.710	0.514	0.9	49.4	24	21	35.1	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.124	0.962
PC-01	PB-01 & PB-02	Foundation Soils	33.6	10.9	60.3	0.307	39.400	0.509	0.9	51.6	22	21	33.8	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.120	0.124	0.968
PC-01	PB-01 & PB-02	Foundation Soils	33.7	10.8	64.0	0.301	24.870	0.470	0.9	54.6	19	21	29.9	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.124	0.962
PC-01	PB-01 & PB-02	Foundation Soils	33.8	10.7	62.7	0.317	11.110	0.506	0.9	53.5	21	21	32.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.124	0.973
PC-01	PB-01 & PB-02	Foundation Soils	33.9	10.6	54.9	0.298	26.370	0.542	0.9	46.8	26	21	37.0	83.8	1.0	-0.7	0.1	0.9	0.119	1.013	0.119	0.124	0.955
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.6	48.1	0.398	25.350	0.827	0.9	40.9	38	21	42.1	83.0	1.0	-0.7	0.1	0.9	0.119	1.013	0.118	0.124	0.949
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.5	43.0	0.469	22.870	1.090	0.9	36.5	46	21	43.4	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.124	0.925
PC-01	PB-01 & PB-02	Foundation Soils	34.1	10.4	32.1	0.349	46.910	1.088	0.9	27.0	55	21	42.7	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.124	0.855
PC-01	PB-01 & PB-02	Foundation Soils	34.2	10.3	27.7	0.336	55.600	1.214	0.9	23.2	62	21	42.5	65.7	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.124	0.830
PC-01	PB-01 & PB-02	Foundation Soils	34.3	10.2	35.6	0.345	43.070	0.968	0.9	30.0	50	21	42.6	72.6	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.124	0.874
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	52.0	0.227	22.620	0.437	0.9	43.9	25	21	35.3	79.1	1.0	-0.7	0.1	0.9	0.115	1.012	0.114	0.124	0.919
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	66.6	0.126	4.240	0.189	0.9	55.4	6	21	1.1	56.5	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.124	0.774
PC-01	PB-01 & PB-02	Foundation Soils	34.5	10.0	71.8	0.047	11.340	0.065	0.9	59.8	0	21	0.0	59.8	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.124	0.793
PC-01	PB-01 & PB-02	Foundation Soils	34.6	9.9	76.0	0.079	15.660	0.104	0.9	63.3	0	21	0.0	63.3	1.0	-0.7	0.1	0.9	0.102	1.009	0.101	0.124	0.814
PC-01	PB-01 & PB-02	Foundation Soils	34.7	9.8	77.0	0.153	16.100	0.199	0.9	64.2	2	21	0.0	64.2	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.124	0.819
PC-01	PB-01 & PB-02	Foundation Soils	34.8	9.7	77.6	0.164	18.080	0.211	0.9	64.6	2	21	0.0	64.6	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.124	0.821
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.7	80.6	0.130	17.390	0.161	0.9	67.1	0	21	0.0	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.104	0.124	0.837
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.6	87.1	0.106	17.220	0.122	0.9	72.7	0	21	0.0	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.124	0.873
PC-01	PB-01 & PB-02	Foundation Soils	35.0	9.5	83.7	0.148	17.340	0.177	0.9	69.6	0	21	0.0	69.6	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.124	0.852
PC-01	PB-01 & PB-02	Foundation Soils	35.1	9.4	86.1	0.197	18.530	0.229	0.9	71.7	0	21	0.0	71.7	1.0	-0.7	0.1	0.9	0.109	1.010	0.108	0.124	0.865
PC-01	PB-01 & PB-02	Foundation Soils	35.2	9.3	81.8	0.245	18.200	0.300	0.9	67.8	5	21	0.4	68.2	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.124	0.843
PC-01	PB-01 & PB-02	Foundation Soils	35.3	9.2	76.2	0.183	19.830	0.240	0.9	62.9	4	21	0.1	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.124	0.811
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.2	73.6	0.210	23.350	0.285	0.9	60.8	8	21	4.2	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.124	0.822
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.1	67.1	0.120	23.390	0.179	0.9	55.0	6	21	0.7	55.7	1.0	-0.8	0.1	0.9	0.096	1.008	0.096	0.125	0.767
PC-01	PB-01 & PB-02	Foundation Soils	35.5	9.0	60.7	0.054	24.350	0.089	0.9	49.4	4	21	0.1	49.6	1.0	-0.8	0.1	0.9	0.092	1.008	0.091	0.125	0.732
PC-01	PB-01 & PB-02	Foundation Soils	35.6	8.9	56.3	0.052	24.860	0.092	0.9	45.7	7	21	2.8	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.125	0.727
PC-01	PB-01 & PB-02	Foundation Soils	35.7	8.8	59.4	0.050	22.770	0.084	0.9	48.2	5	21	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.125	0.726
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.8	70.0	0.045	20.300	0.064	0.9	57.1	0	21	0.0	57.1	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.125	0.775
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.7	78.1	0.030	18.910	0.038	0.9	64.1	0	21	0.0	64.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.125	0.815
PC-01	PB-01 & PB-02	Foundation Soils	35.9	8.6	84.6	0.034	22.370	0.040	0.9	69.6	0	21	0.0	69.6	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.125	0.850
PC-01	PB-01 & PB-02	Foundation Soils	36.0	8.5	87.3	0.063	25.730	0.072	0.9	71.8	0	21	0.0	71.8	1.0	-0.8	0.1	0.9	0.109	1.010	0.108	0.125	0.864
PC-01	PB-01 & PB-02	Foundation Soils	36.1	8.4	86.3	0.079	24.030	0.092	0.9	70.9	0	21	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.125	0.858
PC-01	PB-01 & PB-02	Foundation Soils	36.2	8.3	85.1	0.114	24.900	0.134	0.9	69.7	0	21	0.0	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.125	0.850
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.3	79.1	0.136	24.390	0.172	0.9	64.5	0	21	0.0	64.5	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.125	0.817
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.2	77.5	0.175	24.300	0.226	0.9	63.1	4	21	0.0	63.1	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.125	0.809
PC-01	PB-01 & PB-02	Foundation Soils	36.4	8.1	77.4	0.243	21.410	0.314	0.9	63.2	8	21	4.3	67.4	1.0	-0.8	0.1	0.9	0.105	1.010	0.104	0.125	0.835
PC-01	PB-01 & PB-02	Foundation Soils	36.5	8.0	78.3	0.134	21.060	0.171	0.9	63.7	0	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.125	0.812
PC-01	PB-01 & PB-02	Foundation Soils	36.6	7.9	78.2	0.080	26.060	0.102	0.9	63.5	0	21	0.0	63.5	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.125	0.811
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.9	78.6	0.076	17.220	0.097	0.9	63.7	0	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.125	0.812
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.8	79.9	0.056	18.460	0.070	0.9	64.8	0	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.125	0.818
PC-01	PB-01 & PB-02	Foundation Soils	36.8	7.7	80.4	0.063	16.250	0.078	0.9	65.1	0	21	0.0	65.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.125	0.820
PC-01	PB-01 & PB-02	Foundation Soils	36.9	7.6	76.6	0.081	19.770	0.106	0.9	61.8	0	21	0.0	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.125	0.800
PC-01	PB-01 & PB-02	Foundation Soils	37.0	7.5	73.9	0.054	24.010	0.073	0.9	59.5	0	21	0.0	59.5	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.125	0.786
PC-01	PB-01 & PB-02	Foundation Soils	37.1	7.4	78.0	0.061	23.440	0.078	0.9	62.9	0	21	0.0	62.9	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.125	0.806
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.4	89.4	0.159	23.200	0.178	0.9	72.6	0	21	0.0	72.6	1.0	-0.8	0.1	0.9	0.109	1.011	0.108	0.125	0.866

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.3	91.1	0.150	20.440	0.165	0.9	73.9	0	21	0.0	73.9	1.0	-0.8	0.1	0.9	0.110	1.011	0.109	0.125	0.875
PC-01	PB-01 & PB-02	Foundation Soils	37.3	7.2	94.8	0.176	23.850	0.186	0.9	77.0	0	21	0.0	77.0	1.0	-0.8	0.1	0.9	0.113	1.011	0.112	0.125	0.896
PC-01	PB-01 & PB-02	Foundation Soils	37.4	7.1	106.5	0.131	22.680	0.123	0.9	87.0	0	21	0.0	87.0	1.0	-0.8	0.1	0.9	0.123	1.014	0.121	0.125	0.970
PC-01	PB-01 & PB-02	Foundation Soils	37.5	7.0	113.8	0.184	23.060	0.162	0.9	93.3	0	21	0.0	93.3	1.0	-0.8	0.1	0.9	0.129	1.016	0.128	0.125	1.023
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	114.8	0.228	20.490	0.199	0.9	94.0	0	21	0.0	94.0	1.0	-0.8	0.1	0.9	0.130	1.016	0.128	0.125	1.030
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	109.5	0.201	17.480	0.184	0.9	89.4	0	21	0.0	89.4	1.0	-0.8	0.1	0.9	0.125	1.014	0.123	0.125	0.989
PC-01	PB-01 & PB-02	Foundation Soils	37.7	6.8	95.0	0.168	22.580	0.177	0.9	76.7	0	21	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.111	0.125	0.893
PC-01	PB-01 & PB-02	Foundation Soils	37.8	6.7	81.0	0.051	25.200	0.063	0.8	64.8	0	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.125	0.816
PC-01	PB-01 & PB-02	Foundation Soils	37.9	6.6	80.5	0.060	23.820	0.075	0.8	64.3	0	21	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.125	0.813
PC-01	PB-01 & PB-02	Foundation Soils	38.0	6.5	78.5	0.074	25.770	0.094	0.8	62.5	0	21	0.0	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.125	0.802
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.5	72.3	0.078	22.250	0.108	0.8	57.3	0	21	0.0	57.3	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.125	0.772
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.4	68.7	0.085	22.740	0.124	0.8	54.1	3	21	0.0	54.1	1.0	-0.8	0.1	0.9	0.095	1.008	0.094	0.125	0.754
PC-01	PB-01 & PB-02	Foundation Soils	38.2	6.3	67.3	0.059	20.450	0.088	0.8	52.9	2	21	0.0	52.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.093	0.125	0.747
PC-01	PB-01 & PB-02	Foundation Soils	38.3	6.2	66.1	0.046	22.280	0.070	0.8	51.9	2	21	0.0	51.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.125	0.741
PC-01	PB-01 & PB-02	Foundation Soils	38.4	6.1	62.3	0.047	28.210	0.075	0.8	48.6	4	21	0.1	48.7	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.125	0.723
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	58.5	0.031	22.290	0.053	0.8	45.6	6	21	1.2	46.8	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.125	0.713
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	54.9	0.010	24.060	0.018	0.8	43.4	14	21	18.5	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.125	0.798
PC-01	PB-01 & PB-02	Foundation Soils	38.6	5.9	55.4	0.010	23.440	0.018	0.8	43.7	14	21	18.1	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.125	0.797
PC-01	PB-01 & PB-02	Foundation Soils	38.7	5.8	56.3	0.038	27.780	0.068	0.8	43.7	8	21	3.5	47.2	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.125	0.715
PC-01	PB-01 & PB-02	Foundation Soils	38.8	5.7	59.2	0.063	22.760	0.107	0.8	46.0	7	21	3.1	49.1	1.0	-0.9	0.1	0.9	0.092	1.007	0.090	0.125	0.725
PC-01	PB-01 & PB-02	Foundation Soils	38.9	5.6	60.1	0.035	23.060	0.058	0.8	46.5	5	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.125	0.714
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.6	60.1	0.037	24.540	0.062	0.8	46.5	5	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.125	0.714
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.5	64.7	0.027	23.160	0.042	0.8	50.2	3	21	0.0	50.2	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.125	0.731
PC-01	PB-01 & PB-02	Foundation Soils	39.1	5.4	62.5	0.015	24.390	0.024	0.8	48.5	7	21	3.0	51.5	1.0	-0.9	0.1	0.9	0.093	1.008	0.092	0.125	0.738
PC-01	PB-01 & PB-02	Foundation Soils	39.2	5.3	64.8	0.015	25.350	0.023	0.8	50.2	6	21	1.6	51.8	1.0	-0.9	0.1	0.9	0.094	1.008	0.092	0.125	0.740
PC-01	PB-01 & PB-02	Foundation Soils	39.3	5.2	64.5	0.043	25.490	0.067	0.8	49.9	3	21	0.0	49.9	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.125	0.729
PC-01	PB-01 & PB-02	Foundation Soils	39.4	5.1	65.2	0.062	26.010	0.095	0.8	50.3	4	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.125	0.731
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.1	65.3	0.055	27.690	0.084	0.8	50.4	3	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.125	0.732
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.0	67.4	0.064	25.380	0.095	0.8	52.0	3	21	0.0	52.0	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.125	0.740
PC-01	PB-01 & PB-02	Foundation Soils	39.6	4.9	73.9	0.118	29.680	0.160	0.8	57.3	3	21	0.0	57.3	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.125	0.770
PC-01	PB-01 & PB-02	Foundation Soils	39.7	4.8	78.1	0.131	28.680	0.168	0.8	60.8	1	21	0.0	60.8	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.125	0.790
PC-01	PB-01 & PB-02	Foundation Soils	39.8	4.7	77.8	0.068	25.680	0.087	0.8	60.4	0	21	0.0	60.4	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.125	0.788
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.7	76.5	0.050	27.300	0.065	0.8	59.3	0	21	0.0	59.3	1.0	-0.9	0.1	0.8	0.099	1.009	0.097	0.125	0.781
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.6	78.8	0.077	27.400	0.098	0.8	61.1	0	21	0.0	61.1	1.0	-0.9	0.1	0.8	0.100	1.009	0.099	0.125	0.792
PC-01	PB-01 & PB-02	Foundation Soils	40.0	4.5	87.0	0.098	30.350	0.113	0.8	67.9	0	21	0.0	67.9	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.125	0.832
PC-01	PB-01 & PB-02	Foundation Soils	40.1	4.4	85.5	0.131	20.670	0.153	0.8	66.5	0	21	0.0	66.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.125	0.824
PC-01	PB-01 & PB-02	Foundation Soils	40.2	4.3	83.7	0.236	20.110	0.282	0.8	65.0	5	21	0.5	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.125	0.818
PC-01	PB-01 & PB-02	Foundation Soils	40.3	4.2	80.3	0.170	33.460	0.212	0.8	62.0	3	21	0.0	62.1	1.0	-0.9	0.1	0.8	0.101	1.009	0.099	0.125	0.797
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.2	81.1	0.152	27.820	0.187	0.8	62.7	1	21	0.0	62.7	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.125	0.801
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.1	88.4	0.131	28.780	0.148	0.8	68.6	0	21	0.0	68.6	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.125	0.837
PC-01	PB-01 & PB-02	Foundation Soils	40.5	4.0	89.7	0.134	18.820	0.149	0.8	69.6	0	21	0.0	69.6	1.0	-0.9	0.1	0.8	0.107	1.010	0.105	0.125	0.843
PC-01	PB-01 & PB-02	Foundation Soils	40.6	3.9	87.9	0.164	24.530	0.187	0.8	68.1	0	21	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.125	0.834
PC-01	PB-01 & PB-02	Foundation Soils	40.7	3.8	94.2	0.263	27.680	0.279	0.8	73.3	1	21	0.0	73.3	1.0	-0.9	0.1	0.8	0.110	1.011	0.108	0.125	0.866
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	84.9	0.211	21.760	0.248	0.8	65.5	3	21	0.0	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.125	0.817
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	83.5	0.245	23.300	0.294	0.8	64.3	6	21	1.2	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.124	0.818
PC-01	PB-01 & PB-02	Foundation Soils	40.9	3.6	81.9	0.243	26.230	0.297	0.8	63.1	7	21	2.3	65.3	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.124	0.816
PC-01	PB-01 & PB-02	Foundation Soils	41.0	3.5	81.2	0.233	24.010	0.287	0.8	62.4	7	21	2.1	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.124	0.811
PC-01	PB-01 & PB-02	Foundation Soils	41.1	3.4	83.8	0.156	25.150	0.186	0.8	64.3	1	21	0.0	64.3	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.124	0.810
PC-01	PB-01 & PB-02	Foundation Soils	41.2	3.3	95.6	0.124	24.540	0.130	0.8	74.0	0	21	0.0	74.0	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.124	0.870
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.3	106.6	0.146	20.320	0.137	0.8	83.1	0	21	0.0	83.1	1.0	-0.9	0.1	0.8	0.119	1.013	0.116	0.124	0.934
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.2	118.9	0.082	16.390	0.069	0.8	93.5	0	21	0.0	93.5	1.0	-0.9	0.1	0.8	0.129	1.016	0.127	0.124	1.018
PC-01	PB-01 & PB-02	Foundation Soils	41.4	3.1	111.7	0.071	20.770	0.064	0.8	87.3	0	21	0.0	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.120	0.124	0.966
PC-01	PB-01 & PB-02	Foundation Soils	41.5	3.0	96.1	0.086	31.400	0.090	0.8	74.1	0	21	0.0	74.1	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.124	0.871
PC-01	PB-01 & PB-02	Foundation Soils	41.6	2.9	87.2	0.094	30.460	0.108	0.8	66.7	0	21	0.0	66.7	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.124	0.824
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	84.5	0.129	30.250	0.153	0.8	64.4	0	21	0.0	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.124	0.810
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	83.5	0.203	29.160	0.243	0.8	63.5	4	21	0.0	63.5	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.124	0.805
PC-01	PB-01 & PB-02	Foundation Soils	41.8	2.7	76.1	0.158	34.160	0.208	0.8	57.4	5	21	0.5	57.9	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.124	0.772
PC-01	PB-01 & PB-02	Foundation Soils	41.9	2.6	73.6	0.101	33.670	0.137	0.8	55.3	3	21	0.0	55.3	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.124	0.758
PC-01	PB-01 & PB-02	Foundation Soils	42.0	2.5	73.3	0.118	25.490	0.161	0.8	55.0	4	21	0.1	55.1	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.124	0.756
PC-01	PB-01 & PB-02	Foundation Soils	42.1	2.4	72.1	0.121	18.070	0.168	0.8	54.0	5	21	0.3	54.4	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.124	0.752
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.4	69.5	0.105	24.970	0.151	0.8	51.9	5	21	0.6	52.4	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.124	0.742
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.3	67.3	0.113	23.350	0.168	0.8	50.2	7	21	3.2	53.4	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.124	0.747

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	42.3	2.2	65.4	0.087	15.060	0.133	0.8	48.6	7	21	1.7	50.3	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.124	0.730
PC-01	PB-01 & PB-02	Foundation Soils	42.4	2.1	63.4	0.119	17.770	0.188	0.8	47.5	10	21	10.4	58.0	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.124	0.773
PC-01	PB-01 & PB-02	Foundation Soils	42.5	2.0	61.7	0.115	21.200	0.186	0.8	46.3	11	21	12.7	59.0	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.124	0.778
PC-01	PB-01 & PB-02	Foundation Soils	42.6	1.9	63.2	0.085	20.250	0.135	0.8	46.8	8	21	4.1	50.9	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.124	0.733
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.9	69.4	0.069	28.870	0.099	0.8	51.4	3	21	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.124	0.736
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.8	82.5	0.059	-3.630	0.072	0.8	61.9	0	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.124	0.795
PC-01	PB-01 & PB-02	Foundation Soils	42.8	1.7	88.9	0.067	-12.150	0.075	0.8	67.0	0	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.124	0.826
PC-01	PB-01 & PB-02	Foundation Soils	42.9	1.6	88.9	0.071	12.670	0.080	0.8	67.0	0	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.124	0.826
PC-01	PB-01 & PB-02	Foundation Soils	43.0	1.5	82.7	0.054	24.110	0.065	0.8	61.9	0	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.124	0.795
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.5	81.0	0.071	26.040	0.088	0.8	60.4	0	21	0.0	60.4	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.124	0.787
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.4	80.2	0.080	26.350	0.100	0.8	59.7	0	21	0.0	59.7	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.124	0.782
PC-01	PB-01 & PB-02	Foundation Soils	43.2	1.3	84.2	0.083	22.110	0.099	0.8	62.9	0	21	0.0	62.9	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.124	0.801
PC-01	PB-01 & PB-02	Foundation Soils	43.3	1.2	94.9	0.159	22.540	0.168	0.8	71.5	0	21	0.0	71.5	1.0	-1.0	0.1	0.8	0.109	1.010	0.106	0.124	0.854
PC-01	PB-01 & PB-02	Foundation Soils	43.4	1.1	99.7	0.203	20.730	0.204	0.8	75.4	0	21	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.124	0.879
PC-01	PB-01 & PB-02	Foundation Soils	43.5	1.0	101.6	0.278	26.820	0.274	0.8	76.9	0	21	0.0	76.9	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.124	0.889
PC-01	PB-01 & PB-02	Foundation Soils	43.6	1.0	101.0	0.456	31.490	0.452	0.8	76.6	8	21	3.8	80.4	1.0	-1.0	0.1	0.8	0.116	1.012	0.113	0.124	0.913
PC-01	PB-01 & PB-02	Foundation Soils	43.6	0.9	98.3	0.358	25.660	0.364	0.8	74.0	5	21	0.3	74.3	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.124	0.872
PC-01	PB-01 & PB-02	Foundation Soils	43.7	0.8	96.5	0.378	29.880	0.392	0.8	72.6	7	21	2.1	74.7	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.124	0.874
PC-01	PB-01 & PB-02	Foundation Soils	43.8	0.7	87.7	0.456	25.630	0.520	0.8	67.0	14	21	21.9	88.9	1.0	-1.0	0.1	0.8	0.124	1.014	0.121	0.124	0.977
PC-01	PB-01 & PB-02	Foundation Soils	43.9	0.6	82.8	0.362	25.870	0.437	0.8	62.7	13	21	18.8	81.5	1.0	-1.0	0.1	0.8	0.117	1.012	0.114	0.124	0.921
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.6	84.2	0.267	24.500	0.317	0.8	62.6	8	21	4.3	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.102	0.124	0.825
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.5	101.8	0.295	23.200	0.290	0.8	76.5	1	21	0.0	76.5	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.124	0.886
PC-01	PB-01 & PB-02	Foundation Soils	44.1	0.4	114.7	0.382	21.390	0.333	0.8	87.1	0	21	0.0	87.1	1.0	-1.0	0.1	0.8	0.123	1.014	0.119	0.124	0.963
PC-01	PB-01 & PB-02	Foundation Soils	44.2	0.3	127.1	0.226	17.870	0.178	0.8	97.4	0	21	0.0	97.4	1.0	-1.0	0.1	0.8	0.134	1.017	0.130	0.124	1.052
PC-01	PB-01 & PB-02	Foundation Soils	44.3	0.2	143.1	0.109	14.800	0.076	0.8	110.9	0	21	0.0	110.9	1.0	-1.0	0.1	0.8	0.154	1.022	0.149	0.124	1.205
PC-01	PB-01 & PB-02	Foundation Soils	44.4	0.1	163.0	0.128	18.580	0.079	0.8	128.0	0	21	0.0	128.0	0.9	-1.0	0.1	0.8	0.192	1.031	0.187	0.124	1.506
PC-01	PB-01 & PB-02	Foundation Soils	44.5	0.1	181.4	0.133	1.410	0.073	0.8	144.1	0	21	0.0	144.1	0.9	-1.0	0.1	0.8	0.254	1.041	0.247	0.124	1.998
PC-01	PB-01 & PB-02	Foundation Soils	44.5	-0.0	166.9	0.088	17.580	0.053	0.8	131.2	0	21	0.0	131.2	0.9	-1.0	0.1	0.8	0.201	1.032	0.196	0.124	1.581
PC-01	PB-01 & PB-02	Foundation Soils	44.6	-0.1	120.8	0.130	26.960	0.108	0.8	91.7	0	21	0.0	91.7	1.0	-1.0	0.1	0.8	0.127	1.015	0.124	0.124	1.001
PC-01	PB-01 & PB-02	Foundation Soils	44.7	-0.2	105.8	0.152	23.390	0.144	0.8	79.2	0	21	0.0	79.2	1.0	-1.0	0.1	0.8	0.115	1.012	0.112	0.124	0.905
PC-01	PB-01 & PB-02	Foundation Soils	44.8	-0.3	93.1	0.114	16.600	0.122	0.8	68.8	0	21	0.0	68.8	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.124	0.837
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	88.5	0.092	-1.360	0.104	0.8	65.0	0	21	0.0	65.0	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.124	0.814
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	89.1	0.122	-6.630	0.137	0.8	65.4	0	21	0.0	65.4	1.0	-1.0	0.1	0.8	0.104	1.009	0.101	0.124	0.816
PC-01	PB-01 & PB-02	Foundation Soils	45.0	-0.5	88.8	0.112	-0.670	0.126	0.8	65.1	0	21	0.0	65.1	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.124	0.814
PC-01	PB-01 & PB-02	Foundation Soils	45.1	-0.6	86.3	0.153	9.030	0.177	0.8	63.1	0	21	0.0	63.1	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.124	0.802
PC-01	PB-01 & PB-02	Foundation Soils	45.2	-0.7	84.4	0.157	11.520	0.186	0.8	61.5	2	21	0.0	61.5	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.124	0.793
PC-01	PB-01 & PB-02	Foundation Soils	45.3	-0.8	86.1	0.155	13.050	0.180	0.8	62.8	1	21	0.0	62.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.124	0.801
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.8	86.1	0.168	21.250	0.195	0.8	62.7	2	21	0.0	62.7	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.124	0.800
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.9	78.0	0.203	28.460	0.260	0.8	56.7	8	21	4.9	61.6	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.124	0.794
PC-01	PB-01 & PB-02	Foundation Soils	45.5	-1.0	73.2	0.192	12.290	0.262	0.8	53.3	10	21	10.5	63.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.100	0.124	0.807
PC-01	PB-01 & PB-02	Foundation Soils	45.6	-1.1	66.7	0.178	20.080	0.267	0.8	48.8	14	21	18.9	67.6	1.0	-1.1	0.1	0.8	0.105	1.010	0.103	0.124	0.830
PC-01	PB-01 & PB-02	Foundation Soils	45.7	-1.2	59.8	0.238	15.910	0.398	0.8	44.2	23	21	33.4	77.6	1.0	-1.1	0.1	0.8	0.114	1.012	0.110	0.124	0.894
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	55.6	0.553	13.660	0.995	0.8	41.4	41	21	43.1	84.5	1.0	-1.1	0.1	0.8	0.120	1.013	0.117	0.124	0.943
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	49.1	2.187	18.150	4.452	0.8	36.5	85	21	46.6	83.2	1.0	-1.1	0.1	0.8	0.119	1.013	0.115	0.124	0.933
PC-01	PB-01 & PB-02	Foundation Soils	45.9	-1.4	51.8	3.372	14.250	6.507	0.8	38.6	92	21	47.4	86.0	1.0	-1.1	0.1	0.8	0.121	1.014	0.118	0.124	0.954
PC-01	PB-01 & PB-02	Foundation Soils	46.0	-1.5	78.8	3.907	16.420	4.957	0.8	60.2	75	21	51.4	111.7	0.9	-1.1	0.1	0.8	0.155	1.022	0.150	0.124	1.215
PC-01	PB-01 & PB-02	Foundation Soils	46.1	-1.6	137.9	4.454	22.440	3.229	0.8	110.1	44	21	57.9	168.0	0.9	-1.1	0.1	0.8	0.471	1.061	0.458	0.124	3.710
PC-01	PB-01 & PB-02	Foundation Soils	46.2	-1.7	257.6	2.926	69.300	1.136	0.9	211.0	2	21	0.0	211.0	0.9	-1.1	0.1	0.8	3.724	1.082	3.485	0.123	28.219
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.7	252.0	2.349	34.800	0.932	0.9	205.7	0	21	0.0	205.7	0.9	-1.1	0.1	0.8	2.650	1.082	2.503	0.123	20.274
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.8	188.8	1.966	-6.240	1.041	0.8	149.0	8	21	5.5	154.5	0.9	-1.1	0.1	0.8	0.321	1.049	0.312	0.123	2.525
PC-01	PB-01 & PB-02	Foundation Soils	46.4	-1.9	189.3	1.102	-17.800	0.582	0.8	148.6	0	21	0.0	148.6	0.9	-1.1	0.1	0.8	0.280	1.044	0.271	0.123	2.198
PC-01	PB-01 & PB-02	Foundation Soils	46.5	-2.0	145.8	0.768	-19.200	0.527	0.8	110.9	0	21	0.0	110.9	0.9	-1.1	0.1	0.8	0.153	1.022	0.149	0.123	1.204
PC-01	PB-01 & PB-02	Foundation Soils	46.6	-2.1	136.6	0.633	-18.770	0.463	0.8	103.0	0	21	0.0	103.0	1.0	-1.1	0.1	0.8	0.141	1.019	0.137	0.123	1.109
PC-01	PB-01 & PB-02	Foundation Soils	46.7	-2.2	125.6	0.497	-18.580	0.396	0.8	93.7	0	21	0.0	93.7	1.0	-1.1	0.1	0.8	0.130	1.016	0.126	0.123	1.018
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.2	108.3	0.426	-16.160	0.394	0.8	79.4	4	21	0.1	79.5	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.123	0.907
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.3	100.3	0.407	-1.630	0.406	0.8	73.2	7	21	2.5	75.8	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.123	0.882
PC-01	PB-01 & PB-02	Foundation Soils	46.9	-2.4	94.7	0.414	-6.710	0.437	0.8	69.3	10	21	10.0	79.3	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.123	0.906
PC-01	PB-01 & PB-02	Foundation Soils	47.0	-2.5	82.8	0.242	-14.340	0.292	0.8	59.4	8	21	5.0	64.4	1.0	-1.1	0.1	0.8	0.103	1.009	0.100	0.123	0.811
PC-01	PB-01 & PB-02	Foundation Soils	47.1	-2.6	74.6	0.288	-3.150	0.386	0.8	54.5	16	21	23.5	78.0	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.123	0.897
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.6	67.4	0.268	-15.940	0.398	0.8	49.2	19	21	29.6	78.9	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.123	0.903
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.7	51.6	0.175	-18.010	0.339	0.8	37.3	26	21	35.1	72.5	1.0	-1.1	0.1	0.8	0.109	1.011	0.106	0.123	0.860
PC-01	PB-01 & PB-02	Foundation Soils	47.3	-2.8	53.7	0.196	4.160	0.365	0.8	38.9	25	21	35.2	74.1	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.123	0.871

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	47.4	-2.9	44.7	0.199	6.720	0.446	0.8	32.2	34	21	39.2	71.4	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.123	0.854
PC-01	PB-01 & PB-02	Foundation Soils	47.5	-3.0	45.1	0.118	7.720	0.262	0.8	32.4	27	21	35.3	67.7	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.123	0.831
PC-01	PB-01 & PB-02	Foundation Soils	47.6	-3.1	48.2	0.240	19.150	0.498	0.8	34.8	34	21	39.4	74.2	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.123	0.872
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.1	45.7	0.431	22.490	0.943	0.8	33.1	46	21	42.6	75.7	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.123	0.882
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.2	45.7	0.483	25.970	1.058	0.8	33.1	48	21	43.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.123	0.884
PC-01	PB-01 & PB-02	Foundation Soils	47.8	-3.3	53.4	0.412	33.480	0.772	0.8	38.8	38	21	41.7	80.5	1.0	-1.1	0.1	0.8	0.116	1.012	0.113	0.123	0.915
PC-01	PB-01 & PB-02	Foundation Soils	47.9	-3.4	76.3	0.358	32.100	0.469	0.8	55.7	18	21	28.7	84.3	1.0	-1.1	0.1	0.8	0.120	1.013	0.116	0.123	0.942
PC-01	PB-01 & PB-02	Foundation Soils	48.0	-3.5	104.8	0.337	-9.430	0.322	0.8	75.6	2	21	0.0	75.6	1.0	-1.1	0.1	0.8	0.112	1.011	0.108	0.123	0.881
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.5	64.0	0.313	-0.570	0.489	0.8	46.5	24	21	35.4	81.9	1.0	-1.1	0.1	0.8	0.118	1.013	0.114	0.123	0.925
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.6	59.9	0.291	-0.730	0.486	0.8	43.4	26	21	36.7	80.1	1.0	-1.1	0.1	0.8	0.116	1.012	0.112	0.123	0.912
PC-01	PB-01 & PB-02	Foundation Soils	48.2	-3.7	52.5	0.382	7.340	0.728	0.8	38.0	37	21	41.4	79.4	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.123	0.907
PC-01	PB-01 & PB-02	Foundation Soils	48.3	-3.8	44.2	0.350	-0.330	0.791	0.8	31.7	44	21	42.0	73.7	1.0	-1.1	0.1	0.8	0.110	1.011	0.107	0.123	0.869
PC-01	PB-01 & PB-02	Foundation Soils	48.4	-3.9	38.4	0.338	14.770	0.879	0.8	27.4	50	21	42.2	69.6	1.0	-1.1	0.1	0.8	0.107	1.010	0.104	0.123	0.843
PC-01	PB-01 & PB-02	Foundation Soils	48.5	-4.0	36.1	0.089	-3.890	0.247	0.7	25.5	34	21	37.9	63.3	1.0	-1.1	0.1	0.8	0.102	1.009	0.099	0.123	0.805
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.0	52.2	0.156	-4.960	0.299	0.8	37.2	24	21	33.7	70.9	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.123	0.851
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.1	66.4	0.118	-5.060	0.178	0.7	46.3	10	21	10.1	56.4	1.0	-1.1	0.1	0.8	0.097	1.008	0.094	0.123	0.766
PC-01	PB-01 & PB-02	Foundation Soils	48.7	-4.2	94.5	0.081	11.120	0.086	0.8	66.9	0	21	0.0	66.9	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.123	0.827
PC-01	PB-01 & PB-02	Foundation Soils	48.8	-4.3	67.9	0.247	-3.050	0.364	0.8	48.6	18	21	27.9	76.6	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.123	0.888
PC-01	PB-01 & PB-02	Foundation Soils	48.9	-4.4	51.0	0.302	-5.150	0.592	0.8	36.5	35	21	40.2	76.8	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.123	0.890
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	46.0	0.188	3.410	0.409	0.8	32.7	33	21	38.5	71.2	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.123	0.853
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	43.5	0.173	9.220	0.397	0.8	30.8	34	21	38.8	69.6	1.0	-1.2	0.1	0.8	0.107	1.010	0.104	0.123	0.844
PC-01	PB-01 & PB-02	Foundation Soils	49.1	-4.6	50.5	0.130	11.560	0.258	0.7	35.7	24	21	33.0	68.7	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.123	0.838
PC-01	PB-01 & PB-02	Foundation Soils	49.2	-4.7	61.2	0.097	14.910	0.158	0.7	42.5	12	21	15.0	57.5	1.0	-1.2	0.1	0.8	0.098	1.008	0.095	0.123	0.772
PC-01	PB-01 & PB-02	Foundation Soils	49.3	-4.8	40.2	0.096	18.110	0.239	0.7	28.2	31	21	36.7	64.9	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.123	0.815
PC-01	PB-01 & PB-02	Foundation Soils	49.4	-4.9	27.8	0.272	29.060	0.979	0.7	19.4	74	21	42.4	61.8	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.123	0.797
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-4.9	21.7	0.152	29.830	0.700	0.7	15.0	78	21	41.7	56.7	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.123	0.768
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-5.0	18.6	0.084	33.990	0.451	0.7	12.8	78	21	41.2	54.0	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.123	0.753
PC-01	PB-01 & PB-02	Foundation Soils	49.6	-5.1	21.9	0.140	33.450	0.638	0.7	15.1	77	21	41.6	56.8	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.123	0.768
PC-01	PB-01 & PB-02	Foundation Soils	49.7	-5.2	43.4	0.330	35.490	0.760	0.7	30.7	44	21	41.8	72.5	1.0	-1.2	0.1	0.8	0.109	1.011	0.106	0.123	0.862
PC-01	PB-01 & PB-02	Foundation Soils	49.8	-5.3	66.5	0.527	40.450	0.792	0.8	48.1	32	21	41.1	89.2	1.0	-1.2	0.1	0.8	0.125	1.014	0.120	0.123	0.981
PC-01	PB-01 & PB-02	Foundation Soils	49.9	-5.4	80.5	0.664	22.790	0.825	0.8	58.8	27	21	39.9	98.6	0.9	-1.2	0.1	0.8	0.136	1.017	0.130	0.122	1.065
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.4	80.2	0.700	9.910	0.873	0.8	58.5	28	21	40.8	99.3	0.9	-1.2	0.1	0.8	0.136	1.018	0.131	0.122	1.072
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.5	84.9	0.388	-14.150	0.457	0.8	60.7	15	21	22.8	83.5	1.0	-1.2	0.1	0.8	0.119	1.013	0.115	0.122	0.938
PC-01	PB-01 & PB-02	Foundation Soils	50.1	-5.6	90.0	0.269	-18.580	0.299	0.7	62.6	7	21	2.1	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.122	0.815
PC-01	PB-01 & PB-02	Foundation Soils	50.2	-5.7	94.6	0.207	-19.400	0.219	0.7	65.9	1	21	0.0	65.9	1.0	-1.2	0.1	0.8	0.104	1.009	0.101	0.122	0.822
PC-01	PB-01 & PB-02	Foundation Soils	50.3	-5.8	83.3	0.435	-23.200	0.522	0.8	59.8	18	21	28.6	88.5	0.9	-1.2	0.1	0.8	0.124	1.014	0.119	0.122	0.976
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.8	74.8	0.638	-21.960	0.853	0.8	54.2	30	21	41.1	95.3	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.122	1.034
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.9	70.2	0.595	-20.060	0.848	0.8	50.6	32	21	41.5	92.1	0.9	-1.2	0.1	0.8	0.128	1.015	0.123	0.122	1.006
PC-01	PB-01 & PB-02	Foundation Soils	50.5	-6.0	58.3	0.517	-14.980	0.887	0.8	41.6	38	21	42.4	84.0	1.0	-1.2	0.1	0.8	0.120	1.013	0.115	0.122	0.941
PC-01	PB-01 & PB-02	Foundation Soils	50.6	-6.1	57.2	0.280	-11.240	0.490	0.7	40.4	29	21	37.8	78.2	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.122	0.900
PC-01	PB-01 & PB-02	Foundation Soils	50.7	-6.2	56.9	0.161	-9.350	0.283	0.7	39.7	21	21	31.0	70.7	1.0	-1.2	0.1	0.8	0.108	1.010	0.104	0.122	0.852
PC-01	PB-01 & PB-02	Foundation Soils	50.8	-6.3	58.5	0.207	-6.620	0.354	0.7	41.1	23	21	33.4	74.5	1.0	-1.2	0.1	0.8	0.111	1.011	0.107	0.122	0.876
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.3	60.3	0.261	0.630	0.433	0.7	42.5	25	21	35.5	78.0	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.122	0.899
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.4	64.4	0.193	-1.190	0.300	0.7	44.9	18	21	26.9	71.8	1.0	-1.2	0.1	0.8	0.109	1.010	0.105	0.122	0.859
PC-01	PB-01 & PB-02	Foundation Soils	51.0	-6.5	63.5	0.128	-11.920	0.202	0.7	43.6	14	21	18.7	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.122	0.801
PC-01	PB-01 & PB-02	Foundation Soils	51.1	-6.6	42.3	0.151	-17.720	0.357	0.7	29.3	34	21	38.5	67.8	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.122	0.834
PC-01	PB-01 & PB-02	Foundation Soils	51.2	-6.7	35.5	0.203	-14.680	0.572	0.7	24.5	47	21	40.9	65.4	1.0	-1.2	0.1	0.8	0.104	1.009	0.100	0.122	0.820
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.7	32.4	0.252	-2.290	0.779	0.7	22.2	55	21	41.6	63.8	1.0	-1.2	0.1	0.8	0.102	1.009	0.099	0.122	0.811
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.8	29.1	0.148	12.150	0.509	0.7	19.9	51	21	40.7	60.6	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.122	0.792
PC-01	PB-01 & PB-02	Foundation Soils	51.4	-6.9	28.1	0.152	25.060	0.540	0.7	19.2	53	21	40.8	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.096	0.122	0.789
PC-01	PB-01 & PB-02	Foundation Soils	51.5	-7.0	30.9	0.242	30.770	0.784	0.7	21.1	56	21	41.6	62.7	1.0	-1.2	0.1	0.8	0.102	1.009	0.098	0.122	0.804
PC-01	PB-01 & PB-02	Foundation Soils	51.6	-7.1	40.4	0.226	31.260	0.559	0.7	27.9	42	21	40.7	68.6	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.122	0.840
PC-01	PB-01 & PB-02	Foundation Soils	51.7	-7.2	48.8	0.362	17.370	0.741	0.7	34.1	41	21	41.7	75.7	1.0	-1.2	0.1	0.8	0.112	1.011	0.108	0.122	0.885
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.2	62.4	0.289	9.960	0.463	0.7	43.7	25	21	35.8	79.6	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.122	0.911
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.3	72.5	0.112	-3.700	0.155	0.7	48.4	7	21	2.6	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.090	0.122	0.739
PC-01	PB-01 & PB-02	Foundation Soils	51.9	-7.4	60.2	0.088	3.190	0.146	0.7	40.6	13	21	16.6	57.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.122	0.773
PC-01	PB-01 & PB-02	Foundation Soils	52.0	-7.5	57.3	0.330	19.240	0.576	0.7	40.0	32	21	39.4	79.4	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.122	0.910
PC-01	PB-01 & PB-02	Foundation Soils	52.1	-7.6	63.2	0.251	19.250	0.397	0.7	44.0	23	21	33.3	77.3	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.122	0.896
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	70.4	0.260	30.170	0.370	0.7	48.9	18	21	27.9	76.8	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.122	0.893
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	77.3	0.610	28.190	0.789	0.8	55.0	28	21	40.0	95.0	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.122	1.033
PC-01	PB-01 & PB-02	Foundation Soils	52.3	-7.8	95.0	0.893	23.390	0.940	0.8	68.8	26	21	40.2	109.0	0.9	-1.2	0.1	0.8	0.150	1.021	0.144	0.122	1.182
PC-01	PB-01 & PB-02	Foundation Soils	52.4	-7.9	85.1	0.607	4.340	0.713	0.8	60.7	23	21	36.6	97.3	0.9	-1.2	0.1	0.8	0.134	1.017	0.128	0.122	1.055

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	52.5	-8.0	70.3	0.302	14.090	0.430	0.7	49.0	21	21	31.5	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.122	0.918
PC-01	PB-01 & PB-02	Foundation Soils	52.6	-8.1	60.0	0.290	-11.580	0.484	0.7	41.7	27	21	37.2	78.9	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.122	0.907
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.1	68.9	0.311	-1.020	0.451	0.7	48.0	22	21	33.1	81.2	0.9	-1.3	0.1	0.8	0.117	1.012	0.112	0.122	0.923
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.2	71.7	0.266	-7.620	0.371	0.7	49.6	18	21	27.3	76.9	1.0	-1.3	0.1	0.8	0.113	1.011	0.109	0.122	0.894
PC-01	PB-01 & PB-02	Foundation Soils	52.8	-8.3	80.3	0.336	-11.190	0.419	0.7	55.8	16	21	24.7	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.121	0.919
PC-01	PB-01 & PB-02	Foundation Soils	52.9	-8.4	91.9	0.293	2.950	0.319	0.7	62.4	8	21	3.9	66.3	1.0	-1.3	0.1	0.8	0.104	1.010	0.100	0.121	0.827
PC-01	PB-01 & PB-02	Foundation Soils	53.0	-8.5	116.1	0.315	-1.000	0.271	0.7	80.5	0	21	0.0	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.121	0.919
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	140.4	0.234	-0.910	0.167	0.8	100.0	0	21	0.0	100.0	0.9	-1.3	0.1	0.8	0.137	1.018	0.131	0.121	1.082
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	124.7	0.110	-17.610	0.088	0.7	87.2	0	21	0.0	87.2	0.9	-1.3	0.1	0.8	0.123	1.014	0.118	0.121	0.969
PC-01	PB-01 & PB-02	Foundation Soils	53.2	-8.7	93.1	0.105	-21.680	0.113	0.7	62.6	0	21	0.0	62.6	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.121	0.806
PC-01	PB-01 & PB-02	Foundation Soils	53.3	-8.8	88.5	0.173	-22.340	0.195	0.7	59.1	3	21	0.0	59.1	1.0	-1.3	0.1	0.8	0.099	1.009	0.095	0.121	0.786
PC-01	PB-01 & PB-02	Foundation Soils	53.4	-8.9	84.9	0.201	-19.560	0.237	0.7	56.6	7	21	1.8	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.121	0.782
PC-01	PB-01 & PB-02	Foundation Soils	53.5	-9.0	71.5	0.141	-17.940	0.197	0.7	47.5	10	21	9.9	57.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.121	0.777
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.0	60.3	0.480	-14.770	0.796	0.7	41.8	36	21	41.7	83.5	0.9	-1.3	0.1	0.8	0.119	1.013	0.114	0.121	0.942
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.1	61.9	0.223	-10.860	0.360	0.7	42.3	22	21	32.8	75.1	0.9	-1.3	0.1	0.8	0.111	1.011	0.107	0.121	0.884
PC-01	PB-01 & PB-02	Foundation Soils	53.7	-9.2	70.8	0.098	-10.480	0.138	0.7	46.2	8	21	3.5	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.089	0.121	0.735
PC-01	PB-01 & PB-02	Foundation Soils	53.8	-9.3	71.1	0.122	-12.480	0.172	0.7	46.8	9	21	7.2	54.0	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.121	0.758
PC-01	PB-01 & PB-02	Foundation Soils	53.9	-9.4	55.1	0.094	-9.010	0.171	0.7	36.8	18	21	25.9	62.8	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.121	0.808
PC-01	PB-01 & PB-02	Foundation Soils	54.0	-9.5	41.5	0.067	-10.800	0.162	0.7	27.7	27	21	34.6	62.3	1.0	-1.3	0.1	0.8	0.101	1.009	0.097	0.121	0.805
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.5	32.0	0.050	-7.000	0.156	0.7	21.2	36	21	37.7	58.9	1.0	-1.3	0.1	0.8	0.099	1.008	0.095	0.121	0.786
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.6	28.6	0.077	-2.190	0.269	0.7	18.9	45	21	39.5	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.121	0.783
PC-01	PB-01 & PB-02	Foundation Soils	54.2	-9.7	20.7	0.153	13.050	0.738	0.7	13.6	84	21	41.6	55.2	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.121	0.765
PC-01	PB-01 & PB-02	Foundation Soils	54.3	-9.8	20.5	0.320	24.960	1.564	0.7	13.4	97	21	41.8	55.3	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.121	0.766
PC-01	PB-01 & PB-02	Foundation Soils	54.4	-9.9	24.6	0.331	34.880	1.347	0.7	16.2	87	21	42.2	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.121	0.784
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-9.9	39.2	0.253	37.070	0.646	0.7	26.3	46	21	41.3	67.5	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.121	0.837
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-10.0	63.3	0.236	34.190	0.373	0.7	43.0	22	21	32.8	75.9	0.9	-1.3	0.1	0.8	0.112	1.011	0.108	0.121	0.890
PC-01	PB-01 & PB-02	Foundation Soils	54.6	-10.1	87.3	0.251	25.700	0.287	0.7	58.1	8	21	5.3	63.4	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.121	0.813
PC-01	PB-01 & PB-02	Foundation Soils	54.7	-10.2	56.2	0.172	14.340	0.306	0.7	37.9	24	21	33.4	71.2	0.9	-1.3	0.1	0.8	0.108	1.010	0.104	0.121	0.860
PC-01	PB-01 & PB-02	Foundation Soils	54.8	-10.3	45.1	0.124	17.100	0.275	0.7	30.1	30	21	36.6	66.7	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.121	0.833
PC-01	PB-01 & PB-02	Foundation Soils	54.9	-10.4	28.9	0.031	20.620	0.107	0.7	18.9	37	21	37.7	56.6	1.0	-1.3	0.1	0.8	0.097	1.008	0.093	0.121	0.774
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.4	22.5	0.061	23.440	0.271	0.7	14.7	53	21	39.9	54.5	1.0	-1.3	0.1	0.8	0.096	1.008	0.092	0.121	0.763
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.5	17.5	0.218	34.540	1.247	0.7	11.3	100	21	41.4	52.8	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.121	0.753
PC-01	PB-01 & PB-02	Foundation Soils	55.1	-10.6	16.9	0.157	37.590	0.930	0.7	10.9	97	21	41.3	52.2	1.0	-1.3	0.1	0.8	0.094	1.008	0.090	0.121	0.750
PC-01	PB-01 & PB-02	Foundation Soils	55.2	-10.7	19.2	0.068	39.830	0.355	0.7	12.4	78	21	41.1	53.5	1.0	-1.3	0.1	0.8	0.095	1.008	0.091	0.121	0.757
PC-01	PB-01 & PB-02	Foundation Soils	55.3	-10.8	24.2	0.181	41.310	0.749	0.7	15.8	79	21	41.8	57.6	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.121	0.780
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.8	51.2	0.241	39.160	0.471	0.7	34.4	33	21	39.0	73.4	0.9	-1.3	0.1	0.8	0.110	1.011	0.105	0.121	0.875
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.9	49.7	0.203	36.260	0.409	0.7	33.3	32	21	38.3	71.5	0.9	-1.3	0.1	0.8	0.109	1.010	0.104	0.121	0.863
PC-01	PB-01 & PB-02	Foundation Soils	55.5	-11.0	45.8	0.719	25.010	1.571	0.7	30.8	58	21	43.8	74.6	0.9	-1.3	0.1	0.8	0.111	1.011	0.106	0.121	0.883
PC-01	PB-01 & PB-02	Foundation Soils	55.6	-11.1	47.0	0.685	31.870	1.458	0.7	31.6	56	21	43.7	75.4	0.9	-1.3	0.1	0.8	0.112	1.011	0.107	0.120	0.888
PC-01	PB-01 & PB-02	Foundation Soils	55.7	-11.2	51.9	0.702	37.090	1.352	0.7	35.2	51	21	43.9	79.1	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.120	0.913
PC-01	PB-01 & PB-02	Foundation Soils	55.8	-11.3	96.1	0.996	40.550	1.036	0.7	67.9	28	21	42.2	110.1	0.9	-1.3	0.1	0.8	0.152	1.022	0.145	0.120	1.201
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.3	214.9	0.990	40.590	0.461	0.8	160.2	0	21	0.0	160.2	0.9	-1.3	0.1	0.8	0.374	1.054	0.352	0.120	2.924
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.4	258.4	0.789	34.690	0.305	0.8	199.3	0	21	0.0	199.3	0.8	-1.3	0.1	0.8	1.819	1.082	1.655	0.120	13.752
PC-01	PB-01 & PB-02	Foundation Soils	56.0	-11.5	209.6	0.636	-10.490	0.303	0.8	155.5	0	21	0.0	155.5	0.9	-1.4	0.1	0.8	0.329	1.050	0.310	0.120	2.580
PC-01	PB-01 & PB-02	Foundation Soils	56.1	-11.6	164.3	0.553	-6.810	0.337	0.8	116.8	0	21	0.0	116.8	0.9	-1.4	0.1	0.8	0.164	1.025	0.156	0.120	1.297
PC-01	PB-01 & PB-02	Foundation Soils	56.2	-11.7	129.5	0.438	14.960	0.338	0.7	88.6	0	21	0.0	88.6	0.9	-1.4	0.1	0.8	0.124	1.014	0.118	0.120	0.985
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	65.0	0.470	-0.300	0.723	0.7	44.2	33	21	40.7	84.9	0.9	-1.4	0.1	0.8	0.120	1.013	0.115	0.120	0.956
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	57.0	0.132	-0.170	0.232	0.7	37.6	20	21	29.6	67.2	0.9	-1.4	0.1	0.8	0.105	1.010	0.101	0.120	0.838
PC-01	PB-01 & PB-02	Foundation Soils	56.4	-11.9	49.1	0.237	-4.720	0.483	0.7	32.6	35	21	39.5	72.1	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.120	0.868
PC-01	PB-01 & PB-02	Foundation Soils	56.5	-12.0	40.3	0.103	20.870	0.256	0.7	26.4	33	21	37.6	64.0	1.0	-1.4	0.2	0.8	0.103	1.009	0.098	0.120	0.819
PC-01	PB-01 & PB-02	Foundation Soils	56.6	-12.1	39.4	0.150	25.390	0.381	0.7	25.8	39	21	39.5	65.3	0.9	-1.4	0.2	0.8	0.104	1.009	0.099	0.120	0.827
PC-01	PB-01 & PB-02	Foundation Soils	56.7	-12.2	44.8	0.393	36.940	0.878	0.7	29.7	48	21	42.2	71.9	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.120	0.868
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.2	62.2	0.389	34.490	0.626	0.7	41.9	32	21	39.8	81.6	0.9	-1.4	0.2	0.8	0.117	1.012	0.112	0.120	0.933
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.3	75.0	0.451	43.690	0.602	0.7	51.0	25	21	36.9	87.9	0.9	-1.4	0.2	0.8	0.123	1.014	0.118	0.120	0.980
PC-01	PB-01 & PB-02	Foundation Soils	56.9	-12.4	78.5	0.147	38.780	0.187	0.7	50.1	8	21	3.4	53.5	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.120	0.760
PC-01	PB-01 & PB-02	Foundation Soils	57.0	-12.5	74.3	0.106	37.870	0.143	0.7	47.0	7	21	2.5	49.4	1.0	-1.4	0.2	0.8	0.092	1.008	0.088	0.120	0.738
PC-01	PB-01 & PB-02	Foundation Soils	57.1	-12.6	84.4	0.147	41.070	0.174	0.7	53.8	4	21	0.1	54.0	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.120	0.763
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	98.4	0.209	38.100	0.212	0.7	64.0	1	21	0.0	64.0	0.9	-1.4	0.2	0.8	0.103	1.009	0.098	0.120	0.820
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	90.8	0.809	42.640	0.891	0.7	62.9	27	21	40.4	103.3	0.9	-1.4	0.2	0.8	0.142	1.019	0.135	0.120	1.123
PC-01	PB-01 & PB-02	Foundation Soils	57.3	-12.8	83.5	0.655	31.330	0.785	0.7	57.3	27	21	39.4	96.7	0.9	-1.4	0.2	0.8	0.133	1.017	0.127	0.120	1.057
PC-01	PB-01 & PB-02	Foundation Soils	57.4	-12.9	88.9	0.504	36.120	0.567	0.7	60.5	19	21	30.8	91.2	0.9	-1.4	0.2	0.8	0.127	1.015	0.121	0.120	1.008
PC-01	PB-01 & PB-02	Foundation Soils	57.5	-13.0	100.6	0.381	33.640	0.379	0.7	66.3	9	21	5.9	72.2	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.120	0.871

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	57.6	-13.1	162.8	0.242	37.350	0.149	0.7	114.2	0	21	0.0	114.2	0.9	-1.4	0.2	0.8	0.159	1.023	0.151	0.120	1.260
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.1	146.1	0.151	12.390	0.103	0.7	100.5	0	21	0.0	100.5	0.9	-1.4	0.2	0.8	0.138	1.018	0.131	0.120	1.094
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.2	117.6	0.228	9.390	0.194	0.7	78.2	0	21	0.0	78.2	0.9	-1.4	0.2	0.8	0.114	1.012	0.109	0.120	0.911
PC-01	PB-01 & PB-02	Foundation Soils	57.8	-13.3	96.9	0.244	22.070	0.252	0.7	62.5	4	21	0.1	62.6	0.9	-1.4	0.2	0.8	0.101	1.009	0.097	0.120	0.813
PC-01	PB-01 & PB-02	Foundation Soils	57.9	-13.4	102.7	0.366	25.490	0.356	0.7	67.1	7	21	2.6	69.8	0.9	-1.4	0.2	0.8	0.107	1.010	0.102	0.120	0.857
PC-01	PB-01 & PB-02	Foundation Soils	58.0	-13.5	103.7	0.437	33.070	0.421	0.7	68.6	9	21	8.2	76.8	0.9	-1.4	0.2	0.8	0.113	1.011	0.108	0.119	0.902
PC-01	PB-01 & PB-02	Foundation Soils	58.1	-13.6	101.1	0.572	20.540	0.566	0.7	68.6	15	21	24.2	92.8	0.9	-1.4	0.2	0.8	0.129	1.015	0.122	0.119	1.023
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.6	96.7	0.788	22.770	0.815	0.7	66.7	23	21	37.7	104.4	0.9	-1.4	0.2	0.8	0.143	1.019	0.136	0.119	1.137
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.7	82.9	1.156	17.820	1.394	0.7	57.0	39	21	45.7	102.7	0.9	-1.4	0.2	0.8	0.141	1.019	0.134	0.119	1.118
PC-01	PB-01 & PB-02	Foundation Soils	58.3	-13.8	82.1	2.773	28.300	3.379	0.7	56.6	60	21	49.6	106.2	0.9	-1.4	0.2	0.8	0.146	1.020	0.138	0.119	1.158
PC-01	PB-01 & PB-02	Foundation Soils	58.4	-13.9	91.2	1.602	33.110	1.757	0.7	63.3	42	21	47.8	111.1	0.9	-1.4	0.2	0.8	0.154	1.022	0.145	0.119	1.219
PC-01	PB-01 & PB-02	Foundation Soils	58.5	-14.0	83.1	1.846	49.790	2.221	0.7	57.2	50	21	48.3	105.5	0.9	-1.4	0.2	0.8	0.145	1.020	0.137	0.119	1.150
PC-01	PB-01 & PB-02	Foundation Soils	58.6	-14.0	129.6	3.065	33.350	2.365	0.8	93.8	40	21	53.3	147.2	0.9	-1.4	0.2	0.8	0.271	1.043	0.254	0.119	2.130
PC-02	PB-02 & PB-03	Foundation Soils	14.0	30.1	7.1	0.076	33.550	1.067	1.2	7.8	95	21	40.6	48.4	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.088	1.063
PC-02	PB-02 & PB-03	Foundation Soils	14.1	30.1	7.5	0.075	35.070	0.994	1.2	8.3	92	21	40.6	48.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.088	1.064
PC-02	PB-02 & PB-03	Foundation Soils	14.2	30.0	7.7	0.073	37.340	0.953	1.2	8.4	91	21	40.6	49.0	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.088	1.062
PC-02	PB-02 & PB-03	Foundation Soils	14.3	29.9	7.7	0.089	38.160	1.156	1.2	8.4	94	21	40.7	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.089	1.059
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.8	9.2	0.080	46.120	0.869	1.2	10.0	83	21	40.7	50.7	1.0	-0.2	0.0	1.0	0.093	1.008	0.095	0.089	1.070
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.7	10.8	0.101	43.070	0.931	1.1	11.8	79	21	40.9	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.089	1.084
PC-02	PB-02 & PB-03	Foundation Soils	14.5	29.6	12.1	0.116	24.590	0.962	1.1	13.0	75	21	41.1	54.2	1.0	-0.2	0.0	1.0	0.095	1.008	0.098	0.089	1.093
PC-02	PB-02 & PB-03	Foundation Soils	14.6	29.6	12.1	0.091	23.540	0.754	1.1	13.0	72	21	40.9	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.097	0.089	1.089
PC-02	PB-02 & PB-03	Foundation Soils	14.7	29.5	10.6	0.082	14.530	0.773	1.1	11.5	77	21	40.8	52.3	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.090	1.071
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.4	7.9	0.080	7.530	1.014	1.1	8.5	92	21	40.6	49.2	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.090	1.043
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.3	6.7	0.084	10.830	1.252	1.1	7.2	100	21	40.5	47.8	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.090	1.029
PC-02	PB-02 & PB-03	Foundation Soils	14.9	29.2	5.9	0.089	14.340	1.496	1.1	6.4	100	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.090	1.018
PC-02	PB-02 & PB-03	Foundation Soils	15.0	29.2	5.8	0.098	16.940	1.682	1.1	6.3	100	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.091	1.014
PC-02	PB-02 & PB-03	Foundation Soils	15.1	29.1	5.5	0.088	19.770	1.608	1.1	5.9	100	21	40.2	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.091	0.091	1.007
PC-02	PB-02 & PB-03	Foundation Soils	15.2	29.0	5.3	0.085	19.180	1.610	1.1	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.091	1.003
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.9	5.2	0.085	19.680	1.627	1.1	5.6	100	21	40.2	45.8	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.091	0.999
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.8	5.1	0.085	20.750	1.651	1.1	5.5	100	21	40.1	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.091	0.996
PC-02	PB-02 & PB-03	Foundation Soils	15.4	28.7	5.0	0.081	21.870	1.605	1.1	5.4	100	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.092	0.992
PC-02	PB-02 & PB-03	Foundation Soils	15.5	28.7	5.0	0.077	23.040	1.545	1.1	5.3	100	21	40.1	45.4	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.092	0.989
PC-02	PB-02 & PB-03	Foundation Soils	15.6	28.6	4.8	0.077	22.680	1.607	1.1	5.1	100	21	40.1	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.092	0.985
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.5	4.7	0.075	23.120	1.605	1.1	5.0	100	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.092	0.981
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.4	4.5	0.068	23.200	1.496	1.1	4.8	100	21	40.0	44.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.093	0.977
PC-02	PB-02 & PB-03	Foundation Soils	15.8	28.3	4.6	0.064	24.540	1.387	1.1	4.9	100	21	40.0	44.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.093	0.976
PC-02	PB-02 & PB-03	Foundation Soils	15.9	28.3	4.8	0.064	25.060	1.332	1.1	5.1	100	21	40.0	45.1	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.093	0.975
PC-02	PB-02 & PB-03	Foundation Soils	16.0	28.2	4.9	0.069	25.950	1.408	1.1	5.2	100	21	40.1	45.3	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.093	0.974
PC-02	PB-02 & PB-03	Foundation Soils	16.1	28.1	5.2	0.073	28.780	1.399	1.1	5.5	100	21	40.1	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.093	0.974
PC-02	PB-02 & PB-03	Foundation Soils	16.2	28.0	5.5	0.064	29.400	1.169	1.1	5.8	100	21	40.2	46.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.094	0.975
PC-02	PB-02 & PB-03	Foundation Soils	16.2	27.9	6.1	0.071	26.710	1.165	1.1	6.4	100	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.094	0.978
PC-02	PB-02 & PB-03	Foundation Soils	16.3	27.8	6.7	0.075	28.500	1.125	1.1	7.0	100	21	40.5	47.5	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.094	0.982
PC-02	PB-02 & PB-03	Foundation Soils	16.4	27.8	6.9	0.083	28.250	1.197	1.1	7.3	100	21	40.5	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.094	0.982
PC-02	PB-02 & PB-03	Foundation Soils	16.5	27.7	8.6	0.068	15.530	0.793	1.1	9.0	87	21	40.6	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.094	0.994
PC-02	PB-02 & PB-03	Foundation Soils	16.6	27.6	7.8	0.046	15.380	0.587	1.1	8.2	86	21	40.4	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.095	0.984
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.5	7.2	0.041	16.010	0.571	1.1	7.5	90	21	40.4	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.095	0.976
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.4	6.5	0.044	19.960	0.677	1.1	6.8	96	21	40.3	47.1	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.095	0.968
PC-02	PB-02 & PB-03	Foundation Soils	16.8	27.4	6.1	0.052	28.770	0.846	1.1	6.4	100	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.095	0.963
PC-02	PB-02 & PB-03	Foundation Soils	16.9	27.3	5.9	0.046	31.640	0.775	1.1	6.2	100	21	40.3	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.095	0.959
PC-02	PB-02 & PB-03	Foundation Soils	17.0	27.2	5.9	0.044	32.490	0.749	1.1	6.1	100	21	40.3	46.4	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.096	0.956
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.1	5.8	0.049	35.130	0.851	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.096	0.953
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.0	5.8	0.048	34.540	0.834	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.096	0.951
PC-02	PB-02 & PB-03	Foundation Soils	17.2	26.9	5.5	0.045	34.970	0.817	1.1	5.7	100	21	40.2	45.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.096	0.946
PC-02	PB-02 & PB-03	Foundation Soils	17.3	26.9	5.2	0.045	40.740	0.871	1.1	5.3	100	21	40.1	45.4	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.096	0.941
PC-02	PB-02 & PB-03	Foundation Soils	17.4	26.8	4.8	0.047	41.690	0.977	1.1	5.0	100	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.096	0.936
PC-02	PB-02 & PB-03	Foundation Soils	17.5	26.7	5.5	0.049	48.220	0.897	1.1	5.6	100	21	40.2	45.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.097	0.940
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.6	6.4	0.043	46.120	0.671	1.1	6.6	97	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.097	0.946
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.5	6.4	0.042	40.740	0.653	1.1	6.6	97	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.097	0.944
PC-02	PB-02 & PB-03	Foundation Soils	17.7	26.4	5.8	0.047	35.650	0.804	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.097	0.937
PC-02	PB-02 & PB-03	Foundation Soils	17.8	26.4	5.3	0.071	35.640	1.349	1.1	5.4	100	21	40.1	45.5	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.097	0.930
PC-02	PB-02 & PB-03	Foundation Soils	17.9	26.3	5.7	0.092	35.550	1.622	1.1	5.8	100	21	40.2	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.098	0.932
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.2	8.5	0.094	39.500	1.101	1.1	8.7	94	21	40.7	49.4	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.098	0.955

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.1	13.4	0.068	37.190	0.509	1.1	13.6	65	21	40.7	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.098	0.990
PC-02	PB-02 & PB-03	Foundation Soils	18.1	26.0	19.1	0.107	33.690	0.561	1.1	19.3	55	21	41.0	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.098	1.036
PC-02	PB-02 & PB-03	Foundation Soils	18.2	26.0	24.0	0.135	23.670	0.562	1.1	24.3	48	21	41.1	65.3	1.0	-0.3	0.0	0.9	0.104	1.009	0.106	0.098	1.074
PC-02	PB-02 & PB-03	Foundation Soils	18.3	25.9	29.1	0.184	10.290	0.633	1.1	29.2	44	21	41.3	70.6	1.0	-0.3	0.0	0.9	0.108	1.010	0.110	0.098	1.116
PC-02	PB-02 & PB-03	Foundation Soils	18.4	25.8	42.5	0.235	10.120	0.553	1.1	42.6	29	21	38.7	81.3	1.0	-0.3	0.0	0.9	0.117	1.012	0.120	0.099	1.213
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.7	65.2	0.319	10.010	0.489	1.1	65.1	14	21	21.7	86.8	1.0	-0.3	0.0	0.9	0.122	1.014	0.125	0.099	1.268
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.6	79.1	0.411	9.590	0.519	1.1	78.9	10	21	9.0	87.9	1.0	-0.3	0.0	0.9	0.123	1.014	0.126	0.099	1.278
PC-02	PB-02 & PB-03	Foundation Soils	18.6	25.5	91.4	0.485	7.150	0.530	1.1	91.0	6	21	0.9	91.8	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.099	1.320
PC-02	PB-02 & PB-03	Foundation Soils	18.7	25.5	94.0	0.563	5.600	0.599	1.1	93.3	7	21	3.2	96.5	1.0	-0.3	0.0	0.9	0.133	1.017	0.136	0.099	1.375
PC-02	PB-02 & PB-03	Foundation Soils	18.8	25.4	95.3	0.633	5.670	0.664	1.0	94.4	9	21	7.4	101.8	1.0	-0.3	0.0	0.9	0.140	1.018	0.144	0.099	1.446
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.3	94.0	0.651	6.180	0.692	1.0	92.9	10	21	11.2	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.147	0.100	1.479
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.2	91.9	0.653	6.620	0.711	1.0	90.6	11	21	15.0	105.7	1.0	-0.3	0.0	0.9	0.145	1.020	0.150	0.100	1.500
PC-02	PB-02 & PB-03	Foundation Soils	19.0	25.1	88.7	0.653	6.910	0.736	1.0	87.4	13	21	20.2	107.5	1.0	-0.3	0.0	0.9	0.148	1.021	0.153	0.100	1.528
PC-02	PB-02 & PB-03	Foundation Soils	19.1	25.1	85.8	0.643	7.340	0.750	1.0	84.4	14	21	23.7	108.1	1.0	-0.3	0.0	0.9	0.149	1.021	0.153	0.100	1.534
PC-02	PB-02 & PB-03	Foundation Soils	19.2	25.0	84.4	0.614	7.230	0.727	1.0	83.0	14	21	23.3	106.2	1.0	-0.3	0.0	0.9	0.146	1.020	0.150	0.100	1.501
PC-02	PB-02 & PB-03	Foundation Soils	19.3	24.9	81.8	0.594	6.770	0.726	1.0	80.3	15	21	25.3	105.6	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.100	1.488
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.8	80.5	0.586	6.670	0.728	1.0	78.9	16	21	26.5	105.4	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.100	1.483
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.7	75.5	0.563	5.960	0.746	1.0	73.9	18	21	30.9	104.8	1.0	-0.3	0.0	0.9	0.144	1.020	0.148	0.101	1.470
PC-02	PB-02 & PB-03	Foundation Soils	19.5	24.6	69.9	0.498	6.370	0.713	1.0	68.4	20	21	32.6	101.0	1.0	-0.3	0.0	0.9	0.139	1.018	0.142	0.101	1.411
PC-02	PB-02 & PB-03	Foundation Soils	19.6	24.6	66.6	0.491	6.240	0.737	1.0	65.1	22	21	35.2	100.3	1.0	-0.3	0.0	0.9	0.138	1.018	0.141	0.101	1.399
PC-02	PB-02 & PB-03	Foundation Soils	19.7	24.5	65.7	0.464	6.380	0.706	1.0	64.2	21	21	34.5	98.7	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.101	1.375
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.4	65.3	0.438	4.680	0.671	1.0	63.7	20	21	33.4	97.2	1.0	-0.3	0.0	0.9	0.134	1.017	0.137	0.101	1.352
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.3	65.3	0.424	4.000	0.649	1.0	63.6	20	21	32.6	96.2	1.0	-0.3	0.0	0.9	0.133	1.016	0.136	0.101	1.338
PC-02	PB-02 & PB-03	Foundation Soils	19.9	24.2	61.5	0.419	5.040	0.681	1.0	59.8	23	21	35.7	95.5	1.0	-0.3	0.0	0.9	0.132	1.016	0.135	0.102	1.328
PC-02	PB-02 & PB-03	Foundation Soils	20.0	24.2	53.2	0.432	4.050	0.811	1.0	51.8	30	21	40.8	92.6	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.102	1.290
PC-02	PB-02 & PB-03	Foundation Soils	20.1	24.1	44.3	0.464	4.040	1.047	1.0	43.1	41	21	43.4	86.5	1.0	-0.4	0.0	0.9	0.122	1.014	0.124	0.102	1.221
PC-02	PB-02 & PB-03	Foundation Soils	20.2	24.0	39.9	0.530	4.340	1.327	1.0	38.8	48	21	44.2	83.0	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.102	1.184
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.9	31.6	0.595	5.540	1.885	1.0	30.6	62	21	44.2	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.102	1.107
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.8	23.9	0.646	6.530	2.705	1.0	23.2	79	21	43.5	66.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.102	1.037
PC-02	PB-02 & PB-03	Foundation Soils	20.4	23.7	17.0	0.587	4.380	3.458	1.0	16.5	95	21	42.5	59.0	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.102	0.976
PC-02	PB-02 & PB-03	Foundation Soils	20.5	23.7	11.9	0.491	7.340	4.124	1.0	11.6	100	21	41.5	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.103	0.932
PC-02	PB-02 & PB-03	Foundation Soils	20.6	23.6	10.3	0.457	18.910	4.416	1.0	10.0	100	21	41.2	51.2	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.103	0.917
PC-02	PB-02 & PB-03	Foundation Soils	20.7	23.5	17.3	0.457	22.250	2.645	1.0	16.7	89	21	42.4	59.1	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.103	0.973
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.4	26.6	0.417	22.250	1.569	1.0	25.6	64	21	43.2	68.8	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.103	1.047
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.3	25.0	0.315	3.000	1.260	1.0	24.1	61	21	42.7	66.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.103	1.028
PC-02	PB-02 & PB-03	Foundation Soils	20.9	23.2	18.4	0.279	-9.410	1.520	1.0	17.7	76	21	42.2	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.103	0.974
PC-02	PB-02 & PB-03	Foundation Soils	21.0	23.2	27.4	0.268	-2.760	0.978	1.0	26.3	54	21	42.4	68.7	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.103	1.041
PC-02	PB-02 & PB-03	Foundation Soils	21.1	23.1	33.8	0.288	-0.180	0.851	1.0	32.5	45	21	42.3	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.103	1.089
PC-02	PB-02 & PB-03	Foundation Soils	21.2	23.0	16.9	0.351	0.510	2.075	1.0	16.2	85	21	42.2	58.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.104	0.959
PC-02	PB-02 & PB-03	Foundation Soils	21.2	22.9	11.4	0.315	-2.100	2.757	1.0	11.0	100	21	41.4	52.3	1.0	-0.4	0.0	0.9	0.094	1.008	0.095	0.104	0.914
PC-02	PB-02 & PB-03	Foundation Soils	21.3	22.8	8.8	0.256	-0.140	2.909	1.0	8.4	100	21	40.8	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.104	0.891
PC-02	PB-02 & PB-03	Foundation Soils	21.4	22.8	7.4	0.225	3.480	3.061	1.0	7.0	100	21	40.5	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.091	0.104	0.878
PC-02	PB-02 & PB-03	Foundation Soils	21.5	22.7	5.9	0.166	12.070	2.816	1.0	5.6	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.104	0.865
PC-02	PB-02 & PB-03	Foundation Soils	21.6	22.6	5.9	0.123	43.880	2.069	1.0	5.7	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.104	0.864
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.5	6.7	0.050	67.180	0.743	1.0	6.4	100	21	40.3	46.8	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.104	0.869
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.4	10.5	0.035	69.200	0.334	1.0	10.0	75	21	40.4	50.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.105	0.893
PC-02	PB-02 & PB-03	Foundation Soils	21.8	22.3	10.8	0.033	59.370	0.305	1.0	10.3	73	21	40.4	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.105	0.894
PC-02	PB-02 & PB-03	Foundation Soils	21.9	22.3	8.5	0.032	40.400	0.378	1.0	8.0	85	21	40.3	48.4	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.105	0.877
PC-02	PB-02 & PB-03	Foundation Soils	22.0	22.2	6.5	0.037	54.700	0.573	1.0	6.1	100	21	40.3	46.4	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.105	0.862
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.1	6.1	0.059	63.480	0.974	1.0	5.7	100	21	40.2	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.105	0.858
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.0	5.2	0.047	73.330	0.897	1.0	5.0	100	21	40.0	45.0	1.0	-0.4	0.0	0.9	0.089	1.007	0.089	0.105	0.850
PC-02	PB-02 & PB-03	Foundation Soils	22.2	21.9	5.5	0.053	77.660	0.959	1.0	5.2	100	21	40.1	45.3	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.105	0.851
PC-02	PB-02 & PB-03	Foundation Soils	22.3	21.9	6.3	0.037	82.430	0.586	1.0	6.0	100	21	40.2	46.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.105	0.856
PC-02	PB-02 & PB-03	Foundation Soils	22.4	21.8	12.1	0.025	77.760	0.207	1.0	11.4	61	21	39.9	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.106	0.890
PC-02	PB-02 & PB-03	Foundation Soils	22.5	21.7	25.3	0.020	65.940	0.079	1.0	23.8	31	21	35.9	59.7	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.106	0.947
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.6	31.7	0.022	38.970	0.069	1.0	29.8	22	21	30.9	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.106	0.954
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.5	28.7	0.042	21.140	0.146	1.0	26.9	29	21	35.7	62.6	1.0	-0.4	0.0	0.9	0.101	1.009	0.102	0.106	0.966
PC-02	PB-02 & PB-03	Foundation Soils	22.7	21.4	25.9	0.088	20.390	0.340	1.0	24.2	41	21	39.7	63.9	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.106	0.975
PC-02	PB-02 & PB-03	Foundation Soils	22.8	21.4	22.6	0.091	24.010	0.403	1.0	21.1	47	21	40.4	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.106	0.956
PC-02	PB-02 & PB-03	Foundation Soils	22.9	21.3	22.0	0.119	26.540	0.542	1.0	20.5	52	21	41.0	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.106	0.955
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.2	24.0	0.103	22.930	0.430	1.0	22.4	46	21	40.5	62.8	1.0	-0.4	0.0	0.9	0.102	1.009	0.102	0.106	0.963
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.1	28.7	0.065	5.620	0.227	1.0	26.7	33	21	37.6	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.104	0.106	0.973

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-02	PB-02 & PB-03	Foundation Soils	23.1	21.0	33.0	0.075	7.100	0.227	1.0	30.7	28	21	35.8	66.5	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.107	0.988
PC-02	PB-02 & PB-03	Foundation Soils	23.2	21.0	51.7	0.087	8.900	0.168	1.0	48.0	10	21	10.1	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.107	0.926
PC-02	PB-02 & PB-03	Foundation Soils	23.3	20.9	70.9	0.105	10.150	0.148	1.0	65.9	0	21	0.0	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.107	0.981
PC-02	PB-02 & PB-03	Foundation Soils	23.4	20.8	81.0	0.142	9.430	0.175	1.0	75.2	0	21	0.0	75.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.113	0.107	1.053
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.7	86.9	0.145	8.380	0.167	1.0	80.5	0	21	0.0	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.117	0.107	1.097
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.6	89.5	0.161	12.650	0.180	1.0	82.9	0	21	0.0	82.9	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.107	1.117
PC-02	PB-02 & PB-03	Foundation Soils	23.6	20.5	87.6	0.169	10.050	0.193	1.0	81.1	0	21	0.0	81.1	1.0	-0.4	0.0	0.9	0.117	1.012	0.118	0.107	1.099
PC-02	PB-02 & PB-03	Foundation Soils	23.7	20.5	81.3	0.195	13.820	0.240	1.0	75.0	0	21	0.0	75.0	1.0	-0.4	0.0	0.9	0.111	1.011	0.112	0.107	1.047
PC-02	PB-02 & PB-03	Foundation Soils	23.8	20.4	78.6	0.170	14.390	0.216	1.0	72.5	0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.110	0.107	1.025
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.3	86.1	0.186	17.260	0.216	1.0	79.3	0	21	0.0	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.116	0.107	1.080
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.2	103.6	0.142	8.670	0.137	1.0	95.5	0	21	0.0	95.5	1.0	-0.4	0.1	0.9	0.132	1.016	0.133	0.108	1.238
PC-02	PB-02 & PB-03	Foundation Soils	24.0	20.1	117.4	0.118	5.380	0.101	1.0	108.2	0	21	0.0	108.2	1.0	-0.4	0.1	0.9	0.149	1.021	0.151	0.108	1.406
PC-02	PB-02 & PB-03	Foundation Soils	24.1	20.1	127.1	0.156	-3.420	0.123	1.0	117.2	0	21	0.0	117.2	1.0	-0.4	0.1	0.9	0.165	1.025	0.168	0.108	1.562
PC-02	PB-02 & PB-03	Foundation Soils	24.2	20.0	135.1	0.189	-3.760	0.140	1.0	124.5	0	21	0.0	124.5	1.0	-0.5	0.1	0.9	0.182	1.029	0.186	0.108	1.723
PC-02	PB-02 & PB-03	Foundation Soils	24.3	19.9	146.4	0.192	-3.760	0.131	1.0	135.0	0	21	0.0	135.0	1.0	-0.5	0.1	0.9	0.214	1.035	0.220	0.108	2.036
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.8	163.4	0.182	-3.650	0.111	1.0	150.7	0	21	0.0	150.7	1.0	-0.5	0.1	0.9	0.293	1.046	0.304	0.108	2.810
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.7	174.4	0.140	-4.190	0.080	1.0	160.8	0	21	0.0	160.8	1.0	-0.5	0.1	0.9	0.379	1.055	0.396	0.108	3.661
PC-02	PB-02 & PB-03	Foundation Soils	24.5	19.6	176.6	0.133	-5.670	0.075	1.0	162.7	0	21	0.0	162.7	1.0	-0.5	0.1	0.9	0.401	1.056	0.419	0.108	3.871
PC-02	PB-02 & PB-03	Foundation Soils	24.6	19.6	173.1	0.150	-6.720	0.087	1.0	159.3	0	21	0.0	159.3	1.0	-0.5	0.1	0.9	0.365	1.053	0.380	0.108	3.505
PC-02	PB-02 & PB-03	Foundation Soils	24.7	19.5	168.6	0.191	-7.250	0.113	1.0	155.0	0	21	0.0	155.0	1.0	-0.5	0.1	0.9	0.325	1.049	0.337	0.108	3.111
PC-02	PB-02 & PB-03	Foundation Soils	24.8	19.4	159.7	0.195	-7.770	0.122	1.0	146.5	0	21	0.0	146.5	1.0	-0.5	0.1	0.9	0.267	1.043	0.275	0.109	2.538
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.3	155.2	0.216	-7.290	0.139	1.0	142.2	0	21	0.0	142.2	1.0	-0.5	0.1	0.9	0.244	1.040	0.251	0.109	2.315
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.2	147.9	0.246	-7.480	0.166	1.0	135.2	0	21	0.0	135.2	1.0	-0.5	0.1	0.9	0.215	1.035	0.220	0.109	2.027
PC-03	PB-03 & PB-04	Foundation Soils	10.0	34.4	49.2	0.414	-7.290	0.842	1.3	61.4	26	25	41.6	103.0	1.1	-0.1	0.0	1.0	0.141	1.019	0.153	0.089	1.718
PC-03	PB-03 & PB-04	Foundation Soils	10.1	34.3	53.0	0.470	-1.810	0.886	1.3	65.8	25	25	41.2	107.0	1.1	-0.1	0.0	1.0	0.147	1.020	0.160	0.089	1.787
PC-03	PB-03 & PB-04	Foundation Soils	10.2	34.2	56.9	0.502	1.290	0.882	1.3	70.3	22	25	39.5	109.8	1.1	-0.1	0.0	1.0	0.152	1.022	0.165	0.090	1.837
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	59.9	0.563	1.480	0.941	1.3	73.4	22	25	40.0	113.4	1.1	-0.1	0.0	1.0	0.158	1.023	0.172	0.090	1.912
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	60.6	0.637	1.950	1.052	1.3	73.9	25	25	42.6	116.5	1.1	-0.1	0.0	1.0	0.164	1.025	0.179	0.090	1.982
PC-03	PB-03 & PB-04	Foundation Soils	10.4	34.0	61.7	0.674	3.830	1.092	1.3	75.0	25	25	43.2	118.2	1.1	-0.1	0.0	1.0	0.167	1.025	0.183	0.091	2.019
PC-03	PB-03 & PB-04	Foundation Soils	10.5	33.9	62.2	0.701	5.430	1.127	1.3	75.4	25	25	43.8	119.2	1.1	-0.1	0.0	1.0	0.170	1.026	0.186	0.091	2.038
PC-03	PB-03 & PB-04	Foundation Soils	10.6	33.8	61.7	0.712	6.340	1.153	1.3	74.7	26	25	44.5	119.2	1.1	-0.1	0.0	1.0	0.169	1.026	0.185	0.091	2.028
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	63.3	0.748	9.100	1.181	1.3	76.4	26	25	44.7	121.0	1.1	-0.1	0.0	1.0	0.174	1.027	0.190	0.092	2.072
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	67.0	0.779	9.300	1.162	1.3	80.4	24	25	43.4	123.8	1.1	-0.2	0.0	1.0	0.180	1.028	0.198	0.092	2.150
PC-03	PB-03 & PB-04	Foundation Soils	10.8	33.6	71.6	0.803	8.340	1.122	1.3	85.5	22	25	40.9	126.4	1.1	-0.2	0.0	1.0	0.187	1.030	0.206	0.092	2.227
PC-03	PB-03 & PB-04	Foundation Soils	10.9	33.5	75.9	0.828	8.340	1.091	1.3	90.3	20	25	38.1	128.4	1.1	-0.2	0.0	1.0	0.193	1.031	0.212	0.093	2.289
PC-03	PB-03 & PB-04	Foundation Soils	11.0	33.4	83.0	0.881	8.100	1.061	1.3	98.4	17	25	32.7	131.1	1.1	-0.2	0.0	1.0	0.201	1.032	0.222	0.093	2.386
PC-03	PB-03 & PB-04	Foundation Soils	11.1	33.3	93.4	0.956	7.880	1.024	1.3	110.3	13	25	22.5	132.8	1.1	-0.2	0.0	1.0	0.206	1.033	0.229	0.093	2.446
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	99.1	1.103	7.910	1.113	1.2	116.0	13	25	24.5	140.5	1.1	-0.2	0.0	1.0	0.237	1.038	0.264	0.094	2.820
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	108.2	1.240	8.290	1.147	1.2	125.8	12	25	19.9	145.7	1.1	-0.2	0.0	1.0	0.263	1.042	0.295	0.094	3.141
PC-03	PB-03 & PB-04	Foundation Soils	11.3	33.1	118.6	1.255	7.990	1.058	1.2	138.1	8	25	5.1	143.2	1.1	-0.2	0.0	1.0	0.249	1.040	0.279	0.094	2.959
PC-03	PB-03 & PB-04	Foundation Soils	11.4	33.0	125.9	1.457	7.720	1.157	1.2	145.2	8	25	7.6	152.7	1.1	-0.2	0.0	1.0	0.308	1.048	0.349	0.095	3.687
PC-03	PB-03 & PB-04	Foundation Soils	11.5	32.9	142.4	1.616	8.770	1.134	1.2	162.6	5	25	0.4	163.0	1.1	-0.2	0.0	1.0	0.405	1.057	0.466	0.095	4.910
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	173.4	1.945	10.040	1.122	1.2	193.4	0	25	0.0	193.4	1.1	-0.2	0.0	1.0	1.325	1.082	1.577	0.095	16.557
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	184.6	2.062	3.480	1.117	1.2	204.2	0	25	0.0	204.2	1.1	-0.2	0.0	1.0	2.413	1.082	2.871	0.096	30.052
PC-03	PB-03 & PB-04	Foundation Soils	11.7	32.7	183.8	2.072	0.380	1.128	1.2	203.1	0	25	0.0	203.1	1.1	-0.2	0.0	1.0	2.263	1.082	2.692	0.096	28.090
PC-03	PB-03 & PB-04	Foundation Soils	11.8	32.6	181.5	2.026	0.670	1.116	1.2	200.7	0	25	0.0	200.7	1.1	-0.2	0.0	1.0	1.967	1.082	2.340	0.096	24.347
PC-03	PB-03 & PB-04	Foundation Soils	11.9	32.5	173.1	1.917	-4.170	1.107	1.2	192.2	0	25	0.0	192.2	1.1	-0.2	0.0	1.0	1.253	1.082	1.491	0.096	15.462
PC-03	PB-03 & PB-04	Foundation Soils	12.0	32.4	181.8	1.886	-17.440	1.037	1.2	200.5	0	25	0.0	200.5	1.1	-0.2	0.0	1.0	1.947	1.082	2.316	0.097	23.957
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	190.6	1.745	-16.720	0.916	1.2	208.9	0	25	0.0	208.9	1.1	-0.2	0.0	1.0	3.238	1.082	3.852	0.097	39.728
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	193.5	1.473	-16.390	0.761	1.2	211.5	0	25	0.0	211.5	1.1	-0.2	0.0	1.0	3.854	1.082	4.585	0.097	47.153
PC-03	PB-03 & PB-04	Foundation Soils	12.2	32.2	191.7	1.540	-16.600	0.803	1.2	209.6	0	25	0.0	209.6	1.1	-0.2	0.0	1.0	3.383	1.082	4.025	0.098	41.268
PC-03	PB-03 & PB-04	Foundation Soils	12.3	32.1	187.3	1.574	-13.340	0.840	1.2	205.0	0	25	0.0	205.0	1.1	-0.2	0.0	1.0	2.536	1.082	3.017	0.098	30.851
PC-03	PB-03 & PB-04	Foundation Soils	12.4	32.0	177.9	1.643	-10.040	0.924	1.2	195.6	0	25	0.0	195.6	1.1	-0.2	0.0	1.0	1.486	1.082	1.768	0.098	18.028
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.9	168.3	1.784	-7.290	1.060	1.2	186.0	0	25	0.0	186.0	1.1	-0.2	0.0	1.0	0.934	1.081	1.111	0.098	11.294
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.8	161.5	1.843	-3.270	1.141	1.2	179.0	3	25	0.0	179.0	1.1	-0.2	0.0	1.0	0.697	1.073	0.818	0.099	8.295
PC-03	PB-03 & PB-04	Foundation Soils	12.6	31.8	152.0	1.832	1.330	1.205	1.2	169.2	5	25	1.0	170.2	1.1	-0.2	0.0	1.0	0.507	1.064	0.585	0.099	5.917
PC-03	PB-03 & PB-04	Foundation Soils	12.7	31.7	145.9	1.811	3.580	1.241	1.2	162.6	7	25	4.5	167.0	1.1	-0.2	0.0	1.0	0.457	1.060	0.525	0.099	5.296
PC-03	PB-03 & PB-04	Foundation Soils	12.8	31.6	138.7	1.713	6.240	1.235	1.2	154.8	8	25	8.0	162.8	1.1	-0.2	0.0	1.0	0.402	1.056	0.458	0.099	4.604
PC-03	PB-03 & PB-04	Foundation Soils	12.9	31.5	139.3	1.298	6.580	0.932	1.2	155.9	1	25	0.0	155.9	1.1	-0.2	0.0	1.0	0.332	1.050	0.375	0.100	3.760
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	137.3	1.293	5.810	0.942	1.2	153.6	2	25	0.0	153.6	1.1	-0.2	0.0	1.0	0.315	1.048	0.353	0.100	3.536
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	126.8	1.281	5.170	1.010	1.2	142.7	6	25	1.3	144.0	1.1	-0.2	0.0	1.0	0.254	1.041	0.281	0.100	2.807
PC-03	PB-03 & PB-04	Foundation Soils	13.1	31.3	120.2	1.272	4.670	1.059	1.2	135.2	8	25	7.4	142.6	1.1	-0.2	0.0	1.0	0.246	1.040	0.272	0.100	2.714

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	13.2	31.2	106.0	1.239	-4.000	1.169	1.2	118.7	14	25	27.0	145.8	1.1	-0.2	0.0	1.0	0.263	1.042	0.292	0.101	2.899
PC-03	PB-03 & PB-04	Foundation Soils	13.3	31.1	104.9	1.261	-4.900	1.202	1.2	117.3	15	25	29.9	147.2	1.1	-0.2	0.0	1.0	0.271	1.043	0.301	0.101	2.986
PC-03	PB-03 & PB-04	Foundation Soils	13.4	31.0	103.6	1.263	-1.330	1.220	1.2	115.6	16	25	31.9	147.5	1.1	-0.2	0.0	1.0	0.273	1.043	0.303	0.101	2.995
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	100.5	1.245	5.360	1.238	1.2	112.1	17	25	34.7	146.8	1.1	-0.2	0.0	1.0	0.269	1.043	0.298	0.101	2.938
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	97.0	1.212	5.520	1.249	1.2	108.1	18	25	37.0	145.1	1.1	-0.2	0.0	1.0	0.260	1.042	0.287	0.102	2.826
PC-03	PB-03 & PB-04	Foundation Soils	13.6	30.8	93.9	1.191	5.100	1.268	1.2	104.6	19	25	39.2	143.8	1.1	-0.2	0.0	1.0	0.253	1.041	0.279	0.102	2.738
PC-03	PB-03 & PB-04	Foundation Soils	13.7	30.7	90.9	1.158	4.290	1.275	1.2	101.2	20	25	40.7	141.9	1.1	-0.2	0.0	1.0	0.243	1.039	0.267	0.102	2.620
PC-03	PB-03 & PB-04	Foundation Soils	13.8	30.6	83.7	1.043	4.840	1.246	1.2	93.5	22	25	42.3	135.8	1.1	-0.2	0.0	1.0	0.217	1.035	0.237	0.102	2.319
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	79.2	0.991	6.680	1.252	1.2	88.5	23	25	43.8	132.2	1.1	-0.2	0.0	1.0	0.205	1.033	0.223	0.103	2.172
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	76.6	0.934	6.770	1.219	1.2	85.6	24	25	43.7	129.4	1.1	-0.2	0.0	1.0	0.195	1.031	0.212	0.103	2.063
PC-03	PB-03 & PB-04	Foundation Soils	14.0	30.4	74.4	0.912	7.000	1.225	1.2	83.2	25	25	44.4	127.6	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.103	2.000
PC-03	PB-03 & PB-04	Foundation Soils	14.1	30.3	72.7	0.889	7.450	1.223	1.2	81.2	25	25	44.8	126.0	1.0	-0.2	0.0	1.0	0.186	1.029	0.201	0.103	1.945
PC-03	PB-03 & PB-04	Foundation Soils	14.2	30.2	71.4	0.876	7.720	1.227	1.2	79.7	26	25	45.1	124.8	1.0	-0.2	0.0	1.0	0.183	1.029	0.197	0.103	1.907
PC-03	PB-03 & PB-04	Foundation Soils	14.3	30.1	69.7	0.860	7.860	1.234	1.2	77.8	27	25	45.6	123.4	1.0	-0.2	0.0	1.0	0.179	1.028	0.193	0.104	1.861
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	68.8	0.846	7.960	1.230	1.2	76.7	27	25	45.7	122.4	1.0	-0.2	0.0	1.0	0.177	1.027	0.190	0.104	1.830
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	67.4	0.839	7.960	1.245	1.2	75.1	28	25	46.2	121.3	1.0	-0.2	0.0	1.0	0.174	1.027	0.187	0.104	1.796
PC-03	PB-03 & PB-04	Foundation Soils	14.5	29.9	65.8	0.844	8.240	1.282	1.2	73.3	29	25	46.9	120.2	1.0	-0.2	0.0	1.0	0.172	1.026	0.184	0.104	1.765
PC-03	PB-03 & PB-04	Foundation Soils	14.6	29.8	64.4	0.844	8.530	1.310	1.2	71.7	30	25	47.4	119.1	1.0	-0.2	0.0	1.0	0.169	1.026	0.181	0.105	1.734
PC-03	PB-03 & PB-04	Foundation Soils	14.7	29.7	62.1	0.839	8.580	1.352	1.2	69.1	32	25	48.0	117.0	1.0	-0.2	0.0	1.0	0.165	1.025	0.176	0.105	1.684
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	58.2	0.824	8.810	1.417	1.2	64.8	35	25	48.6	113.4	1.0	-0.2	0.0	1.0	0.158	1.023	0.168	0.105	1.604
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	55.4	0.794	8.720	1.434	1.2	61.7	37	25	48.7	110.4	1.0	-0.2	0.0	1.0	0.153	1.022	0.162	0.105	1.544
PC-03	PB-03 & PB-04	Foundation Soils	14.9	29.5	53.1	0.761	8.720	1.433	1.2	59.2	38	25	48.7	107.9	1.0	-0.2	0.0	1.0	0.149	1.021	0.158	0.105	1.495
PC-03	PB-03 & PB-04	Foundation Soils	15.0	29.4	51.8	0.674	8.580	1.301	1.2	57.8	36	25	47.8	105.6	1.0	-0.2	0.0	1.0	0.145	1.020	0.154	0.106	1.455
PC-03	PB-03 & PB-04	Foundation Soils	15.1	29.3	51.5	0.612	8.270	1.187	1.2	57.4	35	25	47.0	104.4	1.0	-0.2	0.0	1.0	0.143	1.019	0.152	0.106	1.433
PC-03	PB-03 & PB-04	Foundation Soils	15.2	29.2	51.9	0.570	8.200	1.099	1.2	57.7	33	25	46.2	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.106	1.422
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	51.7	0.586	7.640	1.134	1.2	57.4	34	25	46.5	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.106	1.419
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	49.1	0.637	7.000	1.299	1.2	54.5	38	25	47.8	102.3	1.0	-0.2	0.0	1.0	0.140	1.019	0.148	0.106	1.392
PC-03	PB-03 & PB-04	Foundation Soils	15.4	29.0	42.9	0.710	6.540	1.655	1.2	47.8	47	25	48.8	96.6	1.0	-0.2	0.0	1.0	0.133	1.017	0.140	0.107	1.312
PC-03	PB-03 & PB-04	Foundation Soils	15.5	28.9	32.0	0.756	7.770	2.364	1.2	35.9	63	25	48.3	84.2	1.0	-0.2	0.0	1.0	0.120	1.013	0.125	0.107	1.170
PC-03	PB-03 & PB-04	Foundation Soils	15.6	28.8	21.3	0.793	10.330	3.722	1.2	24.2	82	25	46.6	70.8	1.0	-0.2	0.0	1.0	0.108	1.010	0.112	0.107	1.047
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.7	15.4	0.708	10.580	4.608	1.2	17.5	96	25	45.5	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.107	0.983
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.6	11.6	0.512	12.140	4.396	1.2	13.3	100	25	44.6	57.9	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.107	0.942
PC-03	PB-03 & PB-04	Foundation Soils	15.8	28.6	10.8	0.354	13.100	3.280	1.2	12.3	100	25	44.3	56.7	1.0	-0.3	0.0	1.0	0.097	1.008	0.100	0.108	0.931
PC-03	PB-03 & PB-04	Foundation Soils	15.9	28.5	11.3	0.268	20.120	2.368	1.2	12.9	92	25	44.3	57.2	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.108	0.933
PC-03	PB-03 & PB-04	Foundation Soils	16.0	28.4	20.7	0.194	50.790	0.936	1.2	23.4	58	25	44.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.110	0.108	1.015
PC-03	PB-03 & PB-04	Foundation Soils	16.1	28.3	34.9	0.173	47.490	0.496	1.2	38.8	31	25	41.4	80.2	1.0	-0.3	0.0	1.0	0.116	1.012	0.121	0.108	1.115
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	48.2	0.147	25.820	0.305	1.2	53.8	14	25	20.5	74.3	1.0	-0.3	0.0	1.0	0.111	1.011	0.115	0.108	1.061
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	49.9	0.122	14.380	0.244	1.2	56.1	10	25	9.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.109	0.990
PC-03	PB-03 & PB-04	Foundation Soils	16.3	28.1	48.3	0.201	13.960	0.416	1.2	53.4	18	25	30.1	83.6	1.0	-0.3	0.0	1.0	0.119	1.013	0.124	0.109	1.140
PC-03	PB-03 & PB-04	Foundation Soils	16.4	28.0	46.0	0.284	12.050	0.618	1.2	50.5	26	25	40.1	90.6	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.109	1.210
PC-03	PB-03 & PB-04	Foundation Soils	16.5	27.9	41.4	0.362	6.040	0.874	1.2	45.4	36	25	44.9	90.4	1.0	-0.3	0.0	1.0	0.126	1.015	0.131	0.109	1.206
PC-03	PB-03 & PB-04	Foundation Soils	16.6	27.8	37.4	0.446	8.200	1.192	1.2	41.0	45	25	46.8	87.8	1.0	-0.3	0.0	1.0	0.123	1.014	0.129	0.109	1.177
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	29.0	0.482	9.590	1.660	1.2	32.0	59	25	47.0	79.0	1.0	-0.3	0.0	1.0	0.115	1.012	0.119	0.109	1.090
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	22.8	0.495	10.720	2.169	1.2	25.3	70	25	46.3	71.6	1.0	-0.3	0.0	1.0	0.109	1.010	0.112	0.110	1.025
PC-03	PB-03 & PB-04	Foundation Soils	16.8	27.6	12.8	0.506	13.190	3.949	1.2	14.3	99	25	44.8	59.1	1.0	-0.3	0.0	1.0	0.099	1.009	0.102	0.110	0.928
PC-03	PB-03 & PB-04	Foundation Soils	16.9	27.5	8.0	0.476	22.820	5.919	1.2	9.0	100	25	43.6	52.6	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.110	0.880
PC-03	PB-03 & PB-04	Foundation Soils	17.0	27.4	6.6	0.383	36.240	5.789	1.2	7.4	100	25	43.2	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.095	0.110	0.865
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	6.0	0.272	54.600	4.525	1.2	6.7	100	25	43.0	49.8	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.110	0.858
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	6.4	0.153	69.980	2.392	1.2	7.2	100	25	43.1	50.3	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.110	0.860
PC-03	PB-03 & PB-04	Foundation Soils	17.2	27.2	5.5	0.067	66.180	1.229	1.2	6.1	100	25	42.9	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.111	0.849
PC-03	PB-03 & PB-04	Foundation Soils	17.3	27.1	4.7	0.101	71.040	2.143	1.2	5.3	100	25	42.7	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.111	0.841
PC-03	PB-03 & PB-04	Foundation Soils	17.4	27.0	4.6	0.050	79.520	1.078	1.2	5.2	100	25	42.6	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.111	0.839
PC-03	PB-03 & PB-04	Foundation Soils	17.5	26.9	7.6	0.028	86.520	0.371	1.2	8.4	80	25	42.8	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.111	0.860
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	25.6	0.038	67.370	0.148	1.2	28.0	29	25	37.8	65.9	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.111	0.962
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	38.3	0.075	44.400	0.196	1.2	41.8	17	25	26.8	68.6	1.0	-0.3	0.0	1.0	0.106	1.010	0.109	0.111	0.982
PC-03	PB-03 & PB-04	Foundation Soils	17.7	26.7	45.0	0.139	16.090	0.309	1.1	48.8	17	25	27.4	76.1	1.0	-0.3	0.0	0.9	0.112	1.011	0.116	0.112	1.040
PC-03	PB-03 & PB-04	Foundation Soils	17.8	26.6	45.8	0.247	16.690	0.539	1.1	49.2	25	25	38.5	87.7	1.0	-0.3	0.0	0.9	0.123	1.014	0.128	0.112	1.144
PC-03	PB-03 & PB-04	Foundation Soils	17.9	26.5	44.5	0.275	18.010	0.618	1.1	47.7	28	25	41.0	88.7	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.112	1.152
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	42.2	0.334	18.800	0.791	1.1	45.2	34	25	44.2	89.3	1.0	-0.3	0.0	0.9	0.125	1.014	0.130	0.112	1.156
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	41.5	0.390	19.980	0.939	1.1	44.4	38	25	45.5	89.9	1.0	-0.3	0.0	0.9	0.125	1.015	0.130	0.112	1.160
PC-03	PB-03 & PB-04	Foundation Soils	18.1	26.3	42.5	0.475	20.39	1.117193	1.1	45.3	40	25	46.6	91.9	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.112	1.180
PC-03	PB-03 & PB-04	Foundation Soils	18.2	26.2	42.4	0.629	19.730	1.484	1.1	45.0	46	25	48.1	93.1	1.0	-0.3	0.0	0.9	0.129	1.016	0.134	0.113	1.191

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	18.3	26.1	37.8	0.677	18.480	1.789	1.1	40.2	54	25	48.2	88.5	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.113	1.141
PC-03	PB-03 & PB-04	Foundation Soils	18.4	26.0	27.9	0.697	19.360	2.499	1.1	30.0	70	15	38.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.109	0.113	0.966
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	21.2	0.717	20.230	3.378	1.1	22.9	82	15	37.5	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.113	0.907
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	17.7	0.694	21.060	3.916	1.1	19.2	91	15	37.0	56.2	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.113	0.876
PC-03	PB-03 & PB-04	Foundation Soils	18.6	25.8	22.0	0.679	21.330	3.090	1.1	23.6	80	15	37.6	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.113	0.909
PC-03	PB-03 & PB-04	Foundation Soils	18.7	25.7	20.1	0.612	18.060	3.050	1.1	21.6	82	15	37.3	58.9	1.0	-0.3	0.0	0.9	0.099	1.008	0.101	0.113	0.892
PC-03	PB-03 & PB-04	Foundation Soils	18.8	25.6	12.1	0.534	19.870	4.412	1.1	13.1	100	15	36.1	49.1	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.114	0.825
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	8.7	0.446	28.490	5.151	1.1	9.4	100	15	35.3	44.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.114	0.796
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	8.2	0.372	36.240	4.555	1.1	8.8	100	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.114	0.791
PC-03	PB-03 & PB-04	Foundation Soils	19.0	25.4	7.0	0.240	57.460	3.434	1.1	7.6	100	15	35.0	42.6	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.114	0.780
PC-03	PB-03 & PB-04	Foundation Soils	19.1	25.3	6.4	0.156	69.080	2.429	1.1	6.9	100	15	34.9	41.8	1.0	-0.3	0.0	0.9	0.087	1.007	0.088	0.114	0.774
PC-03	PB-03 & PB-04	Foundation Soils	19.2	25.2	5.7	0.107	77.480	1.869	1.1	6.2	100	15	34.7	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.114	0.767
PC-03	PB-03 & PB-04	Foundation Soils	19.3	25.1	5.8	0.054	85.620	0.934	1.1	6.2	100	15	34.7	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.115	0.767
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	6.3	0.029	75.090	0.463	1.1	6.8	93	15	34.7	41.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.115	0.768
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	6.7	0.057	31.020	0.845	1.1	7.2	98	15	34.9	42.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.115	0.772
PC-03	PB-03 & PB-04	Foundation Soils	19.5	24.9	7.5	0.078	31.020	1.039	1.1	8.0	97	15	35.0	43.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.115	0.776
PC-03	PB-03 & PB-04	Foundation Soils	19.6	24.8	8.3	0.080	30.970	0.968	1.1	8.8	92	15	35.1	43.9	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.115	0.781
PC-03	PB-03 & PB-04	Foundation Soils	19.7	24.7	9.0	0.162	30.870	1.797	1.1	9.6	99	15	35.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.115	0.786
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.6	9.7	0.186	23.180	1.913	1.1	10.4	98	15	35.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.115	0.790
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.5	9.6	0.200	34.300	2.087	1.1	10.2	100	15	35.5	45.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.115	0.788
PC-03	PB-03 & PB-04	Foundation Soils	19.9	24.5	8.3	0.178	39.460	2.143	1.1	8.8	100	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.116	0.777
PC-03	PB-03 & PB-04	Foundation Soils	20.0	24.4	6.0	0.128	49.230	2.131	1.1	6.4	100	15	34.8	41.1	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.116	0.758
PC-03	PB-03 & PB-04	Foundation Soils	20.1	24.3	5.3	0.108	71.480	2.035	1.1	5.6	100	15	34.6	40.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.116	0.752
PC-03	PB-03 & PB-04	Foundation Soils	20.2	24.2	12.0	0.166	86.760	1.389	1.1	12.6	85	15	35.6	48.2	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.116	0.800
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	18.0	0.193	83.870	1.075	1.1	18.8	67	15	36.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.116	0.842
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	11.3	0.166	17.530	1.465	1.1	11.9	88	15	35.6	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.116	0.794
PC-03	PB-03 & PB-04	Foundation Soils	20.4	24.0	8.3	0.161	20.150	1.943	1.1	8.7	100	15	35.2	43.9	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.116	0.771
PC-03	PB-03 & PB-04	Foundation Soils	20.5	23.9	6.0	0.152	26.870	2.522	1.1	6.4	100	15	34.7	41.1	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.117	0.752
PC-03	PB-03 & PB-04	Foundation Soils	20.6	23.8	5.2	0.183	56.390	3.525	1.1	5.5	100	15	34.6	40.0	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.117	0.745
PC-03	PB-03 & PB-04	Foundation Soils	20.7	23.7	5.5	0.153	83.900	2.785	1.1	5.8	100	15	34.6	40.4	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.117	0.746
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	6.1	0.103	96.720	1.676	1.1	6.4	100	15	34.8	41.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.117	0.750
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	7.4	0.097	88.620	1.307	1.1	7.8	100	15	35.0	42.8	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.117	0.759
PC-03	PB-03 & PB-04	Foundation Soils	20.9	23.5	7.3	0.112	85.580	1.533	1.1	7.6	100	15	35.0	42.6	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.117	0.757
PC-03	PB-03 & PB-04	Foundation Soils	21.0	23.4	6.7	0.142	98.390	2.109	1.1	7.0	100	15	34.9	41.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.088	0.117	0.752
PC-03	PB-03 & PB-04	Foundation Soils	21.1	23.3	9.1	0.145	96.290	1.586	1.1	9.5	98	15	35.3	44.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.117	0.768
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	13.4	0.166	77.120	1.240	1.1	13.9	80	15	35.7	49.6	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.118	0.797
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	16.7	0.135	63.960	0.808	1.1	17.3	65	15	35.7	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.118	0.817
PC-03	PB-03 & PB-04	Foundation Soils	21.3	23.1	18.6	0.143	73.800	0.770	1.1	19.1	61	15	35.8	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.118	0.828
PC-03	PB-03 & PB-04	Foundation Soils	21.4	23.0	20.7	0.149	83.050	0.719	1.1	21.3	56	15	35.8	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.118	0.842
PC-03	PB-03 & PB-04	Foundation Soils	21.5	22.9	24.0	0.202	92.780	0.842	1.1	24.6	54	15	36.2	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.118	0.865
PC-03	PB-03 & PB-04	Foundation Soils	21.6	22.8	26.6	0.233	89.000	0.876	1.1	27.1	52	15	36.4	63.6	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.118	0.883
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	27.3	0.296	100.820	1.085	1.1	27.8	55	15	36.9	64.7	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.118	0.889
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	28.2	0.364	102.720	1.292	1.1	28.7	57	15	37.3	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.106	0.118	0.897
PC-03	PB-03 & PB-04	Foundation Soils	21.8	22.6	34.2	0.445	95.080	1.300	1.1	34.7	51	15	37.8	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.112	0.118	0.943
PC-03	PB-03 & PB-04	Foundation Soils	21.9	22.5	37.9	0.356	91.530	0.939	1.1	38.3	42	15	36.9	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.119	0.963
PC-03	PB-03 & PB-04	Foundation Soils	22.0	22.4	43.5	0.273	77.850	0.627	1.1	43.9	31	15	34.2	78.1	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.119	0.984
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	54.2	0.210	76.040	0.387	1.1	54.6	16	15	21.6	76.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.115	0.119	0.968
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	73.9	0.220	36.250	0.298	1.1	74.4	3	15	0.0	74.4	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.119	0.953
PC-03	PB-03 & PB-04	Foundation Soils	22.2	22.2	81.8	0.178	39.070	0.218	1.1	82.0	0	15	0.0	82.0	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.119	1.013
PC-03	PB-03 & PB-04	Foundation Soils	22.3	22.1	91.5	0.139	25.660	0.152	1.1	91.4	0	15	0.0	91.4	1.0	-0.4	0.0	0.9	0.127	1.015	0.130	0.119	1.096
PC-03	PB-03 & PB-04	Foundation Soils	22.4	22.0	109.2	0.142	19.220	0.130	1.1	108.5	0	15	0.0	108.5	1.0	-0.4	0.0	0.9	0.150	1.021	0.155	0.119	1.298
PC-03	PB-03 & PB-04	Foundation Soils	22.5	21.9	123.9	0.171	13.020	0.138	1.0	122.6	0	15	0.0	122.6	1.0	-0.4	0.0	0.9	0.177	1.028	0.185	0.119	1.549
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	134.0	0.203	0.140	0.151	1.0	132.2	0	15	0.0	132.2	1.0	-0.4	0.0	0.9	0.204	1.033	0.214	0.119	1.795
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	135.8	0.320	4.360	0.236	1.0	133.7	0	15	0.0	133.7	1.0	-0.4	0.0	0.9	0.210	1.034	0.220	0.119	1.841
PC-03	PB-03 & PB-04	Foundation Soils	22.7	21.7	135.7	0.323	13.290	0.238	1.0	133.5	0	15	0.0	133.5	1.0	-0.4	0.0	0.9	0.209	1.034	0.219	0.119	1.832
PC-03	PB-03 & PB-04	Foundation Soils	22.8	21.6	136.4	0.326	0.340	0.239	1.0	134.0	0	15	0.0	134.0	1.0	-0.4	0.0	0.9	0.211	1.034	0.221	0.120	1.846
PC-03	PB-03 & PB-04	Foundation Soils	22.9	21.5	135.5	0.431	-8.480	0.318	1.0	133.0	0	15	0.0	133.0	1.0	-0.4	0.0	0.9	0.207	1.034	0.217	0.120	1.813
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.4	132.3	0.477	-18.770	0.361	1.0	129.7	0	15	0.0	129.7	1.0	-0.4	0.0	0.9	0.197	1.032	0.205	0.120	1.715
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.3	136.0	0.420	-15.930	0.309	1.0	133.1	0	15	0.0	133.1	1.0	-0.4	0.0	0.9	0.208	1.034	0.217	0.120	1.813
PC-03	PB-03 & PB-04	Foundation Soils	23.1	21.3	139.6	0.297	-20.850	0.213	1.0	136.5	0	15	0.0	136.5	1.0	-0.4	0.0	0.9	0.220	1.036	0.230	0.120	1.922
PC-03	PB-03 & PB-04	Foundation Soils	23.2	21.2	139.1	0.232	-22.110	0.167	1.0	135.9	0	15	0.0	135.9	1.0	-0.4	0.0	0.9	0.218	1.035	0.228	0.120	1.899
PC-03	PB-03 & PB-04	Foundation Soils	23.3	21.1	132.1	0.258	-23.250	0.195	1.0	129.0	0	15	0.0	129.0	1.0	-0.4	0.0	0.9	0.194	1.031	0.203	0.120	1.688

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	23.4	21.0	120.5	0.328	-20.820	0.272	1.0	117.8	0	15	0.0	117.8	1.0	-0.4	0.0	0.9	0.166	1.025	0.172	0.120	1.434
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	105.2	0.397	-9.910	0.377	1.0	102.9	0	15	0.0	102.9	1.0	-0.4	0.0	0.9	0.141	1.019	0.145	0.120	1.206
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	106.2	0.496	-4.860	0.467	1.0	103.7	0	15	0.0	103.7	1.0	-0.4	0.0	0.9	0.142	1.019	0.146	0.120	1.215
PC-03	PB-03 & PB-04	Foundation Soils	23.6	20.8	118.4	0.484	-6.380	0.409	1.0	115.3	0	15	0.0	115.3	1.0	-0.4	0.0	0.9	0.161	1.024	0.167	0.120	1.385
PC-03	PB-03 & PB-04	Foundation Soils	23.7	20.7	142.3	0.428	-16.840	0.301	1.0	138.0	0	15	0.0	138.0	1.0	-0.4	0.0	0.9	0.226	1.037	0.236	0.120	1.963
PC-03	PB-03 & PB-04	Foundation Soils	23.8	20.6	157.5	0.341	-19.680	0.216	1.0	152.4	0	15	0.0	152.4	1.0	-0.4	0.0	0.9	0.305	1.047	0.323	0.120	2.680
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.5	170.2	0.241	-19.300	0.142	1.0	164.3	0	15	0.0	164.3	1.0	-0.4	0.0	0.9	0.420	1.058	0.450	0.121	3.729
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.4	168.5	0.210	-18.300	0.125	1.0	162.5	0	15	0.0	162.5	1.0	-0.4	0.1	0.9	0.399	1.056	0.426	0.121	3.527
PC-03	PB-03 & PB-04	Foundation Soils	24.0	20.4	161.1	0.217	-16.820	0.135	1.0	155.3	0	15	0.0	155.3	1.0	-0.4	0.1	0.9	0.328	1.050	0.347	0.121	2.878
PC-03	PB-03 & PB-04	Foundation Soils	24.1	20.3	152.5	0.272	-13.200	0.178	1.0	147.0	0	15	0.0	147.0	1.0	-0.4	0.1	0.9	0.270	1.043	0.284	0.121	2.352
PC-03	PB-03 & PB-04	Foundation Soils	24.2	20.2	139.3	0.347	-10.790	0.249	1.0	134.3	0	15	0.0	134.3	1.0	-0.5	0.1	0.9	0.212	1.034	0.220	0.121	1.823
PC-03	PB-03 & PB-04	Foundation Soils	24.3	20.1	126.5	0.444	-9.530	0.351	1.0	122.0	0	15	0.0	122.0	1.0	-0.5	0.1	0.9	0.176	1.027	0.182	0.121	1.502
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	112.0	0.465	-7.930	0.415	1.0	108.0	0	15	0.0	108.0	1.0	-0.5	0.1	0.9	0.149	1.021	0.153	0.121	1.262
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	104.7	0.374	-7.620	0.357	1.0	100.9	0	15	0.0	100.9	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.121	1.170
PC-03	PB-03 & PB-04	Foundation Soils	24.5	19.9	96.8	0.346	-13.170	0.358	1.0	93.2	0	15	0.0	93.2	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.121	1.087
PC-03	PB-03 & PB-04	Foundation Soils	24.6	19.8	89.5	0.289	-16.300	0.323	1.0	86.2	0	15	0.0	86.2	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.121	1.021
PC-03	PB-03 & PB-04	Foundation Soils	24.7	19.7	85.9	0.242	-17.250	0.282	1.0	82.6	0	15	0.0	82.6	1.0	-0.5	0.1	0.9	0.118	1.013	0.120	0.121	0.990
PC-03	PB-03 & PB-04	Foundation Soils	24.8	19.6	78.1	0.247	-13.530	0.316	1.0	75.0	3	15	0.0	75.0	1.0	-0.5	0.1	0.9	0.111	1.011	0.113	0.121	0.931
UC-01	UB-02	Foundation Soils	9.5	31.8	31.7	0.228	-9.670	0.718	1.7	50.1	32	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.110	0.899
UC-01	UB-02	Foundation Soils	9.6	31.7	34.9	0.131	-0.330	0.376	1.6	54.2	19	0	0.4	54.6	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.110	0.926
UC-01	UB-02	Foundation Soils	9.7	31.7	34.5	0.135	1.430	0.391	1.6	53.6	20	0	0.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.111	0.918
UC-01	UB-02	Foundation Soils	9.8	31.6	33.3	0.179	1.670	0.538	1.6	51.8	26	0	0.5	52.2	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.111	0.902
UC-01	UB-02	Foundation Soils	9.8	31.5	31.5	0.207	2.290	0.657	1.7	49.2	31	0	0.5	49.7	1.1	-0.1	0.0	1.0	0.092	1.008	0.098	0.111	0.880
UC-01	UB-02	Foundation Soils	9.9	31.4	30.8	0.213	0.770	0.692	1.7	48.1	33	0	0.5	48.6	1.1	-0.1	0.0	1.0	0.091	1.007	0.097	0.112	0.870
UC-01	UB-02	Foundation Soils	10.0	31.3	29.0	0.231	-1.240	0.797	1.7	45.5	37	0	0.5	46.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.095	0.112	0.849
UC-01	UB-02	Foundation Soils	10.1	31.2	27.4	0.272	-0.100	0.992	1.7	43.2	43	0	0.5	43.7	1.1	-0.1	0.0	1.0	0.088	1.007	0.093	0.112	0.830
UC-01	UB-02	Foundation Soils	10.2	31.2	28.4	0.375	-1.290	1.319	1.7	44.4	48	0	0.5	45.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.094	0.113	0.836
UC-01	UB-02	Foundation Soils	10.3	31.1	32.7	0.448	-3.480	1.372	1.6	50.1	45	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.113	0.873
UC-01	UB-02	Foundation Soils	10.3	31.0	42.0	0.497	-13.290	1.182	1.6	62.3	34	0	0.5	62.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.113	0.961
UC-01	UB-02	Foundation Soils	10.4	30.9	49.9	0.468	-20.580	0.938	1.5	72.1	25	0	0.5	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.118	0.113	1.037
UC-01	UB-02	Foundation Soils	10.5	30.8	55.2	0.418	-22.080	0.757	1.5	78.5	18	0	0.4	78.9	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.114	1.090
UC-01	UB-02	Foundation Soils	10.6	30.8	60.1	0.312	-23.600	0.519	1.5	84.3	8	0	0.1	84.4	1.1	-0.1	0.0	1.0	0.120	1.013	0.130	0.114	1.140
UC-01	UB-02	Foundation Soils	10.7	30.7	62.4	0.233	-24.250	0.373	1.5	87.0	1	0	0.0	87.0	1.1	-0.1	0.0	1.0	0.122	1.014	0.133	0.114	1.163
UC-01	UB-02	Foundation Soils	10.7	30.6	60.7	0.182	-23.300	0.300	1.5	84.6	0	0	0.0	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.130	0.115	1.135
UC-01	UB-02	Foundation Soils	10.8	30.5	57.5	0.236	-21.630	0.410	1.5	80.7	6	0	0.0	80.7	1.1	-0.2	0.0	1.0	0.116	1.012	0.126	0.115	1.094
UC-01	UB-02	Foundation Soils	10.9	30.4	50.6	0.317	-19.110	0.626	1.5	72.0	17	0	0.3	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.117	0.115	1.017
UC-01	UB-02	Foundation Soils	11.0	30.3	47.6	0.330	-17.720	0.694	1.5	68.0	21	0	0.4	68.4	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.115	0.982
UC-01	UB-02	Foundation Soils	11.1	30.3	42.0	0.317	-13.480	0.755	1.5	60.8	26	0	0.5	61.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.116	0.924
UC-01	UB-02	Foundation Soils	11.2	30.2	40.6	0.279	-9.950	0.687	1.5	58.8	25	0	0.5	59.3	1.1	-0.2	0.0	1.0	0.099	1.009	0.105	0.116	0.908
UC-01	UB-02	Foundation Soils	11.2	30.1	43.0	0.248	-7.960	0.576	1.5	61.8	21	0	0.4	62.2	1.1	-0.2	0.0	1.0	0.101	1.009	0.108	0.116	0.927
UC-01	UB-02	Foundation Soils	11.3	30.0	44.0	0.238	-5.050	0.541	1.5	62.9	19	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.117	0.932
UC-01	UB-02	Foundation Soils	11.4	29.9	44.1	0.230	-1.570	0.521	1.5	62.8	18	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.117	0.929
UC-01	UB-02	Foundation Soils	11.5	29.8	45.5	0.252	2.100	0.554	1.5	64.4	19	0	0.4	64.8	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.117	0.938
UC-01	UB-02	Foundation Soils	11.6	29.8	48.1	0.285	2.620	0.592	1.5	67.5	18	0	0.4	67.9	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.117	0.960
UC-01	UB-02	Foundation Soils	11.6	29.7	50.3	0.319	2.190	0.634	1.5	70.0	18	0	0.4	70.4	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.118	0.977
UC-01	UB-02	Foundation Soils	11.7	29.6	54.9	0.353	1.980	0.643	1.5	75.5	16	0	0.3	75.8	1.1	-0.2	0.0	1.0	0.112	1.011	0.120	0.118	1.019
UC-01	UB-02	Foundation Soils	11.8	29.5	58.7	0.402	1.520	0.684	1.4	79.9	15	0	0.3	80.2	1.1	-0.2	0.0	1.0	0.116	1.012	0.125	0.118	1.055
UC-01	UB-02	Foundation Soils	11.9	29.4	63.2	0.440	1.190	0.696	1.4	85.0	13	0	0.2	85.3	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.118	1.100
UC-01	UB-02	Foundation Soils	12.0	29.4	66.1	0.477	1.240	0.722	1.4	88.2	13	0	0.2	88.5	1.1	-0.2	0.0	1.0	0.124	1.014	0.134	0.119	1.129
UC-01	UB-02	Foundation Soils	12.1	29.3	68.0	0.507	1.300	0.745	1.4	90.3	13	0	0.2	90.5	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.119	1.147
UC-01	UB-02	Foundation Soils	12.1	29.2	70.0	0.518	1.190	0.740	1.4	92.4	12	0	0.2	92.6	1.1	-0.2	0.0	1.0	0.128	1.015	0.139	0.119	1.167
UC-01	UB-02	Foundation Soils	12.2	29.1	71.5	0.535	1.380	0.749	1.4	93.9	12	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.119	1.181
UC-01	UB-02	Foundation Soils	12.3	29.0	72.6	0.528	1.380	0.727	1.4	95.0	11	0	0.2	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.119	1.190
UC-01	UB-02	Foundation Soils	12.4	28.9	72.8	0.523	1.520	0.718	1.4	95.0	10	0	0.1	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.120	1.188
UC-01	UB-02	Foundation Soils	12.5	28.9	72.0	0.518	1.570	0.719	1.4	94.0	11	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.120	1.173
UC-01	UB-02	Foundation Soils	12.5	28.8	70.6	0.504	1.680	0.713	1.4	92.2	11	0	0.2	92.4	1.1	-0.2	0.0	1.0	0.128	1.015	0.138	0.120	1.151
UC-01	UB-02	Foundation Soils	12.6	28.7	69.4	0.482	1.720	0.695	1.4	90.5	11	0	0.2	90.7	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.120	1.131
UC-01	UB-02	Foundation Soils	12.7	28.6	67.5	0.464	2.020	0.687	1.4	88.2	12	0	0.2	88.4	1.1	-0.2	0.0	1.0	0.124	1.014	0.133	0.121	1.105
UC-01	UB-02	Foundation Soils	12.8	28.5	66.0	0.436	2.050	0.660	1.4	86.3	12	0	0.2	86.5	1.1	-0.2	0.0	1.0	0.122	1.014	0.131	0.121	1.084
UC-01	UB-02	Foundation Soils	12.9	28.5	65.4	0.411	2.150	0.629	1.4	85.4	11	0	0.2	85.5	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.121	1.072
UC-01	UB-02	Foundation Soils	13.0	28.4	64.7	0.379	2.380	0.586	1.4	84.4	10	0	0.1	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.129	0.121	1.061
UC-01	UB-02	Foundation Soils	13.0	28.3	64.5	0.375	2.430	0.582	1.4	84.0	10	0	0.1	84.1	1.1	-0.2	0.0	1.0	0.120	1.013	0.128	0.121	1.054

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	13.1	28.2	64.3	0.364	2.480	0.566	1.4	83.6	10	0	0.1	83.7	1.1	-0.2	0.0	1.0	0.119	1.013	0.128	0.122	1.049
UC-01	UB-02	Foundation Soils	13.2	28.1	60.0	0.361	6.380	0.601	1.4	78.5	13	0	0.2	78.7	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.122	1.003
UC-01	UB-02	Foundation Soils	13.3	28.0	62.8	0.370	2.380	0.589	1.4	81.5	11	0	0.2	81.7	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.122	1.027
UC-01	UB-02	Foundation Soils	13.4	28.0	62.4	0.366	2.330	0.587	1.4	80.9	12	0	0.2	81.0	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.122	1.019
UC-01	UB-02	Foundation Soils	13.5	27.9	61.4	0.358	2.540	0.583	1.4	79.6	12	0	0.2	79.8	1.1	-0.2	0.0	1.0	0.116	1.012	0.123	0.122	1.006
UC-01	UB-02	Foundation Soils	13.5	27.8	59.9	0.346	2.720	0.578	1.4	77.6	13	0	0.2	77.9	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.123	0.988
UC-01	UB-02	Foundation Soils	13.6	27.7	58.8	0.347	2.940	0.590	1.4	76.3	14	0	0.3	76.5	1.1	-0.2	0.0	1.0	0.113	1.011	0.120	0.123	0.975
UC-01	UB-02	Foundation Soils	13.7	27.6	58.3	0.374	3.050	0.641	1.4	75.5	16	0	0.3	75.8	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.123	0.968
UC-01	UB-02	Foundation Soils	13.8	27.6	58.1	0.458	3.150	0.789	1.4	75.1	20	0	0.4	75.5	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.123	0.963
UC-01	UB-02	Foundation Soils	13.9	27.5	57.4	0.517	3.150	0.900	1.4	74.2	23	0	0.5	74.6	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.123	0.955
UC-01	UB-02	Foundation Soils	13.9	27.4	56.0	0.548	3.190	0.978	1.4	72.4	25	0	0.5	72.9	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.124	0.939
UC-01	UB-02	Foundation Soils	14.0	27.3	53.2	0.477	3.330	0.896	1.4	69.0	25	0	0.5	69.5	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.124	0.912
UC-01	UB-02	Foundation Soils	14.1	27.2	50.5	0.465	3.780	0.920	1.4	65.7	27	0	0.5	66.1	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.124	0.887
UC-01	UB-02	Foundation Soils	14.2	27.1	55.0	0.458	4.340	0.832	1.4	70.8	23	0	0.4	71.2	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.124	0.922
UC-01	UB-02	Foundation Soils	14.3	27.1	70.2	0.457	4.220	0.651	1.3	88.0	11	0	0.2	88.1	1.1	-0.2	0.0	1.0	0.124	1.014	0.132	0.124	1.062
UC-01	UB-02	Foundation Soils	14.4	27.0	79.7	0.492	2.890	0.617	1.3	98.4	6	0	0.0	98.4	1.1	-0.2	0.0	1.0	0.135	1.017	0.145	0.124	1.168
UC-01	UB-02	Foundation Soils	14.4	26.9	75.4	0.530	2.150	0.703	1.3	93.4	10	0	0.1	93.5	1.1	-0.2	0.0	1.0	0.129	1.016	0.139	0.125	1.112
UC-01	UB-02	Foundation Soils	14.5	26.8	65.5	0.555	0.710	0.847	1.3	82.2	18	0	0.4	82.5	1.0	-0.2	0.0	1.0	0.118	1.013	0.125	0.125	1.006
UC-01	UB-02	Foundation Soils	14.6	26.7	54.3	0.587	0.620	1.080	1.4	69.2	29	0	0.5	69.7	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.125	0.903
UC-01	UB-02	Foundation Soils	14.7	26.6	37.4	0.621	2.050	1.659	1.4	49.2	48	0	0.6	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.125	0.769
UC-01	UB-02	Foundation Soils	14.8	26.6	25.5	0.658	3.850	2.578	1.4	34.5	69	0	0.5	35.1	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.125	0.681
UC-01	UB-02	Foundation Soils	14.8	26.5	15.7	0.640	6.340	4.087	1.5	21.9	88	0	0.5	22.4	1.0	-0.2	0.0	1.0	0.074	1.006	0.076	0.125	0.609
UC-01	UB-02	Foundation Soils	14.9	26.4	10.4	0.555	8.790	5.339	1.5	14.6	100	0	0.5	15.1	1.0	-0.2	0.0	1.0	0.069	1.006	0.072	0.126	0.570
UC-01	UB-02	Foundation Soils	15.0	26.3	8.7	0.457	9.480	5.235	1.5	12.2	100	0	0.5	12.7	1.0	-0.2	0.0	1.0	0.068	1.006	0.070	0.126	0.557
UC-01	UB-02	Foundation Soils	15.1	26.2	7.3	0.404	9.200	5.567	1.5	10.1	100	0	0.5	10.6	1.0	-0.2	0.0	1.0	0.067	1.006	0.069	0.126	0.545
UC-01	UB-02	Foundation Soils	15.2	26.2	6.8	0.295	12.530	4.314	1.5	9.5	100	0	0.5	10.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.126	0.541
UC-01	UB-02	Foundation Soils	15.3	26.1	6.2	0.225	29.660	3.655	1.5	8.6	100	0	0.5	9.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.126	0.536
UC-01	UB-02	Foundation Soils	15.3	26.0	3.9	0.135	59.460	3.425	1.5	5.5	100	0	0.5	5.9	1.0	-0.2	0.0	1.0	0.064	1.006	0.066	0.127	0.520
UC-01	UB-02	Foundation Soils	15.4	25.9	3.3	0.057	77.330	1.736	1.5	4.5	100	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.127	0.515
UC-01	UB-02	Foundation Soils	15.5	25.8	3.2	0.044	80.420	1.357	1.5	4.5	100	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.127	0.513
UC-01	UB-02	Foundation Soils	15.6	25.7	3.2	0.027	80.950	0.848	1.5	4.4	100	0	0.5	4.9	1.0	-0.2	0.0	1.0	0.063	1.006	0.065	0.127	0.512
UC-01	UB-02	Foundation Soils	15.7	25.7	3.2	0.023	79.850	0.724	1.5	4.4	100	0	0.5	4.8	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.127	0.511
UC-01	UB-02	Foundation Soils	15.7	25.6	3.1	0.025	80.950	0.802	1.5	4.3	100	0	0.5	4.7	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.127	0.510
UC-01	UB-02	Foundation Soils	15.8	25.5	3.5	0.017	85.770	0.492	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.128	0.512
UC-01	UB-02	Foundation Soils	15.9	25.4	11.1	0.017	88.220	0.154	1.4	15.1	54	0	0.5	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.128	0.562
UC-01	UB-02	Foundation Soils	16.0	25.3	23.1	0.066	70.800	0.286	1.4	30.5	34	0	0.5	31.0	1.0	-0.3	0.0	1.0	0.079	1.006	0.082	0.128	0.642
UC-01	UB-02	Foundation Soils	16.1	25.3	25.9	0.094	16.520	0.363	1.4	33.8	34	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.084	0.128	0.659
UC-01	UB-02	Foundation Soils	16.2	25.2	18.8	0.171	10.290	0.909	1.4	25.1	58	0	0.5	25.6	1.0	-0.3	0.0	1.0	0.076	1.006	0.078	0.128	0.611
UC-01	UB-02	Foundation Soils	16.2	25.1	16.1	0.230	18.480	1.430	1.4	21.6	71	0	0.5	22.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.076	0.128	0.592
UC-01	UB-02	Foundation Soils	16.3	25.0	15.3	0.310	22.870	2.024	1.4	20.6	75	0	0.5	21.1	1.0	-0.3	0.0	1.0	0.073	1.006	0.075	0.129	0.586
UC-01	UB-02	Foundation Soils	16.4	24.9	11.9	0.287	25.020	2.421	1.4	15.9	87	0	0.5	16.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.129	0.561
UC-01	UB-02	Foundation Soils	16.5	24.8	9.2	0.263	11.650	2.849	1.4	12.4	98	0	0.5	12.9	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.129	0.543
UC-01	UB-02	Foundation Soils	16.6	24.8	10.2	0.261	30.940	2.563	1.4	13.6	93	0	0.5	14.1	1.0	-0.3	0.0	1.0	0.069	1.006	0.071	0.129	0.548
UC-01	UB-02	Foundation Soils	16.7	24.7	11.7	0.244	21.440	2.090	1.4	15.6	85	0	0.5	16.1	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.129	0.557
UC-01	UB-02	Foundation Soils	16.7	24.6	8.9	0.208	26.560	2.338	1.4	11.8	96	0	0.5	12.3	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.129	0.538
UC-01	UB-02	Foundation Soils	16.8	24.5	5.5	0.155	36.080	2.810	1.4	7.3	100	0	0.5	7.8	1.0	-0.3	0.0	1.0	0.065	1.006	0.067	0.130	0.516
UC-01	UB-02	Foundation Soils	16.9	24.4	4.1	0.138	51.740	3.331	1.4	5.5	100	0	0.5	6.0	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.130	0.506
UC-01	UB-02	Foundation Soils	17.0	24.4	3.9	0.096	62.650	2.461	1.4	5.2	100	0	0.5	5.6	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.130	0.504
UC-01	UB-02	Foundation Soils	17.1	24.3	3.8	0.083	71.180	2.187	1.4	5.0	100	0	0.5	5.5	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.130	0.503
UC-01	UB-02	Foundation Soils	17.1	24.2	3.6	0.057	66.940	1.580	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.130	0.501
UC-01	UB-02	Foundation Soils	17.2	24.1	3.6	0.016	70.700	0.441	1.4	4.8	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.130	0.500
UC-01	UB-02	Foundation Soils	17.3	24.0	3.6	0.020	77.710	0.555	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.130	0.500
UC-01	UB-02	Foundation Soils	17.4	23.9	4.4	0.021	79.710	0.473	1.4	5.8	100	0	0.5	6.3	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.131	0.504
UC-01	UB-02	Foundation Soils	17.5	23.9	7.7	0.039	82.140	0.506	1.4	10.0	78	0	0.5	10.5	1.0	-0.3	0.0	1.0	0.067	1.006	0.068	0.131	0.523
UC-01	UB-02	Foundation Soils	17.6	23.8	10.3	0.121	26.730	1.175	1.4	13.4	79	0	0.5	13.9	1.0	-0.3	0.0	1.0	0.069	1.006	0.070	0.131	0.539
UC-01	UB-02	Foundation Soils	17.6	23.7	11.8	0.168	19.730	1.426	1.4	15.3	78	0	0.5	15.8	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.131	0.547
UC-01	UB-02	Foundation Soils	17.7	23.6	6.7	0.177	9.510	2.646	1.4	8.7	100	0	0.5	9.1	1.0	-0.3	0.0	0.9	0.066	1.006	0.068	0.131	0.515
UC-01	UB-02	Foundation Soils	17.8	23.5	5.3	0.169	22.960	3.187	1.4	6.8	100	0	0.5	7.3	1.0	-0.3	0.0	0.9	0.065	1.006	0.066	0.131	0.506
UC-01	UB-02	Foundation Soils	17.9	23.5	4.6	0.160	27.560	3.462	1.4	6.0	100	0	0.5	6.4	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.131	0.501
UC-01	UB-02	Foundation Soils	18.0	23.4	4.2	0.108	40.740	2.569	1.4	5.4	100	0	0.5	5.9	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.132	0.498
UC-01	UB-02	Foundation Soils	18.0	23.3	3.9	0.095	59.000	2.443	1.3	4.8	100	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.132	0.666
UC-01	UB-02	Foundation Soils	18.1	23.2	4.6	0.075	69.130	1.616	1.3	5.7	100	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.132	0.671

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	18.2	23.1	5.6	0.078	66.510	1.404	1.3	6.8	100	15	34.8	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.132	0.677
UC-01	UB-02	Foundation Soils	18.3	23.0	5.3	0.076	8.950	1.435	1.3	6.5	100	15	34.8	41.2	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.132	0.674
UC-01	UB-02	Foundation Soils	18.4	23.0	4.8	0.077	29.940	1.595	1.3	5.9	100	15	34.7	40.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.132	0.670
UC-01	UB-02	Foundation Soils	18.5	22.9	4.1	0.069	41.450	1.663	1.3	5.1	100	15	34.5	39.6	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.132	0.663
UC-01	UB-02	Foundation Soils	18.5	22.8	3.8	0.052	51.870	1.385	1.3	4.6	100	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.132	0.659
UC-01	UB-02	Foundation Soils	18.6	22.7	3.6	0.038	62.470	1.061	1.3	4.4	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.133	0.657
UC-01	UB-02	Foundation Soils	18.7	22.6	3.6	0.028	71.900	0.785	1.3	4.3	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.133	0.656
UC-01	UB-02	Foundation Soils	18.8	22.5	3.6	0.035	71.280	0.982	1.3	4.3	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.133	0.656
UC-01	UB-02	Foundation Soils	18.9	22.5	3.5	0.028	72.820	0.794	1.3	4.3	100	15	34.3	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.087	0.133	0.655
UC-01	UB-02	Foundation Soils	18.9	22.4	3.8	0.018	76.870	0.475	1.3	4.6	100	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.133	0.656
UC-01	UB-02	Foundation Soils	19.0	22.3	4.2	0.023	74.230	0.552	1.3	5.0	100	15	34.5	39.5	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.133	0.658
UC-01	UB-02	Foundation Soils	19.1	22.2	5.1	0.019	68.390	0.369	1.3	6.2	94	15	34.6	40.8	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.133	0.664
UC-01	UB-02	Foundation Soils	19.2	22.1	5.8	0.025	56.600	0.435	1.3	6.9	91	15	34.7	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.133	0.668
UC-01	UB-02	Foundation Soils	19.3	22.1	4.8	0.027	43.120	0.563	1.3	5.7	100	15	34.6	40.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.134	0.660
UC-01	UB-02	Foundation Soils	19.4	22.0	4.0	0.023	56.410	0.578	1.3	4.8	100	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.134	0.654
UC-01	UB-02	Foundation Soils	19.4	21.9	4.1	0.051	73.490	1.253	1.3	4.9	100	15	34.5	39.3	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.134	0.653
UC-01	UB-02	Foundation Soils	19.5	21.8	4.5	0.076	73.980	1.684	1.3	5.4	100	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.134	0.656
UC-01	UB-02	Foundation Soils	19.6	21.7	4.8	0.175	71.040	3.666	1.3	5.7	100	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.134	0.657
UC-01	UB-02	Foundation Soils	19.7	21.6	4.5	0.123	65.130	2.742	1.3	5.3	100	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.134	0.654
UC-01	UB-02	Foundation Soils	19.8	21.6	4.6	0.094	59.750	2.025	1.3	5.5	100	15	34.6	40.1	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.134	0.655
UC-01	UB-02	Foundation Soils	19.8	21.5	13.4	0.063	83.310	0.470	1.2	15.6	61	15	35.2	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.134	0.713
UC-01	UB-02	Foundation Soils	19.9	21.4	54.2	0.063	98.530	0.116	1.2	62.2	0	0	0.0	62.2	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.134	0.779
UC-01	UB-02	Foundation Soils	20.0	21.3	62.0	0.090	-0.200	0.145	1.2	70.5	0	0	0.0	70.5	1.0	-0.3	0.0	0.9	0.108	1.010	0.112	0.134	0.831
UC-01	UB-02	Foundation Soils	20.1	21.2	47.1	0.135	0.380	0.287	1.2	54.3	13	0	0.2	54.5	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.135	0.732
UC-01	UB-02	Foundation Soils	20.2	21.2	37.1	0.171	6.730	0.461	1.2	43.2	28	0	0.4	43.7	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.135	0.672
UC-01	UB-02	Foundation Soils	20.3	21.1	22.4	0.256	18.200	1.145	1.3	26.7	59	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.135	0.585
UC-01	UB-02	Foundation Soils	20.3	21.0	20.1	0.344	25.510	1.708	1.3	24.1	70	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.135	0.572
UC-01	UB-02	Foundation Soils	20.4	20.9	27.8	0.416	26.820	1.498	1.2	32.6	58	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.135	0.615
UC-01	UB-02	Foundation Soils	20.5	20.8	30.6	0.384	26.520	1.257	1.2	35.7	52	0	0.5	36.2	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.135	0.630
UC-01	UB-02	Foundation Soils	20.6	20.7	16.4	0.277	16.910	1.686	1.3	19.7	74	0	0.5	20.2	1.0	-0.4	0.0	0.9	0.073	1.006	0.074	0.135	0.549
UC-01	UB-02	Foundation Soils	20.7	20.7	13.2	0.210	18.250	1.593	1.3	15.7	80	0	0.5	16.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.135	0.530
UC-01	UB-02	Foundation Soils	20.8	20.6	23.7	0.132	21.150	0.558	1.2	27.8	45	0	0.5	28.3	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.135	0.588
UC-01	UB-02	Foundation Soils	20.8	20.5	48.4	0.112	21.720	0.231	1.2	54.8	10	0	0.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.135	0.730
UC-01	UB-02	Foundation Soils	20.9	20.4	72.9	0.114	11.480	0.156	1.2	80.6	0	0	0.0	80.6	1.0	-0.4	0.0	0.9	0.116	1.012	0.121	0.135	0.893
UC-01	UB-02	Foundation Soils	21.0	20.3	75.9	0.151	9.770	0.199	1.2	83.6	0	0	0.0	83.6	1.0	-0.4	0.0	0.9	0.119	1.013	0.124	0.135	0.915
UC-01	UB-02	Foundation Soils	21.1	20.3	51.3	0.300	8.910	0.584	1.2	57.7	22	0	0.4	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.136	0.746
UC-01	UB-02	Foundation Soils	21.2	20.2	33.3	0.354	8.580	1.064	1.2	38.1	46	0	0.5	38.6	1.0	-0.4	0.0	0.9	0.084	1.007	0.087	0.136	0.638
UC-01	UB-02	Foundation Soils	21.2	20.1	19.5	0.345	14.680	1.766	1.2	22.8	70	0	0.5	23.3	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.136	0.561
UC-01	UB-02	Foundation Soils	21.3	20.0	15.2	0.444	15.910	2.927	1.2	17.8	89	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.136	0.537
UC-01	UB-02	Foundation Soils	21.4	19.9	15.7	0.417	30.110	2.658	1.2	18.3	86	0	0.5	18.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.136	0.539
UC-01	UB-02	Foundation Soils	21.5	19.8	37.5	0.279	22.870	0.745	1.2	42.4	36	0	0.5	42.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.090	0.136	0.659
UC-01	UB-02	Foundation Soils	21.6	19.8	41.6	0.307	13.390	0.738	1.2	46.7	33	0	0.5	47.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.093	0.136	0.682
UC-01	UB-02	Foundation Soils	21.7	19.7	34.9	0.300	18.800	0.861	1.2	39.4	41	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.136	0.642
UC-01	UB-02	Foundation Soils	21.7	19.6	35.3	0.224	20.160	0.635	1.2	39.7	35	0	0.5	40.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.136	0.644
UC-01	UB-02	Foundation Soils	21.8	19.5	35.0	0.294	20.890	0.841	1.2	39.3	41	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.136	0.641
UC-01	UB-02	Foundation Soils	21.9	19.4	39.5	0.503	17.960	1.273	1.2	44.1	45	0	0.5	44.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.136	0.666
UC-01	UB-02	Foundation Soils	22.0	19.3	52.4	0.449	19.850	0.857	1.2	57.7	29	0	0.5	58.2	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.136	0.740
UC-01	UB-02	Foundation Soils	22.1	19.3	65.8	0.600	16.480	0.912	1.2	71.6	24	0	0.5	72.0	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.136	0.825
UC-01	UB-02	Foundation Soils	22.1	19.2	73.2	0.433	17.530	0.592	1.1	79.1	12	0	0.2	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.119	0.136	0.873
UC-01	UB-02	Foundation Soils	22.2	19.1	70.7	0.376	7.340	0.532	1.1	76.4	11	0	0.2	76.5	1.0	-0.4	0.0	0.9	0.113	1.011	0.116	0.136	0.854
UC-01	UB-02	Foundation Soils	22.3	19.0	70.4	0.290	24.020	0.412	1.1	76.0	7	0	0.0	76.1	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.137	0.850
UC-01	UB-02	Foundation Soils	22.4	18.9	71.9	0.378	13.870	0.526	1.1	77.4	11	0	0.1	77.6	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.137	0.860
UC-01	UB-02	Foundation Soils	22.5	18.9	68.5	0.469	11.860	0.685	1.1	73.7	17	0	0.3	74.1	1.0	-0.4	0.0	0.9	0.111	1.011	0.114	0.137	0.835
UC-01	UB-02	Foundation Soils	22.6	18.8	64.2	0.485	20.770	0.756	1.1	69.2	21	0	0.4	69.6	1.0	-0.4	0.0	0.9	0.107	1.010	0.110	0.137	0.806
UC-01	UB-02	Foundation Soils	22.6	18.7	56.6	0.443	19.700	0.783	1.1	61.3	25	0	0.5	61.7	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.137	0.757
UC-01	UB-02	Foundation Soils	22.7	18.6	52.8	0.304	22.390	0.576	1.1	57.2	22	0	0.4	57.6	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.137	0.733
UC-01	UB-02	Foundation Soils	22.8	18.5	58.4	0.300	22.060	0.514	1.1	62.9	17	0	0.3	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.137	0.765
UC-01	UB-02	Foundation Soils	22.9	18.4	76.4	0.354	16.510	0.463	1.1	81.3	7	0	0.0	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.137	0.883
UC-01	UB-02	Foundation Soils	23.0	18.4	76.7	0.356	16.320	0.464	1.1	81.4	7	0	0.0	81.4	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.137	0.883
UC-01	UB-02	Foundation Soils	23.0	18.3	73.0	0.362	17.010	0.496	1.1	77.6	10	0	0.1	77.7	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.137	0.856
UC-01	UB-02	Foundation Soils	23.1	18.2	75.4	0.386	19.210	0.512	1.1	79.9	9	0	0.1	80.0	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.137	0.872
UC-01	UB-02	Foundation Soils	23.2	18.1	80.6	0.379	19.300	0.470	1.1	85.0	6	0	0.0	85.0	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.137	0.909

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	23.3	18.0	81.6	0.411	22.390	0.504	1.1	85.9	7	0	0.0	85.9	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.137	0.915
UC-01	UB-02	Foundation Soils	23.4	18.0	80.6	0.515	23.110	0.639	1.1	84.8	11	0	0.2	85.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.137	0.907
UC-01	UB-02	Foundation Soils	23.5	17.9	78.0	0.561	22.910	0.719	1.1	82.0	15	0	0.3	82.3	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.137	0.886
UC-01	UB-02	Foundation Soils	23.5	17.8	76.3	0.586	24.350	0.768	1.1	80.2	17	0	0.3	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.120	0.137	0.873
UC-01	UB-02	Foundation Soils	23.6	17.7	73.2	0.566	24.060	0.773	1.1	76.9	18	0	0.4	77.3	1.0	-0.4	0.0	0.9	0.113	1.011	0.117	0.137	0.850
UC-01	UB-02	Foundation Soils	23.7	17.6	77.4	0.574	23.420	0.742	1.1	81.0	16	0	0.3	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.137	0.878
UC-01	UB-02	Foundation Soils	23.8	17.5	82.8	0.632	19.680	0.763	1.1	86.3	14	0	0.3	86.6	1.0	-0.4	0.0	0.9	0.122	1.014	0.126	0.137	0.917
UC-01	UB-02	Foundation Soils	23.9	17.5	81.7	0.653	15.390	0.799	1.1	85.0	16	0	0.3	85.4	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.137	0.907
UC-01	UB-02	Foundation Soils	23.9	17.4	78.7	0.592	17.120	0.752	1.1	81.9	16	0	0.3	82.3	1.0	-0.4	0.1	0.9	0.118	1.013	0.121	0.137	0.884
UC-01	UB-02	Foundation Soils	24.0	17.3	77.0	0.581	20.020	0.755	1.1	80.1	16	0	0.3	80.4	1.0	-0.4	0.1	0.9	0.116	1.012	0.120	0.137	0.870
UC-01	UB-02	Foundation Soils	24.1	17.2	90.4	0.558	20.490	0.617	1.1	93.4	8	0	0.1	93.4	1.0	-0.4	0.1	0.9	0.129	1.016	0.134	0.137	0.973
UC-01	UB-02	Foundation Soils	24.2	17.1	102.2	0.491	18.960	0.480	1.1	105.0	0	0	0.0	105.0	1.0	-0.5	0.1	0.9	0.144	1.020	0.150	0.137	1.090
UC-01	UB-02	Foundation Soils	24.3	17.1	101.9	0.487	17.410	0.478	1.1	104.5	0	0	0.0	104.5	1.0	-0.5	0.1	0.9	0.143	1.019	0.149	0.138	1.083
UC-01	UB-02	Foundation Soils	24.4	17.0	97.3	0.500	17.960	0.514	1.1	99.9	2	0	0.0	99.9	1.0	-0.5	0.1	0.9	0.137	1.018	0.142	0.138	1.033
UC-01	UB-02	Foundation Soils	24.4	16.9	91.8	0.498	20.490	0.543	1.1	94.2	5	0	0.0	94.2	1.0	-0.5	0.1	0.9	0.130	1.016	0.135	0.138	0.978
UC-01	UB-02	Foundation Soils	24.5	16.8	84.8	0.445	20.630	0.525	1.1	87.1	7	0	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.126	0.138	0.918
UC-01	UB-02	Foundation Soils	24.6	16.7	80.8	0.435	21.060	0.538	1.1	83.1	9	0	0.1	83.2	1.0	-0.5	0.1	0.9	0.119	1.013	0.122	0.138	0.887
UC-01	UB-02	Foundation Soils	24.7	16.6	71.3	0.463	22.540	0.649	1.1	73.5	16	0	0.3	73.8	1.0	-0.5	0.1	0.9	0.110	1.011	0.113	0.138	0.822
UC-01	UB-02	Foundation Soils	24.8	16.6	63.9	0.492	21.150	0.770	1.1	65.9	23	0	0.4	66.4	1.0	-0.5	0.1	0.9	0.104	1.010	0.107	0.138	0.775
UC-01	UB-02	Foundation Soils	24.9	16.5	49.9	0.523	22.730	1.048	1.1	51.8	36	0	0.5	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.138	0.695
UC-01	UB-02	Foundation Soils	24.9	16.4	42.5	0.513	27.350	1.206	1.1	44.3	43	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.138	0.655
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.7	21.2	0.217	-0.090	1.023	1.6	32.9	49	20	42.3	75.2	1.1	-0.1	0.0	1.0	0.112	1.011	0.122	0.090	1.348
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.6	20.7	0.205	-0.110	0.989	1.6	32.1	49	20	42.2	74.3	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.091	1.330
UC-02A	UB-02 & UB-03	Foundation Soils	7.2	34.5	19.8	0.184	-0.050	0.931	1.6	30.7	50	20	42.0	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.119	0.091	1.303
UC-02A	UB-02 & UB-03	Foundation Soils	7.3	34.5	19.1	0.158	-0.050	0.829	1.6	29.6	49	20	41.6	71.2	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.092	1.281
UC-02A	UB-02 & UB-03	Foundation Soils	7.4	34.4	19.1	0.139	-0.240	0.727	1.6	29.6	47	20	41.3	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.092	1.270
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.3	19.5	0.124	-0.100	0.636	1.6	30.1	44	20	40.8	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.093	1.264
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.2	19.8	0.117	-0.050	0.590	1.6	30.5	43	20	40.6	71.1	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.093	1.258
UC-02A	UB-02 & UB-03	Foundation Soils	7.6	34.1	19.7	0.110	-0.100	0.560	1.6	30.2	42	20	40.4	70.6	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.094	1.246
UC-02A	UB-02 & UB-03	Foundation Soils	7.7	34.0	19.3	0.099	-0.010	0.513	1.6	29.6	42	20	40.1	69.7	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.094	1.231
UC-02A	UB-02 & UB-03	Foundation Soils	7.8	34.0	18.7	0.105	-0.050	0.562	1.6	28.6	44	20	40.5	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.095	1.218
UC-02A	UB-02 & UB-03	Foundation Soils	7.9	33.9	18.5	0.112	-0.050	0.604	1.6	28.3	45	20	40.7	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.095	1.211
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.8	18.0	0.112	-0.050	0.621	1.6	27.5	47	20	40.8	68.3	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.095	1.198
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.7	17.5	0.119	0.000	0.679	1.6	26.7	49	20	41.0	67.7	1.1	-0.1	0.0	1.0	0.105	1.010	0.114	0.096	1.186
UC-02A	UB-02 & UB-03	Foundation Soils	8.1	33.6	17.1	0.127	-0.050	0.741	1.6	26.1	51	20	41.2	67.3	1.1	-0.1	0.0	1.0	0.105	1.010	0.113	0.096	1.176
UC-02A	UB-02 & UB-03	Foundation Soils	8.2	33.5	16.3	0.129	-0.330	0.791	1.6	24.8	54	20	41.3	66.1	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.097	1.159
UC-02A	UB-02 & UB-03	Foundation Soils	8.3	33.5	15.8	0.124	0.000	0.786	1.6	24.0	55	20	41.2	65.2	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.097	1.145
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.4	15.4	0.119	-0.140	0.775	1.6	23.3	56	20	41.2	64.5	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.098	1.133
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.3	15.0	0.114	0.000	0.761	1.6	22.7	56	20	41.1	63.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.098	1.122
UC-02A	UB-02 & UB-03	Foundation Soils	8.5	33.2	14.9	0.110	0.000	0.741	1.6	22.4	56	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.098	1.114
UC-02A	UB-02 & UB-03	Foundation Soils	8.6	33.1	14.9	0.109	0.000	0.731	1.6	22.5	56	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.099	1.109
UC-02A	UB-02 & UB-03	Foundation Soils	8.7	33.1	14.8	0.112	-0.190	0.757	1.6	22.2	57	20	41.1	63.3	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.099	1.102
UC-02A	UB-02 & UB-03	Foundation Soils	8.8	33.0	14.3	0.117	0.000	0.816	1.6	21.5	59	20	41.1	62.7	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.100	1.092
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.9	13.8	0.110	-0.290	0.799	1.6	20.7	60	20	41.0	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.108	0.100	1.079
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.8	13.3	0.088	0.000	0.662	1.6	19.9	58	20	40.7	60.7	1.1	-0.1	0.0	1.0	0.100	1.009	0.107	0.100	1.065
UC-02A	UB-02 & UB-03	Foundation Soils	9.0	32.7	12.6	0.082	-0.050	0.653	1.6	18.8	60	20	40.6	59.5	1.1	-0.1	0.0	1.0	0.099	1.009	0.106	0.101	1.051
UC-02A	UB-02 & UB-03	Foundation Soils	9.1	32.6	11.5	0.081	0.000	0.702	1.6	17.3	64	20	40.6	57.9	1.1	-0.1	0.0	1.0	0.098	1.008	0.105	0.101	1.034
UC-02A	UB-02 & UB-03	Foundation Soils	9.2	32.6	11.0	0.080	-0.190	0.725	1.6	16.5	66	20	40.6	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.102	1.023
UC-02A	UB-02 & UB-03	Foundation Soils	9.3	32.5	11.2	0.081	1.750	0.726	1.6	16.7	66	20	40.6	57.3	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.102	1.020
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.4	11.2	0.089	2.570	0.792	1.6	16.7	67	20	40.7	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.102	1.017
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.3	11.2	0.103	4.510	0.922	1.6	16.6	70	20	40.8	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.103	1.013
UC-02A	UB-02 & UB-03	Foundation Soils	9.5	32.2	11.0	0.121	5.490	1.102	1.6	16.3	69	20	40.7	57.0	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.103	1.006
UC-02A	UB-02 & UB-03	Foundation Soils	9.6	32.2	10.4	0.124	6.200	1.192	1.6	15.4	72	20	40.7	56.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.103	0.103	0.995
UC-02A	UB-02 & UB-03	Foundation Soils	9.7	32.1	9.7	0.134	5.340	1.378	1.6	14.4	72	20	40.5	54.9	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.104	0.981
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	32.0	9.0	0.141	4.820	1.565	1.6	13.4	77	20	40.5	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.104	0.969
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	31.9	8.2	0.133	3.760	1.613	1.6	12.2	81	20	40.4	52.6	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.104	0.956
UC-02A	UB-02 & UB-03	Foundation Soils	9.9	31.8	9.3	0.119	2.420	1.283	1.6	13.7	73	20	40.3	54.0	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.105	0.964
UC-02A	UB-02 & UB-03	Foundation Soils	10.0	31.7	10.1	0.117	-2.520	1.157	1.6	14.8	73	20	40.6	55.4	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.105	0.971
UC-02A	UB-02 & UB-03	Foundation Soils	10.1	31.7	9.7	0.114	-3.380	1.173	1.6	14.2	74	20	40.5	54.8	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.105	0.963
UC-02A	UB-02 & UB-03	Foundation Soils	10.2	31.6	9.6	0.108	1.650	1.128	1.5	14.0	74	20	40.5	54.5	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.106	0.957
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.5	9.3	0.095	5.250	1.026	1.5	13.5	74	20	40.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.106	0.949
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.4	9.2	0.098	4.910	1.064	1.5	13.4	75	20	40.4	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.106	0.946

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	10.4	31.3	9.3	0.101	2.070	1.092	1.5	13.4	71	20	40.2	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.107	0.941
UC-02A	UB-02 & UB-03	Foundation Soils	10.5	31.3	9.4	0.122	1.720	1.292	1.5	13.7	74	20	40.4	54.1	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.107	0.941
UC-02A	UB-02 & UB-03	Foundation Soils	10.6	31.2	9.2	0.131	3.220	1.425	1.5	13.3	76	20	40.4	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.107	0.935
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.1	8.4	0.132	5.190	1.575	1.5	12.1	81	20	40.4	52.5	1.0	-0.1	0.0	1.0	0.094	1.008	0.099	0.108	0.923
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.0	8.1	0.133	8.160	1.640	1.5	11.7	83	20	40.3	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.108	0.917
UC-02A	UB-02 & UB-03	Foundation Soils	10.8	30.9	9.4	0.124	8.860	1.316	1.5	13.5	75	20	40.4	53.9	1.0	-0.2	0.0	1.0	0.095	1.008	0.101	0.108	0.928
UC-02A	UB-02 & UB-03	Foundation Soils	10.9	30.8	10.7	0.112	3.690	1.044	1.5	15.3	70	20	40.6	55.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.102	0.109	0.940
UC-02A	UB-02 & UB-03	Foundation Soils	11.0	30.8	12.6	0.121	0.330	0.963	1.5	17.7	68	20	41.0	58.7	1.1	-0.2	0.0	1.0	0.099	1.008	0.104	0.109	0.958
UC-02A	UB-02 & UB-03	Foundation Soils	11.1	30.7	13.4	0.139	-0.450	1.036	1.5	18.8	67	20	41.1	60.0	1.1	-0.2	0.0	1.0	0.100	1.009	0.105	0.109	0.966
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.6	13.7	0.137	1.240	0.999	1.5	19.2	66	20	41.1	60.3	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.110	0.965
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.5	13.7	0.127	4.670	0.925	1.5	19.2	65	20	41.1	60.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.110	0.962
UC-02A	UB-02 & UB-03	Foundation Soils	11.3	30.4	14.4	0.135	5.860	0.939	1.5	20.0	64	20	41.2	61.1	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.110	0.966
UC-02A	UB-02 & UB-03	Foundation Soils	11.4	30.4	15.9	0.149	1.200	0.935	1.5	22.0	60	20	41.3	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.110	0.980
UC-02A	UB-02 & UB-03	Foundation Soils	11.5	30.3	16.7	0.172	0.240	1.030	1.5	22.9	61	20	41.6	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.111	0.987
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.2	16.8	0.201	0.670	1.199	1.5	23.0	63	20	41.8	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.111	0.986
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.1	17.1	0.240	3.110	1.405	1.4	23.3	66	20	42.0	65.3	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.111	0.988
UC-02A	UB-02 & UB-03	Foundation Soils	11.7	30.0	17.8	0.231	4.750	1.298	1.4	24.2	63	20	42.0	66.2	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.111	0.992
UC-02A	UB-02 & UB-03	Foundation Soils	11.8	29.9	18.6	0.228	5.380	1.227	1.4	25.1	61	20	42.0	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.111	0.112	0.997
UC-02A	UB-02 & UB-03	Foundation Soils	11.9	29.9	19.9	0.240	5.960	1.204	1.4	26.8	59	20	42.2	69.0	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.112	1.009
UC-02A	UB-02 & UB-03	Foundation Soils	12.0	29.8	21.2	0.218	5.650	1.030	1.4	28.3	54	20	42.0	70.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.114	0.112	1.017
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.7	22.2	0.198	3.430	0.892	1.4	29.6	50	20	41.7	71.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.113	1.023
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.6	23.2	0.188	3.290	0.812	1.4	30.8	47	20	41.5	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.116	0.113	1.028
UC-02A	UB-02 & UB-03	Foundation Soils	12.2	29.5	24.1	0.194	5.270	0.804	1.4	31.9	46	20	41.5	73.4	1.1	-0.2	0.0	1.0	0.110	1.011	0.117	0.113	1.035
UC-02A	UB-02 & UB-03	Foundation Soils	12.3	29.4	24.6	0.238	5.880	0.967	1.4	32.4	48	20	42.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.113	1.042
UC-02A	UB-02 & UB-03	Foundation Soils	12.4	29.4	24.6	0.261	6.190	1.062	1.4	32.3	50	20	42.3	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.114	1.040
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.3	24.0	0.356	7.190	1.483	1.4	31.5	58	20	43.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.114	1.036
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.2	24.1	0.350	7.880	1.450	1.4	31.6	57	20	43.0	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.114	1.034
UC-02A	UB-02 & UB-03	Foundation Soils	12.6	29.1	27.9	0.344	10.290	1.235	1.4	36.1	50	20	43.0	79.1	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.114	1.071
UC-02A	UB-02 & UB-03	Foundation Soils	12.7	29.0	27.1	0.335	17.770	1.235	1.4	35.1	50	20	43.0	78.1	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.115	1.060
UC-02A	UB-02 & UB-03	Foundation Soils	12.8	29.0	24.3	0.335	6.170	1.378	1.4	31.6	56	20	42.9	74.5	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.115	1.026
UC-02A	UB-02 & UB-03	Foundation Soils	12.9	28.9	23.2	0.288	3.910	1.239	1.4	30.2	55	20	42.6	72.8	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.115	1.009
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.8	21.7	0.259	6.670	1.193	1.4	28.3	57	20	42.3	70.6	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.115	0.989
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.7	20.7	0.331	9.480	1.598	1.4	26.9	64	20	42.6	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.115	0.979
UC-02A	UB-02 & UB-03	Foundation Soils	13.1	28.6	18.1	0.380	9.600	2.096	1.4	23.7	70	20	42.4	66.0	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.116	0.949
UC-02A	UB-02 & UB-03	Foundation Soils	13.2	28.5	15.2	0.398	3.020	2.617	1.4	20.0	77	20	41.9	61.8	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.116	0.916
UC-02A	UB-02 & UB-03	Foundation Soils	13.3	28.5	13.2	0.263	5.340	1.989	1.4	17.4	76	20	41.3	58.7	1.0	-0.2	0.0	1.0	0.099	1.008	0.104	0.116	0.891
UC-02A	UB-02 & UB-03	Foundation Soils	13.4	28.4	12.1	0.197	11.400	1.627	1.4	16.0	75	20	40.9	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.116	0.877
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.3	17.8	0.135	20.680	0.759	1.4	23.1	55	20	41.1	64.2	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.117	0.927
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.2	20.5	0.061	7.310	0.297	1.4	26.6	38	20	38.5	65.1	1.0	-0.2	0.0	1.0	0.103	1.009	0.109	0.117	0.932
UC-02A	UB-02 & UB-03	Foundation Soils	13.6	28.1	17.6	0.041	-5.620	0.233	1.4	22.9	40	20	38.5	61.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.117	0.903
UC-02A	UB-02 & UB-03	Foundation Soils	13.7	28.1	15.4	0.049	-2.530	0.319	1.4	20.0	48	20	39.5	59.5	1.0	-0.2	0.0	1.0	0.099	1.009	0.104	0.117	0.888
UC-02A	UB-02 & UB-03	Foundation Soils	13.8	28.0	12.5	0.049	2.140	0.392	1.4	16.3	58	20	39.9	56.2	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.117	0.863
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.9	10.5	0.070	22.000	0.665	1.4	13.8	70	20	40.2	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.118	0.846
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.8	9.6	0.091	26.680	0.948	1.4	12.5	74	20	40.1	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.118	0.836
UC-02A	UB-02 & UB-03	Foundation Soils	14.0	27.7	10.1	0.101	27.490	0.999	1.4	13.2	73	20	40.2	53.4	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.118	0.839
UC-02A	UB-02 & UB-03	Foundation Soils	14.1	27.6	11.9	0.122	20.960	1.023	1.4	15.4	70	20	40.6	56.0	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.118	0.854
UC-02A	UB-02 & UB-03	Foundation Soils	14.2	27.6	12.6	0.109	14.850	0.864	1.4	16.3	69	20	40.7	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.119	0.859
UC-02A	UB-02 & UB-03	Foundation Soils	14.3	27.5	12.3	0.122	8.720	0.992	1.4	15.8	69	20	40.6	56.4	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.119	0.854
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.4	13.3	0.124	11.770	0.935	1.4	17.0	69	20	40.8	57.8	1.0	-0.2	0.0	1.0	0.098	1.008	0.102	0.119	0.862
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.3	18.4	0.139	9.710	0.757	1.3	23.2	55	20	41.1	64.3	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.119	0.905
UC-02A	UB-02 & UB-03	Foundation Soils	14.5	27.2	22.2	0.170	9.370	0.767	1.3	27.8	49	20	41.3	69.0	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.119	0.938
UC-02A	UB-02 & UB-03	Foundation Soils	14.6	27.2	31.1	0.212	10.390	0.682	1.3	38.4	37	20	40.5	78.9	1.0	-0.2	0.0	1.0	0.115	1.012	0.121	0.119	1.015
UC-02A	UB-02 & UB-03	Foundation Soils	14.7	27.1	39.3	0.271	8.340	0.690	1.3	47.9	30	20	39.2	87.0	1.0	-0.2	0.0	1.0	0.123	1.014	0.130	0.120	1.086
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	27.0	47.7	0.379	7.770	0.794	1.3	57.5	27	20	38.6	96.1	1.0	-0.2	0.0	1.0	0.132	1.016	0.141	0.120	1.179
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	26.9	59.4	0.426	6.920	0.718	1.3	70.9	19	20	30.6	101.6	1.1	-0.2	0.0	1.0	0.139	1.018	0.149	0.120	1.243
UC-02A	UB-02 & UB-03	Foundation Soils	14.9	26.8	67.3	0.479	6.960	0.712	1.3	80.1	15	20	23.8	103.9	1.1	-0.2	0.0	1.0	0.143	1.019	0.153	0.120	1.271
UC-02A	UB-02 & UB-03	Foundation Soils	15.0	26.7	76.0	0.511	6.640	0.672	1.3	90.4	10	20	11.4	101.8	1.1	-0.2	0.0	1.0	0.140	1.018	0.149	0.120	1.241
UC-02A	UB-02 & UB-03	Foundation Soils	15.1	26.7	85.4	0.607	6.480	0.711	1.3	101.0	8	20	5.4	106.4	1.1	-0.2	0.0	1.0	0.146	1.020	0.157	0.121	1.302
UC-02A	UB-02 & UB-03	Foundation Soils	15.2	26.6	91.2	0.740	6.220	0.811	1.2	106.8	9	20	8.4	115.2	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.121	1.444
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.5	94.9	0.739	5.860	0.779	1.2	110.9	7	20	3.4	114.3	1.1	-0.2	0.0	1.0	0.160	1.024	0.172	0.121	1.426
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.4	94.5	0.755	5.620	0.799	1.2	110.2	8	20	5.1	115.3	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.121	1.440
UC-02A	UB-02 & UB-03	Foundation Soils	15.4	26.3	86.7	0.827	5.380	0.954	1.2	100.2	14	20	23.9	124.1	1.1	-0.2	0.0	1.0	0.181	1.028	0.197	0.121	1.624

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	15.5	26.2	73.3	0.829	5.530	1.132	1.2	84.6	23	20	38.6	123.1	1.1	-0.2	0.0	1.0	0.179	1.028	0.194	0.121	1.598
UC-02A	UB-02 & UB-03	Foundation Soils	15.6	26.2	58.6	0.792	5.720	1.351	1.2	68.2	33	20	44.3	112.4	1.1	-0.2	0.0	1.0	0.156	1.023	0.168	0.122	1.382
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.1	43.3	0.722	6.420	1.669	1.2	51.0	46	20	45.3	96.3	1.0	-0.3	0.0	1.0	0.133	1.017	0.141	0.122	1.159
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.0	34.8	0.651	7.190	1.868	1.3	41.4	54	20	44.7	86.2	1.0	-0.3	0.0	1.0	0.122	1.014	0.128	0.122	1.054
UC-02A	UB-02 & UB-03	Foundation Soils	15.8	25.9	29.6	0.637	8.000	2.155	1.3	35.3	62	20	44.3	79.6	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.122	0.995
UC-02A	UB-02 & UB-03	Foundation Soils	15.9	25.8	20.9	0.617	8.400	2.955	1.3	25.3	74	20	42.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.111	0.122	0.905
UC-02A	UB-02 & UB-03	Foundation Soils	16.0	25.8	15.6	0.534	9.180	3.432	1.3	19.0	86	20	42.0	61.0	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.122	0.854
UC-02A	UB-02 & UB-03	Foundation Soils	16.1	25.7	10.4	0.479	9.340	4.615	1.3	12.8	100	20	41.0	53.7	1.0	-0.3	0.0	1.0	0.095	1.008	0.099	0.123	0.805
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.6	9.5	0.280	14.770	2.940	1.3	11.7	99	20	40.7	52.4	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.123	0.795
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.5	7.7	0.182	37.600	2.375	1.3	9.4	100	20	40.2	49.7	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.123	0.777
UC-02A	UB-02 & UB-03	Foundation Soils	16.3	25.4	8.2	0.161	74.090	1.970	1.3	10.0	96	20	40.3	50.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.123	0.780
UC-02A	UB-02 & UB-03	Foundation Soils	16.4	25.3	15.6	0.116	90.430	0.743	1.3	18.9	61	20	40.7	59.6	1.0	-0.3	0.0	1.0	0.099	1.009	0.103	0.123	0.838
UC-02A	UB-02 & UB-03	Foundation Soils	16.5	25.3	18.6	0.092	18.490	0.495	1.3	22.4	49	20	40.2	62.6	1.0	-0.3	0.0	1.0	0.101	1.009	0.106	0.123	0.856
UC-02A	UB-02 & UB-03	Foundation Soils	16.6	25.2	16.7	0.108	15.440	0.645	1.3	20.1	57	20	40.6	60.8	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.124	0.843
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.1	20.4	0.171	47.000	0.838	1.3	24.4	55	20	41.3	65.6	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.124	0.875
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.0	20.2	0.221	36.780	1.095	1.3	24.0	60	20	41.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.124	0.874
UC-02A	UB-02 & UB-03	Foundation Soils	16.8	24.9	13.9	0.232	14.530	1.673	1.3	16.7	76	20	41.1	57.8	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.124	0.820
UC-02A	UB-02 & UB-03	Foundation Soils	16.9	24.9	9.6	0.236	23.160	2.447	1.3	11.7	96	20	40.6	52.3	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.124	0.784
UC-02A	UB-02 & UB-03	Foundation Soils	17.0	24.8	7.7	0.188	58.390	2.450	1.3	9.3	100	20	40.2	49.5	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.124	0.766
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.7	9.6	0.142	69.470	1.477	1.3	11.6	86	20	40.4	52.0	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.124	0.780
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.6	10.8	0.122	62.770	1.130	1.3	12.9	78	20	40.4	53.3	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.125	0.787
UC-02A	UB-02 & UB-03	Foundation Soils	17.2	24.5	10.6	0.118	41.470	1.113	1.3	12.7	78	20	40.4	53.1	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.125	0.784
UC-02A	UB-02 & UB-03	Foundation Soils	17.3	24.4	9.0	0.108	42.400	1.198	1.3	10.8	85	20	40.2	51.0	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.125	0.770
UC-02A	UB-02 & UB-03	Foundation Soils	17.4	24.4	7.1	0.108	28.680	1.515	1.3	8.6	98	20	40.0	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.125	0.755
UC-02A	UB-02 & UB-03	Foundation Soils	17.5	24.3	5.5	0.112	37.470	2.020	1.3	6.7	100	20	39.6	46.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.125	0.740
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.2	5.2	0.117	51.120	2.268	1.3	6.2	100	20	39.5	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.125	0.735
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.1	4.6	0.136	64.690	2.929	1.3	5.6	100	20	39.4	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.126	0.730
UC-02A	UB-02 & UB-03	Foundation Soils	17.7	24.0	4.8	0.112	72.470	2.342	1.3	5.7	100	20	39.4	45.2	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.126	0.730
UC-02A	UB-02 & UB-03	Foundation Soils	17.8	24.0	5.6	0.085	76.690	1.529	1.3	6.6	100	20	39.6	46.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.126	0.736
UC-02A	UB-02 & UB-03	Foundation Soils	17.9	23.9	6.3	0.071	59.080	1.127	1.3	7.5	99	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.126	0.741
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.8	10.8	0.065	52.980	0.603	1.3	12.7	69	20	39.9	52.7	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.126	0.772
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.7	16.6	0.061	36.500	0.367	1.2	19.4	50	20	39.7	59.1	1.0	-0.3	0.0	0.9	0.099	1.009	0.102	0.126	0.811
UC-02A	UB-02 & UB-03	Foundation Soils	18.1	23.6	13.1	0.064	6.850	0.490	1.2	15.3	62	20	40.0	55.3	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.126	0.786
UC-02A	UB-02 & UB-03	Foundation Soils	18.2	23.5	8.8	0.071	-6.620	0.805	1.2	10.4	81	20	40.0	50.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.127	0.755
UC-02A	UB-02 & UB-03	Foundation Soils	18.3	23.5	7.0	0.071	1.190	1.012	1.2	8.3	94	20	39.9	48.1	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.127	0.741
UC-02A	UB-02 & UB-03	Foundation Soils	18.4	23.4	6.4	0.078	41.980	1.222	1.2	7.5	100	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.127	0.735
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.3	9.7	0.067	59.910	0.688	1.2	11.4	75	20	40.0	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.127	0.758
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.2	11.6	0.067	48.450	0.578	1.2	13.5	69	20	40.1	53.5	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.127	0.771
UC-02A	UB-02 & UB-03	Foundation Soils	18.6	23.1	14.5	0.072	30.590	0.495	1.2	16.8	59	20	40.1	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.127	0.790
UC-02A	UB-02 & UB-03	Foundation Soils	18.7	23.1	16.7	0.053	16.560	0.318	1.2	19.2	49	20	39.5	58.7	1.0	-0.3	0.0	0.9	0.099	1.008	0.102	0.127	0.800
UC-02A	UB-02 & UB-03	Foundation Soils	18.8	23.0	12.9	0.063	11.670	0.488	1.2	14.9	63	20	40.0	54.9	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.127	0.776
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.9	11.2	0.096	15.150	0.854	1.2	13.0	74	20	40.2	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.128	0.765
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.8	11.0	0.115	21.090	1.046	1.2	12.7	78	20	40.4	53.0	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.128	0.763
UC-02A	UB-02 & UB-03	Foundation Soils	19.0	22.7	7.4	0.126	19.660	1.704	1.2	8.6	100	20	40.0	48.6	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.128	0.736
UC-02A	UB-02 & UB-03	Foundation Soils	19.1	22.6	5.6	0.123	30.300	2.213	1.2	6.4	100	20	39.6	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.128	0.720
UC-02A	UB-02 & UB-03	Foundation Soils	19.2	22.6	4.7	0.117	44.640	2.469	1.2	5.5	100	20	39.4	44.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.128	0.713
UC-02A	UB-02 & UB-03	Foundation Soils	19.3	22.5	4.5	0.071	62.910	1.570	1.2	5.2	100	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.128	0.710
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.4	4.5	0.057	73.750	1.275	1.2	5.2	100	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.128	0.709
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.3	4.8	0.082	83.050	1.691	1.2	5.6	100	20	39.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.128	0.711
UC-02A	UB-02 & UB-03	Foundation Soils	19.5	22.2	5.4	0.088	82.660	1.622	1.2	6.2	100	20	39.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.129	0.715
UC-02A	UB-02 & UB-03	Foundation Soils	19.6	22.1	5.6	0.084	72.530	1.513	1.2	6.4	100	20	39.6	45.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.129	0.715
UC-02A	UB-02 & UB-03	Foundation Soils	19.7	22.1	6.9	0.068	69.660	0.981	1.2	7.9	96	20	39.8	47.7	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.129	0.724
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	22.0	9.9	0.091	6.340	0.923	1.2	11.2	81	20	40.1	51.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.129	0.744
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	21.9	8.7	0.100	14.720	1.152	1.2	9.9	90	20	40.1	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.095	0.129	0.736
UC-02A	UB-02 & UB-03	Foundation Soils	19.9	21.8	7.3	0.078	23.250	1.062	1.2	8.3	95	20	39.9	48.2	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.129	0.725
UC-02A	UB-02 & UB-03	Foundation Soils	20.0	21.7	6.1	0.066	44.340	1.077	1.2	7.0	100	20	39.7	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.129	0.715
UC-02A	UB-02 & UB-03	Foundation Soils	20.1	21.7	10.4	0.059	62.940	0.567	1.2	12.2	72	0	0.5	12.7	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.129	0.536
UC-02A	UB-02 & UB-03	Foundation Soils	20.2	21.6	22.2	0.151	71.950	0.681	1.2	25.8	51	0	0.5	26.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.129	0.603
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.5	18.7	0.237	21.870	1.264	1.2	21.9	67	0	0.5	22.4	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.130	0.583
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.4	13.8	0.198	22.930	1.437	1.2	16.1	78	0	0.5	16.6	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.130	0.554
UC-02A	UB-02 & UB-03	Foundation Soils	20.4	21.3	9.4	0.182	42.210	1.942	1.2	10.9	97	0	0.5	11.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.130	0.528
UC-02A	UB-02 & UB-03	Foundation Soils	20.5	21.2	15.3	0.215	64.950	1.407	1.2	17.8	74	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.130	0.561

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	20.6	21.2	57.1	0.254	87.190	0.445	1.2	63.1	14	0	0.3	63.3	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.130	0.809
UC-02A	UB-02 & UB-03	Foundation Soils	20.7	21.1	65.0	0.497	22.660	0.765	1.2	71.2	20	0	0.4	71.6	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.130	0.863
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	21.0	47.0	0.755	7.290	1.608	1.2	52.2	45	0	0.6	52.7	1.0	-0.4	0.0	0.9	0.094	1.008	0.097	0.130	0.744
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	20.9	30.0	0.683	13.100	2.274	1.2	34.0	65	0	0.5	34.5	1.0	-0.4	0.0	0.9	0.082	1.007	0.084	0.130	0.642
UC-02A	UB-02 & UB-03	Foundation Soils	20.9	20.8	25.1	0.659	21.010	2.631	1.2	28.5	72	0	0.5	29.0	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.130	0.612
UC-02A	UB-02 & UB-03	Foundation Soils	21.0	20.8	90.9	0.761	39.020	0.837	1.1	97.4	13	0	0.2	97.6	1.0	-0.4	0.0	0.9	0.134	1.017	0.140	0.130	1.075
UC-02A	UB-02 & UB-03	Foundation Soils	21.1	20.7	218.9	0.883	37.450	0.403	1.1	222.5	0	0	0.0	222.5	1.1	-0.4	0.0	0.9	8.684	1.082	10.094	0.130	77.366
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.6	259.1	1.050	18.530	0.405	1.1	260.8	0	0	0.0	260.8	1.1	-0.4	0.0	0.9	518.132	1.082	601.719	0.131	4609.242
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.5	275.3	1.167	14.110	0.424	1.1	276.9	0	0	0.0	276.9	1.1	-0.4	0.0	0.9	5888.862	1.082	6832.903	0.131	52312.099
UC-02A	UB-02 & UB-03	Foundation Soils	21.3	20.4	280.1	1.218	12.250	0.435	1.1	281.5	0	0	0.0	281.5	1.1	-0.4	0.0	0.9	12926.975	1.082	14985.879	0.131	########
UC-02A	UB-02 & UB-03	Foundation Soils	21.4	20.3	278.3	1.250	8.960	0.449	1.1	279.4	0	0	0.0	279.4	1.1	-0.4	0.0	0.9	8958.875	1.082	10376.732	0.131	79359.871
UC-02A	UB-02 & UB-03	Foundation Soils	21.5	20.3	270.5	1.224	11.000	0.453	1.1	271.3	0	0	0.0	271.3	1.1	-0.4	0.0	0.9	2397.744	1.082	2774.867	0.131	21210.020
UC-02A	UB-02 & UB-03	Foundation Soils	21.6	20.2	252.6	1.148	13.660	0.454	1.1	253.3	0	0	0.0	253.3	1.1	-0.4	0.0	0.9	193.153	1.082	223.344	0.131	1706.221
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.1	240.0	1.038	11.670	0.433	1.1	241.2	0	0	0.0	241.2	1.1	-0.4	0.0	0.9	48.660	1.082	56.218	0.131	429.243
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.0	224.9	0.949	14.050	0.422	1.1	226.7	0	0	0.0	226.7	1.1	-0.4	0.0	0.9	12.292	1.082	14.189	0.131	108.280
UC-02A	UB-02 & UB-03	Foundation Soils	21.8	19.9	214.8	0.852	12.430	0.397	1.1	216.9	0	0	0.0	216.9	1.1	-0.4	0.0	0.9	5.661	1.082	6.529	0.131	49.801
UC-02A	UB-02 & UB-03	Foundation Soils	21.9	19.9	197.3	0.787	12.840	0.399	1.1	200.0	0	0	0.0	200.0	1.1	-0.4	0.0	0.9	1.890	1.082	2.161	0.131	16.474
UC-02A	UB-02 & UB-03	Foundation Soils	22.0	19.8	173.5	0.732	12.820	0.422	1.1	176.9	0	0	0.0	176.9	1.0	-0.4	0.0	0.9	0.643	1.071	0.719	0.131	5.478
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.7	146.4	0.676	12.290	0.462	1.1	150.4	0	0	0.0	150.4	1.0	-0.4	0.0	0.9	0.291	1.046	0.315	0.131	2.398
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.6	118.5	0.704	12.780	0.594	1.1	122.9	0	0	0.0	122.9	1.0	-0.4	0.0	0.9	0.178	1.028	0.188	0.131	1.428
UC-02A	UB-02 & UB-03	Foundation Soils	22.2	19.5	98.6	0.561	13.150	0.569	1.1	103.0	3	0	0.0	103.0	1.0	-0.4	0.0	0.9	0.141	1.019	0.147	0.131	1.120
UC-02A	UB-02 & UB-03	Foundation Soils	22.3	19.4	78.7	0.530	13.530	0.673	1.1	82.9	13	0	0.2	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.122	0.132	0.931
UC-02A	UB-02 & UB-03	Foundation Soils	22.4	19.4	64.9	0.557	14.390	0.858	1.1	68.7	24	0	0.5	69.2	1.0	-0.4	0.0	0.9	0.107	1.010	0.109	0.132	0.832
UC-02A	UB-02 & UB-03	Foundation Soils	22.5	19.3	52.6	0.576	15.800	1.094	1.1	56.1	35	0	0.5	56.6	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.132	0.754
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.2	40.6	0.579	14.910	1.425	1.1	43.6	47	0	0.5	44.1	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.132	0.683
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.1	34.8	0.600	16.300	1.722	1.1	37.5	56	0	0.5	38.0	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.132	0.650
UC-02A	UB-02 & UB-03	Foundation Soils	22.7	19.0	28.6	0.447	18.620	1.565	1.1	30.9	60	0	0.5	31.4	1.0	-0.4	0.0	0.9	0.080	1.006	0.081	0.132	0.615
UC-02A	UB-02 & UB-03	Foundation Soils	22.8	18.9	24.8	0.421	19.280	1.697	1.1	26.9	65	0	0.5	27.4	1.0	-0.4	0.0	0.9	0.077	1.006	0.078	0.132	0.594
UC-02A	UB-02 & UB-03	Foundation Soils	22.9	18.9	15.9	0.332	31.920	2.083	1.2	17.4	83	0	0.5	17.9	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.132	0.547
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.8	13.3	0.284	41.160	2.142	1.2	14.4	90	0	0.5	14.9	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.132	0.533
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.7	17.2	0.213	17.500	1.236	1.2	18.7	71	0	0.5	19.2	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.132	0.553
UC-02A	UB-02 & UB-03	Foundation Soils	23.1	18.6	30.6	0.145	48.030	0.474	1.1	32.7	37	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.082	0.132	0.622
UC-02A	UB-02 & UB-03	Foundation Soils	23.2	18.5	44.4	0.131	20.440	0.295	1.1	46.9	18	0	0.3	47.3	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.132	0.697
UC-02A	UB-02 & UB-03	Foundation Soils	23.3	18.5	49.8	0.140	10.100	0.281	1.1	52.4	14	0	0.2	52.6	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.132	0.726
UC-02A	UB-02 & UB-03	Foundation Soils	23.4	18.4	48.0	0.159	9.740	0.331	1.1	50.4	17	0	0.3	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.132	0.715
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.3	41.1	0.197	15.960	0.479	1.1	43.3	28	0	0.4	43.8	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.132	0.676
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.2	38.0	0.203	19.580	0.534	1.1	40.1	32	0	0.5	40.5	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.132	0.659
UC-02A	UB-02 & UB-03	Foundation Soils	23.6	18.1	35.0	0.214	23.650	0.612	1.1	36.8	37	0	0.5	37.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.133	0.641
UC-02A	UB-02 & UB-03	Foundation Soils	23.7	18.0	34.5	0.210	26.440	0.609	1.1	36.3	37	0	0.5	36.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.133	0.638
UC-02A	UB-02 & UB-03	Foundation Soils	23.8	18.0	35.7	0.193	24.200	0.541	1.1	37.4	34	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.133	0.644
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.9	36.6	0.172	25.350	0.470	1.1	38.3	31	0	0.5	38.8	1.0	-0.4	0.0	0.9	0.085	1.007	0.086	0.133	0.648
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.8	37.6	0.175	24.820	0.465	1.1	39.3	30	0	0.5	39.7	1.0	-0.4	0.1	0.9	0.085	1.007	0.087	0.133	0.652
UC-02A	UB-02 & UB-03	Foundation Soils	24.0	17.7	39.2	0.203	24.260	0.518	1.1	40.8	31	0	0.5	41.3	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.133	0.660
UC-02A	UB-02 & UB-03	Foundation Soils	24.1	17.6	39.5	0.231	22.770	0.585	1.1	41.0	32	0	0.5	41.5	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.133	0.661
UC-02A	UB-02 & UB-03	Foundation Soils	24.2	17.6	39.5	0.238	24.920	0.602	1.1	41.0	33	0	0.5	41.5	1.0	-0.5	0.1	0.9	0.086	1.007	0.088	0.133	0.661
UC-02A	UB-02 & UB-03	Foundation Soils	24.3	17.5	42.9	0.243	27.440	0.566	1.1	44.4	29	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.133	0.678
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.4	46.3	0.237	26.300	0.511	1.1	47.7	25	0	0.4	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.133	0.696
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.3	49.4	0.238	22.960	0.482	1.1	50.7	22	0	0.4	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.095	0.133	0.712
UC-02A	UB-02 & UB-03	Foundation Soils	24.5	17.2	49.1	0.278	22.460	0.567	1.1	50.3	25	0	0.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.094	0.133	0.709
UC-02A	UB-02 & UB-03	Foundation Soils	24.6	17.1	46.6	0.312	22.220	0.670	1.1	47.8	30	0	0.5	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.133	0.695
UC-02A	UB-02 & UB-03	Foundation Soils	24.7	17.1	43.2	0.337	23.350	0.779	1.1	44.3	35	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.133	0.676
UC-02A	UB-02 & UB-03	Foundation Soils	24.8	17.0	39.2	0.333	23.250	0.849	1.1	40.2	39	0	0.5	40.7	1.0	-0.5	0.1	0.9	0.086	1.007	0.087	0.133	0.654
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.9	35.2	0.330	24.090	0.937	1.1	36.1	44	0	0.5	36.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.133	0.633
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.8	34.3	0.342	24.850	0.996	1.1	35.2	46	0	0.5	35.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.133	0.627
UC-03	UB-03	Foundation Soils	6.1	36.1	32.7	0.402	-3.290	1.228	1.7	51.7	38	30	49.9	101.7	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.091	1.723
UC-03	UB-03	Foundation Soils	6.2	36.0	33.3	0.388	-1.020	1.165	1.7	52.4	37	30	49.5	101.9	1.1	-0.1	0.0	1.0	0.140	1.018	0.157	0.091	1.716
UC-03	UB-03	Foundation Soils	6.2	35.9	33.9	0.388	-1.050	1.144	1.7	53.1	36	30	49.3	102.4	1.1	-0.1	0.0	1.0	0.141	1.019	0.157	0.092	1.715
UC-03	UB-03	Foundation Soils	6.3	35.8	34.3	0.340	-1.100	0.990	1.7	53.7	33	30	47.8	101.6	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.092	1.689
UC-03	UB-03	Foundation Soils	6.4	35.8	33.8	0.342	-0.910	1.011	1.7	52.9	34	30	48.1	101.0	1.1	-0.1	0.0	1.0	0.139	1.018	0.155	0.093	1.669
UC-03	UB-03	Foundation Soils	6.5	35.7	31.1	0.356	-0.950	1.145	1.7	48.7	39	30	49.5	98.2	1.1	-0.1	0.0	1.0	0.135	1.017	0.151	0.094	1.614
UC-03	UB-03	Foundation Soils	6.6	35.6	29.7	0.380	-1.000	1.280	1.7	46.5	42	30	50.1	96.7	1.1	-0.1	0.0	1.0	0.133	1.017	0.149	0.094	1.583
UC-03	UB-03	Foundation Soils	6.6	35.5	27.3	0.388	-1.180	1.422	1.7	43.0	47	30	50.5	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.145	0.095	1.527

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	6.7	35.4	27.5	0.370	-0.620	1.347	1.7	43.1	46	30	50.2	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.144	0.095	1.517
UC-03	UB-03	Foundation Soils	6.8	35.4	27.8	0.363	-0.330	1.304	1.7	43.5	45	30	50.1	93.7	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.096	1.513
UC-03	UB-03	Foundation Soils	6.9	35.3	28.7	0.365	-0.670	1.270	1.6	44.7	43	30	50.0	94.7	1.1	-0.1	0.0	1.0	0.131	1.016	0.146	0.096	1.520
UC-03	UB-03	Foundation Soils	7.0	35.2	28.5	0.361	-1.740	1.266	1.6	44.2	44	30	50.0	94.2	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.097	1.504
UC-03	UB-03	Foundation Soils	7.1	35.1	24.1	0.345	-1.750	1.434	1.7	37.8	51	30	50.0	87.8	1.1	-0.1	0.0	1.0	0.123	1.014	0.137	0.097	1.406
UC-03	UB-03	Foundation Soils	7.1	35.0	20.6	0.340	-1.670	1.647	1.7	32.7	58	30	49.8	82.5	1.1	-0.1	0.0	1.0	0.118	1.013	0.130	0.098	1.333
UC-03	UB-03	Foundation Soils	7.2	34.9	14.3	0.349	-1.240	2.445	1.7	22.9	72	30	48.5	71.4	1.1	-0.1	0.0	1.0	0.108	1.010	0.118	0.098	1.206
UC-03	UB-03	Foundation Soils	7.3	34.9	11.1	0.350	-1.160	3.167	1.7	17.7	78	30	47.6	65.3	1.1	-0.1	0.0	1.0	0.104	1.009	0.113	0.099	1.140
UC-03	UB-03	Foundation Soils	7.4	34.8	8.1	0.332	-0.620	4.101	1.7	13.0	93	30	46.9	59.9	1.1	-0.1	0.0	1.0	0.099	1.009	0.108	0.099	1.085
UC-03	UB-03	Foundation Soils	7.5	34.7	6.6	0.309	-0.190	4.661	1.7	10.6	100	30	46.5	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.105	0.100	1.055
UC-03	UB-03	Foundation Soils	7.5	34.6	5.3	0.269	-0.050	5.028	1.7	8.6	100	30	46.0	54.5	1.1	-0.1	0.0	1.0	0.096	1.008	0.103	0.100	1.028
UC-03	UB-03	Foundation Soils	7.6	34.5	4.4	0.230	9.740	5.214	1.7	7.1	100	30	45.6	52.7	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.101	1.007
UC-03	UB-03	Foundation Soils	7.7	34.5	4.0	0.210	13.670	5.283	1.7	6.4	100	30	45.4	51.8	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.101	0.995
UC-03	UB-03	Foundation Soils	7.8	34.4	3.3	0.193	14.150	5.887	1.7	5.3	100	30	45.1	50.4	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.102	0.979
UC-03	UB-03	Foundation Soils	7.9	34.3	2.8	0.167	34.730	5.908	1.7	4.5	100	30	44.9	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.102	0.967
UC-03	UB-03	Foundation Soils	8.0	34.2	2.8	0.178	37.590	6.257	1.7	4.6	100	30	45.0	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.102	0.962
UC-03	UB-03	Foundation Soils	8.0	34.1	3.2	0.182	34.920	5.656	1.7	5.2	100	30	45.1	50.3	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.103	0.964
UC-03	UB-03	Foundation Soils	8.1	34.0	3.9	0.203	31.540	5.209	1.7	6.2	100	30	45.4	51.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.103	0.970
UC-03	UB-03	Foundation Soils	8.2	34.0	3.7	0.229	29.760	6.213	1.7	5.9	100	30	45.3	51.2	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.104	0.962
UC-03	UB-03	Foundation Soils	8.3	33.9	4.0	0.225	35.830	5.564	1.7	6.5	100	30	45.4	51.9	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.104	0.964
UC-03	UB-03	Foundation Soils	8.4	33.8	5.3	0.215	46.980	4.085	1.7	8.4	100	30	45.9	54.4	1.1	-0.1	0.0	1.0	0.095	1.008	0.102	0.105	0.979
UC-03	UB-03	Foundation Soils	8.4	33.7	9.4	0.169	50.500	1.805	1.7	15.0	74	30	46.7	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.109	0.105	1.034
UC-03	UB-03	Foundation Soils	8.5	33.6	19.1	0.156	14.610	0.817	1.6	29.3	49	30	47.6	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.106	1.169
UC-03	UB-03	Foundation Soils	8.6	33.6	22.0	0.178	-0.140	0.809	1.6	33.4	44	30	47.7	81.0	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.106	1.205
UC-03	UB-03	Foundation Soils	8.7	33.5	22.4	0.181	-0.660	0.807	1.6	33.9	44	30	47.7	81.5	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.106	1.205
UC-03	UB-03	Foundation Soils	8.8	33.4	21.4	0.203	-0.990	0.949	1.6	32.3	48	30	48.2	80.5	1.1	-0.1	0.0	1.0	0.116	1.012	0.127	0.107	1.190
UC-03	UB-03	Foundation Soils	8.9	33.3	19.7	0.206	-0.730	1.048	1.6	29.8	53	30	48.4	78.1	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.107	1.161
UC-03	UB-03	Foundation Soils	8.9	33.2	18.7	0.251	-0.950	1.344	1.6	28.3	59	30	48.8	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.107	1.145
UC-03	UB-03	Foundation Soils	9.0	33.1	17.2	0.272	-2.240	1.580	1.6	26.1	65	30	48.8	74.9	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.108	1.120
UC-03	UB-03	Foundation Soils	9.1	33.1	14.4	0.253	-1.130	1.763	1.6	22.0	67	30	48.0	70.0	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.108	1.071
UC-03	UB-03	Foundation Soils	9.2	33.0	11.8	0.198	-0.150	1.680	1.6	18.2	72	30	47.4	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.109	1.029
UC-03	UB-03	Foundation Soils	9.3	32.9	11.9	0.180	-0.670	1.511	1.6	18.3	70	30	47.3	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.109	1.026
UC-03	UB-03	Foundation Soils	9.4	32.8	15.6	0.172	-0.800	1.099	1.6	23.6	61	30	47.9	71.5	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.109	1.073
UC-03	UB-03	Foundation Soils	9.4	32.7	18.7	0.161	-0.670	0.862	1.6	27.9	51	30	47.7	75.6	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.110	1.106
UC-03	UB-03	Foundation Soils	9.5	32.6	21.6	0.174	-1.470	0.804	1.6	31.9	46	30	47.6	79.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.125	0.110	1.139
UC-03	UB-03	Foundation Soils	9.6	32.6	22.0	0.120	-1.380	0.546	1.6	32.4	39	30	45.9	78.4	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.110	1.124
UC-03	UB-03	Foundation Soils	9.7	32.5	22.0	0.129	-1.290	0.587	1.6	32.3	40	30	46.3	78.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.111	1.122
UC-03	UB-03	Foundation Soils	9.8	32.4	21.4	0.163	-1.190	0.761	1.6	31.4	45	30	47.4	78.8	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.111	1.120
UC-03	UB-03	Foundation Soils	9.8	32.3	17.1	0.198	-1.050	1.156	1.6	25.3	59	30	48.2	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.111	1.067
UC-03	UB-03	Foundation Soils	9.9	32.2	19.4	0.222	-0.950	1.146	1.6	28.4	56	30	48.5	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.112	1.094
UC-03	UB-03	Foundation Soils	10.0	32.2	18.4	0.229	-0.710	1.248	1.6	26.9	59	30	48.5	75.4	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.112	1.077
UC-03	UB-03	Foundation Soils	10.1	32.1	17.1	0.245	-0.180	1.435	1.6	25.0	64	30	48.5	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.112	1.057
UC-03	UB-03	Foundation Soils	10.2	32.0	16.0	0.301	1.430	1.880	1.6	23.5	67	30	48.3	71.8	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.113	1.039
UC-03	UB-03	Foundation Soils	10.3	31.9	15.4	0.262	1.520	1.705	1.6	22.5	71	30	48.4	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.113	1.028
UC-03	UB-03	Foundation Soils	10.3	31.8	14.3	0.265	3.200	1.848	1.6	21.1	70	30	48.0	69.0	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.113	1.009
UC-03	UB-03	Foundation Soils	10.4	31.7	15.5	0.288	3.950	1.864	1.5	22.6	68	30	48.2	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.114	1.020
UC-03	UB-03	Foundation Soils	10.5	31.7	19.3	0.304	1.430	1.574	1.5	27.8	62	30	49.0	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.114	1.069
UC-03	UB-03	Foundation Soils	10.6	31.6	22.7	0.278	-3.810	1.223	1.5	32.3	53	30	49.0	81.3	1.1	-0.1	0.0	1.0	0.117	1.012	0.127	0.114	1.107
UC-03	UB-03	Foundation Soils	10.7	31.5	18.4	0.319	-4.320	1.736	1.5	26.4	66	30	49.0	75.3	1.1	-0.1	0.0	1.0	0.112	1.011	0.120	0.115	1.050
UC-03	UB-03	Foundation Soils	10.7	31.4	13.2	0.315	-2.570	2.391	1.5	19.2	74	30	47.7	66.9	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.115	0.977
UC-03	UB-03	Foundation Soils	10.8	31.3	9.7	0.327	12.580	3.372	1.6	14.3	90	30	47.2	61.4	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.115	0.932
UC-03	UB-03	Foundation Soils	10.9	31.3	10.6	0.303	22.510	2.864	1.6	15.5	84	30	47.3	62.7	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.116	0.939
UC-03	UB-03	Foundation Soils	11.0	31.2	9.9	0.245	8.610	2.464	1.6	14.6	83	30	47.0	61.5	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.116	0.927
UC-03	UB-03	Foundation Soils	11.1	31.1	9.5	0.179	4.050	1.879	1.6	13.9	79	30	46.7	60.6	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.116	0.917
UC-03	UB-03	Foundation Soils	11.2	31.0	7.4	0.175	5.700	2.376	1.6	10.8	92	30	46.4	57.2	1.1	-0.2	0.0	1.0	0.097	1.008	0.104	0.116	0.890
UC-03	UB-03	Foundation Soils	11.2	30.9	5.2	0.177	8.480	3.376	1.6	7.8	100	30	45.8	53.5	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.117	0.862
UC-03	UB-03	Foundation Soils	11.3	30.8	3.9	0.192	18.680	4.953	1.6	5.8	100	30	45.3	51.0	1.1	-0.2	0.0	1.0	0.093	1.008	0.099	0.117	0.842
UC-03	UB-03	Foundation Soils	11.4	30.8	4.5	0.184	31.450	4.120	1.6	6.6	100	30	45.5	52.1	1.1	-0.2	0.0	1.0	0.094	1.008	0.099	0.117	0.847
UC-03	UB-03	Foundation Soils	11.5	30.7	5.4	0.166	22.440	3.091	1.6	7.9	100	30	45.8	53.7	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.118	0.856
UC-03	UB-03	Foundation Soils	11.6	30.6	7.9	0.154	22.200	1.937	1.5	11.5	87	30	46.4	57.9	1.1	-0.2	0.0	1.0	0.098	1.008	0.104	0.118	0.883
UC-03	UB-03	Foundation Soils	11.6	30.5	10.5	0.153	5.100	1.460	1.5	15.0	72	30	46.6	61.7	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.118	0.907
UC-03	UB-03	Foundation Soils	11.7	30.4	11.0	0.150	2.000	1.358	1.5	15.8	73	30	46.9	62.6	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.118	0.912

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	11.8	30.4	11.6	0.146	3.100	1.263	1.5	16.5	71	30	46.9	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.119	0.915
UC-03	UB-03	Foundation Soils	11.9	30.3	11.9	0.143	4.380	1.200	1.5	16.9	69	30	46.9	63.8	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.119	0.916
UC-03	UB-03	Foundation Soils	12.0	30.2	12.1	0.154	4.860	1.268	1.5	17.2	70	30	47.0	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.119	0.916
UC-03	UB-03	Foundation Soils	12.1	30.1	12.3	0.148	4.810	1.206	1.5	17.3	68	30	46.9	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.120	0.915
UC-03	UB-03	Foundation Soils	12.1	30.0	12.4	0.164	4.910	1.318	1.5	17.5	70	30	47.1	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.120	0.915
UC-03	UB-03	Foundation Soils	12.2	29.9	12.8	0.157	5.050	1.223	1.5	18.0	67	30	47.0	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.120	0.916
UC-03	UB-03	Foundation Soils	12.3	29.9	13.4	0.155	4.510	1.153	1.5	18.7	69	30	47.3	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.120	0.922
UC-03	UB-03	Foundation Soils	12.4	29.8	13.2	0.158	3.860	1.196	1.5	18.4	70	30	47.3	65.7	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.120	0.917
UC-03	UB-03	Foundation Soils	12.5	29.7	12.5	0.166	4.030	1.331	1.5	17.4	70	30	47.1	64.4	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.121	0.905
UC-03	UB-03	Foundation Soils	12.5	29.6	12.3	0.177	4.190	1.436	1.5	17.1	72	30	47.1	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.121	0.902
UC-03	UB-03	Foundation Soils	12.6	29.5	12.3	0.183	4.900	1.494	1.5	17.0	73	30	47.1	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.121	0.899
UC-03	UB-03	Foundation Soils	12.7	29.4	12.7	0.200	5.290	1.581	1.5	17.5	73	30	47.3	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.121	0.901
UC-03	UB-03	Foundation Soils	12.8	29.4	13.5	0.240	5.880	1.778	1.5	18.6	74	30	47.6	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.122	0.909
UC-03	UB-03	Foundation Soils	12.9	29.3	14.2	0.300	6.150	2.106	1.5	19.5	72	30	47.7	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.122	0.915
UC-03	UB-03	Foundation Soils	13.0	29.2	14.2	0.353	7.950	2.486	1.4	19.4	76	30	47.9	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.122	0.914
UC-03	UB-03	Foundation Soils	13.0	29.1	12.6	0.440	8.620	3.488	1.5	17.3	87	30	47.8	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.122	0.896
UC-03	UB-03	Foundation Soils	13.1	29.0	9.7	0.479	11.930	4.961	1.5	13.3	100	30	47.2	60.5	1.0	-0.2	0.0	1.0	0.100	1.009	0.106	0.123	0.861
UC-03	UB-03	Foundation Soils	13.2	29.0	7.7	0.508	6.100	6.608	1.5	10.6	100	30	46.5	57.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.103	0.123	0.837
UC-03	UB-03	Foundation Soils	13.3	28.9	6.2	0.515	14.190	8.282	1.5	8.6	100	30	46.0	54.6	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.123	0.818
UC-03	UB-03	Foundation Soils	13.4	28.8	4.7	0.522	36.640	11.133	1.5	6.5	100	30	45.5	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.123	0.800
UC-03	UB-03	Foundation Soils	13.5	28.7	4.1	0.497	34.830	12.100	1.5	5.7	100	30	45.2	51.0	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.124	0.792
UC-03	UB-03	Foundation Soils	13.5	28.6	3.6	0.419	42.500	11.494	1.5	5.1	100	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.124	0.785
UC-03	UB-03	Foundation Soils	13.6	28.5	3.4	0.406	49.020	11.955	1.5	4.7	100	30	45.0	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.124	0.780
UC-03	UB-03	Foundation Soils	13.7	28.5	3.1	0.399	50.170	12.816	1.5	4.3	100	30	44.9	49.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.124	0.776
UC-03	UB-03	Foundation Soils	13.8	28.4	3.5	0.381	50.690	10.866	1.5	4.8	100	30	45.0	49.9	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.124	0.778
UC-03	UB-03	Foundation Soils	13.9	28.3	3.7	0.360	21.150	9.724	1.5	5.1	100	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.125	0.779
UC-03	UB-03	Foundation Soils	13.9	28.2	3.1	0.328	9.560	10.685	1.5	4.2	100	30	44.9	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.096	0.125	0.771
UC-03	UB-03	Foundation Soils	14.0	28.1	2.2	0.298	10.050	13.347	1.5	3.1	100	30	44.6	47.7	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.125	0.760
UC-03	UB-03	Foundation Soils	14.1	28.1	1.4	0.250	27.490	17.342	1.5	2.0	100	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.125	0.751
UC-03	UB-03	Foundation Soils	14.2	28.0	1.4	0.193	36.070	13.448	1.5	2.0	100	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.125	0.749
UC-03	UB-03	Foundation Soils	14.3	27.9	1.3	0.339	49.690	25.874	1.5	1.8	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.126	0.747
UC-03	UB-03	Foundation Soils	14.4	27.8	1.3	0.338	55.840	25.063	1.5	1.8	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.126	0.746
UC-03	UB-03	Foundation Soils	14.4	27.7	1.4	0.369	57.410	27.164	1.4	1.9	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.126	0.744
UC-03	UB-03	Foundation Soils	14.5	27.6	1.4	0.370	53.730	26.515	1.4	1.9	100	30	44.3	46.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.126	0.743
UC-03	UB-03	Foundation Soils	14.6	27.6	4.4	0.395	-0.820	8.988	1.4	5.9	100	30	45.3	51.2	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.126	0.773
UC-03	UB-03	Foundation Soils	14.7	27.5	4.4	0.433	12.910	9.953	1.4	5.8	100	30	45.3	51.1	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.126	0.771
UC-03	UB-03	Foundation Soils	14.8	27.4	4.6	0.447	27.110	9.719	1.4	6.1	100	30	45.4	51.5	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.127	0.772
UC-03	UB-03	Foundation Soils	14.8	27.3	5.1	0.408	26.390	7.946	1.4	6.8	100	30	45.5	52.4	1.0	-0.2	0.0	1.0	0.094	1.008	0.098	0.127	0.776
UC-03	UB-03	Foundation Soils	14.9	27.2	6.0	0.375	17.150	6.284	1.4	7.9	100	30	45.8	53.7	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.127	0.783
UC-03	UB-03	Foundation Soils	15.0	27.2	7.2	0.355	7.050	4.942	1.4	9.5	100	30	46.2	55.7	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.127	0.794
UC-03	UB-03	Foundation Soils	15.1	27.1	10.7	0.301	3.260	2.813	1.4	13.9	90	30	47.1	61.0	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.127	0.827
UC-03	UB-03	Foundation Soils	15.2	27.0	17.4	0.267	-8.530	1.534	1.4	22.3	69	30	48.2	70.5	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.128	0.890
UC-03	UB-03	Foundation Soils	15.3	26.9	21.6	0.237	-8.770	1.096	1.3	27.4	56	30	48.2	75.6	1.0	-0.2	0.0	1.0	0.112	1.011	0.118	0.128	0.927
UC-03	UB-03	Foundation Soils	15.3	26.8	22.6	0.253	-5.720	1.120	1.3	28.5	55	30	48.4	76.9	1.0	-0.2	0.0	1.0	0.113	1.011	0.120	0.128	0.936
UC-03	UB-03	Foundation Soils	15.4	26.7	24.1	0.266	5.140	1.103	1.3	30.3	53	30	48.5	78.8	1.0	-0.2	0.0	1.0	0.115	1.012	0.122	0.128	0.949
UC-03	UB-03	Foundation Soils	15.5	26.7	25.1	0.268	6.670	1.068	1.3	31.4	51	30	48.5	79.9	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.128	0.956
UC-03	UB-03	Foundation Soils	15.6	26.6	25.7	0.259	6.860	1.006	1.3	32.1	49	30	48.4	80.5	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.128	0.960
UC-03	UB-03	Foundation Soils	15.7	26.5	25.5	0.252	6.620	0.989	1.3	31.8	49	30	48.3	80.1	1.0	-0.3	0.0	1.0	0.116	1.012	0.123	0.129	0.954
UC-03	UB-03	Foundation Soils	15.7	26.4	24.5	0.244	6.230	0.997	1.3	30.5	51	30	48.2	78.7	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.129	0.943
UC-03	UB-03	Foundation Soils	15.8	26.3	20.4	0.230	6.240	1.129	1.3	25.5	59	30	48.1	73.6	1.0	-0.3	0.0	1.0	0.110	1.011	0.116	0.129	0.902
UC-03	UB-03	Foundation Soils	15.9	26.3	18.1	0.211	6.500	1.166	1.3	22.7	63	30	47.8	70.6	1.0	-0.3	0.0	1.0	0.108	1.010	0.113	0.129	0.879
UC-03	UB-03	Foundation Soils	16.0	26.2	13.8	0.192	6.960	1.390	1.3	17.5	72	30	47.2	64.6	1.0	-0.3	0.0	1.0	0.103	1.009	0.108	0.129	0.837
UC-03	UB-03	Foundation Soils	16.1	26.1	8.6	0.183	7.590	2.139	1.4	10.9	94	30	46.4	57.3	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.129	0.789
UC-03	UB-03	Foundation Soils	16.2	26.0	6.7	0.133	7.720	1.992	1.4	8.5	100	30	46.0	54.5	1.0	-0.3	0.0	1.0	0.095	1.008	0.100	0.129	0.770
UC-03	UB-03	Foundation Soils	16.2	25.9	4.6	0.139	8.120	3.034	1.4	5.9	100	30	45.3	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.130	0.749
UC-03	UB-03	Foundation Soils	16.3	25.8	3.3	0.132	8.240	3.998	1.4	4.2	100	30	44.9	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.096	0.130	0.736
UC-03	UB-03	Foundation Soils	16.4	25.8	2.6	0.125	8.560	4.783	1.4	3.4	100	30	44.7	48.0	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.130	0.728
UC-03	UB-03	Foundation Soils	16.5	25.7	2.2	0.112	7.080	5.175	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.130	0.722
UC-03	UB-03	Foundation Soils	16.6	25.6	2.2	0.106	10.480	4.895	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.131	0.721
UC-03	UB-03	Foundation Soils	16.7	25.5	2.2	0.097	15.970	4.410	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.131	0.720
UC-03	UB-03	Foundation Soils	16.7	25.4	2.5	0.092	17.580	3.637	1.4	3.2	100	30	44.6	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.131	0.721
UC-03	UB-03	Foundation Soils	16.8	25.3	3.9	0.107	17.120	2.767	1.4	4.9	100	30	45.0	50.0	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.131	0.733

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	16.9	25.3	7.0	0.139	14.390	1.974	1.3	8.9	100	30	46.0	55.0	1.0	-0.3	0.0	1.0	0.096	1.008	0.100	0.131	0.761
UC-03	UB-03	Foundation Soils	17.0	25.2	20.6	0.167	6.100	0.809	1.4	27.5	53	0	0.5	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.080	0.132	0.609
UC-03	UB-03	Foundation Soils	17.1	25.1	27.3	0.203	7.050	0.745	1.4	35.6	43	0	0.5	36.1	1.0	-0.3	0.0	1.0	0.083	1.007	0.086	0.132	0.651
UC-03	UB-03	Foundation Soils	17.1	25.0	29.2	0.273	6.380	0.936	1.4	37.8	45	0	0.5	38.3	1.0	-0.3	0.0	1.0	0.084	1.007	0.087	0.132	0.663
UC-03	UB-03	Foundation Soils	17.2	24.9	30.1	0.277	8.000	0.919	1.4	38.8	44	0	0.5	39.4	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.132	0.668
UC-03	UB-03	Foundation Soils	17.3	24.9	30.6	0.282	8.240	0.922	1.4	39.3	43	0	0.5	39.8	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.132	0.669
UC-03	UB-03	Foundation Soils	17.4	24.8	31.8	0.270	8.430	0.849	1.4	40.6	41	0	0.5	41.2	1.0	-0.3	0.0	1.0	0.086	1.007	0.089	0.132	0.676
UC-03	UB-03	Foundation Soils	17.5	24.7	36.4	0.263	9.010	0.722	1.3	46.0	34	0	0.5	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.132	0.705
UC-03	UB-03	Foundation Soils	17.6	24.6	40.7	0.253	8.910	0.621	1.3	50.9	28	0	0.5	51.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.132	0.732
UC-03	UB-03	Foundation Soils	17.6	24.5	44.9	0.260	8.410	0.580	1.3	55.5	24	0	0.4	56.0	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.132	0.759
UC-03	UB-03	Foundation Soils	17.7	24.4	49.6	0.303	8.750	0.611	1.3	60.8	22	0	0.4	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.105	0.133	0.790
UC-03	UB-03	Foundation Soils	17.8	24.4	53.9	0.351	8.850	0.651	1.3	65.6	20	0	0.4	66.0	1.0	-0.3	0.0	0.9	0.104	1.009	0.109	0.133	0.819
UC-03	UB-03	Foundation Soils	17.9	24.3	57.6	0.392	8.580	0.681	1.3	69.5	19	0	0.4	69.9	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.133	0.845
UC-03	UB-03	Foundation Soils	18.0	24.2	58.1	0.421	8.310	0.725	1.3	69.9	20	0	0.4	70.3	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.133	0.846
UC-03	UB-03	Foundation Soils	18.0	24.1	56.3	0.443	8.240	0.786	1.3	67.8	23	0	0.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.133	0.832
UC-03	UB-03	Foundation Soils	18.1	24.0	53.7	0.449	8.240	0.837	1.3	64.7	25	0	0.5	65.2	1.0	-0.3	0.0	0.9	0.103	1.009	0.108	0.133	0.811
UC-03	UB-03	Foundation Soils	18.2	24.0	50.7	0.451	8.380	0.890	1.3	61.2	28	0	0.5	61.7	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.133	0.788
UC-03	UB-03	Foundation Soils	18.3	23.9	47.8	0.442	8.650	0.925	1.3	57.9	31	0	0.5	58.4	1.0	-0.3	0.0	0.9	0.098	1.008	0.102	0.133	0.767
UC-03	UB-03	Foundation Soils	18.4	23.8	45.4	0.435	8.810	0.959	1.3	55.1	33	0	0.5	55.6	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.133	0.750
UC-03	UB-03	Foundation Soils	18.5	23.7	45.0	0.470	8.960	1.045	1.3	54.5	35	0	0.5	55.1	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.134	0.746
UC-03	UB-03	Foundation Soils	18.5	23.6	46.7	0.477	9.290	1.021	1.3	56.4	34	0	0.5	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.134	0.756
UC-03	UB-03	Foundation Soils	18.6	23.5	48.6	0.417	9.500	0.859	1.3	58.3	29	0	0.5	58.8	1.0	-0.3	0.0	0.9	0.099	1.008	0.103	0.134	0.767
UC-03	UB-03	Foundation Soils	18.7	23.5	53.2	0.447	9.910	0.841	1.3	63.3	26	0	0.5	63.8	1.0	-0.3	0.0	0.9	0.102	1.009	0.107	0.134	0.796
UC-03	UB-03	Foundation Soils	18.8	23.4	58.5	0.469	10.050	0.802	1.3	69.1	22	0	0.4	69.5	1.0	-0.3	0.0	0.9	0.107	1.010	0.111	0.134	0.832
UC-03	UB-03	Foundation Soils	18.9	23.3	64.5	0.502	9.460	0.778	1.2	75.5	19	0	0.4	75.9	1.0	-0.3	0.0	0.9	0.112	1.011	0.117	0.134	0.875
UC-03	UB-03	Foundation Soils	18.9	23.2	68.1	0.516	9.020	0.757	1.2	79.3	17	0	0.3	79.6	1.0	-0.3	0.0	0.9	0.115	1.012	0.121	0.134	0.902
UC-03	UB-03	Foundation Soils	19.0	23.1	66.1	0.528	9.200	0.799	1.2	76.9	19	0	0.4	77.3	1.0	-0.3	0.0	0.9	0.113	1.011	0.119	0.134	0.884
UC-03	UB-03	Foundation Soils	19.1	23.1	64.0	0.512	9.340	0.799	1.2	74.6	20	0	0.4	75.0	1.0	-0.3	0.0	0.9	0.111	1.011	0.116	0.134	0.866
UC-03	UB-03	Foundation Soils	19.2	23.0	61.0	0.494	9.790	0.810	1.2	71.1	22	0	0.4	71.6	1.0	-0.3	0.0	0.9	0.109	1.010	0.113	0.134	0.842
UC-03	UB-03	Foundation Soils	19.3	22.9	58.7	0.474	9.840	0.807	1.2	68.6	23	0	0.4	69.0	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.134	0.824
UC-03	UB-03	Foundation Soils	19.4	22.8	56.5	0.469	9.960	0.830	1.2	66.0	24	0	0.5	66.5	1.0	-0.3	0.0	0.9	0.104	1.010	0.109	0.135	0.807
UC-03	UB-03	Foundation Soils	19.4	22.7	53.9	0.427	10.010	0.793	1.2	63.0	25	0	0.5	63.4	1.0	-0.3	0.0	0.9	0.102	1.009	0.106	0.135	0.788
UC-03	UB-03	Foundation Soils	19.5	22.6	51.1	0.385	10.110	0.754	1.2	59.8	26	0	0.5	60.3	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.135	0.768
UC-03	UB-03	Foundation Soils	19.6	22.6	48.4	0.381	10.200	0.786	1.2	56.8	28	0	0.5	57.3	1.0	-0.3	0.0	0.9	0.098	1.008	0.101	0.135	0.749
UC-03	UB-03	Foundation Soils	19.7	22.5	45.8	0.373	10.150	0.814	1.2	53.8	30	0	0.5	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.099	0.135	0.731
UC-03	UB-03	Foundation Soils	19.8	22.4	40.7	0.368	8.760	0.905	1.3	48.0	36	0	0.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.135	0.698
UC-03	UB-03	Foundation Soils	19.8	22.3	39.0	0.400	9.770	1.026	1.3	46.1	40	0	0.5	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.135	0.687
UC-03	UB-03	Foundation Soils	19.9	22.2	37.2	0.442	9.670	1.188	1.3	44.0	44	0	0.5	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.135	0.675
UC-03	UB-03	Foundation Soils	20.0	22.2	31.0	0.487	9.560	1.569	1.3	37.0	55	0	0.5	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.086	0.135	0.637
UC-03	UB-03	Foundation Soils	20.1	22.1	22.1	0.542	9.960	2.458	1.3	26.7	72	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.135	0.584
UC-03	UB-03	Foundation Soils	20.2	22.0	14.9	0.529	10.290	3.561	1.3	18.2	92	0	0.5	18.7	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.135	0.542
UC-03	UB-03	Foundation Soils	20.3	21.9	10.8	0.483	11.100	4.456	1.3	13.2	100	0	0.5	13.7	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.135	0.518
UC-03	UB-03	Foundation Soils	20.3	21.8	8.9	0.379	11.530	4.262	1.3	10.8	100	0	0.5	11.3	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.136	0.506
UC-03	UB-03	Foundation Soils	20.4	21.7	7.2	0.284	12.290	3.968	1.3	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.136	0.496
UC-03	UB-03	Foundation Soils	20.5	21.7	6.0	0.215	24.770	3.575	1.3	7.3	100	0	0.5	7.8	1.0	-0.4	0.0	0.9	0.065	1.006	0.066	0.136	0.489
UC-03	UB-03	Foundation Soils	20.6	21.6	6.2	0.148	56.980	2.404	1.3	7.5	100	0	0.5	7.9	1.0	-0.4	0.0	0.9	0.065	1.006	0.067	0.136	0.490
UC-03	UB-03	Foundation Soils	20.7	21.5	7.2	0.087	93.900	1.209	1.3	8.7	97	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.136	0.495
UC-03	UB-03	Foundation Soils	20.8	21.4	20.8	0.083	68.890	0.400	1.3	24.8	45	0	0.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.136	0.570
UC-03	UB-03	Foundation Soils	20.8	21.3	30.1	0.124	67.850	0.412	1.2	35.3	33	0	0.5	35.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.136	0.622
UC-03	UB-03	Foundation Soils	20.9	21.2	22.4	0.188	8.100	0.839	1.3	26.6	53	0	0.5	27.1	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.136	0.578
UC-03	UB-03	Foundation Soils	21.0	21.2	14.3	0.249	14.320	1.744	1.3	17.1	79	0	0.5	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.136	0.532
UC-03	UB-03	Foundation Soils	21.1	21.1	9.5	0.257	31.490	2.703	1.3	11.4	100	0	0.5	11.9	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.136	0.505
UC-03	UB-03	Foundation Soils	21.2	21.0	7.3	0.213	57.890	2.905	1.3	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.137	0.493
UC-03	UB-03	Foundation Soils	21.2	20.9	6.8	0.214	66.020	3.155	1.3	8.1	100	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.137	0.489
UC-03	UB-03	Foundation Soils	21.3	20.8	19.3	0.218	96.300	1.127	1.3	22.9	63	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.137	0.558
UC-03	UB-03	Foundation Soils	21.4	20.8	28.6	0.285	103.870	0.998	1.2	33.1	49	0	0.5	33.7	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.137	0.608
UC-03	UB-03	Foundation Soils	21.5	20.7	20.5	0.338	7.150	1.648	1.2	24.1	69	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.137	0.563
UC-03	UB-03	Foundation Soils	21.6	20.6	12.3	0.277	3.670	2.248	1.3	14.5	90	0	0.5	15.0	1.0	-0.4	0.0	0.9	0.069	1.006	0.071	0.137	0.517
UC-03	UB-03	Foundation Soils	21.7	20.5	9.6	0.254	22.110	2.655	1.2	11.3	100	0	0.5	11.8	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.137	0.502
UC-03	UB-03	Foundation Soils	21.7	20.4	7.4	0.236	40.070	3.193	1.2	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.137	0.490
UC-03	UB-03	Foundation Soils	21.8	20.3	8.5	0.239	52.080	2.827	1.2	9.9	100	0	0.5	10.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.137	0.495
UC-03	UB-03	Foundation Soils	21.9	20.3	33.1	0.224	96.480	0.676	1.2	37.8	38	0	0.5	38.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.137	0.629

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	22.0	20.2	58.9	0.187	48.600	0.318	1.2	65.2	8	0	0.1	65.3	1.0	-0.4	0.0	0.9	0.104	1.009	0.107	0.137	0.778
UC-03	UB-03	Foundation Soils	22.1	20.1	68.6	0.184	7.000	0.268	1.2	75.3	1	0	0.0	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.137	0.841
UC-03	UB-03	Foundation Soils	22.1	20.0	77.2	0.223	-3.030	0.289	1.2	84.0	0	0	0.0	84.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.137	0.903
UC-03	UB-03	Foundation Soils	22.2	19.9	64.5	0.302	2.860	0.468	1.2	70.8	12	0	0.2	70.9	1.0	-0.4	0.0	0.9	0.108	1.010	0.112	0.137	0.812
UC-03	UB-03	Foundation Soils	22.3	19.9	54.8	0.378	4.920	0.690	1.2	60.5	23	0	0.4	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.138	0.750
UC-03	UB-03	Foundation Soils	22.4	19.8	36.4	0.467	7.130	1.285	1.2	40.8	48	0	0.5	41.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.138	0.642
UC-03	UB-03	Foundation Soils	22.5	19.7	25.7	0.602	9.620	2.347	1.2	29.1	70	0	0.5	29.7	1.0	-0.4	0.0	0.9	0.079	1.006	0.080	0.138	0.583
UC-03	UB-03	Foundation Soils	22.6	19.6	18.2	0.668	12.150	3.663	1.2	20.9	89	0	0.5	21.5	1.0	-0.4	0.0	0.9	0.073	1.006	0.075	0.138	0.543
UC-03	UB-03	Foundation Soils	22.6	19.5	14.4	0.575	14.140	4.005	1.2	16.5	98	0	0.5	17.0	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.138	0.522
UC-03	UB-03	Foundation Soils	22.7	19.4	11.3	0.317	15.720	2.801	1.2	13.0	99	0	0.5	13.5	1.0	-0.4	0.0	0.9	0.068	1.006	0.070	0.138	0.506
UC-03	UB-03	Foundation Soils	22.8	19.4	8.5	0.248	21.170	2.913	1.2	9.7	100	0	0.5	10.2	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.138	0.491
UC-03	UB-03	Foundation Soils	22.9	19.3	7.1	0.234	55.510	3.293	1.2	8.1	100	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.138	0.483
UC-03	UB-03	Foundation Soils	23.0	19.2	19.6	0.163	75.800	0.830	1.2	22.3	59	0	0.5	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.138	0.548
UC-03	UB-03	Foundation Soils	23.0	19.1	41.3	0.140	61.130	0.339	1.2	45.5	21	0	0.4	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.092	0.138	0.663
UC-03	UB-03	Foundation Soils	23.1	19.0	44.5	0.156	6.770	0.351	1.2	48.7	19	0	0.4	49.1	1.0	-0.4	0.0	0.9	0.092	1.007	0.094	0.138	0.679
UC-03	UB-03	Foundation Soils	23.2	19.0	41.2	0.260	10.590	0.631	1.2	45.3	31	0	0.5	45.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.138	0.661
UC-03	UB-03	Foundation Soils	23.3	18.9	30.1	0.378	14.180	1.255	1.2	33.4	53	0	0.5	33.9	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.138	0.600
UC-03	UB-03	Foundation Soils	23.4	18.8	25.3	0.540	16.910	2.131	1.2	28.2	69	0	0.5	28.7	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.138	0.575
UC-03	UB-03	Foundation Soils	23.5	18.7	17.0	0.564	21.180	3.325	1.2	19.1	90	0	0.5	19.6	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.138	0.531
UC-03	UB-03	Foundation Soils	23.5	18.6	11.9	0.475	27.310	3.995	1.2	13.3	100	0	0.5	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.138	0.504
UC-03	UB-03	Foundation Soils	23.6	18.5	9.4	0.389	32.780	4.119	1.2	10.6	100	0	0.5	11.1	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.139	0.492
UC-03	UB-03	Foundation Soils	23.7	18.5	7.4	0.344	56.980	4.670	1.2	8.2	100	0	0.5	8.7	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.139	0.481
UC-03	UB-03	Foundation Soils	23.8	18.4	11.5	0.319	98.280	2.785	1.2	12.8	99	0	0.5	13.3	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.139	0.501
UC-03	UB-03	Foundation Soils	23.9	18.3	25.3	0.319	86.250	1.261	1.2	27.9	59	0	0.5	28.4	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.139	0.571
UC-03	UB-03	Foundation Soils	23.9	18.2	31.0	0.265	23.770	0.855	1.2	33.9	45	0	0.5	34.4	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.139	0.600
UC-03	UB-03	Foundation Soils	24.0	18.1	34.9	0.210	23.960	0.601	1.2	38.0	36	0	0.5	38.4	1.0	-0.4	0.1	0.9	0.084	1.007	0.086	0.139	0.620
UC-03	UB-03	Foundation Soils	24.1	18.0	44.9	0.130	20.610	0.290	1.1	48.2	17	0	0.3	48.5	1.0	-0.4	0.1	0.9	0.091	1.007	0.093	0.139	0.672
UC-03	UB-03	Foundation Soils	24.2	18.0	55.2	0.097	15.340	0.176	1.1	58.8	5	0	0.0	58.8	1.0	-0.5	0.1	0.9	0.099	1.008	0.101	0.139	0.727
UC-03	UB-03	Foundation Soils	24.3	17.9	63.0	0.119	-2.570	0.189	1.1	66.6	1	0	0.0	66.6	1.0	-0.5	0.1	0.9	0.105	1.010	0.107	0.139	0.772
UC-03	UB-03	Foundation Soils	24.4	17.8	57.3	0.151	2.140	0.263	1.1	60.8	8	0	0.1	60.8	1.0	-0.5	0.1	0.9	0.100	1.009	0.103	0.139	0.738
UC-03	UB-03	Foundation Soils	24.4	17.7	48.3	0.231	11.010	0.478	1.1	51.4	22	0	0.4	51.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.139	0.688
UC-03	UB-03	Foundation Soils	24.5	17.6	39.5	0.276	16.630	0.699	1.1	42.2	35	0	0.5	42.7	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.139	0.640
UC-03	UB-03	Foundation Soils	24.6	17.6	32.6	0.327	18.130	1.002	1.1	35.0	47	0	0.5	35.6	1.0	-0.5	0.1	0.9	0.082	1.007	0.084	0.139	0.604
UC-03	UB-03	Foundation Soils	24.7	17.5	28.9	0.371	20.490	1.282	1.1	31.1	55	0	0.5	31.7	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.139	0.584
UC-03	UB-03	Foundation Soils	24.8	17.4	25.8	0.408	22.710	1.582	1.1	27.8	63	0	0.5	28.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.079	0.139	0.568
UC-03	UB-03	Foundation Soils	24.9	17.3	24.4	0.365	25.010	1.494	1.1	26.3	64	0	0.5	26.8	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.139	0.560
UC-03	UB-03	Foundation Soils	24.9	17.2	24.9	0.266	26.360	1.070	1.1	26.7	57	0	0.5	27.2	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.139	0.562
UC-03	UB-03	Foundation Soils	25.0	17.1	27.5	0.209	24.110	0.760	1.1	29.4	48	0	0.5	29.9	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.139	0.575
UC-03	UB-03	Foundation Soils	25.1	17.1	29.2	0.178	9.310	0.610	1.1	31.1	42	0	0.5	31.6	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.139	0.582
UC-03	UB-03	Foundation Soils	25.2	17.0	28.1	0.205	0.910	0.729	1.1	29.9	46	0	0.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.139	0.577
UC-03	UB-03	Foundation Soils	25.3	16.9	23.1	0.243	0.380	1.050	1.1	24.7	59	0	0.5	25.2	1.0	-0.5	0.1	0.9	0.076	1.006	0.077	0.139	0.552
UC-03	UB-03	Foundation Soils	25.3	16.8	19.8	0.245	13.460	1.240	1.1	21.1	67	0	0.5	21.6	1.0	-0.5	0.1	0.9	0.073	1.006	0.075	0.139	0.535
UC-03	UB-03	Foundation Soils	25.4	16.7	16.7	0.273	31.210	1.639	1.1	17.8	78	0	0.5	18.3	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.139	0.519
UC-03	UB-03	Foundation Soils	25.5	16.7	14.7	0.266	35.160	1.811	1.1	15.7	84	0	0.5	16.2	1.0	-0.5	0.1	0.9	0.070	1.006	0.071	0.139	0.510
UC-03	UB-03	Foundation Soils	25.6	16.6	11.9	0.276	51.840	2.319	1.1	12.7	97	0	0.5	13.2	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.140	0.496
UC-03	UB-03	Foundation Soils	25.7	16.5	10.2	0.280	74.370	2.757	1.1	10.8	100	0	0.5	11.3	1.0	-0.5	0.1	0.9	0.067	1.006	0.068	0.140	0.488
UC-03	UB-03	Foundation Soils	25.8	16.4	11.2	0.278	110.440	2.480	1.1	11.9	100	0	0.5	12.4	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.140	0.492
UC-03	UB-03	Foundation Soils	25.8	16.3	13.8	0.252	84.050	1.828	1.1	14.6	87	0	0.5	15.1	1.0	-0.5	0.1	0.9	0.069	1.006	0.070	0.140	0.504
UC-03	UB-03	Foundation Soils	25.9	16.2	16.1	0.226	69.620	1.406	1.1	17.0	77	0	0.5	17.5	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.140	0.514
UC-03	UB-03	Foundation Soils	26.0	16.2	21.9	0.272	60.510	1.241	1.1	23.1	64	0	0.5	23.6	1.0	-0.5	0.1	0.9	0.075	1.006	0.076	0.140	0.542
UC-03	UB-03	Foundation Soils	26.1	16.1	30.2	0.305	28.400	1.010	1.1	31.5	50	0	0.5	32.0	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.140	0.582
UC-03	UB-03	Foundation Soils	26.2	16.0	35.3	0.283	24.820	0.802	1.1	36.6	41	0	0.5	37.1	1.0	-0.5	0.1	0.9	0.083	1.007	0.085	0.140	0.606
UC-03	UB-03	Foundation Soils	26.2	15.9	40.7	0.265	19.820	0.650	1.1	42.1	33	0	0.5	42.5	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.140	0.633
UC-03	UB-03	Foundation Soils	26.3	15.8	53.0	0.260	1.330	0.490	1.1	54.3	20	0	0.4	54.7	1.0	-0.5	0.1	0.9	0.096	1.008	0.097	0.140	0.696
UC-03	UB-03	Foundation Soils	26.4	15.8	70.6	0.280	6.430	0.397	1.1	71.7	8	0	0.1	71.8	1.0	-0.5	0.1	0.9	0.109	1.010	0.111	0.140	0.794
UC-03	UB-03	Foundation Soils	26.5	15.7	85.8	0.336	7.900	0.392	1.1	86.5	2	0	0.0	86.5	1.0	-0.5	0.1	0.9	0.122	1.014	0.125	0.140	0.895
UC-03	UB-03	Foundation Soils	26.6	15.6	94.2	0.378	12.770	0.401	1.1	94.6	0	0	0.0	94.6	1.0	-0.5	0.1	0.9	0.131	1.016	0.134	0.140	0.961
UC-03	UB-03	Foundation Soils	26.7	15.5	96.0	0.458	9.100	0.477	1.1	96.4	2	0	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.140	0.977
UC-03	UB-03	Foundation Soils	26.7	15.4	97.4	0.528	14.270	0.542	1.1	97.6	4	0	0.0	97.6	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.140	0.987
UC-03	UB-03	Foundation Soils	26.8	15.3	97.6	0.543	18.140	0.556	1.1	97.6	4	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.140	0.988
UC-03	UB-03	Foundation Soils	26.9	15.3	97.8	0.575	19.110	0.588	1.1	97.7	6	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.140	0.988
UC-03	UB-03	Foundation Soils	27.0	15.2	101.0	0.601	21.540	0.595	1.1	100.6	5	0	0.0	100.6	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.140	1.017

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	27.1	15.1	108.8	0.630	19.680	0.579	1.1	108.1	2	0	0.0	108.1	1.0	-0.5	0.1	0.9	0.149	1.021	0.154	0.140	1.100
UC-03	UB-03	Foundation Soils	27.1	15.0	112.0	0.680	19.930	0.607	1.1	111.0	2	0	0.0	111.0	1.0	-0.5	0.1	0.9	0.154	1.022	0.159	0.140	1.136
UC-03	UB-03	Foundation Soils	27.2	14.9	109.6	0.702	19.580	0.640	1.1	108.6	4	0	0.0	108.6	1.0	-0.5	0.1	0.9	0.150	1.021	0.155	0.140	1.105
UC-03	UB-03	Foundation Soils	27.3	14.9	105.3	0.718	18.030	0.682	1.1	104.3	7	0	0.0	104.4	1.0	-0.5	0.1	0.9	0.143	1.019	0.148	0.140	1.054
UC-03	UB-03	Foundation Soils	27.4	14.8	98.1	0.717	21.520	0.731	1.1	97.2	10	0	0.1	97.4	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.140	0.983
UC-03	UB-03	Foundation Soils	27.5	14.7	96.2	0.675	22.590	0.702	1.0	95.2	10	0	0.1	95.3	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.140	0.964
UC-03	UB-03	Foundation Soils	27.6	14.6	97.6	0.678	23.870	0.695	1.0	96.5	9	0	0.1	96.6	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.140	0.975
UC-03	UB-03	Foundation Soils	27.6	14.5	96.9	0.692	23.110	0.714	1.0	95.7	10	0	0.1	95.8	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.140	0.967
UC-03	UB-03	Foundation Soils	27.7	14.4	93.6	0.698	18.630	0.746	1.0	92.3	12	0	0.2	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.140	0.938
UC-03	UB-03	Foundation Soils	27.8	14.4	90.0	0.652	24.590	0.724	1.0	88.8	12	0	0.2	89.0	1.0	-0.5	0.1	0.9	0.125	1.014	0.127	0.140	0.909
UC-03	UB-03	Foundation Soils	27.9	14.3	91.5	0.618	23.110	0.676	1.0	90.1	11	0	0.2	90.2	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.140	0.918
UC-03	UB-03	Foundation Soils	28.0	14.2	95.0	0.644	22.520	0.678	1.0	93.3	10	0	0.1	93.5	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.140	0.945
UC-03	UB-03	Foundation Soils	28.1	14.1	95.8	0.665	20.490	0.694	1.0	94.0	10	0	0.1	94.1	1.0	-0.6	0.1	0.9	0.130	1.016	0.133	0.140	0.951
UC-03	UB-03	Foundation Soils	28.1	14.0	92.5	0.677	22.220	0.732	1.0	90.7	12	0	0.2	90.9	1.0	-0.6	0.1	0.9	0.127	1.015	0.129	0.140	0.923
UC-03	UB-03	Foundation Soils	28.2	13.9	90.0	0.681	25.300	0.757	1.0	88.1	14	0	0.3	88.4	1.0	-0.6	0.1	0.9	0.124	1.014	0.127	0.140	0.903
UC-03	UB-03	Foundation Soils	28.3	13.9	91.0	0.666	25.600	0.732	1.0	89.0	13	0	0.2	89.2	1.0	-0.6	0.1	0.9	0.125	1.014	0.127	0.140	0.909
UC-03	UB-03	Foundation Soils	28.4	13.8	95.1	0.636	25.540	0.669	1.0	92.8	10	0	0.1	92.9	1.0	-0.6	0.1	0.9	0.129	1.015	0.132	0.140	0.939
UC-03	UB-03	Foundation Soils	28.5	13.7	101.4	0.625	23.100	0.616	1.0	98.8	6	0	0.0	98.8	1.0	-0.6	0.1	0.9	0.136	1.017	0.139	0.140	0.992
UC-03	UB-03	Foundation Soils	28.5	13.6	108.9	0.613	17.630	0.563	1.0	105.8	2	0	0.0	105.8	1.0	-0.6	0.1	0.9	0.145	1.020	0.149	0.140	1.065
UC-03	UB-03	Foundation Soils	28.6	13.5	109.8	0.617	20.340	0.562	1.0	106.6	2	0	0.0	106.6	1.0	-0.6	0.1	0.9	0.147	1.020	0.150	0.140	1.074
UC-03	UB-03	Foundation Soils	28.7	13.5	105.7	0.642	19.680	0.608	1.0	102.5	5	0	0.0	102.5	1.0	-0.6	0.1	0.9	0.141	1.019	0.144	0.140	1.028
UC-03	UB-03	Foundation Soils	28.8	13.4	101.0	0.636	21.620	0.630	1.0	97.9	7	0	0.0	97.9	1.0	-0.6	0.1	0.9	0.135	1.017	0.138	0.140	0.983
UC-03	UB-03	Foundation Soils	28.9	13.3	98.8	0.599	22.920	0.606	1.0	95.7	7	0	0.0	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.140	0.962
UC-03	UB-03	Foundation Soils	29.0	13.2	100.0	0.583	24.870	0.583	1.0	96.6	6	0	0.0	96.7	1.0	-0.6	0.1	0.9	0.133	1.017	0.136	0.140	0.970
UC-03	UB-03	Foundation Soils	29.0	13.1	101.3	0.623	23.350	0.615	1.0	97.8	6	0	0.0	97.8	1.0	-0.6	0.1	0.9	0.135	1.017	0.137	0.140	0.981
UC-03	UB-03	Foundation Soils	29.1	13.0	99.2	0.657	18.890	0.663	1.0	95.7	9	0	0.1	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.140	0.961
UC-03	UB-03	Foundation Soils	29.2	13.0	90.5	0.773	20.110	0.854	1.0	87.3	16	0	0.3	87.6	1.0	-0.6	0.1	0.9	0.123	1.014	0.125	0.140	0.894
UC-03	UB-03	Foundation Soils	29.3	12.9	84.3	0.704	21.200	0.835	1.0	81.2	18	0	0.4	81.6	1.0	-0.6	0.1	0.9	0.117	1.012	0.119	0.140	0.850
UC-03	UB-03	Foundation Soils	29.4	12.8	65.0	0.845	21.730	1.301	1.0	62.6	35	0	0.5	63.2	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.140	0.736
UC-03	UB-03	Foundation Soils	29.4	12.7	52.4	0.962	23.540	1.835	1.0	50.5	48	0	0.6	51.1	1.0	-0.6	0.1	0.9	0.093	1.008	0.094	0.140	0.671
UC-03	UB-03	Foundation Soils	29.5	12.6	39.7	0.955	27.350	2.406	1.0	38.3	62	0	0.5	38.8	1.0	-0.6	0.1	0.9	0.085	1.007	0.085	0.140	0.609
UC-03	UB-03	Foundation Soils	29.6	12.6	32.1	0.811	13.190	2.529	1.0	30.9	69	0	0.5	31.4	1.0	-0.6	0.1	0.9	0.080	1.006	0.080	0.140	0.573
UC-03	UB-03	Foundation Soils	29.7	12.5	34.8	0.618	35.260	1.774	1.0	33.5	59	0	0.5	34.0	1.0	-0.6	0.1	0.9	0.081	1.007	0.082	0.140	0.585
UC-03	UB-03	Foundation Soils	29.8	12.4	41.6	0.505	40.640	1.213	1.0	39.9	46	0	0.5	40.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.140	0.616
UC-03	UB-03	Foundation Soils	29.9	12.3	70.5	0.446	28.740	0.633	1.0	67.4	18	0	0.4	67.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.107	0.140	0.761
UC-03	UB-03	Foundation Soils	29.9	12.2	83.7	0.466	18.150	0.557	1.0	79.9	10	0	0.1	80.0	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.140	0.837
UC-03	UB-03	Foundation Soils	30.0	12.1	84.4	0.511	8.67	0.605134	1.0	80.4	12	0	0.2	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.118	0.140	0.841
UC-03	UB-03	Foundation Soils	30.1	12.1	80.9	0.543	15.340	0.671	1.0	77.0	15	0	0.3	77.3	1.0	-0.6	0.1	0.9	0.113	1.011	0.115	0.140	0.819
UC-03	UB-03	Foundation Soils	30.2	12.0	77.2	0.548	18.410	0.710	1.0	73.3	18	0	0.4	73.7	1.0	-0.6	0.1	0.9	0.110	1.011	0.112	0.140	0.796
UC-03	UB-03	Foundation Soils	30.3	11.9	73.8	0.563	21.250	0.763	1.0	70.1	20	0	0.4	70.5	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.140	0.776
UC-03	UB-03	Foundation Soils	30.3	11.8	74.5	0.573	24.250	0.769	1.0	70.6	20	0	0.4	71.0	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.140	0.779
UC-03	UB-03	Foundation Soils	30.4	11.7	78.4	0.583	24.920	0.744	1.0	74.2	18	0	0.4	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.140	0.801
UC-03	UB-03	Foundation Soils	30.5	11.7	77.8	0.579	25.610	0.744	1.0	73.6	18	0	0.4	74.0	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.140	0.797
UC-03	UB-03	Foundation Soils	30.6	11.6	76.3	0.558	26.630	0.732	1.0	72.0	19	0	0.4	72.4	1.0	-0.6	0.1	0.9	0.109	1.011	0.110	0.140	0.787
UC-03	UB-03	Foundation Soils	30.7	11.5	74.7	0.522	27.790	0.698	1.0	70.4	18	0	0.4	70.8	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.140	0.778
UC-03	UB-03	Foundation Soils	30.8	11.4	77.8	0.460	28.400	0.591	1.0	73.2	14	0	0.3	73.5	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.140	0.794
UC-03	UB-03	Foundation Soils	30.8	11.3	83.1	0.378	26.690	0.455	1.0	78.1	8	0	0.0	78.2	1.0	-0.6	0.1	0.9	0.114	1.012	0.115	0.140	0.823
UC-03	UB-03	Foundation Soils	30.9	11.2	90.1	0.319	23.250	0.354	1.0	84.7	1	0	0.0	84.7	1.0	-0.6	0.1	0.9	0.120	1.013	0.122	0.140	0.868
UC-03	UB-03	Foundation Soils	31.0	11.2	95.8	0.211	17.170	0.220	1.0	89.9	0	0	0.0	89.9	1.0	-0.6	0.1	0.9	0.125	1.015	0.127	0.140	0.907
UC-03	UB-03	Foundation Soils	31.1	11.1	98.9	0.159	13.440	0.161	1.0	92.6	0	0	0.0	92.6	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.140	0.929
UC-03	UB-03	Foundation Soils	31.2	11.0	98.5	0.124	11.990	0.126	1.0	92.2	0	0	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.140	0.925
UC-03	UB-03	Foundation Soils	31.2	10.9	96.7	0.121	14.630	0.125	1.0	90.3	0	0	0.0	90.3	1.0	-0.6	0.1	0.9	0.126	1.015	0.128	0.140	0.910
UC-03	UB-03	Foundation Soils	31.3	10.8	92.4	0.115	13.570	0.124	1.0	86.2	0	0	0.0	86.2	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.140	0.879
UC-03	UB-03	Foundation Soils	31.4	10.7	87.9	0.113	15.200	0.129	1.0	81.9	0	0	0.0	81.9	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.140	0.847
UC-03	UB-03	Foundation Soils	31.5	10.7	80.4	0.129	18.770	0.161	1.0	74.8	0	0	0.0	74.8	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.140	0.801
UC-03	UB-03	Foundation Soils	31.6	10.6	73.5	0.202	24.770	0.275	1.0	68.2	4	0	0.0	68.2	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.140	0.761
UC-03	UB-03	Foundation Soils	31.7	10.5	66.8	0.259	27.140	0.388	1.0	61.9	12	0	0.2	62.1	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.140	0.726
UC-03	UB-03	Foundation Soils	31.7	10.4	57.1	0.296	29.300	0.518	1.0	52.8	22	0	0.4	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.095	0.140	0.679
UC-03	UB-03	Foundation Soils	31.8	10.3	49.6	0.306	38.090	0.616	1.0	45.8	29	0	0.5	46.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.090	0.140	0.643
UC-03	UB-03	Foundation Soils	31.9	10.3	43.4	0.363	62.560	0.836	1.0	40.0	39	0	0.5	40.5	1.0	-0.7	0.1	0.9	0.086	1.007	0.086	0.140	0.615
UC-03	UB-03	Foundation Soils	32.0	10.2	41.2	0.341	95.400	0.828	1.0	37.8	40	0	0.5	38.3	1.0	-0.7	0.1	0.9	0.084	1.007	0.085	0.140	0.604
UC-03	UB-03	Foundation Soils	32.1	10.1	42.5	0.237	93.480	0.558	1.0	39.0	32	0	0.5	39.4	1.0	-0.7	0.1	0.9	0.085	1.007	0.085	0.140	0.609

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	32.2	10.0	48.0	0.231	83.270	0.481	1.0	44.1	26	0	0.4	44.5	1.0	-0.7	0.1	0.9	0.088	1.007	0.089	0.140	0.634
UC-03	UB-03	Foundation Soils	32.2	9.9	57.7	0.101	46.160	0.175	1.0	52.9	7	0	0.0	52.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.095	0.140	0.677
UC-03	UB-03	Foundation Soils	32.3	9.8	63.8	0.150	42.530	0.235	1.0	58.5	7	0	0.0	58.5	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.140	0.706
UC-03	UB-03	Foundation Soils	32.4	9.8	63.4	0.208	59.030	0.328	1.0	58.0	12	0	0.2	58.2	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.140	0.704
UC-03	UB-03	Foundation Soils	32.5	9.7	60.0	0.301	69.240	0.502	1.0	54.8	20	0	0.4	55.2	1.0	-0.7	0.1	0.9	0.096	1.008	0.096	0.140	0.688
UC-03	UB-03	Foundation Soils	32.6	9.6	55.9	0.267	84.710	0.477	1.0	51.0	21	0	0.4	51.4	1.0	-0.7	0.1	0.9	0.093	1.008	0.094	0.140	0.669
UC-03	UB-03	Foundation Soils	32.6	9.5	53.3	0.244	85.000	0.458	1.0	48.5	22	0	0.4	48.9	1.0	-0.7	0.1	0.9	0.092	1.007	0.092	0.140	0.656
UC-03	UB-03	Foundation Soils	32.7	9.4	56.6	0.279	78.760	0.493	1.0	51.5	22	0	0.4	51.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.094	0.140	0.671
UC-03	UB-03	Foundation Soils	32.8	9.4	64.7	0.259	64.370	0.400	1.0	58.8	14	0	0.2	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.140	0.709
UC-03	UB-03	Foundation Soils	32.9	9.3	74.4	0.216	37.740	0.290	1.0	67.7	5	0	0.0	67.7	1.0	-0.7	0.1	0.9	0.105	1.010	0.106	0.140	0.757
UC-03	UB-03	Foundation Soils	33.0	9.2	79.2	0.182	53.930	0.230	1.0	72.0	0	0	0.0	72.0	1.0	-0.7	0.1	0.9	0.109	1.010	0.109	0.140	0.782
UC-03	UB-03	Foundation Soils	33.1	9.1	82.8	0.244	58.460	0.295	1.0	75.2	2	0	0.0	75.2	1.0	-0.7	0.1	0.9	0.112	1.011	0.112	0.140	0.801
UC-03	UB-03	Foundation Soils	33.1	9.0	84.9	0.228	56.720	0.269	1.0	77.0	0	0	0.0	77.0	1.0	-0.7	0.1	0.9	0.113	1.011	0.114	0.140	0.813
UC-03	UB-03	Foundation Soils	33.2	8.9	87.3	0.217	63.030	0.248	1.0	79.2	0	0	0.0	79.2	1.0	-0.7	0.1	0.9	0.115	1.012	0.116	0.140	0.827
UC-03	UB-03	Foundation Soils	33.3	8.9	94.4	0.169	53.270	0.179	1.0	85.6	0	0	0.0	85.6	1.0	-0.7	0.1	0.9	0.121	1.013	0.122	0.140	0.871
UC-03	UB-03	Foundation Soils	33.4	8.8	109.2	0.157	20.090	0.144	1.0	99.2	0	0	0.0	99.2	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.140	0.983
UC-03	UB-03	Foundation Soils	33.5	8.7	117.6	0.312	33.640	0.265	1.0	106.8	0	0	0.0	106.8	1.0	-0.7	0.1	0.9	0.147	1.020	0.149	0.140	1.063
UC-03	UB-03	Foundation Soils	33.5	8.6	114.4	0.453	47.070	0.396	1.0	103.7	0	0	0.0	103.7	1.0	-0.7	0.1	0.9	0.142	1.019	0.144	0.140	1.028
UC-03	UB-03	Foundation Soils	33.6	8.5	109.1	0.498	53.120	0.457	1.0	98.7	1	0	0.0	98.7	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.140	0.978
UC-03	UB-03	Foundation Soils	33.7	8.5	98.5	0.689	61.770	0.700	1.0	88.8	12	0	0.2	89.0	1.0	-0.7	0.1	0.9	0.125	1.014	0.125	0.140	0.896
UC-03	UB-03	Foundation Soils	33.8	8.4	95.9	0.802	51.980	0.836	1.0	86.4	16	0	0.3	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.123	0.140	0.879
UC-03	UB-03	Foundation Soils	33.9	8.3	103.9	0.901	39.120	0.867	1.0	93.7	15	0	0.3	94.0	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.140	0.936
UC-03	UB-03	Foundation Soils	34.0	8.2	113.2	1.077	34.070	0.951	1.0	102.1	14	0	0.3	102.4	1.0	-0.7	0.1	0.9	0.140	1.019	0.142	0.140	1.014
UC-03	UB-03	Foundation Soils	34.0	8.1	137.2	1.015	11.630	0.740	1.0	124.1	4	0	0.0	124.1	1.0	-0.7	0.1	0.9	0.181	1.028	0.184	0.140	1.316
UC-03	UB-03	Foundation Soils	34.1	8.0	175.6	0.929	-1.910	0.529	1.0	159.6	0	0	0.0	159.6	1.0	-0.7	0.1	0.9	0.368	1.053	0.381	0.140	2.725
UC-03	UB-03	Foundation Soils	34.2	8.0	217.0	0.913	-8.130	0.421	1.0	198.1	0	0	0.0	198.1	1.0	-0.7	0.1	0.9	1.703	1.082	1.795	0.140	12.848
UC-03	UB-03	Foundation Soils	34.3	7.9	223.5	0.779	2.950	0.348	1.0	204.1	0	0	0.0	204.1	1.0	-0.7	0.1	0.9	2.404	1.082	2.528	0.140	18.096
UC-03	UB-03	Foundation Soils	34.4	7.8	220.7	0.718	5.820	0.325	1.0	201.3	0	0	0.0	201.3	1.0	-0.7	0.1	0.9	2.037	1.082	2.142	0.140	15.340
UC-03	UB-03	Foundation Soils	34.4	7.7	198.7	0.681	32.640	0.343	1.0	180.6	0	0	0.0	180.6	1.0	-0.7	0.1	0.9	0.743	1.075	0.780	0.140	5.587
UC-03	UB-03	Foundation Soils	34.5	7.6	190.2	0.585	47.960	0.308	1.0	172.5	0	0	0.0	172.5	1.0	-0.7	0.1	0.9	0.548	1.066	0.572	0.140	4.097
UC-03	UB-03	Foundation Soils	34.6	7.6	171.6	0.490	34.020	0.286	1.0	155.0	0	0	0.0	155.0	1.0	-0.7	0.1	0.9	0.325	1.049	0.335	0.140	2.402
UC-03	UB-03	Foundation Soils	34.7	7.5	152.6	0.435	15.900	0.285	1.0	137.3	0	0	0.0	137.3	1.0	-0.7	0.1	0.9	0.223	1.036	0.227	0.140	1.629
UC-03	UB-03	Foundation Soils	34.8	7.4	149.6	0.480	-10.340	0.321	1.0	134.4	0	0	0.0	134.4	1.0	-0.7	0.1	0.9	0.212	1.034	0.216	0.140	1.547
UC-03	UB-03	Foundation Soils	34.9	7.3	150.2	0.367	-13.350	0.244	1.0	134.9	0	0	0.0	134.9	1.0	-0.7	0.1	0.9	0.214	1.035	0.217	0.140	1.559
UC-03	UB-03	Foundation Soils	34.9	7.2	149.4	0.373	22.850	0.250	1.0	134.0	0	0	0.0	134.0	1.0	-0.7	0.1	0.9	0.211	1.034	0.214	0.140	1.535
UC-03	UB-03	Foundation Soils	35.0	7.1	135.4	0.384	34.900	0.284	0.9	121.0	0	0	0.0	121.0	1.0	-0.7	0.1	0.9	0.173	1.027	0.175	0.139	1.257
UC-03	UB-03	Foundation Soils	35.1	7.1	120.0	0.420	35.400	0.350	0.9	106.7	0	0	0.0	106.7	1.0	-0.7	0.1	0.9	0.147	1.020	0.148	0.139	1.059
UC-03	UB-03	Foundation Soils	35.2	7.0	118.2	0.369	40.180	0.312	0.9	104.9	0	0	0.0	104.9	1.0	-0.7	0.1	0.9	0.144	1.020	0.145	0.139	1.039
UC-03	UB-03	Foundation Soils	35.3	6.9	116.9	0.290	27.020	0.248	0.9	103.7	0	0	0.0	103.7	1.0	-0.8	0.1	0.9	0.142	1.019	0.143	0.139	1.026
UC-03	UB-03	Foundation Soils	35.4	6.8	118.3	0.273	28.680	0.231	0.9	104.9	0	0	0.0	104.9	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.139	1.038
UC-03	UB-03	Foundation Soils	35.4	6.7	118.7	0.186	2.810	0.157	0.9	105.1	0	0	0.0	105.1	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.139	1.041
UC-03	UB-03	Foundation Soils	35.5	6.6	114.3	0.334	23.510	0.292	0.9	101.0	0	0	0.0	101.0	1.0	-0.8	0.1	0.9	0.139	1.018	0.139	0.139	0.998
UC-03	UB-03	Foundation Soils	35.6	6.6	109.1	0.344	22.340	0.315	0.9	96.1	0	0	0.0	96.1	1.0	-0.8	0.1	0.9	0.132	1.016	0.133	0.139	0.953
UC-03	UB-03	Foundation Soils	35.7	6.5	103.5	0.389	17.680	0.376	0.9	90.9	0	0	0.0	90.9	1.0	-0.8	0.1	0.9	0.127	1.015	0.127	0.139	0.910
UC-03	UB-03	Foundation Soils	35.8	6.4	102.1	0.360	24.250	0.352	0.9	89.6	0	0	0.0	89.6	1.0	-0.8	0.1	0.9	0.125	1.014	0.125	0.139	0.899
UC-03	UB-03	Foundation Soils	35.8	6.3	103.2	0.286	30.890	0.277	0.9	90.5	0	0	0.0	90.5	1.0	-0.8	0.1	0.9	0.126	1.015	0.126	0.139	0.906
UC-03	UB-03	Foundation Soils	35.9	6.2	112.5	0.211	33.590	0.188	0.9	98.8	0	0	0.0	98.8	1.0	-0.8	0.1	0.9	0.136	1.017	0.136	0.139	0.977
UC-03	UB-03	Foundation Soils	36.0	6.2	110.8	0.238	33.490	0.215	0.9	97.2	0	0	0.0	97.2	1.0	-0.8	0.1	0.9	0.134	1.017	0.134	0.139	0.962
UC-03	UB-03	Foundation Soils	36.1	6.1	117.2	0.228	34.970	0.194	0.9	102.9	0	0	0.0	102.9	1.0	-0.8	0.1	0.9	0.141	1.019	0.142	0.139	1.017
UC-03	UB-03	Foundation Soils	36.2	6.0	114.6	0.175	27.790	0.153	0.9	100.3	0	0	0.0	100.3	1.0	-0.8	0.1	0.9	0.138	1.018	0.138	0.139	0.991
UC-03	UB-03	Foundation Soils	36.3	5.9	111.9	0.149	26.060	0.133	0.9	97.8	0	0	0.0	97.8	1.0	-0.8	0.1	0.9	0.135	1.017	0.135	0.139	0.968
UC-03	UB-03	Foundation Soils	36.3	5.8	102.1	0.138	26.110	0.135	0.9	88.9	0	0	0.0	88.9	1.0	-0.8	0.1	0.9	0.124	1.014	0.124	0.139	0.894
UC-03	UB-03	Foundation Soils	36.4	5.7	96.3	0.111	35.260	0.115	0.9	83.6	0	0	0.0	83.6	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.139	0.855
UC-03	UB-03	Foundation Soils	36.5	5.7	96.2	0.106	16.580	0.110	0.9	83.4	0	0	0.0	83.4	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.139	0.853
UC-03	UB-03	Foundation Soils	36.6	5.6	95.9	0.083	19.390	0.087	0.9	83.0	0	0	0.0	83.0	1.0	-0.8	0.1	0.9	0.119	1.013	0.118	0.139	0.851
UC-03	UB-03	Foundation Soils	36.7	5.5	92.7	0.053	28.630	0.057	0.9	80.1	0	0	0.0	80.1	1.0	-0.8	0.1	0.9	0.116	1.012	0.116	0.139	0.831
UC-03	UB-03	Foundation Soils	36.7	5.4	89.0	0.115	29.640	0.129	0.9	76.7	0	0	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.113	0.139	0.809
UC-03	UB-03	Foundation Soils	36.8	5.3	90.8	0.151	27.090	0.166	0.9	78.2	0	0	0.0	78.2	1.0	-0.8	0.1	0.9	0.114	1.012	0.114	0.139	0.819
UC-03	UB-03	Foundation Soils	36.9	5.3	85.5	0.149	32.880	0.174	0.9	73.4	0	0	0.0	73.4	1.0	-0.8	0.1	0.9	0.110	1.011	0.110	0.139	0.789
UC-03	UB-03	Foundation Soils	37.0	5.2	84.2	0.136	28.120	0.162	0.9	72.2	0	0	0.0	72.2	1.0	-0.8	0.1	0.9	0.109	1.010	0.109	0.139	0.782
UC-03	UB-03	Foundation Soils	37.1	5.1	82.9	0.110	31.350	0.133	0.9	70.9	0	0	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.108	0.139	0.774
UC-03	UB-03	Foundation Soils	37.2	5.0	82.4	0.062	21.150	0.075	0.9	70.3	0	0	0.0	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.139	0.771

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	37.2	4.9	81.8	0.088	13.200	0.108	0.9	69.8	0	0	0.0	69.8	1.0	-0.8	0.1	0.9	0.107	1.010	0.107	0.139	0.768
UC-03	UB-03	Foundation Soils	37.3	4.8	80.0	0.092	19.270	0.115	0.9	68.1	0	0	0.0	68.1	1.0	-0.8	0.1	0.9	0.106	1.010	0.105	0.139	0.758
UC-03	UB-03	Foundation Soils	37.4	4.8	77.9	0.068	25.200	0.087	0.9	66.1	0	0	0.0	66.1	1.0	-0.8	0.1	0.9	0.104	1.009	0.104	0.139	0.747
UC-03	UB-03	Foundation Soils	37.5	4.7	76.5	0.109	27.560	0.143	0.9	64.8	0	0	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.103	0.139	0.740
UC-03	UB-03	Foundation Soils	37.6	4.6	74.2	0.127	41.640	0.171	0.9	62.8	1	0	0.0	62.8	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.139	0.728
UC-03	UB-03	Foundation Soils	37.6	4.5	74.1	0.122	43.090	0.165	0.9	62.6	1	0	0.0	62.6	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.139	0.728
UC-03	UB-03	Foundation Soils	37.7	4.4	70.9	0.117	44.070	0.165	0.9	59.7	2	0	0.0	59.7	1.0	-0.8	0.1	0.9	0.099	1.009	0.099	0.139	0.712
UC-03	UB-03	Foundation Soils	37.8	4.4	70.5	0.116	41.110	0.165	0.9	59.3	3	0	0.0	59.3	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.139	0.710
UC-03	UB-03	Foundation Soils	37.9	4.3	72.5	0.144	37.690	0.199	0.9	61.0	3	0	0.0	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.100	0.139	0.719
UC-03	UB-03	Foundation Soils	38.0	4.2	73.1	0.186	59.350	0.255	0.9	61.4	6	0	0.0	61.4	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.139	0.721
UC-03	UB-03	Foundation Soils	38.1	4.1	71.8	0.223	59.170	0.311	0.9	60.2	9	0	0.1	60.3	1.0	-0.8	0.1	0.9	0.100	1.009	0.099	0.139	0.715
UC-03	UB-03	Foundation Soils	38.1	4.0	68.6	0.239	58.990	0.348	0.9	57.3	12	0	0.2	57.5	1.0	-0.8	0.1	0.9	0.098	1.008	0.097	0.139	0.701
UC-03	UB-03	Foundation Soils	38.2	3.9	61.9	0.194	57.330	0.314	0.9	51.4	14	0	0.2	51.7	1.0	-0.8	0.1	0.9	0.093	1.008	0.093	0.138	0.670
UC-03	UB-03	Foundation Soils	38.3	3.9	58.2	0.273	55.330	0.469	0.9	48.2	22	0	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.091	0.138	0.655
UC-03	UB-03	Foundation Soils	38.4	3.8	51.3	0.233	78.710	0.454	0.9	42.3	26	0	0.4	42.7	1.0	-0.8	0.1	0.9	0.087	1.007	0.087	0.138	0.626
UC-03	UB-03	Foundation Soils	38.5	3.7	49.5	0.208	75.320	0.420	0.9	40.7	26	0	0.4	41.1	1.0	-0.8	0.1	0.9	0.086	1.007	0.086	0.138	0.618
UC-03	UB-03	Foundation Soils	38.5	3.6	47.0	0.184	85.090	0.392	0.9	38.5	26	0	0.4	38.9	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.138	0.608
UC-03	UB-03	Foundation Soils	38.6	3.5	47.2	0.149	77.040	0.316	0.9	38.6	23	0	0.4	39.0	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.138	0.608
UC-03	UB-03	Foundation Soils	38.7	3.4	47.8	0.135	65.080	0.282	0.9	39.1	22	0	0.4	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.138	0.611
UC-03	UB-03	Foundation Soils	38.8	3.4	49.5	0.120	50.970	0.243	0.9	40.4	19	0	0.3	40.8	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.138	0.617
UC-03	UB-03	Foundation Soils	38.9	3.3	49.0	0.093	65.080	0.190	0.9	40.0	17	0	0.3	40.3	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.138	0.615
UC-03	UB-03	Foundation Soils	39.0	3.2	48.1	0.112	70.420	0.233	0.9	39.2	19	0	0.3	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.138	0.611
UC-03	UB-03	Foundation Soils	39.0	3.1	47.4	0.166	84.880	0.350	0.9	38.5	25	0	0.4	38.9	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.138	0.608
UC-03	UB-03	Foundation Soils	39.1	3.0	47.9	0.253	80.690	0.528	0.9	38.9	31	0	0.5	39.3	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.138	0.610
UC-03	UB-03	Foundation Soils	39.2	3.0	45.9	0.237	90.720	0.516	0.9	37.2	32	0	0.5	37.7	1.0	-0.9	0.1	0.9	0.084	1.007	0.083	0.138	0.602
UC-03	UB-03	Foundation Soils	39.3	2.9	42.9	0.234	90.140	0.546	0.9	34.6	35	0	0.5	35.1	1.0	-0.9	0.1	0.9	0.082	1.007	0.081	0.138	0.590
UC-03	UB-03	Foundation Soils	39.4	2.8	44.5	0.231	75.430	0.519	0.9	35.9	33	0	0.5	36.3	1.0	-0.9	0.1	0.9	0.083	1.007	0.082	0.138	0.596
UC-03	UB-03	Foundation Soils	39.5	2.7	52.7	0.200	2.480	0.379	0.9	42.8	23	0	0.4	43.1	1.0	-0.9	0.1	0.9	0.088	1.007	0.087	0.138	0.629
UC-03	UB-03	Foundation Soils	39.5	2.6	57.2	0.209	69.510	0.366	0.9	46.4	20	0	0.4	46.8	1.0	-0.9	0.1	0.8	0.090	1.007	0.089	0.138	0.647
UC-03	UB-03	Foundation Soils	39.6	2.5	63.1	0.283	54.790	0.449	0.9	51.4	19	0	0.4	51.8	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.138	0.672
UC-03	UB-03	Foundation Soils	39.7	2.5	61.6	0.402	56.140	0.653	0.9	50.1	27	0	0.5	50.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.138	0.665
UC-03	UB-03	Foundation Soils	39.8	2.4	59.2	0.589	66.510	0.995	0.9	48.0	36	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.138	0.655
UC-03	UB-03	Foundation Soils	39.9	2.3	59.2	0.628	73.620	1.061	0.9	47.9	37	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.138	0.655
UC-03	UB-03	Foundation Soils	39.9	2.2	64.2	0.586	51.450	0.913	0.9	52.1	32	0	0.5	52.6	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.138	0.676
UC-03	UB-03	Foundation Soils	40.0	2.1	69.6	0.534	-7.200	0.767	0.9	56.6	26	0	0.5	57.1	1.0	-0.9	0.1	0.8	0.097	1.008	0.096	0.138	0.699
UC-03	UB-03	Foundation Soils	40.1	2.1	71.4	0.474	-20.490	0.664	0.9	58.1	23	0	0.4	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.138	0.707
UC-03	UB-03	Foundation Soils	40.2	2.0	70.1	0.436	-8.210	0.622	0.9	57.0	22	0	0.4	57.4	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.138	0.701
UC-03	UB-03	Foundation Soils	40.3	1.9	66.3	0.426	32.880	0.643	0.9	53.6	24	0	0.4	54.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.138	0.684
UC-03	UB-03	Foundation Soils	40.4	1.8	64.2	0.493	27.110	0.768	0.9	51.8	28	0	0.5	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.138	0.675
UC-03	UB-03	Foundation Soils	40.4	1.7	63.3	0.593	-1.330	0.937	0.9	51.0	33	0	0.5	51.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.138	0.671
UC-03	UB-03	Foundation Soils	40.5	1.6	61.7	0.616	-4.760	0.998	0.9	49.6	35	0	0.5	50.1	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.138	0.664
UC-03	UB-03	Foundation Soils	40.6	1.6	59.2	0.578	-19.060	0.976	0.8	47.4	36	0	0.5	47.9	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.138	0.653
UC-03	UB-03	Foundation Soils	40.7	1.5	60.9	0.466	-21.200	0.766	0.8	48.8	30	0	0.5	49.2	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.138	0.660
UC-03	UB-03	Foundation Soils	40.8	1.4	68.1	0.397	31.350	0.583	0.9	54.8	22	0	0.4	55.2	1.0	-0.9	0.1	0.8	0.096	1.008	0.095	0.138	0.690
UC-03	UB-03	Foundation Soils	40.8	1.3	83.6	0.409	17.050	0.489	0.9	67.9	13	0	0.2	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.138	0.760
UC-03	UB-03	Foundation Soils	40.9	1.2	94.5	0.254	1.910	0.269	0.9	77.2	0	0	0.0	77.2	1.0	-0.9	0.1	0.8	0.113	1.011	0.112	0.137	0.814
UC-03	UB-03	Foundation Soils	41.0	1.2	103.8	0.196	20.200	0.189	0.9	85.1	0	0	0.0	85.1	1.0	-0.9	0.1	0.8	0.121	1.013	0.119	0.137	0.867
UC-03	UB-03	Foundation Soils	41.1	1.1	118.7	0.125	6.910	0.105	0.9	98.0	0	0	0.0	98.0	1.0	-0.9	0.1	0.8	0.135	1.017	0.133	0.137	0.970
UC-03	UB-03	Foundation Soils	41.2	1.0	128.9	0.143	13.830	0.111	0.9	106.9	0	0	0.0	106.9	1.0	-0.9	0.1	0.8	0.147	1.020	0.146	0.137	1.060
UC-03	UB-03	Foundation Soils	41.3	0.9	131.4	0.243	31.780	0.185	0.9	109.0	0	0	0.0	109.0	1.0	-0.9	0.1	0.8	0.150	1.021	0.149	0.137	1.084
UC-03	UB-03	Foundation Soils	41.3	0.8	123.7	0.233	32.680	0.188	0.9	102.1	0	0	0.0	102.1	1.0	-0.9	0.1	0.8	0.140	1.019	0.139	0.137	1.009
UC-03	UB-03	Foundation Soils	41.4	0.7	95.3	0.205	34.090	0.215	0.9	77.4	0	0	0.0	77.4	1.0	-0.9	0.1	0.8	0.113	1.012	0.112	0.137	0.816
UC-03	UB-03	Foundation Soils	41.5	0.7	77.3	0.224	36.020	0.290	0.8	62.0	7	0	0.0	62.0	1.0	-0.9	0.1	0.8	0.101	1.009	0.100	0.137	0.727
UC-03	UB-03	Foundation Soils	41.6	0.6	65.6	0.215	34.830	0.328	0.8	52.0	14	0	0.2	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.137	0.676
UC-03	UB-03	Foundation Soils	41.7	0.5	56.3	0.194	36.780	0.344	0.8	44.3	20	0	0.4	44.6	1.0	-0.9	0.1	0.8	0.089	1.007	0.088	0.137	0.638
UC-03	UB-03	Foundation Soils	41.7	0.4	55.0	0.236	34.600	0.429	0.8	43.2	24	0	0.4	43.6	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.137	0.633
UC-03	UB-03	Foundation Soils	41.8	0.3	52.5	0.241	33.490	0.459	0.8	41.0	26	0	0.4	41.4	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.137	0.623
UC-03	UB-03	Foundation Soils	41.9	0.3	51.7	0.217	36.350	0.420	0.8	40.3	26	0	0.4	40.8	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.137	0.619
UC-03	UB-03	Foundation Soils	42.0	0.2	53.0	0.169	28.310	0.319	0.8	41.4	21	0	0.4	41.7	1.0	-0.9	0.1	0.8	0.087	1.007	0.086	0.137	0.624
UC-03	UB-03	Foundation Soils	42.1	0.1	56.0	0.135	34.490	0.241	0.8	43.7	16	0	0.3	44.0	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.137	0.635
UC-03	UB-03	Foundation Soils	42.2	0.0	58.3	0.092	23.060	0.158	0.8	45.5	10	0	0.1	45.7	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.137	0.644
UC-03	UB-03	Foundation Soils	42.2	-0.1	57.0	0.064	30.150	0.112	0.8	44.4	9	0	0.1	44.5	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.137	0.638

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	42.3	-0.2	51.0	0.111	35.810	0.218	0.8	39.5	18	0	0.3	39.8	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.137	0.615
UC-03	UB-03	Foundation Soils	42.4	-0.2	50.2	0.124	33.690	0.247	0.8	38.8	20	0	0.3	39.1	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.137	0.612
UC-03	UB-03	Foundation Soils	42.5	-0.3	52.9	0.122	35.400	0.230	0.8	40.9	17	0	0.3	41.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.137	0.623
UC-03	UB-03	Foundation Soils	42.6	-0.4	55.7	0.099	32.300	0.178	0.8	43.2	13	0	0.2	43.4	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.137	0.633
UC-03	UB-03	Foundation Soils	42.7	-0.5	57.9	0.065	38.010	0.112	0.8	44.9	8	0	0.1	44.9	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.137	0.641
UC-03	UB-03	Foundation Soils	42.7	-0.6	62.1	0.064	26.970	0.103	0.8	48.3	6	0	0.0	48.3	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.137	0.657
UC-03	UB-03	Foundation Soils	42.8	-0.7	65.6	0.061	29.610	0.093	0.8	51.1	3	0	0.0	51.1	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.137	0.671
UC-03	UB-03	Foundation Soils	42.9	-0.7	66.1	0.061	33.380	0.092	0.8	51.4	3	0	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.137	0.673
UC-03	UB-03	Foundation Soils	43.0	-0.8	67.0	0.045	36.210	0.067	0.8	52.1	2	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.137	0.677
UC-03	UB-03	Foundation Soils	43.1	-0.9	67.0	0.042	33.880	0.063	0.8	52.1	2	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.137	0.677
UC-03	UB-03	Foundation Soils	43.1	-1.0	63.8	0.014	34.930	0.022	0.8	49.4	7	0	0.0	49.4	1.0	-1.0	0.1	0.8	0.092	1.008	0.091	0.136	0.663
UC-03	UB-03	Foundation Soils	43.2	-1.1	63.1	0.017	32.400	0.027	0.8	48.8	6	0	0.0	48.8	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.136	0.660
UC-03	UB-03	Foundation Soils	43.3	-1.1	59.1	0.074	36.300	0.125	0.8	45.5	9	0	0.1	45.5	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.136	0.644
UC-03	UB-03	Foundation Soils	43.4	-1.2	60.7	0.090	41.310	0.148	0.8	46.7	9	0	0.1	46.8	1.0	-1.0	0.1	0.8	0.090	1.007	0.089	0.136	0.651
UC-03	UB-03	Foundation Soils	43.5	-1.3	59.3	0.137	37.920	0.231	0.8	45.5	14	0	0.2	45.8	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.136	0.646
UC-03	UB-03	Foundation Soils	43.6	-1.4	57.4	0.168	37.640	0.293	0.8	43.9	18	0	0.3	44.2	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.136	0.638
UC-03	UB-03	Foundation Soils	43.6	-1.5	52.6	0.143	36.120	0.272	0.8	39.9	20	0	0.3	40.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.084	0.136	0.619
UC-03	UB-03	Foundation Soils	43.7	-1.6	43.6	0.195	36.280	0.447	0.8	32.7	33	0	0.5	33.2	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.136	0.586
UC-03	UB-03	Foundation Soils	43.8	-1.6	44.3	0.188	35.260	0.424	0.8	33.3	31	0	0.5	33.7	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.136	0.588
UC-03	UB-03	Foundation Soils	43.9	-1.7	48.3	0.194	33.970	0.402	0.8	36.4	28	0	0.4	36.8	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.136	0.603
UC-03	UB-03	Foundation Soils	44.0	-1.8	54.2	0.160	25.950	0.295	0.8	41.1	20	0	0.4	41.5	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.136	0.625
UC-03	UB-03	Foundation Soils	44.0	-1.9	69.3	0.124	20.340	0.179	0.8	53.3	6	0	0.0	53.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.136	0.684
UC-03	UB-03	Foundation Soils	44.1	-2.0	87.9	0.086	26.260	0.098	0.8	68.6	0	0	0.0	68.6	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.136	0.766
UC-03	UB-03	Foundation Soils	44.2	-2.0	99.8	0.077	32.400	0.077	0.8	78.5	0	0	0.0	78.5	1.0	-1.0	0.1	0.8	0.114	1.012	0.112	0.136	0.826
UC-03	UB-03	Foundation Soils	44.3	-2.1	101.5	0.065	36.950	0.064	0.8	79.9	0	0	0.0	79.9	1.0	-1.0	0.1	0.8	0.116	1.012	0.114	0.136	0.835
UC-03	UB-03	Foundation Soils	44.4	-2.2	96.3	0.056	38.880	0.058	0.8	75.4	0	0	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.110	0.136	0.807
UC-03	UB-03	Foundation Soils	44.5	-2.3	93.1	0.086	39.130	0.092	0.8	72.6	0	0	0.0	72.6	1.0	-1.0	0.1	0.8	0.109	1.011	0.107	0.136	0.790
UC-03	UB-03	Foundation Soils	44.5	-2.4	92.3	0.094	37.310	0.102	0.8	71.8	0	0	0.0	71.8	1.0	-1.0	0.1	0.8	0.109	1.010	0.107	0.136	0.786
UC-03	UB-03	Foundation Soils	44.6	-2.5	87.7	0.094	36.280	0.107	0.8	67.9	0	0	0.0	67.9	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.136	0.763
UC-03	UB-03	Foundation Soils	44.7	-2.5	84.0	0.035	34.830	0.042	0.8	64.8	0	0	0.0	64.8	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.136	0.746
UC-03	UB-03	Foundation Soils	44.8	-2.6	79.6	0.035	34.400	0.044	0.8	61.1	0	0	0.0	61.1	1.0	-1.0	0.1	0.8	0.100	1.009	0.099	0.136	0.726
UC-03	UB-03	Foundation Soils	44.9	-2.7	78.3	0.031	31.060	0.040	0.8	60.0	0	0	0.0	60.0	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.136	0.720
UC-03	UB-03	Foundation Soils	44.9	-2.8	77.8	0.029	31.800	0.037	0.8	59.6	0	0	0.0	59.6	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.136	0.718
UC-03	UB-03	Foundation Soils	45.0	-2.9	75.2	0.010	34.540	0.013	0.8	57.4	8	0	0.0	57.4	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.136	0.707
UC-03	UB-03	Foundation Soils	45.1	-2.9	73.5	0.027	36.090	0.037	0.8	55.9	0	0	0.0	55.9	1.0	-1.0	0.1	0.8	0.097	1.008	0.095	0.136	0.699
UC-03	UB-03	Foundation Soils	45.2	-3.0	68.9	0.045	34.210	0.065	0.8	52.1	1	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.136	0.679
UC-03	UB-03	Foundation Soils	45.3	-3.1	60.4	0.051	35.360	0.085	0.8	45.2	7	0	0.0	45.2	1.0	-1.0	0.1	0.8	0.089	1.007	0.087	0.136	0.645
UC-03	UB-03	Foundation Soils	45.4	-3.2	52.9	0.070	36.540	0.132	0.8	39.2	13	0	0.2	39.4	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.135	0.617
UC-03	UB-03	Foundation Soils	45.4	-3.3	48.5	0.142	36.850	0.293	0.8	35.7	24	0	0.4	36.1	1.0	-1.0	0.1	0.8	0.083	1.007	0.081	0.135	0.602
UC-03	UB-03	Foundation Soils	45.5	-3.4	49.1	0.084	37.920	0.171	0.8	36.1	18	0	0.3	36.4	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.135	0.603
UC-03	UB-03	Foundation Soils	45.6	-3.4	56.1	0.026	39.630	0.046	0.8	41.6	9	0	0.1	41.7	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.135	0.629
UC-03	UB-03	Foundation Soils	45.7	-3.5	56.6	0.072	37.780	0.127	0.8	42.0	11	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.135	0.631
UC-03	UB-03	Foundation Soils	45.8	-3.6	53.8	0.228	35.530	0.424	0.8	39.7	26	0	0.4	40.1	1.0	-1.1	0.1	0.8	0.085	1.007	0.084	0.135	0.621
UC-03	UB-03	Foundation Soils	45.8	-3.7	52.6	0.301	39.120	0.572	0.8	38.8	31	0	0.5	39.2	1.0	-1.1	0.1	0.8	0.085	1.007	0.083	0.135	0.617
UC-03	UB-03	Foundation Soils	45.9	-3.8	55.9	0.488	37.730	0.873	0.8	41.3	37	0	0.5	41.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.135	0.629
UC-03	UB-03	Foundation Soils	46.0	-3.9	74.0	0.404	40.020	0.546	0.8	55.7	20	0	0.4	56.0	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.135	0.701
UC-03	UB-03	Foundation Soils	46.1	-3.9	74.5	0.281	35.070	0.377	0.8	56.0	14	0	0.2	56.3	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.135	0.702
UC-03	UB-03	Foundation Soils	46.2	-4.0	55.0	0.242	34.150	0.440	0.8	40.4	26	0	0.4	40.8	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.135	0.625
UC-03	UB-03	Foundation Soils	46.3	-4.1	48.0	0.155	38.780	0.323	0.8	34.9	26	0	0.4	35.3	1.0	-1.1	0.1	0.8	0.082	1.007	0.081	0.135	0.599
UC-03	UB-03	Foundation Soils	46.3	-4.2	56.3	0.059	48.650	0.105	0.8	41.3	10	0	0.1	41.4	1.0	-1.1	0.1	0.8	0.086	1.007	0.085	0.135	0.628
UC-03	UB-03	Foundation Soils	46.4	-4.3	70.1	0.045	38.550	0.064	0.8	52.2	1	0	0.0	52.2	1.0	-1.1	0.1	0.8	0.094	1.008	0.092	0.135	0.682
UC-03	UB-03	Foundation Soils	46.5	-4.3	65.3	0.066	33.400	0.101	0.8	48.4	5	0	0.0	48.4	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.135	0.663
UC-03	UB-03	Foundation Soils	46.6	-4.4	57.5	0.039	34.920	0.068	0.8	42.1	8	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.135	0.632
UC-03	UB-03	Foundation Soils	46.7	-4.5	50.7	0.043	36.690	0.085	0.8	36.8	13	0	0.2	37.0	1.0	-1.1	0.1	0.8	0.083	1.007	0.082	0.135	0.608
UC-03	UB-03	Foundation Soils	46.8	-4.6	55.7	0.062	39.450	0.111	0.8	40.6	11	0	0.1	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.135	0.626
UC-03	UB-03	Foundation Soils	46.8	-4.7	76.6	0.059	35.400	0.077	0.8	57.2	0	0	0.0	57.2	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.135	0.708
UC-03	UB-03	Foundation Soils	46.9	-4.8	86.4	0.095	29.490	0.110	0.8	65.0	0	0	0.0	65.0	1.0	-1.1	0.1	0.8	0.103	1.009	0.101	0.135	0.750
UC-03	UB-03	Foundation Soils	47.0	-4.8	92.5	0.064	31.780	0.069	0.8	69.9	0	0	0.0	69.9	1.0	-1.1	0.1	0.8	0.107	1.010	0.105	0.135	0.778
UC-03	UB-03	Foundation Soils	47.1	-4.9	97.4	0.087	32.540	0.089	0.8	73.8	0	0	0.0	73.8	1.0	-1.1	0.1	0.8	0.110	1.011	0.108	0.135	0.801
UC-03	UB-03	Foundation Soils	47.2	-5.0	102.4	0.135	25.910	0.132	0.8	77.9	0	0	0.0	77.9	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.135	0.827
UC-03	UB-03	Foundation Soils	47.2	-5.1	114.4	0.166	1.760	0.145	0.8	87.9	0	0	0.0	87.9	1.0	-1.1	0.1	0.8	0.123	1.014	0.120	0.134	0.895
UC-03	UB-03	Foundation Soils	47.3	-5.2	121.1	0.155	18.160	0.128	0.8	93.4	0	0	0.0	93.4	1.0	-1.1	0.1	0.8	0.129	1.016	0.126	0.134	0.938

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	47.4	-5.2	128.0	0.130	17.900	0.102	0.8	99.1	0	0	0.0	99.1	1.0	-1.1	0.1	0.8	0.136	1.017	0.133	0.134	0.988
UC-03	UB-03	Foundation Soils	47.5	-5.3	130.4	0.136	28.780	0.104	0.8	101.1	0	0	0.0	101.1	1.0	-1.1	0.1	0.8	0.139	1.018	0.135	0.134	1.007
UC-03	UB-03	Foundation Soils	47.6	-5.4	116.6	0.146	32.260	0.125	0.8	89.3	0	0	0.0	89.3	1.0	-1.1	0.1	0.8	0.125	1.014	0.122	0.134	0.907
UC-03	UB-03	Foundation Soils	47.7	-5.5	116.2	0.133	28.650	0.114	0.8	88.9	0	0	0.0	88.9	1.0	-1.1	0.1	0.8	0.124	1.014	0.121	0.134	0.904
UC-03	UB-03	Foundation Soils	47.7	-5.6	108.7	0.016	27.010	0.015	0.8	82.6	0	0	0.0	82.6	1.0	-1.1	0.1	0.8	0.118	1.013	0.115	0.134	0.858
UC-03	UB-03	Foundation Soils	47.8	-5.7	110.1	0.010	24.010	0.009	0.8	83.7	2	0	0.0	83.7	1.0	-1.1	0.1	0.8	0.119	1.013	0.116	0.134	0.866
UC-03	UB-03	Foundation Soils	47.9	-5.7	100.9	0.010	29.420	0.010	0.8	76.1	3	0	0.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.110	0.134	0.816
UC-03	UB-03	Foundation Soils	48.0	-5.8	91.1	0.046	30.030	0.050	0.8	68.0	0	0	0.0	68.0	1.0	-1.1	0.1	0.8	0.106	1.010	0.103	0.134	0.769
UC-03	UB-03	Foundation Soils	48.1	-5.9	79.6	0.032	34.450	0.040	0.8	58.7	0	0	0.0	58.7	1.0	-1.1	0.1	0.8	0.099	1.008	0.096	0.134	0.718
UC-03	UB-03	Foundation Soils	48.1	-6.0	66.5	0.045	27.300	0.068	0.8	48.2	4	0	0.0	48.2	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.134	0.665
UC-03	UB-03	Foundation Soils	48.2	-6.1	63.0	0.027	30.330	0.043	0.8	45.4	6	0	0.0	45.4	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.134	0.651
UC-03	UB-03	Foundation Soils	48.3	-6.1	59.5	0.047	35.890	0.079	0.8	42.7	8	0	0.0	42.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.134	0.638
UC-03	UB-03	Foundation Soils	48.4	-6.2	56.3	0.052	31.400	0.092	0.8	40.1	10	0	0.1	40.3	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.134	0.626
UC-03	UB-03	Foundation Soils	48.5	-6.3	56.5	0.172	39.020	0.304	0.8	40.3	20	0	0.4	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.134	0.628
UC-03	UB-03	Foundation Soils	48.6	-6.4	62.1	0.226	39.000	0.364	0.8	44.5	20	0	0.4	44.9	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.134	0.649
UC-03	UB-03	Foundation Soils	48.6	-6.5	69.6	0.186	38.020	0.267	0.8	50.3	12	0	0.2	50.5	1.0	-1.1	0.1	0.8	0.093	1.008	0.091	0.134	0.677
UC-03	UB-03	Foundation Soils	48.7	-6.6	79.3	0.150	38.160	0.189	0.8	57.9	4	0	0.0	57.9	1.0	-1.1	0.1	0.8	0.098	1.008	0.096	0.134	0.715
UC-03	UB-03	Foundation Soils	48.8	-6.6	96.4	0.119	38.730	0.123	0.8	71.6	0	0	0.0	71.6	1.0	-1.1	0.1	0.8	0.109	1.010	0.106	0.134	0.791
UC-03	UB-03	Foundation Soils	48.9	-6.7	115.2	0.085	39.940	0.074	0.8	87.0	0	0	0.0	87.0	1.0	-1.1	0.1	0.8	0.122	1.014	0.119	0.134	0.891
UC-03	UB-03	Foundation Soils	49.0	-6.8	115.4	0.082	31.490	0.071	0.8	87.1	0	0	0.0	87.1	1.0	-1.1	0.1	0.8	0.123	1.014	0.119	0.134	0.892
UC-03	UB-03	Foundation Soils	49.0	-6.9	111.0	0.091	39.020	0.082	0.8	83.3	0	0	0.0	83.3	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.134	0.866
UC-03	UB-03	Foundation Soils	49.1	-7.0	107.0	0.047	34.880	0.044	0.8	80.0	0	0	0.0	80.0	1.0	-1.2	0.1	0.8	0.116	1.012	0.113	0.133	0.844
UC-03	UB-03	Foundation Soils	49.2	-7.0	113.6	0.064	36.470	0.056	0.8	85.3	0	0	0.0	85.3	1.0	-1.2	0.1	0.8	0.121	1.013	0.117	0.133	0.880
UC-03	UB-03	Foundation Soils	49.3	-7.1	104.2	0.065	43.170	0.062	0.8	77.5	0	0	0.0	77.5	1.0	-1.2	0.1	0.8	0.114	1.012	0.111	0.133	0.828
UC-03	UB-03	Foundation Soils	49.4	-7.2	112.9	0.091	43.690	0.081	0.8	84.6	0	0	0.0	84.6	1.0	-1.2	0.1	0.8	0.120	1.013	0.117	0.133	0.875
UC-03	UB-03	Foundation Soils	49.5	-7.3	111.6	0.079	40.400	0.071	0.8	83.4	0	0	0.0	83.4	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.133	0.867
UC-03	UB-03	Foundation Soils	49.5	-7.4	115.6	0.063	38.500	0.054	0.8	86.7	0	0	0.0	86.7	1.0	-1.2	0.1	0.8	0.122	1.014	0.119	0.133	0.890
UC-03	UB-03	Foundation Soils	49.6	-7.5	117.2	0.102	40.220	0.087	0.8	87.9	0	0	0.0	87.9	1.0	-1.2	0.1	0.8	0.123	1.014	0.120	0.133	0.900
UC-03	UB-03	Foundation Soils	49.7	-7.5	118.8	0.094	29.250	0.079	0.8	89.1	0	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.133	0.909
UC-03	UB-03	Foundation Soils	49.8	-7.6	118.9	0.095	34.000	0.080	0.8	89.1	0	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.133	0.909
UC-03	UB-03	Foundation Soils	49.9	-7.7	118.7	0.048	28.210	0.040	0.8	88.9	0	0	0.0	88.9	1.0	-1.2	0.1	0.8	0.124	1.014	0.121	0.133	0.908
UC-03	UB-03	Foundation Soils	50.0	-7.8	104.8	0.071	21.990	0.068	0.8	77.4	0	0	0.0	77.4	1.0	-1.2	0.1	0.8	0.113	1.012	0.110	0.133	0.829
UC-03	UB-03	Foundation Soils	50.0	-7.9	93.8	0.149	29.450	0.159	0.8	68.5	0	0	0.0	68.5	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.133	0.776
UC-03	UB-03	Foundation Soils	50.1	-8.0	86.3	0.120	24.980	0.139	0.8	62.5	0	0	0.0	62.5	1.0	-1.2	0.1	0.8	0.101	1.009	0.099	0.133	0.742
UC-03	UB-03	Foundation Soils	50.2	-8.0	76.6	0.163	24.250	0.213	0.8	54.7	7	0	0.0	54.8	1.0	-1.2	0.1	0.8	0.096	1.008	0.093	0.133	0.702
UC-03	UB-03	Foundation Soils	50.3	-8.1	84.3	0.183	30.550	0.217	0.8	60.7	4	0	0.0	60.7	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.133	0.733
UC-03	UB-03	Foundation Soils	50.4	-8.2	92.3	0.181	37.350	0.196	0.8	67.0	0	0	0.0	67.0	1.0	-1.2	0.1	0.8	0.105	1.010	0.102	0.133	0.768
UC-03	UB-03	Foundation Soils	50.4	-8.3	71.8	0.167	36.360	0.233	0.8	50.9	10	0	0.1	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.133	0.683
UC-03	UB-03	Foundation Soils	50.5	-8.4	65.0	0.086	36.730	0.132	0.7	45.6	8	0	0.1	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.133	0.657
UC-03	UB-03	Foundation Soils	50.6	-8.4	60.9	0.108	38.880	0.177	0.7	42.4	13	0	0.2	42.6	1.0	-1.2	0.1	0.8	0.087	1.007	0.085	0.133	0.642
UC-03	UB-03	Foundation Soils	50.7	-8.5	67.4	0.259	33.590	0.384	0.7	47.4	19	0	0.3	47.7	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.133	0.667
UC-03	UB-03	Foundation Soils	50.8	-8.6	75.1	0.289	21.320	0.385	0.8	53.2	15	0	0.3	53.5	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.133	0.696
UC-03	UB-03	Foundation Soils	50.9	-8.7	75.5	0.201	31.730	0.266	0.8	53.5	10	0	0.1	53.6	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.133	0.697
UC-03	UB-03	Foundation Soils	50.9	-8.8	73.2	0.153	34.160	0.209	0.7	51.6	8	0	0.1	51.7	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.132	0.687
UC-03	UB-03	Foundation Soils	51.0	-8.9	79.2	0.106	37.690	0.134	0.8	56.2	2	0	0.0	56.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.132	0.711
UC-03	UB-03	Foundation Soils	51.1	-8.9	89.5	0.122	39.020	0.136	0.8	64.2	0	0	0.0	64.2	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.132	0.754
UC-03	UB-03	Foundation Soils	51.2	-9.0	90.2	0.092	32.350	0.102	0.8	64.7	0	0	0.0	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.132	0.757
UC-03	UB-03	Foundation Soils	51.3	-9.1	84.2	0.112	41.200	0.133	0.8	60.0	0	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.099	1.009	0.097	0.132	0.731
UC-03	UB-03	Foundation Soils	51.3	-9.2	82.9	0.168	45.020	0.203	0.8	58.8	4	0	0.0	58.8	1.0	-1.2	0.1	0.8	0.099	1.008	0.096	0.132	0.726
UC-03	UB-03	Foundation Soils	51.4	-9.3	84.5	0.169	38.140	0.200	0.8	60.0	3	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.132	0.732
UC-03	UB-03	Foundation Soils	51.5	-9.3	87.4	0.087	26.970	0.100	0.8	62.3	0	0	0.0	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.132	0.744
UC-03	UB-03	Foundation Soils	51.6	-9.4	71.1	0.078	36.150	0.110	0.7	49.6	4	0	0.0	49.6	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.132	0.678
UC-03	UB-03	Foundation Soils	51.7	-9.5	68.5	0.054	32.830	0.079	0.7	47.6	4	0	0.0	47.6	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.132	0.668
UC-03	UB-03	Foundation Soils	51.8	-9.6	64.4	0.106	38.350	0.165	0.7	44.4	11	0	0.1	44.5	1.0	-1.2	0.1	0.8	0.088	1.007	0.086	0.132	0.653
UC-03	UB-03	Foundation Soils	51.8	-9.7	66.2	0.065	34.590	0.098	0.7	45.7	6	0	0.0	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.132	0.659
UC-03	UB-03	Foundation Soils	51.9	-9.8	71.6	0.102	39.840	0.142	0.7	49.8	6	0	0.0	49.8	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.132	0.680
UC-03	UB-03	Foundation Soils	52.0	-9.8	70.5	0.164	42.310	0.233	0.7	48.9	11	0	0.1	49.0	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.132	0.676
UC-03	UB-03	Foundation Soils	52.1	-9.9	70.6	0.124	41.450	0.176	0.7	48.9	8	0	0.1	48.9	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.132	0.676
UC-03	UB-03	Foundation Soils	52.2	-10.0	68.4	0.036	44.930	0.053	0.7	47.1	4	0	0.0	47.1	1.0	-1.2	0.1	0.8	0.090	1.007	0.088	0.132	0.667
UC-03	UB-03	Foundation Soils	52.2	-10.1	65.6	0.043	42.590	0.066	0.7	45.0	6	0	0.0	45.0	1.0	-1.2	0.1	0.8	0.089	1.007	0.086	0.132	0.657
UC-03	UB-03	Foundation Soils	52.3	-10.2	71.7	0.053	42.260	0.074	0.7	49.5	3	0	0.0	49.5	1.0	-1.2	0.1	0.8	0.092	1.008	0.089	0.132	0.680
UC-03	UB-03	Foundation Soils	52.4	-10.2	72.5	0.036	41.310	0.050	0.7	50.1	2	0	0.0	50.1	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.132	0.683

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	52.5	-10.3	72.9	0.032	40.450	0.044	0.7	50.3	2	0	0.0	50.3	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.132	0.684
UC-03	UB-03	Foundation Soils	52.6	-10.4	75.4	0.012	37.590	0.016	0.7	52.2	8	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.132	0.694
UC-03	UB-03	Foundation Soils	52.7	-10.5	72.0	0.012	32.930	0.017	0.7	49.6	9	0	0.1	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.090	0.131	0.681
UC-03	UB-03	Foundation Soils	52.7	-10.6	59.3	0.019	29.210	0.032	0.7	40.1	10	0	0.1	40.2	1.0	-1.3	0.1	0.8	0.086	1.007	0.083	0.131	0.634
UC-03	UB-03	Foundation Soils	52.8	-10.7	55.5	0.010	27.970	0.018	0.7	37.2	17	0	0.3	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.131	0.622
UC-03	UB-03	Foundation Soils	52.9	-10.7	54.0	0.041	37.730	0.076	0.7	36.1	13	0	0.2	36.3	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.131	0.616
UC-03	UB-03	Foundation Soils	53.0	-10.8	50.8	0.064	38.930	0.126	0.7	33.8	17	0	0.3	34.1	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.131	0.605
UC-03	UB-03	Foundation Soils	53.1	-10.9	51.3	0.085	44.450	0.166	0.7	34.1	19	0	0.3	34.4	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.131	0.607
UC-03	UB-03	Foundation Soils	53.1	-11.0	55.7	0.082	42.83	0.147171	0.7	37.2	15	0	0.2	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.131	0.622
UC-03	UB-03	Foundation Soils	53.2	-11.1	63.8	0.034	42.260	0.053	0.7	43.1	7	0	0.0	43.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.085	0.131	0.650
UC-03	UB-03	Foundation Soils	53.3	-11.2	68.1	0.080	36.020	0.118	0.7	46.3	7	0	0.0	46.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.131	0.665
UC-03	UB-03	Foundation Soils	53.4	-11.2	66.6	0.098	37.210	0.147	0.7	45.1	9	0	0.1	45.2	1.0	-1.3	0.1	0.8	0.089	1.007	0.087	0.131	0.660
UC-03	UB-03	Foundation Soils	53.5	-11.3	69.4	0.129	34.100	0.186	0.7	47.2	10	0	0.1	47.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.131	0.671
UC-03	UB-03	Foundation Soils	53.6	-11.4	69.0	0.066	28.820	0.096	0.7	46.8	5	0	0.0	46.8	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.131	0.669
UC-03	UB-03	Foundation Soils	53.6	-11.5	78.2	0.067	31.100	0.086	0.7	53.7	0	0	0.0	53.7	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.131	0.704
UC-03	UB-03	Foundation Soils	53.7	-11.6	88.9	0.108	14.150	0.121	0.7	61.9	0	0	0.0	61.9	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.131	0.747
UC-03	UB-03	Foundation Soils	53.8	-11.6	88.6	0.085	12.080	0.096	0.7	61.6	0	0	0.0	61.6	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.131	0.746
UC-03	UB-03	Foundation Soils	53.9	-11.7	86.3	0.137	-6.720	0.159	0.7	59.7	1	0	0.0	59.7	1.0	-1.3	0.1	0.8	0.099	1.009	0.096	0.131	0.736
UC-03	UB-03	Foundation Soils	54.0	-11.8	81.7	0.184	18.580	0.225	0.7	56.1	6	0	0.0	56.2	1.0	-1.3	0.1	0.8	0.097	1.008	0.094	0.131	0.717
UC-03	UB-03	Foundation Soils	54.1	-11.9	78.5	0.124	1.910	0.158	0.7	53.6	4	0	0.0	53.6	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.131	0.704
UC-03	UB-03	Foundation Soils	54.1	-12.0	76.7	0.146	19.050	0.190	0.7	52.2	7	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.131	0.697
UC-03	UB-03	Foundation Soils	54.2	-12.1	70.6	0.124	2.050	0.176	0.7	47.6	9	0	0.1	47.7	1.0	-1.3	0.1	0.8	0.091	1.007	0.088	0.131	0.674
UC-03	UB-03	Foundation Soils	54.3	-12.1	68.3	0.119	-16.340	0.174	0.7	45.9	10	0	0.1	46.0	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.130	0.666
UC-03	UB-03	Foundation Soils	54.4	-12.2	71.9	0.057	11.270	0.079	0.7	48.5	3	0	0.0	48.5	1.0	-1.3	0.1	0.8	0.091	1.007	0.089	0.130	0.679
UC-03	UB-03	Foundation Soils	54.5	-12.3	80.4	0.073	28.650	0.091	0.7	54.9	0	0	0.0	54.9	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.130	0.712
UC-03	UB-03	Foundation Soils	54.5	-12.4	75.1	0.029	18.770	0.039	0.7	50.8	2	0	0.0	50.8	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.130	0.691
UC-03	UB-03	Foundation Soils	54.6	-12.5	62.6	0.070	19.150	0.112	0.7	41.5	10	0	0.1	41.6	1.0	-1.3	0.1	0.8	0.086	1.007	0.084	0.130	0.645
UC-03	UB-03	Foundation Soils	54.7	-12.5	55.2	0.147	25.680	0.266	0.7	36.1	22	0	0.4	36.5	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.130	0.621
UC-03	UB-03	Foundation Soils	54.8	-12.6	51.5	0.130	24.820	0.253	0.7	33.4	23	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.130	0.608
UC-03	UB-03	Foundation Soils	54.9	-12.7	48.6	0.044	38.450	0.090	0.7	31.4	17	0	0.3	31.7	1.0	-1.3	0.1	0.8	0.080	1.006	0.078	0.130	0.598
UC-03	UB-03	Foundation Soils	55.0	-12.8	49.9	0.017	35.450	0.034	0.7	32.3	17	0	0.3	32.5	1.0	-1.3	0.1	0.8	0.080	1.007	0.078	0.130	0.602
UC-03	UB-03	Foundation Soils	55.0	-12.9	58.5	0.011	39.090	0.019	0.7	38.3	15	0	0.3	38.6	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.130	0.631
UC-03	UB-03	Foundation Soils	55.1	-13.0	66.4	0.013	36.500	0.020	0.7	44.0	11	0	0.1	44.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.086	0.130	0.659
UC-03	UB-03	Foundation Soils	55.2	-13.0	54.7	0.034	40.590	0.062	0.7	35.6	13	0	0.2	35.7	1.0	-1.3	0.1	0.8	0.083	1.007	0.080	0.130	0.618
UC-03	UB-03	Foundation Soils	55.3	-13.1	51.8	0.107	41.330	0.207	0.7	33.5	21	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.130	0.609
UC-03	UB-03	Foundation Soils	55.4	-13.2	47.1	0.033	45.200	0.070	0.7	30.1	18	0	0.3	30.4	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.130	0.593
UC-03	UB-03	Foundation Soils	55.4	-13.3	43.2	0.010	44.500	0.023	0.7	27.4	24	0	0.4	27.7	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.130	0.581
UC-03	UB-03	Foundation Soils	55.5	-13.4	47.7	0.016	42.550	0.034	0.7	30.5	18	0	0.3	30.8	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.130	0.595
UC-03	UB-03	Foundation Soils	55.6	-13.4	54.2	0.051	42.710	0.094	0.7	35.0	14	0	0.2	35.2	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.130	0.616
UC-03	UB-03	Foundation Soils	55.7	-13.5	48.3	0.058	44.680	0.120	0.7	30.8	19	0	0.3	31.1	1.0	-1.3	0.1	0.8	0.080	1.006	0.077	0.130	0.597
UC-03	UB-03	Foundation Soils	55.8	-13.6	43.8	0.073	46.170	0.167	0.7	27.6	25	0	0.4	28.0	1.0	-1.3	0.1	0.8	0.078	1.006	0.076	0.130	0.583
UC-03	UB-03	Foundation Soils	55.9	-13.7	42.3	0.170	46.650	0.402	0.7	26.6	36	0	0.5	27.1	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.130	0.579
UC-03	UB-03	Foundation Soils	55.9	-13.8	46.5	0.119	46.880	0.256	0.7	29.5	27	0	0.4	29.9	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.130	0.592
UC-03	UB-03	Foundation Soils	56.0	-13.9	53.4	0.195	43.050	0.365	0.7	34.3	27	0	0.4	34.7	1.0	-1.4	0.1	0.8	0.082	1.007	0.080	0.130	0.615
UC-03	UB-03	Foundation Soils	56.1	-13.9	65.7	0.354	46.450	0.538	0.7	43.1	26	0	0.4	43.5	1.0	-1.4	0.1	0.8	0.088	1.007	0.085	0.129	0.658
UC-03	UB-03	Foundation Soils	56.2	-14.0	84.9	0.539	35.100	0.634	0.7	57.2	21	0	0.4	57.6	1.0	-1.4	0.1	0.8	0.098	1.008	0.094	0.129	0.730
UC-03	UB-03	Foundation Soils	56.3	-14.1	85.9	0.707	41.400	0.823	0.7	57.9	26	0	0.5	58.3	1.0	-1.4	0.1	0.8	0.098	1.008	0.095	0.129	0.734
UC-03	UB-03	Foundation Soils	56.3	-14.2	108.1	0.475	28.800	0.439	0.7	74.8	7	0	0.0	74.9	1.0	-1.4	0.1	0.8	0.111	1.011	0.107	0.129	0.828
UC-03	UB-03	Foundation Soils	56.4	-14.3	107.6	0.173	28.640	0.161	0.7	74.3	0	0	0.0	74.3	1.0	-1.4	0.2	0.8	0.111	1.011	0.107	0.129	0.825
UC-03	UB-03	Foundation Soils	56.5	-14.3	119.5	0.175	16.300	0.146	0.7	83.7	0	0	0.0	83.7	0.9	-1.4	0.2	0.8	0.119	1.013	0.114	0.129	0.886
UC-03	UB-03	Foundation Soils	56.6	-14.4	127.6	0.209	-14.390	0.164	0.7	90.0	0	0	0.0	90.0	0.9	-1.4	0.2	0.8	0.126	1.015	0.120	0.129	0.933
UC-03	UB-03	Foundation Soils	56.7	-14.5	118.7	0.252	13.940	0.212	0.7	82.9	0	0	0.0	82.9	0.9	-1.4	0.2	0.8	0.118	1.013	0.114	0.129	0.881
UC-03	UB-03	Foundation Soils	56.8	-14.6	106.5	0.337	36.450	0.316	0.7	73.2	3	0	0.0	73.2	1.0	-1.4	0.2	0.8	0.110	1.011	0.106	0.129	0.819
UC-03	UB-03	Foundation Soils	56.8	-14.7	88.2	0.395	33.880	0.448	0.7	59.2	14	0	0.2	59.4	1.0	-1.4	0.2	0.8	0.099	1.009	0.096	0.129	0.741
UC-03	UB-03	Foundation Soils	56.9	-14.8	69.6	0.136	28.920	0.195	0.7	45.4	11	0	0.1	45.5	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.129	0.670
UC-03	UB-03	Foundation Soils	57.0	-14.8	60.2	0.064	8.160	0.106	0.7	38.6	11	0	0.1	38.7	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.129	0.636
UC-03	UB-03	Foundation Soils	57.1	-14.9	58.2	0.063	16.630	0.108	0.7	37.2	13	0	0.2	37.4	1.0	-1.4	0.2	0.8	0.084	1.007	0.081	0.129	0.630
UC-03	UB-03	Foundation Soils	57.2	-15.0	61.0	0.059	11.440	0.097	0.7	39.1	11	0	0.1	39.2	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.129	0.639
UC-03	UB-03	Foundation Soils	57.2	-15.1	54.2	0.077	26.900	0.142	0.7	34.3	17	0	0.3	34.6	1.0	-1.4	0.2	0.8	0.082	1.007	0.079	0.129	0.617
UC-03	UB-03	Foundation Soils	57.3	-15.2	53.0	0.148	36.470	0.279	0.7	33.4	24	0	0.4	33.8	1.0	-1.4	0.2	0.8	0.081	1.007	0.079	0.129	0.613
UC-03	UB-03	Foundation Soils	57.4	-15.3	77.6	0.161	48.410	0.207	0.7	51.0	8	0	0.1	51.0	1.0	-1.4	0.2	0.8	0.093	1.008	0.090	0.129	0.699
UC-03	UB-03	Foundation Soils	57.5	-15.3	90.1	0.207	44.500	0.230	0.7	60.2	4	0	0.0	60.2	1.0	-1.4	0.2	0.8	0.100	1.009	0.096	0.129	0.747

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	57.6	-15.4	103.3	0.285	37.010	0.276	0.7	70.1	2	0	0.0	70.1	1.0	-1.4	0.2	0.8	0.107	1.010	0.103	0.129	0.803
UC-03	UB-03	Foundation Soils	57.7	-15.5	104.0	0.291	34.230	0.280	0.7	70.7	2	0	0.0	70.7	1.0	-1.4	0.2	0.8	0.108	1.010	0.104	0.129	0.806
UC-03	UB-03	Foundation Soils	57.7	-15.6	89.0	0.232	34.540	0.261	0.7	59.2	6	0	0.0	59.2	1.0	-1.4	0.2	0.8	0.099	1.009	0.095	0.128	0.742
UC-03	UB-03	Foundation Soils	57.8	-15.7	79.2	0.205	14.100	0.259	0.7	51.9	10	0	0.1	52.0	1.0	-1.4	0.2	0.8	0.094	1.008	0.091	0.128	0.705
UC-03	UB-03	Foundation Soils	57.9	-15.7	75.0	0.083	18.040	0.111	0.7	48.7	4	0	0.0	48.7	1.0	-1.4	0.2	0.8	0.091	1.007	0.088	0.128	0.688
UC-03	UB-03	Foundation Soils	58.0	-15.8	82.5	0.046	26.200	0.056	0.7	54.2	0	0	0.0	54.2	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.128	0.717
UC-03	UB-03	Foundation Soils	58.1	-15.9	84.0	0.031	16.910	0.037	0.7	55.3	0	0	0.0	55.3	1.0	-1.4	0.2	0.8	0.096	1.008	0.093	0.128	0.723
UC-03	UB-03	Foundation Soils	58.2	-16.0	85.0	0.050	13.860	0.059	0.7	55.9	0	0	0.0	55.9	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.128	0.726
UC-03	UB-03	Foundation Soils	58.2	-16.1	82.1	0.185	23.110	0.225	0.7	53.8	7	0	0.0	53.8	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.128	0.715
UC-03	UB-03	Foundation Soils	58.3	-16.2	68.3	0.082	40.550	0.120	0.7	43.7	8	0	0.1	43.8	1.0	-1.4	0.2	0.8	0.088	1.007	0.085	0.128	0.664
UC-03	UB-03	Foundation Soils	58.4	-16.2	70.6	0.017	45.170	0.024	0.7	45.3	8	0	0.0	45.4	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.128	0.672
UC-03	UB-03	Foundation Soils	58.5	-16.3	73.3	0.021	47.840	0.029	0.7	47.2	5	0	0.0	47.2	1.0	-1.4	0.2	0.8	0.090	1.007	0.087	0.128	0.682
UC-03	UB-03	Foundation Soils	58.6	-16.4	85.4	0.010	46.450	0.012	0.7	56.1	9	0	0.1	56.1	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.128	0.728
UC-03	UB-03	Foundation Soils	58.6	-16.5	66.8	0.010	42.400	0.015	0.7	42.5	14	0	0.2	42.7	1.0	-1.4	0.2	0.8	0.087	1.007	0.084	0.128	0.660
UC-03	UB-03	Foundation Soils	58.7	-16.6	47.0	0.011	47.650	0.023	0.6	28.7	22	0	0.4	29.1	1.0	-1.4	0.2	0.8	0.078	1.006	0.076	0.128	0.594

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$

FS<=1.0

1.0<FS<=1.5

FS>1.5

[1]Earthquake magnitude taken as modal event for the deaggregation of the 5,000 year peak ground accleration

[2]PGA estimated from 2014 USGS seismic hazard maps for a 5,000-year return period earthquake

[3]Averaged corrected tip resistence cone tip resistance corrected for unequal end area effects. See Conetec report for additional info.

[4]Unit weight of soil based on Soil Behavior Type. See Conetec report for additional info.

[5]Equilibrium pore water pressure based on Pore Pressure Dissipation Tests. See Conetec report for additional info.

[6]$m = 1.338 - 0.249 * q_{c1Ncs}$ ^0.264 where $21 < q_{c1Ncs} < 254$ (Boulanger&Idriss, 2014, Equation 2.15b)

[7]C_N = overburden correction factor = $(1.06\ tsf/s'_{vc})^m$, where C_N <=1.7 (Boulanger&Idriss, 2014, Equation 2.15a)

[8]$q_{c1N} = C_N * qt/1.06$ tsf (Boulanger&Idriss, 2014, Equation 2.4)

[9]Values based sieve test results and boring log descriptions

[10]$Dq_{c1N} = (11.9+q_{c1N}/14.6)*\exp[1.63 - (9.7 / (FC + 2)) - (15.7 / (FC + 2))^2]$ (Boulanger&Idriss, 2014, Equation 2.22)

[11]$q_{c1Ncs} = q_{c1N} + Dq_{c1N}$ (Boulanger&Idriss, 2014, Equation 2.10)

[12]$C\sigma = 1 / (37.3 - 8.27 * q_{c1Ncs}$^0.264 where q_{C1Ncs}<=211 $K_s = 1-(C_s*\ln(s'_{vc}/106\ tsf))$ <=1.1 (Boulanger&Idriss,2014, Equations 2.16a, 2.16b)

[13]$a(z) = -1.012 - 1.126 * \sin(z / 11.73 + 5.133)$, where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14b)

[14]$b(z) = 0.106 + 0.118 * \sin(z /11.28 + 5.142)$, where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14c)

[15]r_d = shear stress reduction coefficient = exp[a(z) + b(z) * M] (Boulanger&Idriss, 2014, Equation 2.14a)

[16]$CRR_{M=7.5, \sigma'vc=1atm} = \exp((q_{c1Ncs}/113+q_{c1Ncs}/1000)^2-(q_{c1Ncs}/140)^3+(q_{c1Ncs}/137))^4-2.8)$ (Boulanger&Idriss, 2014, Equation, 2.24), say q_{c1Ncs} <= 300

[17]$MSF=1+(MSF_{max}-1)(8.64\exp(-M/4)-1.325)$ $MSF_{max}=1.09(q_{c1Ncs}/180)^2$<=2.2 (Boulanger&Idriss, Equations 2.19,2.20)

[18]$CRR_{corr.}=CRR_{M=7.5,\sigma'vc=1atm}*K_\sigma*MSF$ (Boulanger and Idriss,2014, Equation 2.7)

[19]$CSR_{M,\sigma'v} = 0.65*PHGA*(s_v/s'_{vc})*r_d$ (Boulanger and Idriss,2014, Equation 2.2)

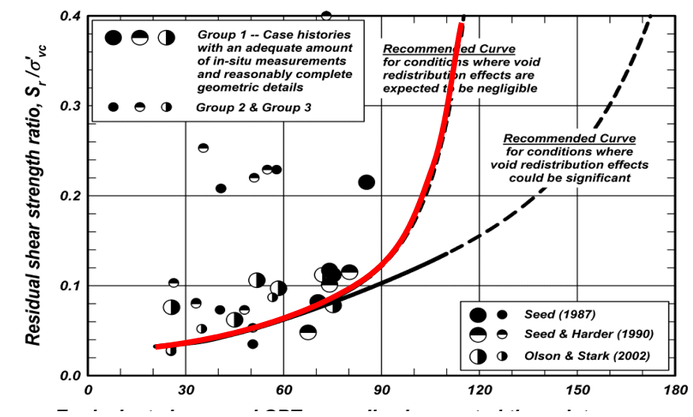
[21]State Param = state parameter index provided by Conetec and based on Been and Jefferies (1985). Positive = contractive soil, negative = dilative soil

[21]$Dq_{c1Ncs-Sr}$ is a function of fines content, values were estimated based on recommendations from Seed and Idriss, 2008

[22]$q_{c1Ncs-Sr} = q_{c1N} + Dq_{c1Ncs-Sr}$

[23]S_r/s'_{vo} estimated based on recommendations from Idriss and Boulanger, 2008, Equation 82

Idriss & Boulanger, 2008



$$\frac{S_r}{\sigma'_{vo}} = \exp\left(\frac{q_{c1Ncs-Sr}}{24.5} - \left(\frac{q_{c1Ncs-Sr}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs-Sr}}{106}\right)^3 - 4.42\right) \leq \tan\phi' \quad (82)$$

for conditions where void redistribution effects are expected to be negligible

ANALYSIS OF LIQUEFACTION POTENTIAL FOR EMBANKMENT AND FOUNDATION FOR 5000-YEAR RETURN INTERVAL

By: ZAO 1/5/2020
Checked: CDS 1/13/2020

Method: Boulanger&Idriss, CPT and SPT Based Liquefaction Triggering Procedures, April 2014
https://faculty.engineering.ucdavis.edu/boulanger/wp-content/uploads/sites/71/2014/09/Boulanger_Idriss_CPT_and_SPT_Liq_triggering_CGM-1

[1]Earthquake Magnitude, M: 7.3
[2]Peak Ground Acceleration, PHGA (g): 0.20

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	15.0	26.2	158.8	1.031	0.950	0.649	1.1	158.0	0	0	0.0	158.0	1.0	-0.2	0.0	1.0	0.351	1.052	0.378	0.125	3.030
NC-01	NB-02	Foundation Soils	15.1	26.1	149.2	1.015	0.810	0.680	1.1	148.6	0	0	0.0	148.6	1.0	-0.2	0.0	1.0	0.279	1.044	0.298	0.125	2.379
NC-01	NB-02	Foundation Soils	15.2	26.0	137.7	0.981	0.700	0.713	1.1	137.3	0	0	0.0	137.3	1.0	-0.2	0.0	1.0	0.223	1.036	0.235	0.126	1.876
NC-01	NB-02	Foundation Soils	15.3	25.9	125.6	0.934	0.910	0.743	1.1	125.5	3	0	0.0	125.5	1.0	-0.2	0.0	1.0	0.185	1.029	0.193	0.126	1.535
NC-01	NB-02	Foundation Soils	15.3	25.9	118.6	0.964	1.190	0.813	1.1	118.5	7	0	0.0	118.6	1.0	-0.2	0.0	1.0	0.168	1.026	0.175	0.126	1.388
NC-01	NB-02	Foundation Soils	15.4	25.8	99.3	1.015	1.190	1.022	1.1	99.6	16	0	0.4	100.0	1.0	-0.2	0.0	1.0	0.137	1.018	0.142	0.126	1.120
NC-01	NB-02	Foundation Soils	15.5	25.7	84.5	1.056	0.880	1.250	1.1	84.9	25	0	0.5	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.124	0.127	0.978
NC-01	NB-02	Foundation Soils	15.6	25.6	63.4	1.076	1.190	1.698	1.1	64.1	40	0	0.6	64.6	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.127	0.827
NC-01	NB-02	Foundation Soils	15.7	25.5	52.2	1.055	2.670	2.023	1.1	52.9	49	0	0.6	53.4	1.0	-0.3	0.0	1.0	0.095	1.008	0.096	0.127	0.757
NC-01	NB-02	Foundation Soils	15.7	25.4	49.3	0.967	5.540	1.962	1.1	49.9	50	0	0.6	50.5	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.128	0.738
NC-01	NB-02	Foundation Soils	15.8	25.4	48.9	0.914	7.050	1.868	1.1	49.5	49	0	0.6	50.1	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.128	0.733
NC-01	NB-02	Foundation Soils	15.9	25.3	49.6	0.812	8.620	1.636	1.1	50.1	46	0	0.6	50.7	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.128	0.735
NC-01	NB-02	Foundation Soils	16.0	25.2	49.6	0.733	12.530	1.477	1.1	50.1	44	0	0.5	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.128	0.733
NC-01	NB-02	Foundation Soils	16.1	25.1	48.2	0.571	16.320	1.185	1.1	48.6	40	0	0.5	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.129	0.723
NC-01	NB-02	Foundation Soils	16.2	25.0	47.9	0.307	18.630	0.642	1.1	48.1	28	0	0.5	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.129	0.718
NC-01	NB-02	Foundation Soils	16.2	25.0	48.4	0.228	19.450	0.471	1.1	48.6	23	0	0.4	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.129	0.719
NC-01	NB-02	Foundation Soils	16.3	24.9	47.1	0.242	15.570	0.514	1.1	47.2	25	0	0.4	47.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.130	0.710
NC-01	NB-02	Foundation Soils	16.4	24.8	42.8	0.337	18.200	0.788	1.1	42.9	36	0	0.5	43.4	1.0	-0.3	0.0	1.0	0.088	1.007	0.089	0.130	0.685
NC-01	NB-02	Foundation Soils	16.5	24.7	39.4	0.310	22.390	0.787	1.1	39.5	38	0	0.5	40.0	1.0	-0.3	0.0	1.0	0.085	1.007	0.086	0.130	0.665
NC-01	NB-02	Foundation Soils	16.6	24.6	33.7	0.274	68.340	0.814	1.1	33.8	44	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.130	0.633
NC-01	NB-02	Foundation Soils	16.7	24.5	31.8	0.232	103.200	0.729	1.1	31.9	43	0	0.5	32.4	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.131	0.622
NC-01	NB-02	Foundation Soils	16.7	24.5	31.4	0.227	95.170	0.723	1.1	31.4	44	0	0.5	31.9	1.0	-0.3	0.0	1.0	0.080	1.006	0.081	0.131	0.619
NC-01	NB-02	Foundation Soils	16.8	24.4	30.7	0.192	83.430	0.626	1.1	30.6	42	0	0.5	31.1	1.0	-0.3	0.0	1.0	0.080	1.006	0.080	0.131	0.613
NC-01	NB-02	Foundation Soils	16.9	24.3	29.4	0.182	83.430	0.619	1.1	29.3	43	0	0.5	29.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.131	0.605
NC-01	NB-02	Foundation Soils	17.0	24.2	30.4	0.203	81.570	0.668	1.1	30.3	44	0	0.5	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.132	0.609
NC-01	NB-02	Foundation Soils	17.1	24.1	31.9	0.275	72.130	0.863	1.1	31.7	47	0	0.5	32.2	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.132	0.615
NC-01	NB-02	Foundation Soils	17.1	24.0	34.4	0.182	61.270	0.529	1.1	34.1	36	0	0.5	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.132	0.626
NC-01	NB-02	Foundation Soils	17.2	24.0	35.1	0.080	57.160	0.228	1.0	34.8	25	0	0.4	35.2	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.132	0.627
NC-01	NB-02	Foundation Soils	17.3	23.9	33.6	0.063	44.640	0.187	1.0	33.2	24	0	0.4	33.6	1.0	-0.3	0.0	1.0	0.081	1.007	0.082	0.133	0.618
NC-01	NB-02	Foundation Soils	17.4	23.8	27.9	0.062	33.880	0.222	1.0	27.6	32	0	0.4	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.133	0.589
NC-01	NB-02	Foundation Soils	17.5	23.7	20.2	0.069	63.890	0.342	1.0	19.9	48	0	0.5	20.4	1.0	-0.3	0.0	1.0	0.073	1.006	0.073	0.133	0.551
NC-01	NB-02	Foundation Soils	17.6	23.6	15.8	0.104	122.090	0.660	1.0	15.6	65	0	0.5	16.0	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.133	0.530
NC-01	NB-02	Foundation Soils	17.6	23.6	16.7	0.135	150.800	0.809	1.0	16.4	66	0	0.5	16.9	1.0	-0.3	0.0	1.0	0.071	1.006	0.071	0.134	0.533
NC-01	NB-02	Foundation Soils	17.7	23.5	19.4	0.121	105.960	0.624	1.0	19.1	57	0	0.5	19.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.134	0.544
NC-01	NB-02	Foundation Soils	17.8	23.4	24.7	0.138	65.740	0.560	1.0	24.2	48	0	0.5	24.7	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.134	0.567
NC-01	NB-02	Foundation Soils	17.9	23.3	29.3	0.150	43.100	0.512	1.0	28.6	41	0	0.5	29.1	1.0	-0.3	0.0	0.9	0.078	1.006	0.079	0.134	0.587
NC-01	NB-02	Foundation Soils	18.0	23.2	31.1	0.164	37.120	0.528	1.0	30.3	40	0	0.5	30.8	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.135	0.594
NC-01	NB-02	Foundation Soils	18.0	23.1	31.7	0.190	47.830	0.600	1.0	30.8	41	0	0.5	31.3	1.0	-0.3	0.0	0.9	0.080	1.006	0.080	0.135	0.596
NC-01	NB-02	Foundation Soils	18.1	23.1	36.9	0.240	40.130	0.650	1.0	35.8	38	0	0.5	36.3	1.0	-0.3	0.0	0.9	0.083	1.007	0.084	0.135	0.620
NC-01	NB-02	Foundation Soils	18.2	23.0	41.8	0.273	30.020	0.653	1.0	40.5	34	0	0.5	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.135	0.642
NC-01	NB-02	Foundation Soils	18.3	22.9	45.9	0.314	27.250	0.685	1.0	44.3	32	0	0.5	44.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.136	0.660
NC-01	NB-02	Foundation Soils	18.4	22.8	48.6	0.336	24.610	0.691	1.0	46.9	30	0	0.5	47.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.136	0.673
NC-01	NB-02	Foundation Soils	18.5	22.7	51.4	0.353	20.150	0.686	1.0	49.5	29	0	0.5	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.136	0.685
NC-01	NB-02	Foundation Soils	18.5	22.7	53.4	0.382	18.200	0.715	1.0	51.3	28	0	0.5	51.8	1.0	-0.3	0.0	0.9	0.094	1.008	0.094	0.136	0.693
NC-01	NB-02	Foundation Soils	18.6	22.6	56.6	0.398	15.010	0.703	1.0	54.3	26	0	0.5	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.097	0.136	0.708
NC-01	NB-02	Foundation Soils	18.7	22.5	58.6	0.422	14.770	0.720	1.0	56.1	26	0	0.5	56.5	1.0	-0.3	0.0	0.9	0.097	1.008	0.098	0.137	0.717
NC-01	NB-02	Foundation Soils	18.8	22.4	60.4	0.444	15.340	0.735	1.0	57.7	25	0	0.5	58.2	1.0	-0.3	0.0	0.9	0.098	1.008	0.099	0.137	0.724
NC-01	NB-02	Foundation Soils	18.9	22.3	61.6	0.474	14.050	0.770	1.0	58.8	25	0	0.5	59.3	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.137	0.729
NC-01	NB-02	Foundation Soils	18.9	22.2	62.7	0.497	11.380	0.792	1.0	59.8	26	0	0.5	60.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.101	0.137	0.733
NC-01	NB-02	Foundation Soils	19.0	22.2	64.1	0.513	8.410	0.800	1.0	61.0	25	0	0.5	61.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.138	0.739
NC-01	NB-02	Foundation Soils	19.1	22.1	64.9	0.537	8.000	0.828	1.0	61.6	26	0	0.5	62.1	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.138	0.741
NC-01	NB-02	Foundation Soils	19.2	22.0	66.4	0.562	7.720	0.846	1.0	63.0	25	0	0.5	63.5	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.138	0.747
NC-01	NB-02	Foundation Soils	19.3	21.9	68.0	0.584	7.560	0.858	1.0	64.5	25	0	0.5	64.9	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.138	0.755

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	19.4	21.8	68.7	0.607	7.080	0.884	1.0	65.0	25	0	0.5	65.4	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.138	0.756
NC-01	NB-02	Foundation Soils	19.4	21.8	69.0	0.546	7.000	0.791	1.0	65.2	23	0	0.4	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.139	0.756
NC-01	NB-02	Foundation Soils	19.5	21.7	68.9	0.586	7.150	0.850	1.0	65.0	24	0	0.5	65.5	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.139	0.754
NC-01	NB-02	Foundation Soils	19.6	21.6	69.1	0.628	7.040	0.908	1.0	65.1	26	0	0.5	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.139	0.753
NC-01	NB-02	Foundation Soils	19.7	21.5	69.4	0.671	7.000	0.967	1.0	65.3	27	0	0.5	65.8	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.139	0.753
NC-01	NB-02	Foundation Soils	19.8	21.4	67.5	0.687	3.430	1.019	1.0	63.4	29	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.139	0.741
NC-01	NB-02	Foundation Soils	19.8	21.3	67.4	0.701	5.670	1.040	1.0	63.2	29	0	0.5	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.140	0.739
NC-01	NB-02	Foundation Soils	19.9	21.3	67.7	0.705	6.190	1.042	1.0	63.4	29	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.140	0.739
NC-01	NB-02	Foundation Soils	20.0	21.2	69.0	0.695	6.340	1.007	1.0	64.6	28	0	0.5	65.1	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.140	0.744
NC-01	NB-02	Foundation Soils	20.1	21.1	70.0	0.681	6.340	0.973	1.0	65.4	27	0	0.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.140	0.748
NC-01	NB-02	Foundation Soils	20.2	21.0	70.8	0.688	6.810	0.972	1.0	66.1	27	0	0.5	66.6	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.140	0.750
NC-01	NB-02	Foundation Soils	20.3	20.9	72.2	0.696	7.720	0.964	1.0	67.3	26	0	0.5	67.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.141	0.756
NC-01	NB-02	Foundation Soils	20.3	20.9	73.0	0.692	8.100	0.948	1.0	68.0	25	0	0.5	68.5	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.141	0.759
NC-01	NB-02	Foundation Soils	20.4	20.8	73.6	0.700	8.450	0.951	1.0	68.5	25	0	0.5	68.9	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.141	0.760
NC-01	NB-02	Foundation Soils	20.5	20.7	73.9	0.729	8.620	0.987	1.0	68.6	26	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.141	0.760
NC-01	NB-02	Foundation Soils	20.6	20.6	74.0	0.760	8.560	1.027	1.0	68.6	27	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.141	0.759
NC-01	NB-02	Foundation Soils	20.7	20.5	73.2	0.766	8.580	1.046	1.0	67.8	27	0	0.5	68.3	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.142	0.753
NC-01	NB-02	Foundation Soils	20.8	20.4	72.0	0.772	8.580	1.073	1.0	66.5	29	0	0.5	67.0	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.142	0.745
NC-01	NB-02	Foundation Soils	20.8	20.4	68.8	0.771	8.880	1.121	1.0	63.5	31	0	0.5	64.0	1.0	-0.4	0.0	0.9	0.103	1.009	0.103	0.142	0.727
NC-01	NB-02	Foundation Soils	20.9	20.3	65.4	0.785	9.420	1.200	1.0	60.3	34	0	0.5	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.142	0.708
NC-01	NB-02	Foundation Soils	21.0	20.2	63.8	0.790	9.340	1.238	1.0	58.7	35	0	0.5	59.2	1.0	-0.4	0.0	0.9	0.099	1.009	0.099	0.142	0.699
NC-01	NB-02	Foundation Soils	21.1	20.1	60.6	0.780	9.430	1.288	1.0	55.6	37	0	0.5	56.2	1.0	-0.4	0.0	0.9	0.097	1.008	0.097	0.143	0.682
NC-01	NB-02	Foundation Soils	21.2	20.0	58.6	0.743	10.050	1.269	1.0	53.7	38	0	0.5	54.3	1.0	-0.4	0.0	0.9	0.095	1.008	0.096	0.143	0.671
NC-01	NB-02	Foundation Soils	21.2	19.9	56.1	0.704	11.580	1.255	1.0	51.4	39	0	0.5	51.9	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.143	0.658
NC-01	NB-02	Foundation Soils	21.3	19.9	54.9	0.671	12.530	1.222	1.0	50.2	39	0	0.5	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.143	0.651
NC-01	NB-02	Foundation Soils	21.4	19.8	54.0	0.633	12.670	1.172	1.0	49.3	39	0	0.5	49.8	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.143	0.646
NC-01	NB-02	Foundation Soils	21.5	19.7	53.1	0.618	12.670	1.164	1.0	48.4	39	0	0.5	48.9	1.0	-0.4	0.0	0.9	0.092	1.007	0.092	0.143	0.640
NC-01	NB-02	Foundation Soils	21.6	19.6	52.9	0.616	13.440	1.165	1.0	48.1	39	0	0.5	48.6	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.144	0.638
NC-01	NB-02	Foundation Soils	21.7	19.5	53.6	0.601	13.960	1.121	1.0	48.7	38	0	0.5	49.3	1.0	-0.4	0.0	0.9	0.092	1.008	0.092	0.144	0.640
NC-01	NB-02	Foundation Soils	21.7	19.5	56.1	0.575	13.780	1.026	1.0	50.9	35	0	0.5	51.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.144	0.650
NC-01	NB-02	Foundation Soils	21.8	19.4	58.5	0.551	13.720	0.941	1.0	53.1	32	0	0.5	53.6	1.0	-0.4	0.0	0.9	0.095	1.008	0.095	0.144	0.660
NC-01	NB-02	Foundation Soils	21.9	19.3	63.0	0.559	13.570	0.887	1.0	57.2	29	0	0.5	57.7	1.0	-0.4	0.0	0.9	0.098	1.008	0.098	0.144	0.680
NC-01	NB-02	Foundation Soils	22.0	19.2	66.4	0.561	12.570	0.844	1.0	60.2	26	0	0.5	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.144	0.695
NC-01	NB-02	Foundation Soils	22.1	19.1	66.8	0.586	11.700	0.877	1.0	60.5	27	0	0.5	61.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.145	0.695
NC-01	NB-02	Foundation Soils	22.1	19.0	66.5	0.599	9.960	0.901	1.0	60.1	28	0	0.5	60.6	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.145	0.692
NC-01	NB-02	Foundation Soils	22.2	19.0	62.7	0.613	0.080	0.978	1.0	56.5	31	0	0.5	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.098	0.145	0.673
NC-01	NB-02	Foundation Soils	22.3	18.9	55.6	0.675	-1.290	1.213	1.0	50.0	39	0	0.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.145	0.640
NC-01	NB-02	Foundation Soils	22.4	18.8	47.1	0.697	3.130	1.480	0.9	42.2	48	0	0.5	42.7	1.0	-0.4	0.0	0.9	0.087	1.007	0.087	0.145	0.602
NC-01	NB-02	Foundation Soils	22.5	18.7	41.8	0.655	3.050	1.566	0.9	37.4	52	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.084	0.145	0.578
NC-01	NB-02	Foundation Soils	22.6	18.6	39.5	0.629	9.790	1.593	0.9	35.2	54	0	0.5	35.7	1.0	-0.4	0.0	0.9	0.083	1.007	0.083	0.146	0.567
NC-01	NB-02	Foundation Soils	22.6	18.6	39.4	0.593	7.100	1.506	0.9	35.0	53	0	0.5	35.6	1.0	-0.4	0.0	0.9	0.082	1.007	0.083	0.146	0.566
NC-01	NB-02	Foundation Soils	22.7	18.5	39.3	0.485	-0.820	1.235	0.9	34.9	49	0	0.5	35.4	1.0	-0.4	0.0	0.9	0.082	1.007	0.082	0.146	0.565
NC-01	NB-02	Foundation Soils	22.8	18.4	36.5	0.398	1.240	1.091	0.9	32.3	49	0	0.5	32.8	1.0	-0.4	0.0	0.9	0.081	1.007	0.081	0.146	0.552
NC-01	NB-02	Foundation Soils	22.9	18.3	33.9	0.354	4.170	1.044	0.9	30.0	51	0	0.5	30.5	1.0	-0.4	0.0	0.9	0.079	1.006	0.079	0.146	0.541
NC-01	NB-02	Foundation Soils	23.0	18.2	29.7	0.310	7.290	1.044	0.9	26.1	55	0	0.5	26.7	1.0	-0.4	0.0	0.9	0.077	1.006	0.077	0.146	0.524
NC-01	NB-02	Foundation Soils	23.0	18.1	26.5	0.300	7.120	1.131	0.9	23.3	60	0	0.5	23.8	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.147	0.511
NC-01	NB-02	Foundation Soils	23.1	18.1	24.8	0.284	8.580	1.146	0.9	21.7	62	0	0.5	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.147	0.503
NC-01	NB-02	Foundation Soils	23.2	18.0	25.7	0.270	11.890	1.049	0.9	22.5	59	0	0.5	23.0	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.147	0.506
NC-01	NB-02	Foundation Soils	23.3	17.9	27.4	0.253	11.410	0.922	0.9	24.0	55	0	0.5	24.5	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.147	0.512
NC-01	NB-02	Foundation Soils	23.4	17.8	26.9	0.249	14.010	0.925	0.9	23.5	56	0	0.5	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.147	0.509
NC-01	NB-02	Foundation Soils	23.5	17.7	26.3	0.252	16.390	0.958	0.9	22.9	57	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.147	0.506
NC-01	NB-02	Foundation Soils	23.5	17.7	25.8	0.247	18.340	0.959	0.9	22.4	58	0	0.5	22.9	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.148	0.504
NC-01	NB-02	Foundation Soils	23.6	17.6	25.1	0.252	17.880	1.004	0.9	21.8	59	0	0.5	22.3	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.148	0.500
NC-01	NB-02	Foundation Soils	23.7	17.5	24.1	0.258	18.060	1.072	0.9	20.8	62	0	0.5	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.148	0.496
NC-01	NB-02	Foundation Soils	23.8	17.4	22.9	0.263	18.490	1.147	0.9	20.3	65	30	47.4	67.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.148	0.713
NC-01	NB-02	Foundation Soils	23.9	17.3	20.9	0.264	18.540	1.265	0.9	18.4	74	30	47.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.104	0.148	0.703
NC-01	NB-02	Foundation Soils	23.9	17.2	19.3	0.262	18.720	1.358	0.9	17.0	77	30	47.4	64.4	1.0	-0.4	0.1	0.9	0.103	1.009	0.103	0.148	0.693
NC-01	NB-02	Foundation Soils	24.0	17.2	17.7	0.260	18.870	1.468	0.9	15.6	82	30	47.2	62.8	1.0	-0.4	0.1	0.9	0.102	1.009	0.102	0.148	0.684
NC-01	NB-02	Foundation Soils	24.1	17.1	15.9	0.261	19.200	1.646	0.9	13.9	88	30	47.0	60.9	1.0	-0.4	0.1	0.9	0.100	1.009	0.100	0.149	0.674
NC-01	NB-02	Foundation Soils	24.2	17.0	14.5	0.240	20.250	1.658	0.9	12.7	91	30	46.8	59.5	1.0	-0.5	0.1	0.9	0.099	1.009	0.099	0.149	0.666
NC-01	NB-02	Foundation Soils	24.3	16.9	12.8	0.205	29.540	1.601	0.9	11.2	95	30	46.5	57.7	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.149	0.657
NC-01	NB-02	Foundation Soils	24.4	16.8	12.7	0.158	35.010	1.247	0.9	11.1	91	30	46.4	57.4	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.149	0.655

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	24.4	16.7	13.2	0.115	32.350	0.871	0.9	11.5	84	30	46.3	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.149	0.656
NC-01	NB-02	Foundation Soils	24.5	16.7	13.5	0.083	31.410	0.614	0.9	11.8	78	30	46.1	57.9	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.149	0.655
NC-01	NB-02	Foundation Soils	24.6	16.6	13.6	0.068	34.690	0.500	0.9	11.8	75	30	46.0	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.149	0.654
NC-01	NB-02	Foundation Soils	24.7	16.5	13.8	0.072	32.160	0.522	0.9	12.0	75	30	46.0	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.150	0.655
NC-01	NB-02	Foundation Soils	24.8	16.4	13.8	0.076	32.590	0.551	0.9	12.0	76	30	46.1	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.150	0.654
NC-01	NB-02	Foundation Soils	24.9	16.3	13.2	0.090	32.280	0.683	0.9	11.4	81	30	46.1	57.6	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.150	0.651
NC-01	NB-02	Foundation Soils	24.9	16.3	12.8	0.114	33.260	0.893	0.9	11.1	86	30	46.2	57.3	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.150	0.649
NC-01	NB-02	Foundation Soils	25.0	16.2	12.5	0.131	29.490	1.048	0.9	10.8	89	30	46.3	57.1	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.150	0.647
NC-01	NB-02	Foundation Soils	25.1	16.1	12.8	0.085	32.160	0.663	0.9	11.1	82	30	46.1	57.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.150	0.647
NC-01	NB-02	Foundation Soils	25.2	16.0	12.1	0.066	28.230	0.543	0.9	10.5	81	30	45.9	56.4	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.150	0.642
NC-01	NB-02	Foundation Soils	25.3	15.9	11.7	0.076	22.160	0.651	0.9	10.1	85	30	45.9	56.0	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.151	0.640
NC-01	NB-02	Foundation Soils	25.3	15.8	11.9	0.071	14.240	0.596	0.9	10.3	83	30	45.9	56.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.151	0.640
NC-01	NB-02	Foundation Soils	25.4	15.8	11.3	0.070	21.920	0.620	0.9	9.7	86	30	45.9	55.6	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.151	0.637
NC-01	NB-02	Foundation Soils	25.5	15.7	10.8	0.063	27.590	0.586	0.9	9.2	87	30	45.8	55.0	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.151	0.633
NC-01	NB-02	Foundation Soils	25.6	15.6	9.6	0.057	31.400	0.592	0.9	8.2	92	15	35.0	43.2	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.151	0.578
NC-01	NB-02	Foundation Soils	25.7	15.5	8.2	0.036	30.020	0.439	0.9	7.0	95	15	34.8	41.8	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.151	0.571
NC-01	NB-02	Foundation Soils	25.8	15.4	6.0	0.040	39.550	0.661	0.9	5.1	100	15	34.5	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.151	0.561
NC-01	NB-02	Foundation Soils	25.8	15.4	4.7	0.052	52.080	1.117	0.9	3.9	100	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.151	0.554
NC-01	NB-02	Foundation Soils	25.9	15.3	4.7	0.059	71.090	1.268	0.9	3.9	100	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.152	0.554
NC-01	NB-02	Foundation Soils	26.0	15.2	9.5	0.063	62.400	0.660	0.9	8.1	94	15	35.0	43.1	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.152	0.575
NC-01	NB-02	Foundation Soils	26.1	15.1	12.9	0.071	42.450	0.551	0.9	10.9	80	15	35.2	46.1	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.152	0.588
NC-01	NB-02	Foundation Soils	26.2	15.0	15.8	0.068	29.210	0.431	0.9	13.4	63	15	34.9	48.3	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.152	0.597
NC-01	NB-02	Foundation Soils	26.2	14.9	16.7	0.075	34.860	0.449	0.9	14.2	61	15	34.9	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.152	0.600
NC-01	NB-02	Foundation Soils	26.3	14.9	19.0	0.082	15.200	0.431	0.9	16.1	57	15	34.9	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.152	0.609
NC-01	NB-02	Foundation Soils	26.4	14.8	19.3	0.071	19.520	0.368	0.9	16.3	54	15	34.7	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.152	0.608
NC-01	NB-02	Foundation Soils	26.5	14.7	19.7	0.075	16.440	0.381	0.9	16.7	54	15	34.8	51.4	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.152	0.609
NC-01	NB-02	Foundation Soils	26.6	14.6	19.7	0.065	27.060	0.330	0.9	16.6	52	15	34.6	51.2	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.153	0.608
NC-01	NB-02	Foundation Soils	26.7	14.5	19.8	0.053	34.240	0.268	0.9	16.7	50	15	34.3	51.0	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.153	0.606
NC-01	NB-02	Foundation Soils	26.7	14.5	20.4	0.057	40.350	0.280	0.9	17.2	49	15	34.4	51.5	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.153	0.608
NC-01	NB-02	Foundation Soils	26.8	14.4	20.8	0.065	37.690	0.312	0.9	17.6	50	15	34.5	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.153	0.610
NC-01	NB-02	Foundation Soils	26.9	14.3	19.7	0.060	40.280	0.304	0.9	16.6	51	15	34.5	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.153	0.605
NC-01	NB-02	Foundation Soils	27.0	14.2	18.4	0.054	51.090	0.294	0.9	15.4	54	15	34.5	49.9	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.153	0.599
NC-01	NB-02	Foundation Soils	27.1	14.1	17.5	0.047	59.890	0.269	0.9	14.6	54	15	34.4	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.153	0.595
NC-01	NB-02	Foundation Soils	27.1	14.0	17.5	0.037	55.410	0.212	0.9	14.6	52	15	34.2	48.9	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.153	0.593
NC-01	NB-02	Foundation Soils	27.2	14.0	17.8	0.034	56.190	0.191	0.9	14.9	51	15	34.1	49.0	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.153	0.594
NC-01	NB-02	Foundation Soils	27.3	13.9	19.3	0.029	52.030	0.151	0.9	16.1	46	15	33.7	49.8	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.154	0.597
NC-01	NB-02	Foundation Soils	27.4	13.8	20.9	0.027	55.220	0.129	0.9	17.4	43	15	33.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.154	0.601
NC-01	NB-02	Foundation Soils	27.5	13.7	22.9	0.026	65.750	0.113	0.9	19.1	39	15	32.8	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.154	0.605
NC-01	NB-02	Foundation Soils	27.6	13.6	24.8	0.019	69.680	0.077	0.9	20.7	35	15	31.9	52.6	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.154	0.608
NC-01	NB-02	Foundation Soils	27.6	13.6	25.2	0.021	70.420	0.083	0.9	21.0	34	15	31.9	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.154	0.609
NC-01	NB-02	Foundation Soils	27.7	13.5	25.2	0.025	71.610	0.099	0.9	21.0	35	15	32.1	53.1	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.154	0.609
NC-01	NB-02	Foundation Soils	27.8	13.4	24.7	0.026	72.470	0.105	0.9	20.6	36	15	32.3	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.154	0.608
NC-01	NB-02	Foundation Soils	27.9	13.3	23.7	0.025	76.210	0.106	0.9	19.7	37	15	32.6	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.154	0.604
NC-01	NB-02	Foundation Soils	28.0	13.2	22.9	0.023	78.140	0.101	0.9	18.9	38	15	32.7	51.7	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.154	0.601
NC-01	NB-02	Foundation Soils	28.1	13.1	21.7	0.019	81.420	0.088	0.9	17.9	40	15	32.9	50.8	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.154	0.597
NC-01	NB-02	Foundation Soils	28.1	13.1	20.7	0.015	83.330	0.073	0.9	17.1	41	15	33.0	50.1	1.0	-0.6	0.1	0.9	0.092	1.008	0.092	0.155	0.593
NC-01	NB-02	Foundation Soils	28.2	13.0	19.8	0.010	86.460	0.050	0.9	16.3	42	15	33.1	49.5	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.155	0.590
NC-01	NB-02	Foundation Soils	28.3	12.9	19.3	0.010	89.240	0.052	0.9	15.9	43	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.155	0.588
NC-01	NB-02	Foundation Soils	28.4	12.8	19.2	0.011	91.430	0.057	0.9	15.8	43	15	33.2	49.0	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.155	0.587
NC-01	NB-02	Foundation Soils	28.5	12.7	19.4	0.012	93.050	0.062	0.9	15.9	43	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.155	0.587
NC-01	NB-02	Foundation Soils	28.5	12.6	19.6	0.017	95.530	0.087	0.9	16.1	44	15	33.3	49.3	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.155	0.588
NC-01	NB-02	Foundation Soils	28.6	12.6	19.5	0.031	98.050	0.159	0.9	16.0	47	15	33.8	49.8	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.155	0.589
NC-01	NB-02	Foundation Soils	28.7	12.5	18.9	0.041	98.950	0.217	0.9	15.4	50	15	34.2	49.6	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.155	0.588
NC-01	NB-02	Foundation Soils	28.8	12.4	16.7	0.037	102.290	0.222	0.9	13.6	55	15	34.3	47.9	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.155	0.580
NC-01	NB-02	Foundation Soils	28.9	12.3	14.5	0.041	104.650	0.283	0.9	11.8	62	15	34.5	46.3	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.155	0.573
NC-01	NB-02	Foundation Soils	29.0	12.2	11.8	0.048	111.250	0.405	0.9	9.6	82	15	35.0	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.155	0.565
NC-01	NB-02	Foundation Soils	29.0	12.2	9.4	0.052	127.860	0.555	0.9	7.6	96	15	34.9	42.5	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.156	0.555
NC-01	NB-02	Foundation Soils	29.1	12.1	8.3	0.042	139.790	0.504	0.9	6.7	100	15	34.8	41.6	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.156	0.551
NC-01	NB-02	Foundation Soils	29.2	12.0	8.3	0.040	139.360	0.480	0.9	6.7	99	15	34.8	41.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.156	0.550
NC-01	NB-02	Foundation Soils	29.3	11.9	8.8	0.081	127.640	0.918	0.9	7.1	100	15	34.9	42.0	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.156	0.552
NC-01	NB-02	Foundation Soils	29.4	11.8	9.5	0.099	132.060	1.044	0.9	7.7	100	15	35.0	42.7	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.156	0.554
NC-01	NB-02	Foundation Soils	29.4	11.7	11.5	0.145	121.780	1.258	0.9	9.3	100	15	35.3	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.156	0.562

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	29.5	11.7	12.7	0.115	110.010	0.903	0.9	10.3	91	15	35.3	45.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.156	0.566
NC-01	NB-02	Foundation Soils	29.6	11.6	20.0	0.187	52.550	0.937	0.9	16.2	75	15	36.0	52.2	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.156	0.595
NC-01	NB-02	Foundation Soils	29.7	11.5	23.6	0.173	82.330	0.734	0.9	19.2	58	15	35.6	54.8	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.156	0.606
NC-01	NB-02	Foundation Soils	29.8	11.4	35.3	0.163	143.140	0.462	0.9	28.8	38	15	34.4	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.156	0.645
NC-01	NB-02	Foundation Soils	29.9	11.3	47.3	0.176	68.040	0.372	0.9	38.8	26	15	30.6	69.4	1.0	-0.6	0.1	0.9	0.107	1.010	0.106	0.157	0.675
NC-01	NB-02	Foundation Soils	29.9	11.3	53.4	0.242	-0.810	0.453	0.9	43.9	25	15	30.6	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.110	0.157	0.701
NC-01	NB-02	Foundation Soils	30.0	11.2	59.7	0.088	10.430	0.148	0.9	48.1	8	15	4.1	52.3	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.157	0.593
NC-01	NB-02	Foundation Soils	30.1	11.1	68.2	0.102	6.760	0.149	0.9	55.1	4	15	0.0	55.2	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.157	0.606
NC-01	NB-02	Foundation Soils	30.2	11.0	74.6	0.177	10.010	0.237	0.9	60.5	5	15	0.5	61.0	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.157	0.633
NC-01	NB-02	Foundation Soils	30.3	10.9	74.4	0.149	4.470	0.200	0.9	60.3	4	15	0.0	60.3	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.157	0.629
NC-01	NB-02	Foundation Soils	30.3	10.8	70.4	0.286	11.820	0.406	0.9	57.6	15	15	18.9	76.5	1.0	-0.6	0.1	0.9	0.113	1.011	0.111	0.157	0.710
NC-01	NB-02	Foundation Soils	30.4	10.8	73.1	0.271	11.650	0.371	0.9	59.7	12	15	13.4	73.1	1.0	-0.6	0.1	0.9	0.110	1.011	0.109	0.157	0.691
NC-01	NB-02	Foundation Soils	30.5	10.7	81.3	0.187	12.200	0.230	0.9	66.0	2	15	0.0	66.0	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.157	0.654
NC-01	NB-02	Foundation Soils	30.6	10.6	78.3	0.132	23.570	0.168	0.9	63.3	0	15	0.0	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.157	0.641
NC-01	NB-02	Foundation Soils	30.7	10.5	70.1	0.183	23.490	0.261	0.9	56.6	9	15	5.4	62.0	1.0	-0.6	0.1	0.9	0.101	1.009	0.100	0.157	0.635
NC-01	NB-02	Foundation Soils	30.8	10.4	70.1	0.280	20.010	0.399	0.9	57.1	15	15	18.9	75.9	1.0	-0.6	0.1	0.9	0.112	1.011	0.111	0.157	0.704
NC-01	NB-02	Foundation Soils	30.8	10.4	76.9	0.242	11.980	0.315	0.9	62.1	8	15	4.6	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.157	0.656
NC-01	NB-02	Foundation Soils	30.9	10.3	80.3	0.197	12.260	0.245	0.9	64.7	4	15	0.0	64.7	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.157	0.647
NC-01	NB-02	Foundation Soils	31.0	10.2	83.1	0.202	5.100	0.243	0.9	67.0	2	15	0.0	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.104	0.158	0.657
NC-01	NB-02	Foundation Soils	31.1	10.1	79.5	0.268	41.260	0.337	0.9	64.2	8	15	4.6	68.7	1.0	-0.6	0.1	0.9	0.106	1.010	0.105	0.158	0.665
NC-01	NB-02	Foundation Soils	31.2	10.0	74.5	0.362	14.640	0.486	0.9	60.6	16	15	21.8	82.4	1.0	-0.6	0.1	0.9	0.118	1.013	0.117	0.158	0.739
NC-01	NB-02	Foundation Soils	31.2	9.9	74.5	0.275	17.590	0.369	0.9	60.1	12	15	12.6	72.8	1.0	-0.6	0.1	0.9	0.110	1.011	0.108	0.158	0.685
NC-01	NB-02	Foundation Soils	31.3	9.9	86.3	0.255	15.440	0.295	0.9	69.5	4	15	0.0	69.5	1.0	-0.6	0.1	0.9	0.107	1.010	0.105	0.158	0.668
NC-01	NB-02	Foundation Soils	31.4	9.8	82.0	0.249	27.920	0.304	0.8	65.7	6	15	1.0	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.158	0.654
NC-01	NB-02	Foundation Soils	31.5	9.7	80.5	0.241	8.750	0.299	0.8	64.4	6	15	1.4	65.8	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.158	0.649
NC-01	NB-02	Foundation Soils	31.6	9.6	81.2	0.210	25.760	0.259	0.8	64.9	4	15	0.1	65.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.158	0.645
NC-01	NB-02	Foundation Soils	31.7	9.5	83.3	0.084	20.630	0.101	0.8	66.6	0	15	0.0	66.6	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.158	0.652
NC-01	NB-02	Foundation Soils	31.7	9.4	83.4	0.068	18.720	0.082	0.8	66.6	0	15	0.0	66.6	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.158	0.652
NC-01	NB-02	Foundation Soils	31.8	9.4	84.0	0.045	18.240	0.054	0.8	67.0	0	15	0.0	67.0	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.158	0.653
NC-01	NB-02	Foundation Soils	31.9	9.3	83.1	0.031	20.730	0.037	0.8	66.2	0	15	0.0	66.2	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.158	0.649
NC-01	NB-02	Foundation Soils	32.0	9.2	78.4	0.045	25.970	0.057	0.8	62.2	0	15	0.0	62.2	1.0	-0.7	0.1	0.9	0.101	1.009	0.100	0.158	0.630
NC-01	NB-02	Foundation Soils	32.1	9.1	72.3	0.044	18.820	0.061	0.8	57.0	0	15	0.0	57.0	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.158	0.606
NC-01	NB-02	Foundation Soils	32.2	9.0	67.2	0.057	21.620	0.085	0.8	52.6	2	15	0.0	52.6	1.0	-0.7	0.1	0.9	0.094	1.008	0.093	0.158	0.586
NC-01	NB-02	Foundation Soils	32.2	9.0	64.0	0.058	14.200	0.091	0.8	49.9	4	15	0.0	50.0	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.159	0.574
NC-01	NB-02	Foundation Soils	32.3	8.9	58.7	0.065	21.860	0.111	0.8	45.7	8	15	3.3	49.0	1.0	-0.7	0.1	0.9	0.092	1.007	0.090	0.159	0.570
NC-01	NB-02	Foundation Soils	32.4	8.8	53.2	0.056	25.050	0.105	0.8	41.5	11	15	9.8	51.3	1.0	-0.7	0.1	0.9	0.093	1.008	0.092	0.159	0.579
NC-01	NB-02	Foundation Soils	32.5	8.7	57.4	0.034	18.470	0.059	0.8	44.4	7	15	1.9	46.4	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.159	0.558
NC-01	NB-02	Foundation Soils	32.6	8.6	59.6	0.031	5.720	0.052	0.8	46.1	6	15	0.7	46.8	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.159	0.559
NC-01	NB-02	Foundation Soils	32.6	8.5	63.7	0.067	10.420	0.105	0.8	49.4	5	15	0.2	49.7	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.159	0.571
NC-01	NB-02	Foundation Soils	32.7	8.5	63.2	0.070	10.860	0.111	0.8	49.0	5	15	0.5	49.5	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.159	0.570
NC-01	NB-02	Foundation Soils	32.8	8.4	65.2	0.080	8.800	0.123	0.8	50.5	5	15	0.3	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.159	0.576
NC-01	NB-02	Foundation Soils	32.9	8.3	59.7	0.181	11.910	0.303	0.8	47.0	17	15	21.7	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.159	0.658
NC-01	NB-02	Foundation Soils	33.0	8.2	54.6	0.218	11.910	0.399	0.8	43.1	23	15	29.3	72.5	1.0	-0.7	0.1	0.9	0.109	1.011	0.107	0.159	0.676
NC-01	NB-02	Foundation Soils	33.1	8.1	57.6	0.175	33.020	0.304	0.8	45.3	18	15	23.4	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.159	0.657
NC-01	NB-02	Foundation Soils	33.1	8.1	65.7	0.191	6.580	0.291	0.8	51.6	13	15	15.3	66.8	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.159	0.647
NC-01	NB-02	Foundation Soils	33.2	8.0	72.7	0.171	21.620	0.235	0.8	56.6	7	15	2.6	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.159	0.611
NC-01	NB-02	Foundation Soils	33.3	7.9	73.8	0.181	10.280	0.245	0.8	57.4	7	15	2.6	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.159	0.615
NC-01	NB-02	Foundation Soils	33.4	7.8	70.9	0.172	20.920	0.243	0.8	55.1	9	15	4.9	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.159	0.614
NC-01	NB-02	Foundation Soils	33.5	7.7	71.3	0.261	14.390	0.366	0.8	56.0	14	15	17.0	73.0	1.0	-0.7	0.1	0.9	0.110	1.011	0.108	0.159	0.677
NC-01	NB-02	Foundation Soils	33.5	7.6	66.9	0.344	17.340	0.514	0.8	52.9	21	15	28.3	81.2	1.0	-0.7	0.1	0.9	0.117	1.012	0.115	0.159	0.720
NC-01	NB-02	Foundation Soils	33.6	7.6	65.3	0.452	27.970	0.692	0.8	51.8	27	15	33.3	85.1	1.0	-0.7	0.1	0.9	0.121	1.013	0.118	0.159	0.743
NC-01	NB-02	Foundation Soils	33.7	7.5	63.2	0.217	18.770	0.343	0.8	49.5	17	15	22.0	71.5	1.0	-0.7	0.1	0.9	0.109	1.010	0.107	0.159	0.668
NC-01	NB-02	Foundation Soils	33.8	7.4	65.6	0.211	18.490	0.321	0.8	51.2	15	15	18.5	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.160	0.659
NC-01	NB-02	Foundation Soils	33.9	7.3	68.0	0.203	4.380	0.299	0.8	52.9	13	15	14.3	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.160	0.646
NC-01	NB-02	Foundation Soils	34.0	7.2	67.1	0.210	23.160	0.313	0.8	52.2	14	15	16.6	68.8	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.160	0.654
NC-01	NB-02	Foundation Soils	34.0	7.2	59.1	0.184	18.220	0.312	0.8	45.9	18	15	23.2	69.2	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.160	0.655
NC-01	NB-02	Foundation Soils	34.1	7.1	57.7	0.175	18.490	0.303	0.8	44.8	18	15	23.7	68.6	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.160	0.652
NC-01	NB-02	Foundation Soils	34.2	7.0	59.7	0.101	18.860	0.169	0.8	45.7	11	15	9.8	55.5	1.0	-0.7	0.1	0.9	0.096	1.008	0.095	0.160	0.592
NC-01	NB-02	Foundation Soils	34.3	6.9	62.2	0.034	35.490	0.055	0.8	47.0	5	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.160	0.556
NC-01	NB-02	Foundation Soils	34.4	6.8	62.3	0.036	19.920	0.058	0.8	47.1	5	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.160	0.556
NC-01	NB-02	Foundation Soils	34.4	6.7	63.8	0.020	11.780	0.031	0.8	48.2	6	15	0.6	48.8	1.0	-0.7	0.1	0.9	0.091	1.007	0.090	0.160	0.562
NC-01	NB-02	Foundation Soils	34.5	6.7	67.0	0.025	18.870	0.037	0.8	50.8	3	15	0.0	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.160	0.570

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	34.6	6.6	70.9	0.111	16.910	0.157	0.8	53.9	5	15	0.1	54.0	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.160	0.584
NC-01	NB-02	Foundation Soils	34.7	6.5	72.0	0.055	14.220	0.076	0.8	54.7	0	15	0.0	54.7	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.160	0.587
NC-01	NB-02	Foundation Soils	34.8	6.4	71.7	0.054	18.470	0.075	0.8	54.4	0	15	0.0	54.4	1.0	-0.7	0.1	0.9	0.095	1.008	0.094	0.160	0.585
NC-01	NB-02	Foundation Soils	34.9	6.3	72.6	0.087	6.120	0.120	0.8	55.1	2	15	0.0	55.1	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.160	0.588
NC-01	NB-02	Foundation Soils	34.9	6.3	72.4	0.175	10.480	0.242	0.8	55.2	8	15	4.5	59.6	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.160	0.608
NC-01	NB-02	Foundation Soils	35.0	6.2	72.6	0.045	19.030	0.062	0.8	54.9	0	15	0.0	54.9	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.160	0.587
NC-01	NB-02	Foundation Soils	35.1	6.1	70.5	0.074	14.050	0.105	0.8	53.2	2	15	0.0	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.160	0.579
NC-01	NB-02	Foundation Soils	35.2	6.0	68.9	0.078	17.720	0.113	0.8	51.8	3	15	0.0	51.8	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.160	0.573
NC-01	NB-02	Foundation Soils	35.3	5.9	66.5	0.095	7.240	0.143	0.8	49.9	6	15	1.2	51.1	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.160	0.570
NC-01	NB-02	Foundation Soils	35.4	5.8	65.6	0.099	13.860	0.151	0.8	49.2	7	15	2.3	51.5	1.0	-0.8	0.1	0.9	0.093	1.008	0.092	0.160	0.571
NC-01	NB-02	Foundation Soils	35.4	5.8	66.0	0.079	30.730	0.120	0.8	49.4	5	15	0.4	49.8	1.0	-0.8	0.1	0.9	0.092	1.008	0.090	0.160	0.564
NC-01	NB-02	Foundation Soils	35.5	5.7	69.0	0.138	11.510	0.200	0.8	52.0	8	15	3.8	55.8	1.0	-0.8	0.1	0.9	0.096	1.008	0.095	0.160	0.589
NC-01	NB-02	Foundation Soils	35.6	5.6	63.1	0.202	15.200	0.320	0.8	48.3	17	15	21.5	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.105	0.160	0.653
NC-01	NB-02	Foundation Soils	35.7	5.5	68.5	0.176	29.720	0.257	0.8	51.9	11	15	10.6	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.161	0.619
NC-01	NB-02	Foundation Soils	35.8	5.4	71.7	0.142	11.240	0.198	0.8	53.8	7	15	1.8	55.6	1.0	-0.8	0.1	0.9	0.096	1.008	0.094	0.161	0.588
NC-01	NB-02	Foundation Soils	35.8	5.3	70.4	0.090	20.330	0.128	0.8	52.6	4	15	0.0	52.6	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.161	0.575
NC-01	NB-02	Foundation Soils	35.9	5.3	68.0	0.052	19.720	0.077	0.8	50.6	3	15	0.0	50.6	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.161	0.566
NC-01	NB-02	Foundation Soils	36.0	5.2	65.8	0.048	18.410	0.073	0.8	48.8	4	15	0.0	48.8	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.161	0.558
NC-01	NB-02	Foundation Soils	36.1	5.1	62.9	0.028	17.060	0.045	0.8	46.5	5	15	0.4	46.9	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.161	0.550
NC-01	NB-02	Foundation Soils	36.2	5.0	56.3	0.026	15.650	0.046	0.8	41.6	9	15	5.7	47.3	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.161	0.552
NC-01	NB-02	Foundation Soils	36.3	4.9	54.5	0.026	15.700	0.048	0.8	40.2	10	15	8.1	48.3	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.161	0.556
NC-01	NB-02	Foundation Soils	36.3	4.9	54.3	0.031	11.010	0.057	0.8	40.1	10	15	8.0	48.1	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.161	0.555
NC-01	NB-02	Foundation Soils	36.4	4.8	52.9	0.117	20.120	0.221	0.8	39.7	18	15	23.2	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.161	0.619
NC-01	NB-02	Foundation Soils	36.5	4.7	51.1	0.138	19.050	0.270	0.8	38.5	22	15	27.1	65.5	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.161	0.631
NC-01	NB-02	Foundation Soils	36.6	4.6	50.9	0.194	25.780	0.381	0.8	38.4	26	15	30.8	69.3	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.161	0.648
NC-01	NB-02	Foundation Soils	36.7	4.5	52.3	0.151	28.640	0.289	0.8	39.4	22	15	27.2	66.6	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.161	0.635
NC-01	NB-02	Foundation Soils	36.7	4.4	57.3	0.142	18.200	0.248	0.8	42.9	17	15	21.6	64.6	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.161	0.626
NC-01	NB-02	Foundation Soils	36.8	4.4	60.2	0.193	23.300	0.321	0.8	45.4	19	15	24.2	69.5	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.161	0.649
NC-01	NB-02	Foundation Soils	36.9	4.3	62.5	0.260	21.960	0.416	0.8	47.4	21	15	27.5	74.8	1.0	-0.8	0.1	0.9	0.111	1.011	0.109	0.161	0.675
NC-01	NB-02	Foundation Soils	37.0	4.2	74.7	0.225	16.390	0.301	0.8	56.0	11	15	10.0	65.9	1.0	-0.8	0.1	0.9	0.104	1.009	0.102	0.161	0.631
NC-01	NB-02	Foundation Soils	37.1	4.1	81.7	0.121	13.510	0.148	0.8	60.7	0	15	0.0	60.7	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.161	0.607
NC-01	NB-02	Foundation Soils	37.2	4.0	85.0	0.103	17.870	0.121	0.8	63.4	0	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.161	0.619
NC-01	NB-02	Foundation Soils	37.2	4.0	85.1	0.087	30.300	0.102	0.8	63.4	0	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.161	0.619
NC-01	NB-02	Foundation Soils	37.3	3.9	82.9	0.097	29.160	0.117	0.8	61.5	0	15	0.0	61.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.161	0.610
NC-01	NB-02	Foundation Soils	37.4	3.8	72.5	0.113	28.030	0.156	0.8	53.2	5	15	0.2	53.3	1.0	-0.8	0.1	0.9	0.095	1.008	0.093	0.161	0.575
NC-01	NB-02	Foundation Soils	37.5	3.7	78.7	0.275	21.960	0.349	0.8	58.9	11	15	11.4	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.161	0.651
NC-01	NB-02	Foundation Soils	37.6	3.6	83.3	0.144	24.820	0.173	0.8	61.7	1	15	0.0	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.161	0.611
NC-01	NB-02	Foundation Soils	37.6	3.5	82.6	0.211	31.100	0.256	0.8	61.1	6	15	0.6	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.161	0.610
NC-01	NB-02	Foundation Soils	37.7	3.5	77.9	0.317	22.480	0.407	0.8	58.5	14	15	17.6	76.1	1.0	-0.8	0.1	0.9	0.112	1.011	0.110	0.161	0.679
NC-01	NB-02	Foundation Soils	37.8	3.4	65.2	0.279	19.440	0.428	0.8	49.0	20	15	27.0	75.9	1.0	-0.8	0.1	0.9	0.112	1.011	0.109	0.161	0.678
NC-01	NB-02	Foundation Soils	37.9	3.3	59.9	0.172	15.340	0.287	0.8	44.5	18	15	22.8	67.3	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.161	0.635
NC-01	NB-02	Foundation Soils	38.0	3.2	53.3	0.136	24.590	0.255	0.8	39.5	20	15	25.4	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.161	0.624
NC-01	NB-02	Foundation Soils	38.1	3.1	52.8	0.103	12.340	0.195	0.8	38.8	18	15	22.2	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.161	0.607
NC-01	NB-02	Foundation Soils	38.1	3.1	54.2	0.104	9.670	0.192	0.8	39.8	17	15	20.8	60.6	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.161	0.604
NC-01	NB-02	Foundation Soils	38.2	3.0	57.2	0.118	28.590	0.206	0.8	42.0	16	15	19.1	61.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.161	0.607
NC-01	NB-02	Foundation Soils	38.3	2.9	66.3	0.188	30.780	0.284	0.8	49.0	14	15	17.4	66.3	1.0	-0.8	0.1	0.9	0.104	1.010	0.102	0.161	0.630
NC-01	NB-02	Foundation Soils	38.4	2.8	79.5	0.199	26.200	0.250	0.8	58.1	7	15	1.9	60.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.097	0.161	0.602
NC-01	NB-02	Foundation Soils	38.5	2.7	87.4	0.217	28.320	0.248	0.8	64.3	4	15	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.100	0.161	0.620
NC-01	NB-02	Foundation Soils	38.5	2.6	91.1	0.279	24.210	0.306	0.8	67.1	5	15	0.4	67.5	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.162	0.635
NC-01	NB-02	Foundation Soils	38.6	2.6	87.5	0.354	36.750	0.405	0.8	65.0	11	15	9.8	74.9	1.0	-0.8	0.1	0.9	0.111	1.011	0.108	0.162	0.671
NC-01	NB-02	Foundation Soils	38.7	2.5	84.1	0.363	32.540	0.431	0.8	62.7	13	15	15.2	77.9	1.0	-0.9	0.1	0.9	0.114	1.012	0.111	0.162	0.686
NC-01	NB-02	Foundation Soils	38.8	2.4	87.3	0.320	21.670	0.366	0.8	64.5	9	15	6.4	70.9	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.162	0.651
NC-01	NB-02	Foundation Soils	38.9	2.3	100.5	0.359	1.810	0.357	0.8	74.5	4	15	0.1	74.6	1.0	-0.9	0.1	0.9	0.111	1.011	0.108	0.162	0.669
NC-01	NB-02	Foundation Soils	39.0	2.2	110.1	0.239	-8.370	0.217	0.8	82.3	0	15	0.0	82.3	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.162	0.709
NC-01	NB-02	Foundation Soils	39.0	2.1	117.4	0.242	21.060	0.206	0.8	88.2	0	15	0.0	88.2	1.0	-0.9	0.1	0.9	0.124	1.014	0.120	0.162	0.744
NC-01	NB-02	Foundation Soils	39.1	2.1	115.4	0.178	19.950	0.154	0.8	86.5	0	15	0.0	86.5	1.0	-0.9	0.1	0.9	0.122	1.014	0.118	0.162	0.733
NC-01	NB-02	Foundation Soils	39.2	2.0	110.7	0.206	25.200	0.186	0.8	82.6	0	15	0.0	82.6	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.162	0.710
NC-01	NB-02	Foundation Soils	39.3	1.9	102.5	0.170	28.110	0.166	0.8	75.8	0	15	0.0	75.8	1.0	-0.9	0.1	0.9	0.112	1.011	0.109	0.162	0.674
NC-01	NB-02	Foundation Soils	39.4	1.8	99.4	0.138	25.350	0.139	0.8	73.2	0	15	0.0	73.2	1.0	-0.9	0.1	0.9	0.110	1.011	0.107	0.162	0.661
NC-01	NB-02	Foundation Soils	39.5	1.7	96.8	0.092	11.600	0.095	0.8	71.0	0	15	0.0	71.0	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.162	0.650
NC-01	NB-02	Foundation Soils	39.5	1.7	92.5	0.073	25.700	0.079	0.8	67.5	0	15	0.0	67.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.102	0.162	0.633
NC-01	NB-02	Foundation Soils	39.6	1.6	93.4	0.109	28.300	0.117	0.8	68.1	0	15	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.162	0.636

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	39.698	1.5	96.578	0.057	23.630	0.059	0.8	70.6	0	15	0.0	70.6	1.0	-0.9	0.1	0.8	0.108	1.010	0.105	0.162	0.648
NC-01	NB-02	Foundation Soils	39.8	1.4	104.0	0.127	15.750	0.122	0.8	76.6	0	15	0.0	76.6	1.0	-0.9	0.1	0.8	0.113	1.011	0.110	0.162	0.677
NC-01	NB-02	Foundation Soils	39.9	1.3	108.4	0.173	15.390	0.160	0.8	80.0	0	15	0.0	80.0	1.0	-0.9	0.1	0.8	0.116	1.012	0.112	0.162	0.695
NC-01	NB-02	Foundation Soils	39.9	1.2	115.5	0.261	12.150	0.226	0.8	85.8	0	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.162	0.727
NC-01	NB-02	Foundation Soils	40.0	1.2	113.4	0.267	27.250	0.235	0.8	84.0	0	15	0.0	84.0	1.0	-0.9	0.1	0.8	0.120	1.013	0.116	0.162	0.717
NC-01	NB-02	Foundation Soils	40.1	1.1	111.8	0.199	29.020	0.178	0.8	82.6	0	15	0.0	82.6	1.0	-0.9	0.1	0.8	0.118	1.013	0.115	0.162	0.708
NC-01	NB-02	Foundation Soils	40.2	1.0	115.9	0.133	18.300	0.115	0.8	85.8	0	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.162	0.727
NC-01	NB-02	Foundation Soils	40.3	0.9	130.9	0.200	15.230	0.153	0.8	98.2	0	15	0.0	98.2	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.162	0.808
NC-01	NB-02	Foundation Soils	40.4	0.8	143.2	0.430	15.680	0.300	0.8	108.4	0	15	0.0	108.4	0.9	-0.9	0.1	0.8	0.149	1.021	0.145	0.162	0.894
NC-01	NB-02	Foundation Soils	40.4	0.8	144.3	0.379	17.220	0.263	0.8	109.3	0	15	0.0	109.3	0.9	-0.9	0.1	0.8	0.151	1.021	0.146	0.162	0.902
NC-01	NB-02	Foundation Soils	40.5	0.7	131.5	0.651	18.250	0.495	0.8	98.5	2	15	0.0	98.5	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.162	0.809
NC-01	NB-02	Foundation Soils	40.6	0.6	127.3	0.879	31.250	0.690	0.8	95.8	9	15	8.2	104.0	0.9	-0.9	0.1	0.8	0.143	1.019	0.138	0.162	0.853
NC-01	NB-02	Foundation Soils	40.7	0.5	132.1	0.589	31.620	0.446	0.8	98.8	0	15	0.0	98.8	1.0	-0.9	0.1	0.8	0.136	1.017	0.131	0.162	0.811
NC-01	NB-02	Foundation Soils	40.8	0.4	136.0	0.581	20.020	0.427	0.8	102.0	0	15	0.0	102.0	0.9	-0.9	0.1	0.8	0.140	1.018	0.135	0.162	0.836
NC-01	NB-02	Foundation Soils	40.8	0.3	137.4	0.478	10.910	0.348	0.8	103.1	0	15	0.0	103.1	0.9	-0.9	0.1	0.8	0.141	1.019	0.137	0.162	0.845
NC-01	NB-02	Foundation Soils	40.9	0.3	134.9	0.419	-4.900	0.311	0.8	100.9	0	15	0.0	100.9	0.9	-0.9	0.1	0.8	0.138	1.018	0.134	0.162	0.827
NC-01	NB-02	Foundation Soils	41.0	0.2	120.1	0.516	4.280	0.430	0.8	88.5	2	15	0.0	88.5	1.0	-0.9	0.1	0.8	0.124	1.014	0.120	0.162	0.741
NC-01	NB-02	Foundation Soils	41.1	0.1	97.6	0.525	30.530	0.538	0.8	71.8	13	15	15.5	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.119	0.162	0.734
NC-01	NB-02	Foundation Soils	41.2	0.0	89.3	0.394	25.490	0.441	0.8	64.9	12	15	13.6	78.5	1.0	-0.9	0.1	0.8	0.114	1.012	0.111	0.162	0.684
NC-01	NB-02	Foundation Soils	41.3	-0.1	93.7	0.400	20.300	0.427	0.8	67.9	10	15	8.8	76.7	1.0	-0.9	0.1	0.8	0.113	1.011	0.109	0.162	0.675
NC-01	NB-02	Foundation Soils	41.3	-0.1	87.4	0.297	23.350	0.340	0.8	62.6	9	15	5.5	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.162	0.633
NC-01	NB-02	Foundation Soils	41.4	-0.2	83.7	0.192	26.160	0.229	0.7	59.1	5	15	0.3	59.4	1.0	-0.9	0.1	0.8	0.099	1.009	0.096	0.162	0.594
NC-01	NB-02	Foundation Soils	41.5	-0.3	80.3	0.191	20.150	0.238	0.7	56.6	7	15	1.9	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.162	0.590
NC-01	NB-02	Foundation Soils	41.6	-0.4	79.6	0.114	19.110	0.143	0.7	55.8	2	15	0.0	55.8	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.162	0.579
NC-01	NB-02	Foundation Soils	41.7	-0.5	81.1	0.072	17.490	0.089	0.7	56.9	0	15	0.0	56.9	1.0	-0.9	0.1	0.8	0.097	1.008	0.094	0.162	0.583
NC-01	NB-02	Foundation Soils	41.7	-0.6	79.6	0.067	4.070	0.084	0.7	55.7	0	15	0.0	55.7	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.162	0.578
NC-01	NB-02	Foundation Soils	41.8	-0.6	76.3	0.045	17.910	0.059	0.7	53.1	0	15	0.0	53.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.092	0.162	0.567
NC-01	NB-02	Foundation Soils	41.9	-0.7	74.4	0.034	24.100	0.046	0.7	51.6	1	15	0.0	51.6	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.162	0.561
NC-01	NB-02	Foundation Soils	42.0	-0.8	74.5	0.046	22.680	0.062	0.7	51.7	1	15	0.0	51.7	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.162	0.561
NC-01	NB-02	Foundation Soils	42.1	-0.9	76.2	0.068	18.360	0.089	0.7	52.9	1	15	0.0	52.9	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.162	0.566
NC-01	NB-02	Foundation Soils	42.2	-1.0	77.4	0.061	24.110	0.079	0.7	53.8	0	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.162	0.569
NC-01	NB-02	Foundation Soils	42.2	-1.0	77.6	0.086	26.290	0.111	0.7	53.8	2	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.162	0.570
NC-01	NB-02	Foundation Soils	42.3	-1.1	78.9	0.066	21.490	0.084	0.7	54.8	0	15	0.0	54.8	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.162	0.574
NC-01	NB-02	Foundation Soils	42.4	-1.2	79.3	0.075	22.020	0.095	0.7	55.0	0	15	0.0	55.0	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.162	0.574
NC-01	NB-02	Foundation Soils	42.5	-1.3	81.3	0.059	12.960	0.073	0.7	56.5	0	15	0.0	56.5	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.162	0.581
NC-01	NB-02	Foundation Soils	42.6	-1.4	83.1	0.055	8.120	0.066	0.7	57.8	0	15	0.0	57.8	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.162	0.586
NC-01	NB-02	Foundation Soils	42.7	-1.5	83.7	0.075	7.340	0.090	0.7	58.2	0	15	0.0	58.2	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.162	0.588
NC-01	NB-02	Foundation Soils	42.7	-1.5	81.2	0.091	-7.150	0.112	0.7	56.2	0	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.162	0.579
NC-01	NB-02	Foundation Soils	42.8	-1.6	78.7	0.112	-0.430	0.142	0.7	54.3	3	15	0.0	54.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.162	0.571
NC-01	NB-02	Foundation Soils	42.9	-1.7	78.5	0.110	2.100	0.140	0.7	54.1	3	15	0.0	54.1	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.162	0.570
NC-01	NB-02	Foundation Soils	43.0	-1.8	78.2	0.127	-5.290	0.162	0.7	53.8	4	15	0.1	53.9	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.162	0.569
NC-01	NB-02	Foundation Soils	43.1	-1.9	81.4	0.106	1.050	0.130	0.7	56.2	1	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.162	0.579
NC-01	NB-02	Foundation Soils	43.1	-2.0	90.7	0.234	3.570	0.258	0.7	63.3	4	15	0.1	63.4	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.162	0.610
NC-01	NB-02	Foundation Soils	43.2	-2.0	96.5	0.315	2.950	0.326	0.7	67.8	6	15	0.6	68.4	1.0	-1.0	0.1	0.8	0.106	1.010	0.103	0.162	0.633
NC-01	NB-02	Foundation Soils	43.3	-2.1	107.2	0.396	18.430	0.369	0.8	76.1	4	15	0.1	76.2	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.162	0.670
NC-02	NB-02 & NB-03	Foundation Soils	15.0	25.6	48.6	0.952	2.220	1.961	1.1	49.6	50	4	14.2	63.8	1.0	-0.2	0.0	1.0	0.102	1.009	0.104	0.125	0.836
NC-02	NB-02 & NB-03	Foundation Soils	15.1	25.5	47.6	0.843	9.170	1.769	1.1	48.6	48	4	14.0	62.6	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.125	0.826
NC-02	NB-02 & NB-03	Foundation Soils	15.2	25.4	46.8	0.733	64.700	1.566	1.1	47.7	46	4	13.8	61.5	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.126	0.817
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.3	50.5	0.684	3.660	1.353	1.1	51.4	41	4	13.7	65.0	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.126	0.838
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.2	61.4	0.657	6.910	1.071	1.1	62.0	31	4	13.0	75.0	1.0	-0.2	0.0	1.0	0.111	1.011	0.114	0.126	0.903
NC-02	NB-02 & NB-03	Foundation Soils	15.4	25.2	76.6	0.644	-1.760	0.841	1.1	77.0	19	4	10.2	87.2	1.0	-0.2	0.0	1.0	0.123	1.014	0.126	0.126	0.996
NC-02	NB-02 & NB-03	Foundation Soils	15.5	25.1	86.2	0.674	-4.910	0.782	1.1	86.4	15	4	7.4	93.8	1.0	-0.2	0.0	1.0	0.130	1.016	0.133	0.127	1.053
NC-02	NB-02 & NB-03	Foundation Soils	15.6	25.0	93.2	0.702	-1.980	0.753	1.1	93.2	12	4	5.0	98.2	1.0	-0.2	0.0	1.0	0.135	1.017	0.139	0.127	1.094
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.9	102.8	0.698	0.950	0.679	1.1	102.5	7	4	0.8	103.4	1.0	-0.3	0.0	1.0	0.142	1.019	0.146	0.127	1.150
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.8	108.7	0.707	1.140	0.650	1.1	108.2	4	4	0.0	108.2	1.0	-0.3	0.0	1.0	0.149	1.021	0.154	0.128	1.209
NC-02	NB-02 & NB-03	Foundation Soils	15.8	24.8	114.9	0.726	1.330	0.632	1.1	114.1	2	4	0.0	114.1	1.0	-0.3	0.0	1.0	0.159	1.023	0.165	0.128	1.290
NC-02	NB-02 & NB-03	Foundation Soils	15.9	24.7	120.4	0.732	1.160	0.608	1.0	119.2	0	4	0.0	119.2	1.0	-0.3	0.0	1.0	0.169	1.026	0.176	0.128	1.374
NC-02	NB-02 & NB-03	Foundation Soils	16.0	24.6	123.0	0.734	1.100	0.597	1.0	121.6	0	4	0.0	121.6	1.0	-0.3	0.0	1.0	0.175	1.027	0.182	0.128	1.417
NC-02	NB-02 & NB-03	Foundation Soils	16.1	24.5	125.1	0.731	1.000	0.584	1.0	123.4	0	4	0.0	123.4	1.0	-0.3	0.0	1.0	0.179	1.028	0.187	0.129	1.450
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.4	125.4	0.653	0.890	0.521	1.0	123.6	0	4	0.0	123.6	1.0	-0.3	0.0	1.0	0.180	1.028	0.187	0.129	1.450
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.3	124.1	0.634	0.640	0.511	1.0	122.2	0	4	0.0	122.2	1.0	-0.3	0.0	1.0	0.176	1.027	0.183	0.129	1.418
NC-02	NB-02 & NB-03	Foundation Soils	16.3	24.3	120.1	0.614	0.380	0.511	1.0	118.2	0	4	0.0	118.2	1.0	-0.3	0.0	1.0	0.167	1.025	0.174	0.130	1.340

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-02	NB-02 & NB-03	Foundation Soils	16.4	24.2	115.6	0.592	0.040	0.512	1.0	113.8	0	4	0.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.164	0.130	1.264
NC-02	NB-02 & NB-03	Foundation Soils	16.5	24.1	95.4	0.554	-5.290	0.581	1.0	94.1	6	4	0.5	94.6	1.0	-0.3	0.0	1.0	0.131	1.016	0.134	0.130	1.030
NC-02	NB-02 & NB-03	Foundation Soils	16.6	24.0	90.1	0.529	-5.380	0.587	1.0	88.8	8	4	1.7	90.5	1.0	-0.3	0.0	1.0	0.126	1.015	0.129	0.130	0.990
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	70.5	0.502	-3.480	0.712	1.0	69.6	19	4	9.7	79.3	1.0	-0.3	0.0	1.0	0.115	1.012	0.117	0.131	0.899
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	60.8	0.522	-2.690	0.858	1.0	60.0	27	4	12.1	72.2	1.0	-0.3	0.0	1.0	0.109	1.010	0.111	0.131	0.848
NC-02	NB-02 & NB-03	Foundation Soils	16.8	23.8	44.2	0.521	-1.430	1.178	1.0	43.7	43	4	13.3	57.1	1.0	-0.3	0.0	1.0	0.097	1.008	0.099	0.131	0.753
NC-02	NB-02 & NB-03	Foundation Soils	16.9	23.7	37.6	0.519	-0.860	1.381	1.0	37.2	51	4	13.4	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.131	0.715
NC-02	NB-02 & NB-03	Foundation Soils	17.0	23.6	28.3	0.515	0.050	1.820	1.0	28.0	64	4	13.2	41.3	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.132	0.663
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.5	21.8	0.496	1.430	2.274	1.1	21.6	77	4	13.0	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.132	0.627
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.4	18.1	0.444	1.860	2.460	1.0	17.9	85	4	12.9	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.132	0.606
NC-02	NB-02 & NB-03	Foundation Soils	17.2	23.4	15.6	0.402	3.240	2.582	1.0	15.4	90	4	12.8	28.2	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.132	0.592
NC-02	NB-02 & NB-03	Foundation Soils	17.3	23.3	13.5	0.308	4.940	2.275	1.0	13.4	92	4	12.6	26.0	1.0	-0.3	0.0	1.0	0.076	1.006	0.077	0.133	0.580
NC-02	NB-02 & NB-03	Foundation Soils	17.4	23.2	11.2	0.257	10.390	2.285	1.0	11.1	99	4	12.5	23.6	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.133	0.568
NC-02	NB-02 & NB-03	Foundation Soils	17.5	23.1	10.8	0.204	18.200	1.897	1.0	10.6	97	4	12.5	23.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.133	0.564
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	10.4	0.175	22.060	1.683	1.0	10.2	96	4	12.4	22.7	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.133	0.561
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	9.6	0.144	27.870	1.496	1.0	9.5	97	4	12.4	21.9	1.0	-0.3	0.0	1.0	0.074	1.006	0.074	0.134	0.556
NC-02	NB-02 & NB-03	Foundation Soils	17.7	22.9	9.8	0.113	29.340	1.149	1.0	9.7	92	4	12.4	22.0	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.134	0.555
NC-02	NB-02 & NB-03	Foundation Soils	17.8	22.8	10.3	0.081	31.160	0.785	1.0	10.1	84	4	12.3	22.5	1.0	-0.3	0.0	0.9	0.074	1.006	0.075	0.134	0.556
NC-02	NB-02 & NB-03	Foundation Soils	17.9	22.7	11.6	0.191	32.210	1.645	1.0	11.4	92	4	12.5	23.9	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.134	0.562
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.6	12.8	1.007	37.000	7.848	1.0	12.5	100	4	12.6	25.2	1.0	-0.3	0.0	0.9	0.076	1.006	0.076	0.135	0.567
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.5	13.7	1.240	43.930	9.081	1.0	13.3	100	4	12.7	26.0	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.135	0.570
NC-02	NB-02 & NB-03	Foundation Soils	18.1	22.5	13.2	1.385	57.950	10.515	1.0	12.8	100	4	12.6	25.5	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.135	0.566
NC-02	NB-02 & NB-03	Foundation Soils	18.2	22.4	36.8	1.505	90.670	4.095	1.0	35.6	76	4	14.0	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.135	0.687
NC-02	NB-02 & NB-03	Foundation Soils	18.3	22.3	122.2	1.745	76.740	1.428	1.0	117.2	20	4	12.1	129.3	1.0	-0.3	0.0	0.9	0.195	1.031	0.202	0.136	1.493
NC-02	NB-02 & NB-03	Foundation Soils	18.4	22.2	166.1	1.841	179.340	1.109	1.0	158.8	6	4	0.6	159.4	1.0	-0.3	0.0	0.9	0.365	1.053	0.387	0.136	2.852
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.1	169.7	2.012	130.830	1.185	1.0	162.2	7	4	1.4	163.6	1.0	-0.3	0.0	0.9	0.411	1.057	0.437	0.136	3.213
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.0	154.9	1.950	13.350	1.259	1.0	147.9	11	4	5.3	153.3	1.0	-0.3	0.0	0.9	0.312	1.048	0.328	0.136	2.409
NC-02	NB-02 & NB-03	Foundation Soils	18.6	22.0	143.4	1.633	13.850	1.139	1.0	136.9	11	4	4.6	141.5	1.0	-0.3	0.0	0.9	0.241	1.039	0.252	0.136	1.843
NC-02	NB-02 & NB-03	Foundation Soils	18.7	21.9	105.2	1.349	27.730	1.282	1.0	100.5	21	4	12.1	112.6	1.0	-0.3	0.0	0.9	0.156	1.023	0.161	0.137	1.174
NC-02	NB-02 & NB-03	Foundation Soils	18.8	21.8	81.5	0.961	37.950	1.179	1.0	77.8	26	4	12.8	90.7	1.0	-0.3	0.0	0.9	0.126	1.015	0.128	0.137	0.938
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.7	67.7	0.923	25.640	1.363	1.0	64.6	35	4	13.8	78.4	1.0	-0.3	0.0	0.9	0.114	1.012	0.116	0.137	0.845
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.6	64.6	1.005	20.060	1.555	1.0	61.6	39	4	14.1	75.7	1.0	-0.3	0.0	0.9	0.112	1.011	0.113	0.137	0.826
NC-02	NB-02 & NB-03	Foundation Soils	19.0	21.6	62.6	0.933	18.340	1.491	1.0	59.6	39	4	14.0	73.5	1.0	-0.3	0.0	0.9	0.110	1.011	0.112	0.138	0.810
NC-02	NB-02 & NB-03	Foundation Soils	19.1	21.5	55.3	0.883	10.040	1.597	1.0	52.6	44	4	14.0	66.6	1.0	-0.3	0.0	0.9	0.105	1.010	0.106	0.138	0.767
NC-02	NB-02 & NB-03	Foundation Soils	19.2	21.4	47.7	0.817	1.520	1.711	1.0	45.4	49	4	13.8	59.2	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.138	0.724
NC-02	NB-02 & NB-03	Foundation Soils	19.3	21.3	41.6	0.719	4.530	1.726	1.0	39.5	53	4	13.7	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.095	0.138	0.690
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.2	35.6	0.672	3.480	1.889	1.0	33.7	60	4	13.5	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.138	0.658
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.1	29.3	0.497	3.670	1.698	1.0	27.7	63	4	13.2	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.139	0.625
NC-02	NB-02 & NB-03	Foundation Soils	19.5	21.1	26.0	0.389	3.960	1.498	1.0	24.5	64	4	13.0	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.084	0.139	0.607
NC-02	NB-02 & NB-03	Foundation Soils	19.6	21.0	21.4	0.283	1.760	1.325	1.0	20.2	68	4	12.8	32.9	1.0	-0.3	0.0	0.9	0.081	1.007	0.081	0.139	0.584
NC-02	NB-02 & NB-03	Foundation Soils	19.7	20.9	15.7	0.244	2.620	1.555	1.0	14.8	83	4	12.6	27.4	1.0	-0.3	0.0	0.9	0.077	1.006	0.078	0.139	0.557
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.8	9.5	0.156	-1.950	1.634	1.0	9.0	100	4	12.4	21.4	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.140	0.528
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.7	8.4	0.103	0.830	1.233	1.0	7.8	100	4	12.3	20.2	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.140	0.522
NC-02	NB-02 & NB-03	Foundation Soils	19.9	20.7	6.3	0.057	1.000	0.902	1.0	5.9	100	4	12.2	18.1	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.140	0.512
NC-02	NB-02 & NB-03	Foundation Soils	20.0	20.6	4.8	0.038	0.140	0.795	1.0	4.5	100	4	12.1	16.6	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.140	0.505
NC-02	NB-02 & NB-03	Foundation Soils	20.1	20.5	2.3	0.023	3.860	0.994	1.0	2.2	100	4	11.9	14.1	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.140	0.493
NC-02	NB-02 & NB-03	Foundation Soils	20.2	20.4	1.2	0.011	1.690	0.887	1.0	1.2	100	4	11.9	13.0	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.141	0.488
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.3	1.0	0.010	4.340	0.974	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.141	0.486
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.2	1.0	0.010	4.090	0.975	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.141	0.485
NC-02	NB-02 & NB-03	Foundation Soils	20.4	20.2	1.0	0.010	4.090	0.975	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.141	0.485
NC-02	NB-02 & NB-03	Foundation Soils	20.5	20.1	1.0	0.010	4.790	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.141	0.484
NC-02	NB-02 & NB-03	Foundation Soils	20.6	20.0	1.0	0.010	4.810	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.142	0.483
NC-02	NB-02 & NB-03	Foundation Soils	20.7	19.9	1.0	0.010	4.740	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.142	0.483
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	1.0	0.010	5.690	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.142	0.482
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	1.0	0.010	5.610	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.142	0.481
NC-02	NB-02 & NB-03	Foundation Soils	20.9	19.7	1.0	0.010	5.670	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.142	0.480
NC-02	NB-02 & NB-03	Foundation Soils	21.0	19.6	1.0	0.010	5.800	0.965	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.143	0.480
NC-02	NB-02 & NB-03	Foundation Soils	21.1	19.5	1.0	0.010	5.960	0.964	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.143	0.479
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.4	1.0	0.010	6.100	0.963	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.143	0.478
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.3	1.0	0.010	6.050	0.964	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.143	0.478
NC-02	NB-02 & NB-03	Foundation Soils	21.3	19.3	1.0	0.010	6.260	0.962	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.143	0.477
NC-02	NB-02 & NB-03	Foundation Soils	21.4	19.2	1.0	0.010	6.050	0.964	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.143	0.476

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-02	NB-02 & NB-03	Foundation Soils	21.5	19.1	1.0	0.010	6.190	0.963	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.144	0.476
NC-02	NB-02 & NB-03	Foundation Soils	21.6	19.0	1.0	0.010	6.460	0.961	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.144	0.475
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	1.0	0.010	6.610	0.960	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.144	0.474
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	1.0	0.010	6.620	0.960	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.144	0.474
NC-02	NB-02 & NB-03	Foundation Soils	21.8	18.8	1.4	0.010	6.530	0.724	1.0	1.2	100	4	11.9	13.1	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.144	0.475
NC-02	NB-02 & NB-03	Foundation Soils	21.9	18.7	1.6	0.010	6.460	0.610	1.0	1.5	100	4	11.9	13.4	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.145	0.475
NC-02	NB-02 & NB-03	Foundation Soils	22.0	18.6	2.1	0.010	5.790	0.470	1.0	1.9	100	4	11.9	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.145	0.476
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.5	2.6	0.010	7.000	0.386	1.0	2.3	100	4	11.9	14.3	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.145	0.477
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.4	3.0	0.010	7.910	0.336	1.0	2.7	100	4	12.0	14.6	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.145	0.478
NC-02	NB-02 & NB-03	Foundation Soils	22.2	18.4	3.6	0.010	9.280	0.278	1.0	3.2	100	4	12.0	15.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.145	0.480
NC-02	NB-02 & NB-03	Foundation Soils	22.3	18.3	4.1	0.011	10.720	0.270	1.0	3.7	100	4	12.0	15.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.145	0.481
NC-02	NB-02 & NB-03	Foundation Soils	22.4	18.2	5.2	0.013	8.430	0.252	0.9	4.6	100	4	12.1	16.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.071	0.146	0.485
NC-02	NB-02 & NB-03	Foundation Soils	22.5	18.1	5.6	0.018	9.030	0.321	0.9	5.0	100	4	12.1	17.1	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.146	0.486
NC-02	NB-02 & NB-03	Foundation Soils	22.6	18.0	6.1	0.020	8.580	0.326	0.9	5.5	100	4	12.1	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.146	0.488
NC-02	NB-02 & NB-03	Foundation Soils	22.6	17.9	7.1	0.021	6.910	0.298	0.9	6.3	94	4	12.2	18.5	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.146	0.490
NC-02	NB-02 & NB-03	Foundation Soils	22.7	17.9	7.7	0.024	9.480	0.311	0.9	6.9	90	4	12.2	19.0	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.146	0.492
NC-02	NB-02 & NB-03	Foundation Soils	22.8	17.8	8.5	0.032	9.650	0.375	0.9	7.6	88	4	12.2	19.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.146	0.495
NC-02	NB-02 & NB-03	Foundation Soils	22.9	17.7	9.8	0.060	9.960	0.615	0.9	8.7	89	4	12.3	20.9	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.147	0.499
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.6	10.1	0.071	10.290	0.701	0.9	9.0	89	4	12.3	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.147	0.500
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.5	11.1	0.078	9.240	0.703	0.9	9.8	86	4	12.3	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.147	0.503
NC-02	NB-02 & NB-03	Foundation Soils	23.1	17.5	11.8	0.087	9.900	0.737	0.9	10.4	84	4	12.4	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.147	0.505
NC-02	NB-02 & NB-03	Foundation Soils	23.2	17.4	13.0	0.094	9.040	0.725	0.9	11.5	80	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.147	0.509
NC-02	NB-02 & NB-03	Foundation Soils	23.3	17.3	13.2	0.103	10.310	0.782	0.9	11.6	81	4	12.4	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.147	0.509
NC-02	NB-02 & NB-03	Foundation Soils	23.4	17.2	13.3	0.113	10.200	0.848	0.9	11.7	82	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.148	0.509
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.1	13.0	0.114	10.060	0.877	0.9	11.4	83	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.148	0.507
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.0	13.4	0.118	11.200	0.881	0.9	11.8	82	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.148	0.508
NC-02	NB-02 & NB-03	Foundation Soils	23.6	17.0	14.6	0.130	10.240	0.891	0.9	12.8	79	4	12.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.148	0.512
NC-02	NB-02 & NB-03	Foundation Soils	23.7	16.9	15.4	0.138	9.910	0.898	0.9	13.5	78	4	12.5	26.0	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.148	0.515
NC-02	NB-02 & NB-03	Foundation Soils	23.8	16.8	14.9	0.137	10.710	0.917	0.9	13.1	79	4	12.5	25.6	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.148	0.512
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.7	14.5	0.131	10.720	0.906	0.9	12.7	80	4	12.5	25.1	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.148	0.510
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.6	13.8	0.124	9.430	0.897	0.9	12.1	82	4	12.5	24.5	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.149	0.507
NC-02	NB-02 & NB-03	Foundation Soils	24.0	16.6	13.5	0.112	10.060	0.831	0.9	11.7	82	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.149	0.505
NC-02	NB-02 & NB-03	Foundation Soils	24.1	16.5	13.6	0.105	9.600	0.774	0.9	11.8	80	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.149	0.504
NC-02	NB-02 & NB-03	Foundation Soils	24.2	16.4	14.1	0.108	9.960	0.767	0.9	12.2	79	4	12.4	24.7	1.0	-0.5	0.1	0.9	0.075	1.006	0.075	0.149	0.506
NC-02	NB-02 & NB-03	Foundation Soils	24.3	16.3	14.5	0.119	10.960	0.822	0.9	12.6	79	4	12.5	25.0	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.149	0.507
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.2	15.2	0.120	11.300	0.789	0.9	13.2	77	4	12.5	25.7	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.149	0.509
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.1	16.3	0.122	11.430	0.750	0.9	14.1	74	4	12.5	26.6	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.150	0.512
NC-02	NB-02 & NB-03	Foundation Soils	24.5	16.1	17.5	0.136	11.390	0.778	0.9	15.1	72	4	12.5	27.7	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.150	0.516
NC-02	NB-02 & NB-03	Foundation Soils	24.6	16.0	19.5	0.142	11.670	0.730	0.9	16.9	62	4	12.5	29.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.078	0.150	0.523
NC-02	NB-02 & NB-03	Foundation Soils	24.7	15.9	20.6	0.145	11.210	0.703	0.9	17.9	60	4	12.5	30.3	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.150	0.526
NC-02	NB-02 & NB-03	Foundation Soils	24.8	15.8	20.7	0.154	11.200	0.743	0.9	17.9	61	4	12.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.150	0.526
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	21.7	0.172	11.670	0.793	0.9	18.7	60	4	12.5	31.3	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.150	0.529
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	22.4	0.181	11.570	0.808	0.9	19.3	60	4	12.6	31.9	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.150	0.532
NC-03	NB-03	Foundation Soils	14.0	26.0	6.5	0.033	85.940	0.510	1.2	7.2	90	4	12.2	19.4	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.125	0.584
NC-03	NB-03	Foundation Soils	14.1	25.9	16.3	0.060	85.580	0.368	1.2	17.9	53	4	12.3	30.1	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.126	0.639
NC-03	NB-03	Foundation Soils	14.2	25.8	28.3	0.119	23.250	0.421	1.1	30.5	37	4	12.0	42.6	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.126	0.705
NC-03	NB-03	Foundation Soils	14.3	25.7	27.2	0.189	6.150	0.695	1.1	29.3	46	4	12.6	42.0	1.0	-0.2	0.0	1.0	0.087	1.007	0.088	0.126	0.700
NC-03	NB-03	Foundation Soils	14.4	25.7	23.0	0.241	9.850	1.049	1.1	24.8	58	4	12.9	37.7	1.0	-0.2	0.0	1.0	0.084	1.007	0.085	0.127	0.674
NC-03	NB-03	Foundation Soils	14.4	25.6	16.0	0.341	12.340	2.129	1.2	17.4	81	4	12.8	30.2	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.127	0.632
NC-03	NB-03	Foundation Soils	14.5	25.5	10.8	0.415	13.700	3.826	1.2	11.8	100	4	12.6	24.4	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.127	0.600
NC-03	NB-03	Foundation Soils	14.6	25.4	7.2	0.372	15.390	5.184	1.2	7.9	100	4	12.3	20.2	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.128	0.577
NC-03	NB-03	Foundation Soils	14.7	25.3	5.8	0.313	18.750	5.362	1.2	6.4	100	4	12.2	18.6	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.128	0.568
NC-03	NB-03	Foundation Soils	14.8	25.3	9.0	0.299	25.350	3.338	1.2	9.8	100	4	12.4	22.2	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.128	0.584
NC-03	NB-03	Foundation Soils	14.8	25.2	10.2	0.289	25.440	2.825	1.2	11.1	100	4	12.5	23.6	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.129	0.590
NC-03	NB-03	Foundation Soils	14.9	25.1	9.4	0.307	27.590	3.262	1.1	10.2	100	4	12.5	22.7	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.129	0.584
NC-03	NB-03	Foundation Soils	15.0	25.0	7.8	0.290	33.810	3.698	1.1	8.5	100	4	12.4	20.9	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.129	0.573
NC-03	NB-03	Foundation Soils	15.1	24.9	7.5	0.243	37.880	3.237	1.1	8.1	100	4	12.3	20.5	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.130	0.570
NC-03	NB-03	Foundation Soils	15.2	24.8	6.1	0.201	43.450	3.311	1.1	6.6	100	4	12.2	18.8	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.130	0.560
NC-03	NB-03	Foundation Soils	15.3	24.8	4.4	0.160	31.950	3.604	1.1	4.8	100	4	12.1	16.9	1.0	-0.2	0.0	1.0	0.071	1.006	0.072	0.130	0.550
NC-03	NB-03	Foundation Soils	15.3	24.7	3.6	0.149	40.900	4.167	1.1	3.9	100	4	12.0	15.9	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.131	0.544
NC-03	NB-03	Foundation Soils	15.4	24.6	4.4	0.168	65.560	3.854	1.1	4.7	100	4	12.1	16.8	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.131	0.547
NC-03	NB-03	Foundation Soils	15.5	24.5	6.5	0.151	67.990	2.307	1.1	7.0	100	4	12.3	19.3	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.131	0.557

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-03	NB-03	Foundation Soils	15.6	24.4	5.8	0.119	38.600	2.051	1.1	6.2	100	4	12.2	18.4	1.0	-0.2	0.0	1.0	0.071	1.006	0.073	0.131	0.552
NC-03	NB-03	Foundation Soils	15.7	24.4	3.9	0.112	39.880	2.836	1.1	4.2	100	4	12.1	16.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.132	0.540
NC-03	NB-03	Foundation Soils	15.7	24.3	3.1	0.110	47.450	3.553	1.1	3.3	100	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.132	0.534
NC-03	NB-03	Foundation Soils	15.8	24.2	3.1	0.108	70.750	3.460	1.1	3.3	100	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.132	0.533
NC-03	NB-03	Foundation Soils	15.9	24.1	3.2	0.062	75.560	1.930	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.133	0.533
NC-03	NB-03	Foundation Soils	16.0	24.0	3.2	0.042	77.420	1.328	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.133	0.531
NC-03	NB-03	Foundation Soils	16.1	23.9	3.2	0.052	79.900	1.636	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.133	0.530
NC-03	NB-03	Foundation Soils	16.2	23.9	3.4	0.110	81.590	3.236	1.1	3.6	100	4	12.0	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.133	0.530
NC-03	NB-03	Foundation Soils	16.2	23.8	4.8	0.119	79.760	2.485	1.1	5.1	100	4	12.1	17.2	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.134	0.536
NC-03	NB-03	Foundation Soils	16.3	23.7	5.1	0.131	60.030	2.571	1.1	5.4	100	4	12.1	17.5	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.134	0.536
NC-03	NB-03	Foundation Soils	16.4	23.6	4.4	0.129	47.550	2.947	1.1	4.6	100	4	12.1	16.7	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.134	0.531
NC-03	NB-03	Foundation Soils	16.5	23.5	7.1	0.142	17.530	2.011	1.1	7.4	100	4	12.3	19.7	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.135	0.544
NC-03	NB-03	Foundation Soils	16.6	23.4	6.3	0.131	20.040	2.091	1.1	6.6	100	4	12.2	18.8	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.135	0.539
NC-03	NB-03	Foundation Soils	16.7	23.4	7.3	0.108	56.650	1.479	1.1	7.7	100	4	12.3	20.0	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.135	0.543
NC-03	NB-03	Foundation Soils	16.7	23.3	10.4	0.117	54.270	1.122	1.1	10.9	86	4	12.4	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.135	0.558
NC-03	NB-03	Foundation Soils	16.8	23.2	25.1	0.124	41.740	0.495	1.1	25.9	44	4	12.3	38.2	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.136	0.630
NC-03	NB-03	Foundation Soils	16.9	23.1	36.7	0.191	29.720	0.520	1.1	37.6	33	4	12.0	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.136	0.688
NC-03	NB-03	Foundation Soils	17.0	23.0	35.3	0.275	-3.050	0.779	1.1	36.1	41	4	12.7	48.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.136	0.683
NC-03	NB-03	Foundation Soils	17.1	23.0	26.9	0.415	7.100	1.545	1.1	27.5	62	4	13.2	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.136	0.639
NC-03	NB-03	Foundation Soils	17.1	22.9	21.2	0.442	10.290	2.088	1.1	21.7	75	4	13.0	34.8	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.137	0.607
NC-03	NB-03	Foundation Soils	17.2	22.8	14.4	0.470	16.020	3.271	1.1	14.8	96	4	12.8	27.6	1.0	-0.3	0.0	1.0	0.077	1.006	0.078	0.137	0.571
NC-03	NB-03	Foundation Soils	17.3	22.7	10.9	0.451	22.300	4.134	1.1	11.2	100	4	12.5	23.8	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.137	0.552
NC-03	NB-03	Foundation Soils	17.4	22.6	10.5	0.387	17.060	3.687	1.1	10.8	100	4	12.5	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.137	0.549
NC-03	NB-03	Foundation Soils	17.5	22.5	11.7	0.361	22.250	3.075	1.1	12.1	100	4	12.6	24.7	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.138	0.554
NC-03	NB-03	Foundation Soils	17.6	22.5	10.2	0.262	26.410	2.567	1.1	10.5	100	4	12.5	23.0	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.138	0.545
NC-03	NB-03	Foundation Soils	17.6	22.4	7.1	0.251	40.260	3.520	1.1	7.3	100	4	12.3	19.6	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.138	0.528
NC-03	NB-03	Foundation Soils	17.7	22.3	6.2	0.230	54.510	3.710	1.1	6.4	100	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.139	0.523
NC-03	NB-03	Foundation Soils	17.8	22.2	5.9	0.189	63.560	3.216	1.1	6.0	100	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.139	0.520
NC-03	NB-03	Foundation Soils	17.9	22.1	4.6	0.135	83.260	2.929	1.1	4.7	100	4	12.1	16.8	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.139	0.513
NC-03	NB-03	Foundation Soils	18.0	22.1	4.5	0.103	88.430	2.288	1.1	4.6	100	4	12.1	16.7	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.139	0.511
NC-03	NB-03	Foundation Soils	18.0	22.0	5.3	0.076	93.780	1.443	1.1	5.4	100	4	12.1	17.5	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.140	0.514
NC-03	NB-03	Foundation Soils	18.1	21.9	5.9	0.064	75.140	1.076	1.1	6.0	100	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.140	0.516
NC-03	NB-03	Foundation Soils	18.2	21.8	6.2	0.071	68.590	1.144	1.1	6.3	100	4	12.2	18.5	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.140	0.516
NC-03	NB-03	Foundation Soils	18.3	21.7	6.3	0.080	54.310	1.264	1.1	6.4	100	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.140	0.516
NC-03	NB-03	Foundation Soils	18.4	21.6	5.6	0.084	42.550	1.496	1.1	5.7	100	4	12.2	17.8	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.140	0.512
NC-03	NB-03	Foundation Soils	18.5	21.6	4.2	0.083	55.510	1.959	1.1	4.3	100	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.141	0.504
NC-03	NB-03	Foundation Soils	18.5	21.5	3.9	0.077	67.420	1.959	1.1	4.0	100	4	12.0	16.0	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.141	0.502
NC-03	NB-03	Foundation Soils	18.6	21.4	4.2	0.067	79.190	1.597	1.1	4.2	100	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.141	0.502
NC-03	NB-03	Foundation Soils	18.7	21.3	4.4	0.047	81.920	1.080	1.1	4.4	100	4	12.1	16.4	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.141	0.502
NC-03	NB-03	Foundation Soils	18.8	21.2	4.4	0.029	92.050	0.660	1.1	4.4	100	4	12.1	16.5	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.142	0.501
NC-03	NB-03	Foundation Soils	18.9	21.2	5.1	0.048	88.520	0.944	1.1	5.1	100	4	12.1	17.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.071	0.142	0.503
NC-03	NB-03	Foundation Soils	18.9	21.1	9.4	0.084	58.460	0.892	1.1	9.4	89	4	12.3	21.8	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.142	0.523
NC-03	NB-03	Foundation Soils	19.0	21.0	11.7	0.164	15.340	1.405	1.1	11.6	89	4	12.5	24.1	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.142	0.532
NC-03	NB-03	Foundation Soils	19.1	20.9	11.6	0.191	2.190	1.653	1.1	11.5	92	4	12.5	24.0	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.143	0.531
NC-03	NB-03	Foundation Soils	19.2	20.8	9.1	0.163	5.530	1.782	1.1	9.1	100	4	12.4	21.5	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.143	0.519
NC-03	NB-03	Foundation Soils	19.3	20.7	8.1	0.160	16.960	1.981	1.1	8.0	100	4	12.3	20.3	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.143	0.513
NC-03	NB-03	Foundation Soils	19.4	20.7	6.9	0.161	28.510	2.334	1.1	6.8	100	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.143	0.506
NC-03	NB-03	Foundation Soils	19.4	20.6	5.8	0.246	45.070	4.226	1.0	5.8	100	4	12.2	17.9	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.143	0.501
NC-03	NB-03	Foundation Soils	19.5	20.5	7.0	0.325	75.090	4.664	1.0	6.9	100	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.144	0.505
NC-03	NB-03	Foundation Soils	19.6	20.4	17.9	0.379	71.630	2.116	1.0	17.6	82	4	12.8	30.5	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.144	0.555
NC-03	NB-03	Foundation Soils	19.7	20.3	25.9	0.580	71.720	2.237	1.0	25.4	72	4	13.2	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.085	0.144	0.592
NC-03	NB-03	Foundation Soils	19.8	20.3	37.6	0.676	-11.820	1.798	1.0	36.7	56	4	13.6	50.3	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.144	0.648
NC-03	NB-03	Foundation Soils	19.8	20.2	49.9	0.870	-14.840	1.744	1.0	48.5	48	4	14.0	62.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.103	0.145	0.711
NC-03	NB-03	Foundation Soils	19.9	20.1	69.0	0.926	-14.480	1.342	1.0	66.9	33	4	13.7	80.6	1.0	-0.3	0.0	0.9	0.116	1.012	0.118	0.145	0.817
NC-03	NB-03	Foundation Soils	20.0	20.0	88.7	1.161	-18.530	1.308	1.0	85.7	26	4	13.2	98.9	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.145	0.958
NC-03	NB-03	Foundation Soils	20.1	19.9	91.1	1.337	-18.530	1.468	1.0	87.8	28	4	13.8	101.7	1.0	-0.4	0.0	0.9	0.140	1.018	0.143	0.145	0.983
NC-03	NB-03	Foundation Soils	20.2	19.8	92.9	1.590	-18.680	1.711	1.0	89.5	31	4	14.6	104.1	1.0	-0.4	0.0	0.9	0.143	1.019	0.146	0.145	1.007
NC-03	NB-03	Foundation Soils	20.3	19.8	92.7	1.793	-18.340	1.933	1.0	89.2	34	4	15.1	104.3	1.0	-0.4	0.0	0.9	0.143	1.019	0.147	0.146	1.007
NC-03	NB-03	Foundation Soils	20.3	19.7	85.2	1.856	-18.770	2.179	1.0	81.9	39	4	15.4	97.2	1.0	-0.4	0.0	0.9	0.134	1.017	0.137	0.146	0.937
NC-03	NB-03	Foundation Soils	20.4	19.6	81.7	1.853	-18.440	2.269	1.0	78.4	41	4	15.4	93.8	1.0	-0.4	0.0	0.9	0.130	1.016	0.132	0.146	0.906
NC-03	NB-03	Foundation Soils	20.5	19.5	86.5	1.743	-18.510	2.014	1.0	83.0	37	4	15.2	98.2	1.0	-0.4	0.0	0.9	0.135	1.017	0.138	0.146	0.942
NC-03	NB-03	Foundation Soils	20.6	19.4	92.4	1.623	-18.530	1.756	1.0	88.5	32	4	14.7	103.2	1.0	-0.4	0.0	0.9	0.142	1.019	0.145	0.146	0.990

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-03	NB-03	Foundation Soils	20.7	19.3	100.3	1.406	-16.900	1.401	1.0	95.9	25	4	13.2	109.2	1.0	-0.4	0.0	0.9	0.151	1.021	0.154	0.147	1.053
NC-03	NB-03	Foundation Soils	20.8	19.3	105.4	1.124	-17.930	1.067	1.0	100.6	17	4	9.7	110.3	1.0	-0.4	0.0	0.9	0.153	1.022	0.156	0.147	1.065
NC-03	NB-03	Foundation Soils	20.8	19.2	104.0	0.998	-19.270	0.960	1.0	99.2	15	4	8.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.147	1.029
NC-03	NB-03	Foundation Soils	20.9	19.1	101.2	1.061	-19.300	1.048	1.0	96.4	18	4	10.1	106.5	1.0	-0.4	0.0	0.9	0.146	1.020	0.150	0.147	1.018
NC-03	NB-03	Foundation Soils	21.0	19.0	95.6	1.133	-18.840	1.185	1.0	91.0	22	4	12.1	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.147	0.980
NC-03	NB-03	Foundation Soils	21.1	18.9	94.0	1.205	-18.200	1.282	1.0	89.4	24	4	12.9	102.2	1.0	-0.4	0.0	0.9	0.140	1.019	0.143	0.147	0.971
NC-03	NB-03	Foundation Soils	21.2	18.9	98.2	1.189	-18.340	1.210	1.0	93.3	22	4	12.1	105.4	1.0	-0.4	0.0	0.9	0.145	1.020	0.148	0.148	1.001
NC-03	NB-03	Foundation Soils	21.2	18.8	102.9	1.017	-18.250	0.988	1.0	97.6	16	4	9.0	106.6	1.0	-0.4	0.0	0.9	0.147	1.020	0.150	0.148	1.013
NC-03	NB-03	Foundation Soils	21.3	18.7	106.8	0.944	-18.550	0.884	1.0	101.2	13	4	6.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.148	1.020
NC-03	NB-03	Foundation Soils	21.4	18.6	106.8	0.961	-18.680	0.900	1.0	101.0	13	4	6.6	107.7	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.148	1.022
NC-03	NB-03	Foundation Soils	21.5	18.5	105.4	1.004	-18.440	0.952	1.0	99.6	15	4	8.0	107.6	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.148	1.020
NC-03	NB-03	Foundation Soils	21.6	18.4	109.4	1.136	-17.960	1.038	1.0	103.3	16	4	8.9	112.2	1.0	-0.4	0.0	0.9	0.156	1.023	0.159	0.149	1.072
NC-03	NB-03	Foundation Soils	21.7	18.4	116.7	1.146	-17.950	0.982	1.0	110.1	13	4	6.5	116.6	1.0	-0.4	0.0	0.9	0.164	1.025	0.168	0.149	1.130
NC-03	NB-03	Foundation Soils	21.7	18.3	118.5	1.091	-18.390	0.921	1.0	111.6	11	4	4.7	116.3	1.0	-0.4	0.0	0.9	0.163	1.024	0.167	0.149	1.124
NC-03	NB-03	Foundation Soils	21.8	18.2	119.6	1.011	-18.380	0.845	1.0	112.5	9	4	2.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.149	1.106
NC-03	NB-03	Foundation Soils	21.9	18.1	121.9	0.933	-18.340	0.766	1.0	114.5	6	4	0.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.149	1.105
NC-03	NB-03	Foundation Soils	22.0	18.0	126.9	0.808	-18.300	0.637	1.0	119.1	1	4	0.0	119.1	1.0	-0.4	0.0	0.9	0.169	1.026	0.173	0.149	1.161
NC-03	NB-03	Foundation Soils	22.1	18.0	138.5	0.562	-18.010	0.406	1.0	129.9	0	4	0.0	129.9	1.0	-0.4	0.0	0.9	0.197	1.032	0.203	0.150	1.358
NC-03	NB-03	Foundation Soils	22.1	17.9	146.4	0.509	-18.320	0.348	1.0	137.2	0	4	0.0	137.2	1.0	-0.4	0.0	0.9	0.223	1.036	0.230	0.150	1.538
NC-03	NB-03	Foundation Soils	22.2	17.8	148.6	0.592	-18.870	0.398	1.0	139.2	0	4	0.0	139.2	1.0	-0.4	0.0	0.9	0.231	1.038	0.239	0.150	1.594
NC-03	NB-03	Foundation Soils	22.3	17.7	142.9	0.649	-19.090	0.454	1.0	133.6	0	4	0.0	133.6	1.0	-0.4	0.0	0.9	0.209	1.034	0.216	0.150	1.438
NC-03	NB-03	Foundation Soils	22.4	17.6	130.9	0.756	-18.720	0.578	1.0	122.2	0	4	0.0	122.2	1.0	-0.4	0.0	0.9	0.176	1.027	0.181	0.150	1.203
NC-03	NB-03	Foundation Soils	22.5	17.5	124.2	0.867	-18.000	0.698	1.0	115.8	4	4	0.0	115.9	1.0	-0.4	0.0	0.9	0.163	1.024	0.166	0.150	1.104
NC-03	NB-03	Foundation Soils	22.6	17.5	114.3	0.943	-16.440	0.825	1.0	106.5	10	4	3.5	110.0	1.0	-0.4	0.0	0.9	0.152	1.022	0.155	0.151	1.028
NC-03	NB-03	Foundation Soils	22.6	17.4	110.8	0.975	-15.210	0.880	1.0	103.1	12	4	5.7	108.8	1.0	-0.4	0.0	0.9	0.150	1.021	0.153	0.151	1.014
NC-03	NB-03	Foundation Soils	22.7	17.3	107.9	0.801	-14.580	0.742	1.0	100.2	9	4	2.9	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.151	0.952
NC-03	NB-03	Foundation Soils	22.8	17.2	102.7	0.822	-14.060	0.800	1.0	95.3	12	4	5.7	101.0	1.0	-0.4	0.0	0.9	0.139	1.018	0.141	0.151	0.931
NC-03	NB-03	Foundation Soils	22.9	17.1	98.3	0.906	-14.250	0.922	1.0	91.0	17	4	9.1	100.1	1.0	-0.4	0.0	0.9	0.137	1.018	0.139	0.151	0.922
NC-03	NB-03	Foundation Soils	23.0	17.1	93.5	0.966	-14.100	1.033	1.0	86.5	21	4	11.1	97.7	1.0	-0.4	0.0	0.9	0.134	1.017	0.136	0.151	0.899
NC-03	NB-03	Foundation Soils	23.0	17.0	90.4	1.015	-8.030	1.123	1.0	83.5	23	4	12.2	95.7	1.0	-0.4	0.0	0.9	0.132	1.016	0.134	0.151	0.882
NC-03	NB-03	Foundation Soils	23.1	16.9	85.4	1.094	-15.680	1.281	1.0	78.8	28	4	13.3	92.1	1.0	-0.4	0.0	0.9	0.128	1.015	0.129	0.152	0.853
NC-03	NB-03	Foundation Soils	23.2	16.8	80.3	1.133	-16.910	1.412	1.0	73.9	32	4	13.8	87.8	1.0	-0.4	0.0	0.9	0.123	1.014	0.124	0.152	0.820
NC-03	NB-03	Foundation Soils	23.3	16.7	77.3	1.183	-16.340	1.530	1.0	71.1	35	4	14.1	85.3	1.0	-0.4	0.0	0.9	0.121	1.013	0.122	0.152	0.802
NC-03	NB-03	Foundation Soils	23.4	16.6	72.5	1.198	-16.830	1.653	1.0	66.5	38	4	14.3	80.9	1.0	-0.4	0.0	0.9	0.117	1.012	0.117	0.152	0.773
NC-03	NB-03	Foundation Soils	23.5	16.6	64.0	1.266	-16.820	1.978	1.0	58.6	46	4	14.5	73.1	1.0	-0.4	0.0	0.9	0.110	1.011	0.110	0.152	0.726
NC-03	NB-03	Foundation Soils	23.5	16.5	61.3	1.308	-17.250	2.133	1.0	56.1	48	4	14.5	70.6	1.0	-0.4	0.0	0.9	0.108	1.010	0.108	0.152	0.711
NC-03	NB-03	Foundation Soils	23.6	16.4	54.2	1.234	-17.200	2.277	1.0	49.5	53	4	14.3	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.152	0.674
NC-03	NB-03	Foundation Soils	23.7	16.3	49.0	1.033	-16.970	2.109	1.0	44.6	54	4	14.0	58.6	1.0	-0.4	0.0	0.9	0.099	1.008	0.099	0.153	0.648
NC-03	NB-03	Foundation Soils	23.8	16.2	42.5	0.938	-16.630	2.205	1.0	38.6	59	4	13.8	52.4	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.153	0.617
NC-03	NB-03	Foundation Soils	23.9	16.1	35.5	0.827	-15.820	2.332	1.0	32.1	65	4	13.5	45.6	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.153	0.585
NC-03	NB-03	Foundation Soils	23.9	16.1	28.3	0.751	-14.580	2.657	1.0	25.5	77	4	13.3	38.8	1.0	-0.4	0.1	0.9	0.085	1.007	0.085	0.153	0.554
NC-03	NB-03	Foundation Soils	24.0	16.0	24.2	0.783	-10.680	3.238	1.0	21.8	86	4	13.1	34.9	1.0	-0.4	0.1	0.9	0.082	1.007	0.082	0.153	0.537
NC-03	NB-03	Foundation Soils	24.1	15.9	24.9	0.769	-6.100	3.083	1.0	22.4	84	4	13.2	35.6	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.153	0.539
NC-03	NB-03	Foundation Soils	24.2	15.8	27.7	0.638	-2.380	2.302	1.0	24.9	75	4	13.2	38.1	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.154	0.549
NC-03	NB-03	Foundation Soils	24.3	15.7	32.3	0.532	0.760	1.645	1.0	29.1	61	4	13.2	42.3	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.154	0.567
NC-03	NB-03	Foundation Soils	24.4	15.7	35.3	0.377	-0.240	1.067	1.0	31.7	50	4	13.0	44.7	1.0	-0.5	0.1	0.9	0.089	1.007	0.089	0.154	0.578
NC-03	NB-03	Foundation Soils	24.4	15.6	34.7	0.297	-0.330	0.855	1.0	31.2	46	4	12.8	43.9	1.0	-0.5	0.1	0.9	0.088	1.007	0.088	0.154	0.573
NC-03	NB-03	Foundation Soils	24.5	15.5	33.6	0.310	1.550	0.921	0.9	30.1	49	4	12.8	43.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.088	0.154	0.568
NC-03	NB-03	Foundation Soils	24.6	15.4	32.5	0.366	6.400	1.127	0.9	29.0	53	4	13.0	42.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.154	0.564
NC-03	NB-03	Foundation Soils	24.7	15.3	29.9	0.437	21.820	1.461	0.9	26.7	61	4	13.1	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.154	0.553
NC-03	NB-03	Foundation Soils	24.8	15.2	26.7	0.409	67.320	1.530	0.9	23.8	65	4	13.0	36.8	1.0	-0.5	0.1	0.9	0.083	1.007	0.083	0.154	0.540
NC-03	NB-03	Foundation Soils	24.9	15.2	33.1	0.424	134.790	1.281	0.9	29.5	55	4	13.1	42.6	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.155	0.564
NC-03	NB-03	Foundation Soils	24.9	15.1	44.2	0.532	67.620	1.204	0.9	39.4	46	4	13.3	52.7	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.155	0.610
PC-01	PB-01 & PB-02	Foundation Soils	11.1	33.4	4.9	0.079	40.120	1.612	1.4	6.5	100	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.127	0.739
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.4	5.1	0.078	42.040	1.517	1.4	6.7	100	21	40.4	47.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.128	0.738
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.3	5.3	0.087	44.450	1.636	1.4	7.0	100	21	40.5	47.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.128	0.737
PC-01	PB-01 & PB-02	Foundation Soils	11.3	33.2	5.2	0.087	44.310	1.661	1.4	6.8	100	21	40.4	47.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.129	0.733
PC-01	PB-01 & PB-02	Foundation Soils	11.4	33.1	5.1	0.097	43.590	1.897	1.4	6.7	100	21	40.4	47.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.129	0.729
PC-01	PB-01 & PB-02	Foundation Soils	11.5	33.0	5.0	0.110	40.690	2.211	1.4	6.5	100	21	40.4	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.129	0.725
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	5.0	0.106	39.070	2.110	1.4	6.5	100	21	40.4	46.9	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.130	0.722
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	5.4	0.101	40.310	1.856	1.4	7.1	100	21	40.5	47.5	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.130	0.724
PC-01	PB-01 & PB-02	Foundation Soils	11.7	32.8	6.1	0.099	44.740	1.613	1.4	7.9	99	21	40.7	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.131	0.727

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	11.8	32.7	6.2	0.092	40.500	1.488	1.4	8.0	97	21	40.6	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.131	0.724
PC-01	PB-01 & PB-02	Foundation Soils	11.9	32.6	5.7	0.087	25.590	1.526	1.4	7.3	100	21	40.5	47.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.132	0.718
PC-01	PB-01 & PB-02	Foundation Soils	12.0	32.5	4.9	0.077	20.260	1.576	1.4	6.3	100	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.132	0.708
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.5	4.4	0.076	17.630	1.712	1.4	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.133	0.701
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.4	4.2	0.080	20.950	1.900	1.4	5.4	100	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.133	0.697
PC-01	PB-01 & PB-02	Foundation Soils	12.2	32.3	4.1	0.084	24.880	2.071	1.4	5.2	100	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.133	0.693
PC-01	PB-01 & PB-02	Foundation Soils	12.3	32.2	4.0	0.085	27.280	2.130	1.4	5.1	100	21	40.0	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.134	0.690
PC-01	PB-01 & PB-02	Foundation Soils	12.4	32.1	3.9	0.092	29.540	2.368	1.4	5.0	100	21	40.0	45.0	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.134	0.687
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	3.7	0.091	28.410	2.468	1.4	4.7	100	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.135	0.683
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	3.7	0.088	29.060	2.384	1.4	4.7	100	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.135	0.681
PC-01	PB-01 & PB-02	Foundation Soils	12.6	31.9	3.6	0.085	29.970	2.343	1.3	4.6	100	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.136	0.678
PC-01	PB-01 & PB-02	Foundation Soils	12.7	31.8	3.6	0.083	31.160	2.284	1.3	4.6	100	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.136	0.676
PC-01	PB-01 & PB-02	Foundation Soils	12.8	31.7	3.6	0.080	30.400	2.235	1.3	4.5	100	21	39.9	44.5	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.136	0.673
PC-01	PB-01 & PB-02	Foundation Soils	12.9	31.6	3.9	0.076	32.880	1.946	1.3	4.9	100	21	40.0	44.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.137	0.674
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.6	4.2	0.073	34.640	1.752	1.3	5.3	100	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.137	0.674
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.5	4.4	0.074	37.140	1.666	1.3	5.6	100	21	40.2	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.138	0.674
PC-01	PB-01 & PB-02	Foundation Soils	13.1	31.4	4.6	0.098	39.210	2.142	1.3	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.138	0.673
PC-01	PB-01 & PB-02	Foundation Soils	13.2	31.3	4.9	0.164	39.160	3.351	1.3	6.1	100	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.138	0.673
PC-01	PB-01 & PB-02	Foundation Soils	13.3	31.2	4.9	0.447	39.160	9.133	1.3	6.1	100	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.139	0.671
PC-01	PB-01 & PB-02	Foundation Soils	13.4	31.1	10.1	0.757	49.220	7.527	1.3	12.4	100	21	41.7	54.1	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.139	0.711
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.1	16.1	0.888	51.500	5.525	1.3	19.5	96	21	43.2	62.7	1.0	-0.2	0.0	1.0	0.102	1.009	0.106	0.139	0.759
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.0	20.9	0.787	25.490	3.759	1.3	25.2	79	21	43.9	69.1	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.140	0.796
PC-01	PB-01 & PB-02	Foundation Soils	13.6	30.9	45.9	0.739	14.630	1.609	1.2	53.4	43	21	46.2	99.5	1.0	-0.2	0.0	1.0	0.137	1.018	0.145	0.140	1.036
PC-01	PB-01 & PB-02	Foundation Soils	13.7	30.8	86.2	0.879	16.250	1.020	1.2	97.6	16	21	29.8	127.4	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.141	1.466
PC-01	PB-01 & PB-02	Foundation Soils	13.8	30.7	102.1	0.973	23.110	0.953	1.2	115.4	10	21	12.9	128.3	1.1	-0.2	0.0	1.0	0.192	1.031	0.209	0.141	1.483
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.7	75.6	1.027	2.100	1.358	1.2	85.3	26	21	43.7	129.0	1.1	-0.2	0.0	1.0	0.194	1.031	0.211	0.141	1.495
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.6	66.8	1.048	-1.760	1.568	1.2	75.7	33	21	46.7	122.4	1.1	-0.2	0.0	1.0	0.177	1.027	0.191	0.142	1.348
PC-01	PB-01 & PB-02	Foundation Soils	14.0	30.5	41.3	1.138	12.420	2.754	1.2	47.8	59	21	47.5	95.3	1.0	-0.2	0.0	1.0	0.131	1.016	0.139	0.142	0.979
PC-01	PB-01 & PB-02	Foundation Soils	14.1	30.4	27.6	1.122	5.340	4.060	1.2	32.4	74	21	45.3	77.8	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.142	0.837
PC-01	PB-01 & PB-02	Foundation Soils	14.2	30.3	22.8	0.952	1.950	4.170	1.3	27.0	80	21	44.4	71.3	1.0	-0.2	0.0	1.0	0.108	1.010	0.113	0.143	0.793
PC-01	PB-01 & PB-02	Foundation Soils	14.3	30.2	16.3	0.758	3.570	4.658	1.3	19.4	92	21	43.1	62.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.105	0.143	0.737
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.2	18.7	0.591	7.330	3.156	1.3	22.2	80	21	43.3	65.5	1.0	-0.2	0.0	1.0	0.104	1.009	0.108	0.143	0.753
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.1	26.7	0.590	18.300	2.210	1.2	31.2	66	21	44.5	75.7	1.0	-0.2	0.0	1.0	0.112	1.011	0.117	0.144	0.815
PC-01	PB-01 & PB-02	Foundation Soils	14.5	30.0	35.0	0.556	20.490	1.589	1.2	40.4	51	21	45.0	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.127	0.144	0.881
PC-01	PB-01 & PB-02	Foundation Soils	14.6	29.9	41.3	0.531	13.880	1.285	1.2	47.4	42	21	44.6	92.1	1.0	-0.2	0.0	1.0	0.128	1.015	0.135	0.144	0.932
PC-01	PB-01 & PB-02	Foundation Soils	14.7	29.8	47.5	0.547	4.880	1.151	1.2	54.1	36	21	44.0	98.1	1.0	-0.2	0.0	1.0	0.135	1.017	0.143	0.145	0.985
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.8	51.4	0.540	1.380	1.050	1.2	58.4	32	21	42.8	101.2	1.0	-0.2	0.0	1.0	0.139	1.018	0.147	0.145	1.014
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.7	52.3	0.550	1.460	1.052	1.2	59.2	31	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.145	1.019
PC-01	PB-01 & PB-02	Foundation Soils	14.9	29.6	52.8	0.564	2.290	1.068	1.2	59.6	31	21	42.9	102.6	1.0	-0.2	0.0	1.0	0.141	1.019	0.149	0.146	1.023
PC-01	PB-01 & PB-02	Foundation Soils	15.0	29.5	53.1	0.574	3.460	1.081	1.2	59.9	32	21	43.0	102.9	1.0	-0.2	0.0	1.0	0.141	1.019	0.150	0.146	1.024
PC-01	PB-01 & PB-02	Foundation Soils	15.1	29.4	52.5	0.551	4.140	1.050	1.2	59.1	31	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.146	1.011
PC-01	PB-01 & PB-02	Foundation Soils	15.2	29.3	49.5	0.551	4.880	1.114	1.2	55.7	34	21	43.6	99.4	1.0	-0.2	0.0	1.0	0.136	1.018	0.144	0.147	0.982
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.3	45.0	0.580	5.180	1.289	1.2	50.8	40	21	44.8	95.6	1.0	-0.2	0.0	1.0	0.132	1.016	0.139	0.147	0.944
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.2	36.7	0.632	5.760	1.723	1.2	41.6	52	21	45.4	87.0	1.0	-0.2	0.0	1.0	0.122	1.014	0.128	0.147	0.871
PC-01	PB-01 & PB-02	Foundation Soils	15.4	29.1	28.7	0.722	6.620	2.519	1.2	32.7	67	21	45.0	77.7	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.148	0.804
PC-01	PB-01 & PB-02	Foundation Soils	15.5	29.0	22.3	0.768	7.450	3.441	1.2	25.6	78	21	44.0	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.148	0.751
PC-01	PB-01 & PB-02	Foundation Soils	15.6	28.9	15.7	0.599	9.050	3.821	1.2	18.1	90	21	42.7	60.9	1.0	-0.2	0.0	1.0	0.100	1.009	0.104	0.148	0.700
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	13.2	0.528	11.710	4.008	1.2	15.3	97	21	42.3	57.5	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.149	0.680
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	11.6	0.498	13.670	4.310	1.2	13.4	100	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.149	0.667
PC-01	PB-01 & PB-02	Foundation Soils	15.8	28.7	20.7	0.324	29.210	1.567	1.2	23.7	67	21	43.0	66.6	1.0	-0.3	0.0	1.0	0.105	1.010	0.108	0.149	0.727
PC-01	PB-01 & PB-02	Foundation Soils	15.9	28.6	59.1	0.261	49.980	0.441	1.2	66.6	12	21	16.2	82.8	1.0	-0.3	0.0	1.0	0.118	1.013	0.124	0.149	0.827
PC-01	PB-01 & PB-02	Foundation Soils	16.0	28.5	79.1	0.237	29.920	0.300	1.2	88.5	0	21	0.0	88.5	1.0	-0.3	0.0	1.0	0.124	1.014	0.130	0.150	0.867
PC-01	PB-01 & PB-02	Foundation Soils	16.1	28.4	80.8	0.273	6.770	0.338	1.2	90.2	0	21	0.0	90.2	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.150	0.878
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.4	78.2	0.410	6.330	0.524	1.2	87.2	7	21	2.5	89.6	1.0	-0.3	0.0	1.0	0.125	1.015	0.131	0.150	0.872
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.3	77.4	0.422	9.010	0.545	1.2	86.1	8	21	4.7	90.8	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.151	0.879
PC-01	PB-01 & PB-02	Foundation Soils	16.3	28.2	76.3	0.498	10.270	0.653	1.2	84.1	12	21	16.2	100.2	1.0	-0.3	0.0	1.0	0.138	1.018	0.145	0.151	0.959
PC-01	PB-01 & PB-02	Foundation Soils	16.4	28.1	75.3	0.621	10.480	0.824	1.2	82.3	17	21	29.3	111.6	1.0	-0.3	0.0	1.0	0.155	1.022	0.164	0.151	1.085
PC-01	PB-01 & PB-02	Foundation Soils	16.5	28.0	73.2	0.657	11.180	0.897	1.2	79.8	19	21	34.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.168	0.151	1.111
PC-01	PB-01 & PB-02	Foundation Soils	16.6	27.9	74.0	0.711	8.910	0.961	1.2	80.3	21	21	36.1	116.4	1.0	-0.3	0.0	1.0	0.164	1.024	0.174	0.152	1.146
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.9	72.5	0.785	8.290	1.082	1.1	78.5	24	21	40.0	118.5	1.0	-0.3	0.0	1.0	0.168	1.025	0.179	0.152	1.176
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.8	69.1	0.826	6.750	1.195	1.1	74.7	27	21	42.8	117.6	1.0	-0.3	0.0	1.0	0.166	1.025	0.176	0.152	1.159
PC-01	PB-01 & PB-02	Foundation Soils	16.8	27.7	58.6	0.890	5.000	1.519	1.2	63.6	37	21	46.3	109.9	1.0	-0.3	0.0	1.0	0.152	1.022	0.160	0.152	1.052

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	16.9	27.6	44.6	0.907	3.720	2.032	1.2	48.8	51	21	46.8	95.6	1.0	-0.3	0.0	1.0	0.132	1.016	0.138	0.153	0.903
PC-01	PB-01 & PB-02	Foundation Soils	17.0	27.5	27.9	0.968	3.750	3.469	1.2	30.9	73	21	44.9	75.8	1.0	-0.3	0.0	1.0	0.112	1.011	0.116	0.153	0.760
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.5	17.7	0.907	6.430	5.124	1.2	19.8	95	21	43.2	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.153	0.686
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.4	11.9	0.782	15.340	6.579	1.2	13.4	100	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.153	0.644
PC-01	PB-01 & PB-02	Foundation Soils	17.2	27.3	11.1	0.656	19.680	5.919	1.2	12.4	100	21	41.7	54.1	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.154	0.637
PC-01	PB-01 & PB-02	Foundation Soils	17.3	27.2	8.9	0.431	23.490	4.828	1.2	10.0	100	21	41.2	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.154	0.621
PC-01	PB-01 & PB-02	Foundation Soils	17.4	27.1	7.3	0.340	35.350	4.657	1.2	8.2	100	21	40.7	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.154	0.609
PC-01	PB-01 & PB-02	Foundation Soils	17.5	27.0	7.0	0.292	95.530	4.150	1.2	7.9	100	21	40.7	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.155	0.607
PC-01	PB-01 & PB-02	Foundation Soils	17.6	27.0	24.0	0.243	115.300	1.010	1.2	26.5	55	21	42.6	69.1	1.0	-0.3	0.0	1.0	0.107	1.010	0.110	0.155	0.710
PC-01	PB-01 & PB-02	Foundation Soils	17.6	26.9	92.7	0.270	88.090	0.291	1.1	99.9	0	21	0.0	99.9	1.0	-0.3	0.0	1.0	0.137	1.018	0.144	0.155	0.926
PC-01	PB-01 & PB-02	Foundation Soils	17.7	26.8	97.0	0.353	34.020	0.364	1.1	104.1	0	21	0.0	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.150	0.155	0.965
PC-01	PB-01 & PB-02	Foundation Soils	17.8	26.7	82.2	0.439	-0.340	0.534	1.1	88.8	7	21	2.0	90.9	1.0	-0.3	0.0	0.9	0.126	1.015	0.132	0.156	0.847
PC-01	PB-01 & PB-02	Foundation Soils	17.9	26.6	61.6	0.583	-2.920	0.946	1.1	65.9	26	21	40.2	106.1	1.0	-0.3	0.0	0.9	0.146	1.020	0.153	0.156	0.982
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.6	43.3	0.711	-2.580	1.642	1.1	46.6	48	21	45.7	92.3	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.156	0.855
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.5	27.3	0.765	-0.330	2.798	1.2	29.7	71	21	44.5	74.2	1.0	-0.3	0.0	0.9	0.111	1.011	0.114	0.156	0.732
PC-01	PB-01 & PB-02	Foundation Soils	18.1	26.4	18.7	0.780	1.810	4.166	1.2	20.5	90	21	43.3	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.156	0.673
PC-01	PB-01 & PB-02	Foundation Soils	18.2	26.3	11.8	0.667	6.790	5.651	1.2	13.0	100	21	41.8	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.098	0.157	0.627
PC-01	PB-01 & PB-02	Foundation Soils	18.3	26.2	10.2	0.558	13.010	5.497	1.2	11.2	100	21	41.4	52.6	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.157	0.615
PC-01	PB-01 & PB-02	Foundation Soils	18.4	26.1	8.8	0.463	15.820	5.244	1.2	9.7	100	21	41.1	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.157	0.605
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.1	6.6	0.375	23.040	5.696	1.2	7.3	100	21	40.5	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.157	0.590
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.0	5.9	0.269	42.830	4.531	1.2	6.5	100	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.158	0.585
PC-01	PB-01 & PB-02	Foundation Soils	18.6	25.9	5.9	0.256	69.320	4.330	1.2	6.5	100	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.158	0.584
PC-01	PB-01 & PB-02	Foundation Soils	18.7	25.8	6.1	0.305	84.240	4.971	1.2	6.7	100	21	40.4	47.1	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.158	0.584
PC-01	PB-01 & PB-02	Foundation Soils	18.8	25.7	13.2	0.312	94.870	2.356	1.2	14.4	89	21	41.9	56.3	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.158	0.627
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	19.2	0.299	71.230	1.554	1.1	20.8	70	21	42.6	63.3	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.159	0.661
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	11.0	0.253	32.120	2.302	1.2	11.9	95	21	41.5	53.4	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.159	0.611
PC-01	PB-01 & PB-02	Foundation Soils	19.0	25.5	7.7	0.237	25.440	3.062	1.2	8.4	100	21	40.8	49.2	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.159	0.590
PC-01	PB-01 & PB-02	Foundation Soils	19.1	25.4	7.5	0.173	39.150	2.296	1.2	8.2	100	21	40.7	48.9	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.159	0.588
PC-01	PB-01 & PB-02	Foundation Soils	19.2	25.3	6.2	0.089	66.420	1.432	1.2	6.8	100	21	40.4	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.160	0.579
PC-01	PB-01 & PB-02	Foundation Soils	19.3	25.2	5.7	0.038	84.530	0.670	1.2	6.2	100	21	40.3	46.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.160	0.575
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.2	5.8	0.033	103.340	0.568	1.1	6.3	98	21	40.3	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.160	0.574
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.1	5.9	0.044	100.290	0.751	1.1	6.3	100	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.160	0.574
PC-01	PB-01 & PB-02	Foundation Soils	19.5	25.0	5.9	0.038	95.150	0.646	1.1	6.4	99	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.160	0.573
PC-01	PB-01 & PB-02	Foundation Soils	19.6	24.9	6.9	0.036	97.350	0.523	1.1	7.4	90	21	40.3	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.161	0.577
PC-01	PB-01 & PB-02	Foundation Soils	19.7	24.8	7.5	0.048	82.570	0.643	1.1	8.0	89	21	40.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.161	0.580
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	8.4	0.058	63.310	0.688	1.1	9.0	86	21	40.6	49.6	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.161	0.584
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	8.3	0.064	66.560	0.770	1.1	8.9	88	21	40.6	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.161	0.583
PC-01	PB-01 & PB-02	Foundation Soils	19.9	24.6	9.9	0.045	86.020	0.454	1.1	10.6	74	21	40.5	51.1	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.161	0.589
PC-01	PB-01 & PB-02	Foundation Soils	20.0	24.5	10.1	0.063	81.080	0.625	1.1	10.8	78	21	40.7	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.162	0.590
PC-01	PB-01 & PB-02	Foundation Soils	20.1	24.4	26.6	0.084	62.560	0.316	1.1	28.0	36	21	38.8	66.9	1.0	-0.4	0.0	0.9	0.105	1.010	0.107	0.162	0.664
PC-01	PB-01 & PB-02	Foundation Soils	20.2	24.3	41.7	0.123	48.980	0.295	1.1	43.8	20	21	29.8	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.162	0.698
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.3	38.7	0.189	7.350	0.488	1.1	40.4	29	21	38.2	78.6	1.0	-0.4	0.0	0.9	0.115	1.012	0.118	0.162	0.727
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.2	29.9	0.250	0.760	0.836	1.1	31.2	46	21	42.3	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.162	0.697
PC-01	PB-01 & PB-02	Foundation Soils	20.4	24.1	19.0	0.338	5.500	1.777	1.1	20.0	74	21	42.5	62.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.163	0.638
PC-01	PB-01 & PB-02	Foundation Soils	20.5	24.0	14.5	0.432	8.290	2.975	1.1	15.3	93	21	42.2	57.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.163	0.613
PC-01	PB-01 & PB-02	Foundation Soils	20.6	23.9	9.6	0.411	14.080	4.269	1.1	10.1	100	21	41.2	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.163	0.584
PC-01	PB-01 & PB-02	Foundation Soils	20.7	23.8	7.7	0.340	17.200	4.423	1.1	8.1	100	21	40.7	48.8	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.163	0.572
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.8	6.3	0.282	21.770	4.508	1.1	6.6	100	21	40.4	47.0	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.163	0.563
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.7	5.0	0.207	29.680	4.119	1.1	5.3	100	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.164	0.555
PC-01	PB-01 & PB-02	Foundation Soils	20.9	23.6	5.0	0.107	46.020	2.124	1.1	5.3	100	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.164	0.554
PC-01	PB-01 & PB-02	Foundation Soils	21.0	23.5	5.4	0.053	64.460	0.987	1.1	5.6	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.164	0.555
PC-01	PB-01 & PB-02	Foundation Soils	21.1	23.4	6.8	0.034	71.180	0.499	1.1	7.1	92	21	40.3	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.164	0.562
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.4	7.8	0.031	62.650	0.398	1.1	8.1	84	21	40.3	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.164	0.565
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.3	8.5	0.038	45.780	0.449	1.1	8.8	82	21	40.4	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.164	0.568
PC-01	PB-01 & PB-02	Foundation Soils	21.3	23.2	9.7	0.040	37.120	0.411	1.1	10.1	75	21	40.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.165	0.573
PC-01	PB-01 & PB-02	Foundation Soils	21.4	23.1	10.8	0.041	31.370	0.380	1.1	11.2	69	21	40.4	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.165	0.577
PC-01	PB-01 & PB-02	Foundation Soils	21.5	23.0	9.0	0.064	26.130	0.708	1.1	9.4	85	21	40.7	50.0	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.165	0.570
PC-01	PB-01 & PB-02	Foundation Soils	21.6	22.9	7.5	0.090	24.950	1.193	1.1	7.8	100	21	40.7	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.165	0.562
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.9	6.0	0.084	28.680	1.391	1.1	6.3	100	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.165	0.553
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.8	6.1	0.070	33.890	1.157	1.1	6.3	100	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.166	0.552
PC-01	PB-01 & PB-02	Foundation Soils	21.8	22.7	7.5	0.066	35.210	0.881	1.1	7.7	96	21	40.6	48.3	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.166	0.559
PC-01	PB-01 & PB-02	Foundation Soils	21.9	22.6	10.5	0.066	33.070	0.627	1.1	10.8	78	21	40.7	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.166	0.573

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	22.0	22.5	13.8	0.070	20.770	0.506	1.1	14.2	64	21	40.7	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.166	0.587
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.5	16.8	0.073	15.480	0.435	1.1	17.2	56	21	40.7	57.8	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.166	0.600
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.4	22.2	0.098	11.290	0.442	1.1	22.6	47	21	40.6	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.166	0.625
PC-01	PB-01 & PB-02	Foundation Soils	22.2	22.3	27.2	0.150	12.240	0.552	1.1	27.6	43	21	41.0	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.167	0.650
PC-01	PB-01 & PB-02	Foundation Soils	22.3	22.2	43.7	0.147	11.200	0.336	1.1	44.2	21	21	31.4	75.7	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.167	0.687
PC-01	PB-01 & PB-02	Foundation Soils	22.4	22.1	46.4	0.093	10.960	0.200	1.1	47.0	13	21	17.2	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.167	0.628
PC-01	PB-01 & PB-02	Foundation Soils	22.5	22.0	41.7	0.110	11.150	0.263	1.1	42.2	20	21	29.2	71.4	1.0	-0.4	0.0	0.9	0.108	1.010	0.111	0.167	0.663
PC-01	PB-01 & PB-02	Foundation Soils	22.6	22.0	37.8	0.198	11.290	0.524	1.1	38.0	32	21	39.4	77.4	1.0	-0.4	0.0	0.9	0.114	1.012	0.116	0.167	0.694
PC-01	PB-01 & PB-02	Foundation Soils	22.6	21.9	43.8	0.227	13.340	0.519	1.1	43.9	28	21	37.7	81.6	1.0	-0.4	0.0	0.9	0.117	1.012	0.120	0.167	0.717
PC-01	PB-01 & PB-02	Foundation Soils	22.7	21.8	53.1	0.210	13.240	0.395	1.1	53.2	17	21	26.9	80.2	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.167	0.708
PC-01	PB-01 & PB-02	Foundation Soils	22.8	21.7	55.3	0.240	9.480	0.434	1.1	55.3	18	21	27.6	82.8	1.0	-0.4	0.0	0.9	0.118	1.013	0.121	0.168	0.723
PC-01	PB-01 & PB-02	Foundation Soils	22.9	21.6	51.0	0.232	8.380	0.455	1.1	51.0	21	21	32.1	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.168	0.724
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	49.7	0.126	9.550	0.254	1.1	49.8	14	21	18.8	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.168	0.644
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	59.6	0.052	15.680	0.087	1.1	59.8	0	21	0.0	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.168	0.602
PC-01	PB-01 & PB-02	Foundation Soils	23.1	21.4	72.7	0.084	11.620	0.116	1.1	72.5	0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.111	0.168	0.663
PC-01	PB-01 & PB-02	Foundation Soils	23.2	21.3	80.8	0.100	10.990	0.124	1.1	80.3	0	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.168	0.705
PC-01	PB-01 & PB-02	Foundation Soils	23.3	21.2	80.9	0.168	10.380	0.208	1.1	80.3	0	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.118	0.168	0.704
PC-01	PB-01 & PB-02	Foundation Soils	23.4	21.1	77.5	0.225	9.910	0.290	1.1	76.9	1	21	0.0	76.9	1.0	-0.4	0.0	0.9	0.113	1.011	0.115	0.168	0.684
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.1	71.0	0.192	9.860	0.270	1.1	70.4	3	21	0.0	70.5	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.169	0.650
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.0	65.6	0.116	10.870	0.177	1.1	65.1	1	21	0.0	65.1	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.169	0.623
PC-01	PB-01 & PB-02	Foundation Soils	23.6	20.9	64.3	0.122	10.960	0.190	1.1	63.7	2	21	0.0	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.169	0.616
PC-01	PB-01 & PB-02	Foundation Soils	23.7	20.8	72.2	0.112	12.440	0.155	1.0	71.3	0	21	0.0	71.3	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.169	0.652
PC-01	PB-01 & PB-02	Foundation Soils	23.8	20.7	85.9	0.130	12.980	0.151	1.0	84.5	0	21	0.0	84.5	1.0	-0.4	0.0	0.9	0.120	1.013	0.122	0.169	0.724
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	107.2	0.148	13.050	0.138	1.0	104.9	0	21	0.0	104.9	1.0	-0.4	0.0	0.9	0.144	1.020	0.148	0.169	0.875
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	116.4	0.161	11.720	0.138	1.0	113.6	0	21	0.0	113.6	1.0	-0.4	0.1	0.9	0.158	1.023	0.163	0.169	0.965
PC-01	PB-01 & PB-02	Foundation Soils	24.0	20.5	122.3	0.178	8.770	0.146	1.0	119.1	0	21	0.0	119.1	1.0	-0.4	0.1	0.9	0.169	1.026	0.175	0.169	1.034
PC-01	PB-01 & PB-02	Foundation Soils	24.1	20.4	127.9	0.200	6.230	0.156	1.0	124.4	0	21	0.0	124.4	1.0	-0.4	0.1	0.9	0.182	1.029	0.188	0.170	1.111
PC-01	PB-01 & PB-02	Foundation Soils	24.2	20.3	129.5	0.226	1.760	0.175	1.0	125.7	0	21	0.0	125.7	1.0	-0.5	0.1	0.9	0.185	1.029	0.192	0.170	1.133
PC-01	PB-01 & PB-02	Foundation Soils	24.3	20.2	127.6	0.237	-2.620	0.186	1.0	123.8	0	21	0.0	123.8	1.0	-0.5	0.1	0.9	0.180	1.028	0.187	0.170	1.100
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.2	119.0	0.205	-6.920	0.172	1.0	115.4	0	21	0.0	115.4	1.0	-0.5	0.1	0.9	0.162	1.024	0.167	0.170	0.982
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.1	110.2	0.156	-5.570	0.142	1.0	106.8	0	21	0.0	106.8	1.0	-0.5	0.1	0.9	0.147	1.020	0.151	0.170	0.888
PC-01	PB-01 & PB-02	Foundation Soils	24.5	20.0	102.2	0.109	-2.720	0.107	1.0	99.0	0	21	0.0	99.0	1.0	-0.5	0.1	0.9	0.136	1.017	0.139	0.170	0.818
PC-01	PB-01 & PB-02	Foundation Soils	24.6	19.9	95.4	0.128	-0.330	0.134	1.0	92.5	0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.170	0.769
PC-01	PB-01 & PB-02	Foundation Soils	24.7	19.8	90.9	0.184	2.490	0.202	1.0	88.1	0	21	0.0	88.1	1.0	-0.5	0.1	0.9	0.124	1.014	0.126	0.170	0.739
PC-01	PB-01 & PB-02	Foundation Soils	24.8	19.7	84.1	0.228	5.860	0.271	1.0	81.4	0	21	0.0	81.4	1.0	-0.5	0.1	0.9	0.117	1.012	0.119	0.170	0.698
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.7	81.6	0.233	9.950	0.286	1.0	78.9	0	21	0.0	78.9	1.0	-0.5	0.1	0.9	0.115	1.012	0.117	0.171	0.684
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.6	82.9	0.187	11.860	0.225	1.0	80.1	0	21	0.0	80.1	1.0	-0.5	0.1	0.9	0.116	1.012	0.118	0.171	0.690
PC-01	PB-01 & PB-02	Foundation Soils	25.0	19.5	89.6	0.204	8.860	0.228	1.0	86.3	0	21	0.0	86.3	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.171	0.726
PC-01	PB-01 & PB-02	Foundation Soils	25.1	19.4	93.7	0.177	7.000	0.189	1.0	90.1	0	21	0.0	90.1	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.171	0.749
PC-01	PB-01 & PB-02	Foundation Soils	25.2	19.3	94.5	0.156	8.390	0.165	1.0	90.7	0	21	0.0	90.7	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.171	0.753
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.3	96.6	0.138	6.380	0.143	1.0	92.7	0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.171	0.765
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.2	100.7	0.125	5.000	0.124	1.0	96.4	0	21	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.135	0.171	0.791
PC-01	PB-01 & PB-02	Foundation Soils	25.4	19.1	102.4	0.115	5.150	0.112	1.0	97.9	0	21	0.0	97.9	1.0	-0.5	0.1	0.9	0.135	1.017	0.137	0.171	0.802
PC-01	PB-01 & PB-02	Foundation Soils	25.5	19.0	108.3	0.104	6.190	0.096	1.0	103.4	0	21	0.0	103.4	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.171	0.846
PC-01	PB-01 & PB-02	Foundation Soils	25.6	18.9	114.7	0.119	7.360	0.104	1.0	109.3	0	21	0.0	109.3	1.0	-0.5	0.1	0.9	0.151	1.021	0.155	0.171	0.901
PC-01	PB-01 & PB-02	Foundation Soils	25.7	18.8	113.3	0.155	8.450	0.137	1.0	107.9	0	21	0.0	107.9	1.0	-0.5	0.1	0.9	0.149	1.021	0.152	0.172	0.886
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.8	108.9	0.135	12.200	0.124	1.0	103.6	0	21	0.0	103.6	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.172	0.846
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.7	106.8	0.106	15.430	0.099	1.0	101.5	0	21	0.0	101.5	1.0	-0.5	0.1	0.9	0.139	1.018	0.142	0.172	0.827
PC-01	PB-01 & PB-02	Foundation Soils	25.9	18.6	105.8	0.112	15.910	0.106	1.0	100.5	0	21	0.0	100.5	1.0	-0.5	0.1	0.9	0.138	1.018	0.141	0.172	0.818
PC-01	PB-01 & PB-02	Foundation Soils	26.0	18.5	104.3	0.136	15.720	0.130	1.0	98.9	0	21	0.0	98.9	1.0	-0.5	0.1	0.9	0.136	1.017	0.138	0.172	0.805
PC-01	PB-01 & PB-02	Foundation Soils	26.1	18.4	101.5	0.118	17.100	0.116	1.0	96.1	0	21	0.0	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.172	0.784
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	96.9	0.085	19.150	0.088	1.0	91.7	0	21	0.0	91.7	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.172	0.751
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	92.3	0.172	21.060	0.186	1.0	87.2	0	21	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.124	0.172	0.722
PC-01	PB-01 & PB-02	Foundation Soils	26.3	18.2	83.3	0.164	16.380	0.197	1.0	78.6	0	21	0.0	78.6	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.172	0.673
PC-01	PB-01 & PB-02	Foundation Soils	26.4	18.1	86.0	0.133	21.920	0.155	1.0	81.0	0	21	0.0	81.0	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.172	0.685
PC-01	PB-01 & PB-02	Foundation Soils	26.5	18.0	84.2	0.133	25.010	0.158	1.0	79.2	0	21	0.0	79.2	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.172	0.675
PC-01	PB-01 & PB-02	Foundation Soils	26.6	17.9	83.1	0.155	25.440	0.187	1.0	78.1	0	21	0.0	78.1	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.173	0.668
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.9	81.0	0.150	35.970	0.185	1.0	76.1	0	21	0.0	76.1	1.0	-0.5	0.1	0.9	0.112	1.011	0.114	0.173	0.657
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.8	82.1	0.129	36.020	0.157	1.0	76.9	0	21	0.0	76.9	1.0	-0.5	0.1	0.9	0.113	1.011	0.114	0.173	0.661
PC-01	PB-01 & PB-02	Foundation Soils	26.8	17.7	82.7	0.100	29.830	0.121	1.0	77.5	0	21	0.0	77.5	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.173	0.664
PC-01	PB-01 & PB-02	Foundation Soils	26.9	17.6	83.6	0.098	26.800	0.117	1.0	78.2	0	21	0.0	78.2	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.173	0.667
PC-01	PB-01 & PB-02	Foundation Soils	27.0	17.5	85.9	0.087	29.040	0.101	1.0	80.2	0	21	0.0	80.2	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.173	0.678

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	93.3	0.036	21.110	0.039	1.0	87.0	0	21	0.0	87.0	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.173	0.716
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	97.0	0.025	16.200	0.026	1.0	90.4	0	21	0.0	90.4	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.173	0.737
PC-01	PB-01 & PB-02	Foundation Soils	27.2	17.3	99.3	0.061	17.680	0.061	1.0	92.5	0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.130	0.173	0.750
PC-01	PB-01 & PB-02	Foundation Soils	27.3	17.2	99.7	0.233	21.540	0.234	1.0	92.7	0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.129	1.015	0.130	0.173	0.751
PC-01	PB-01 & PB-02	Foundation Soils	27.4	17.1	95.9	0.263	36.200	0.274	1.0	89.1	0	21	0.0	89.1	1.0	-0.5	0.1	0.9	0.125	1.014	0.126	0.173	0.727
PC-01	PB-01 & PB-02	Foundation Soils	27.5	17.0	87.5	0.370	40.590	0.423	1.0	81.1	5	21	0.4	81.5	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.173	0.682
PC-01	PB-01 & PB-02	Foundation Soils	27.6	17.0	76.0	0.439	42.830	0.577	1.0	70.5	15	21	23.4	93.9	1.0	-0.5	0.1	0.9	0.130	1.016	0.131	0.174	0.757
PC-01	PB-01 & PB-02	Foundation Soils	27.6	16.9	66.1	0.445	39.640	0.673	1.0	61.2	22	21	34.9	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.134	0.174	0.773
PC-01	PB-01 & PB-02	Foundation Soils	27.7	16.8	54.8	0.435	55.420	0.793	1.0	50.7	31	21	40.8	91.5	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.174	0.740
PC-01	PB-01 & PB-02	Foundation Soils	27.8	16.7	50.1	0.448	42.450	0.894	1.0	46.3	35	21	42.3	88.6	1.0	-0.5	0.1	0.9	0.124	1.014	0.125	0.174	0.721
PC-01	PB-01 & PB-02	Foundation Soils	27.9	16.6	47.2	0.398	45.120	0.843	1.0	43.5	36	21	42.1	85.6	1.0	-0.5	0.1	0.9	0.121	1.013	0.122	0.174	0.703
PC-01	PB-01 & PB-02	Foundation Soils	28.0	16.5	41.0	0.400	89.670	0.976	1.0	37.7	43	21	43.0	80.7	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.174	0.675
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.5	32.6	0.404	119.270	1.238	1.0	30.0	55	21	43.3	73.2	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.174	0.636
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.4	26.7	0.420	150.320	1.574	1.0	24.5	65	21	43.0	67.5	1.0	-0.6	0.1	0.9	0.105	1.010	0.106	0.174	0.608
PC-01	PB-01 & PB-02	Foundation Soils	28.2	16.3	22.6	0.430	244.700	1.906	1.0	20.6	77	21	42.9	63.5	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.174	0.589
PC-01	PB-01 & PB-02	Foundation Soils	28.3	16.2	26.3	0.388	223.410	1.474	1.0	24.1	65	21	42.9	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.174	0.605
PC-01	PB-01 & PB-02	Foundation Soils	28.4	16.1	29.9	0.342	149.050	1.146	1.0	27.3	56	21	42.8	70.1	1.0	-0.6	0.1	0.9	0.107	1.010	0.108	0.174	0.619
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.1	28.8	0.299	110.970	1.038	1.0	26.3	55	21	42.5	68.8	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.174	0.613
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.0	23.6	0.333	146.170	1.411	1.0	21.5	67	21	42.5	64.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.103	0.174	0.590
PC-01	PB-01 & PB-02	Foundation Soils	28.6	15.9	21.5	0.406	204.300	1.884	1.0	19.6	79	21	42.7	62.3	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.175	0.582
PC-01	PB-01 & PB-02	Foundation Soils	28.7	15.8	26.3	0.414	291.590	1.572	1.0	23.9	66	21	43.0	66.9	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.175	0.603
PC-01	PB-01 & PB-02	Foundation Soils	28.8	15.7	39.6	0.384	198.630	0.969	1.0	36.1	44	21	42.9	79.0	1.0	-0.6	0.1	0.9	0.115	1.012	0.116	0.175	0.661
PC-01	PB-01 & PB-02	Foundation Soils	28.9	15.6	64.0	0.358	49.030	0.559	1.0	58.3	20	21	31.9	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.127	0.175	0.725
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.6	81.4	0.299	-17.440	0.367	1.0	73.9	6	21	0.8	74.7	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.175	0.639
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.5	88.9	0.258	-15.530	0.290	1.0	80.6	0	21	0.0	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.175	0.669
PC-01	PB-01 & PB-02	Foundation Soils	29.1	15.4	95.9	0.245	-16.820	0.256	1.0	87.0	0	21	0.0	87.0	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.175	0.704
PC-01	PB-01 & PB-02	Foundation Soils	29.2	15.3	98.6	0.271	-17.050	0.275	1.0	89.4	0	21	0.0	89.4	1.0	-0.6	0.1	0.9	0.125	1.014	0.126	0.175	0.719
PC-01	PB-01 & PB-02	Foundation Soils	29.3	15.2	101.8	0.254	-14.820	0.250	1.0	92.2	0	21	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.129	0.175	0.736
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.2	103.9	0.283	-10.360	0.272	1.0	94.0	0	21	0.0	94.0	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.175	0.748
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.1	103.9	0.439	-11.960	0.423	1.0	93.9	1	21	0.0	93.9	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.175	0.747
PC-01	PB-01 & PB-02	Foundation Soils	29.5	15.0	101.5	0.482	-15.170	0.475	1.0	91.6	3	21	0.0	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.175	0.731
PC-01	PB-01 & PB-02	Foundation Soils	29.6	14.9	92.4	0.560	-4.210	0.606	1.0	83.4	11	21	12.8	96.2	1.0	-0.6	0.1	0.9	0.133	1.016	0.134	0.175	0.762
PC-01	PB-01 & PB-02	Foundation Soils	29.7	14.8	89.4	0.672	-16.150	0.751	1.0	80.8	16	21	27.0	107.8	1.0	-0.6	0.1	0.9	0.149	1.021	0.150	0.175	0.856
PC-01	PB-01 & PB-02	Foundation Soils	29.8	14.7	84.1	0.700	-19.150	0.833	1.0	75.9	20	21	34.0	110.0	1.0	-0.6	0.1	0.9	0.152	1.022	0.154	0.175	0.875
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.7	82.3	0.681	-20.110	0.828	1.0	74.2	20	21	34.6	108.9	1.0	-0.6	0.1	0.9	0.150	1.021	0.152	0.175	0.864
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.6	79.5	0.581	-20.960	0.730	1.0	71.6	19	21	31.9	103.5	1.0	-0.6	0.1	0.9	0.142	1.019	0.143	0.176	0.816
PC-01	PB-01 & PB-02	Foundation Soils	30.0	14.5	73.0	0.556	-21.060	0.762	1.0	65.6	22	21	36.0	101.6	1.0	-0.6	0.1	0.9	0.139	1.018	0.140	0.176	0.800
PC-01	PB-01 & PB-02	Foundation Soils	30.1	14.4	68.1	0.516	-21.440	0.757	1.0	61.1	24	21	37.5	98.7	1.0	-0.6	0.1	0.9	0.136	1.017	0.136	0.176	0.777
PC-01	PB-01 & PB-02	Foundation Soils	30.2	14.3	64.9	0.542	-21.110	0.835	0.9	58.1	28	21	40.1	98.2	1.0	-0.6	0.1	0.9	0.135	1.017	0.136	0.176	0.773
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	60.4	0.800	-20.750	1.326	0.9	54.0	39	21	45.1	99.2	1.0	-0.6	0.1	0.9	0.136	1.017	0.137	0.176	0.780
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	54.7	0.873	-13.820	1.597	0.9	48.8	46	21	45.8	94.7	1.0	-0.6	0.1	0.9	0.131	1.016	0.131	0.176	0.747
PC-01	PB-01 & PB-02	Foundation Soils	30.4	14.1	48.4	0.864	-14.390	1.785	0.9	43.1	52	21	45.7	88.8	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.176	0.709
PC-01	PB-01 & PB-02	Foundation Soils	30.5	14.0	41.6	0.921	-8.960	2.216	0.9	36.9	61	21	45.4	82.3	1.0	-0.6	0.1	0.9	0.118	1.013	0.118	0.176	0.672
PC-01	PB-01 & PB-02	Foundation Soils	30.6	13.9	35.8	0.809	-3.060	2.258	0.9	31.7	65	21	44.6	76.4	1.0	-0.6	0.1	0.9	0.113	1.011	0.113	0.176	0.641
PC-01	PB-01 & PB-02	Foundation Soils	30.7	13.8	39.1	0.790	-0.240	2.022	0.9	34.6	61	21	44.9	79.5	1.0	-0.6	0.1	0.9	0.115	1.012	0.115	0.176	0.656
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.8	43.0	0.682	8.850	1.586	0.9	38.1	53	21	44.7	82.8	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.176	0.674
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.7	50.2	0.578	-8.200	1.151	0.9	44.5	42	21	44.0	88.5	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.176	0.706
PC-01	PB-01 & PB-02	Foundation Soils	30.9	13.6	53.8	0.502	-4.380	0.934	0.9	47.6	35	21	42.6	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.126	0.176	0.716
PC-01	PB-01 & PB-02	Foundation Soils	31.0	13.5	51.9	0.517	-4.910	0.996	0.9	45.9	38	21	43.1	89.1	1.0	-0.6	0.1	0.9	0.125	1.014	0.125	0.176	0.708
PC-01	PB-01 & PB-02	Foundation Soils	31.1	13.4	54.5	0.394	-5.240	0.723	0.9	48.2	30	21	40.2	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.176	0.704
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	54.8	0.411	0.480	0.751	0.9	48.3	31	21	40.5	88.9	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.176	0.707
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	50.8	0.538	11.070	1.059	0.9	44.8	40	21	43.5	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.176	0.703
PC-01	PB-01 & PB-02	Foundation Soils	31.3	13.2	56.9	0.476	-4.290	0.837	0.9	50.2	32	21	41.4	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.176	0.723
PC-01	PB-01 & PB-02	Foundation Soils	31.4	13.1	62.4	0.472	-2.460	0.757	0.9	55.0	27	21	39.3	94.3	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.176	0.740
PC-01	PB-01 & PB-02	Foundation Soils	31.5	13.0	76.3	0.472	1.760	0.619	0.9	67.2	17	21	28.9	96.1	1.0	-0.6	0.1	0.9	0.132	1.016	0.133	0.177	0.752
PC-01	PB-01 & PB-02	Foundation Soils	31.6	12.9	84.7	0.470	2.520	0.555	0.9	74.5	12	21	17.3	91.8	1.0	-0.6	0.1	0.9	0.128	1.015	0.128	0.177	0.723
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.9	77.0	0.500	6.100	0.649	0.9	67.8	18	21	30.2	98.0	1.0	-0.6	0.1	0.9	0.135	1.017	0.135	0.177	0.765
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.8	74.8	0.446	6.080	0.596	0.9	65.7	18	21	28.8	94.4	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.177	0.740
PC-01	PB-01 & PB-02	Foundation Soils	31.8	12.7	71.5	0.383	13.870	0.536	0.9	62.6	17	21	27.4	90.0	1.0	-0.7	0.1	0.9	0.126	1.015	0.126	0.177	0.711
PC-01	PB-01 & PB-02	Foundation Soils	31.9	12.6	66.9	0.323	19.150	0.483	0.9	58.5	17	21	27.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.177	0.687
PC-01	PB-01 & PB-02	Foundation Soils	32.0	12.5	56.7	0.388	19.190	0.685	0.9	49.5	28	21	39.3	88.8	1.0	-0.7	0.1	0.9	0.124	1.014	0.124	0.177	0.703
PC-01	PB-01 & PB-02	Foundation Soils	32.1	12.4	48.9	0.450	22.250	0.921	0.9	42.6	38	21	42.7	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.177	0.682

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.4	39.1	0.470	27.920	1.203	0.9	33.9	50	21	43.5	77.4	1.0	-0.7	0.1	0.9	0.113	1.012	0.113	0.177	0.640
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.3	33.6	0.524	72.900	1.560	0.9	29.1	60	21	43.6	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.177	0.617
PC-01	PB-01 & PB-02	Foundation Soils	32.3	12.2	28.3	0.556	104.150	1.965	0.9	24.4	74	21	43.5	68.0	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.177	0.595
PC-01	PB-01 & PB-02	Foundation Soils	32.4	12.1	28.3	0.472	130.310	1.670	0.9	24.4	67	21	43.1	67.5	1.0	-0.7	0.1	0.9	0.105	1.010	0.105	0.177	0.593
PC-01	PB-01 & PB-02	Foundation Soils	32.5	12.0	31.2	0.321	124.400	1.030	0.9	26.9	54	21	42.6	69.4	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.177	0.601
PC-01	PB-01 & PB-02	Foundation Soils	32.6	12.0	34.0	0.227	113.000	0.669	0.9	29.2	44	21	41.5	70.7	1.0	-0.7	0.1	0.9	0.108	1.010	0.107	0.177	0.607
PC-01	PB-01 & PB-02	Foundation Soils	32.6	11.9	45.5	0.126	37.390	0.277	0.9	39.1	22	21	32.0	71.1	1.0	-0.7	0.1	0.9	0.108	1.010	0.108	0.177	0.609
PC-01	PB-01 & PB-02	Foundation Soils	32.7	11.8	52.6	0.160	26.590	0.304	0.9	45.2	19	21	28.1	73.3	1.0	-0.7	0.1	0.9	0.110	1.011	0.110	0.177	0.619
PC-01	PB-01 & PB-02	Foundation Soils	32.8	11.7	56.4	0.230	35.450	0.408	0.9	48.6	20	21	31.2	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.177	0.651
PC-01	PB-01 & PB-02	Foundation Soils	32.9	11.6	53.7	0.229	25.850	0.426	0.9	46.2	23	21	33.6	79.9	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.177	0.651
PC-01	PB-01 & PB-02	Foundation Soils	33.0	11.5	48.5	0.243	62.400	0.501	0.9	41.7	28	21	37.9	79.5	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.177	0.649
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.5	48.7	0.239	56.130	0.490	0.9	41.8	28	21	37.6	79.4	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.177	0.648
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.4	53.2	0.268	49.790	0.504	0.9	45.6	26	21	36.5	82.1	1.0	-0.7	0.1	0.9	0.118	1.013	0.117	0.177	0.662
PC-01	PB-01 & PB-02	Foundation Soils	33.2	11.3	54.6	0.300	56.690	0.550	0.9	46.9	26	21	37.2	84.1	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.177	0.672
PC-01	PB-01 & PB-02	Foundation Soils	33.3	11.2	59.6	0.347	26.540	0.582	0.9	51.2	25	21	36.4	87.6	1.0	-0.7	0.1	0.9	0.123	1.014	0.123	0.177	0.692
PC-01	PB-01 & PB-02	Foundation Soils	33.4	11.1	60.5	0.328	35.590	0.543	0.9	51.9	23	21	34.9	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.122	0.177	0.686
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	58.3	0.317	50.220	0.544	0.9	49.9	24	21	35.8	85.7	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.177	0.680
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	57.8	0.297	45.710	0.514	0.9	49.4	24	21	35.1	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.177	0.673
PC-01	PB-01 & PB-02	Foundation Soils	33.6	10.9	60.3	0.307	39.400	0.509	0.9	51.6	22	21	33.8	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.120	0.177	0.678
PC-01	PB-01 & PB-02	Foundation Soils	33.7	10.8	64.0	0.301	24.870	0.470	0.9	54.6	19	21	29.9	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.177	0.673
PC-01	PB-01 & PB-02	Foundation Soils	33.8	10.7	62.7	0.317	11.110	0.506	0.9	53.5	21	21	32.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.177	0.681
PC-01	PB-01 & PB-02	Foundation Soils	33.9	10.6	54.9	0.298	26.370	0.542	0.9	46.8	26	21	37.0	83.8	1.0	-0.7	0.1	0.9	0.119	1.013	0.119	0.178	0.669
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.6	48.1	0.398	25.350	0.827	0.9	40.9	38	21	42.1	83.0	1.0	-0.7	0.1	0.9	0.119	1.013	0.118	0.178	0.664
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.5	43.0	0.469	22.870	1.090	0.9	36.5	46	21	43.4	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.178	0.648
PC-01	PB-01 & PB-02	Foundation Soils	34.1	10.4	32.1	0.349	46.910	1.088	0.9	27.0	55	21	42.7	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.178	0.599
PC-01	PB-01 & PB-02	Foundation Soils	34.2	10.3	27.7	0.336	55.600	1.214	0.9	23.2	62	21	42.5	65.7	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.178	0.581
PC-01	PB-01 & PB-02	Foundation Soils	34.3	10.2	35.6	0.345	43.070	0.968	0.9	30.0	50	21	42.6	72.6	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.178	0.612
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	52.0	0.227	22.620	0.437	0.9	43.9	25	21	35.3	79.1	1.0	-0.7	0.1	0.9	0.115	1.012	0.114	0.178	0.643
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	66.6	0.126	4.240	0.189	0.9	55.4	6	21	1.1	56.5	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.178	0.542
PC-01	PB-01 & PB-02	Foundation Soils	34.5	10.0	71.8	0.047	11.340	0.065	0.9	59.8	0	21	0.0	59.8	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.178	0.555
PC-01	PB-01 & PB-02	Foundation Soils	34.6	9.9	76.0	0.079	15.660	0.104	0.9	63.3	0	21	0.0	63.3	1.0	-0.7	0.1	0.9	0.102	1.009	0.101	0.178	0.570
PC-01	PB-01 & PB-02	Foundation Soils	34.7	9.8	77.0	0.153	16.100	0.199	0.9	64.2	2	21	0.0	64.2	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.178	0.573
PC-01	PB-01 & PB-02	Foundation Soils	34.8	9.7	77.6	0.164	18.080	0.211	0.9	64.6	2	21	0.0	64.6	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.178	0.575
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.7	80.6	0.130	17.390	0.161	0.9	67.1	0	21	0.0	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.104	0.178	0.586
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.6	87.1	0.106	17.220	0.122	0.9	72.7	0	21	0.0	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.178	0.611
PC-01	PB-01 & PB-02	Foundation Soils	35.0	9.5	83.7	0.148	17.340	0.177	0.9	69.6	0	21	0.0	69.6	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.178	0.597
PC-01	PB-01 & PB-02	Foundation Soils	35.1	9.4	86.1	0.197	18.530	0.229	0.9	71.7	0	21	0.0	71.7	1.0	-0.7	0.1	0.9	0.109	1.010	0.108	0.178	0.606
PC-01	PB-01 & PB-02	Foundation Soils	35.2	9.3	81.8	0.245	18.200	0.300	0.9	67.8	5	21	0.4	68.2	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.178	0.590
PC-01	PB-01 & PB-02	Foundation Soils	35.3	9.2	76.2	0.183	19.830	0.240	0.9	62.9	4	21	0.1	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.178	0.567
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.2	73.6	0.210	23.350	0.285	0.9	60.8	8	21	4.2	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.178	0.575
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.1	67.1	0.120	23.390	0.179	0.9	55.0	6	21	0.7	55.7	1.0	-0.8	0.1	0.9	0.096	1.008	0.096	0.178	0.537
PC-01	PB-01 & PB-02	Foundation Soils	35.5	9.0	60.7	0.054	24.350	0.089	0.9	49.4	4	21	0.1	49.6	1.0	-0.8	0.1	0.9	0.092	1.008	0.091	0.178	0.513
PC-01	PB-01 & PB-02	Foundation Soils	35.6	8.9	56.3	0.052	24.860	0.092	0.9	45.7	7	21	2.8	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.178	0.509
PC-01	PB-01 & PB-02	Foundation Soils	35.7	8.8	59.4	0.050	22.770	0.084	0.9	48.2	5	21	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.178	0.508
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.8	70.0	0.045	20.300	0.064	0.9	57.1	0	21	0.0	57.1	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.178	0.542
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.7	78.1	0.030	18.910	0.038	0.9	64.1	0	21	0.0	64.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.178	0.571
PC-01	PB-01 & PB-02	Foundation Soils	35.9	8.6	84.6	0.034	22.370	0.040	0.9	69.6	0	21	0.0	69.6	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.178	0.595
PC-01	PB-01 & PB-02	Foundation Soils	36.0	8.5	87.3	0.063	25.730	0.072	0.9	71.8	0	21	0.0	71.8	1.0	-0.8	0.1	0.9	0.109	1.010	0.108	0.178	0.605
PC-01	PB-01 & PB-02	Foundation Soils	36.1	8.4	86.3	0.079	24.030	0.092	0.9	70.9	0	21	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.178	0.600
PC-01	PB-01 & PB-02	Foundation Soils	36.2	8.3	85.1	0.114	24.900	0.134	0.9	69.7	0	21	0.0	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.178	0.595
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.3	79.1	0.136	24.390	0.172	0.9	64.5	0	21	0.0	64.5	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.178	0.572
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.2	77.5	0.175	24.300	0.226	0.9	63.1	4	21	0.0	63.1	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.178	0.566
PC-01	PB-01 & PB-02	Foundation Soils	36.4	8.1	77.4	0.243	21.410	0.314	0.9	63.2	8	21	4.3	67.4	1.0	-0.8	0.1	0.9	0.105	1.010	0.104	0.178	0.585
PC-01	PB-01 & PB-02	Foundation Soils	36.5	8.0	78.3	0.134	21.060	0.171	0.9	63.7	0	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.178	0.568
PC-01	PB-01 & PB-02	Foundation Soils	36.6	7.9	78.2	0.080	26.060	0.102	0.9	63.5	0	21	0.0	63.5	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.178	0.567
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.9	78.6	0.076	17.220	0.097	0.9	63.7	0	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.178	0.568
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.8	79.9	0.056	18.460	0.070	0.9	64.8	0	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.178	0.573
PC-01	PB-01 & PB-02	Foundation Soils	36.8	7.7	80.4	0.063	16.250	0.078	0.9	65.1	0	21	0.0	65.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.178	0.574
PC-01	PB-01 & PB-02	Foundation Soils	36.9	7.6	76.6	0.081	19.770	0.106	0.9	61.8	0	21	0.0	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.178	0.560
PC-01	PB-01 & PB-02	Foundation Soils	37.0	7.5	73.9	0.054	24.010	0.073	0.9	59.5	0	21	0.0	59.5	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.178	0.550
PC-01	PB-01 & PB-02	Foundation Soils	37.1	7.4	78.0	0.061	23.440	0.078	0.9	62.9	0	21	0.0	62.9	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.178	0.564
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.4	89.4	0.159	23.200	0.178	0.9	72.6	0	21	0.0	72.6	1.0	-0.8	0.1	0.9	0.109	1.011	0.108	0.178	0.606

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.3	91.1	0.150	20.440	0.165	0.9	73.9	0	21	0.0	73.9	1.0	-0.8	0.1	0.9	0.110	1.011	0.109	0.178	0.612
PC-01	PB-01 & PB-02	Foundation Soils	37.3	7.2	94.8	0.176	23.850	0.186	0.9	77.0	0	21	0.0	77.0	1.0	-0.8	0.1	0.9	0.113	1.011	0.112	0.178	0.627
PC-01	PB-01 & PB-02	Foundation Soils	37.4	7.1	106.5	0.131	22.680	0.123	0.9	87.0	0	21	0.0	87.0	1.0	-0.8	0.1	0.9	0.123	1.014	0.121	0.178	0.679
PC-01	PB-01 & PB-02	Foundation Soils	37.5	7.0	113.8	0.184	23.060	0.162	0.9	93.3	0	21	0.0	93.3	1.0	-0.8	0.1	0.9	0.129	1.016	0.128	0.178	0.716
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	114.8	0.228	20.490	0.199	0.9	94.0	0	21	0.0	94.0	1.0	-0.8	0.1	0.9	0.130	1.016	0.128	0.178	0.721
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	109.5	0.201	17.480	0.184	0.9	89.4	0	21	0.0	89.4	1.0	-0.8	0.1	0.9	0.125	1.014	0.123	0.178	0.692
PC-01	PB-01 & PB-02	Foundation Soils	37.7	6.8	95.0	0.168	22.580	0.177	0.9	76.7	0	21	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.111	0.178	0.625
PC-01	PB-01 & PB-02	Foundation Soils	37.8	6.7	81.0	0.051	25.200	0.063	0.8	64.8	0	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.178	0.571
PC-01	PB-01 & PB-02	Foundation Soils	37.9	6.6	80.5	0.060	23.820	0.075	0.8	64.3	0	21	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.178	0.569
PC-01	PB-01 & PB-02	Foundation Soils	38.0	6.5	78.5	0.074	25.770	0.094	0.8	62.5	0	21	0.0	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.178	0.562
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.5	72.3	0.078	22.250	0.108	0.8	57.3	0	21	0.0	57.3	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.178	0.540
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.4	68.7	0.085	22.740	0.124	0.8	54.1	3	21	0.0	54.1	1.0	-0.8	0.1	0.9	0.095	1.008	0.094	0.178	0.528
PC-01	PB-01 & PB-02	Foundation Soils	38.2	6.3	67.3	0.059	20.450	0.088	0.8	52.9	2	21	0.0	52.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.093	0.178	0.523
PC-01	PB-01 & PB-02	Foundation Soils	38.3	6.2	66.1	0.046	22.280	0.070	0.8	51.9	2	21	0.0	51.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.178	0.519
PC-01	PB-01 & PB-02	Foundation Soils	38.4	6.1	62.3	0.047	28.210	0.075	0.8	48.6	4	21	0.1	48.7	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.178	0.506
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	58.5	0.031	22.290	0.053	0.8	45.6	6	21	1.2	46.8	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.178	0.499
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	54.9	0.010	24.060	0.018	0.8	43.4	14	21	18.5	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.178	0.558
PC-01	PB-01 & PB-02	Foundation Soils	38.6	5.9	55.4	0.010	23.440	0.018	0.8	43.7	14	21	18.1	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.178	0.558
PC-01	PB-01 & PB-02	Foundation Soils	38.7	5.8	56.3	0.038	27.780	0.068	0.8	43.7	8	21	3.5	47.2	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.178	0.500
PC-01	PB-01 & PB-02	Foundation Soils	38.8	5.7	59.2	0.063	22.760	0.107	0.8	46.0	7	21	3.1	49.1	1.0	-0.9	0.1	0.9	0.092	1.007	0.090	0.178	0.507
PC-01	PB-01 & PB-02	Foundation Soils	38.9	5.6	60.1	0.035	23.060	0.058	0.8	46.5	5	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.178	0.500
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.6	60.1	0.037	24.540	0.062	0.8	46.5	5	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.178	0.500
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.5	64.7	0.027	23.160	0.042	0.8	50.2	3	21	0.0	50.2	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.178	0.512
PC-01	PB-01 & PB-02	Foundation Soils	39.1	5.4	62.5	0.015	24.390	0.024	0.8	48.5	7	21	3.0	51.5	1.0	-0.9	0.1	0.9	0.093	1.008	0.092	0.178	0.517
PC-01	PB-01 & PB-02	Foundation Soils	39.2	5.3	64.8	0.015	25.350	0.023	0.8	50.2	6	21	1.6	51.8	1.0	-0.9	0.1	0.9	0.094	1.008	0.092	0.178	0.518
PC-01	PB-01 & PB-02	Foundation Soils	39.3	5.2	64.5	0.043	25.490	0.067	0.8	49.9	3	21	0.0	49.9	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.178	0.510
PC-01	PB-01 & PB-02	Foundation Soils	39.4	5.1	65.2	0.062	26.010	0.095	0.8	50.3	4	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.178	0.512
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.1	65.3	0.055	27.690	0.084	0.8	50.4	3	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.178	0.512
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.0	67.4	0.064	25.380	0.095	0.8	52.0	3	21	0.0	52.0	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.178	0.518
PC-01	PB-01 & PB-02	Foundation Soils	39.6	4.9	73.9	0.118	29.680	0.160	0.8	57.3	3	21	0.0	57.3	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.178	0.539
PC-01	PB-01 & PB-02	Foundation Soils	39.7	4.8	78.1	0.131	28.680	0.168	0.8	60.8	1	21	0.0	60.8	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.178	0.553
PC-01	PB-01 & PB-02	Foundation Soils	39.8	4.7	77.8	0.068	25.680	0.087	0.8	60.4	0	21	0.0	60.4	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.178	0.552
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.7	76.5	0.050	27.300	0.065	0.8	59.3	0	21	0.0	59.3	1.0	-0.9	0.1	0.8	0.099	1.009	0.097	0.178	0.547
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.6	78.8	0.077	27.400	0.098	0.8	61.1	0	21	0.0	61.1	1.0	-0.9	0.1	0.8	0.100	1.009	0.099	0.178	0.554
PC-01	PB-01 & PB-02	Foundation Soils	40.0	4.5	87.0	0.098	30.350	0.113	0.8	67.9	0	21	0.0	67.9	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.178	0.583
PC-01	PB-01 & PB-02	Foundation Soils	40.1	4.4	85.5	0.131	20.670	0.153	0.8	66.5	0	21	0.0	66.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.178	0.577
PC-01	PB-01 & PB-02	Foundation Soils	40.2	4.3	83.7	0.236	20.110	0.282	0.8	65.0	5	21	0.5	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.178	0.572
PC-01	PB-01 & PB-02	Foundation Soils	40.3	4.2	80.3	0.170	33.460	0.212	0.8	62.0	3	21	0.0	62.1	1.0	-0.9	0.1	0.8	0.101	1.009	0.099	0.178	0.558
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.2	81.1	0.152	27.820	0.187	0.8	62.7	1	21	0.0	62.7	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.178	0.561
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.1	88.4	0.131	28.780	0.148	0.8	68.6	0	21	0.0	68.6	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.178	0.586
PC-01	PB-01 & PB-02	Foundation Soils	40.5	4.0	89.7	0.134	18.820	0.149	0.8	69.6	0	21	0.0	69.6	1.0	-0.9	0.1	0.8	0.107	1.010	0.105	0.178	0.590
PC-01	PB-01 & PB-02	Foundation Soils	40.6	3.9	87.9	0.164	24.530	0.187	0.8	68.1	0	21	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.178	0.584
PC-01	PB-01 & PB-02	Foundation Soils	40.7	3.8	94.2	0.263	27.680	0.279	0.8	73.3	1	21	0.0	73.3	1.0	-0.9	0.1	0.8	0.110	1.011	0.108	0.178	0.606
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	84.9	0.211	21.760	0.248	0.8	65.5	3	21	0.0	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.178	0.572
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	83.5	0.245	23.300	0.294	0.8	64.3	6	21	1.2	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.178	0.572
PC-01	PB-01 & PB-02	Foundation Soils	40.9	3.6	81.9	0.243	26.230	0.297	0.8	63.1	7	21	2.3	65.3	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.178	0.571
PC-01	PB-01 & PB-02	Foundation Soils	41.0	3.5	81.2	0.233	24.010	0.287	0.8	62.4	7	21	2.1	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.178	0.568
PC-01	PB-01 & PB-02	Foundation Soils	41.1	3.4	83.8	0.156	25.150	0.186	0.8	64.3	1	21	0.0	64.3	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.178	0.567
PC-01	PB-01 & PB-02	Foundation Soils	41.2	3.3	95.6	0.124	24.540	0.130	0.8	74.0	0	21	0.0	74.0	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.178	0.609
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.3	106.6	0.146	20.320	0.137	0.8	83.1	0	21	0.0	83.1	1.0	-0.9	0.1	0.8	0.119	1.013	0.116	0.178	0.654
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.2	118.9	0.082	16.390	0.069	0.8	93.5	0	21	0.0	93.5	1.0	-0.9	0.1	0.8	0.129	1.016	0.127	0.178	0.713
PC-01	PB-01 & PB-02	Foundation Soils	41.4	3.1	111.7	0.071	20.770	0.064	0.8	87.3	0	21	0.0	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.120	0.178	0.676
PC-01	PB-01 & PB-02	Foundation Soils	41.5	3.0	96.1	0.086	31.400	0.090	0.8	74.1	0	21	0.0	74.1	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.178	0.610
PC-01	PB-01 & PB-02	Foundation Soils	41.6	2.9	87.2	0.094	30.460	0.108	0.8	66.7	0	21	0.0	66.7	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.178	0.577
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	84.5	0.129	30.250	0.153	0.8	64.4	0	21	0.0	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.178	0.567
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	83.5	0.203	29.160	0.243	0.8	63.5	4	21	0.0	63.5	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.178	0.564
PC-01	PB-01 & PB-02	Foundation Soils	41.8	2.7	76.1	0.158	34.160	0.208	0.8	57.4	5	21	0.5	57.9	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.178	0.541
PC-01	PB-01 & PB-02	Foundation Soils	41.9	2.6	73.6	0.101	33.670	0.137	0.8	55.3	3	21	0.0	55.3	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.178	0.530
PC-01	PB-01 & PB-02	Foundation Soils	42.0	2.5	73.3	0.118	25.490	0.161	0.8	55.0	4	21	0.1	55.1	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.178	0.530
PC-01	PB-01 & PB-02	Foundation Soils	42.1	2.4	72.1	0.121	18.070	0.168	0.8	54.0	5	21	0.3	54.4	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.178	0.527
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.4	69.5	0.105	24.970	0.151	0.8	51.9	5	21	0.6	52.4	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.178	0.519
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.3	67.3	0.113	23.350	0.168	0.8	50.2	7	21	3.2	53.4	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.178	0.523

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	42.3	2.2	65.4	0.087	15.060	0.133	0.8	48.6	7	21	1.7	50.3	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.178	0.511
PC-01	PB-01 & PB-02	Foundation Soils	42.4	2.1	63.4	0.119	17.770	0.188	0.8	47.5	10	21	10.4	58.0	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.178	0.541
PC-01	PB-01 & PB-02	Foundation Soils	42.5	2.0	61.7	0.115	21.200	0.186	0.8	46.3	11	21	12.7	59.0	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.178	0.545
PC-01	PB-01 & PB-02	Foundation Soils	42.6	1.9	63.2	0.085	20.250	0.135	0.8	46.8	8	21	4.1	50.9	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.177	0.513
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.9	69.4	0.069	28.870	0.099	0.8	51.4	3	21	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.177	0.515
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.8	82.5	0.059	-3.630	0.072	0.8	61.9	0	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.177	0.556
PC-01	PB-01 & PB-02	Foundation Soils	42.8	1.7	88.9	0.067	-12.150	0.075	0.8	67.0	0	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.177	0.578
PC-01	PB-01 & PB-02	Foundation Soils	42.9	1.6	88.9	0.071	12.670	0.080	0.8	67.0	0	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.177	0.578
PC-01	PB-01 & PB-02	Foundation Soils	43.0	1.5	82.7	0.054	24.110	0.065	0.8	61.9	0	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.177	0.556
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.5	81.0	0.071	26.040	0.088	0.8	60.4	0	21	0.0	60.4	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.177	0.551
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.4	80.2	0.080	26.350	0.100	0.8	59.7	0	21	0.0	59.7	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.177	0.548
PC-01	PB-01 & PB-02	Foundation Soils	43.2	1.3	84.2	0.083	22.110	0.099	0.8	62.9	0	21	0.0	62.9	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.177	0.561
PC-01	PB-01 & PB-02	Foundation Soils	43.3	1.2	94.9	0.159	22.540	0.168	0.8	71.5	0	21	0.0	71.5	1.0	-1.0	0.1	0.8	0.109	1.010	0.106	0.177	0.598
PC-01	PB-01 & PB-02	Foundation Soils	43.4	1.1	99.7	0.203	20.730	0.204	0.8	75.4	0	21	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.177	0.615
PC-01	PB-01 & PB-02	Foundation Soils	43.5	1.0	101.6	0.278	26.820	0.274	0.8	76.9	0	21	0.0	76.9	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.177	0.622
PC-01	PB-01 & PB-02	Foundation Soils	43.6	1.0	101.0	0.456	31.490	0.452	0.8	76.6	8	21	3.8	80.4	1.0	-1.0	0.1	0.8	0.116	1.012	0.113	0.177	0.639
PC-01	PB-01 & PB-02	Foundation Soils	43.6	0.9	98.3	0.358	25.660	0.364	0.8	74.0	5	21	0.3	74.3	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.177	0.610
PC-01	PB-01 & PB-02	Foundation Soils	43.7	0.8	96.5	0.378	29.880	0.392	0.8	72.6	7	21	2.1	74.7	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.177	0.612
PC-01	PB-01 & PB-02	Foundation Soils	43.8	0.7	87.7	0.456	25.630	0.520	0.8	67.0	14	21	21.9	88.9	1.0	-1.0	0.1	0.8	0.124	1.014	0.121	0.177	0.684
PC-01	PB-01 & PB-02	Foundation Soils	43.9	0.6	82.8	0.362	25.870	0.437	0.8	62.7	13	21	18.8	81.5	1.0	-1.0	0.1	0.8	0.117	1.012	0.114	0.177	0.645
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.6	84.2	0.267	24.500	0.317	0.8	62.6	8	21	4.3	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.102	0.177	0.578
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.5	101.8	0.295	23.200	0.290	0.8	76.5	1	21	0.0	76.5	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.177	0.620
PC-01	PB-01 & PB-02	Foundation Soils	44.1	0.4	114.7	0.382	21.390	0.333	0.8	87.1	0	21	0.0	87.1	1.0	-1.0	0.1	0.8	0.123	1.014	0.119	0.177	0.674
PC-01	PB-01 & PB-02	Foundation Soils	44.2	0.3	127.1	0.226	17.870	0.178	0.8	97.4	0	21	0.0	97.4	1.0	-1.0	0.1	0.8	0.134	1.017	0.130	0.177	0.737
PC-01	PB-01 & PB-02	Foundation Soils	44.3	0.2	143.1	0.109	14.800	0.076	0.8	110.9	0	21	0.0	110.9	1.0	-1.0	0.1	0.8	0.154	1.022	0.149	0.177	0.844
PC-01	PB-01 & PB-02	Foundation Soils	44.4	0.1	163.0	0.128	18.580	0.079	0.8	128.0	0	21	0.0	128.0	0.9	-1.0	0.1	0.8	0.192	1.031	0.187	0.177	1.054
PC-01	PB-01 & PB-02	Foundation Soils	44.5	0.1	181.4	0.133	1.410	0.073	0.8	144.1	0	21	0.0	144.1	0.9	-1.0	0.1	0.8	0.254	1.041	0.247	0.177	1.399
PC-01	PB-01 & PB-02	Foundation Soils	44.5	-0.0	166.9	0.088	17.580	0.053	0.8	131.2	0	21	0.0	131.2	0.9	-1.0	0.1	0.8	0.201	1.032	0.196	0.177	1.107
PC-01	PB-01 & PB-02	Foundation Soils	44.6	-0.1	120.8	0.130	26.960	0.108	0.8	91.7	0	21	0.0	91.7	1.0	-1.0	0.1	0.8	0.127	1.015	0.124	0.177	0.700
PC-01	PB-01 & PB-02	Foundation Soils	44.7	-0.2	105.8	0.152	23.390	0.144	0.8	79.2	0	21	0.0	79.2	1.0	-1.0	0.1	0.8	0.115	1.012	0.112	0.177	0.633
PC-01	PB-01 & PB-02	Foundation Soils	44.8	-0.3	93.1	0.114	16.600	0.122	0.8	68.8	0	21	0.0	68.8	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.177	0.586
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	88.5	0.092	-1.360	0.104	0.8	65.0	0	21	0.0	65.0	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.177	0.570
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	89.1	0.122	-6.630	0.137	0.8	65.4	0	21	0.0	65.4	1.0	-1.0	0.1	0.8	0.104	1.009	0.101	0.177	0.571
PC-01	PB-01 & PB-02	Foundation Soils	45.0	-0.5	88.8	0.112	-0.670	0.126	0.8	65.1	0	21	0.0	65.1	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.177	0.570
PC-01	PB-01 & PB-02	Foundation Soils	45.1	-0.6	86.3	0.153	9.030	0.177	0.8	63.1	0	21	0.0	63.1	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.177	0.562
PC-01	PB-01 & PB-02	Foundation Soils	45.2	-0.7	84.4	0.157	11.520	0.186	0.8	61.5	2	21	0.0	61.5	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.177	0.555
PC-01	PB-01 & PB-02	Foundation Soils	45.3	-0.8	86.1	0.155	13.050	0.180	0.8	62.8	1	21	0.0	62.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.177	0.561
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.8	86.1	0.168	21.250	0.195	0.8	62.7	2	21	0.0	62.7	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.177	0.560
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.9	78.0	0.203	28.460	0.260	0.8	56.7	8	21	4.9	61.6	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.177	0.556
PC-01	PB-01 & PB-02	Foundation Soils	45.5	-1.0	73.2	0.192	12.290	0.262	0.8	53.3	10	21	10.5	63.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.100	0.177	0.565
PC-01	PB-01 & PB-02	Foundation Soils	45.6	-1.1	66.7	0.178	20.080	0.267	0.8	48.8	14	21	18.9	67.6	1.0	-1.1	0.1	0.8	0.105	1.010	0.103	0.177	0.581
PC-01	PB-01 & PB-02	Foundation Soils	45.7	-1.2	59.8	0.238	15.910	0.398	0.8	44.2	23	21	33.4	77.6	1.0	-1.1	0.1	0.8	0.114	1.012	0.110	0.177	0.626
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	55.6	0.553	13.660	0.995	0.8	41.4	41	21	43.1	84.5	1.0	-1.1	0.1	0.8	0.120	1.013	0.117	0.177	0.660
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	49.1	2.187	18.150	4.452	0.8	36.5	85	21	46.6	83.2	1.0	-1.1	0.1	0.8	0.119	1.013	0.115	0.176	0.653
PC-01	PB-01 & PB-02	Foundation Soils	45.9	-1.4	51.8	3.372	14.250	6.507	0.8	38.6	92	21	47.4	86.0	1.0	-1.1	0.1	0.8	0.121	1.014	0.118	0.176	0.668
PC-01	PB-01 & PB-02	Foundation Soils	46.0	-1.5	78.8	3.907	16.420	4.957	0.8	60.2	75	21	51.4	111.7	0.9	-1.1	0.1	0.8	0.155	1.022	0.150	0.176	0.850
PC-01	PB-01 & PB-02	Foundation Soils	46.1	-1.6	137.9	4.454	22.440	3.229	0.8	110.1	44	21	57.9	168.0	0.9	-1.1	0.1	0.8	0.471	1.061	0.458	0.176	2.597
PC-01	PB-01 & PB-02	Foundation Soils	46.2	-1.7	257.6	2.926	69.300	1.136	0.9	211.0	2	21	0.0	211.0	0.9	-1.1	0.1	0.8	3.724	1.082	3.485	0.176	19.754
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.7	252.0	2.349	34.800	0.932	0.9	205.7	0	21	0.0	205.7	0.9	-1.1	0.1	0.8	2.650	1.082	2.503	0.176	14.192
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.8	188.8	1.966	-6.240	1.041	0.8	149.0	8	21	5.5	154.5	0.9	-1.1	0.1	0.8	0.321	1.049	0.312	0.176	1.768
PC-01	PB-01 & PB-02	Foundation Soils	46.4	-1.9	189.3	1.102	-17.800	0.582	0.8	148.6	0	21	0.0	148.6	0.9	-1.1	0.1	0.8	0.280	1.044	0.271	0.176	1.539
PC-01	PB-01 & PB-02	Foundation Soils	46.5	-2.0	145.8	0.768	-19.200	0.527	0.8	110.9	0	21	0.0	110.9	0.9	-1.1	0.1	0.8	0.153	1.022	0.149	0.176	0.843
PC-01	PB-01 & PB-02	Foundation Soils	46.6	-2.1	136.6	0.633	-18.770	0.463	0.8	103.0	0	21	0.0	103.0	1.0	-1.1	0.1	0.8	0.141	1.019	0.137	0.176	0.776
PC-01	PB-01 & PB-02	Foundation Soils	46.7	-2.2	125.6	0.497	-18.580	0.396	0.8	93.7	0	21	0.0	93.7	1.0	-1.1	0.1	0.8	0.130	1.016	0.126	0.176	0.713
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.2	108.3	0.426	-16.160	0.394	0.8	79.4	4	21	0.1	79.5	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.176	0.635
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.3	100.3	0.407	-1.630	0.406	0.8	73.2	7	21	2.5	75.8	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.176	0.617
PC-01	PB-01 & PB-02	Foundation Soils	46.9	-2.4	94.7	0.414	-6.710	0.437	0.8	69.3	10	21	10.0	79.3	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.176	0.634
PC-01	PB-01 & PB-02	Foundation Soils	47.0	-2.5	82.8	0.242	-14.340	0.292	0.8	59.4	8	21	5.0	64.4	1.0	-1.1	0.1	0.8	0.103	1.009	0.100	0.176	0.568
PC-01	PB-01 & PB-02	Foundation Soils	47.1	-2.6	74.6	0.288	-3.150	0.386	0.8	54.5	16	21	23.5	78.0	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.176	0.628
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.6	67.4	0.268	-15.940	0.398	0.8	49.2	19	21	29.6	78.9	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.176	0.632
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.7	51.6	0.175	-18.010	0.339	0.8	37.3	26	21	35.1	72.5	1.0	-1.1	0.1	0.8	0.109	1.011	0.106	0.176	0.602
PC-01	PB-01 & PB-02	Foundation Soils	47.3	-2.8	53.7	0.196	4.160	0.365	0.8	38.9	25	21	35.2	74.1	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.176	0.609

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	47.4	-2.9	44.7	0.199	6.720	0.446	0.8	32.2	34	21	39.2	71.4	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.176	0.598
PC-01	PB-01 & PB-02	Foundation Soils	47.5	-3.0	45.1	0.118	7.720	0.262	0.8	32.4	27	21	35.3	67.7	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.176	0.581
PC-01	PB-01 & PB-02	Foundation Soils	47.6	-3.1	48.2	0.240	19.150	0.498	0.8	34.8	34	21	39.4	74.2	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.176	0.610
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.1	45.7	0.431	22.490	0.943	0.8	33.1	46	21	42.6	75.7	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.176	0.617
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.2	45.7	0.483	25.970	1.058	0.8	33.1	48	21	43.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.176	0.619
PC-01	PB-01 & PB-02	Foundation Soils	47.8	-3.3	53.4	0.412	33.480	0.772	0.8	38.8	38	21	41.7	80.5	1.0	-1.1	0.1	0.8	0.116	1.012	0.113	0.176	0.640
PC-01	PB-01 & PB-02	Foundation Soils	47.9	-3.4	76.3	0.358	32.100	0.469	0.8	55.7	18	21	28.7	84.3	1.0	-1.1	0.1	0.8	0.120	1.013	0.116	0.176	0.660
PC-01	PB-01 & PB-02	Foundation Soils	48.0	-3.5	104.8	0.337	-9.430	0.322	0.8	75.6	2	21	0.0	75.6	1.0	-1.1	0.1	0.8	0.112	1.011	0.108	0.176	0.617
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.5	64.0	0.313	-0.570	0.489	0.8	46.5	24	21	35.4	81.9	1.0	-1.1	0.1	0.8	0.118	1.013	0.114	0.176	0.647
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.6	59.9	0.291	-0.730	0.486	0.8	43.4	26	21	36.7	80.1	1.0	-1.1	0.1	0.8	0.116	1.012	0.112	0.176	0.638
PC-01	PB-01 & PB-02	Foundation Soils	48.2	-3.7	52.5	0.382	7.340	0.728	0.8	38.0	37	21	41.4	79.4	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.176	0.635
PC-01	PB-01 & PB-02	Foundation Soils	48.3	-3.8	44.2	0.350	-0.330	0.791	0.8	31.7	44	21	42.0	73.7	1.0	-1.1	0.1	0.8	0.110	1.011	0.107	0.176	0.608
PC-01	PB-01 & PB-02	Foundation Soils	48.4	-3.9	38.4	0.338	14.770	0.879	0.8	27.4	50	21	42.2	69.6	1.0	-1.1	0.1	0.8	0.107	1.010	0.104	0.176	0.590
PC-01	PB-01 & PB-02	Foundation Soils	48.5	-4.0	36.1	0.089	-3.890	0.247	0.7	25.5	34	21	37.9	63.3	1.0	-1.1	0.1	0.8	0.102	1.009	0.099	0.176	0.564
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.0	52.2	0.156	-4.960	0.299	0.8	37.2	24	21	33.7	70.9	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.176	0.596
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.1	66.4	0.118	-5.060	0.178	0.7	46.3	10	21	10.1	56.4	1.0	-1.1	0.1	0.8	0.097	1.008	0.094	0.175	0.536
PC-01	PB-01 & PB-02	Foundation Soils	48.7	-4.2	94.5	0.081	11.120	0.086	0.8	66.9	0	21	0.0	66.9	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.175	0.579
PC-01	PB-01 & PB-02	Foundation Soils	48.8	-4.3	67.9	0.247	-3.050	0.364	0.8	48.6	18	21	27.9	76.6	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.175	0.622
PC-01	PB-01 & PB-02	Foundation Soils	48.9	-4.4	51.0	0.302	-5.150	0.592	0.8	36.5	35	21	40.2	76.8	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.175	0.623
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	46.0	0.188	3.410	0.409	0.8	32.7	33	21	38.5	71.2	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.175	0.597
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	43.5	0.173	9.220	0.397	0.8	30.8	34	21	38.8	69.6	1.0	-1.2	0.1	0.8	0.107	1.010	0.104	0.175	0.591
PC-01	PB-01 & PB-02	Foundation Soils	49.1	-4.6	50.5	0.130	11.560	0.258	0.7	35.7	24	21	33.0	68.7	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.175	0.586
PC-01	PB-01 & PB-02	Foundation Soils	49.2	-4.7	61.2	0.097	14.910	0.158	0.7	42.5	12	21	15.0	57.5	1.0	-1.2	0.1	0.8	0.098	1.008	0.095	0.175	0.541
PC-01	PB-01 & PB-02	Foundation Soils	49.3	-4.8	40.2	0.096	18.110	0.239	0.7	28.2	31	21	36.7	64.9	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.175	0.571
PC-01	PB-01 & PB-02	Foundation Soils	49.4	-4.9	27.8	0.272	29.060	0.979	0.7	19.4	74	21	42.4	61.8	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.175	0.558
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-4.9	21.7	0.152	29.830	0.700	0.7	15.0	78	21	41.7	56.7	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.175	0.538
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-5.0	18.6	0.084	33.990	0.451	0.7	12.8	78	21	41.2	54.0	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.175	0.527
PC-01	PB-01 & PB-02	Foundation Soils	49.6	-5.1	21.9	0.140	33.450	0.638	0.7	15.1	77	21	41.6	56.8	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.175	0.538
PC-01	PB-01 & PB-02	Foundation Soils	49.7	-5.2	43.4	0.330	35.490	0.760	0.7	30.7	44	21	41.8	72.5	1.0	-1.2	0.1	0.8	0.109	1.011	0.106	0.175	0.603
PC-01	PB-01 & PB-02	Foundation Soils	49.8	-5.3	66.5	0.527	40.450	0.792	0.8	48.1	32	21	41.1	89.2	1.0	-1.2	0.1	0.8	0.125	1.014	0.120	0.175	0.687
PC-01	PB-01 & PB-02	Foundation Soils	49.9	-5.4	80.5	0.664	22.790	0.825	0.8	58.8	27	21	39.9	98.6	0.9	-1.2	0.1	0.8	0.136	1.017	0.130	0.175	0.746
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.4	80.2	0.700	9.910	0.873	0.8	58.5	28	21	40.8	99.3	0.9	-1.2	0.1	0.8	0.136	1.018	0.131	0.175	0.750
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.5	84.9	0.388	-14.150	0.457	0.8	60.7	15	21	22.8	83.5	1.0	-1.2	0.1	0.8	0.119	1.013	0.115	0.175	0.656
PC-01	PB-01 & PB-02	Foundation Soils	50.1	-5.6	90.0	0.269	-18.580	0.299	0.7	62.6	7	21	2.1	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.175	0.570
PC-01	PB-01 & PB-02	Foundation Soils	50.2	-5.7	94.6	0.207	-19.400	0.219	0.7	65.9	1	21	0.0	65.9	1.0	-1.2	0.1	0.8	0.104	1.009	0.101	0.175	0.575
PC-01	PB-01 & PB-02	Foundation Soils	50.3	-5.8	83.3	0.435	-23.200	0.522	0.8	59.8	18	21	28.6	88.5	0.9	-1.2	0.1	0.8	0.124	1.014	0.119	0.175	0.683
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.8	74.8	0.638	-21.960	0.853	0.8	54.2	30	21	41.1	95.3	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.175	0.724
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.9	70.2	0.595	-20.060	0.848	0.8	50.6	32	21	41.5	92.1	0.9	-1.2	0.1	0.8	0.128	1.015	0.123	0.175	0.704
PC-01	PB-01 & PB-02	Foundation Soils	50.5	-6.0	58.3	0.517	-14.980	0.887	0.8	41.6	38	21	42.4	84.0	1.0	-1.2	0.1	0.8	0.120	1.013	0.115	0.175	0.659
PC-01	PB-01 & PB-02	Foundation Soils	50.6	-6.1	57.2	0.280	-11.240	0.490	0.7	40.4	29	21	37.8	78.2	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.175	0.630
PC-01	PB-01 & PB-02	Foundation Soils	50.7	-6.2	56.9	0.161	-9.350	0.283	0.7	39.7	21	21	31.0	70.7	1.0	-1.2	0.1	0.8	0.108	1.010	0.104	0.175	0.596
PC-01	PB-01 & PB-02	Foundation Soils	50.8	-6.3	58.5	0.207	-6.620	0.354	0.7	41.1	23	21	33.4	74.5	1.0	-1.2	0.1	0.8	0.111	1.011	0.107	0.175	0.613
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.3	60.3	0.261	0.630	0.433	0.7	42.5	25	21	35.5	78.0	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.175	0.629
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.4	64.4	0.193	-1.190	0.300	0.7	44.9	18	21	26.9	71.8	1.0	-1.2	0.1	0.8	0.109	1.010	0.105	0.174	0.601
PC-01	PB-01 & PB-02	Foundation Soils	51.0	-6.5	63.5	0.128	-11.920	0.202	0.7	43.6	14	21	18.7	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.174	0.561
PC-01	PB-01 & PB-02	Foundation Soils	51.1	-6.6	42.3	0.151	-17.720	0.357	0.7	29.3	34	21	38.5	67.8	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.174	0.584
PC-01	PB-01 & PB-02	Foundation Soils	51.2	-6.7	35.5	0.203	-14.680	0.572	0.7	24.5	47	21	40.9	65.4	1.0	-1.2	0.1	0.8	0.104	1.009	0.100	0.174	0.574
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.7	32.4	0.252	-2.290	0.779	0.7	22.2	55	21	41.6	63.8	1.0	-1.2	0.1	0.8	0.102	1.009	0.099	0.174	0.568
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.8	29.1	0.148	12.150	0.509	0.7	19.9	51	21	40.7	60.6	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.174	0.554
PC-01	PB-01 & PB-02	Foundation Soils	51.4	-6.9	28.1	0.152	25.060	0.540	0.7	19.2	53	21	40.8	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.096	0.174	0.552
PC-01	PB-01 & PB-02	Foundation Soils	51.5	-7.0	30.9	0.242	30.770	0.784	0.7	21.1	56	21	41.6	62.7	1.0	-1.2	0.1	0.8	0.102	1.009	0.098	0.174	0.563
PC-01	PB-01 & PB-02	Foundation Soils	51.6	-7.1	40.4	0.226	31.260	0.559	0.7	27.9	42	21	40.7	68.6	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.174	0.588
PC-01	PB-01 & PB-02	Foundation Soils	51.7	-7.2	48.8	0.362	17.370	0.741	0.7	34.1	41	21	41.7	75.7	1.0	-1.2	0.1	0.8	0.112	1.011	0.108	0.174	0.619
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.2	62.4	0.289	9.960	0.463	0.7	43.7	25	21	35.8	79.6	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.174	0.638
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.3	72.5	0.112	-3.700	0.155	0.7	48.4	7	21	2.6	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.090	0.174	0.517
PC-01	PB-01 & PB-02	Foundation Soils	51.9	-7.4	60.2	0.088	3.190	0.146	0.7	40.6	13	21	16.6	57.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.174	0.541
PC-01	PB-01 & PB-02	Foundation Soils	52.0	-7.5	57.3	0.330	19.240	0.576	0.7	40.0	32	21	39.4	79.4	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.174	0.637
PC-01	PB-01 & PB-02	Foundation Soils	52.1	-7.6	63.2	0.251	19.250	0.397	0.7	44.0	23	21	33.3	77.3	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.174	0.627
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	70.4	0.260	30.170	0.370	0.7	48.9	18	21	27.9	76.8	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.174	0.625
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	77.3	0.610	28.190	0.789	0.8	55.0	28	21	40.0	95.0	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.174	0.723
PC-01	PB-01 & PB-02	Foundation Soils	52.3	-7.8	95.0	0.893	23.390	0.940	0.8	68.8	26	21	40.2	109.0	0.9	-1.2	0.1	0.8	0.150	1.021	0.144	0.174	0.827
PC-01	PB-01 & PB-02	Foundation Soils	52.4	-7.9	85.1	0.607	4.340	0.713	0.8	60.7	23	21	36.6	97.3	0.9	-1.2	0.1	0.8	0.134	1.017	0.128	0.174	0.739

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	52.5	-8.0	70.3	0.302	14.090	0.430	0.7	49.0	21	21	31.5	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.174	0.643
PC-01	PB-01 & PB-02	Foundation Soils	52.6	-8.1	60.0	0.290	-11.580	0.484	0.7	41.7	27	21	37.2	78.9	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.174	0.635
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.1	68.9	0.311	-1.020	0.451	0.7	48.0	22	21	33.1	81.2	0.9	-1.3	0.1	0.8	0.117	1.012	0.112	0.174	0.646
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.2	71.7	0.266	-7.620	0.371	0.7	49.6	18	21	27.3	76.9	1.0	-1.3	0.1	0.8	0.113	1.011	0.109	0.174	0.626
PC-01	PB-01 & PB-02	Foundation Soils	52.8	-8.3	80.3	0.336	-11.190	0.419	0.7	55.8	16	21	24.7	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.174	0.643
PC-01	PB-01 & PB-02	Foundation Soils	52.9	-8.4	91.9	0.293	2.950	0.319	0.7	62.4	8	21	3.9	66.3	1.0	-1.3	0.1	0.8	0.104	1.010	0.100	0.174	0.579
PC-01	PB-01 & PB-02	Foundation Soils	53.0	-8.5	116.1	0.315	-1.000	0.271	0.7	80.5	0	21	0.0	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.173	0.644
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	140.4	0.234	-0.910	0.167	0.8	100.0	0	21	0.0	100.0	0.9	-1.3	0.1	0.8	0.137	1.018	0.131	0.173	0.757
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	124.7	0.110	-17.610	0.088	0.7	87.2	0	21	0.0	87.2	0.9	-1.3	0.1	0.8	0.123	1.014	0.118	0.173	0.679
PC-01	PB-01 & PB-02	Foundation Soils	53.2	-8.7	93.1	0.105	-21.680	0.113	0.7	62.6	0	21	0.0	62.6	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.173	0.564
PC-01	PB-01 & PB-02	Foundation Soils	53.3	-8.8	88.5	0.173	-22.340	0.195	0.7	59.1	3	21	0.0	59.1	1.0	-1.3	0.1	0.8	0.099	1.009	0.095	0.173	0.550
PC-01	PB-01 & PB-02	Foundation Soils	53.4	-8.9	84.9	0.201	-19.560	0.237	0.7	56.6	7	21	1.8	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.173	0.547
PC-01	PB-01 & PB-02	Foundation Soils	53.5	-9.0	71.5	0.141	-17.940	0.197	0.7	47.5	10	21	9.9	57.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.173	0.544
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.0	60.3	0.480	-14.770	0.796	0.7	41.8	36	21	41.7	83.5	0.9	-1.3	0.1	0.8	0.119	1.013	0.114	0.173	0.659
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.1	61.9	0.223	-10.860	0.360	0.7	42.3	22	21	32.8	75.1	0.9	-1.3	0.1	0.8	0.111	1.011	0.107	0.173	0.619
PC-01	PB-01 & PB-02	Foundation Soils	53.7	-9.2	70.8	0.098	-10.480	0.138	0.7	46.2	8	21	3.5	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.089	0.173	0.514
PC-01	PB-01 & PB-02	Foundation Soils	53.8	-9.3	71.1	0.122	-12.480	0.172	0.7	46.8	9	21	7.2	54.0	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.173	0.531
PC-01	PB-01 & PB-02	Foundation Soils	53.9	-9.4	55.1	0.094	-9.010	0.171	0.7	36.8	18	21	25.9	62.8	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.173	0.566
PC-01	PB-01 & PB-02	Foundation Soils	54.0	-9.5	41.5	0.067	-10.800	0.162	0.7	27.7	27	21	34.6	62.3	1.0	-1.3	0.1	0.8	0.101	1.009	0.097	0.173	0.564
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.5	32.0	0.050	-7.000	0.156	0.7	21.2	36	21	37.7	58.9	1.0	-1.3	0.1	0.8	0.099	1.008	0.095	0.173	0.550
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.6	28.6	0.077	-2.190	0.269	0.7	18.9	45	21	39.5	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.173	0.548
PC-01	PB-01 & PB-02	Foundation Soils	54.2	-9.7	20.7	0.153	13.050	0.738	0.7	13.6	84	21	41.6	55.2	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.173	0.536
PC-01	PB-01 & PB-02	Foundation Soils	54.3	-9.8	20.5	0.320	24.960	1.564	0.7	13.4	97	21	41.8	55.3	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.173	0.536
PC-01	PB-01 & PB-02	Foundation Soils	54.4	-9.9	24.6	0.331	34.880	1.347	0.7	16.2	87	21	42.2	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.173	0.549
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-9.9	39.2	0.253	37.070	0.646	0.7	26.3	46	21	41.3	67.5	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.173	0.586
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-10.0	63.3	0.236	34.190	0.373	0.7	43.0	22	21	32.8	75.9	0.9	-1.3	0.1	0.8	0.112	1.011	0.108	0.173	0.623
PC-01	PB-01 & PB-02	Foundation Soils	54.6	-10.1	87.3	0.251	25.700	0.287	0.7	58.1	8	21	5.3	63.4	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.173	0.569
PC-01	PB-01 & PB-02	Foundation Soils	54.7	-10.2	56.2	0.172	14.340	0.306	0.7	37.9	24	21	33.4	71.2	0.9	-1.3	0.1	0.8	0.108	1.010	0.104	0.173	0.602
PC-01	PB-01 & PB-02	Foundation Soils	54.8	-10.3	45.1	0.124	17.100	0.275	0.7	30.1	30	21	36.6	66.7	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.172	0.583
PC-01	PB-01 & PB-02	Foundation Soils	54.9	-10.4	28.9	0.031	20.620	0.107	0.7	18.9	37	21	37.7	56.6	1.0	-1.3	0.1	0.8	0.097	1.008	0.093	0.172	0.542
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.4	22.5	0.061	23.440	0.271	0.7	14.7	53	21	39.9	54.5	1.0	-1.3	0.1	0.8	0.096	1.008	0.092	0.172	0.534
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.5	17.5	0.218	34.540	1.247	0.7	11.3	100	21	41.4	52.8	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.172	0.527
PC-01	PB-01 & PB-02	Foundation Soils	55.1	-10.6	16.9	0.157	37.590	0.930	0.7	10.9	97	21	41.3	52.2	1.0	-1.3	0.1	0.8	0.094	1.008	0.090	0.172	0.525
PC-01	PB-01 & PB-02	Foundation Soils	55.2	-10.7	19.2	0.068	39.830	0.355	0.7	12.4	78	21	41.1	53.5	1.0	-1.3	0.1	0.8	0.095	1.008	0.091	0.172	0.530
PC-01	PB-01 & PB-02	Foundation Soils	55.3	-10.8	24.2	0.181	41.310	0.749	0.7	15.8	79	21	41.8	57.6	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.172	0.546
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.8	51.2	0.241	39.160	0.471	0.7	34.4	33	21	39.0	73.4	0.9	-1.3	0.1	0.8	0.110	1.011	0.105	0.172	0.612
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.9	49.7	0.203	36.260	0.409	0.7	33.3	32	21	38.3	71.5	0.9	-1.3	0.1	0.8	0.109	1.010	0.104	0.172	0.604
PC-01	PB-01 & PB-02	Foundation Soils	55.5	-11.0	45.8	0.719	25.010	1.571	0.7	30.8	58	21	43.8	74.6	0.9	-1.3	0.1	0.8	0.111	1.011	0.106	0.172	0.618
PC-01	PB-01 & PB-02	Foundation Soils	55.6	-11.1	47.0	0.685	31.870	1.458	0.7	31.6	56	21	43.7	75.4	0.9	-1.3	0.1	0.8	0.112	1.011	0.107	0.172	0.622
PC-01	PB-01 & PB-02	Foundation Soils	55.7	-11.2	51.9	0.702	37.090	1.352	0.7	35.2	51	21	43.9	79.1	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.172	0.639
PC-01	PB-01 & PB-02	Foundation Soils	55.8	-11.3	96.1	0.996	40.550	1.036	0.7	67.9	28	21	42.2	110.1	0.9	-1.3	0.1	0.8	0.152	1.022	0.145	0.172	0.841
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.3	214.9	0.990	40.590	0.461	0.8	160.2	0	21	0.0	160.2	0.9	-1.3	0.1	0.8	0.374	1.054	0.352	0.172	2.047
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.4	258.4	0.789	34.690	0.305	0.8	199.3	0	21	0.0	199.3	0.8	-1.3	0.1	0.8	1.819	1.082	1.655	0.172	9.626
PC-01	PB-01 & PB-02	Foundation Soils	56.0	-11.5	209.6	0.636	-10.490	0.303	0.8	155.5	0	21	0.0	155.5	0.9	-1.4	0.1	0.8	0.329	1.050	0.310	0.172	1.806
PC-01	PB-01 & PB-02	Foundation Soils	56.1	-11.6	164.3	0.553	-6.810	0.337	0.8	116.8	0	21	0.0	116.8	0.9	-1.4	0.1	0.8	0.164	1.025	0.156	0.172	0.908
PC-01	PB-01 & PB-02	Foundation Soils	56.2	-11.7	129.5	0.438	14.960	0.338	0.7	88.6	0	21	0.0	88.6	0.9	-1.4	0.1	0.8	0.124	1.014	0.118	0.172	0.689
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	65.0	0.470	-0.300	0.723	0.7	44.2	33	21	40.7	84.9	0.9	-1.4	0.1	0.8	0.120	1.013	0.115	0.172	0.669
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	57.0	0.132	-0.170	0.232	0.7	37.6	20	21	29.6	67.2	0.9	-1.4	0.1	0.8	0.105	1.010	0.101	0.172	0.586
PC-01	PB-01 & PB-02	Foundation Soils	56.4	-11.9	49.1	0.237	-4.720	0.483	0.7	32.6	35	21	39.5	72.1	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.172	0.608
PC-01	PB-01 & PB-02	Foundation Soils	56.5	-12.0	40.3	0.103	20.870	0.256	0.7	26.4	33	21	37.6	64.0	1.0	-1.4	0.2	0.8	0.103	1.009	0.098	0.172	0.573
PC-01	PB-01 & PB-02	Foundation Soils	56.6	-12.1	39.4	0.150	25.390	0.381	0.7	25.8	39	21	39.5	65.3	0.9	-1.4	0.2	0.8	0.104	1.009	0.099	0.172	0.579
PC-01	PB-01 & PB-02	Foundation Soils	56.7	-12.2	44.8	0.393	36.940	0.878	0.7	29.7	48	21	42.2	71.9	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.171	0.607
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.2	62.2	0.389	34.490	0.626	0.7	41.9	32	21	39.8	81.6	0.9	-1.4	0.2	0.8	0.117	1.012	0.112	0.171	0.653
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.3	75.0	0.451	43.690	0.602	0.7	51.0	25	21	36.9	87.9	0.9	-1.4	0.2	0.8	0.123	1.014	0.118	0.171	0.686
PC-01	PB-01 & PB-02	Foundation Soils	56.9	-12.4	78.5	0.147	38.780	0.187	0.7	50.1	8	21	3.4	53.5	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.171	0.532
PC-01	PB-01 & PB-02	Foundation Soils	57.0	-12.5	74.3	0.106	37.870	0.143	0.7	47.0	7	21	2.5	49.4	1.0	-1.4	0.2	0.8	0.092	1.008	0.088	0.171	0.517
PC-01	PB-01 & PB-02	Foundation Soils	57.1	-12.6	84.4	0.147	41.070	0.174	0.7	53.8	4	21	0.1	54.0	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.171	0.534
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	98.4	0.209	38.100	0.212	0.7	64.0	1	21	0.0	64.0	0.9	-1.4	0.2	0.8	0.103	1.009	0.098	0.171	0.574
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	90.8	0.809	42.640	0.891	0.7	62.9	27	21	40.4	103.3	0.9	-1.4	0.2	0.8	0.142	1.019	0.135	0.171	0.786
PC-01	PB-01 & PB-02	Foundation Soils	57.3	-12.8	83.5	0.655	31.330	0.785	0.7	57.3	27	21	39.4	96.7	0.9	-1.4	0.2	0.8	0.133	1.017	0.127	0.171	0.740
PC-01	PB-01 & PB-02	Foundation Soils	57.4	-12.9	88.9	0.504	36.120	0.567	0.7	60.5	19	21	30.8	91.2	0.9	-1.4	0.2	0.8	0.127	1.015	0.121	0.171	0.706
PC-01	PB-01 & PB-02	Foundation Soils	57.5	-13.0	100.6	0.381	33.640	0.379	0.7	66.3	9	21	5.9	72.2	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.171	0.610

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	57.6	-13.1	162.8	0.242	37.350	0.149	0.7	114.2	0	21	0.0	114.2	0.9	-1.4	0.2	0.8	0.159	1.023	0.151	0.171	0.882
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.1	146.1	0.151	12.390	0.103	0.7	100.5	0	21	0.0	100.5	0.9	-1.4	0.2	0.8	0.138	1.018	0.131	0.171	0.766
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.2	117.6	0.228	9.390	0.194	0.7	78.2	0	21	0.0	78.2	0.9	-1.4	0.2	0.8	0.114	1.012	0.109	0.171	0.637
PC-01	PB-01 & PB-02	Foundation Soils	57.8	-13.3	96.9	0.244	22.070	0.252	0.7	62.5	4	21	0.1	62.6	0.9	-1.4	0.2	0.8	0.101	1.009	0.097	0.171	0.569
PC-01	PB-01 & PB-02	Foundation Soils	57.9	-13.4	102.7	0.366	25.490	0.356	0.7	67.1	7	21	2.6	69.8	0.9	-1.4	0.2	0.8	0.107	1.010	0.102	0.171	0.600
PC-01	PB-01 & PB-02	Foundation Soils	58.0	-13.5	103.7	0.437	33.070	0.421	0.7	68.6	9	21	8.2	76.8	0.9	-1.4	0.2	0.8	0.113	1.011	0.108	0.171	0.631
PC-01	PB-01 & PB-02	Foundation Soils	58.1	-13.6	101.1	0.572	20.540	0.566	0.7	68.6	15	21	24.2	92.8	0.9	-1.4	0.2	0.8	0.129	1.015	0.122	0.171	0.716
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.6	96.7	0.788	22.770	0.815	0.7	66.7	23	21	37.7	104.4	0.9	-1.4	0.2	0.8	0.143	1.019	0.136	0.171	0.796
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.7	82.9	1.156	17.820	1.394	0.7	57.0	39	21	45.7	102.7	0.9	-1.4	0.2	0.8	0.141	1.019	0.134	0.171	0.783
PC-01	PB-01 & PB-02	Foundation Soils	58.3	-13.8	82.1	2.773	28.300	3.379	0.7	56.6	60	21	49.6	106.2	0.9	-1.4	0.2	0.8	0.146	1.020	0.138	0.171	0.811
PC-01	PB-01 & PB-02	Foundation Soils	58.4	-13.9	91.2	1.602	33.110	1.757	0.7	63.3	42	21	47.8	111.1	0.9	-1.4	0.2	0.8	0.154	1.022	0.145	0.170	0.853
PC-01	PB-01 & PB-02	Foundation Soils	58.5	-14.0	83.1	1.846	49.790	2.221	0.7	57.2	50	21	48.3	105.5	0.9	-1.4	0.2	0.8	0.145	1.020	0.137	0.170	0.805
PC-01	PB-01 & PB-02	Foundation Soils	58.6	-14.0	129.6	3.065	33.350	2.365	0.8	93.8	40	21	53.3	147.2	0.9	-1.4	0.2	0.8	0.271	1.043	0.254	0.170	1.491
PC-02	PB-02 & PB-03	Foundation Soils	14.0	30.1	7.1	0.076	33.550	1.067	1.2	7.8	95	21	40.6	48.4	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.125	0.744
PC-02	PB-02 & PB-03	Foundation Soils	14.1	30.1	7.5	0.075	35.070	0.994	1.2	8.3	92	21	40.6	48.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.126	0.745
PC-02	PB-02 & PB-03	Foundation Soils	14.2	30.0	7.7	0.073	37.340	0.953	1.2	8.4	91	21	40.6	49.0	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.126	0.743
PC-02	PB-02 & PB-03	Foundation Soils	14.3	29.9	7.7	0.089	38.160	1.156	1.2	8.4	94	21	40.7	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.126	0.742
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.8	9.2	0.080	46.120	0.869	1.2	10.0	83	21	40.7	50.7	1.0	-0.2	0.0	1.0	0.093	1.008	0.095	0.127	0.749
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.7	10.8	0.101	43.070	0.931	1.1	11.8	79	21	40.9	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.127	0.759
PC-02	PB-02 & PB-03	Foundation Soils	14.5	29.6	12.1	0.116	24.590	0.962	1.1	13.0	75	21	41.1	54.2	1.0	-0.2	0.0	1.0	0.095	1.008	0.098	0.127	0.765
PC-02	PB-02 & PB-03	Foundation Soils	14.6	29.6	12.1	0.091	23.540	0.754	1.1	13.0	72	21	40.9	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.097	0.128	0.762
PC-02	PB-02 & PB-03	Foundation Soils	14.7	29.5	10.6	0.082	14.530	0.773	1.1	11.5	77	21	40.8	52.3	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.128	0.750
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.4	7.9	0.080	7.530	1.014	1.1	8.5	92	21	40.6	49.2	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.128	0.730
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.3	6.7	0.084	10.830	1.252	1.1	7.2	100	21	40.5	47.8	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.129	0.720
PC-02	PB-02 & PB-03	Foundation Soils	14.9	29.2	5.9	0.089	14.340	1.496	1.1	6.4	100	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.129	0.712
PC-02	PB-02 & PB-03	Foundation Soils	15.0	29.2	5.8	0.098	16.940	1.682	1.1	6.3	100	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.129	0.710
PC-02	PB-02 & PB-03	Foundation Soils	15.1	29.1	5.5	0.088	19.770	1.608	1.1	5.9	100	21	40.2	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.091	0.130	0.705
PC-02	PB-02 & PB-03	Foundation Soils	15.2	29.0	5.3	0.085	19.180	1.610	1.1	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.130	0.702
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.9	5.2	0.085	19.680	1.627	1.1	5.6	100	21	40.2	45.8	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.130	0.700
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.8	5.1	0.085	20.750	1.651	1.1	5.5	100	21	40.1	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.131	0.697
PC-02	PB-02 & PB-03	Foundation Soils	15.4	28.7	5.0	0.081	21.870	1.605	1.1	5.4	100	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.131	0.695
PC-02	PB-02 & PB-03	Foundation Soils	15.5	28.7	5.0	0.077	23.040	1.545	1.1	5.3	100	21	40.1	45.4	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.131	0.692
PC-02	PB-02 & PB-03	Foundation Soils	15.6	28.6	4.8	0.077	22.680	1.607	1.1	5.1	100	21	40.1	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.132	0.689
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.5	4.7	0.075	23.120	1.605	1.1	5.0	100	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.132	0.687
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.4	4.5	0.068	23.200	1.496	1.1	4.8	100	21	40.0	44.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.132	0.684
PC-02	PB-02 & PB-03	Foundation Soils	15.8	28.3	4.6	0.064	24.540	1.387	1.1	4.9	100	21	40.0	44.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.132	0.683
PC-02	PB-02 & PB-03	Foundation Soils	15.9	28.3	4.8	0.064	25.060	1.332	1.1	5.1	100	21	40.0	45.1	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.133	0.683
PC-02	PB-02 & PB-03	Foundation Soils	16.0	28.2	4.9	0.069	25.950	1.408	1.1	5.2	100	21	40.1	45.3	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.133	0.682
PC-02	PB-02 & PB-03	Foundation Soils	16.1	28.1	5.2	0.073	28.780	1.399	1.1	5.5	100	21	40.1	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.133	0.682
PC-02	PB-02 & PB-03	Foundation Soils	16.2	28.0	5.5	0.064	29.400	1.169	1.1	5.8	100	21	40.2	46.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.134	0.682
PC-02	PB-02 & PB-03	Foundation Soils	16.2	27.9	6.1	0.071	26.710	1.165	1.1	6.4	100	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.134	0.685
PC-02	PB-02 & PB-03	Foundation Soils	16.3	27.8	6.7	0.075	28.500	1.125	1.1	7.0	100	21	40.5	47.5	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.134	0.687
PC-02	PB-02 & PB-03	Foundation Soils	16.4	27.8	6.9	0.083	28.250	1.197	1.1	7.3	100	21	40.5	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.135	0.687
PC-02	PB-02 & PB-03	Foundation Soils	16.5	27.7	8.6	0.068	15.530	0.793	1.1	9.0	87	21	40.6	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.135	0.696
PC-02	PB-02 & PB-03	Foundation Soils	16.6	27.6	7.8	0.046	15.380	0.587	1.1	8.2	86	21	40.4	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.135	0.689
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.5	7.2	0.041	16.010	0.571	1.1	7.5	90	21	40.4	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.135	0.683
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.4	6.5	0.044	19.960	0.677	1.1	6.8	96	21	40.3	47.1	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.136	0.678
PC-02	PB-02 & PB-03	Foundation Soils	16.8	27.4	6.1	0.052	28.770	0.846	1.1	6.4	100	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.136	0.674
PC-02	PB-02 & PB-03	Foundation Soils	16.9	27.3	5.9	0.046	31.640	0.775	1.1	6.2	100	21	40.3	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.136	0.671
PC-02	PB-02 & PB-03	Foundation Soils	17.0	27.2	5.9	0.044	32.490	0.749	1.1	6.1	100	21	40.3	46.4	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.136	0.669
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.1	5.8	0.049	35.130	0.851	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.137	0.667
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.0	5.8	0.048	34.540	0.834	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.137	0.665
PC-02	PB-02 & PB-03	Foundation Soils	17.2	26.9	5.5	0.045	34.970	0.817	1.1	5.7	100	21	40.2	45.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.137	0.662
PC-02	PB-02 & PB-03	Foundation Soils	17.3	26.9	5.2	0.045	40.740	0.871	1.1	5.3	100	21	40.1	45.4	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.138	0.659
PC-02	PB-02 & PB-03	Foundation Soils	17.4	26.8	4.8	0.047	41.690	0.977	1.1	5.0	100	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.138	0.655
PC-02	PB-02 & PB-03	Foundation Soils	17.5	26.7	5.5	0.049	48.220	0.897	1.1	5.6	100	21	40.2	45.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.138	0.658
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.6	6.4	0.043	46.120	0.671	1.1	6.6	97	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.138	0.662
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.5	6.4	0.042	40.740	0.653	1.1	6.6	97	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.139	0.661
PC-02	PB-02 & PB-03	Foundation Soils	17.7	26.4	5.8	0.047	35.650	0.804	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.139	0.656
PC-02	PB-02 & PB-03	Foundation Soils	17.8	26.4	5.3	0.071	35.640	1.349	1.1	5.4	100	21	40.1	45.5	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.139	0.651
PC-02	PB-02 & PB-03	Foundation Soils	17.9	26.3	5.7	0.092	35.550	1.622	1.1	5.8	100	21	40.2	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.139	0.652
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.2	8.5	0.094	39.500	1.101	1.1	8.7	94	21	40.7	49.4	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.140	0.669

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.1	13.4	0.068	37.190	0.509	1.1	13.6	65	21	40.7	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.140	0.693
PC-02	PB-02 & PB-03	Foundation Soils	18.1	26.0	19.1	0.107	33.690	0.561	1.1	19.3	55	21	41.0	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.140	0.725
PC-02	PB-02 & PB-03	Foundation Soils	18.2	26.0	24.0	0.135	23.670	0.562	1.1	24.3	48	21	41.1	65.3	1.0	-0.3	0.0	0.9	0.104	1.009	0.106	0.140	0.752
PC-02	PB-02 & PB-03	Foundation Soils	18.3	25.9	29.1	0.184	10.290	0.633	1.1	29.2	44	21	41.3	70.6	1.0	-0.3	0.0	0.9	0.108	1.010	0.110	0.141	0.781
PC-02	PB-02 & PB-03	Foundation Soils	18.4	25.8	42.5	0.235	10.120	0.553	1.1	42.6	29	21	38.7	81.3	1.0	-0.3	0.0	0.9	0.117	1.012	0.120	0.141	0.849
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.7	65.2	0.319	10.010	0.489	1.1	65.1	14	21	21.7	86.8	1.0	-0.3	0.0	0.9	0.122	1.014	0.125	0.141	0.888
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.6	79.1	0.411	9.590	0.519	1.1	78.9	10	21	9.0	87.9	1.0	-0.3	0.0	0.9	0.123	1.014	0.126	0.141	0.894
PC-02	PB-02 & PB-03	Foundation Soils	18.6	25.5	91.4	0.485	7.150	0.530	1.1	91.0	6	21	0.9	91.8	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.142	0.924
PC-02	PB-02 & PB-03	Foundation Soils	18.7	25.5	94.0	0.563	5.600	0.599	1.1	93.3	7	21	3.2	96.5	1.0	-0.3	0.0	0.9	0.133	1.017	0.136	0.142	0.963
PC-02	PB-02 & PB-03	Foundation Soils	18.8	25.4	95.3	0.633	5.670	0.664	1.0	94.4	9	21	7.4	101.8	1.0	-0.3	0.0	0.9	0.140	1.018	0.144	0.142	1.012
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.3	94.0	0.651	6.180	0.692	1.0	92.9	10	21	11.2	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.147	0.142	1.035
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.2	91.9	0.653	6.620	0.711	1.0	90.6	11	21	15.0	105.7	1.0	-0.3	0.0	0.9	0.145	1.020	0.150	0.142	1.050
PC-02	PB-02 & PB-03	Foundation Soils	19.0	25.1	88.7	0.653	6.910	0.736	1.0	87.4	13	21	20.2	107.5	1.0	-0.3	0.0	0.9	0.148	1.021	0.153	0.143	1.069
PC-02	PB-02 & PB-03	Foundation Soils	19.1	25.1	85.8	0.643	7.340	0.750	1.0	84.4	14	21	23.7	108.1	1.0	-0.3	0.0	0.9	0.149	1.021	0.153	0.143	1.074
PC-02	PB-02 & PB-03	Foundation Soils	19.2	25.0	84.4	0.614	7.230	0.727	1.0	83.0	14	21	23.3	106.2	1.0	-0.3	0.0	0.9	0.146	1.020	0.150	0.143	1.050
PC-02	PB-02 & PB-03	Foundation Soils	19.3	24.9	81.8	0.594	6.770	0.726	1.0	80.3	15	21	25.3	105.6	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.143	1.042
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.8	80.5	0.586	6.670	0.728	1.0	78.9	16	21	26.5	105.4	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.144	1.038
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.7	75.5	0.563	5.960	0.746	1.0	73.9	18	21	30.9	104.8	1.0	-0.3	0.0	0.9	0.144	1.020	0.148	0.144	1.029
PC-02	PB-02 & PB-03	Foundation Soils	19.5	24.6	69.9	0.498	6.370	0.713	1.0	68.4	20	21	32.6	101.0	1.0	-0.3	0.0	0.9	0.139	1.018	0.142	0.144	0.988
PC-02	PB-02 & PB-03	Foundation Soils	19.6	24.6	66.6	0.491	6.240	0.737	1.0	65.1	22	21	35.2	100.3	1.0	-0.3	0.0	0.9	0.138	1.018	0.141	0.144	0.980
PC-02	PB-02 & PB-03	Foundation Soils	19.7	24.5	65.7	0.464	6.380	0.706	1.0	64.2	21	21	34.5	98.7	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.144	0.963
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.4	65.3	0.438	4.680	0.671	1.0	63.7	20	21	33.4	97.2	1.0	-0.3	0.0	0.9	0.134	1.017	0.137	0.145	0.947
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.3	65.3	0.424	4.000	0.649	1.0	63.6	20	21	32.6	96.2	1.0	-0.3	0.0	0.9	0.133	1.016	0.136	0.145	0.937
PC-02	PB-02 & PB-03	Foundation Soils	19.9	24.2	61.5	0.419	5.040	0.681	1.0	59.8	23	21	35.7	95.5	1.0	-0.3	0.0	0.9	0.132	1.016	0.135	0.145	0.929
PC-02	PB-02 & PB-03	Foundation Soils	20.0	24.2	53.2	0.432	4.050	0.811	1.0	51.8	30	21	40.8	92.6	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.145	0.903
PC-02	PB-02 & PB-03	Foundation Soils	20.1	24.1	44.3	0.464	4.040	1.047	1.0	43.1	41	21	43.4	86.5	1.0	-0.4	0.0	0.9	0.122	1.014	0.124	0.145	0.854
PC-02	PB-02 & PB-03	Foundation Soils	20.2	24.0	39.9	0.530	4.340	1.327	1.0	38.8	48	21	44.2	83.0	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.146	0.829
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.9	31.6	0.595	5.540	1.885	1.0	30.6	62	21	44.2	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.146	0.775
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.8	23.9	0.646	6.530	2.705	1.0	23.2	79	21	43.5	66.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.146	0.726
PC-02	PB-02 & PB-03	Foundation Soils	20.4	23.7	17.0	0.587	4.380	3.458	1.0	16.5	95	21	42.5	59.0	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.146	0.683
PC-02	PB-02 & PB-03	Foundation Soils	20.5	23.7	11.9	0.491	7.340	4.124	1.0	11.6	100	21	41.5	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.146	0.652
PC-02	PB-02 & PB-03	Foundation Soils	20.6	23.6	10.3	0.457	18.910	4.416	1.0	10.0	100	21	41.2	51.2	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.147	0.642
PC-02	PB-02 & PB-03	Foundation Soils	20.7	23.5	17.3	0.457	22.250	2.645	1.0	16.7	89	21	42.4	59.1	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.147	0.681
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.4	26.6	0.417	22.250	1.569	1.0	25.6	64	21	43.2	68.8	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.147	0.733
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.3	25.0	0.315	3.000	1.260	1.0	24.1	61	21	42.7	66.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.147	0.720
PC-02	PB-02 & PB-03	Foundation Soils	20.9	23.2	18.4	0.279	-9.410	1.520	1.0	17.7	76	21	42.2	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.147	0.682
PC-02	PB-02 & PB-03	Foundation Soils	21.0	23.2	27.4	0.268	-2.760	0.978	1.0	26.3	54	21	42.4	68.7	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.148	0.729
PC-02	PB-02 & PB-03	Foundation Soils	21.1	23.1	33.8	0.288	-0.180	0.851	1.0	32.5	45	21	42.3	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.148	0.763
PC-02	PB-02 & PB-03	Foundation Soils	21.2	23.0	16.9	0.351	0.510	2.075	1.0	16.2	85	21	42.2	58.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.148	0.671
PC-02	PB-02 & PB-03	Foundation Soils	21.2	22.9	11.4	0.315	-2.100	2.757	1.0	11.0	100	21	41.4	52.3	1.0	-0.4	0.0	0.9	0.094	1.008	0.095	0.148	0.640
PC-02	PB-02 & PB-03	Foundation Soils	21.3	22.8	8.8	0.256	-0.140	2.909	1.0	8.4	100	21	40.8	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.148	0.624
PC-02	PB-02 & PB-03	Foundation Soils	21.4	22.8	7.4	0.225	3.480	3.061	1.0	7.0	100	21	40.5	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.091	0.149	0.615
PC-02	PB-02 & PB-03	Foundation Soils	21.5	22.7	5.9	0.166	12.070	2.816	1.0	5.6	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.149	0.606
PC-02	PB-02 & PB-03	Foundation Soils	21.6	22.6	5.9	0.123	43.880	2.069	1.0	5.7	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.149	0.605
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.5	6.7	0.050	67.180	0.743	1.0	6.4	100	21	40.3	46.8	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.149	0.609
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.4	10.5	0.035	69.200	0.334	1.0	10.0	75	21	40.4	50.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.149	0.625
PC-02	PB-02 & PB-03	Foundation Soils	21.8	22.3	10.8	0.033	59.370	0.305	1.0	10.3	73	21	40.4	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.150	0.626
PC-02	PB-02 & PB-03	Foundation Soils	21.9	22.3	8.5	0.032	40.400	0.378	1.0	8.0	85	21	40.3	48.4	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.150	0.614
PC-02	PB-02 & PB-03	Foundation Soils	22.0	22.2	6.5	0.037	54.700	0.573	1.0	6.1	100	21	40.3	46.4	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.150	0.604
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.1	6.1	0.059	63.480	0.974	1.0	5.7	100	21	40.2	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.150	0.601
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.0	5.2	0.047	73.330	0.897	1.0	5.0	100	21	40.0	45.0	1.0	-0.4	0.0	0.9	0.089	1.007	0.089	0.150	0.595
PC-02	PB-02 & PB-03	Foundation Soils	22.2	21.9	5.5	0.053	77.660	0.959	1.0	5.2	100	21	40.1	45.3	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.150	0.596
PC-02	PB-02 & PB-03	Foundation Soils	22.3	21.9	6.3	0.037	82.430	0.586	1.0	6.0	100	21	40.2	46.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.151	0.599
PC-02	PB-02 & PB-03	Foundation Soils	22.4	21.8	12.1	0.025	77.760	0.207	1.0	11.4	61	21	39.9	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.151	0.623
PC-02	PB-02 & PB-03	Foundation Soils	22.5	21.7	25.3	0.020	65.940	0.079	1.0	23.8	31	21	35.9	59.7	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.151	0.663
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.6	31.7	0.022	38.970	0.069	1.0	29.8	22	21	30.9	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.151	0.668
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.5	28.7	0.042	21.140	0.146	1.0	26.9	29	21	35.7	62.6	1.0	-0.4	0.0	0.9	0.101	1.009	0.102	0.151	0.676
PC-02	PB-02 & PB-03	Foundation Soils	22.7	21.4	25.9	0.088	20.390	0.340	1.0	24.2	41	21	39.7	63.9	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.151	0.682
PC-02	PB-02 & PB-03	Foundation Soils	22.8	21.4	22.6	0.091	24.010	0.403	1.0	21.1	47	21	40.4	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.152	0.669
PC-02	PB-02 & PB-03	Foundation Soils	22.9	21.3	22.0	0.119	26.540	0.542	1.0	20.5	52	21	41.0	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.152	0.668
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.2	24.0	0.103	22.930	0.430	1.0	22.4	46	21	40.5	62.8	1.0	-0.4	0.0	0.9	0.102	1.009	0.102	0.152	0.674
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.1	28.7	0.065	5.620	0.227	1.0	26.7	33	21	37.6	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.104	0.152	0.681

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-02	PB-02 & PB-03	Foundation Soils	23.1	21.0	33.0	0.075	7.100	0.227	1.0	30.7	28	21	35.8	66.5	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.152	0.692
PC-02	PB-02 & PB-03	Foundation Soils	23.2	21.0	51.7	0.087	8.900	0.168	1.0	48.0	10	21	10.1	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.152	0.648
PC-02	PB-02 & PB-03	Foundation Soils	23.3	20.9	70.9	0.105	10.150	0.148	1.0	65.9	0	21	0.0	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.153	0.687
PC-02	PB-02 & PB-03	Foundation Soils	23.4	20.8	81.0	0.142	9.430	0.175	1.0	75.2	0	21	0.0	75.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.113	0.153	0.737
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.7	86.9	0.145	8.380	0.167	1.0	80.5	0	21	0.0	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.117	0.153	0.768
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.6	89.5	0.161	12.650	0.180	1.0	82.9	0	21	0.0	82.9	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.153	0.782
PC-02	PB-02 & PB-03	Foundation Soils	23.6	20.5	87.6	0.169	10.050	0.193	1.0	81.1	0	21	0.0	81.1	1.0	-0.4	0.0	0.9	0.117	1.012	0.118	0.153	0.769
PC-02	PB-02 & PB-03	Foundation Soils	23.7	20.5	81.3	0.195	13.820	0.240	1.0	75.0	0	21	0.0	75.0	1.0	-0.4	0.0	0.9	0.111	1.011	0.112	0.153	0.733
PC-02	PB-02 & PB-03	Foundation Soils	23.8	20.4	78.6	0.170	14.390	0.216	1.0	72.5	0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.110	0.153	0.718
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.3	86.1	0.186	17.260	0.216	1.0	79.3	0	21	0.0	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.116	0.154	0.756
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.2	103.6	0.142	8.670	0.137	1.0	95.5	0	21	0.0	95.5	1.0	-0.4	0.1	0.9	0.132	1.016	0.133	0.154	0.867
PC-02	PB-02 & PB-03	Foundation Soils	24.0	20.1	117.4	0.118	5.380	0.101	1.0	108.2	0	21	0.0	108.2	1.0	-0.4	0.1	0.9	0.149	1.021	0.151	0.154	0.984
PC-02	PB-02 & PB-03	Foundation Soils	24.1	20.1	127.1	0.156	-3.420	0.123	1.0	117.2	0	21	0.0	117.2	1.0	-0.4	0.1	0.9	0.165	1.025	0.168	0.154	1.093
PC-02	PB-02 & PB-03	Foundation Soils	24.2	20.0	135.1	0.189	-3.760	0.140	1.0	124.5	0	21	0.0	124.5	1.0	-0.5	0.1	0.9	0.182	1.029	0.186	0.154	1.206
PC-02	PB-02 & PB-03	Foundation Soils	24.3	19.9	146.4	0.192	-3.760	0.131	1.0	135.0	0	21	0.0	135.0	1.0	-0.5	0.1	0.9	0.214	1.035	0.220	0.154	1.425
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.8	163.4	0.182	-3.650	0.111	1.0	150.7	0	21	0.0	150.7	1.0	-0.5	0.1	0.9	0.293	1.046	0.304	0.154	1.967
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.7	174.4	0.140	-4.190	0.080	1.0	160.8	0	21	0.0	160.8	1.0	-0.5	0.1	0.9	0.379	1.055	0.396	0.155	2.563
PC-02	PB-02 & PB-03	Foundation Soils	24.5	19.6	176.6	0.133	-5.670	0.075	1.0	162.7	0	21	0.0	162.7	1.0	-0.5	0.1	0.9	0.401	1.056	0.419	0.155	2.709
PC-02	PB-02 & PB-03	Foundation Soils	24.6	19.6	173.1	0.150	-6.720	0.087	1.0	159.3	0	21	0.0	159.3	1.0	-0.5	0.1	0.9	0.365	1.053	0.380	0.155	2.453
PC-02	PB-02 & PB-03	Foundation Soils	24.7	19.5	168.6	0.191	-7.250	0.113	1.0	155.0	0	21	0.0	155.0	1.0	-0.5	0.1	0.9	0.325	1.049	0.337	0.155	2.178
PC-02	PB-02 & PB-03	Foundation Soils	24.8	19.4	159.7	0.195	-7.770	0.122	1.0	146.5	0	21	0.0	146.5	1.0	-0.5	0.1	0.9	0.267	1.043	0.275	0.155	1.776
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.3	155.2	0.216	-7.290	0.139	1.0	142.2	0	21	0.0	142.2	1.0	-0.5	0.1	0.9	0.244	1.040	0.251	0.155	1.621
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.2	147.9	0.246	-7.480	0.166	1.0	135.2	0	21	0.0	135.2	1.0	-0.5	0.1	0.9	0.215	1.035	0.220	0.155	1.419
PC-03	PB-03 & PB-04	Foundation Soils	10.0	34.4	49.2	0.414	-7.290	0.842	1.3	61.4	26	25	41.6	103.0	1.1	-0.1	0.0	1.0	0.141	1.019	0.153	0.127	1.202
PC-03	PB-03 & PB-04	Foundation Soils	10.1	34.3	53.0	0.470	-1.810	0.886	1.3	65.8	25	25	41.2	107.0	1.1	-0.1	0.0	1.0	0.147	1.020	0.160	0.128	1.251
PC-03	PB-03 & PB-04	Foundation Soils	10.2	34.2	56.9	0.502	1.290	0.882	1.3	70.3	22	25	39.5	109.8	1.1	-0.1	0.0	1.0	0.152	1.022	0.165	0.128	1.286
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	59.9	0.563	1.480	0.941	1.3	73.4	22	25	40.0	113.4	1.1	-0.1	0.0	1.0	0.158	1.023	0.172	0.129	1.338
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	60.6	0.637	1.950	1.052	1.3	73.9	25	25	42.6	116.5	1.1	-0.1	0.0	1.0	0.164	1.025	0.179	0.129	1.387
PC-03	PB-03 & PB-04	Foundation Soils	10.4	34.0	61.7	0.674	3.830	1.092	1.3	75.0	25	25	43.2	118.2	1.1	-0.1	0.0	1.0	0.167	1.025	0.183	0.130	1.413
PC-03	PB-03 & PB-04	Foundation Soils	10.5	33.9	62.2	0.701	5.430	1.127	1.3	75.4	25	25	43.8	119.2	1.1	-0.1	0.0	1.0	0.170	1.026	0.186	0.130	1.427
PC-03	PB-03 & PB-04	Foundation Soils	10.6	33.8	61.7	0.712	6.340	1.153	1.3	74.7	26	25	44.5	119.2	1.1	-0.1	0.0	1.0	0.169	1.026	0.185	0.131	1.420
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	63.3	0.748	9.100	1.181	1.3	76.4	26	25	44.7	121.0	1.1	-0.1	0.0	1.0	0.174	1.027	0.190	0.131	1.451
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	67.0	0.779	9.300	1.162	1.3	80.4	24	25	43.4	123.8	1.1	-0.2	0.0	1.0	0.180	1.028	0.198	0.132	1.505
PC-03	PB-03 & PB-04	Foundation Soils	10.8	33.6	71.6	0.803	8.340	1.122	1.3	85.5	22	25	40.9	126.4	1.1	-0.2	0.0	1.0	0.187	1.030	0.206	0.132	1.559
PC-03	PB-03 & PB-04	Foundation Soils	10.9	33.5	75.9	0.828	8.340	1.091	1.3	90.3	20	25	38.1	128.4	1.1	-0.2	0.0	1.0	0.193	1.031	0.212	0.133	1.603
PC-03	PB-03 & PB-04	Foundation Soils	11.0	33.4	83.0	0.881	8.100	1.061	1.3	98.4	17	25	32.7	131.1	1.1	-0.2	0.0	1.0	0.201	1.032	0.222	0.133	1.670
PC-03	PB-03 & PB-04	Foundation Soils	11.1	33.3	93.4	0.956	7.880	1.024	1.3	110.3	13	25	22.5	132.8	1.1	-0.2	0.0	1.0	0.206	1.033	0.229	0.133	1.712
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	99.1	1.103	7.910	1.113	1.2	116.0	13	25	24.5	140.5	1.1	-0.2	0.0	1.0	0.237	1.038	0.264	0.134	1.974
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	108.2	1.240	8.290	1.147	1.2	125.8	12	25	19.9	145.7	1.1	-0.2	0.0	1.0	0.263	1.042	0.295	0.134	2.199
PC-03	PB-03 & PB-04	Foundation Soils	11.3	33.1	118.6	1.255	7.990	1.058	1.2	138.1	8	25	5.1	143.2	1.1	-0.2	0.0	1.0	0.249	1.040	0.279	0.135	2.072
PC-03	PB-03 & PB-04	Foundation Soils	11.4	33.0	125.9	1.457	7.720	1.157	1.2	145.2	8	25	7.6	152.7	1.1	-0.2	0.0	1.0	0.308	1.048	0.349	0.135	2.581
PC-03	PB-03 & PB-04	Foundation Soils	11.5	32.9	142.4	1.616	8.770	1.134	1.2	162.6	5	25	0.4	163.0	1.1	-0.2	0.0	1.0	0.405	1.057	0.466	0.136	3.437
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	173.4	1.945	10.040	1.122	1.2	193.4	0	25	0.0	193.4	1.1	-0.2	0.0	1.0	1.325	1.082	1.577	0.136	11.590
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	184.6	2.062	3.480	1.117	1.2	204.2	0	25	0.0	204.2	1.1	-0.2	0.0	1.0	2.413	1.082	2.871	0.136	21.037
PC-03	PB-03 & PB-04	Foundation Soils	11.7	32.7	183.8	2.072	0.380	1.128	1.2	203.1	0	25	0.0	203.1	1.1	-0.2	0.0	1.0	2.263	1.082	2.692	0.137	19.663
PC-03	PB-03 & PB-04	Foundation Soils	11.8	32.6	181.5	2.026	0.670	1.116	1.2	200.7	0	25	0.0	200.7	1.1	-0.2	0.0	1.0	1.967	1.082	2.340	0.137	17.043
PC-03	PB-03 & PB-04	Foundation Soils	11.9	32.5	173.1	1.917	-4.170	1.107	1.2	192.2	0	25	0.0	192.2	1.1	-0.2	0.0	1.0	1.253	1.082	1.491	0.138	10.824
PC-03	PB-03 & PB-04	Foundation Soils	12.0	32.4	181.8	1.886	-17.440	1.037	1.2	200.5	0	25	0.0	200.5	1.1	-0.2	0.0	1.0	1.947	1.082	2.316	0.138	16.770
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	190.6	1.745	-16.720	0.916	1.2	208.9	0	25	0.0	208.9	1.1	-0.2	0.0	1.0	3.238	1.082	3.852	0.139	27.809
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	193.5	1.473	-16.390	0.761	1.2	211.5	0	25	0.0	211.5	1.1	-0.2	0.0	1.0	3.854	1.082	4.585	0.139	33.007
PC-03	PB-03 & PB-04	Foundation Soils	12.2	32.2	191.7	1.540	-16.600	0.803	1.2	209.6	0	25	0.0	209.6	1.1	-0.2	0.0	1.0	3.383	1.082	4.025	0.139	28.888
PC-03	PB-03 & PB-04	Foundation Soils	12.3	32.1	187.3	1.574	-13.340	0.840	1.2	205.0	0	25	0.0	205.0	1.1	-0.2	0.0	1.0	2.536	1.082	3.017	0.140	21.595
PC-03	PB-03 & PB-04	Foundation Soils	12.4	32.0	177.9	1.643	-10.040	0.924	1.2	195.6	0	25	0.0	195.6	1.1	-0.2	0.0	1.0	1.486	1.082	1.768	0.140	12.620
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.9	168.3	1.784	-7.290	1.060	1.2	186.0	0	25	0.0	186.0	1.1	-0.2	0.0	1.0	0.934	1.081	1.111	0.140	7.905
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.8	161.5	1.843	-3.270	1.141	1.2	179.0	3	25	0.0	179.0	1.1	-0.2	0.0	1.0	0.697	1.073	0.818	0.141	5.806
PC-03	PB-03 & PB-04	Foundation Soils	12.6	31.8	152.0	1.832	1.330	1.205	1.2	169.2	5	25	1.0	170.2	1.1	-0.2	0.0	1.0	0.507	1.064	0.585	0.141	4.142
PC-03	PB-03 & PB-04	Foundation Soils	12.7	31.7	145.9	1.811	3.580	1.241	1.2	162.6	7	25	4.5	167.0	1.1	-0.2	0.0	1.0	0.457	1.060	0.525	0.142	3.707
PC-03	PB-03 & PB-04	Foundation Soils	12.8	31.6	138.7	1.713	6.240	1.235	1.2	154.8	8	25	8.0	162.8	1.1	-0.2	0.0	1.0	0.402	1.056	0.458	0.142	3.223
PC-03	PB-03 & PB-04	Foundation Soils	12.9	31.5	139.3	1.298	6.580	0.932	1.2	155.9	1	25	0.0	155.9	1.1	-0.2	0.0	1.0	0.332	1.050	0.375	0.142	2.632
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	137.3	1.293	5.810	0.942	1.2	153.6	2	25	0.0	153.6	1.1	-0.2	0.0	1.0	0.315	1.048	0.353	0.143	2.475
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	126.8	1.281	5.170	1.010	1.2	142.7	6	25	1.3	144.0	1.1	-0.2	0.0	1.0	0.254	1.041	0.281	0.143	1.965
PC-03	PB-03 & PB-04	Foundation Soils	13.1	31.3	120.2	1.272	4.670	1.059	1.2	135.2	8	25	7.4	142.6	1.1	-0.2	0.0	1.0	0.246	1.040	0.272	0.143	1.900

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	13.2	31.2	106.0	1.239	-4.000	1.169	1.2	118.7	14	25	27.0	145.8	1.1	-0.2	0.0	1.0	0.263	1.042	0.292	0.144	2.029
PC-03	PB-03 & PB-04	Foundation Soils	13.3	31.1	104.9	1.261	-4.900	1.202	1.2	117.3	15	25	29.9	147.2	1.1	-0.2	0.0	1.0	0.271	1.043	0.301	0.144	2.090
PC-03	PB-03 & PB-04	Foundation Soils	13.4	31.0	103.6	1.263	-1.330	1.220	1.2	115.6	16	25	31.9	147.5	1.1	-0.2	0.0	1.0	0.273	1.043	0.303	0.144	2.097
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	100.5	1.245	5.360	1.238	1.2	112.1	17	25	34.7	146.8	1.1	-0.2	0.0	1.0	0.269	1.043	0.298	0.145	2.057
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	97.0	1.212	5.520	1.249	1.2	108.1	18	25	37.0	145.1	1.1	-0.2	0.0	1.0	0.260	1.042	0.287	0.145	1.978
PC-03	PB-03 & PB-04	Foundation Soils	13.6	30.8	93.9	1.191	5.100	1.268	1.2	104.6	19	25	39.2	143.8	1.1	-0.2	0.0	1.0	0.253	1.041	0.279	0.146	1.917
PC-03	PB-03 & PB-04	Foundation Soils	13.7	30.7	90.9	1.158	4.290	1.275	1.2	101.2	20	25	40.7	141.9	1.1	-0.2	0.0	1.0	0.243	1.039	0.267	0.146	1.834
PC-03	PB-03 & PB-04	Foundation Soils	13.8	30.6	83.7	1.043	4.840	1.246	1.2	93.5	22	25	42.3	135.8	1.1	-0.2	0.0	1.0	0.217	1.035	0.237	0.146	1.623
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	79.2	0.991	6.680	1.252	1.2	88.5	23	25	43.8	132.2	1.1	-0.2	0.0	1.0	0.205	1.033	0.223	0.146	1.520
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	76.6	0.934	6.770	1.219	1.2	85.6	24	25	43.7	129.4	1.1	-0.2	0.0	1.0	0.195	1.031	0.212	0.147	1.444
PC-03	PB-03 & PB-04	Foundation Soils	14.0	30.4	74.4	0.912	7.000	1.225	1.2	83.2	25	25	44.4	127.6	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.147	1.400
PC-03	PB-03 & PB-04	Foundation Soils	14.1	30.3	72.7	0.889	7.450	1.223	1.2	81.2	25	25	44.8	126.0	1.0	-0.2	0.0	1.0	0.186	1.029	0.201	0.147	1.362
PC-03	PB-03 & PB-04	Foundation Soils	14.2	30.2	71.4	0.876	7.720	1.227	1.2	79.7	26	25	45.1	124.8	1.0	-0.2	0.0	1.0	0.183	1.029	0.197	0.148	1.335
PC-03	PB-03 & PB-04	Foundation Soils	14.3	30.1	69.7	0.860	7.860	1.234	1.2	77.8	27	25	45.6	123.4	1.0	-0.2	0.0	1.0	0.179	1.028	0.193	0.148	1.303
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	68.8	0.846	7.960	1.230	1.2	76.7	27	25	45.7	122.4	1.0	-0.2	0.0	1.0	0.177	1.027	0.190	0.148	1.281
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	67.4	0.839	7.960	1.245	1.2	75.1	28	25	46.2	121.3	1.0	-0.2	0.0	1.0	0.174	1.027	0.187	0.149	1.257
PC-03	PB-03 & PB-04	Foundation Soils	14.5	29.9	65.8	0.844	8.240	1.282	1.2	73.3	29	25	46.9	120.2	1.0	-0.2	0.0	1.0	0.172	1.026	0.184	0.149	1.236
PC-03	PB-03 & PB-04	Foundation Soils	14.6	29.8	64.4	0.844	8.530	1.310	1.2	71.7	30	25	47.4	119.1	1.0	-0.2	0.0	1.0	0.169	1.026	0.181	0.149	1.214
PC-03	PB-03 & PB-04	Foundation Soils	14.7	29.7	62.1	0.839	8.580	1.352	1.2	69.1	32	25	48.0	117.0	1.0	-0.2	0.0	1.0	0.165	1.025	0.176	0.150	1.178
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	58.2	0.824	8.810	1.417	1.2	64.8	35	25	48.6	113.4	1.0	-0.2	0.0	1.0	0.158	1.023	0.168	0.150	1.123
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	55.4	0.794	8.720	1.434	1.2	61.7	37	25	48.7	110.4	1.0	-0.2	0.0	1.0	0.153	1.022	0.162	0.150	1.081
PC-03	PB-03 & PB-04	Foundation Soils	14.9	29.5	53.1	0.761	8.720	1.433	1.2	59.2	38	25	48.7	107.9	1.0	-0.2	0.0	1.0	0.149	1.021	0.158	0.151	1.047
PC-03	PB-03 & PB-04	Foundation Soils	15.0	29.4	51.8	0.674	8.580	1.301	1.2	57.8	36	25	47.8	105.6	1.0	-0.2	0.0	1.0	0.145	1.020	0.154	0.151	1.018
PC-03	PB-03 & PB-04	Foundation Soils	15.1	29.3	51.5	0.612	8.270	1.187	1.2	57.4	35	25	47.0	104.4	1.0	-0.2	0.0	1.0	0.143	1.019	0.152	0.151	1.003
PC-03	PB-03 & PB-04	Foundation Soils	15.2	29.2	51.9	0.570	8.200	1.099	1.2	57.7	33	25	46.2	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.151	0.995
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	51.7	0.586	7.640	1.134	1.2	57.4	34	25	46.5	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.152	0.994
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	49.1	0.637	7.000	1.299	1.2	54.5	38	25	47.8	102.3	1.0	-0.2	0.0	1.0	0.140	1.019	0.148	0.152	0.974
PC-03	PB-03 & PB-04	Foundation Soils	15.4	29.0	42.9	0.710	6.540	1.655	1.2	47.8	47	25	48.8	96.6	1.0	-0.2	0.0	1.0	0.133	1.017	0.140	0.152	0.918
PC-03	PB-03 & PB-04	Foundation Soils	15.5	28.9	32.0	0.756	7.770	2.364	1.2	35.9	63	25	48.3	84.2	1.0	-0.2	0.0	1.0	0.120	1.013	0.125	0.153	0.819
PC-03	PB-03 & PB-04	Foundation Soils	15.6	28.8	21.3	0.793	10.330	3.722	1.2	24.2	82	25	46.6	70.8	1.0	-0.2	0.0	1.0	0.108	1.010	0.112	0.153	0.733
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.7	15.4	0.708	10.580	4.608	1.2	17.5	96	25	45.5	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.153	0.688
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.6	11.6	0.512	12.140	4.396	1.2	13.3	100	25	44.6	57.9	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.153	0.660
PC-03	PB-03 & PB-04	Foundation Soils	15.8	28.6	10.8	0.354	13.100	3.280	1.2	12.3	100	25	44.3	56.7	1.0	-0.3	0.0	1.0	0.097	1.008	0.100	0.154	0.652
PC-03	PB-03 & PB-04	Foundation Soils	15.9	28.5	11.3	0.268	20.120	2.368	1.2	12.9	92	25	44.3	57.2	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.154	0.653
PC-03	PB-03 & PB-04	Foundation Soils	16.0	28.4	20.7	0.194	50.790	0.936	1.2	23.4	58	25	44.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.110	0.154	0.711
PC-03	PB-03 & PB-04	Foundation Soils	16.1	28.3	34.9	0.173	47.490	0.496	1.2	38.8	31	25	41.4	80.2	1.0	-0.3	0.0	1.0	0.116	1.012	0.121	0.155	0.781
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	48.2	0.147	25.820	0.305	1.2	53.8	14	25	20.5	74.3	1.0	-0.3	0.0	1.0	0.111	1.011	0.115	0.155	0.743
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	49.9	0.122	14.380	0.244	1.2	56.1	10	25	9.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.155	0.693
PC-03	PB-03 & PB-04	Foundation Soils	16.3	28.1	48.3	0.201	13.960	0.416	1.2	53.4	18	25	30.1	83.6	1.0	-0.3	0.0	1.0	0.119	1.013	0.124	0.155	0.798
PC-03	PB-03 & PB-04	Foundation Soils	16.4	28.0	46.0	0.284	12.050	0.618	1.2	50.5	26	25	40.1	90.6	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.156	0.847
PC-03	PB-03 & PB-04	Foundation Soils	16.5	27.9	41.4	0.362	6.040	0.874	1.2	45.4	36	25	44.9	90.4	1.0	-0.3	0.0	1.0	0.126	1.015	0.131	0.156	0.844
PC-03	PB-03 & PB-04	Foundation Soils	16.6	27.8	37.4	0.446	8.200	1.192	1.2	41.0	45	25	46.8	87.8	1.0	-0.3	0.0	1.0	0.123	1.014	0.129	0.156	0.824
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	29.0	0.482	9.590	1.660	1.2	32.0	59	25	47.0	79.0	1.0	-0.3	0.0	1.0	0.115	1.012	0.119	0.156	0.763
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	22.8	0.495	10.720	2.169	1.2	25.3	70	25	46.3	71.6	1.0	-0.3	0.0	1.0	0.109	1.010	0.112	0.157	0.717
PC-03	PB-03 & PB-04	Foundation Soils	16.8	27.6	12.8	0.506	13.190	3.949	1.2	14.3	99	25	44.8	59.1	1.0	-0.3	0.0	1.0	0.099	1.009	0.102	0.157	0.649
PC-03	PB-03 & PB-04	Foundation Soils	16.9	27.5	8.0	0.476	22.820	5.919	1.2	9.0	100	25	43.6	52.6	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.157	0.616
PC-03	PB-03 & PB-04	Foundation Soils	17.0	27.4	6.6	0.383	36.240	5.789	1.2	7.4	100	25	43.2	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.095	0.157	0.605
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	6.0	0.272	54.600	4.525	1.2	6.7	100	25	43.0	49.8	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.158	0.600
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	6.4	0.153	69.980	2.392	1.2	7.2	100	25	43.1	50.3	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.158	0.602
PC-03	PB-03 & PB-04	Foundation Soils	17.2	27.2	5.5	0.067	66.180	1.229	1.2	6.1	100	25	42.9	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.158	0.594
PC-03	PB-03 & PB-04	Foundation Soils	17.3	27.1	4.7	0.101	71.040	2.143	1.2	5.3	100	25	42.7	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.158	0.589
PC-03	PB-03 & PB-04	Foundation Soils	17.4	27.0	4.6	0.050	79.520	1.078	1.2	5.2	100	25	42.6	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.159	0.587
PC-03	PB-03 & PB-04	Foundation Soils	17.5	26.9	7.6	0.028	86.520	0.371	1.2	8.4	80	25	42.8	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.159	0.602
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	25.6	0.038	67.370	0.148	1.2	28.0	29	25	37.8	65.9	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.159	0.674
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	38.3	0.075	44.400	0.196	1.2	41.8	17	25	26.8	68.6	1.0	-0.3	0.0	1.0	0.106	1.010	0.109	0.159	0.687
PC-03	PB-03 & PB-04	Foundation Soils	17.7	26.7	45.0	0.139	16.090	0.309	1.1	48.8	17	25	27.4	76.1	1.0	-0.3	0.0	0.9	0.112	1.011	0.116	0.159	0.728
PC-03	PB-03 & PB-04	Foundation Soils	17.8	26.6	45.8	0.247	16.690	0.539	1.1	49.2	25	25	38.5	87.7	1.0	-0.3	0.0	0.9	0.123	1.014	0.128	0.160	0.801
PC-03	PB-03 & PB-04	Foundation Soils	17.9	26.5	44.5	0.275	18.010	0.618	1.1	47.7	28	25	41.0	88.7	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.160	0.807
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	42.2	0.334	18.800	0.791	1.1	45.2	34	25	44.2	89.3	1.0	-0.3	0.0	0.9	0.125	1.014	0.130	0.160	0.809
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	41.5	0.390	19.980	0.939	1.1	44.4	38	25	45.5	89.9	1.0	-0.3	0.0	0.9	0.125	1.015	0.130	0.160	0.812
PC-03	PB-03 & PB-04	Foundation Soils	18.1	26.3	42.5	0.475	20.39	1.117193	1.1	45.3	40	25	46.6	91.9	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.161	0.826
PC-03	PB-03 & PB-04	Foundation Soils	18.2	26.2	42.4	0.629	19.730	1.484	1.1	45.0	46	25	48.1	93.1	1.0	-0.3	0.0	0.9	0.129	1.016	0.134	0.161	0.834

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	18.3	26.1	37.8	0.677	18.480	1.789	1.1	40.2	54	25	48.2	88.5	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.161	0.798
PC-03	PB-03 & PB-04	Foundation Soils	18.4	26.0	27.9	0.697	19.360	2.499	1.1	30.0	70	15	38.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.109	0.161	0.676
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	21.2	0.717	20.230	3.378	1.1	22.9	82	15	37.5	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.161	0.635
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	17.7	0.694	21.060	3.916	1.1	19.2	91	15	37.0	56.2	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.162	0.613
PC-03	PB-03 & PB-04	Foundation Soils	18.6	25.8	22.0	0.679	21.330	3.090	1.1	23.6	80	15	37.6	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.162	0.637
PC-03	PB-03 & PB-04	Foundation Soils	18.7	25.7	20.1	0.612	18.060	3.050	1.1	21.6	82	15	37.3	58.9	1.0	-0.3	0.0	0.9	0.099	1.008	0.101	0.162	0.624
PC-03	PB-03 & PB-04	Foundation Soils	18.8	25.6	12.1	0.534	19.870	4.412	1.1	13.1	100	15	36.1	49.1	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.162	0.578
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	8.7	0.446	28.490	5.151	1.1	9.4	100	15	35.3	44.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.163	0.557
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	8.2	0.372	36.240	4.555	1.1	8.8	100	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.163	0.553
PC-03	PB-03 & PB-04	Foundation Soils	19.0	25.4	7.0	0.240	57.460	3.434	1.1	7.6	100	15	35.0	42.6	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.163	0.546
PC-03	PB-03 & PB-04	Foundation Soils	19.1	25.3	6.4	0.156	69.080	2.429	1.1	6.9	100	15	34.9	41.8	1.0	-0.3	0.0	0.9	0.087	1.007	0.088	0.163	0.542
PC-03	PB-03 & PB-04	Foundation Soils	19.2	25.2	5.7	0.107	77.480	1.869	1.1	6.2	100	15	34.7	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.163	0.537
PC-03	PB-03 & PB-04	Foundation Soils	19.3	25.1	5.8	0.054	85.620	0.934	1.1	6.2	100	15	34.7	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.164	0.537
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	6.3	0.029	75.090	0.463	1.1	6.8	93	15	34.7	41.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.164	0.538
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	6.7	0.057	31.020	0.845	1.1	7.2	98	15	34.9	42.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.164	0.540
PC-03	PB-03 & PB-04	Foundation Soils	19.5	24.9	7.5	0.078	31.020	1.039	1.1	8.0	97	15	35.0	43.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.164	0.543
PC-03	PB-03 & PB-04	Foundation Soils	19.6	24.8	8.3	0.080	30.970	0.968	1.1	8.8	92	15	35.1	43.9	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.164	0.546
PC-03	PB-03 & PB-04	Foundation Soils	19.7	24.7	9.0	0.162	30.870	1.797	1.1	9.6	99	15	35.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.165	0.550
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.6	9.7	0.186	23.180	1.913	1.1	10.4	98	15	35.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.165	0.553
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.5	9.6	0.200	34.300	2.087	1.1	10.2	100	15	35.5	45.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.165	0.552
PC-03	PB-03 & PB-04	Foundation Soils	19.9	24.5	8.3	0.178	39.460	2.143	1.1	8.8	100	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.165	0.544
PC-03	PB-03 & PB-04	Foundation Soils	20.0	24.4	6.0	0.128	49.230	2.131	1.1	6.4	100	15	34.8	41.1	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.165	0.531
PC-03	PB-03 & PB-04	Foundation Soils	20.1	24.3	5.3	0.108	71.480	2.035	1.1	5.6	100	15	34.6	40.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.166	0.526
PC-03	PB-03 & PB-04	Foundation Soils	20.2	24.2	12.0	0.166	86.760	1.389	1.1	12.6	85	15	35.6	48.2	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.166	0.560
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	18.0	0.193	83.870	1.075	1.1	18.8	67	15	36.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.166	0.590
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	11.3	0.166	17.530	1.465	1.1	11.9	88	15	35.6	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.166	0.556
PC-03	PB-03 & PB-04	Foundation Soils	20.4	24.0	8.3	0.161	20.150	1.943	1.1	8.7	100	15	35.2	43.9	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.166	0.539
PC-03	PB-03 & PB-04	Foundation Soils	20.5	23.9	6.0	0.152	26.870	2.522	1.1	6.4	100	15	34.7	41.1	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.166	0.527
PC-03	PB-03 & PB-04	Foundation Soils	20.6	23.8	5.2	0.183	56.390	3.525	1.1	5.5	100	15	34.6	40.0	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.167	0.521
PC-03	PB-03 & PB-04	Foundation Soils	20.7	23.7	5.5	0.153	83.900	2.785	1.1	5.8	100	15	34.6	40.4	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.167	0.522
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	6.1	0.103	96.720	1.676	1.1	6.4	100	15	34.8	41.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.167	0.525
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	7.4	0.097	88.620	1.307	1.1	7.8	100	15	35.0	42.8	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.167	0.531
PC-03	PB-03 & PB-04	Foundation Soils	20.9	23.5	7.3	0.112	85.580	1.533	1.1	7.6	100	15	35.0	42.6	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.167	0.530
PC-03	PB-03 & PB-04	Foundation Soils	21.0	23.4	6.7	0.142	98.390	2.109	1.1	7.0	100	15	34.9	41.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.088	0.168	0.526
PC-03	PB-03 & PB-04	Foundation Soils	21.1	23.3	9.1	0.145	96.290	1.586	1.1	9.5	98	15	35.3	44.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.168	0.538
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	13.4	0.166	77.120	1.240	1.1	13.9	80	15	35.7	49.6	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.168	0.558
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	16.7	0.135	63.960	0.808	1.1	17.3	65	15	35.7	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.168	0.572
PC-03	PB-03 & PB-04	Foundation Soils	21.3	23.1	18.6	0.143	73.800	0.770	1.1	19.1	61	15	35.8	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.168	0.580
PC-03	PB-03 & PB-04	Foundation Soils	21.4	23.0	20.7	0.149	83.050	0.719	1.1	21.3	56	15	35.8	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.168	0.589
PC-03	PB-03 & PB-04	Foundation Soils	21.5	22.9	24.0	0.202	92.780	0.842	1.1	24.6	54	15	36.2	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.169	0.605
PC-03	PB-03 & PB-04	Foundation Soils	21.6	22.8	26.6	0.233	89.000	0.876	1.1	27.1	52	15	36.4	63.6	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.169	0.618
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	27.3	0.296	100.820	1.085	1.1	27.8	55	15	36.9	64.7	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.169	0.623
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	28.2	0.364	102.720	1.292	1.1	28.7	57	15	37.3	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.106	0.169	0.628
PC-03	PB-03 & PB-04	Foundation Soils	21.8	22.6	34.2	0.445	95.080	1.300	1.1	34.7	51	15	37.8	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.112	0.169	0.660
PC-03	PB-03 & PB-04	Foundation Soils	21.9	22.5	37.9	0.356	91.530	0.939	1.1	38.3	42	15	36.9	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.169	0.674
PC-03	PB-03 & PB-04	Foundation Soils	22.0	22.4	43.5	0.273	77.850	0.627	1.1	43.9	31	15	34.2	78.1	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.169	0.688
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	54.2	0.210	76.040	0.387	1.1	54.6	16	15	21.6	76.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.115	0.170	0.677
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	73.9	0.220	36.250	0.298	1.1	74.4	3	15	0.0	74.4	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.170	0.667
PC-03	PB-03 & PB-04	Foundation Soils	22.2	22.2	81.8	0.178	39.070	0.218	1.1	82.0	0	15	0.0	82.0	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.170	0.709
PC-03	PB-03 & PB-04	Foundation Soils	22.3	22.1	91.5	0.139	25.660	0.152	1.1	91.4	0	15	0.0	91.4	1.0	-0.4	0.0	0.9	0.127	1.015	0.130	0.170	0.767
PC-03	PB-03 & PB-04	Foundation Soils	22.4	22.0	109.2	0.142	19.220	0.130	1.1	108.5	0	15	0.0	108.5	1.0	-0.4	0.0	0.9	0.150	1.021	0.155	0.170	0.909
PC-03	PB-03 & PB-04	Foundation Soils	22.5	21.9	123.9	0.171	13.020	0.138	1.0	122.6	0	15	0.0	122.6	1.0	-0.4	0.0	0.9	0.177	1.028	0.185	0.170	1.084
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	134.0	0.203	0.140	0.151	1.0	132.2	0	15	0.0	132.2	1.0	-0.4	0.0	0.9	0.204	1.033	0.214	0.170	1.257
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	135.8	0.320	4.360	0.236	1.0	133.7	0	15	0.0	133.7	1.0	-0.4	0.0	0.9	0.210	1.034	0.220	0.170	1.289
PC-03	PB-03 & PB-04	Foundation Soils	22.7	21.7	135.7	0.323	13.290	0.238	1.0	133.5	0	15	0.0	133.5	1.0	-0.4	0.0	0.9	0.209	1.034	0.219	0.171	1.282
PC-03	PB-03 & PB-04	Foundation Soils	22.8	21.6	136.4	0.326	0.340	0.239	1.0	134.0	0	15	0.0	134.0	1.0	-0.4	0.0	0.9	0.211	1.034	0.221	0.171	1.292
PC-03	PB-03 & PB-04	Foundation Soils	22.9	21.5	135.5	0.431	-8.480	0.318	1.0	133.0	0	15	0.0	133.0	1.0	-0.4	0.0	0.9	0.207	1.034	0.217	0.171	1.269
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.4	132.3	0.477	-18.770	0.361	1.0	129.7	0	15	0.0	129.7	1.0	-0.4	0.0	0.9	0.197	1.032	0.205	0.171	1.200
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.3	136.0	0.420	-15.930	0.309	1.0	133.1	0	15	0.0	133.1	1.0	-0.4	0.0	0.9	0.208	1.034	0.217	0.171	1.269
PC-03	PB-03 & PB-04	Foundation Soils	23.1	21.3	139.6	0.297	-20.850	0.213	1.0	136.5	0	15	0.0	136.5	1.0	-0.4	0.0	0.9	0.220	1.036	0.230	0.171	1.346
PC-03	PB-03 & PB-04	Foundation Soils	23.2	21.2	139.1	0.232	-22.110	0.167	1.0	135.9	0	15	0.0	135.9	1.0	-0.4	0.0	0.9	0.218	1.035	0.228	0.171	1.330
PC-03	PB-03 & PB-04	Foundation Soils	23.3	21.1	132.1	0.258	-23.250	0.195	1.0	129.0	0	15	0.0	129.0	1.0	-0.4	0.0	0.9	0.194	1.031	0.203	0.171	1.181

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	23.4	21.0	120.5	0.328	-20.820	0.272	1.0	117.8	0	15	0.0	117.8	1.0	-0.4	0.0	0.9	0.166	1.025	0.172	0.172	1.004
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	105.2	0.397	-9.910	0.377	1.0	102.9	0	15	0.0	102.9	1.0	-0.4	0.0	0.9	0.141	1.019	0.145	0.172	0.844
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	106.2	0.496	-4.860	0.467	1.0	103.7	0	15	0.0	103.7	1.0	-0.4	0.0	0.9	0.142	1.019	0.146	0.172	0.851
PC-03	PB-03 & PB-04	Foundation Soils	23.6	20.8	118.4	0.484	-6.380	0.409	1.0	115.3	0	15	0.0	115.3	1.0	-0.4	0.0	0.9	0.161	1.024	0.167	0.172	0.970
PC-03	PB-03 & PB-04	Foundation Soils	23.7	20.7	142.3	0.428	-16.840	0.301	1.0	138.0	0	15	0.0	138.0	1.0	-0.4	0.0	0.9	0.226	1.037	0.236	0.172	1.374
PC-03	PB-03 & PB-04	Foundation Soils	23.8	20.6	157.5	0.341	-19.680	0.216	1.0	152.4	0	15	0.0	152.4	1.0	-0.4	0.0	0.9	0.305	1.047	0.323	0.172	1.876
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.5	170.2	0.241	-19.300	0.142	1.0	164.3	0	15	0.0	164.3	1.0	-0.4	0.0	0.9	0.420	1.058	0.450	0.172	2.610
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.4	168.5	0.210	-18.300	0.125	1.0	162.5	0	15	0.0	162.5	1.0	-0.4	0.1	0.9	0.399	1.056	0.426	0.172	2.469
PC-03	PB-03 & PB-04	Foundation Soils	24.0	20.4	161.1	0.217	-16.820	0.135	1.0	155.3	0	15	0.0	155.3	1.0	-0.4	0.1	0.9	0.328	1.050	0.347	0.172	2.015
PC-03	PB-03 & PB-04	Foundation Soils	24.1	20.3	152.5	0.272	-13.200	0.178	1.0	147.0	0	15	0.0	147.0	1.0	-0.4	0.1	0.9	0.270	1.043	0.284	0.173	1.646
PC-03	PB-03 & PB-04	Foundation Soils	24.2	20.2	139.3	0.347	-10.790	0.249	1.0	134.3	0	15	0.0	134.3	1.0	-0.5	0.1	0.9	0.212	1.034	0.220	0.173	1.276
PC-03	PB-03 & PB-04	Foundation Soils	24.3	20.1	126.5	0.444	-9.530	0.351	1.0	122.0	0	15	0.0	122.0	1.0	-0.5	0.1	0.9	0.176	1.027	0.182	0.173	1.051
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	112.0	0.465	-7.930	0.415	1.0	108.0	0	15	0.0	108.0	1.0	-0.5	0.1	0.9	0.149	1.021	0.153	0.173	0.883
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	104.7	0.374	-7.620	0.357	1.0	100.9	0	15	0.0	100.9	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.173	0.819
PC-03	PB-03 & PB-04	Foundation Soils	24.5	19.9	96.8	0.346	-13.170	0.358	1.0	93.2	0	15	0.0	93.2	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.173	0.761
PC-03	PB-03 & PB-04	Foundation Soils	24.6	19.8	89.5	0.289	-16.300	0.323	1.0	86.2	0	15	0.0	86.2	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.173	0.715
PC-03	PB-03 & PB-04	Foundation Soils	24.7	19.7	85.9	0.242	-17.250	0.282	1.0	82.6	0	15	0.0	82.6	1.0	-0.5	0.1	0.9	0.118	1.013	0.120	0.173	0.693
PC-03	PB-03 & PB-04	Foundation Soils	24.8	19.6	78.1	0.247	-13.530	0.316	1.0	75.0	3	15	0.0	75.0	1.0	-0.5	0.1	0.9	0.111	1.011	0.113	0.173	0.652
UC-01	UB-02	Foundation Soils	9.5	31.8	31.7	0.228	-9.670	0.718	1.7	50.1	32	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.157	0.629
UC-01	UB-02	Foundation Soils	9.6	31.7	34.9	0.131	-0.330	0.376	1.6	54.2	19	0	0.4	54.6	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.157	0.648
UC-01	UB-02	Foundation Soils	9.7	31.7	34.5	0.135	1.430	0.391	1.6	53.6	20	0	0.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.158	0.642
UC-01	UB-02	Foundation Soils	9.8	31.6	33.3	0.179	1.670	0.538	1.6	51.8	26	0	0.5	52.2	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.158	0.631
UC-01	UB-02	Foundation Soils	9.8	31.5	31.5	0.207	2.290	0.657	1.7	49.2	31	0	0.5	49.7	1.1	-0.1	0.0	1.0	0.092	1.008	0.098	0.159	0.616
UC-01	UB-02	Foundation Soils	9.9	31.4	30.8	0.213	0.770	0.692	1.7	48.1	33	0	0.5	48.6	1.1	-0.1	0.0	1.0	0.091	1.007	0.097	0.159	0.609
UC-01	UB-02	Foundation Soils	10.0	31.3	29.0	0.231	-1.240	0.797	1.7	45.5	37	0	0.5	46.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.095	0.160	0.594
UC-01	UB-02	Foundation Soils	10.1	31.2	27.4	0.272	-0.100	0.992	1.7	43.2	43	0	0.5	43.7	1.1	-0.1	0.0	1.0	0.088	1.007	0.093	0.160	0.581
UC-01	UB-02	Foundation Soils	10.2	31.2	28.4	0.375	-1.290	1.319	1.7	44.4	48	0	0.5	45.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.094	0.161	0.585
UC-01	UB-02	Foundation Soils	10.3	31.1	32.7	0.448	-3.480	1.372	1.6	50.1	45	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.161	0.611
UC-01	UB-02	Foundation Soils	10.3	31.0	42.0	0.497	-13.290	1.182	1.6	62.3	34	0	0.5	62.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.162	0.673
UC-01	UB-02	Foundation Soils	10.4	30.9	49.9	0.468	-20.580	0.938	1.5	72.1	25	0	0.5	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.118	0.162	0.726
UC-01	UB-02	Foundation Soils	10.5	30.8	55.2	0.418	-22.080	0.757	1.5	78.5	18	0	0.4	78.9	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.162	0.763
UC-01	UB-02	Foundation Soils	10.6	30.8	60.1	0.312	-23.600	0.519	1.5	84.3	8	0	0.1	84.4	1.1	-0.1	0.0	1.0	0.120	1.013	0.130	0.163	0.798
UC-01	UB-02	Foundation Soils	10.7	30.7	62.4	0.233	-24.250	0.373	1.5	87.0	1	0	0.0	87.0	1.1	-0.1	0.0	1.0	0.122	1.014	0.133	0.163	0.814
UC-01	UB-02	Foundation Soils	10.7	30.6	60.7	0.182	-23.300	0.300	1.5	84.6	0	0	0.0	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.130	0.164	0.795
UC-01	UB-02	Foundation Soils	10.8	30.5	57.5	0.236	-21.630	0.410	1.5	80.7	6	0	0.0	80.7	1.1	-0.2	0.0	1.0	0.116	1.012	0.126	0.164	0.766
UC-01	UB-02	Foundation Soils	10.9	30.4	50.6	0.317	-19.110	0.626	1.5	72.0	17	0	0.3	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.117	0.165	0.712
UC-01	UB-02	Foundation Soils	11.0	30.3	47.6	0.330	-17.720	0.694	1.5	68.0	21	0	0.4	68.4	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.165	0.687
UC-01	UB-02	Foundation Soils	11.1	30.3	42.0	0.317	-13.480	0.755	1.5	60.8	26	0	0.5	61.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.165	0.647
UC-01	UB-02	Foundation Soils	11.2	30.2	40.6	0.279	-9.950	0.687	1.5	58.8	25	0	0.5	59.3	1.1	-0.2	0.0	1.0	0.099	1.009	0.105	0.166	0.635
UC-01	UB-02	Foundation Soils	11.2	30.1	43.0	0.248	-7.960	0.576	1.5	61.8	21	0	0.4	62.2	1.1	-0.2	0.0	1.0	0.101	1.009	0.108	0.166	0.649
UC-01	UB-02	Foundation Soils	11.3	30.0	44.0	0.238	-5.050	0.541	1.5	62.9	19	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.166	0.652
UC-01	UB-02	Foundation Soils	11.4	29.9	44.1	0.230	-1.570	0.521	1.5	62.8	18	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.167	0.650
UC-01	UB-02	Foundation Soils	11.5	29.8	45.5	0.252	2.100	0.554	1.5	64.4	19	0	0.4	64.8	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.167	0.657
UC-01	UB-02	Foundation Soils	11.6	29.8	48.1	0.285	2.620	0.592	1.5	67.5	18	0	0.4	67.9	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.168	0.672
UC-01	UB-02	Foundation Soils	11.6	29.7	50.3	0.319	2.190	0.634	1.5	70.0	18	0	0.4	70.4	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.168	0.684
UC-01	UB-02	Foundation Soils	11.7	29.6	54.9	0.353	1.980	0.643	1.5	75.5	16	0	0.3	75.8	1.1	-0.2	0.0	1.0	0.112	1.011	0.120	0.168	0.713
UC-01	UB-02	Foundation Soils	11.8	29.5	58.7	0.402	1.520	0.684	1.4	79.9	15	0	0.3	80.2	1.1	-0.2	0.0	1.0	0.116	1.012	0.125	0.169	0.738
UC-01	UB-02	Foundation Soils	11.9	29.4	63.2	0.440	1.190	0.696	1.4	85.0	13	0	0.2	85.3	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.169	0.770
UC-01	UB-02	Foundation Soils	12.0	29.4	66.1	0.477	1.240	0.722	1.4	88.2	13	0	0.2	88.5	1.1	-0.2	0.0	1.0	0.124	1.014	0.134	0.169	0.790
UC-01	UB-02	Foundation Soils	12.1	29.3	68.0	0.507	1.300	0.745	1.4	90.3	13	0	0.2	90.5	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.170	0.803
UC-01	UB-02	Foundation Soils	12.1	29.2	70.0	0.518	1.190	0.740	1.4	92.4	12	0	0.2	92.6	1.1	-0.2	0.0	1.0	0.128	1.015	0.139	0.170	0.817
UC-01	UB-02	Foundation Soils	12.2	29.1	71.5	0.535	1.380	0.749	1.4	93.9	12	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.170	0.826
UC-01	UB-02	Foundation Soils	12.3	29.0	72.6	0.528	1.380	0.727	1.4	95.0	11	0	0.2	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.171	0.833
UC-01	UB-02	Foundation Soils	12.4	28.9	72.8	0.523	1.520	0.718	1.4	95.0	10	0	0.1	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.171	0.832
UC-01	UB-02	Foundation Soils	12.5	28.9	72.0	0.518	1.570	0.719	1.4	94.0	11	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.171	0.821
UC-01	UB-02	Foundation Soils	12.5	28.8	70.6	0.504	1.680	0.713	1.4	92.2	11	0	0.2	92.4	1.1	-0.2	0.0	1.0	0.128	1.015	0.138	0.172	0.806
UC-01	UB-02	Foundation Soils	12.6	28.7	69.4	0.482	1.720	0.695	1.4	90.5	11	0	0.2	90.7	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.172	0.791
UC-01	UB-02	Foundation Soils	12.7	28.6	67.5	0.464	2.020	0.687	1.4	88.2	12	0	0.2	88.4	1.1	-0.2	0.0	1.0	0.124	1.014	0.133	0.172	0.773
UC-01	UB-02	Foundation Soils	12.8	28.5	66.0	0.436	2.050	0.660	1.4	86.3	12	0	0.2	86.5	1.1	-0.2	0.0	1.0	0.122	1.014	0.131	0.173	0.759
UC-01	UB-02	Foundation Soils	12.9	28.5	65.4	0.411	2.150	0.629	1.4	85.4	11	0	0.2	85.5	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.173	0.751
UC-01	UB-02	Foundation Soils	13.0	28.4	64.7	0.379	2.380	0.586	1.4	84.4	10	0	0.1	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.129	0.173	0.743
UC-01	UB-02	Foundation Soils	13.0	28.3	64.5	0.375	2.430	0.582	1.4	84.0	10	0	0.1	84.1	1.1	-0.2	0.0	1.0	0.120	1.013	0.128	0.173	0.738

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	13.1	28.2	64.3	0.364	2.480	0.566	1.4	83.6	10	0	0.1	83.7	1.1	-0.2	0.0	1.0	0.119	1.013	0.128	0.174	0.734
UC-01	UB-02	Foundation Soils	13.2	28.1	60.0	0.361	6.380	0.601	1.4	78.5	13	0	0.2	78.7	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.174	0.702
UC-01	UB-02	Foundation Soils	13.3	28.0	62.8	0.370	2.380	0.589	1.4	81.5	11	0	0.2	81.7	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.174	0.719
UC-01	UB-02	Foundation Soils	13.4	28.0	62.4	0.366	2.330	0.587	1.4	80.9	12	0	0.2	81.0	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.175	0.713
UC-01	UB-02	Foundation Soils	13.5	27.9	61.4	0.358	2.540	0.583	1.4	79.6	12	0	0.2	79.8	1.1	-0.2	0.0	1.0	0.116	1.012	0.123	0.175	0.704
UC-01	UB-02	Foundation Soils	13.5	27.8	59.9	0.346	2.720	0.578	1.4	77.6	13	0	0.2	77.9	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.175	0.692
UC-01	UB-02	Foundation Soils	13.6	27.7	58.8	0.347	2.940	0.590	1.4	76.3	14	0	0.3	76.5	1.1	-0.2	0.0	1.0	0.113	1.011	0.120	0.175	0.682
UC-01	UB-02	Foundation Soils	13.7	27.6	58.3	0.374	3.050	0.641	1.4	75.5	16	0	0.3	75.8	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.176	0.678
UC-01	UB-02	Foundation Soils	13.8	27.6	58.1	0.458	3.150	0.789	1.4	75.1	20	0	0.4	75.5	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.176	0.674
UC-01	UB-02	Foundation Soils	13.9	27.5	57.4	0.517	3.150	0.900	1.4	74.2	23	0	0.5	74.6	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.176	0.668
UC-01	UB-02	Foundation Soils	13.9	27.4	56.0	0.548	3.190	0.978	1.4	72.4	25	0	0.5	72.9	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.177	0.658
UC-01	UB-02	Foundation Soils	14.0	27.3	53.2	0.477	3.330	0.896	1.4	69.0	25	0	0.5	69.5	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.177	0.639
UC-01	UB-02	Foundation Soils	14.1	27.2	50.5	0.465	3.780	0.920	1.4	65.7	27	0	0.5	66.1	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.177	0.621
UC-01	UB-02	Foundation Soils	14.2	27.1	55.0	0.458	4.340	0.832	1.4	70.8	23	0	0.4	71.2	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.177	0.645
UC-01	UB-02	Foundation Soils	14.3	27.1	70.2	0.457	4.220	0.651	1.3	88.0	11	0	0.2	88.1	1.1	-0.2	0.0	1.0	0.124	1.014	0.132	0.178	0.743
UC-01	UB-02	Foundation Soils	14.4	27.0	79.7	0.492	2.890	0.617	1.3	98.4	6	0	0.0	98.4	1.1	-0.2	0.0	1.0	0.135	1.017	0.145	0.178	0.818
UC-01	UB-02	Foundation Soils	14.4	26.9	75.4	0.530	2.150	0.703	1.3	93.4	10	0	0.1	93.5	1.1	-0.2	0.0	1.0	0.129	1.016	0.139	0.178	0.778
UC-01	UB-02	Foundation Soils	14.5	26.8	65.5	0.555	0.710	0.847	1.3	82.2	18	0	0.4	82.5	1.0	-0.2	0.0	1.0	0.118	1.013	0.125	0.178	0.704
UC-01	UB-02	Foundation Soils	14.6	26.7	54.3	0.587	0.620	1.080	1.4	69.2	29	0	0.5	69.7	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.178	0.632
UC-01	UB-02	Foundation Soils	14.7	26.6	37.4	0.621	2.050	1.659	1.4	49.2	48	0	0.6	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.179	0.538
UC-01	UB-02	Foundation Soils	14.8	26.6	25.5	0.658	3.850	2.578	1.4	34.5	69	0	0.5	35.1	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.179	0.476
UC-01	UB-02	Foundation Soils	14.8	26.5	15.7	0.640	6.340	4.087	1.5	21.9	88	0	0.5	22.4	1.0	-0.2	0.0	1.0	0.074	1.006	0.076	0.179	0.427
UC-01	UB-02	Foundation Soils	14.9	26.4	10.4	0.555	8.790	5.339	1.5	14.6	100	0	0.5	15.1	1.0	-0.2	0.0	1.0	0.069	1.006	0.072	0.180	0.399
UC-01	UB-02	Foundation Soils	15.0	26.3	8.7	0.457	9.480	5.235	1.5	12.2	100	0	0.5	12.7	1.0	-0.2	0.0	1.0	0.068	1.006	0.070	0.180	0.390
UC-01	UB-02	Foundation Soils	15.1	26.2	7.3	0.404	9.200	5.567	1.5	10.1	100	0	0.5	10.6	1.0	-0.2	0.0	1.0	0.067	1.006	0.069	0.180	0.382
UC-01	UB-02	Foundation Soils	15.2	26.2	6.8	0.295	12.530	4.314	1.5	9.5	100	0	0.5	10.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.180	0.379
UC-01	UB-02	Foundation Soils	15.3	26.1	6.2	0.225	29.660	3.655	1.5	8.6	100	0	0.5	9.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.181	0.375
UC-01	UB-02	Foundation Soils	15.3	26.0	3.9	0.135	59.460	3.425	1.5	5.5	100	0	0.5	5.9	1.0	-0.2	0.0	1.0	0.064	1.006	0.066	0.181	0.364
UC-01	UB-02	Foundation Soils	15.4	25.9	3.3	0.057	77.330	1.736	1.5	4.5	100	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.181	0.360
UC-01	UB-02	Foundation Soils	15.5	25.8	3.2	0.044	80.420	1.357	1.5	4.5	100	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.181	0.359
UC-01	UB-02	Foundation Soils	15.6	25.7	3.2	0.027	80.950	0.848	1.5	4.4	100	0	0.5	4.9	1.0	-0.2	0.0	1.0	0.063	1.006	0.065	0.182	0.359
UC-01	UB-02	Foundation Soils	15.7	25.7	3.2	0.023	79.850	0.724	1.5	4.4	100	0	0.5	4.8	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.182	0.358
UC-01	UB-02	Foundation Soils	15.7	25.6	3.1	0.025	80.950	0.802	1.5	4.3	100	0	0.5	4.7	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.182	0.357
UC-01	UB-02	Foundation Soils	15.8	25.5	3.5	0.017	85.770	0.492	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.182	0.358
UC-01	UB-02	Foundation Soils	15.9	25.4	11.1	0.017	88.220	0.154	1.4	15.1	54	0	0.5	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.183	0.393
UC-01	UB-02	Foundation Soils	16.0	25.3	23.1	0.066	70.800	0.286	1.4	30.5	34	0	0.5	31.0	1.0	-0.3	0.0	1.0	0.079	1.006	0.082	0.183	0.449
UC-01	UB-02	Foundation Soils	16.1	25.3	25.9	0.094	16.520	0.363	1.4	33.8	34	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.084	0.183	0.462
UC-01	UB-02	Foundation Soils	16.2	25.2	18.8	0.171	10.290	0.909	1.4	25.1	58	0	0.5	25.6	1.0	-0.3	0.0	1.0	0.076	1.006	0.078	0.183	0.428
UC-01	UB-02	Foundation Soils	16.2	25.1	16.1	0.230	18.480	1.430	1.4	21.6	71	0	0.5	22.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.076	0.183	0.415
UC-01	UB-02	Foundation Soils	16.3	25.0	15.3	0.310	22.870	2.024	1.4	20.6	75	0	0.5	21.1	1.0	-0.3	0.0	1.0	0.073	1.006	0.075	0.184	0.410
UC-01	UB-02	Foundation Soils	16.4	24.9	11.9	0.287	25.020	2.421	1.4	15.9	87	0	0.5	16.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.184	0.393
UC-01	UB-02	Foundation Soils	16.5	24.8	9.2	0.263	11.650	2.849	1.4	12.4	98	0	0.5	12.9	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.184	0.380
UC-01	UB-02	Foundation Soils	16.6	24.8	10.2	0.261	30.940	2.563	1.4	13.6	93	0	0.5	14.1	1.0	-0.3	0.0	1.0	0.069	1.006	0.071	0.184	0.384
UC-01	UB-02	Foundation Soils	16.7	24.7	11.7	0.244	21.440	2.090	1.4	15.6	85	0	0.5	16.1	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.185	0.390
UC-01	UB-02	Foundation Soils	16.7	24.6	8.9	0.208	26.560	2.338	1.4	11.8	96	0	0.5	12.3	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.185	0.377
UC-01	UB-02	Foundation Soils	16.8	24.5	5.5	0.155	36.080	2.810	1.4	7.3	100	0	0.5	7.8	1.0	-0.3	0.0	1.0	0.065	1.006	0.067	0.185	0.361
UC-01	UB-02	Foundation Soils	16.9	24.4	4.1	0.138	51.740	3.331	1.4	5.5	100	0	0.5	6.0	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.185	0.354
UC-01	UB-02	Foundation Soils	17.0	24.4	3.9	0.096	62.650	2.461	1.4	5.2	100	0	0.5	5.6	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.185	0.353
UC-01	UB-02	Foundation Soils	17.1	24.3	3.8	0.083	71.180	2.187	1.4	5.0	100	0	0.5	5.5	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.186	0.352
UC-01	UB-02	Foundation Soils	17.1	24.2	3.6	0.057	66.940	1.580	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.186	0.351
UC-01	UB-02	Foundation Soils	17.2	24.1	3.6	0.016	70.700	0.441	1.4	4.8	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.186	0.350
UC-01	UB-02	Foundation Soils	17.3	24.0	3.6	0.020	77.710	0.555	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.186	0.350
UC-01	UB-02	Foundation Soils	17.4	23.9	4.4	0.021	79.710	0.473	1.4	5.8	100	0	0.5	6.3	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.187	0.353
UC-01	UB-02	Foundation Soils	17.5	23.9	7.7	0.039	82.140	0.506	1.4	10.0	78	0	0.5	10.5	1.0	-0.3	0.0	1.0	0.067	1.006	0.068	0.187	0.366
UC-01	UB-02	Foundation Soils	17.6	23.8	10.3	0.121	26.730	1.175	1.4	13.4	79	0	0.5	13.9	1.0	-0.3	0.0	1.0	0.069	1.006	0.070	0.187	0.377
UC-01	UB-02	Foundation Soils	17.6	23.7	11.8	0.168	19.730	1.426	1.4	15.3	78	0	0.5	15.8	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.187	0.383
UC-01	UB-02	Foundation Soils	17.7	23.6	6.7	0.177	9.510	2.646	1.4	8.7	100	0	0.5	9.1	1.0	-0.3	0.0	0.9	0.066	1.006	0.068	0.187	0.360
UC-01	UB-02	Foundation Soils	17.8	23.5	5.3	0.169	22.960	3.187	1.4	6.8	100	0	0.5	7.3	1.0	-0.3	0.0	0.9	0.065	1.006	0.066	0.187	0.354
UC-01	UB-02	Foundation Soils	17.9	23.5	4.6	0.160	27.560	3.462	1.4	6.0	100	0	0.5	6.4	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.188	0.351
UC-01	UB-02	Foundation Soils	18.0	23.4	4.2	0.108	40.740	2.569	1.4	5.4	100	0	0.5	5.9	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.188	0.349
UC-01	UB-02	Foundation Soils	18.0	23.3	3.9	0.095	59.000	2.443	1.3	4.8	100	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.188	0.466
UC-01	UB-02	Foundation Soils	18.1	23.2	4.6	0.075	69.130	1.616	1.3	5.7	100	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.188	0.469

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	18.2	23.1	5.6	0.078	66.510	1.404	1.3	6.8	100	15	34.8	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.188	0.474
UC-01	UB-02	Foundation Soils	18.3	23.0	5.3	0.076	8.950	1.435	1.3	6.5	100	15	34.8	41.2	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.189	0.472
UC-01	UB-02	Foundation Soils	18.4	23.0	4.8	0.077	29.940	1.595	1.3	5.9	100	15	34.7	40.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.189	0.469
UC-01	UB-02	Foundation Soils	18.5	22.9	4.1	0.069	41.450	1.663	1.3	5.1	100	15	34.5	39.6	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.189	0.464
UC-01	UB-02	Foundation Soils	18.5	22.8	3.8	0.052	51.870	1.385	1.3	4.6	100	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.189	0.462
UC-01	UB-02	Foundation Soils	18.6	22.7	3.6	0.038	62.470	1.061	1.3	4.4	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.189	0.460
UC-01	UB-02	Foundation Soils	18.7	22.6	3.6	0.028	71.900	0.785	1.3	4.3	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.190	0.459
UC-01	UB-02	Foundation Soils	18.8	22.5	3.6	0.035	71.280	0.982	1.3	4.3	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.190	0.459
UC-01	UB-02	Foundation Soils	18.9	22.5	3.5	0.028	72.820	0.794	1.3	4.3	100	15	34.3	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.087	0.190	0.458
UC-01	UB-02	Foundation Soils	18.9	22.4	3.8	0.018	76.870	0.475	1.3	4.6	100	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.190	0.459
UC-01	UB-02	Foundation Soils	19.0	22.3	4.2	0.023	74.230	0.552	1.3	5.0	100	15	34.5	39.5	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.190	0.461
UC-01	UB-02	Foundation Soils	19.1	22.2	5.1	0.019	68.390	0.369	1.3	6.2	94	15	34.6	40.8	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.190	0.465
UC-01	UB-02	Foundation Soils	19.2	22.1	5.8	0.025	56.600	0.435	1.3	6.9	91	15	34.7	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.191	0.467
UC-01	UB-02	Foundation Soils	19.3	22.1	4.8	0.027	43.120	0.563	1.3	5.7	100	15	34.6	40.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.191	0.462
UC-01	UB-02	Foundation Soils	19.4	22.0	4.0	0.023	56.410	0.578	1.3	4.8	100	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.191	0.457
UC-01	UB-02	Foundation Soils	19.4	21.9	4.1	0.051	73.490	1.253	1.3	4.9	100	15	34.5	39.3	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.191	0.457
UC-01	UB-02	Foundation Soils	19.5	21.8	4.5	0.076	73.980	1.684	1.3	5.4	100	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.191	0.459
UC-01	UB-02	Foundation Soils	19.6	21.7	4.8	0.175	71.040	3.666	1.3	5.7	100	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.191	0.460
UC-01	UB-02	Foundation Soils	19.7	21.6	4.5	0.123	65.130	2.742	1.3	5.3	100	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.192	0.458
UC-01	UB-02	Foundation Soils	19.8	21.6	4.6	0.094	59.750	2.025	1.3	5.5	100	15	34.6	40.1	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.192	0.458
UC-01	UB-02	Foundation Soils	19.8	21.5	13.4	0.063	83.310	0.470	1.2	15.6	61	15	35.2	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.192	0.499
UC-01	UB-02	Foundation Soils	19.9	21.4	54.2	0.063	98.530	0.116	1.2	62.2	0	0	0.0	62.2	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.192	0.545
UC-01	UB-02	Foundation Soils	20.0	21.3	62.0	0.090	-0.200	0.145	1.2	70.5	0	0	0.0	70.5	1.0	-0.3	0.0	0.9	0.108	1.010	0.112	0.192	0.582
UC-01	UB-02	Foundation Soils	20.1	21.2	47.1	0.135	0.380	0.287	1.2	54.3	13	0	0.2	54.5	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.192	0.513
UC-01	UB-02	Foundation Soils	20.2	21.2	37.1	0.171	6.730	0.461	1.2	43.2	28	0	0.4	43.7	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.192	0.470
UC-01	UB-02	Foundation Soils	20.3	21.1	22.4	0.256	18.200	1.145	1.3	26.7	59	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.192	0.410
UC-01	UB-02	Foundation Soils	20.3	21.0	20.1	0.344	25.510	1.708	1.3	24.1	70	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.193	0.400
UC-01	UB-02	Foundation Soils	20.4	20.9	27.8	0.416	26.820	1.498	1.2	32.6	58	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.193	0.430
UC-01	UB-02	Foundation Soils	20.5	20.8	30.6	0.384	26.520	1.257	1.2	35.7	52	0	0.5	36.2	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.193	0.441
UC-01	UB-02	Foundation Soils	20.6	20.7	16.4	0.277	16.910	1.686	1.3	19.7	74	0	0.5	20.2	1.0	-0.4	0.0	0.9	0.073	1.006	0.074	0.193	0.384
UC-01	UB-02	Foundation Soils	20.7	20.7	13.2	0.210	18.250	1.593	1.3	15.7	80	0	0.5	16.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.193	0.371
UC-01	UB-02	Foundation Soils	20.8	20.6	23.7	0.132	21.150	0.558	1.2	27.8	45	0	0.5	28.3	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.193	0.412
UC-01	UB-02	Foundation Soils	20.8	20.5	48.4	0.112	21.720	0.231	1.2	54.8	10	0	0.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.193	0.511
UC-01	UB-02	Foundation Soils	20.9	20.4	72.9	0.114	11.480	0.156	1.2	80.6	0	0	0.0	80.6	1.0	-0.4	0.0	0.9	0.116	1.012	0.121	0.193	0.625
UC-01	UB-02	Foundation Soils	21.0	20.3	75.9	0.151	9.770	0.199	1.2	83.6	0	0	0.0	83.6	1.0	-0.4	0.0	0.9	0.119	1.013	0.124	0.193	0.641
UC-01	UB-02	Foundation Soils	21.1	20.3	51.3	0.300	8.910	0.584	1.2	57.7	22	0	0.4	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.194	0.522
UC-01	UB-02	Foundation Soils	21.2	20.2	33.3	0.354	8.580	1.064	1.2	38.1	46	0	0.5	38.6	1.0	-0.4	0.0	0.9	0.084	1.007	0.087	0.194	0.447
UC-01	UB-02	Foundation Soils	21.2	20.1	19.5	0.345	14.680	1.766	1.2	22.8	70	0	0.5	23.3	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.194	0.393
UC-01	UB-02	Foundation Soils	21.3	20.0	15.2	0.444	15.910	2.927	1.2	17.8	89	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.194	0.376
UC-01	UB-02	Foundation Soils	21.4	19.9	15.7	0.417	30.110	2.658	1.2	18.3	86	0	0.5	18.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.194	0.377
UC-01	UB-02	Foundation Soils	21.5	19.8	37.5	0.279	22.870	0.745	1.2	42.4	36	0	0.5	42.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.090	0.194	0.461
UC-01	UB-02	Foundation Soils	21.6	19.8	41.6	0.307	13.390	0.738	1.2	46.7	33	0	0.5	47.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.093	0.194	0.477
UC-01	UB-02	Foundation Soils	21.7	19.7	34.9	0.300	18.800	0.861	1.2	39.4	41	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.194	0.450
UC-01	UB-02	Foundation Soils	21.7	19.6	35.3	0.224	20.160	0.635	1.2	39.7	35	0	0.5	40.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.194	0.451
UC-01	UB-02	Foundation Soils	21.8	19.5	35.0	0.294	20.890	0.841	1.2	39.3	41	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.195	0.449
UC-01	UB-02	Foundation Soils	21.9	19.4	39.5	0.503	17.960	1.273	1.2	44.1	45	0	0.5	44.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.195	0.466
UC-01	UB-02	Foundation Soils	22.0	19.3	52.4	0.449	19.850	0.857	1.2	57.7	29	0	0.5	58.2	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.195	0.518
UC-01	UB-02	Foundation Soils	22.1	19.3	65.8	0.600	16.480	0.912	1.2	71.6	24	0	0.5	72.0	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.195	0.577
UC-01	UB-02	Foundation Soils	22.1	19.2	73.2	0.433	17.530	0.592	1.1	79.1	12	0	0.2	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.119	0.195	0.611
UC-01	UB-02	Foundation Soils	22.2	19.1	70.7	0.376	7.340	0.532	1.1	76.4	11	0	0.2	76.5	1.0	-0.4	0.0	0.9	0.113	1.011	0.116	0.195	0.597
UC-01	UB-02	Foundation Soils	22.3	19.0	70.4	0.290	24.020	0.412	1.1	76.0	7	0	0.0	76.1	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.195	0.595
UC-01	UB-02	Foundation Soils	22.4	18.9	71.9	0.378	13.870	0.526	1.1	77.4	11	0	0.1	77.6	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.195	0.602
UC-01	UB-02	Foundation Soils	22.5	18.9	68.5	0.469	11.860	0.685	1.1	73.7	17	0	0.3	74.1	1.0	-0.4	0.0	0.9	0.111	1.011	0.114	0.195	0.585
UC-01	UB-02	Foundation Soils	22.6	18.8	64.2	0.485	20.770	0.756	1.1	69.2	21	0	0.4	69.6	1.0	-0.4	0.0	0.9	0.107	1.010	0.110	0.195	0.564
UC-01	UB-02	Foundation Soils	22.6	18.7	56.6	0.443	19.700	0.783	1.1	61.3	25	0	0.5	61.7	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.195	0.530
UC-01	UB-02	Foundation Soils	22.7	18.6	52.8	0.304	22.390	0.576	1.1	57.2	22	0	0.4	57.6	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.195	0.513
UC-01	UB-02	Foundation Soils	22.8	18.5	58.4	0.300	22.060	0.514	1.1	62.9	17	0	0.3	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.195	0.536
UC-01	UB-02	Foundation Soils	22.9	18.4	76.4	0.354	16.510	0.463	1.1	81.3	7	0	0.0	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.195	0.618
UC-01	UB-02	Foundation Soils	23.0	18.4	76.7	0.356	16.320	0.464	1.1	81.4	7	0	0.0	81.4	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.196	0.618
UC-01	UB-02	Foundation Soils	23.0	18.3	73.0	0.362	17.010	0.496	1.1	77.6	10	0	0.1	77.7	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.196	0.599
UC-01	UB-02	Foundation Soils	23.1	18.2	75.4	0.386	19.210	0.512	1.1	79.9	9	0	0.1	80.0	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.196	0.610
UC-01	UB-02	Foundation Soils	23.2	18.1	80.6	0.379	19.300	0.470	1.1	85.0	6	0	0.0	85.0	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.196	0.636

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	23.3	18.0	81.6	0.411	22.390	0.504	1.1	85.9	7	0	0.0	85.9	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.196	0.641
UC-01	UB-02	Foundation Soils	23.4	18.0	80.6	0.515	23.110	0.639	1.1	84.8	11	0	0.2	85.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.196	0.635
UC-01	UB-02	Foundation Soils	23.5	17.9	78.0	0.561	22.910	0.719	1.1	82.0	15	0	0.3	82.3	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.196	0.620
UC-01	UB-02	Foundation Soils	23.5	17.8	76.3	0.586	24.350	0.768	1.1	80.2	17	0	0.3	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.120	0.196	0.611
UC-01	UB-02	Foundation Soils	23.6	17.7	73.2	0.566	24.060	0.773	1.1	76.9	18	0	0.4	77.3	1.0	-0.4	0.0	0.9	0.113	1.011	0.117	0.196	0.595
UC-01	UB-02	Foundation Soils	23.7	17.6	77.4	0.574	23.420	0.742	1.1	81.0	16	0	0.3	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.196	0.615
UC-01	UB-02	Foundation Soils	23.8	17.5	82.8	0.632	19.680	0.763	1.1	86.3	14	0	0.3	86.6	1.0	-0.4	0.0	0.9	0.122	1.014	0.126	0.196	0.642
UC-01	UB-02	Foundation Soils	23.9	17.5	81.7	0.653	15.390	0.799	1.1	85.0	16	0	0.3	85.4	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.196	0.635
UC-01	UB-02	Foundation Soils	23.9	17.4	78.7	0.592	17.120	0.752	1.1	81.9	16	0	0.3	82.3	1.0	-0.4	0.1	0.9	0.118	1.013	0.121	0.196	0.618
UC-01	UB-02	Foundation Soils	24.0	17.3	77.0	0.581	20.020	0.755	1.1	80.1	16	0	0.3	80.4	1.0	-0.4	0.1	0.9	0.116	1.012	0.120	0.196	0.609
UC-01	UB-02	Foundation Soils	24.1	17.2	90.4	0.558	20.490	0.617	1.1	93.4	8	0	0.1	93.4	1.0	-0.4	0.1	0.9	0.129	1.016	0.134	0.196	0.681
UC-01	UB-02	Foundation Soils	24.2	17.1	102.2	0.491	18.960	0.480	1.1	105.0	0	0	0.0	105.0	1.0	-0.5	0.1	0.9	0.144	1.020	0.150	0.196	0.763
UC-01	UB-02	Foundation Soils	24.3	17.1	101.9	0.487	17.410	0.478	1.1	104.5	0	0	0.0	104.5	1.0	-0.5	0.1	0.9	0.143	1.019	0.149	0.196	0.758
UC-01	UB-02	Foundation Soils	24.4	17.0	97.3	0.500	17.960	0.514	1.1	99.9	2	0	0.0	99.9	1.0	-0.5	0.1	0.9	0.137	1.018	0.142	0.197	0.723
UC-01	UB-02	Foundation Soils	24.4	16.9	91.8	0.498	20.490	0.543	1.1	94.2	5	0	0.0	94.2	1.0	-0.5	0.1	0.9	0.130	1.016	0.135	0.197	0.684
UC-01	UB-02	Foundation Soils	24.5	16.8	84.8	0.445	20.630	0.525	1.1	87.1	7	0	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.126	0.197	0.642
UC-01	UB-02	Foundation Soils	24.6	16.7	80.8	0.435	21.060	0.538	1.1	83.1	9	0	0.1	83.2	1.0	-0.5	0.1	0.9	0.119	1.013	0.122	0.197	0.621
UC-01	UB-02	Foundation Soils	24.7	16.6	71.3	0.463	22.540	0.649	1.1	73.5	16	0	0.3	73.8	1.0	-0.5	0.1	0.9	0.110	1.011	0.113	0.197	0.575
UC-01	UB-02	Foundation Soils	24.8	16.6	63.9	0.492	21.150	0.770	1.1	65.9	23	0	0.4	66.4	1.0	-0.5	0.1	0.9	0.104	1.010	0.107	0.197	0.542
UC-01	UB-02	Foundation Soils	24.9	16.5	49.9	0.523	22.730	1.048	1.1	51.8	36	0	0.5	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.197	0.486
UC-01	UB-02	Foundation Soils	24.9	16.4	42.5	0.513	27.350	1.206	1.1	44.3	43	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.197	0.458
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.7	21.2	0.217	-0.090	1.023	1.6	32.9	49	20	42.3	75.2	1.1	-0.1	0.0	1.0	0.112	1.011	0.122	0.129	0.944
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.6	20.7	0.205	-0.110	0.989	1.6	32.1	49	20	42.2	74.3	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.130	0.931
UC-02A	UB-02 & UB-03	Foundation Soils	7.2	34.5	19.8	0.184	-0.050	0.931	1.6	30.7	50	20	42.0	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.119	0.130	0.912
UC-02A	UB-02 & UB-03	Foundation Soils	7.3	34.5	19.1	0.158	-0.050	0.829	1.6	29.6	49	20	41.6	71.2	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.131	0.896
UC-02A	UB-02 & UB-03	Foundation Soils	7.4	34.4	19.1	0.139	-0.240	0.727	1.6	29.6	47	20	41.3	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.132	0.889
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.3	19.5	0.124	-0.100	0.636	1.6	30.1	44	20	40.8	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.132	0.885
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.2	19.8	0.117	-0.050	0.590	1.6	30.5	43	20	40.6	71.1	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.133	0.881
UC-02A	UB-02 & UB-03	Foundation Soils	7.6	34.1	19.7	0.110	-0.100	0.560	1.6	30.2	42	20	40.4	70.6	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.134	0.872
UC-02A	UB-02 & UB-03	Foundation Soils	7.7	34.0	19.3	0.099	-0.010	0.513	1.6	29.6	42	20	40.1	69.7	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.134	0.862
UC-02A	UB-02 & UB-03	Foundation Soils	7.8	34.0	18.7	0.105	-0.050	0.562	1.6	28.6	44	20	40.5	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.135	0.853
UC-02A	UB-02 & UB-03	Foundation Soils	7.9	33.9	18.5	0.112	-0.050	0.604	1.6	28.3	45	20	40.7	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.136	0.848
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.8	18.0	0.112	-0.050	0.621	1.6	27.5	47	20	40.8	68.3	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.136	0.839
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.7	17.5	0.119	0.000	0.679	1.6	26.7	49	20	41.0	67.7	1.1	-0.1	0.0	1.0	0.105	1.010	0.114	0.137	0.830
UC-02A	UB-02 & UB-03	Foundation Soils	8.1	33.6	17.1	0.127	-0.050	0.741	1.6	26.1	51	20	41.2	67.3	1.1	-0.1	0.0	1.0	0.105	1.010	0.113	0.138	0.823
UC-02A	UB-02 & UB-03	Foundation Soils	8.2	33.5	16.3	0.129	-0.330	0.791	1.6	24.8	54	20	41.3	66.1	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.138	0.811
UC-02A	UB-02 & UB-03	Foundation Soils	8.3	33.5	15.8	0.124	0.000	0.786	1.6	24.0	55	20	41.2	65.2	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.139	0.802
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.4	15.4	0.119	-0.140	0.775	1.6	23.3	56	20	41.2	64.5	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.139	0.793
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.3	15.0	0.114	0.000	0.761	1.6	22.7	56	20	41.1	63.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.140	0.785
UC-02A	UB-02 & UB-03	Foundation Soils	8.5	33.2	14.9	0.110	0.000	0.741	1.6	22.4	56	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.141	0.780
UC-02A	UB-02 & UB-03	Foundation Soils	8.6	33.1	14.9	0.109	0.000	0.731	1.6	22.5	56	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.141	0.776
UC-02A	UB-02 & UB-03	Foundation Soils	8.7	33.1	14.8	0.112	-0.190	0.757	1.6	22.2	57	20	41.1	63.3	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.142	0.772
UC-02A	UB-02 & UB-03	Foundation Soils	8.8	33.0	14.3	0.117	0.000	0.816	1.6	21.5	59	20	41.1	62.7	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.142	0.764
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.9	13.8	0.110	-0.290	0.799	1.6	20.7	60	20	41.0	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.108	0.143	0.755
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.8	13.3	0.088	0.000	0.662	1.6	19.9	58	20	40.7	60.7	1.1	-0.1	0.0	1.0	0.100	1.009	0.107	0.143	0.746
UC-02A	UB-02 & UB-03	Foundation Soils	9.0	32.7	12.6	0.082	-0.050	0.653	1.6	18.8	60	20	40.6	59.5	1.1	-0.1	0.0	1.0	0.099	1.009	0.106	0.144	0.736
UC-02A	UB-02 & UB-03	Foundation Soils	9.1	32.6	11.5	0.081	0.000	0.702	1.6	17.3	64	20	40.6	57.9	1.1	-0.1	0.0	1.0	0.098	1.008	0.105	0.144	0.724
UC-02A	UB-02 & UB-03	Foundation Soils	9.2	32.6	11.0	0.080	-0.190	0.725	1.6	16.5	66	20	40.6	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.145	0.716
UC-02A	UB-02 & UB-03	Foundation Soils	9.3	32.5	11.2	0.081	1.750	0.726	1.6	16.7	66	20	40.6	57.3	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.146	0.714
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.4	11.2	0.089	2.570	0.792	1.6	16.7	67	20	40.7	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.146	0.712
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.3	11.2	0.103	4.510	0.922	1.6	16.6	70	20	40.8	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.147	0.709
UC-02A	UB-02 & UB-03	Foundation Soils	9.5	32.2	11.0	0.121	5.490	1.102	1.6	16.3	69	20	40.7	57.0	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.147	0.704
UC-02A	UB-02 & UB-03	Foundation Soils	9.6	32.2	10.4	0.124	6.200	1.192	1.6	15.4	72	20	40.7	56.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.103	0.148	0.696
UC-02A	UB-02 & UB-03	Foundation Soils	9.7	32.1	9.7	0.134	5.340	1.378	1.6	14.4	72	20	40.5	54.9	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.148	0.687
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	32.0	9.0	0.141	4.820	1.565	1.6	13.4	77	20	40.5	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.149	0.679
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	31.9	8.2	0.133	3.760	1.613	1.6	12.2	81	20	40.4	52.6	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.149	0.669
UC-02A	UB-02 & UB-03	Foundation Soils	9.9	31.8	9.3	0.119	2.420	1.283	1.6	13.7	73	20	40.3	54.0	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.150	0.675
UC-02A	UB-02 & UB-03	Foundation Soils	10.0	31.7	10.1	0.117	-2.520	1.157	1.6	14.8	73	20	40.6	55.4	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.150	0.680
UC-02A	UB-02 & UB-03	Foundation Soils	10.1	31.7	9.7	0.114	-3.380	1.173	1.6	14.2	74	20	40.5	54.8	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.151	0.674
UC-02A	UB-02 & UB-03	Foundation Soils	10.2	31.6	9.6	0.108	1.650	1.128	1.5	14.0	74	20	40.5	54.5	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.151	0.670
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.5	9.3	0.095	5.250	1.026	1.5	13.5	74	20	40.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.152	0.665
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.4	9.2	0.098	4.910	1.064	1.5	13.4	75	20	40.4	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.152	0.662

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	10.4	31.3	9.3	0.101	2.070	1.092	1.5	13.4	71	20	40.2	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.153	0.659
UC-02A	UB-02 & UB-03	Foundation Soils	10.5	31.3	9.4	0.122	1.720	1.292	1.5	13.7	74	20	40.4	54.1	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.153	0.659
UC-02A	UB-02 & UB-03	Foundation Soils	10.6	31.2	9.2	0.131	3.220	1.425	1.5	13.3	76	20	40.4	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.153	0.655
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.1	8.4	0.132	5.190	1.575	1.5	12.1	81	20	40.4	52.5	1.0	-0.1	0.0	1.0	0.094	1.008	0.099	0.154	0.646
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.0	8.1	0.133	8.160	1.640	1.5	11.7	83	20	40.3	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.154	0.642
UC-02A	UB-02 & UB-03	Foundation Soils	10.8	30.9	9.4	0.124	8.860	1.316	1.5	13.5	75	20	40.4	53.9	1.0	-0.2	0.0	1.0	0.095	1.008	0.101	0.155	0.650
UC-02A	UB-02 & UB-03	Foundation Soils	10.9	30.8	10.7	0.112	3.690	1.044	1.5	15.3	70	20	40.6	55.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.102	0.155	0.658
UC-02A	UB-02 & UB-03	Foundation Soils	11.0	30.8	12.6	0.121	0.330	0.963	1.5	17.7	68	20	41.0	58.7	1.1	-0.2	0.0	1.0	0.099	1.008	0.104	0.156	0.671
UC-02A	UB-02 & UB-03	Foundation Soils	11.1	30.7	13.4	0.139	-0.450	1.036	1.5	18.8	67	20	41.1	60.0	1.1	-0.2	0.0	1.0	0.100	1.009	0.105	0.156	0.676
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.6	13.7	0.137	1.240	0.999	1.5	19.2	66	20	41.1	60.3	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.156	0.676
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.5	13.7	0.127	4.670	0.925	1.5	19.2	65	20	41.1	60.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.157	0.673
UC-02A	UB-02 & UB-03	Foundation Soils	11.3	30.4	14.4	0.135	5.860	0.939	1.5	20.0	64	20	41.2	61.1	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.157	0.676
UC-02A	UB-02 & UB-03	Foundation Soils	11.4	30.4	15.9	0.149	1.200	0.935	1.5	22.0	60	20	41.3	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.158	0.686
UC-02A	UB-02 & UB-03	Foundation Soils	11.5	30.3	16.7	0.172	0.240	1.030	1.5	22.9	61	20	41.6	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.158	0.691
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.2	16.8	0.201	0.670	1.199	1.5	23.0	63	20	41.8	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.159	0.690
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.1	17.1	0.240	3.110	1.405	1.4	23.3	66	20	42.0	65.3	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.159	0.691
UC-02A	UB-02 & UB-03	Foundation Soils	11.7	30.0	17.8	0.231	4.750	1.298	1.4	24.2	63	20	42.0	66.2	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.159	0.694
UC-02A	UB-02 & UB-03	Foundation Soils	11.8	29.9	18.6	0.228	5.380	1.227	1.4	25.1	61	20	42.0	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.111	0.160	0.698
UC-02A	UB-02 & UB-03	Foundation Soils	11.9	29.9	19.9	0.240	5.960	1.204	1.4	26.8	59	20	42.2	69.0	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.160	0.706
UC-02A	UB-02 & UB-03	Foundation Soils	12.0	29.8	21.2	0.218	5.650	1.030	1.4	28.3	54	20	42.0	70.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.114	0.160	0.712
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.7	22.2	0.198	3.430	0.892	1.4	29.6	50	20	41.7	71.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.161	0.716
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.6	23.2	0.188	3.290	0.812	1.4	30.8	47	20	41.5	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.116	0.161	0.720
UC-02A	UB-02 & UB-03	Foundation Soils	12.2	29.5	24.1	0.194	5.270	0.804	1.4	31.9	46	20	41.5	73.4	1.1	-0.2	0.0	1.0	0.110	1.011	0.117	0.162	0.725
UC-02A	UB-02 & UB-03	Foundation Soils	12.3	29.4	24.6	0.238	5.880	0.967	1.4	32.4	48	20	42.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.162	0.729
UC-02A	UB-02 & UB-03	Foundation Soils	12.4	29.4	24.6	0.261	6.190	1.062	1.4	32.3	50	20	42.3	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.162	0.728
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.3	24.0	0.356	7.190	1.483	1.4	31.5	58	20	43.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.163	0.726
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.2	24.1	0.350	7.880	1.450	1.4	31.6	57	20	43.0	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.163	0.724
UC-02A	UB-02 & UB-03	Foundation Soils	12.6	29.1	27.9	0.344	10.290	1.235	1.4	36.1	50	20	43.0	79.1	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.163	0.750
UC-02A	UB-02 & UB-03	Foundation Soils	12.7	29.0	27.1	0.335	17.770	1.235	1.4	35.1	50	20	43.0	78.1	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.164	0.742
UC-02A	UB-02 & UB-03	Foundation Soils	12.8	29.0	24.3	0.335	6.170	1.378	1.4	31.6	56	20	42.9	74.5	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.164	0.718
UC-02A	UB-02 & UB-03	Foundation Soils	12.9	28.9	23.2	0.288	3.910	1.239	1.4	30.2	55	20	42.6	72.8	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.164	0.707
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.8	21.7	0.259	6.670	1.193	1.4	28.3	57	20	42.3	70.6	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.165	0.692
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.7	20.7	0.331	9.480	1.598	1.4	26.9	64	20	42.6	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.165	0.685
UC-02A	UB-02 & UB-03	Foundation Soils	13.1	28.6	18.1	0.380	9.600	2.096	1.4	23.7	70	20	42.4	66.0	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.165	0.665
UC-02A	UB-02 & UB-03	Foundation Soils	13.2	28.5	15.2	0.398	3.020	2.617	1.4	20.0	77	20	41.9	61.8	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.166	0.641
UC-02A	UB-02 & UB-03	Foundation Soils	13.3	28.5	13.2	0.263	5.340	1.989	1.4	17.4	76	20	41.3	58.7	1.0	-0.2	0.0	1.0	0.099	1.008	0.104	0.166	0.624
UC-02A	UB-02 & UB-03	Foundation Soils	13.4	28.4	12.1	0.197	11.400	1.627	1.4	16.0	75	20	40.9	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.166	0.614
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.3	17.8	0.135	20.680	0.759	1.4	23.1	55	20	41.1	64.2	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.167	0.649
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.2	20.5	0.061	7.310	0.297	1.4	26.6	38	20	38.5	65.1	1.0	-0.2	0.0	1.0	0.103	1.009	0.109	0.167	0.652
UC-02A	UB-02 & UB-03	Foundation Soils	13.6	28.1	17.6	0.041	-5.620	0.233	1.4	22.9	40	20	38.5	61.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.167	0.632
UC-02A	UB-02 & UB-03	Foundation Soils	13.7	28.1	15.4	0.049	-2.530	0.319	1.4	20.0	48	20	39.5	59.5	1.0	-0.2	0.0	1.0	0.099	1.009	0.104	0.168	0.621
UC-02A	UB-02 & UB-03	Foundation Soils	13.8	28.0	12.5	0.049	2.140	0.392	1.4	16.3	58	20	39.9	56.2	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.168	0.604
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.9	10.5	0.070	22.000	0.665	1.4	13.8	70	20	40.2	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.168	0.592
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.8	9.6	0.091	26.680	0.948	1.4	12.5	74	20	40.1	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.168	0.585
UC-02A	UB-02 & UB-03	Foundation Soils	14.0	27.7	10.1	0.101	27.490	0.999	1.4	13.2	73	20	40.2	53.4	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.169	0.587
UC-02A	UB-02 & UB-03	Foundation Soils	14.1	27.6	11.9	0.122	20.960	1.023	1.4	15.4	70	20	40.6	56.0	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.169	0.598
UC-02A	UB-02 & UB-03	Foundation Soils	14.2	27.6	12.6	0.109	14.850	0.864	1.4	16.3	69	20	40.7	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.169	0.601
UC-02A	UB-02 & UB-03	Foundation Soils	14.3	27.5	12.3	0.122	8.720	0.992	1.4	15.8	69	20	40.6	56.4	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.170	0.598
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.4	13.3	0.124	11.770	0.935	1.4	17.0	69	20	40.8	57.8	1.0	-0.2	0.0	1.0	0.098	1.008	0.102	0.170	0.603
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.3	18.4	0.139	9.710	0.757	1.3	23.2	55	20	41.1	64.3	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.170	0.634
UC-02A	UB-02 & UB-03	Foundation Soils	14.5	27.2	22.2	0.170	9.370	0.767	1.3	27.8	49	20	41.3	69.0	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.170	0.657
UC-02A	UB-02 & UB-03	Foundation Soils	14.6	27.2	31.1	0.212	10.390	0.682	1.3	38.4	37	20	40.5	78.9	1.0	-0.2	0.0	1.0	0.115	1.012	0.121	0.171	0.710
UC-02A	UB-02 & UB-03	Foundation Soils	14.7	27.1	39.3	0.271	8.340	0.690	1.3	47.9	30	20	39.2	87.0	1.0	-0.2	0.0	1.0	0.123	1.014	0.130	0.171	0.760
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	27.0	47.7	0.379	7.770	0.794	1.3	57.5	27	20	38.6	96.1	1.0	-0.2	0.0	1.0	0.132	1.016	0.141	0.171	0.825
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	26.9	59.4	0.426	6.920	0.718	1.3	70.9	19	20	30.6	101.6	1.1	-0.2	0.0	1.0	0.139	1.018	0.149	0.171	0.870
UC-02A	UB-02 & UB-03	Foundation Soils	14.9	26.8	67.3	0.479	6.960	0.712	1.3	80.1	15	20	23.8	103.9	1.1	-0.2	0.0	1.0	0.143	1.019	0.153	0.172	0.890
UC-02A	UB-02 & UB-03	Foundation Soils	15.0	26.7	76.0	0.511	6.640	0.672	1.3	90.4	10	20	11.4	101.8	1.1	-0.2	0.0	1.0	0.140	1.018	0.149	0.172	0.869
UC-02A	UB-02 & UB-03	Foundation Soils	15.1	26.7	85.4	0.607	6.480	0.711	1.3	101.0	8	20	5.4	106.4	1.1	-0.2	0.0	1.0	0.146	1.020	0.157	0.172	0.912
UC-02A	UB-02 & UB-03	Foundation Soils	15.2	26.6	91.2	0.740	6.220	0.811	1.2	106.8	9	20	8.4	115.2	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.172	1.011
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.5	94.9	0.739	5.860	0.779	1.2	110.9	7	20	3.4	114.3	1.1	-0.2	0.0	1.0	0.160	1.024	0.172	0.173	0.998
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.4	94.5	0.755	5.620	0.799	1.2	110.2	8	20	5.1	115.3	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.173	1.008
UC-02A	UB-02 & UB-03	Foundation Soils	15.4	26.3	86.7	0.827	5.380	0.954	1.2	100.2	14	20	23.9	124.1	1.1	-0.2	0.0	1.0	0.181	1.028	0.197	0.173	1.137

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	15.5	26.2	73.3	0.829	5.530	1.132	1.2	84.6	23	20	38.6	123.1	1.1	-0.2	0.0	1.0	0.179	1.028	0.194	0.173	1.119
UC-02A	UB-02 & UB-03	Foundation Soils	15.6	26.2	58.6	0.792	5.720	1.351	1.2	68.2	33	20	44.3	112.4	1.1	-0.2	0.0	1.0	0.156	1.023	0.168	0.174	0.968
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.1	43.3	0.722	6.420	1.669	1.2	51.0	46	20	45.3	96.3	1.0	-0.3	0.0	1.0	0.133	1.017	0.141	0.174	0.811
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.0	34.8	0.651	7.190	1.868	1.3	41.4	54	20	44.7	86.2	1.0	-0.3	0.0	1.0	0.122	1.014	0.128	0.174	0.738
UC-02A	UB-02 & UB-03	Foundation Soils	15.8	25.9	29.6	0.637	8.000	2.155	1.3	35.3	62	20	44.3	79.6	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.174	0.696
UC-02A	UB-02 & UB-03	Foundation Soils	15.9	25.8	20.9	0.617	8.400	2.955	1.3	25.3	74	20	42.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.111	0.175	0.634
UC-02A	UB-02 & UB-03	Foundation Soils	16.0	25.8	15.6	0.534	9.180	3.432	1.3	19.0	86	20	42.0	61.0	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.175	0.598
UC-02A	UB-02 & UB-03	Foundation Soils	16.1	25.7	10.4	0.479	9.340	4.615	1.3	12.8	100	20	41.0	53.7	1.0	-0.3	0.0	1.0	0.095	1.008	0.099	0.175	0.564
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.6	9.5	0.280	14.770	2.940	1.3	11.7	99	20	40.7	52.4	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.175	0.557
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.5	7.7	0.182	37.600	2.375	1.3	9.4	100	20	40.2	49.7	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.176	0.544
UC-02A	UB-02 & UB-03	Foundation Soils	16.3	25.4	8.2	0.161	74.090	1.970	1.3	10.0	96	20	40.3	50.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.176	0.546
UC-02A	UB-02 & UB-03	Foundation Soils	16.4	25.3	15.6	0.116	90.430	0.743	1.3	18.9	61	20	40.7	59.6	1.0	-0.3	0.0	1.0	0.099	1.009	0.103	0.176	0.587
UC-02A	UB-02 & UB-03	Foundation Soils	16.5	25.3	18.6	0.092	18.490	0.495	1.3	22.4	49	20	40.2	62.6	1.0	-0.3	0.0	1.0	0.101	1.009	0.106	0.176	0.599
UC-02A	UB-02 & UB-03	Foundation Soils	16.6	25.2	16.7	0.108	15.440	0.645	1.3	20.1	57	20	40.6	60.8	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.177	0.590
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.1	20.4	0.171	47.000	0.838	1.3	24.4	55	20	41.3	65.6	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.177	0.612
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.0	20.2	0.221	36.780	1.095	1.3	24.0	60	20	41.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.177	0.612
UC-02A	UB-02 & UB-03	Foundation Soils	16.8	24.9	13.9	0.232	14.530	1.673	1.3	16.7	76	20	41.1	57.8	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.177	0.574
UC-02A	UB-02 & UB-03	Foundation Soils	16.9	24.9	9.6	0.236	23.160	2.447	1.3	11.7	96	20	40.6	52.3	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.177	0.549
UC-02A	UB-02 & UB-03	Foundation Soils	17.0	24.8	7.7	0.188	58.390	2.450	1.3	9.3	100	20	40.2	49.5	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.178	0.536
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.7	9.6	0.142	69.470	1.477	1.3	11.6	86	20	40.4	52.0	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.178	0.546
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.6	10.8	0.122	62.770	1.130	1.3	12.9	78	20	40.4	53.3	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.178	0.551
UC-02A	UB-02 & UB-03	Foundation Soils	17.2	24.5	10.6	0.118	41.470	1.113	1.3	12.7	78	20	40.4	53.1	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.178	0.549
UC-02A	UB-02 & UB-03	Foundation Soils	17.3	24.4	9.0	0.108	42.400	1.198	1.3	10.8	85	20	40.2	51.0	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.178	0.539
UC-02A	UB-02 & UB-03	Foundation Soils	17.4	24.4	7.1	0.108	28.680	1.515	1.3	8.6	98	20	40.0	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.179	0.528
UC-02A	UB-02 & UB-03	Foundation Soils	17.5	24.3	5.5	0.112	37.470	2.020	1.3	6.7	100	20	39.6	46.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.179	0.518
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.2	5.2	0.117	51.120	2.268	1.3	6.2	100	20	39.5	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.179	0.515
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.1	4.6	0.136	64.690	2.929	1.3	5.6	100	20	39.4	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.179	0.511
UC-02A	UB-02 & UB-03	Foundation Soils	17.7	24.0	4.8	0.112	72.470	2.342	1.3	5.7	100	20	39.4	45.2	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.180	0.511
UC-02A	UB-02 & UB-03	Foundation Soils	17.8	24.0	5.6	0.085	76.690	1.529	1.3	6.6	100	20	39.6	46.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.180	0.515
UC-02A	UB-02 & UB-03	Foundation Soils	17.9	23.9	6.3	0.071	59.080	1.127	1.3	7.5	99	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.180	0.518
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.8	10.8	0.065	52.980	0.603	1.3	12.7	69	20	39.9	52.7	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.180	0.540
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.7	16.6	0.061	36.500	0.367	1.2	19.4	50	20	39.7	59.1	1.0	-0.3	0.0	0.9	0.099	1.009	0.102	0.180	0.568
UC-02A	UB-02 & UB-03	Foundation Soils	18.1	23.6	13.1	0.064	6.850	0.490	1.2	15.3	62	20	40.0	55.3	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.181	0.551
UC-02A	UB-02 & UB-03	Foundation Soils	18.2	23.5	8.8	0.071	-6.620	0.805	1.2	10.4	81	20	40.0	50.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.181	0.529
UC-02A	UB-02 & UB-03	Foundation Soils	18.3	23.5	7.0	0.071	1.190	1.012	1.2	8.3	94	20	39.9	48.1	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.181	0.519
UC-02A	UB-02 & UB-03	Foundation Soils	18.4	23.4	6.4	0.078	41.980	1.222	1.2	7.5	100	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.181	0.515
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.3	9.7	0.067	59.910	0.688	1.2	11.4	75	20	40.0	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.181	0.531
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.2	11.6	0.067	48.450	0.578	1.2	13.5	69	20	40.1	53.5	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.181	0.539
UC-02A	UB-02 & UB-03	Foundation Soils	18.6	23.1	14.5	0.072	30.590	0.495	1.2	16.8	59	20	40.1	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.182	0.553
UC-02A	UB-02 & UB-03	Foundation Soils	18.7	23.1	16.7	0.053	16.560	0.318	1.2	19.2	49	20	39.5	58.7	1.0	-0.3	0.0	0.9	0.099	1.008	0.102	0.182	0.560
UC-02A	UB-02 & UB-03	Foundation Soils	18.8	23.0	12.9	0.063	11.670	0.488	1.2	14.9	63	20	40.0	54.9	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.182	0.543
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.9	11.2	0.096	15.150	0.854	1.2	13.0	74	20	40.2	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.182	0.536
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.8	11.0	0.115	21.090	1.046	1.2	12.7	78	20	40.4	53.0	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.182	0.534
UC-02A	UB-02 & UB-03	Foundation Soils	19.0	22.7	7.4	0.126	19.660	1.704	1.2	8.6	100	20	40.0	48.6	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.183	0.515
UC-02A	UB-02 & UB-03	Foundation Soils	19.1	22.6	5.6	0.123	30.300	2.213	1.2	6.4	100	20	39.6	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.183	0.504
UC-02A	UB-02 & UB-03	Foundation Soils	19.2	22.6	4.7	0.117	44.640	2.469	1.2	5.5	100	20	39.4	44.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.183	0.499
UC-02A	UB-02 & UB-03	Foundation Soils	19.3	22.5	4.5	0.071	62.910	1.570	1.2	5.2	100	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.183	0.497
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.4	4.5	0.057	73.750	1.275	1.2	5.2	100	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.183	0.496
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.3	4.8	0.082	83.050	1.691	1.2	5.6	100	20	39.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.183	0.498
UC-02A	UB-02 & UB-03	Foundation Soils	19.5	22.2	5.4	0.088	82.660	1.622	1.2	6.2	100	20	39.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.184	0.500
UC-02A	UB-02 & UB-03	Foundation Soils	19.6	22.1	5.6	0.084	72.530	1.513	1.2	6.4	100	20	39.6	45.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.184	0.500
UC-02A	UB-02 & UB-03	Foundation Soils	19.7	22.1	6.9	0.068	69.660	0.981	1.2	7.9	96	20	39.8	47.7	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.184	0.507
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	22.0	9.9	0.091	6.340	0.923	1.2	11.2	81	20	40.1	51.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.184	0.521
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	21.9	8.7	0.100	14.720	1.152	1.2	9.9	90	20	40.1	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.095	0.184	0.515
UC-02A	UB-02 & UB-03	Foundation Soils	19.9	21.8	7.3	0.078	23.250	1.062	1.2	8.3	95	20	39.9	48.2	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.184	0.507
UC-02A	UB-02 & UB-03	Foundation Soils	20.0	21.7	6.1	0.066	44.340	1.077	1.2	7.0	100	20	39.7	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.185	0.500
UC-02A	UB-02 & UB-03	Foundation Soils	20.1	21.7	10.4	0.059	62.940	0.567	1.2	12.2	72	0	0.5	12.7	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.185	0.375
UC-02A	UB-02 & UB-03	Foundation Soils	20.2	21.6	22.2	0.151	71.950	0.681	1.2	25.8	51	0	0.5	26.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.185	0.422
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.5	18.7	0.237	21.870	1.264	1.2	21.9	67	0	0.5	22.4	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.185	0.408
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.4	13.8	0.198	22.930	1.437	1.2	16.1	78	0	0.5	16.6	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.185	0.388
UC-02A	UB-02 & UB-03	Foundation Soils	20.4	21.3	9.4	0.182	42.210	1.942	1.2	10.9	97	0	0.5	11.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.185	0.370
UC-02A	UB-02 & UB-03	Foundation Soils	20.5	21.2	15.3	0.215	64.950	1.407	1.2	17.8	74	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.185	0.393

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	20.6	21.2	57.1	0.254	87.190	0.445	1.2	63.1	14	0	0.3	63.3	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.186	0.566
UC-02A	UB-02 & UB-03	Foundation Soils	20.7	21.1	65.0	0.497	22.660	0.765	1.2	71.2	20	0	0.4	71.6	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.186	0.604
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	21.0	47.0	0.755	7.290	1.608	1.2	52.2	45	0	0.6	52.7	1.0	-0.4	0.0	0.9	0.094	1.008	0.097	0.186	0.521
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	20.9	30.0	0.683	13.100	2.274	1.2	34.0	65	0	0.5	34.5	1.0	-0.4	0.0	0.9	0.082	1.007	0.084	0.186	0.449
UC-02A	UB-02 & UB-03	Foundation Soils	20.9	20.8	25.1	0.659	21.010	2.631	1.2	28.5	72	0	0.5	29.0	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.186	0.429
UC-02A	UB-02 & UB-03	Foundation Soils	21.0	20.8	90.9	0.761	39.020	0.837	1.1	97.4	13	0	0.2	97.6	1.0	-0.4	0.0	0.9	0.134	1.017	0.140	0.186	0.752
UC-02A	UB-02 & UB-03	Foundation Soils	21.1	20.7	218.9	0.883	37.450	0.403	1.1	222.5	0	0	0.0	222.5	1.1	-0.4	0.0	0.9	8.684	1.082	10.094	0.186	54.157
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.6	259.1	1.050	18.530	0.405	1.1	260.8	0	0	0.0	260.8	1.1	-0.4	0.0	0.9	518.132	1.082	601.719	0.186	3226.469
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.5	275.3	1.167	14.110	0.424	1.1	276.9	0	0	0.0	276.9	1.1	-0.4	0.0	0.9	5888.862	1.082	6832.903	0.187	36618.469
UC-02A	UB-02 & UB-03	Foundation Soils	21.3	20.4	280.1	1.218	12.250	0.435	1.1	281.5	0	0	0.0	281.5	1.1	-0.4	0.0	0.9	12926.975	1.082	14985.879	0.187	80270.002
UC-02A	UB-02 & UB-03	Foundation Soils	21.4	20.3	278.3	1.250	8.960	0.449	1.1	279.4	0	0	0.0	279.4	1.1	-0.4	0.0	0.9	8958.875	1.082	10376.732	0.187	55551.910
UC-02A	UB-02 & UB-03	Foundation Soils	21.5	20.3	270.5	1.224	11.000	0.453	1.1	271.3	0	0	0.0	271.3	1.1	-0.4	0.0	0.9	2397.744	1.082	2774.867	0.187	14847.014
UC-02A	UB-02 & UB-03	Foundation Soils	21.6	20.2	252.6	1.148	13.660	0.454	1.1	253.3	0	0	0.0	253.3	1.1	-0.4	0.0	0.9	193.153	1.082	223.344	0.187	1194.355
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.1	240.0	1.038	11.670	0.433	1.1	241.2	0	0	0.0	241.2	1.1	-0.4	0.0	0.9	48.660	1.082	56.218	0.187	300.470
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.0	224.9	0.949	14.050	0.422	1.1	226.7	0	0	0.0	226.7	1.1	-0.4	0.0	0.9	12.292	1.082	14.189	0.187	75.796
UC-02A	UB-02 & UB-03	Foundation Soils	21.8	19.9	214.8	0.852	12.430	0.397	1.1	216.9	0	0	0.0	216.9	1.1	-0.4	0.0	0.9	5.661	1.082	6.529	0.187	34.861
UC-02A	UB-02 & UB-03	Foundation Soils	21.9	19.9	197.3	0.787	12.840	0.399	1.1	200.0	0	0	0.0	200.0	1.1	-0.4	0.0	0.9	1.890	1.082	2.161	0.187	11.532
UC-02A	UB-02 & UB-03	Foundation Soils	22.0	19.8	173.5	0.732	12.820	0.422	1.1	176.9	0	0	0.0	176.9	1.0	-0.4	0.0	0.9	0.643	1.071	0.719	0.187	3.834
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.7	146.4	0.676	12.290	0.462	1.1	150.4	0	0	0.0	150.4	1.0	-0.4	0.0	0.9	0.291	1.046	0.315	0.188	1.678
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.6	118.5	0.704	12.780	0.594	1.1	122.9	0	0	0.0	122.9	1.0	-0.4	0.0	0.9	0.178	1.028	0.188	0.188	1.000
UC-02A	UB-02 & UB-03	Foundation Soils	22.2	19.5	98.6	0.561	13.150	0.569	1.1	103.0	3	0	0.0	103.0	1.0	-0.4	0.0	0.9	0.141	1.019	0.147	0.188	0.784
UC-02A	UB-02 & UB-03	Foundation Soils	22.3	19.4	78.7	0.530	13.530	0.673	1.1	82.9	13	0	0.2	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.122	0.188	0.652
UC-02A	UB-02 & UB-03	Foundation Soils	22.4	19.4	64.9	0.557	14.390	0.858	1.1	68.7	24	0	0.5	69.2	1.0	-0.4	0.0	0.9	0.107	1.010	0.109	0.188	0.582
UC-02A	UB-02 & UB-03	Foundation Soils	22.5	19.3	52.6	0.576	15.800	1.094	1.1	56.1	35	0	0.5	56.6	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.188	0.528
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.2	40.6	0.579	14.910	1.425	1.1	43.6	47	0	0.5	44.1	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.188	0.478
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.1	34.8	0.600	16.300	1.722	1.1	37.5	56	0	0.5	38.0	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.188	0.455
UC-02A	UB-02 & UB-03	Foundation Soils	22.7	19.0	28.6	0.447	18.620	1.565	1.1	30.9	60	0	0.5	31.4	1.0	-0.4	0.0	0.9	0.080	1.006	0.081	0.188	0.431
UC-02A	UB-02 & UB-03	Foundation Soils	22.8	18.9	24.8	0.421	19.280	1.697	1.1	26.9	65	0	0.5	27.4	1.0	-0.4	0.0	0.9	0.077	1.006	0.078	0.188	0.416
UC-02A	UB-02 & UB-03	Foundation Soils	22.9	18.9	15.9	0.332	31.920	2.083	1.2	17.4	83	0	0.5	17.9	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.189	0.383
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.8	13.3	0.284	41.160	2.142	1.2	14.4	90	0	0.5	14.9	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.189	0.373
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.7	17.2	0.213	17.500	1.236	1.2	18.7	71	0	0.5	19.2	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.189	0.387
UC-02A	UB-02 & UB-03	Foundation Soils	23.1	18.6	30.6	0.145	48.030	0.474	1.1	32.7	37	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.082	0.189	0.436
UC-02A	UB-02 & UB-03	Foundation Soils	23.2	18.5	44.4	0.131	20.440	0.295	1.1	46.9	18	0	0.3	47.3	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.189	0.488
UC-02A	UB-02 & UB-03	Foundation Soils	23.3	18.5	49.8	0.140	10.100	0.281	1.1	52.4	14	0	0.2	52.6	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.189	0.508
UC-02A	UB-02 & UB-03	Foundation Soils	23.4	18.4	48.0	0.159	9.740	0.331	1.1	50.4	17	0	0.3	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.189	0.500
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.3	41.1	0.197	15.960	0.479	1.1	43.3	28	0	0.4	43.8	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.189	0.473
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.2	38.0	0.203	19.580	0.534	1.1	40.1	32	0	0.5	40.5	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.189	0.461
UC-02A	UB-02 & UB-03	Foundation Soils	23.6	18.1	35.0	0.214	23.650	0.612	1.1	36.8	37	0	0.5	37.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.189	0.449
UC-02A	UB-02 & UB-03	Foundation Soils	23.7	18.0	34.5	0.210	26.440	0.609	1.1	36.3	37	0	0.5	36.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.189	0.447
UC-02A	UB-02 & UB-03	Foundation Soils	23.8	18.0	35.7	0.193	24.200	0.541	1.1	37.4	34	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.190	0.451
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.9	36.6	0.172	25.350	0.470	1.1	38.3	31	0	0.5	38.8	1.0	-0.4	0.0	0.9	0.085	1.007	0.086	0.190	0.454
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.8	37.6	0.175	24.820	0.465	1.1	39.3	30	0	0.5	39.7	1.0	-0.4	0.1	0.9	0.085	1.007	0.087	0.190	0.457
UC-02A	UB-02 & UB-03	Foundation Soils	24.0	17.7	39.2	0.203	24.260	0.518	1.1	40.8	31	0	0.5	41.3	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.190	0.462
UC-02A	UB-02 & UB-03	Foundation Soils	24.1	17.6	39.5	0.231	22.770	0.585	1.1	41.0	32	0	0.5	41.5	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.190	0.463
UC-02A	UB-02 & UB-03	Foundation Soils	24.2	17.6	39.5	0.238	24.920	0.602	1.1	41.0	33	0	0.5	41.5	1.0	-0.5	0.1	0.9	0.086	1.007	0.088	0.190	0.463
UC-02A	UB-02 & UB-03	Foundation Soils	24.3	17.5	42.9	0.243	27.440	0.566	1.1	44.4	29	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.190	0.475
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.4	46.3	0.237	26.300	0.511	1.1	47.7	25	0	0.4	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.190	0.487
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.3	49.4	0.238	22.960	0.482	1.1	50.7	22	0	0.4	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.095	0.190	0.498
UC-02A	UB-02 & UB-03	Foundation Soils	24.5	17.2	49.1	0.278	22.460	0.567	1.1	50.3	25	0	0.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.094	0.190	0.496
UC-02A	UB-02 & UB-03	Foundation Soils	24.6	17.1	46.6	0.312	22.220	0.670	1.1	47.8	30	0	0.5	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.190	0.486
UC-02A	UB-02 & UB-03	Foundation Soils	24.7	17.1	43.2	0.337	23.350	0.779	1.1	44.3	35	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.190	0.473
UC-02A	UB-02 & UB-03	Foundation Soils	24.8	17.0	39.2	0.333	23.250	0.849	1.1	40.2	39	0	0.5	40.7	1.0	-0.5	0.1	0.9	0.086	1.007	0.087	0.190	0.458
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.9	35.2	0.330	24.090	0.937	1.1	36.1	44	0	0.5	36.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.190	0.443
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.8	34.3	0.342	24.850	0.996	1.1	35.2	46	0	0.5	35.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.191	0.439
UC-03	UB-03	Foundation Soils	6.1	36.1	32.7	0.402	-3.290	1.228	1.7	51.7	38	30	49.9	101.7	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.130	1.206
UC-03	UB-03	Foundation Soils	6.2	36.0	33.3	0.388	-1.020	1.165	1.7	52.4	37	30	49.5	101.9	1.1	-0.1	0.0	1.0	0.140	1.018	0.157	0.130	1.201
UC-03	UB-03	Foundation Soils	6.2	35.9	33.9	0.388	-1.050	1.144	1.7	53.1	36	30	49.3	102.4	1.1	-0.1	0.0	1.0	0.141	1.019	0.157	0.131	1.200
UC-03	UB-03	Foundation Soils	6.3	35.8	34.3	0.340	-1.100	0.990	1.7	53.7	33	30	47.8	101.6	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.132	1.182
UC-03	UB-03	Foundation Soils	6.4	35.8	33.8	0.342	-0.910	1.011	1.7	52.9	34	30	48.1	101.0	1.1	-0.1	0.0	1.0	0.139	1.018	0.155	0.133	1.169
UC-03	UB-03	Foundation Soils	6.5	35.7	31.1	0.356	-0.950	1.145	1.7	48.7	39	30	49.5	98.2	1.1	-0.1	0.0	1.0	0.135	1.017	0.151	0.134	1.130
UC-03	UB-03	Foundation Soils	6.6	35.6	29.7	0.380	-1.000	1.280	1.7	46.5	42	30	50.1	96.7	1.1	-0.1	0.0	1.0	0.133	1.017	0.149	0.134	1.108
UC-03	UB-03	Foundation Soils	6.6	35.5	27.3	0.388	-1.180	1.422	1.7	43.0	47	30	50.5	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.145	0.135	1.069

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	6.7	35.4	27.5	0.370	-0.620	1.347	1.7	43.1	46	30	50.2	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.144	0.136	1.062
UC-03	UB-03	Foundation Soils	6.8	35.4	27.8	0.363	-0.330	1.304	1.7	43.5	45	30	50.1	93.7	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.137	1.059
UC-03	UB-03	Foundation Soils	6.9	35.3	28.7	0.365	-0.670	1.270	1.6	44.7	43	30	50.0	94.7	1.1	-0.1	0.0	1.0	0.131	1.016	0.146	0.137	1.064
UC-03	UB-03	Foundation Soils	7.0	35.2	28.5	0.361	-1.740	1.266	1.6	44.2	44	30	50.0	94.2	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.138	1.053
UC-03	UB-03	Foundation Soils	7.1	35.1	24.1	0.345	-1.750	1.434	1.7	37.8	51	30	50.0	87.8	1.1	-0.1	0.0	1.0	0.123	1.014	0.137	0.139	0.984
UC-03	UB-03	Foundation Soils	7.1	35.0	20.6	0.340	-1.670	1.647	1.7	32.7	58	30	49.8	82.5	1.1	-0.1	0.0	1.0	0.118	1.013	0.130	0.140	0.933
UC-03	UB-03	Foundation Soils	7.2	34.9	14.3	0.349	-1.240	2.445	1.7	22.9	72	30	48.5	71.4	1.1	-0.1	0.0	1.0	0.108	1.010	0.118	0.140	0.844
UC-03	UB-03	Foundation Soils	7.3	34.9	11.1	0.350	-1.160	3.167	1.7	17.7	78	30	47.6	65.3	1.1	-0.1	0.0	1.0	0.104	1.009	0.113	0.141	0.798
UC-03	UB-03	Foundation Soils	7.4	34.8	8.1	0.332	-0.620	4.101	1.7	13.0	93	30	46.9	59.9	1.1	-0.1	0.0	1.0	0.099	1.009	0.108	0.142	0.760
UC-03	UB-03	Foundation Soils	7.5	34.7	6.6	0.309	-0.190	4.661	1.7	10.6	100	30	46.5	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.105	0.142	0.739
UC-03	UB-03	Foundation Soils	7.5	34.6	5.3	0.269	-0.050	5.028	1.7	8.6	100	30	46.0	54.5	1.1	-0.1	0.0	1.0	0.096	1.008	0.103	0.143	0.719
UC-03	UB-03	Foundation Soils	7.6	34.5	4.4	0.230	9.740	5.214	1.7	7.1	100	30	45.6	52.7	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.144	0.705
UC-03	UB-03	Foundation Soils	7.7	34.5	4.0	0.210	13.670	5.283	1.7	6.4	100	30	45.4	51.8	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.144	0.696
UC-03	UB-03	Foundation Soils	7.8	34.4	3.3	0.193	14.150	5.887	1.7	5.3	100	30	45.1	50.4	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.145	0.685
UC-03	UB-03	Foundation Soils	7.9	34.3	2.8	0.167	34.730	5.908	1.7	4.5	100	30	44.9	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.146	0.677
UC-03	UB-03	Foundation Soils	8.0	34.2	2.8	0.178	37.590	6.257	1.7	4.6	100	30	45.0	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.146	0.674
UC-03	UB-03	Foundation Soils	8.0	34.1	3.2	0.182	34.920	5.656	1.7	5.2	100	30	45.1	50.3	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.147	0.675
UC-03	UB-03	Foundation Soils	8.1	34.0	3.9	0.203	31.540	5.209	1.7	6.2	100	30	45.4	51.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.148	0.679
UC-03	UB-03	Foundation Soils	8.2	34.0	3.7	0.229	29.760	6.213	1.7	5.9	100	30	45.3	51.2	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.148	0.674
UC-03	UB-03	Foundation Soils	8.3	33.9	4.0	0.225	35.830	5.564	1.7	6.5	100	30	45.4	51.9	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.149	0.675
UC-03	UB-03	Foundation Soils	8.4	33.8	5.3	0.215	46.980	4.085	1.7	8.4	100	30	45.9	54.4	1.1	-0.1	0.0	1.0	0.095	1.008	0.102	0.150	0.685
UC-03	UB-03	Foundation Soils	8.4	33.7	9.4	0.169	50.500	1.805	1.7	15.0	74	30	46.7	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.109	0.150	0.724
UC-03	UB-03	Foundation Soils	8.5	33.6	19.1	0.156	14.610	0.817	1.6	29.3	49	30	47.6	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.151	0.818
UC-03	UB-03	Foundation Soils	8.6	33.6	22.0	0.178	-0.140	0.809	1.6	33.4	44	30	47.7	81.0	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.151	0.843
UC-03	UB-03	Foundation Soils	8.7	33.5	22.4	0.181	-0.660	0.807	1.6	33.9	44	30	47.7	81.5	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.152	0.844
UC-03	UB-03	Foundation Soils	8.8	33.4	21.4	0.203	-0.990	0.949	1.6	32.3	48	30	48.2	80.5	1.1	-0.1	0.0	1.0	0.116	1.012	0.127	0.152	0.833
UC-03	UB-03	Foundation Soils	8.9	33.3	19.7	0.206	-0.730	1.048	1.6	29.8	53	30	48.4	78.1	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.153	0.812
UC-03	UB-03	Foundation Soils	8.9	33.2	18.7	0.251	-0.950	1.344	1.6	28.3	59	30	48.8	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.154	0.802
UC-03	UB-03	Foundation Soils	9.0	33.1	17.2	0.272	-2.240	1.580	1.6	26.1	65	30	48.8	74.9	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.154	0.784
UC-03	UB-03	Foundation Soils	9.1	33.1	14.4	0.253	-1.130	1.763	1.6	22.0	67	30	48.0	70.0	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.155	0.750
UC-03	UB-03	Foundation Soils	9.2	33.0	11.8	0.198	-0.150	1.680	1.6	18.2	72	30	47.4	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.155	0.721
UC-03	UB-03	Foundation Soils	9.3	32.9	11.9	0.180	-0.670	1.511	1.6	18.3	70	30	47.3	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.156	0.718
UC-03	UB-03	Foundation Soils	9.4	32.8	15.6	0.172	-0.800	1.099	1.6	23.6	61	30	47.9	71.5	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.156	0.751
UC-03	UB-03	Foundation Soils	9.4	32.7	18.7	0.161	-0.670	0.862	1.6	27.9	51	30	47.7	75.6	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.157	0.774
UC-03	UB-03	Foundation Soils	9.5	32.6	21.6	0.174	-1.470	0.804	1.6	31.9	46	30	47.6	79.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.125	0.157	0.798
UC-03	UB-03	Foundation Soils	9.6	32.6	22.0	0.120	-1.380	0.546	1.6	32.4	39	30	45.9	78.4	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.158	0.787
UC-03	UB-03	Foundation Soils	9.7	32.5	22.0	0.129	-1.290	0.587	1.6	32.3	40	30	46.3	78.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.158	0.785
UC-03	UB-03	Foundation Soils	9.8	32.4	21.4	0.163	-1.190	0.761	1.6	31.4	45	30	47.4	78.8	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.159	0.784
UC-03	UB-03	Foundation Soils	9.8	32.3	17.1	0.198	-1.050	1.156	1.6	25.3	59	30	48.2	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.159	0.747
UC-03	UB-03	Foundation Soils	9.9	32.2	19.4	0.222	-0.950	1.146	1.6	28.4	56	30	48.5	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.160	0.766
UC-03	UB-03	Foundation Soils	10.0	32.2	18.4	0.229	-0.710	1.248	1.6	26.9	59	30	48.5	75.4	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.160	0.754
UC-03	UB-03	Foundation Soils	10.1	32.1	17.1	0.245	-0.180	1.435	1.6	25.0	64	30	48.5	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.161	0.740
UC-03	UB-03	Foundation Soils	10.2	32.0	16.0	0.301	1.430	1.880	1.6	23.5	67	30	48.3	71.8	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.161	0.727
UC-03	UB-03	Foundation Soils	10.3	31.9	15.4	0.262	1.520	1.705	1.6	22.5	71	30	48.4	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.162	0.719
UC-03	UB-03	Foundation Soils	10.3	31.8	14.3	0.265	3.200	1.848	1.6	21.1	70	30	48.0	69.0	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.162	0.706
UC-03	UB-03	Foundation Soils	10.4	31.7	15.5	0.288	3.950	1.864	1.5	22.6	68	30	48.2	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.162	0.714
UC-03	UB-03	Foundation Soils	10.5	31.7	19.3	0.304	1.430	1.574	1.5	27.8	62	30	49.0	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.163	0.748
UC-03	UB-03	Foundation Soils	10.6	31.6	22.7	0.278	-3.810	1.223	1.5	32.3	53	30	49.0	81.3	1.1	-0.1	0.0	1.0	0.117	1.012	0.127	0.163	0.775
UC-03	UB-03	Foundation Soils	10.7	31.5	18.4	0.319	-4.320	1.736	1.5	26.4	66	30	49.0	75.3	1.1	-0.1	0.0	1.0	0.112	1.011	0.120	0.164	0.735
UC-03	UB-03	Foundation Soils	10.7	31.4	13.2	0.315	-2.570	2.391	1.5	19.2	74	30	47.7	66.9	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.164	0.684
UC-03	UB-03	Foundation Soils	10.8	31.3	9.7	0.327	12.580	3.372	1.6	14.3	90	30	47.2	61.4	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.165	0.652
UC-03	UB-03	Foundation Soils	10.9	31.3	10.6	0.303	22.510	2.864	1.6	15.5	84	30	47.3	62.7	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.165	0.657
UC-03	UB-03	Foundation Soils	11.0	31.2	9.9	0.245	8.610	2.464	1.6	14.6	83	30	47.0	61.5	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.166	0.649
UC-03	UB-03	Foundation Soils	11.1	31.1	9.5	0.179	4.050	1.879	1.6	13.9	79	30	46.7	60.6	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.166	0.642
UC-03	UB-03	Foundation Soils	11.2	31.0	7.4	0.175	5.700	2.376	1.6	10.8	92	30	46.4	57.2	1.1	-0.2	0.0	1.0	0.097	1.008	0.104	0.166	0.623
UC-03	UB-03	Foundation Soils	11.2	30.9	5.2	0.177	8.480	3.376	1.6	7.8	100	30	45.8	53.5	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.167	0.603
UC-03	UB-03	Foundation Soils	11.3	30.8	3.9	0.192	18.680	4.953	1.6	5.8	100	30	45.3	51.0	1.1	-0.2	0.0	1.0	0.093	1.008	0.099	0.167	0.589
UC-03	UB-03	Foundation Soils	11.4	30.8	4.5	0.184	31.450	4.120	1.6	6.6	100	30	45.5	52.1	1.1	-0.2	0.0	1.0	0.094	1.008	0.099	0.168	0.593
UC-03	UB-03	Foundation Soils	11.5	30.7	5.4	0.166	22.440	3.091	1.6	7.9	100	30	45.8	53.7	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.168	0.599
UC-03	UB-03	Foundation Soils	11.6	30.6	7.9	0.154	22.200	1.937	1.5	11.5	87	30	46.4	57.9	1.1	-0.2	0.0	1.0	0.098	1.008	0.104	0.168	0.618
UC-03	UB-03	Foundation Soils	11.6	30.5	10.5	0.153	5.100	1.460	1.5	15.0	72	30	46.6	61.7	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.169	0.635
UC-03	UB-03	Foundation Soils	11.7	30.4	11.0	0.150	2.000	1.358	1.5	15.8	73	30	46.9	62.6	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.169	0.638

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	11.8	30.4	11.6	0.146	3.100	1.263	1.5	16.5	71	30	46.9	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.170	0.640
UC-03	UB-03	Foundation Soils	11.9	30.3	11.9	0.143	4.380	1.200	1.5	16.9	69	30	46.9	63.8	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.170	0.641
UC-03	UB-03	Foundation Soils	12.0	30.2	12.1	0.154	4.860	1.268	1.5	17.2	70	30	47.0	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.170	0.641
UC-03	UB-03	Foundation Soils	12.1	30.1	12.3	0.148	4.810	1.206	1.5	17.3	68	30	46.9	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.171	0.640
UC-03	UB-03	Foundation Soils	12.1	30.0	12.4	0.164	4.910	1.318	1.5	17.5	70	30	47.1	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.171	0.640
UC-03	UB-03	Foundation Soils	12.2	29.9	12.8	0.157	5.050	1.223	1.5	18.0	67	30	47.0	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.171	0.641
UC-03	UB-03	Foundation Soils	12.3	29.9	13.4	0.155	4.510	1.153	1.5	18.7	69	30	47.3	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.172	0.645
UC-03	UB-03	Foundation Soils	12.4	29.8	13.2	0.158	3.860	1.196	1.5	18.4	70	30	47.3	65.7	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.172	0.642
UC-03	UB-03	Foundation Soils	12.5	29.7	12.5	0.166	4.030	1.331	1.5	17.4	70	30	47.1	64.4	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.172	0.634
UC-03	UB-03	Foundation Soils	12.5	29.6	12.3	0.177	4.190	1.436	1.5	17.1	72	30	47.1	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.173	0.631
UC-03	UB-03	Foundation Soils	12.6	29.5	12.3	0.183	4.900	1.494	1.5	17.0	73	30	47.1	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.173	0.629
UC-03	UB-03	Foundation Soils	12.7	29.4	12.7	0.200	5.290	1.581	1.5	17.5	73	30	47.3	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.174	0.631
UC-03	UB-03	Foundation Soils	12.8	29.4	13.5	0.240	5.880	1.778	1.5	18.6	74	30	47.6	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.174	0.636
UC-03	UB-03	Foundation Soils	12.9	29.3	14.2	0.300	6.150	2.106	1.5	19.5	72	30	47.7	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.174	0.641
UC-03	UB-03	Foundation Soils	13.0	29.2	14.2	0.353	7.950	2.486	1.4	19.4	76	30	47.9	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.175	0.639
UC-03	UB-03	Foundation Soils	13.0	29.1	12.6	0.440	8.620	3.488	1.5	17.3	87	30	47.8	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.175	0.627
UC-03	UB-03	Foundation Soils	13.1	29.0	9.7	0.479	11.930	4.961	1.5	13.3	100	30	47.2	60.5	1.0	-0.2	0.0	1.0	0.100	1.009	0.106	0.175	0.603
UC-03	UB-03	Foundation Soils	13.2	29.0	7.7	0.508	6.100	6.608	1.5	10.6	100	30	46.5	57.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.103	0.176	0.586
UC-03	UB-03	Foundation Soils	13.3	28.9	6.2	0.515	14.190	8.282	1.5	8.6	100	30	46.0	54.6	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.176	0.573
UC-03	UB-03	Foundation Soils	13.4	28.8	4.7	0.522	36.640	11.133	1.5	6.5	100	30	45.5	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.176	0.560
UC-03	UB-03	Foundation Soils	13.5	28.7	4.1	0.497	34.830	12.100	1.5	5.7	100	30	45.2	51.0	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.177	0.554
UC-03	UB-03	Foundation Soils	13.5	28.6	3.6	0.419	42.500	11.494	1.5	5.1	100	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.177	0.549
UC-03	UB-03	Foundation Soils	13.6	28.5	3.4	0.406	49.020	11.955	1.5	4.7	100	30	45.0	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.177	0.546
UC-03	UB-03	Foundation Soils	13.7	28.5	3.1	0.399	50.170	12.816	1.5	4.3	100	30	44.9	49.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.177	0.543
UC-03	UB-03	Foundation Soils	13.8	28.4	3.5	0.381	50.690	10.866	1.5	4.8	100	30	45.0	49.9	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.178	0.545
UC-03	UB-03	Foundation Soils	13.9	28.3	3.7	0.360	21.150	9.724	1.5	5.1	100	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.178	0.545
UC-03	UB-03	Foundation Soils	13.9	28.2	3.1	0.328	9.560	10.685	1.5	4.2	100	30	44.9	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.096	0.178	0.540
UC-03	UB-03	Foundation Soils	14.0	28.1	2.2	0.298	10.050	13.347	1.5	3.1	100	30	44.6	47.7	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.179	0.532
UC-03	UB-03	Foundation Soils	14.1	28.1	1.4	0.250	27.490	17.342	1.5	2.0	100	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.179	0.525
UC-03	UB-03	Foundation Soils	14.2	28.0	1.4	0.193	36.070	13.448	1.5	2.0	100	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.179	0.524
UC-03	UB-03	Foundation Soils	14.3	27.9	1.3	0.339	49.690	25.874	1.5	1.8	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.179	0.523
UC-03	UB-03	Foundation Soils	14.4	27.8	1.3	0.338	55.840	25.063	1.5	1.8	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.180	0.522
UC-03	UB-03	Foundation Soils	14.4	27.7	1.4	0.369	57.410	27.164	1.4	1.9	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.180	0.521
UC-03	UB-03	Foundation Soils	14.5	27.6	1.4	0.370	53.730	26.515	1.4	1.9	100	30	44.3	46.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.180	0.520
UC-03	UB-03	Foundation Soils	14.6	27.6	4.4	0.395	-0.820	8.988	1.4	5.9	100	30	45.3	51.2	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.180	0.541
UC-03	UB-03	Foundation Soils	14.7	27.5	4.4	0.433	12.910	9.953	1.4	5.8	100	30	45.3	51.1	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.181	0.540
UC-03	UB-03	Foundation Soils	14.8	27.4	4.6	0.447	27.110	9.719	1.4	6.1	100	30	45.4	51.5	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.181	0.541
UC-03	UB-03	Foundation Soils	14.8	27.3	5.1	0.408	26.390	7.946	1.4	6.8	100	30	45.5	52.4	1.0	-0.2	0.0	1.0	0.094	1.008	0.098	0.181	0.543
UC-03	UB-03	Foundation Soils	14.9	27.2	6.0	0.375	17.150	6.284	1.4	7.9	100	30	45.8	53.7	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.181	0.548
UC-03	UB-03	Foundation Soils	15.0	27.2	7.2	0.355	7.050	4.942	1.4	9.5	100	30	46.2	55.7	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.182	0.556
UC-03	UB-03	Foundation Soils	15.1	27.1	10.7	0.301	3.260	2.813	1.4	13.9	90	30	47.1	61.0	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.182	0.579
UC-03	UB-03	Foundation Soils	15.2	27.0	17.4	0.267	-8.530	1.534	1.4	22.3	69	30	48.2	70.5	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.182	0.623
UC-03	UB-03	Foundation Soils	15.3	26.9	21.6	0.237	-8.770	1.096	1.3	27.4	56	30	48.2	75.6	1.0	-0.2	0.0	1.0	0.112	1.011	0.118	0.183	0.649
UC-03	UB-03	Foundation Soils	15.3	26.8	22.6	0.253	-5.720	1.120	1.3	28.5	55	30	48.4	76.9	1.0	-0.2	0.0	1.0	0.113	1.011	0.120	0.183	0.655
UC-03	UB-03	Foundation Soils	15.4	26.7	24.1	0.266	5.140	1.103	1.3	30.3	53	30	48.5	78.8	1.0	-0.2	0.0	1.0	0.115	1.012	0.122	0.183	0.664
UC-03	UB-03	Foundation Soils	15.5	26.7	25.1	0.268	6.670	1.068	1.3	31.4	51	30	48.5	79.9	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.183	0.669
UC-03	UB-03	Foundation Soils	15.6	26.6	25.7	0.259	6.860	1.006	1.3	32.1	49	30	48.4	80.5	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.183	0.672
UC-03	UB-03	Foundation Soils	15.7	26.5	25.5	0.252	6.620	0.989	1.3	31.8	49	30	48.3	80.1	1.0	-0.3	0.0	1.0	0.116	1.012	0.123	0.184	0.668
UC-03	UB-03	Foundation Soils	15.7	26.4	24.5	0.244	6.230	0.997	1.3	30.5	51	30	48.2	78.7	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.184	0.660
UC-03	UB-03	Foundation Soils	15.8	26.3	20.4	0.230	6.240	1.129	1.3	25.5	59	30	48.1	73.6	1.0	-0.3	0.0	1.0	0.110	1.011	0.116	0.184	0.632
UC-03	UB-03	Foundation Soils	15.9	26.3	18.1	0.211	6.500	1.166	1.3	22.7	63	30	47.8	70.6	1.0	-0.3	0.0	1.0	0.108	1.010	0.113	0.184	0.615
UC-03	UB-03	Foundation Soils	16.0	26.2	13.8	0.192	6.960	1.390	1.3	17.5	72	30	47.2	64.6	1.0	-0.3	0.0	1.0	0.103	1.009	0.108	0.185	0.586
UC-03	UB-03	Foundation Soils	16.1	26.1	8.6	0.183	7.590	2.139	1.4	10.9	94	30	46.4	57.3	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.185	0.552
UC-03	UB-03	Foundation Soils	16.2	26.0	6.7	0.133	7.720	1.992	1.4	8.5	100	30	46.0	54.5	1.0	-0.3	0.0	1.0	0.095	1.008	0.100	0.185	0.539
UC-03	UB-03	Foundation Soils	16.2	25.9	4.6	0.139	8.120	3.034	1.4	5.9	100	30	45.3	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.185	0.524
UC-03	UB-03	Foundation Soils	16.3	25.8	3.3	0.132	8.240	3.998	1.4	4.2	100	30	44.9	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.096	0.185	0.515
UC-03	UB-03	Foundation Soils	16.4	25.8	2.6	0.125	8.560	4.783	1.4	3.4	100	30	44.7	48.0	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.186	0.510
UC-03	UB-03	Foundation Soils	16.5	25.7	2.2	0.112	7.080	5.175	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.186	0.506
UC-03	UB-03	Foundation Soils	16.6	25.6	2.2	0.106	10.480	4.895	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.186	0.505
UC-03	UB-03	Foundation Soils	16.7	25.5	2.2	0.097	15.970	4.410	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.187	0.504
UC-03	UB-03	Foundation Soils	16.7	25.4	2.5	0.092	17.580	3.637	1.4	3.2	100	30	44.6	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.187	0.505
UC-03	UB-03	Foundation Soils	16.8	25.3	3.9	0.107	17.120	2.767	1.4	4.9	100	30	45.0	50.0	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.187	0.513

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	16.9	25.3	7.0	0.139	14.390	1.974	1.3	8.9	100	30	46.0	55.0	1.0	-0.3	0.0	1.0	0.096	1.008	0.100	0.188	0.533
UC-03	UB-03	Foundation Soils	17.0	25.2	20.6	0.167	6.100	0.809	1.4	27.5	53	0	0.5	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.080	0.188	0.426
UC-03	UB-03	Foundation Soils	17.1	25.1	27.3	0.203	7.050	0.745	1.4	35.6	43	0	0.5	36.1	1.0	-0.3	0.0	1.0	0.083	1.007	0.086	0.188	0.456
UC-03	UB-03	Foundation Soils	17.1	25.0	29.2	0.273	6.380	0.936	1.4	37.8	45	0	0.5	38.3	1.0	-0.3	0.0	1.0	0.084	1.007	0.087	0.188	0.464
UC-03	UB-03	Foundation Soils	17.2	24.9	30.1	0.277	8.000	0.919	1.4	38.8	44	0	0.5	39.4	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.188	0.467
UC-03	UB-03	Foundation Soils	17.3	24.9	30.6	0.282	8.240	0.922	1.4	39.3	43	0	0.5	39.8	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.189	0.469
UC-03	UB-03	Foundation Soils	17.4	24.8	31.8	0.270	8.430	0.849	1.4	40.6	41	0	0.5	41.2	1.0	-0.3	0.0	1.0	0.086	1.007	0.089	0.189	0.473
UC-03	UB-03	Foundation Soils	17.5	24.7	36.4	0.263	9.010	0.722	1.3	46.0	34	0	0.5	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.189	0.494
UC-03	UB-03	Foundation Soils	17.6	24.6	40.7	0.253	8.910	0.621	1.3	50.9	28	0	0.5	51.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.189	0.513
UC-03	UB-03	Foundation Soils	17.6	24.5	44.9	0.260	8.410	0.580	1.3	55.5	24	0	0.4	56.0	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.189	0.531
UC-03	UB-03	Foundation Soils	17.7	24.4	49.6	0.303	8.750	0.611	1.3	60.8	22	0	0.4	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.105	0.189	0.553
UC-03	UB-03	Foundation Soils	17.8	24.4	53.9	0.351	8.850	0.651	1.3	65.6	20	0	0.4	66.0	1.0	-0.3	0.0	0.9	0.104	1.009	0.109	0.190	0.574
UC-03	UB-03	Foundation Soils	17.9	24.3	57.6	0.392	8.580	0.681	1.3	69.5	19	0	0.4	69.9	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.190	0.591
UC-03	UB-03	Foundation Soils	18.0	24.2	58.1	0.421	8.310	0.725	1.3	69.9	20	0	0.4	70.3	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.190	0.592
UC-03	UB-03	Foundation Soils	18.0	24.1	56.3	0.443	8.240	0.786	1.3	67.8	23	0	0.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.190	0.582
UC-03	UB-03	Foundation Soils	18.1	24.0	53.7	0.449	8.240	0.837	1.3	64.7	25	0	0.5	65.2	1.0	-0.3	0.0	0.9	0.103	1.009	0.108	0.190	0.568
UC-03	UB-03	Foundation Soils	18.2	24.0	50.7	0.451	8.380	0.890	1.3	61.2	28	0	0.5	61.7	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.190	0.552
UC-03	UB-03	Foundation Soils	18.3	23.9	47.8	0.442	8.650	0.925	1.3	57.9	31	0	0.5	58.4	1.0	-0.3	0.0	0.9	0.098	1.008	0.102	0.190	0.537
UC-03	UB-03	Foundation Soils	18.4	23.8	45.4	0.435	8.810	0.959	1.3	55.1	33	0	0.5	55.6	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.191	0.525
UC-03	UB-03	Foundation Soils	18.5	23.7	45.0	0.470	8.960	1.045	1.3	54.5	35	0	0.5	55.1	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.191	0.522
UC-03	UB-03	Foundation Soils	18.5	23.6	46.7	0.477	9.290	1.021	1.3	56.4	34	0	0.5	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.191	0.529
UC-03	UB-03	Foundation Soils	18.6	23.5	48.6	0.417	9.500	0.859	1.3	58.3	29	0	0.5	58.8	1.0	-0.3	0.0	0.9	0.099	1.008	0.103	0.191	0.537
UC-03	UB-03	Foundation Soils	18.7	23.5	53.2	0.447	9.910	0.841	1.3	63.3	26	0	0.5	63.8	1.0	-0.3	0.0	0.9	0.102	1.009	0.107	0.191	0.557
UC-03	UB-03	Foundation Soils	18.8	23.4	58.5	0.469	10.050	0.802	1.3	69.1	22	0	0.4	69.5	1.0	-0.3	0.0	0.9	0.107	1.010	0.111	0.191	0.583
UC-03	UB-03	Foundation Soils	18.9	23.3	64.5	0.502	9.460	0.778	1.2	75.5	19	0	0.4	75.9	1.0	-0.3	0.0	0.9	0.112	1.011	0.117	0.191	0.613
UC-03	UB-03	Foundation Soils	18.9	23.2	68.1	0.516	9.020	0.757	1.2	79.3	17	0	0.3	79.6	1.0	-0.3	0.0	0.9	0.115	1.012	0.121	0.192	0.631
UC-03	UB-03	Foundation Soils	19.0	23.1	66.1	0.528	9.200	0.799	1.2	76.9	19	0	0.4	77.3	1.0	-0.3	0.0	0.9	0.113	1.011	0.119	0.192	0.619
UC-03	UB-03	Foundation Soils	19.1	23.1	64.0	0.512	9.340	0.799	1.2	74.6	20	0	0.4	75.0	1.0	-0.3	0.0	0.9	0.111	1.011	0.116	0.192	0.606
UC-03	UB-03	Foundation Soils	19.2	23.0	61.0	0.494	9.790	0.810	1.2	71.1	22	0	0.4	71.6	1.0	-0.3	0.0	0.9	0.109	1.010	0.113	0.192	0.589
UC-03	UB-03	Foundation Soils	19.3	22.9	58.7	0.474	9.840	0.807	1.2	68.6	23	0	0.4	69.0	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.192	0.577
UC-03	UB-03	Foundation Soils	19.4	22.8	56.5	0.469	9.960	0.830	1.2	66.0	24	0	0.5	66.5	1.0	-0.3	0.0	0.9	0.104	1.010	0.109	0.192	0.565
UC-03	UB-03	Foundation Soils	19.4	22.7	53.9	0.427	10.010	0.793	1.2	63.0	25	0	0.5	63.4	1.0	-0.3	0.0	0.9	0.102	1.009	0.106	0.192	0.551
UC-03	UB-03	Foundation Soils	19.5	22.6	51.1	0.385	10.110	0.754	1.2	59.8	26	0	0.5	60.3	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.192	0.537
UC-03	UB-03	Foundation Soils	19.6	22.6	48.4	0.381	10.200	0.786	1.2	56.8	28	0	0.5	57.3	1.0	-0.3	0.0	0.9	0.098	1.008	0.101	0.193	0.525
UC-03	UB-03	Foundation Soils	19.7	22.5	45.8	0.373	10.150	0.814	1.2	53.8	30	0	0.5	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.099	0.193	0.512
UC-03	UB-03	Foundation Soils	19.8	22.4	40.7	0.368	8.760	0.905	1.3	48.0	36	0	0.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.193	0.489
UC-03	UB-03	Foundation Soils	19.8	22.3	39.0	0.400	9.770	1.026	1.3	46.1	40	0	0.5	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.193	0.481
UC-03	UB-03	Foundation Soils	19.9	22.2	37.2	0.442	9.670	1.188	1.3	44.0	44	0	0.5	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.193	0.472
UC-03	UB-03	Foundation Soils	20.0	22.2	31.0	0.487	9.560	1.569	1.3	37.0	55	0	0.5	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.086	0.193	0.446
UC-03	UB-03	Foundation Soils	20.1	22.1	22.1	0.542	9.960	2.458	1.3	26.7	72	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.193	0.409
UC-03	UB-03	Foundation Soils	20.2	22.0	14.9	0.529	10.290	3.561	1.3	18.2	92	0	0.5	18.7	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.193	0.379
UC-03	UB-03	Foundation Soils	20.3	21.9	10.8	0.483	11.100	4.456	1.3	13.2	100	0	0.5	13.7	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.194	0.362
UC-03	UB-03	Foundation Soils	20.3	21.8	8.9	0.379	11.530	4.262	1.3	10.8	100	0	0.5	11.3	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.194	0.354
UC-03	UB-03	Foundation Soils	20.4	21.7	7.2	0.284	12.290	3.968	1.3	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.194	0.347
UC-03	UB-03	Foundation Soils	20.5	21.7	6.0	0.215	24.770	3.575	1.3	7.3	100	0	0.5	7.8	1.0	-0.4	0.0	0.9	0.065	1.006	0.066	0.194	0.343
UC-03	UB-03	Foundation Soils	20.6	21.6	6.2	0.148	56.980	2.404	1.3	7.5	100	0	0.5	7.9	1.0	-0.4	0.0	0.9	0.065	1.006	0.067	0.194	0.343
UC-03	UB-03	Foundation Soils	20.7	21.5	7.2	0.087	93.900	1.209	1.3	8.7	97	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.194	0.346
UC-03	UB-03	Foundation Soils	20.8	21.4	20.8	0.083	68.890	0.400	1.3	24.8	45	0	0.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.194	0.399
UC-03	UB-03	Foundation Soils	20.8	21.3	30.1	0.124	67.850	0.412	1.2	35.3	33	0	0.5	35.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.195	0.436
UC-03	UB-03	Foundation Soils	20.9	21.2	22.4	0.188	8.100	0.839	1.3	26.6	53	0	0.5	27.1	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.195	0.405
UC-03	UB-03	Foundation Soils	21.0	21.2	14.3	0.249	14.320	1.744	1.3	17.1	79	0	0.5	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.195	0.372
UC-03	UB-03	Foundation Soils	21.1	21.1	9.5	0.257	31.490	2.703	1.3	11.4	100	0	0.5	11.9	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.195	0.354
UC-03	UB-03	Foundation Soils	21.2	21.0	7.3	0.213	57.890	2.905	1.3	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.195	0.345
UC-03	UB-03	Foundation Soils	21.2	20.9	6.8	0.214	66.020	3.155	1.3	8.1	100	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.195	0.343
UC-03	UB-03	Foundation Soils	21.3	20.8	19.3	0.218	96.300	1.127	1.3	22.9	63	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.195	0.390
UC-03	UB-03	Foundation Soils	21.4	20.8	28.6	0.285	103.870	0.998	1.2	33.1	49	0	0.5	33.7	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.195	0.426
UC-03	UB-03	Foundation Soils	21.5	20.7	20.5	0.338	7.150	1.648	1.2	24.1	69	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.195	0.394
UC-03	UB-03	Foundation Soils	21.6	20.6	12.3	0.277	3.670	2.248	1.3	14.5	90	0	0.5	15.0	1.0	-0.4	0.0	0.9	0.069	1.006	0.071	0.196	0.362
UC-03	UB-03	Foundation Soils	21.7	20.5	9.6	0.254	22.110	2.655	1.2	11.3	100	0	0.5	11.8	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.196	0.351
UC-03	UB-03	Foundation Soils	21.7	20.4	7.4	0.236	40.070	3.193	1.2	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.196	0.343
UC-03	UB-03	Foundation Soils	21.8	20.3	8.5	0.239	52.080	2.827	1.2	9.9	100	0	0.5	10.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.196	0.347
UC-03	UB-03	Foundation Soils	21.9	20.3	33.1	0.224	96.480	0.676	1.2	37.8	38	0	0.5	38.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.196	0.440

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	22.0	20.2	58.9	0.187	48.600	0.318	1.2	65.2	8	0	0.1	65.3	1.0	-0.4	0.0	0.9	0.104	1.009	0.107	0.196	0.545
UC-03	UB-03	Foundation Soils	22.1	20.1	68.6	0.184	7.000	0.268	1.2	75.3	1	0	0.0	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.196	0.589
UC-03	UB-03	Foundation Soils	22.1	20.0	77.2	0.223	-3.030	0.289	1.2	84.0	0	0	0.0	84.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.196	0.632
UC-03	UB-03	Foundation Soils	22.2	19.9	64.5	0.302	2.860	0.468	1.2	70.8	12	0	0.2	70.9	1.0	-0.4	0.0	0.9	0.108	1.010	0.112	0.196	0.568
UC-03	UB-03	Foundation Soils	22.3	19.9	54.8	0.378	4.920	0.690	1.2	60.5	23	0	0.4	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.196	0.525
UC-03	UB-03	Foundation Soils	22.4	19.8	36.4	0.467	7.130	1.285	1.2	40.8	48	0	0.5	41.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.197	0.450
UC-03	UB-03	Foundation Soils	22.5	19.7	25.7	0.602	9.620	2.347	1.2	29.1	70	0	0.5	29.7	1.0	-0.4	0.0	0.9	0.079	1.006	0.080	0.197	0.408
UC-03	UB-03	Foundation Soils	22.6	19.6	18.2	0.668	12.150	3.663	1.2	20.9	89	0	0.5	21.5	1.0	-0.4	0.0	0.9	0.073	1.006	0.075	0.197	0.380
UC-03	UB-03	Foundation Soils	22.6	19.5	14.4	0.575	14.140	4.005	1.2	16.5	98	0	0.5	17.0	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.197	0.365
UC-03	UB-03	Foundation Soils	22.7	19.4	11.3	0.317	15.720	2.801	1.2	13.0	99	0	0.5	13.5	1.0	-0.4	0.0	0.9	0.068	1.006	0.070	0.197	0.354
UC-03	UB-03	Foundation Soils	22.8	19.4	8.5	0.248	21.170	2.913	1.2	9.7	100	0	0.5	10.2	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.197	0.344
UC-03	UB-03	Foundation Soils	22.9	19.3	7.1	0.234	55.510	3.293	1.2	8.1	100	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.197	0.338
UC-03	UB-03	Foundation Soils	23.0	19.2	19.6	0.163	75.800	0.830	1.2	22.3	59	0	0.5	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.197	0.383
UC-03	UB-03	Foundation Soils	23.0	19.1	41.3	0.140	61.130	0.339	1.2	45.5	21	0	0.4	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.092	0.197	0.464
UC-03	UB-03	Foundation Soils	23.1	19.0	44.5	0.156	6.770	0.351	1.2	48.7	19	0	0.4	49.1	1.0	-0.4	0.0	0.9	0.092	1.007	0.094	0.197	0.476
UC-03	UB-03	Foundation Soils	23.2	19.0	41.2	0.260	10.590	0.631	1.2	45.3	31	0	0.5	45.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.197	0.463
UC-03	UB-03	Foundation Soils	23.3	18.9	30.1	0.378	14.180	1.255	1.2	33.4	53	0	0.5	33.9	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.198	0.420
UC-03	UB-03	Foundation Soils	23.4	18.8	25.3	0.540	16.910	2.131	1.2	28.2	69	0	0.5	28.7	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.198	0.402
UC-03	UB-03	Foundation Soils	23.5	18.7	17.0	0.564	21.180	3.325	1.2	19.1	90	0	0.5	19.6	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.198	0.372
UC-03	UB-03	Foundation Soils	23.5	18.6	11.9	0.475	27.310	3.995	1.2	13.3	100	0	0.5	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.198	0.353
UC-03	UB-03	Foundation Soils	23.6	18.5	9.4	0.389	32.780	4.119	1.2	10.6	100	0	0.5	11.1	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.198	0.344
UC-03	UB-03	Foundation Soils	23.7	18.5	7.4	0.344	56.980	4.670	1.2	8.2	100	0	0.5	8.7	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.198	0.337
UC-03	UB-03	Foundation Soils	23.8	18.4	11.5	0.319	98.280	2.785	1.2	12.8	99	0	0.5	13.3	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.198	0.351
UC-03	UB-03	Foundation Soils	23.9	18.3	25.3	0.319	86.250	1.261	1.2	27.9	59	0	0.5	28.4	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.198	0.400
UC-03	UB-03	Foundation Soils	23.9	18.2	31.0	0.265	23.770	0.855	1.2	33.9	45	0	0.5	34.4	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.198	0.420
UC-03	UB-03	Foundation Soils	24.0	18.1	34.9	0.210	23.960	0.601	1.2	38.0	36	0	0.5	38.4	1.0	-0.4	0.1	0.9	0.084	1.007	0.086	0.198	0.434
UC-03	UB-03	Foundation Soils	24.1	18.0	44.9	0.130	20.610	0.290	1.1	48.2	17	0	0.3	48.5	1.0	-0.4	0.1	0.9	0.091	1.007	0.093	0.198	0.470
UC-03	UB-03	Foundation Soils	24.2	18.0	55.2	0.097	15.340	0.176	1.1	58.8	5	0	0.0	58.8	1.0	-0.5	0.1	0.9	0.099	1.008	0.101	0.198	0.509
UC-03	UB-03	Foundation Soils	24.3	17.9	63.0	0.119	-2.570	0.189	1.1	66.6	1	0	0.0	66.6	1.0	-0.5	0.1	0.9	0.105	1.010	0.107	0.198	0.541
UC-03	UB-03	Foundation Soils	24.4	17.8	57.3	0.151	2.140	0.263	1.1	60.8	8	0	0.1	60.8	1.0	-0.5	0.1	0.9	0.100	1.009	0.103	0.199	0.517
UC-03	UB-03	Foundation Soils	24.4	17.7	48.3	0.231	11.010	0.478	1.1	51.4	22	0	0.4	51.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.199	0.481
UC-03	UB-03	Foundation Soils	24.5	17.6	39.5	0.276	16.630	0.699	1.1	42.2	35	0	0.5	42.7	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.199	0.448
UC-03	UB-03	Foundation Soils	24.6	17.6	32.6	0.327	18.130	1.002	1.1	35.0	47	0	0.5	35.6	1.0	-0.5	0.1	0.9	0.082	1.007	0.084	0.199	0.422
UC-03	UB-03	Foundation Soils	24.7	17.5	28.9	0.371	20.490	1.282	1.1	31.1	55	0	0.5	31.7	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.199	0.409
UC-03	UB-03	Foundation Soils	24.8	17.4	25.8	0.408	22.710	1.582	1.1	27.8	63	0	0.5	28.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.079	0.199	0.397
UC-03	UB-03	Foundation Soils	24.9	17.3	24.4	0.365	25.010	1.494	1.1	26.3	64	0	0.5	26.8	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.199	0.392
UC-03	UB-03	Foundation Soils	24.9	17.2	24.9	0.266	26.360	1.070	1.1	26.7	57	0	0.5	27.2	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.199	0.393
UC-03	UB-03	Foundation Soils	25.0	17.1	27.5	0.209	24.110	0.760	1.1	29.4	48	0	0.5	29.9	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.199	0.402
UC-03	UB-03	Foundation Soils	25.1	17.1	29.2	0.178	9.310	0.610	1.1	31.1	42	0	0.5	31.6	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.199	0.408
UC-03	UB-03	Foundation Soils	25.2	17.0	28.1	0.205	0.910	0.729	1.1	29.9	46	0	0.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.199	0.404
UC-03	UB-03	Foundation Soils	25.3	16.9	23.1	0.243	0.380	1.050	1.1	24.7	59	0	0.5	25.2	1.0	-0.5	0.1	0.9	0.076	1.006	0.077	0.199	0.386
UC-03	UB-03	Foundation Soils	25.3	16.8	19.8	0.245	13.460	1.240	1.1	21.1	67	0	0.5	21.6	1.0	-0.5	0.1	0.9	0.073	1.006	0.075	0.199	0.374
UC-03	UB-03	Foundation Soils	25.4	16.7	16.7	0.273	31.210	1.639	1.1	17.8	78	0	0.5	18.3	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.199	0.364
UC-03	UB-03	Foundation Soils	25.5	16.7	14.7	0.266	35.160	1.811	1.1	15.7	84	0	0.5	16.2	1.0	-0.5	0.1	0.9	0.070	1.006	0.071	0.199	0.357
UC-03	UB-03	Foundation Soils	25.6	16.6	11.9	0.276	51.840	2.319	1.1	12.7	97	0	0.5	13.2	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.199	0.347
UC-03	UB-03	Foundation Soils	25.7	16.5	10.2	0.280	74.370	2.757	1.1	10.8	100	0	0.5	11.3	1.0	-0.5	0.1	0.9	0.067	1.006	0.068	0.199	0.341
UC-03	UB-03	Foundation Soils	25.8	16.4	11.2	0.278	110.440	2.480	1.1	11.9	100	0	0.5	12.4	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.199	0.345
UC-03	UB-03	Foundation Soils	25.8	16.3	13.8	0.252	84.050	1.828	1.1	14.6	87	0	0.5	15.1	1.0	-0.5	0.1	0.9	0.069	1.006	0.070	0.200	0.353
UC-03	UB-03	Foundation Soils	25.9	16.2	16.1	0.226	69.620	1.406	1.1	17.0	77	0	0.5	17.5	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.200	0.360
UC-03	UB-03	Foundation Soils	26.0	16.2	21.9	0.272	60.510	1.241	1.1	23.1	64	0	0.5	23.6	1.0	-0.5	0.1	0.9	0.075	1.006	0.076	0.200	0.379
UC-03	UB-03	Foundation Soils	26.1	16.1	30.2	0.305	28.400	1.010	1.1	31.5	50	0	0.5	32.0	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.200	0.407
UC-03	UB-03	Foundation Soils	26.2	16.0	35.3	0.283	24.820	0.802	1.1	36.6	41	0	0.5	37.1	1.0	-0.5	0.1	0.9	0.083	1.007	0.085	0.200	0.424
UC-03	UB-03	Foundation Soils	26.2	15.9	40.7	0.265	19.820	0.650	1.1	42.1	33	0	0.5	42.5	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.200	0.443
UC-03	UB-03	Foundation Soils	26.3	15.8	53.0	0.260	1.330	0.490	1.1	54.3	20	0	0.4	54.7	1.0	-0.5	0.1	0.9	0.096	1.008	0.097	0.200	0.487
UC-03	UB-03	Foundation Soils	26.4	15.8	70.6	0.280	6.430	0.397	1.1	71.7	8	0	0.1	71.8	1.0	-0.5	0.1	0.9	0.109	1.010	0.111	0.200	0.556
UC-03	UB-03	Foundation Soils	26.5	15.7	85.8	0.336	7.900	0.392	1.1	86.5	2	0	0.0	86.5	1.0	-0.5	0.1	0.9	0.122	1.014	0.125	0.200	0.626
UC-03	UB-03	Foundation Soils	26.6	15.6	94.2	0.378	12.770	0.401	1.1	94.6	0	0	0.0	94.6	1.0	-0.5	0.1	0.9	0.131	1.016	0.134	0.200	0.673
UC-03	UB-03	Foundation Soils	26.7	15.5	96.0	0.458	9.100	0.477	1.1	96.4	2	0	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.200	0.684
UC-03	UB-03	Foundation Soils	26.7	15.4	97.4	0.528	14.270	0.542	1.1	97.6	4	0	0.0	97.6	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.200	0.691
UC-03	UB-03	Foundation Soils	26.8	15.3	97.6	0.543	18.140	0.556	1.1	97.6	4	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.200	0.692
UC-03	UB-03	Foundation Soils	26.9	15.3	97.8	0.575	19.110	0.588	1.1	97.7	6	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.200	0.692
UC-03	UB-03	Foundation Soils	27.0	15.2	101.0	0.601	21.540	0.595	1.1	100.6	5	0	0.0	100.6	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.200	0.712

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	27.1	15.1	108.8	0.630	19.680	0.579	1.1	108.1	2	0	0.0	108.1	1.0	-0.5	0.1	0.9	0.149	1.021	0.154	0.200	0.770
UC-03	UB-03	Foundation Soils	27.1	15.0	112.0	0.680	19.930	0.607	1.1	111.0	2	0	0.0	111.0	1.0	-0.5	0.1	0.9	0.154	1.022	0.159	0.200	0.795
UC-03	UB-03	Foundation Soils	27.2	14.9	109.6	0.702	19.580	0.640	1.1	108.6	4	0	0.0	108.6	1.0	-0.5	0.1	0.9	0.150	1.021	0.155	0.200	0.774
UC-03	UB-03	Foundation Soils	27.3	14.9	105.3	0.718	18.030	0.682	1.1	104.3	7	0	0.0	104.4	1.0	-0.5	0.1	0.9	0.143	1.019	0.148	0.200	0.738
UC-03	UB-03	Foundation Soils	27.4	14.8	98.1	0.717	21.520	0.731	1.1	97.2	10	0	0.1	97.4	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.200	0.688
UC-03	UB-03	Foundation Soils	27.5	14.7	96.2	0.675	22.590	0.702	1.0	95.2	10	0	0.1	95.3	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.200	0.675
UC-03	UB-03	Foundation Soils	27.6	14.6	97.6	0.678	23.870	0.695	1.0	96.5	9	0	0.1	96.6	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.200	0.682
UC-03	UB-03	Foundation Soils	27.6	14.5	96.9	0.692	23.110	0.714	1.0	95.7	10	0	0.1	95.8	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.200	0.677
UC-03	UB-03	Foundation Soils	27.7	14.4	93.6	0.698	18.630	0.746	1.0	92.3	12	0	0.2	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.200	0.657
UC-03	UB-03	Foundation Soils	27.8	14.4	90.0	0.652	24.590	0.724	1.0	88.8	12	0	0.2	89.0	1.0	-0.5	0.1	0.9	0.125	1.014	0.127	0.200	0.636
UC-03	UB-03	Foundation Soils	27.9	14.3	91.5	0.618	23.110	0.676	1.0	90.1	11	0	0.2	90.2	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.200	0.643
UC-03	UB-03	Foundation Soils	28.0	14.2	95.0	0.644	22.520	0.678	1.0	93.3	10	0	0.1	93.5	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.200	0.662
UC-03	UB-03	Foundation Soils	28.1	14.1	95.8	0.665	20.490	0.694	1.0	94.0	10	0	0.1	94.1	1.0	-0.6	0.1	0.9	0.130	1.016	0.133	0.200	0.666
UC-03	UB-03	Foundation Soils	28.1	14.0	92.5	0.677	22.220	0.732	1.0	90.7	12	0	0.2	90.9	1.0	-0.6	0.1	0.9	0.127	1.015	0.129	0.200	0.646
UC-03	UB-03	Foundation Soils	28.2	13.9	90.0	0.681	25.300	0.757	1.0	88.1	14	0	0.3	88.4	1.0	-0.6	0.1	0.9	0.124	1.014	0.127	0.200	0.632
UC-03	UB-03	Foundation Soils	28.3	13.9	91.0	0.666	25.600	0.732	1.0	89.0	13	0	0.2	89.2	1.0	-0.6	0.1	0.9	0.125	1.014	0.127	0.200	0.637
UC-03	UB-03	Foundation Soils	28.4	13.8	95.1	0.636	25.540	0.669	1.0	92.8	10	0	0.1	92.9	1.0	-0.6	0.1	0.9	0.129	1.015	0.132	0.200	0.657
UC-03	UB-03	Foundation Soils	28.5	13.7	101.4	0.625	23.100	0.616	1.0	98.8	6	0	0.0	98.8	1.0	-0.6	0.1	0.9	0.136	1.017	0.139	0.200	0.694
UC-03	UB-03	Foundation Soils	28.5	13.6	108.9	0.613	17.630	0.563	1.0	105.8	2	0	0.0	105.8	1.0	-0.6	0.1	0.9	0.145	1.020	0.149	0.200	0.746
UC-03	UB-03	Foundation Soils	28.6	13.5	109.8	0.617	20.340	0.562	1.0	106.6	2	0	0.0	106.6	1.0	-0.6	0.1	0.9	0.147	1.020	0.150	0.200	0.752
UC-03	UB-03	Foundation Soils	28.7	13.5	105.7	0.642	19.680	0.608	1.0	102.5	5	0	0.0	102.5	1.0	-0.6	0.1	0.9	0.141	1.019	0.144	0.200	0.720
UC-03	UB-03	Foundation Soils	28.8	13.4	101.0	0.636	21.620	0.630	1.0	97.9	7	0	0.0	97.9	1.0	-0.6	0.1	0.9	0.135	1.017	0.138	0.200	0.688
UC-03	UB-03	Foundation Soils	28.9	13.3	98.8	0.599	22.920	0.606	1.0	95.7	7	0	0.0	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.200	0.673
UC-03	UB-03	Foundation Soils	29.0	13.2	100.0	0.583	24.870	0.583	1.0	96.6	6	0	0.0	96.7	1.0	-0.6	0.1	0.9	0.133	1.017	0.136	0.200	0.679
UC-03	UB-03	Foundation Soils	29.0	13.1	101.3	0.623	23.350	0.615	1.0	97.8	6	0	0.0	97.8	1.0	-0.6	0.1	0.9	0.135	1.017	0.137	0.200	0.687
UC-03	UB-03	Foundation Soils	29.1	13.0	99.2	0.657	18.890	0.663	1.0	95.7	9	0	0.1	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.200	0.673
UC-03	UB-03	Foundation Soils	29.2	13.0	90.5	0.773	20.110	0.854	1.0	87.3	16	0	0.3	87.6	1.0	-0.6	0.1	0.9	0.123	1.014	0.125	0.200	0.626
UC-03	UB-03	Foundation Soils	29.3	12.9	84.3	0.704	21.200	0.835	1.0	81.2	18	0	0.4	81.6	1.0	-0.6	0.1	0.9	0.117	1.012	0.119	0.200	0.595
UC-03	UB-03	Foundation Soils	29.4	12.8	65.0	0.845	21.730	1.301	1.0	62.6	35	0	0.5	63.2	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.200	0.515
UC-03	UB-03	Foundation Soils	29.4	12.7	52.4	0.962	23.540	1.835	1.0	50.5	48	0	0.6	51.1	1.0	-0.6	0.1	0.9	0.093	1.008	0.094	0.200	0.469
UC-03	UB-03	Foundation Soils	29.5	12.6	39.7	0.955	27.350	2.406	1.0	38.3	62	0	0.5	38.8	1.0	-0.6	0.1	0.9	0.085	1.007	0.085	0.200	0.426
UC-03	UB-03	Foundation Soils	29.6	12.6	32.1	0.811	13.190	2.529	1.0	30.9	69	0	0.5	31.4	1.0	-0.6	0.1	0.9	0.080	1.006	0.080	0.200	0.401
UC-03	UB-03	Foundation Soils	29.7	12.5	34.8	0.618	35.260	1.774	1.0	33.5	59	0	0.5	34.0	1.0	-0.6	0.1	0.9	0.081	1.007	0.082	0.200	0.410
UC-03	UB-03	Foundation Soils	29.8	12.4	41.6	0.505	40.640	1.213	1.0	39.9	46	0	0.5	40.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.200	0.431
UC-03	UB-03	Foundation Soils	29.9	12.3	70.5	0.446	28.740	0.633	1.0	67.4	18	0	0.4	67.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.107	0.200	0.533
UC-03	UB-03	Foundation Soils	29.9	12.2	83.7	0.466	18.150	0.557	1.0	79.9	10	0	0.1	80.0	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.200	0.586
UC-03	UB-03	Foundation Soils	30.0	12.1	84.4	0.511	8.67	0.605134	1.0	80.4	12	0	0.2	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.118	0.200	0.589
UC-03	UB-03	Foundation Soils	30.1	12.1	80.9	0.543	15.340	0.671	1.0	77.0	15	0	0.3	77.3	1.0	-0.6	0.1	0.9	0.113	1.011	0.115	0.200	0.573
UC-03	UB-03	Foundation Soils	30.2	12.0	77.2	0.548	18.410	0.710	1.0	73.3	18	0	0.4	73.7	1.0	-0.6	0.1	0.9	0.110	1.011	0.112	0.200	0.557
UC-03	UB-03	Foundation Soils	30.3	11.9	73.8	0.563	21.250	0.763	1.0	70.1	20	0	0.4	70.5	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.200	0.543
UC-03	UB-03	Foundation Soils	30.3	11.8	74.5	0.573	24.250	0.769	1.0	70.6	20	0	0.4	71.0	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.200	0.545
UC-03	UB-03	Foundation Soils	30.4	11.7	78.4	0.583	24.920	0.744	1.0	74.2	18	0	0.4	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.200	0.561
UC-03	UB-03	Foundation Soils	30.5	11.7	77.8	0.579	25.610	0.744	1.0	73.6	18	0	0.4	74.0	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.200	0.558
UC-03	UB-03	Foundation Soils	30.6	11.6	76.3	0.558	26.630	0.732	1.0	72.0	19	0	0.4	72.4	1.0	-0.6	0.1	0.9	0.109	1.011	0.110	0.200	0.551
UC-03	UB-03	Foundation Soils	30.7	11.5	74.7	0.522	27.790	0.698	1.0	70.4	18	0	0.4	70.8	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.200	0.544
UC-03	UB-03	Foundation Soils	30.8	11.4	77.8	0.460	28.400	0.591	1.0	73.2	14	0	0.3	73.5	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.200	0.556
UC-03	UB-03	Foundation Soils	30.8	11.3	83.1	0.378	26.690	0.455	1.0	78.1	8	0	0.0	78.2	1.0	-0.6	0.1	0.9	0.114	1.012	0.115	0.200	0.576
UC-03	UB-03	Foundation Soils	30.9	11.2	90.1	0.319	23.250	0.354	1.0	84.7	1	0	0.0	84.7	1.0	-0.6	0.1	0.9	0.120	1.013	0.122	0.200	0.607
UC-03	UB-03	Foundation Soils	31.0	11.2	95.8	0.211	17.170	0.220	1.0	89.9	0	0	0.0	89.9	1.0	-0.6	0.1	0.9	0.125	1.015	0.127	0.200	0.635
UC-03	UB-03	Foundation Soils	31.1	11.1	98.9	0.159	13.440	0.161	1.0	92.6	0	0	0.0	92.6	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.200	0.650
UC-03	UB-03	Foundation Soils	31.2	11.0	98.5	0.124	11.990	0.126	1.0	92.2	0	0	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.200	0.648
UC-03	UB-03	Foundation Soils	31.2	10.9	96.7	0.121	14.630	0.125	1.0	90.3	0	0	0.0	90.3	1.0	-0.6	0.1	0.9	0.126	1.015	0.128	0.200	0.637
UC-03	UB-03	Foundation Soils	31.3	10.8	92.4	0.115	13.570	0.124	1.0	86.2	0	0	0.0	86.2	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.200	0.615
UC-03	UB-03	Foundation Soils	31.4	10.7	87.9	0.113	15.200	0.129	1.0	81.9	0	0	0.0	81.9	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.200	0.593
UC-03	UB-03	Foundation Soils	31.5	10.7	80.4	0.129	18.770	0.161	1.0	74.8	0	0	0.0	74.8	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.200	0.560
UC-03	UB-03	Foundation Soils	31.6	10.6	73.5	0.202	24.770	0.275	1.0	68.2	4	0	0.0	68.2	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.200	0.533
UC-03	UB-03	Foundation Soils	31.7	10.5	66.8	0.259	27.140	0.388	1.0	61.9	12	0	0.2	62.1	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.200	0.508
UC-03	UB-03	Foundation Soils	31.7	10.4	57.1	0.296	29.300	0.518	1.0	52.8	22	0	0.4	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.095	0.200	0.475
UC-03	UB-03	Foundation Soils	31.8	10.3	49.6	0.306	38.090	0.616	1.0	45.8	29	0	0.5	46.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.090	0.200	0.450
UC-03	UB-03	Foundation Soils	31.9	10.3	43.4	0.363	62.560	0.836	1.0	40.0	39	0	0.5	40.5	1.0	-0.7	0.1	0.9	0.086	1.007	0.086	0.200	0.430
UC-03	UB-03	Foundation Soils	32.0	10.2	41.2	0.341	95.400	0.828	1.0	37.8	40	0	0.5	38.3	1.0	-0.7	0.1	0.9	0.084	1.007	0.085	0.200	0.423
UC-03	UB-03	Foundation Soils	32.1	10.1	42.5	0.237	93.480	0.558	1.0	39.0	32	0	0.5	39.4	1.0	-0.7	0.1	0.9	0.085	1.007	0.085	0.200	0.427

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	32.2	10.0	48.0	0.231	83.270	0.481	1.0	44.1	26	0	0.4	44.5	1.0	-0.7	0.1	0.9	0.088	1.007	0.089	0.200	0.444
UC-03	UB-03	Foundation Soils	32.2	9.9	57.7	0.101	46.160	0.175	1.0	52.9	7	0	0.0	52.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.095	0.200	0.474
UC-03	UB-03	Foundation Soils	32.3	9.8	63.8	0.150	42.530	0.235	1.0	58.5	7	0	0.0	58.5	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.200	0.494
UC-03	UB-03	Foundation Soils	32.4	9.8	63.4	0.208	59.030	0.328	1.0	58.0	12	0	0.2	58.2	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.200	0.493
UC-03	UB-03	Foundation Soils	32.5	9.7	60.0	0.301	69.240	0.502	1.0	54.8	20	0	0.4	55.2	1.0	-0.7	0.1	0.9	0.096	1.008	0.096	0.200	0.482
UC-03	UB-03	Foundation Soils	32.6	9.6	55.9	0.267	84.710	0.477	1.0	51.0	21	0	0.4	51.4	1.0	-0.7	0.1	0.9	0.093	1.008	0.094	0.200	0.468
UC-03	UB-03	Foundation Soils	32.6	9.5	53.3	0.244	85.000	0.458	1.0	48.5	22	0	0.4	48.9	1.0	-0.7	0.1	0.9	0.092	1.007	0.092	0.200	0.459
UC-03	UB-03	Foundation Soils	32.7	9.4	56.6	0.279	78.760	0.493	1.0	51.5	22	0	0.4	51.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.094	0.200	0.470
UC-03	UB-03	Foundation Soils	32.8	9.4	64.7	0.259	64.370	0.400	1.0	58.8	14	0	0.2	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.200	0.496
UC-03	UB-03	Foundation Soils	32.9	9.3	74.4	0.216	37.740	0.290	1.0	67.7	5	0	0.0	67.7	1.0	-0.7	0.1	0.9	0.105	1.010	0.106	0.200	0.530
UC-03	UB-03	Foundation Soils	33.0	9.2	79.2	0.182	53.930	0.230	1.0	72.0	0	0	0.0	72.0	1.0	-0.7	0.1	0.9	0.109	1.010	0.109	0.200	0.547
UC-03	UB-03	Foundation Soils	33.1	9.1	82.8	0.244	58.460	0.295	1.0	75.2	2	0	0.0	75.2	1.0	-0.7	0.1	0.9	0.112	1.011	0.112	0.200	0.561
UC-03	UB-03	Foundation Soils	33.1	9.0	84.9	0.228	56.720	0.269	1.0	77.0	0	0	0.0	77.0	1.0	-0.7	0.1	0.9	0.113	1.011	0.114	0.200	0.569
UC-03	UB-03	Foundation Soils	33.2	8.9	87.3	0.217	63.030	0.248	1.0	79.2	0	0	0.0	79.2	1.0	-0.7	0.1	0.9	0.115	1.012	0.116	0.200	0.579
UC-03	UB-03	Foundation Soils	33.3	8.9	94.4	0.169	53.270	0.179	1.0	85.6	0	0	0.0	85.6	1.0	-0.7	0.1	0.9	0.121	1.013	0.122	0.200	0.610
UC-03	UB-03	Foundation Soils	33.4	8.8	109.2	0.157	20.090	0.144	1.0	99.2	0	0	0.0	99.2	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.200	0.688
UC-03	UB-03	Foundation Soils	33.5	8.7	117.6	0.312	33.640	0.265	1.0	106.8	0	0	0.0	106.8	1.0	-0.7	0.1	0.9	0.147	1.020	0.149	0.200	0.744
UC-03	UB-03	Foundation Soils	33.5	8.6	114.4	0.453	47.070	0.396	1.0	103.7	0	0	0.0	103.7	1.0	-0.7	0.1	0.9	0.142	1.019	0.144	0.200	0.720
UC-03	UB-03	Foundation Soils	33.6	8.5	109.1	0.498	53.120	0.457	1.0	98.7	1	0	0.0	98.7	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.200	0.685
UC-03	UB-03	Foundation Soils	33.7	8.5	98.5	0.689	61.770	0.700	1.0	88.8	12	0	0.2	89.0	1.0	-0.7	0.1	0.9	0.125	1.014	0.125	0.200	0.627
UC-03	UB-03	Foundation Soils	33.8	8.4	95.9	0.802	51.980	0.836	1.0	86.4	16	0	0.3	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.123	0.200	0.615
UC-03	UB-03	Foundation Soils	33.9	8.3	103.9	0.901	39.120	0.867	1.0	93.7	15	0	0.3	94.0	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.200	0.655
UC-03	UB-03	Foundation Soils	34.0	8.2	113.2	1.077	34.070	0.951	1.0	102.1	14	0	0.3	102.4	1.0	-0.7	0.1	0.9	0.140	1.019	0.142	0.200	0.710
UC-03	UB-03	Foundation Soils	34.0	8.1	137.2	1.015	11.630	0.740	1.0	124.1	4	0	0.0	124.1	1.0	-0.7	0.1	0.9	0.181	1.028	0.184	0.200	0.921
UC-03	UB-03	Foundation Soils	34.1	8.0	175.6	0.929	-1.910	0.529	1.0	159.6	0	0	0.0	159.6	1.0	-0.7	0.1	0.9	0.368	1.053	0.381	0.200	1.907
UC-03	UB-03	Foundation Soils	34.2	8.0	217.0	0.913	-8.130	0.421	1.0	198.1	0	0	0.0	198.1	1.0	-0.7	0.1	0.9	1.703	1.082	1.795	0.200	8.994
UC-03	UB-03	Foundation Soils	34.3	7.9	223.5	0.779	2.950	0.348	1.0	204.1	0	0	0.0	204.1	1.0	-0.7	0.1	0.9	2.404	1.082	2.528	0.200	12.667
UC-03	UB-03	Foundation Soils	34.4	7.8	220.7	0.718	5.820	0.325	1.0	201.3	0	0	0.0	201.3	1.0	-0.7	0.1	0.9	2.037	1.082	2.142	0.200	10.738
UC-03	UB-03	Foundation Soils	34.4	7.7	198.7	0.681	32.640	0.343	1.0	180.6	0	0	0.0	180.6	1.0	-0.7	0.1	0.9	0.743	1.075	0.780	0.199	3.911
UC-03	UB-03	Foundation Soils	34.5	7.6	190.2	0.585	47.960	0.308	1.0	172.5	0	0	0.0	172.5	1.0	-0.7	0.1	0.9	0.548	1.066	0.572	0.199	2.868
UC-03	UB-03	Foundation Soils	34.6	7.6	171.6	0.490	34.020	0.286	1.0	155.0	0	0	0.0	155.0	1.0	-0.7	0.1	0.9	0.325	1.049	0.335	0.199	1.681
UC-03	UB-03	Foundation Soils	34.7	7.5	152.6	0.435	15.900	0.285	1.0	137.3	0	0	0.0	137.3	1.0	-0.7	0.1	0.9	0.223	1.036	0.227	0.199	1.141
UC-03	UB-03	Foundation Soils	34.8	7.4	149.6	0.480	-10.340	0.321	1.0	134.4	0	0	0.0	134.4	1.0	-0.7	0.1	0.9	0.212	1.034	0.216	0.199	1.083
UC-03	UB-03	Foundation Soils	34.9	7.3	150.2	0.367	-13.350	0.244	1.0	134.9	0	0	0.0	134.9	1.0	-0.7	0.1	0.9	0.214	1.035	0.217	0.199	1.091
UC-03	UB-03	Foundation Soils	34.9	7.2	149.4	0.373	22.850	0.250	1.0	134.0	0	0	0.0	134.0	1.0	-0.7	0.1	0.9	0.211	1.034	0.214	0.199	1.074
UC-03	UB-03	Foundation Soils	35.0	7.1	135.4	0.384	34.900	0.284	0.9	121.0	0	0	0.0	121.0	1.0	-0.7	0.1	0.9	0.173	1.027	0.175	0.199	0.880
UC-03	UB-03	Foundation Soils	35.1	7.1	120.0	0.420	35.400	0.350	0.9	106.7	0	0	0.0	106.7	1.0	-0.7	0.1	0.9	0.147	1.020	0.148	0.199	0.741
UC-03	UB-03	Foundation Soils	35.2	7.0	118.2	0.369	40.180	0.312	0.9	104.9	0	0	0.0	104.9	1.0	-0.7	0.1	0.9	0.144	1.020	0.145	0.199	0.727
UC-03	UB-03	Foundation Soils	35.3	6.9	116.9	0.290	27.020	0.248	0.9	103.7	0	0	0.0	103.7	1.0	-0.8	0.1	0.9	0.142	1.019	0.143	0.199	0.718
UC-03	UB-03	Foundation Soils	35.4	6.8	118.3	0.273	28.680	0.231	0.9	104.9	0	0	0.0	104.9	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.199	0.727
UC-03	UB-03	Foundation Soils	35.4	6.7	118.7	0.186	2.810	0.157	0.9	105.1	0	0	0.0	105.1	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.199	0.728
UC-03	UB-03	Foundation Soils	35.5	6.6	114.3	0.334	23.510	0.292	0.9	101.0	0	0	0.0	101.0	1.0	-0.8	0.1	0.9	0.139	1.018	0.139	0.199	0.699
UC-03	UB-03	Foundation Soils	35.6	6.6	109.1	0.344	22.340	0.315	0.9	96.1	0	0	0.0	96.1	1.0	-0.8	0.1	0.9	0.132	1.016	0.133	0.199	0.667
UC-03	UB-03	Foundation Soils	35.7	6.5	103.5	0.389	17.680	0.376	0.9	90.9	0	0	0.0	90.9	1.0	-0.8	0.1	0.9	0.127	1.015	0.127	0.199	0.637
UC-03	UB-03	Foundation Soils	35.8	6.4	102.1	0.360	24.250	0.352	0.9	89.6	0	0	0.0	89.6	1.0	-0.8	0.1	0.9	0.125	1.014	0.125	0.199	0.629
UC-03	UB-03	Foundation Soils	35.8	6.3	103.2	0.286	30.890	0.277	0.9	90.5	0	0	0.0	90.5	1.0	-0.8	0.1	0.9	0.126	1.015	0.126	0.199	0.634
UC-03	UB-03	Foundation Soils	35.9	6.2	112.5	0.211	33.590	0.188	0.9	98.8	0	0	0.0	98.8	1.0	-0.8	0.1	0.9	0.136	1.017	0.136	0.199	0.684
UC-03	UB-03	Foundation Soils	36.0	6.2	110.8	0.238	33.490	0.215	0.9	97.2	0	0	0.0	97.2	1.0	-0.8	0.1	0.9	0.134	1.017	0.134	0.199	0.673
UC-03	UB-03	Foundation Soils	36.1	6.1	117.2	0.228	34.970	0.194	0.9	102.9	0	0	0.0	102.9	1.0	-0.8	0.1	0.9	0.141	1.019	0.142	0.199	0.712
UC-03	UB-03	Foundation Soils	36.2	6.0	114.6	0.175	27.790	0.153	0.9	100.3	0	0	0.0	100.3	1.0	-0.8	0.1	0.9	0.138	1.018	0.138	0.199	0.694
UC-03	UB-03	Foundation Soils	36.3	5.9	111.9	0.149	26.060	0.133	0.9	97.8	0	0	0.0	97.8	1.0	-0.8	0.1	0.9	0.135	1.017	0.135	0.199	0.677
UC-03	UB-03	Foundation Soils	36.3	5.8	102.1	0.138	26.110	0.135	0.9	88.9	0	0	0.0	88.9	1.0	-0.8	0.1	0.9	0.124	1.014	0.124	0.199	0.626
UC-03	UB-03	Foundation Soils	36.4	5.7	96.3	0.111	35.260	0.115	0.9	83.6	0	0	0.0	83.6	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.199	0.599
UC-03	UB-03	Foundation Soils	36.5	5.7	96.2	0.106	16.580	0.110	0.9	83.4	0	0	0.0	83.4	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.199	0.597
UC-03	UB-03	Foundation Soils	36.6	5.6	95.9	0.083	19.390	0.087	0.9	83.0	0	0	0.0	83.0	1.0	-0.8	0.1	0.9	0.119	1.013	0.118	0.199	0.596
UC-03	UB-03	Foundation Soils	36.7	5.5	92.7	0.053	28.630	0.057	0.9	80.1	0	0	0.0	80.1	1.0	-0.8	0.1	0.9	0.116	1.012	0.116	0.199	0.582
UC-03	UB-03	Foundation Soils	36.7	5.4	89.0	0.115	29.640	0.129	0.9	76.7	0	0	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.113	0.199	0.567
UC-03	UB-03	Foundation Soils	36.8	5.3	90.8	0.151	27.090	0.166	0.9	78.2	0	0	0.0	78.2	1.0	-0.8	0.1	0.9	0.114	1.012	0.114	0.199	0.573
UC-03	UB-03	Foundation Soils	36.9	5.3	85.5	0.149	32.880	0.174	0.9	73.4	0	0	0.0	73.4	1.0	-0.8	0.1	0.9	0.110	1.011	0.110	0.198	0.552
UC-03	UB-03	Foundation Soils	37.0	5.2	84.2	0.136	28.120	0.162	0.9	72.2	0	0	0.0	72.2	1.0	-0.8	0.1	0.9	0.109	1.010	0.109	0.198	0.547
UC-03	UB-03	Foundation Soils	37.1	5.1	82.9	0.110	31.350	0.133	0.9	70.9	0	0	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.108	0.198	0.542
UC-03	UB-03	Foundation Soils	37.2	5.0	82.4	0.062	21.150	0.075	0.9	70.3	0	0	0.0	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.198	0.540

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	37.2	4.9	81.8	0.088	13.200	0.108	0.9	69.8	0	0	0.0	69.8	1.0	-0.8	0.1	0.9	0.107	1.010	0.107	0.198	0.537
UC-03	UB-03	Foundation Soils	37.3	4.8	80.0	0.092	19.270	0.115	0.9	68.1	0	0	0.0	68.1	1.0	-0.8	0.1	0.9	0.106	1.010	0.105	0.198	0.531
UC-03	UB-03	Foundation Soils	37.4	4.8	77.9	0.068	25.200	0.087	0.9	66.1	0	0	0.0	66.1	1.0	-0.8	0.1	0.9	0.104	1.009	0.104	0.198	0.523
UC-03	UB-03	Foundation Soils	37.5	4.7	76.5	0.109	27.560	0.143	0.9	64.8	0	0	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.103	0.198	0.518
UC-03	UB-03	Foundation Soils	37.6	4.6	74.2	0.127	41.640	0.171	0.9	62.8	1	0	0.0	62.8	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.198	0.510
UC-03	UB-03	Foundation Soils	37.6	4.5	74.1	0.122	43.090	0.165	0.9	62.6	1	0	0.0	62.6	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.198	0.509
UC-03	UB-03	Foundation Soils	37.7	4.4	70.9	0.117	44.070	0.165	0.9	59.7	2	0	0.0	59.7	1.0	-0.8	0.1	0.9	0.099	1.009	0.099	0.198	0.498
UC-03	UB-03	Foundation Soils	37.8	4.4	70.5	0.116	41.110	0.165	0.9	59.3	3	0	0.0	59.3	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.198	0.497
UC-03	UB-03	Foundation Soils	37.9	4.3	72.5	0.144	37.690	0.199	0.9	61.0	3	0	0.0	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.100	0.198	0.503
UC-03	UB-03	Foundation Soils	38.0	4.2	73.1	0.186	59.350	0.255	0.9	61.4	6	0	0.0	61.4	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.198	0.505
UC-03	UB-03	Foundation Soils	38.1	4.1	71.8	0.223	59.170	0.311	0.9	60.2	9	0	0.1	60.3	1.0	-0.8	0.1	0.9	0.100	1.009	0.099	0.198	0.501
UC-03	UB-03	Foundation Soils	38.1	4.0	68.6	0.239	58.990	0.348	0.9	57.3	12	0	0.2	57.5	1.0	-0.8	0.1	0.9	0.098	1.008	0.097	0.198	0.490
UC-03	UB-03	Foundation Soils	38.2	3.9	61.9	0.194	57.330	0.314	0.9	51.4	14	0	0.2	51.7	1.0	-0.8	0.1	0.9	0.093	1.008	0.093	0.198	0.469
UC-03	UB-03	Foundation Soils	38.3	3.9	58.2	0.273	55.330	0.469	0.9	48.2	22	0	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.091	0.198	0.459
UC-03	UB-03	Foundation Soils	38.4	3.8	51.3	0.233	78.710	0.454	0.9	42.3	26	0	0.4	42.7	1.0	-0.8	0.1	0.9	0.087	1.007	0.087	0.198	0.438
UC-03	UB-03	Foundation Soils	38.5	3.7	49.5	0.208	75.320	0.420	0.9	40.7	26	0	0.4	41.1	1.0	-0.8	0.1	0.9	0.086	1.007	0.086	0.198	0.433
UC-03	UB-03	Foundation Soils	38.5	3.6	47.0	0.184	85.090	0.392	0.9	38.5	26	0	0.4	38.9	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.198	0.425
UC-03	UB-03	Foundation Soils	38.6	3.5	47.2	0.149	77.040	0.316	0.9	38.6	23	0	0.4	39.0	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.198	0.426
UC-03	UB-03	Foundation Soils	38.7	3.4	47.8	0.135	65.080	0.282	0.9	39.1	22	0	0.4	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.198	0.427
UC-03	UB-03	Foundation Soils	38.8	3.4	49.5	0.120	50.970	0.243	0.9	40.4	19	0	0.3	40.8	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.198	0.432
UC-03	UB-03	Foundation Soils	38.9	3.3	49.0	0.093	65.080	0.190	0.9	40.0	17	0	0.3	40.3	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.198	0.430
UC-03	UB-03	Foundation Soils	39.0	3.2	48.1	0.112	70.420	0.233	0.9	39.2	19	0	0.3	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.197	0.428
UC-03	UB-03	Foundation Soils	39.0	3.1	47.4	0.166	84.880	0.350	0.9	38.5	25	0	0.4	38.9	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.197	0.426
UC-03	UB-03	Foundation Soils	39.1	3.0	47.9	0.253	80.690	0.528	0.9	38.9	31	0	0.5	39.3	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.197	0.427
UC-03	UB-03	Foundation Soils	39.2	3.0	45.9	0.237	90.720	0.516	0.9	37.2	32	0	0.5	37.7	1.0	-0.9	0.1	0.9	0.084	1.007	0.083	0.197	0.422
UC-03	UB-03	Foundation Soils	39.3	2.9	42.9	0.234	90.140	0.546	0.9	34.6	35	0	0.5	35.1	1.0	-0.9	0.1	0.9	0.082	1.007	0.081	0.197	0.413
UC-03	UB-03	Foundation Soils	39.4	2.8	44.5	0.231	75.430	0.519	0.9	35.9	33	0	0.5	36.3	1.0	-0.9	0.1	0.9	0.083	1.007	0.082	0.197	0.417
UC-03	UB-03	Foundation Soils	39.5	2.7	52.7	0.200	2.480	0.379	0.9	42.8	23	0	0.4	43.1	1.0	-0.9	0.1	0.9	0.088	1.007	0.087	0.197	0.440
UC-03	UB-03	Foundation Soils	39.5	2.6	57.2	0.209	69.510	0.366	0.9	46.4	20	0	0.4	46.8	1.0	-0.9	0.1	0.8	0.090	1.007	0.089	0.197	0.453
UC-03	UB-03	Foundation Soils	39.6	2.5	63.1	0.283	54.790	0.449	0.9	51.4	19	0	0.4	51.8	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.197	0.470
UC-03	UB-03	Foundation Soils	39.7	2.5	61.6	0.402	56.140	0.653	0.9	50.1	27	0	0.5	50.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.197	0.466
UC-03	UB-03	Foundation Soils	39.8	2.4	59.2	0.589	66.510	0.995	0.9	48.0	36	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.197	0.459
UC-03	UB-03	Foundation Soils	39.9	2.3	59.2	0.628	73.620	1.061	0.9	47.9	37	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.197	0.459
UC-03	UB-03	Foundation Soils	39.9	2.2	64.2	0.586	51.450	0.913	0.9	52.1	32	0	0.5	52.6	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.197	0.473
UC-03	UB-03	Foundation Soils	40.0	2.1	69.6	0.534	-7.200	0.767	0.9	56.6	26	0	0.5	57.1	1.0	-0.9	0.1	0.8	0.097	1.008	0.096	0.197	0.490
UC-03	UB-03	Foundation Soils	40.1	2.1	71.4	0.474	-20.490	0.664	0.9	58.1	23	0	0.4	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.197	0.495
UC-03	UB-03	Foundation Soils	40.2	2.0	70.1	0.436	-8.210	0.622	0.9	57.0	22	0	0.4	57.4	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.197	0.491
UC-03	UB-03	Foundation Soils	40.3	1.9	66.3	0.426	32.880	0.643	0.9	53.6	24	0	0.4	54.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.197	0.479
UC-03	UB-03	Foundation Soils	40.4	1.8	64.2	0.493	27.110	0.768	0.9	51.8	28	0	0.5	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.197	0.472
UC-03	UB-03	Foundation Soils	40.4	1.7	63.3	0.593	-1.330	0.937	0.9	51.0	33	0	0.5	51.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.197	0.470
UC-03	UB-03	Foundation Soils	40.5	1.6	61.7	0.616	-4.760	0.998	0.9	49.6	35	0	0.5	50.1	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.197	0.465
UC-03	UB-03	Foundation Soils	40.6	1.6	59.2	0.578	-19.060	0.976	0.8	47.4	36	0	0.5	47.9	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.197	0.457
UC-03	UB-03	Foundation Soils	40.7	1.5	60.9	0.466	-21.200	0.766	0.8	48.8	30	0	0.5	49.2	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.197	0.462
UC-03	UB-03	Foundation Soils	40.8	1.4	68.1	0.397	31.350	0.583	0.9	54.8	22	0	0.4	55.2	1.0	-0.9	0.1	0.8	0.096	1.008	0.095	0.197	0.483
UC-03	UB-03	Foundation Soils	40.8	1.3	83.6	0.409	17.050	0.489	0.9	67.9	13	0	0.2	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.196	0.532
UC-03	UB-03	Foundation Soils	40.9	1.2	94.5	0.254	1.910	0.269	0.9	77.2	0	0	0.0	77.2	1.0	-0.9	0.1	0.8	0.113	1.011	0.112	0.196	0.570
UC-03	UB-03	Foundation Soils	41.0	1.2	103.8	0.196	20.200	0.189	0.9	85.1	0	0	0.0	85.1	1.0	-0.9	0.1	0.8	0.121	1.013	0.119	0.196	0.607
UC-03	UB-03	Foundation Soils	41.1	1.1	118.7	0.125	6.910	0.105	0.9	98.0	0	0	0.0	98.0	1.0	-0.9	0.1	0.8	0.135	1.017	0.133	0.196	0.679
UC-03	UB-03	Foundation Soils	41.2	1.0	128.9	0.143	13.830	0.111	0.9	106.9	0	0	0.0	106.9	1.0	-0.9	0.1	0.8	0.147	1.020	0.146	0.196	0.742
UC-03	UB-03	Foundation Soils	41.3	0.9	131.4	0.243	31.780	0.185	0.9	109.0	0	0	0.0	109.0	1.0	-0.9	0.1	0.8	0.150	1.021	0.149	0.196	0.759
UC-03	UB-03	Foundation Soils	41.3	0.8	123.7	0.233	32.680	0.188	0.9	102.1	0	0	0.0	102.1	1.0	-0.9	0.1	0.8	0.140	1.019	0.139	0.196	0.706
UC-03	UB-03	Foundation Soils	41.4	0.7	95.3	0.205	34.090	0.215	0.9	77.4	0	0	0.0	77.4	1.0	-0.9	0.1	0.8	0.113	1.012	0.112	0.196	0.571
UC-03	UB-03	Foundation Soils	41.5	0.7	77.3	0.224	36.020	0.290	0.8	62.0	7	0	0.0	62.0	1.0	-0.9	0.1	0.8	0.101	1.009	0.100	0.196	0.509
UC-03	UB-03	Foundation Soils	41.6	0.6	65.6	0.215	34.830	0.328	0.8	52.0	14	0	0.2	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.196	0.473
UC-03	UB-03	Foundation Soils	41.7	0.5	56.3	0.194	36.780	0.344	0.8	44.3	20	0	0.4	44.6	1.0	-0.9	0.1	0.8	0.089	1.007	0.088	0.196	0.447
UC-03	UB-03	Foundation Soils	41.7	0.4	55.0	0.236	34.600	0.429	0.8	43.2	24	0	0.4	43.6	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.196	0.443
UC-03	UB-03	Foundation Soils	41.8	0.3	52.5	0.241	33.490	0.459	0.8	41.0	26	0	0.4	41.4	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.196	0.436
UC-03	UB-03	Foundation Soils	41.9	0.3	51.7	0.217	36.350	0.420	0.8	40.3	26	0	0.4	40.8	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.196	0.434
UC-03	UB-03	Foundation Soils	42.0	0.2	53.0	0.169	28.310	0.319	0.8	41.4	21	0	0.4	41.7	1.0	-0.9	0.1	0.8	0.087	1.007	0.086	0.196	0.437
UC-03	UB-03	Foundation Soils	42.1	0.1	56.0	0.135	34.490	0.241	0.8	43.7	16	0	0.3	44.0	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.196	0.445
UC-03	UB-03	Foundation Soils	42.2	0.0	58.3	0.092	23.060	0.158	0.8	45.5	10	0	0.1	45.7	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.196	0.450
UC-03	UB-03	Foundation Soils	42.2	-0.1	57.0	0.064	30.150	0.112	0.8	44.4	9	0	0.1	44.5	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.196	0.447

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	42.3	-0.2	51.0	0.111	35.810	0.218	0.8	39.5	18	0	0.3	39.8	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.196	0.431
UC-03	UB-03	Foundation Soils	42.4	-0.2	50.2	0.124	33.690	0.247	0.8	38.8	20	0	0.3	39.1	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.195	0.428
UC-03	UB-03	Foundation Soils	42.5	-0.3	52.9	0.122	35.400	0.230	0.8	40.9	17	0	0.3	41.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.195	0.436
UC-03	UB-03	Foundation Soils	42.6	-0.4	55.7	0.099	32.300	0.178	0.8	43.2	13	0	0.2	43.4	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.195	0.443
UC-03	UB-03	Foundation Soils	42.7	-0.5	57.9	0.065	38.010	0.112	0.8	44.9	8	0	0.1	44.9	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.195	0.448
UC-03	UB-03	Foundation Soils	42.7	-0.6	62.1	0.064	26.970	0.103	0.8	48.3	6	0	0.0	48.3	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.195	0.460
UC-03	UB-03	Foundation Soils	42.8	-0.7	65.6	0.061	29.610	0.093	0.8	51.1	3	0	0.0	51.1	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.195	0.470
UC-03	UB-03	Foundation Soils	42.9	-0.7	66.1	0.061	33.380	0.092	0.8	51.4	3	0	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.195	0.471
UC-03	UB-03	Foundation Soils	43.0	-0.8	67.0	0.045	36.210	0.067	0.8	52.1	2	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.195	0.474
UC-03	UB-03	Foundation Soils	43.1	-0.9	67.0	0.042	33.880	0.063	0.8	52.1	2	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.195	0.474
UC-03	UB-03	Foundation Soils	43.1	-1.0	63.8	0.014	34.930	0.022	0.8	49.4	7	0	0.0	49.4	1.0	-1.0	0.1	0.8	0.092	1.008	0.091	0.195	0.464
UC-03	UB-03	Foundation Soils	43.2	-1.1	63.1	0.017	32.400	0.027	0.8	48.8	6	0	0.0	48.8	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.195	0.462
UC-03	UB-03	Foundation Soils	43.3	-1.1	59.1	0.074	36.300	0.125	0.8	45.5	9	0	0.1	45.5	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.195	0.451
UC-03	UB-03	Foundation Soils	43.4	-1.2	60.7	0.090	41.310	0.148	0.8	46.7	9	0	0.1	46.8	1.0	-1.0	0.1	0.8	0.090	1.007	0.089	0.195	0.455
UC-03	UB-03	Foundation Soils	43.5	-1.3	59.3	0.137	37.920	0.231	0.8	45.5	14	0	0.2	45.8	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.195	0.452
UC-03	UB-03	Foundation Soils	43.6	-1.4	57.4	0.168	37.640	0.293	0.8	43.9	18	0	0.3	44.2	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.195	0.447
UC-03	UB-03	Foundation Soils	43.6	-1.5	52.6	0.143	36.120	0.272	0.8	39.9	20	0	0.3	40.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.084	0.195	0.434
UC-03	UB-03	Foundation Soils	43.7	-1.6	43.6	0.195	36.280	0.447	0.8	32.7	33	0	0.5	33.2	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.195	0.410
UC-03	UB-03	Foundation Soils	43.8	-1.6	44.3	0.188	35.260	0.424	0.8	33.3	31	0	0.5	33.7	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.195	0.412
UC-03	UB-03	Foundation Soils	43.9	-1.7	48.3	0.194	33.970	0.402	0.8	36.4	28	0	0.4	36.8	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.195	0.422
UC-03	UB-03	Foundation Soils	44.0	-1.8	54.2	0.160	25.950	0.295	0.8	41.1	20	0	0.4	41.5	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.194	0.438
UC-03	UB-03	Foundation Soils	44.0	-1.9	69.3	0.124	20.340	0.179	0.8	53.3	6	0	0.0	53.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.194	0.479
UC-03	UB-03	Foundation Soils	44.1	-2.0	87.9	0.086	26.260	0.098	0.8	68.6	0	0	0.0	68.6	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.194	0.536
UC-03	UB-03	Foundation Soils	44.2	-2.0	99.8	0.077	32.400	0.077	0.8	78.5	0	0	0.0	78.5	1.0	-1.0	0.1	0.8	0.114	1.012	0.112	0.194	0.578
UC-03	UB-03	Foundation Soils	44.3	-2.1	101.5	0.065	36.950	0.064	0.8	79.9	0	0	0.0	79.9	1.0	-1.0	0.1	0.8	0.116	1.012	0.114	0.194	0.585
UC-03	UB-03	Foundation Soils	44.4	-2.2	96.3	0.056	38.880	0.058	0.8	75.4	0	0	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.110	0.194	0.565
UC-03	UB-03	Foundation Soils	44.5	-2.3	93.1	0.086	39.130	0.092	0.8	72.6	0	0	0.0	72.6	1.0	-1.0	0.1	0.8	0.109	1.011	0.107	0.194	0.553
UC-03	UB-03	Foundation Soils	44.5	-2.4	92.3	0.094	37.310	0.102	0.8	71.8	0	0	0.0	71.8	1.0	-1.0	0.1	0.8	0.109	1.010	0.107	0.194	0.550
UC-03	UB-03	Foundation Soils	44.6	-2.5	87.7	0.094	36.280	0.107	0.8	67.9	0	0	0.0	67.9	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.194	0.534
UC-03	UB-03	Foundation Soils	44.7	-2.5	84.0	0.035	34.830	0.042	0.8	64.8	0	0	0.0	64.8	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.194	0.522
UC-03	UB-03	Foundation Soils	44.8	-2.6	79.6	0.035	34.400	0.044	0.8	61.1	0	0	0.0	61.1	1.0	-1.0	0.1	0.8	0.100	1.009	0.099	0.194	0.508
UC-03	UB-03	Foundation Soils	44.9	-2.7	78.3	0.031	31.060	0.040	0.8	60.0	0	0	0.0	60.0	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.194	0.504
UC-03	UB-03	Foundation Soils	44.9	-2.8	77.8	0.029	31.800	0.037	0.8	59.6	0	0	0.0	59.6	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.194	0.503
UC-03	UB-03	Foundation Soils	45.0	-2.9	75.2	0.010	34.540	0.013	0.8	57.4	8	0	0.0	57.4	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.194	0.495
UC-03	UB-03	Foundation Soils	45.1	-2.9	73.5	0.027	36.090	0.037	0.8	55.9	0	0	0.0	55.9	1.0	-1.0	0.1	0.8	0.097	1.008	0.095	0.194	0.489
UC-03	UB-03	Foundation Soils	45.2	-3.0	68.9	0.045	34.210	0.065	0.8	52.1	1	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.194	0.476
UC-03	UB-03	Foundation Soils	45.3	-3.1	60.4	0.051	35.360	0.085	0.8	45.2	7	0	0.0	45.2	1.0	-1.0	0.1	0.8	0.089	1.007	0.087	0.194	0.452
UC-03	UB-03	Foundation Soils	45.4	-3.2	52.9	0.070	36.540	0.132	0.8	39.2	13	0	0.2	39.4	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.194	0.432
UC-03	UB-03	Foundation Soils	45.4	-3.3	48.5	0.142	36.850	0.293	0.8	35.7	24	0	0.4	36.1	1.0	-1.0	0.1	0.8	0.083	1.007	0.081	0.193	0.421
UC-03	UB-03	Foundation Soils	45.5	-3.4	49.1	0.084	37.920	0.171	0.8	36.1	18	0	0.3	36.4	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.193	0.422
UC-03	UB-03	Foundation Soils	45.6	-3.4	56.1	0.026	39.630	0.046	0.8	41.6	9	0	0.1	41.7	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.193	0.440
UC-03	UB-03	Foundation Soils	45.7	-3.5	56.6	0.072	37.780	0.127	0.8	42.0	11	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.193	0.442
UC-03	UB-03	Foundation Soils	45.8	-3.6	53.8	0.228	35.530	0.424	0.8	39.7	26	0	0.4	40.1	1.0	-1.1	0.1	0.8	0.085	1.007	0.084	0.193	0.435
UC-03	UB-03	Foundation Soils	45.8	-3.7	52.6	0.301	39.120	0.572	0.8	38.8	31	0	0.5	39.2	1.0	-1.1	0.1	0.8	0.085	1.007	0.083	0.193	0.432
UC-03	UB-03	Foundation Soils	45.9	-3.8	55.9	0.488	37.730	0.873	0.8	41.3	37	0	0.5	41.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.193	0.441
UC-03	UB-03	Foundation Soils	46.0	-3.9	74.0	0.404	40.020	0.546	0.8	55.7	20	0	0.4	56.0	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.193	0.491
UC-03	UB-03	Foundation Soils	46.1	-3.9	74.5	0.281	35.070	0.377	0.8	56.0	14	0	0.2	56.3	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.193	0.492
UC-03	UB-03	Foundation Soils	46.2	-4.0	55.0	0.242	34.150	0.440	0.8	40.4	26	0	0.4	40.8	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.193	0.438
UC-03	UB-03	Foundation Soils	46.3	-4.1	48.0	0.155	38.780	0.323	0.8	34.9	26	0	0.4	35.3	1.0	-1.1	0.1	0.8	0.082	1.007	0.081	0.193	0.419
UC-03	UB-03	Foundation Soils	46.3	-4.2	56.3	0.059	48.650	0.105	0.8	41.3	10	0	0.1	41.4	1.0	-1.1	0.1	0.8	0.086	1.007	0.085	0.193	0.440
UC-03	UB-03	Foundation Soils	46.4	-4.3	70.1	0.045	38.550	0.064	0.8	52.2	1	0	0.0	52.2	1.0	-1.1	0.1	0.8	0.094	1.008	0.092	0.193	0.477
UC-03	UB-03	Foundation Soils	46.5	-4.3	65.3	0.066	33.400	0.101	0.8	48.4	5	0	0.0	48.4	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.193	0.464
UC-03	UB-03	Foundation Soils	46.6	-4.4	57.5	0.039	34.920	0.068	0.8	42.1	8	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.193	0.443
UC-03	UB-03	Foundation Soils	46.7	-4.5	50.7	0.043	36.690	0.085	0.8	36.8	13	0	0.2	37.0	1.0	-1.1	0.1	0.8	0.083	1.007	0.082	0.193	0.425
UC-03	UB-03	Foundation Soils	46.8	-4.6	55.7	0.062	39.450	0.111	0.8	40.6	11	0	0.1	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.193	0.438
UC-03	UB-03	Foundation Soils	46.8	-4.7	76.6	0.059	35.400	0.077	0.8	57.2	0	0	0.0	57.2	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.192	0.496
UC-03	UB-03	Foundation Soils	46.9	-4.8	86.4	0.095	29.490	0.110	0.8	65.0	0	0	0.0	65.0	1.0	-1.1	0.1	0.8	0.103	1.009	0.101	0.192	0.525
UC-03	UB-03	Foundation Soils	47.0	-4.8	92.5	0.064	31.780	0.069	0.8	69.9	0	0	0.0	69.9	1.0	-1.1	0.1	0.8	0.107	1.010	0.105	0.192	0.545
UC-03	UB-03	Foundation Soils	47.1	-4.9	97.4	0.087	32.540	0.089	0.8	73.8	0	0	0.0	73.8	1.0	-1.1	0.1	0.8	0.110	1.011	0.108	0.192	0.561
UC-03	UB-03	Foundation Soils	47.2	-5.0	102.4	0.135	25.910	0.132	0.8	77.9	0	0	0.0	77.9	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.192	0.579
UC-03	UB-03	Foundation Soils	47.2	-5.1	114.4	0.166	1.760	0.145	0.8	87.9	0	0	0.0	87.9	1.0	-1.1	0.1	0.8	0.123	1.014	0.120	0.192	0.626
UC-03	UB-03	Foundation Soils	47.3	-5.2	121.1	0.155	18.160	0.128	0.8	93.4	0	0	0.0	93.4	1.0	-1.1	0.1	0.8	0.129	1.016	0.126	0.192	0.657

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	47.4	-5.2	128.0	0.130	17.900	0.102	0.8	99.1	0	0	0.0	99.1	1.0	-1.1	0.1	0.8	0.136	1.017	0.133	0.192	0.691
UC-03	UB-03	Foundation Soils	47.5	-5.3	130.4	0.136	28.780	0.104	0.8	101.1	0	0	0.0	101.1	1.0	-1.1	0.1	0.8	0.139	1.018	0.135	0.192	0.705
UC-03	UB-03	Foundation Soils	47.6	-5.4	116.6	0.146	32.260	0.125	0.8	89.3	0	0	0.0	89.3	1.0	-1.1	0.1	0.8	0.125	1.014	0.122	0.192	0.635
UC-03	UB-03	Foundation Soils	47.7	-5.5	116.2	0.133	28.650	0.114	0.8	88.9	0	0	0.0	88.9	1.0	-1.1	0.1	0.8	0.124	1.014	0.121	0.192	0.632
UC-03	UB-03	Foundation Soils	47.7	-5.6	108.7	0.016	27.010	0.015	0.8	82.6	0	0	0.0	82.6	1.0	-1.1	0.1	0.8	0.118	1.013	0.115	0.192	0.601
UC-03	UB-03	Foundation Soils	47.8	-5.7	110.1	0.010	24.010	0.009	0.8	83.7	2	0	0.0	83.7	1.0	-1.1	0.1	0.8	0.119	1.013	0.116	0.192	0.606
UC-03	UB-03	Foundation Soils	47.9	-5.7	100.9	0.010	29.420	0.010	0.8	76.1	3	0	0.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.110	0.192	0.572
UC-03	UB-03	Foundation Soils	48.0	-5.8	91.1	0.046	30.030	0.050	0.8	68.0	0	0	0.0	68.0	1.0	-1.1	0.1	0.8	0.106	1.010	0.103	0.192	0.538
UC-03	UB-03	Foundation Soils	48.1	-5.9	79.6	0.032	34.450	0.040	0.8	58.7	0	0	0.0	58.7	1.0	-1.1	0.1	0.8	0.099	1.008	0.096	0.192	0.503
UC-03	UB-03	Foundation Soils	48.1	-6.0	66.5	0.045	27.300	0.068	0.8	48.2	4	0	0.0	48.2	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.191	0.465
UC-03	UB-03	Foundation Soils	48.2	-6.1	63.0	0.027	30.330	0.043	0.8	45.4	6	0	0.0	45.4	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.191	0.456
UC-03	UB-03	Foundation Soils	48.3	-6.1	59.5	0.047	35.890	0.079	0.8	42.7	8	0	0.0	42.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.191	0.447
UC-03	UB-03	Foundation Soils	48.4	-6.2	56.3	0.052	31.400	0.092	0.8	40.1	10	0	0.1	40.3	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.191	0.438
UC-03	UB-03	Foundation Soils	48.5	-6.3	56.5	0.172	39.020	0.304	0.8	40.3	20	0	0.4	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.191	0.440
UC-03	UB-03	Foundation Soils	48.6	-6.4	62.1	0.226	39.000	0.364	0.8	44.5	20	0	0.4	44.9	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.191	0.454
UC-03	UB-03	Foundation Soils	48.6	-6.5	69.6	0.186	38.020	0.267	0.8	50.3	12	0	0.2	50.5	1.0	-1.1	0.1	0.8	0.093	1.008	0.091	0.191	0.474
UC-03	UB-03	Foundation Soils	48.7	-6.6	79.3	0.150	38.160	0.189	0.8	57.9	4	0	0.0	57.9	1.0	-1.1	0.1	0.8	0.098	1.008	0.096	0.191	0.501
UC-03	UB-03	Foundation Soils	48.8	-6.6	96.4	0.119	38.730	0.123	0.8	71.6	0	0	0.0	71.6	1.0	-1.1	0.1	0.8	0.109	1.010	0.106	0.191	0.554
UC-03	UB-03	Foundation Soils	48.9	-6.7	115.2	0.085	39.940	0.074	0.8	87.0	0	0	0.0	87.0	1.0	-1.1	0.1	0.8	0.122	1.014	0.119	0.191	0.624
UC-03	UB-03	Foundation Soils	49.0	-6.8	115.4	0.082	31.490	0.071	0.8	87.1	0	0	0.0	87.1	1.0	-1.1	0.1	0.8	0.123	1.014	0.119	0.191	0.624
UC-03	UB-03	Foundation Soils	49.0	-6.9	111.0	0.091	39.020	0.082	0.8	83.3	0	0	0.0	83.3	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.191	0.606
UC-03	UB-03	Foundation Soils	49.1	-7.0	107.0	0.047	34.880	0.044	0.8	80.0	0	0	0.0	80.0	1.0	-1.2	0.1	0.8	0.116	1.012	0.113	0.191	0.591
UC-03	UB-03	Foundation Soils	49.2	-7.0	113.6	0.064	36.470	0.056	0.8	85.3	0	0	0.0	85.3	1.0	-1.2	0.1	0.8	0.121	1.013	0.117	0.191	0.616
UC-03	UB-03	Foundation Soils	49.3	-7.1	104.2	0.065	43.170	0.062	0.8	77.5	0	0	0.0	77.5	1.0	-1.2	0.1	0.8	0.114	1.012	0.111	0.191	0.580
UC-03	UB-03	Foundation Soils	49.4	-7.2	112.9	0.091	43.690	0.081	0.8	84.6	0	0	0.0	84.6	1.0	-1.2	0.1	0.8	0.120	1.013	0.117	0.191	0.613
UC-03	UB-03	Foundation Soils	49.5	-7.3	111.6	0.079	40.400	0.071	0.8	83.4	0	0	0.0	83.4	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.190	0.607
UC-03	UB-03	Foundation Soils	49.5	-7.4	115.6	0.063	38.500	0.054	0.8	86.7	0	0	0.0	86.7	1.0	-1.2	0.1	0.8	0.122	1.014	0.119	0.190	0.623
UC-03	UB-03	Foundation Soils	49.6	-7.5	117.2	0.102	40.220	0.087	0.8	87.9	0	0	0.0	87.9	1.0	-1.2	0.1	0.8	0.123	1.014	0.120	0.190	0.630
UC-03	UB-03	Foundation Soils	49.7	-7.5	118.8	0.094	29.250	0.079	0.8	89.1	0	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.190	0.636
UC-03	UB-03	Foundation Soils	49.8	-7.6	118.9	0.095	34.000	0.080	0.8	89.1	0	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.190	0.636
UC-03	UB-03	Foundation Soils	49.9	-7.7	118.7	0.048	28.210	0.040	0.8	88.9	0	0	0.0	88.9	1.0	-1.2	0.1	0.8	0.124	1.014	0.121	0.190	0.636
UC-03	UB-03	Foundation Soils	50.0	-7.8	104.8	0.071	21.990	0.068	0.8	77.4	0	0	0.0	77.4	1.0	-1.2	0.1	0.8	0.113	1.012	0.110	0.190	0.580
UC-03	UB-03	Foundation Soils	50.0	-7.9	93.8	0.149	29.450	0.159	0.8	68.5	0	0	0.0	68.5	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.190	0.543
UC-03	UB-03	Foundation Soils	50.1	-8.0	86.3	0.120	24.980	0.139	0.8	62.5	0	0	0.0	62.5	1.0	-1.2	0.1	0.8	0.101	1.009	0.099	0.190	0.520
UC-03	UB-03	Foundation Soils	50.2	-8.0	76.6	0.163	24.250	0.213	0.8	54.7	7	0	0.0	54.8	1.0	-1.2	0.1	0.8	0.096	1.008	0.093	0.190	0.491
UC-03	UB-03	Foundation Soils	50.3	-8.1	84.3	0.183	30.550	0.217	0.8	60.7	4	0	0.0	60.7	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.190	0.513
UC-03	UB-03	Foundation Soils	50.4	-8.2	92.3	0.181	37.350	0.196	0.8	67.0	0	0	0.0	67.0	1.0	-1.2	0.1	0.8	0.105	1.010	0.102	0.190	0.538
UC-03	UB-03	Foundation Soils	50.4	-8.3	71.8	0.167	36.360	0.233	0.8	50.9	10	0	0.1	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.190	0.478
UC-03	UB-03	Foundation Soils	50.5	-8.4	65.0	0.086	36.730	0.132	0.7	45.6	8	0	0.1	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.190	0.460
UC-03	UB-03	Foundation Soils	50.6	-8.4	60.9	0.108	38.880	0.177	0.7	42.4	13	0	0.2	42.6	1.0	-1.2	0.1	0.8	0.087	1.007	0.085	0.190	0.449
UC-03	UB-03	Foundation Soils	50.7	-8.5	67.4	0.259	33.590	0.384	0.7	47.4	19	0	0.3	47.7	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.189	0.467
UC-03	UB-03	Foundation Soils	50.8	-8.6	75.1	0.289	21.320	0.385	0.8	53.2	15	0	0.3	53.5	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.189	0.488
UC-03	UB-03	Foundation Soils	50.9	-8.7	75.5	0.201	31.730	0.266	0.8	53.5	10	0	0.1	53.6	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.189	0.488
UC-03	UB-03	Foundation Soils	50.9	-8.8	73.2	0.153	34.160	0.209	0.7	51.6	8	0	0.1	51.7	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.189	0.481
UC-03	UB-03	Foundation Soils	51.0	-8.9	79.2	0.106	37.690	0.134	0.8	56.2	2	0	0.0	56.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.189	0.498
UC-03	UB-03	Foundation Soils	51.1	-8.9	89.5	0.122	39.020	0.136	0.8	64.2	0	0	0.0	64.2	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.189	0.528
UC-03	UB-03	Foundation Soils	51.2	-9.0	90.2	0.092	32.350	0.102	0.8	64.7	0	0	0.0	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.189	0.530
UC-03	UB-03	Foundation Soils	51.3	-9.1	84.2	0.112	41.200	0.133	0.8	60.0	0	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.099	1.009	0.097	0.189	0.512
UC-03	UB-03	Foundation Soils	51.3	-9.2	82.9	0.168	45.020	0.203	0.8	58.8	4	0	0.0	58.8	1.0	-1.2	0.1	0.8	0.099	1.008	0.096	0.189	0.508
UC-03	UB-03	Foundation Soils	51.4	-9.3	84.5	0.169	38.140	0.200	0.8	60.0	3	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.189	0.512
UC-03	UB-03	Foundation Soils	51.5	-9.3	87.4	0.087	26.970	0.100	0.8	62.3	0	0	0.0	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.189	0.521
UC-03	UB-03	Foundation Soils	51.6	-9.4	71.1	0.078	36.150	0.110	0.7	49.6	4	0	0.0	49.6	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.189	0.475
UC-03	UB-03	Foundation Soils	51.7	-9.5	68.5	0.054	32.830	0.079	0.7	47.6	4	0	0.0	47.6	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.189	0.468
UC-03	UB-03	Foundation Soils	51.8	-9.6	64.4	0.106	38.350	0.165	0.7	44.4	11	0	0.1	44.5	1.0	-1.2	0.1	0.8	0.088	1.007	0.086	0.189	0.457
UC-03	UB-03	Foundation Soils	51.8	-9.7	66.2	0.065	34.590	0.098	0.7	45.7	6	0	0.0	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.188	0.462
UC-03	UB-03	Foundation Soils	51.9	-9.8	71.6	0.102	39.840	0.142	0.7	49.8	6	0	0.0	49.8	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.188	0.476
UC-03	UB-03	Foundation Soils	52.0	-9.8	70.5	0.164	42.310	0.233	0.7	48.9	11	0	0.1	49.0	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.188	0.473
UC-03	UB-03	Foundation Soils	52.1	-9.9	70.6	0.124	41.450	0.176	0.7	48.9	8	0	0.1	48.9	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.188	0.473
UC-03	UB-03	Foundation Soils	52.2	-10.0	68.4	0.036	44.930	0.053	0.7	47.1	4	0	0.0	47.1	1.0	-1.2	0.1	0.8	0.090	1.007	0.088	0.188	0.467
UC-03	UB-03	Foundation Soils	52.2	-10.1	65.6	0.043	42.590	0.066	0.7	45.0	6	0	0.0	45.0	1.0	-1.2	0.1	0.8	0.089	1.007	0.086	0.188	0.460
UC-03	UB-03	Foundation Soils	52.3	-10.2	71.7	0.053	42.260	0.074	0.7	49.5	3	0	0.0	49.5	1.0	-1.2	0.1	0.8	0.092	1.008	0.089	0.188	0.476
UC-03	UB-03	Foundation Soils	52.4	-10.2	72.5	0.036	41.310	0.050	0.7	50.1	2	0	0.0	50.1	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.188	0.478

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	52.5	-10.3	72.9	0.032	40.450	0.044	0.7	50.3	2	0	0.0	50.3	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.188	0.479
UC-03	UB-03	Foundation Soils	52.6	-10.4	75.4	0.012	37.590	0.016	0.7	52.2	8	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.188	0.486
UC-03	UB-03	Foundation Soils	52.7	-10.5	72.0	0.012	32.930	0.017	0.7	49.6	9	0	0.1	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.090	0.188	0.477
UC-03	UB-03	Foundation Soils	52.7	-10.6	59.3	0.019	29.210	0.032	0.7	40.1	10	0	0.1	40.2	1.0	-1.3	0.1	0.8	0.086	1.007	0.083	0.188	0.444
UC-03	UB-03	Foundation Soils	52.8	-10.7	55.5	0.010	27.970	0.018	0.7	37.2	17	0	0.3	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.188	0.435
UC-03	UB-03	Foundation Soils	52.9	-10.7	54.0	0.041	37.730	0.076	0.7	36.1	13	0	0.2	36.3	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.188	0.431
UC-03	UB-03	Foundation Soils	53.0	-10.8	50.8	0.064	38.930	0.126	0.7	33.8	17	0	0.3	34.1	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.188	0.424
UC-03	UB-03	Foundation Soils	53.1	-10.9	51.3	0.085	44.450	0.166	0.7	34.1	19	0	0.3	34.4	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.187	0.425
UC-03	UB-03	Foundation Soils	53.1	-11.0	55.7	0.082	42.83	0.147171	0.7	37.2	15	0	0.2	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.187	0.435
UC-03	UB-03	Foundation Soils	53.2	-11.1	63.8	0.034	42.260	0.053	0.7	43.1	7	0	0.0	43.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.085	0.187	0.455
UC-03	UB-03	Foundation Soils	53.3	-11.2	68.1	0.080	36.020	0.118	0.7	46.3	7	0	0.0	46.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.187	0.466
UC-03	UB-03	Foundation Soils	53.4	-11.2	66.6	0.098	37.210	0.147	0.7	45.1	9	0	0.1	45.2	1.0	-1.3	0.1	0.8	0.089	1.007	0.087	0.187	0.462
UC-03	UB-03	Foundation Soils	53.5	-11.3	69.4	0.129	34.100	0.186	0.7	47.2	10	0	0.1	47.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.187	0.470
UC-03	UB-03	Foundation Soils	53.6	-11.4	69.0	0.066	28.820	0.096	0.7	46.8	5	0	0.0	46.8	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.187	0.468
UC-03	UB-03	Foundation Soils	53.6	-11.5	78.2	0.067	31.100	0.086	0.7	53.7	0	0	0.0	53.7	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.187	0.493
UC-03	UB-03	Foundation Soils	53.7	-11.6	88.9	0.108	14.150	0.121	0.7	61.9	0	0	0.0	61.9	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.187	0.523
UC-03	UB-03	Foundation Soils	53.8	-11.6	88.6	0.085	12.080	0.096	0.7	61.6	0	0	0.0	61.6	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.187	0.522
UC-03	UB-03	Foundation Soils	53.9	-11.7	86.3	0.137	-6.720	0.159	0.7	59.7	1	0	0.0	59.7	1.0	-1.3	0.1	0.8	0.099	1.009	0.096	0.187	0.515
UC-03	UB-03	Foundation Soils	54.0	-11.8	81.7	0.184	18.580	0.225	0.7	56.1	6	0	0.0	56.2	1.0	-1.3	0.1	0.8	0.097	1.008	0.094	0.187	0.502
UC-03	UB-03	Foundation Soils	54.1	-11.9	78.5	0.124	1.910	0.158	0.7	53.6	4	0	0.0	53.6	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.187	0.493
UC-03	UB-03	Foundation Soils	54.1	-12.0	76.7	0.146	19.050	0.190	0.7	52.2	7	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.187	0.488
UC-03	UB-03	Foundation Soils	54.2	-12.1	70.6	0.124	2.050	0.176	0.7	47.6	9	0	0.1	47.7	1.0	-1.3	0.1	0.8	0.091	1.007	0.088	0.186	0.472
UC-03	UB-03	Foundation Soils	54.3	-12.1	68.3	0.119	-16.340	0.174	0.7	45.9	10	0	0.1	46.0	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.186	0.466
UC-03	UB-03	Foundation Soils	54.4	-12.2	71.9	0.057	11.270	0.079	0.7	48.5	3	0	0.0	48.5	1.0	-1.3	0.1	0.8	0.091	1.007	0.089	0.186	0.475
UC-03	UB-03	Foundation Soils	54.5	-12.3	80.4	0.073	28.650	0.091	0.7	54.9	0	0	0.0	54.9	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.186	0.498
UC-03	UB-03	Foundation Soils	54.5	-12.4	75.1	0.029	18.770	0.039	0.7	50.8	2	0	0.0	50.8	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.186	0.484
UC-03	UB-03	Foundation Soils	54.6	-12.5	62.6	0.070	19.150	0.112	0.7	41.5	10	0	0.1	41.6	1.0	-1.3	0.1	0.8	0.086	1.007	0.084	0.186	0.452
UC-03	UB-03	Foundation Soils	54.7	-12.5	55.2	0.147	25.680	0.266	0.7	36.1	22	0	0.4	36.5	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.186	0.434
UC-03	UB-03	Foundation Soils	54.8	-12.6	51.5	0.130	24.820	0.253	0.7	33.4	23	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.186	0.426
UC-03	UB-03	Foundation Soils	54.9	-12.7	48.6	0.044	38.450	0.090	0.7	31.4	17	0	0.3	31.7	1.0	-1.3	0.1	0.8	0.080	1.006	0.078	0.186	0.419
UC-03	UB-03	Foundation Soils	55.0	-12.8	49.9	0.017	35.450	0.034	0.7	32.3	17	0	0.3	32.5	1.0	-1.3	0.1	0.8	0.080	1.007	0.078	0.186	0.422
UC-03	UB-03	Foundation Soils	55.0	-12.9	58.5	0.011	39.090	0.019	0.7	38.3	15	0	0.3	38.6	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.186	0.442
UC-03	UB-03	Foundation Soils	55.1	-13.0	66.4	0.013	36.500	0.020	0.7	44.0	11	0	0.1	44.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.086	0.186	0.461
UC-03	UB-03	Foundation Soils	55.2	-13.0	54.7	0.034	40.590	0.062	0.7	35.6	13	0	0.2	35.7	1.0	-1.3	0.1	0.8	0.083	1.007	0.080	0.186	0.433
UC-03	UB-03	Foundation Soils	55.3	-13.1	51.8	0.107	41.330	0.207	0.7	33.5	21	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.186	0.426
UC-03	UB-03	Foundation Soils	55.4	-13.2	47.1	0.033	45.200	0.070	0.7	30.1	18	0	0.3	30.4	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.186	0.415
UC-03	UB-03	Foundation Soils	55.4	-13.3	43.2	0.010	44.500	0.023	0.7	27.4	24	0	0.4	27.7	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.185	0.407
UC-03	UB-03	Foundation Soils	55.5	-13.4	47.7	0.016	42.550	0.034	0.7	30.5	18	0	0.3	30.8	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.185	0.417
UC-03	UB-03	Foundation Soils	55.6	-13.4	54.2	0.051	42.710	0.094	0.7	35.0	14	0	0.2	35.2	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.185	0.431
UC-03	UB-03	Foundation Soils	55.7	-13.5	48.3	0.058	44.680	0.120	0.7	30.8	19	0	0.3	31.1	1.0	-1.3	0.1	0.8	0.080	1.006	0.077	0.185	0.418
UC-03	UB-03	Foundation Soils	55.8	-13.6	43.8	0.073	46.170	0.167	0.7	27.6	25	0	0.4	28.0	1.0	-1.3	0.1	0.8	0.078	1.006	0.076	0.185	0.408
UC-03	UB-03	Foundation Soils	55.9	-13.7	42.3	0.170	46.650	0.402	0.7	26.6	36	0	0.5	27.1	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.185	0.405
UC-03	UB-03	Foundation Soils	55.9	-13.8	46.5	0.119	46.880	0.256	0.7	29.5	27	0	0.4	29.9	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.185	0.414
UC-03	UB-03	Foundation Soils	56.0	-13.9	53.4	0.195	43.050	0.365	0.7	34.3	27	0	0.4	34.7	1.0	-1.4	0.1	0.8	0.082	1.007	0.080	0.185	0.430
UC-03	UB-03	Foundation Soils	56.1	-13.9	65.7	0.354	46.450	0.538	0.7	43.1	26	0	0.4	43.5	1.0	-1.4	0.1	0.8	0.088	1.007	0.085	0.185	0.460
UC-03	UB-03	Foundation Soils	56.2	-14.0	84.9	0.539	35.100	0.634	0.7	57.2	21	0	0.4	57.6	1.0	-1.4	0.1	0.8	0.098	1.008	0.094	0.185	0.511
UC-03	UB-03	Foundation Soils	56.3	-14.1	85.9	0.707	41.400	0.823	0.7	57.9	26	0	0.5	58.3	1.0	-1.4	0.1	0.8	0.098	1.008	0.095	0.185	0.514
UC-03	UB-03	Foundation Soils	56.3	-14.2	108.1	0.475	28.800	0.439	0.7	74.8	7	0	0.0	74.9	1.0	-1.4	0.1	0.8	0.111	1.011	0.107	0.185	0.580
UC-03	UB-03	Foundation Soils	56.4	-14.3	107.6	0.173	28.640	0.161	0.7	74.3	0	0	0.0	74.3	1.0	-1.4	0.2	0.8	0.111	1.011	0.107	0.185	0.578
UC-03	UB-03	Foundation Soils	56.5	-14.3	119.5	0.175	16.300	0.146	0.7	83.7	0	0	0.0	83.7	0.9	-1.4	0.2	0.8	0.119	1.013	0.114	0.185	0.620
UC-03	UB-03	Foundation Soils	56.6	-14.4	127.6	0.209	-14.390	0.164	0.7	90.0	0	0	0.0	90.0	0.9	-1.4	0.2	0.8	0.126	1.015	0.120	0.185	0.653
UC-03	UB-03	Foundation Soils	56.7	-14.5	118.7	0.252	13.940	0.212	0.7	82.9	0	0	0.0	82.9	0.9	-1.4	0.2	0.8	0.118	1.013	0.114	0.184	0.617
UC-03	UB-03	Foundation Soils	56.8	-14.6	106.5	0.337	36.450	0.316	0.7	73.2	3	0	0.0	73.2	1.0	-1.4	0.2	0.8	0.110	1.011	0.106	0.184	0.573
UC-03	UB-03	Foundation Soils	56.8	-14.7	88.2	0.395	33.880	0.448	0.7	59.2	14	0	0.2	59.4	1.0	-1.4	0.2	0.8	0.099	1.009	0.096	0.184	0.519
UC-03	UB-03	Foundation Soils	56.9	-14.8	69.6	0.136	28.920	0.195	0.7	45.4	11	0	0.1	45.5	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.184	0.469
UC-03	UB-03	Foundation Soils	57.0	-14.8	60.2	0.064	8.160	0.106	0.7	38.6	11	0	0.1	38.7	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.184	0.445
UC-03	UB-03	Foundation Soils	57.1	-14.9	58.2	0.063	16.630	0.108	0.7	37.2	13	0	0.2	37.4	1.0	-1.4	0.2	0.8	0.084	1.007	0.081	0.184	0.441
UC-03	UB-03	Foundation Soils	57.2	-15.0	61.0	0.059	11.440	0.097	0.7	39.1	11	0	0.1	39.2	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.184	0.447
UC-03	UB-03	Foundation Soils	57.2	-15.1	54.2	0.077	26.900	0.142	0.7	34.3	17	0	0.3	34.6	1.0	-1.4	0.2	0.8	0.082	1.007	0.079	0.184	0.432
UC-03	UB-03	Foundation Soils	57.3	-15.2	53.0	0.148	36.470	0.279	0.7	33.4	24	0	0.4	33.8	1.0	-1.4	0.2	0.8	0.081	1.007	0.079	0.184	0.429
UC-03	UB-03	Foundation Soils	57.4	-15.3	77.6	0.161	48.410	0.207	0.7	51.0	8	0	0.1	51.0	1.0	-1.4	0.2	0.8	0.093	1.008	0.090	0.184	0.489
UC-03	UB-03	Foundation Soils	57.5	-15.3	90.1	0.207	44.500	0.230	0.7	60.2	4	0	0.0	60.2	1.0	-1.4	0.2	0.8	0.100	1.009	0.096	0.184	0.523

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	57.6	-15.4	103.3	0.285	37.010	0.276	0.7	70.1	2	0	0.0	70.1	1.0	-1.4	0.2	0.8	0.107	1.010	0.103	0.184	0.562
UC-03	UB-03	Foundation Soils	57.7	-15.5	104.0	0.291	34.230	0.280	0.7	70.7	2	0	0.0	70.7	1.0	-1.4	0.2	0.8	0.108	1.010	0.104	0.184	0.564
UC-03	UB-03	Foundation Soils	57.7	-15.6	89.0	0.232	34.540	0.261	0.7	59.2	6	0	0.0	59.2	1.0	-1.4	0.2	0.8	0.099	1.009	0.095	0.183	0.520
UC-03	UB-03	Foundation Soils	57.8	-15.7	79.2	0.205	14.100	0.259	0.7	51.9	10	0	0.1	52.0	1.0	-1.4	0.2	0.8	0.094	1.008	0.091	0.183	0.493
UC-03	UB-03	Foundation Soils	57.9	-15.7	75.0	0.083	18.040	0.111	0.7	48.7	4	0	0.0	48.7	1.0	-1.4	0.2	0.8	0.091	1.007	0.088	0.183	0.482
UC-03	UB-03	Foundation Soils	58.0	-15.8	82.5	0.046	26.200	0.056	0.7	54.2	0	0	0.0	54.2	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.183	0.502
UC-03	UB-03	Foundation Soils	58.1	-15.9	84.0	0.031	16.910	0.037	0.7	55.3	0	0	0.0	55.3	1.0	-1.4	0.2	0.8	0.096	1.008	0.093	0.183	0.506
UC-03	UB-03	Foundation Soils	58.2	-16.0	85.0	0.050	13.860	0.059	0.7	55.9	0	0	0.0	55.9	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.183	0.508
UC-03	UB-03	Foundation Soils	58.2	-16.1	82.1	0.185	23.110	0.225	0.7	53.8	7	0	0.0	53.8	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.183	0.501
UC-03	UB-03	Foundation Soils	58.3	-16.2	68.3	0.082	40.550	0.120	0.7	43.7	8	0	0.1	43.8	1.0	-1.4	0.2	0.8	0.088	1.007	0.085	0.183	0.465
UC-03	UB-03	Foundation Soils	58.4	-16.2	70.6	0.017	45.170	0.024	0.7	45.3	8	0	0.0	45.4	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.183	0.471
UC-03	UB-03	Foundation Soils	58.5	-16.3	73.3	0.021	47.840	0.029	0.7	47.2	5	0	0.0	47.2	1.0	-1.4	0.2	0.8	0.090	1.007	0.087	0.183	0.477
UC-03	UB-03	Foundation Soils	58.6	-16.4	85.4	0.010	46.450	0.012	0.7	56.1	9	0	0.1	56.1	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.183	0.510
UC-03	UB-03	Foundation Soils	58.6	-16.5	66.8	0.010	42.400	0.015	0.7	42.5	14	0	0.2	42.7	1.0	-1.4	0.2	0.8	0.087	1.007	0.084	0.183	0.462
UC-03	UB-03	Foundation Soils	58.7	-16.6	47.0	0.011	47.650	0.023	0.6	28.7	22	0	0.4	29.1	1.0	-1.4	0.2	0.8	0.078	1.006	0.076	0.183	0.416

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$

FS<=1.0

1.0<FS<=1.5

FS>1.5

[1]Earthquake magnitude taken as modal event for the deaggregation of the 5,000 year peak ground accleration

[2]PGA estimated from 2014 USGS seismic hazard maps for a 5,000-year return period earthquake

[3]Averaged corrected tip resistence cone tip resistance corrected for unequal end area effects. See Conetec report for additional info.

[4]Unit weight of soil based on Soil Behavior Type. See Conetec report for additional info.

[5]Equilibrium pore water pressure based on Pore Pressure Dissipation Tests. See Conetec report for additional info.

[6]$m = 1.338 - 0.249 * q_{c1Ncs}$ ^0.264 where $21 < q_{c1Ncs} < 254$ (Boulanger&Idriss, 2014, Equation 2.15b)

[7]C_N = overburden correction factor = $(1.06\ tsf/s'_{vc})^m$, where C_N <=1.7 (Boulanger&Idriss, 2014, Equation 2.15a)

[8]$q_{c1N} = C_N * qt/1.06$ tsf (Boulanger&Idriss, 2014, Equation 2.4)

[9]Values based sieve test results and boring log descriptions

[10]$Dq_{c1N} = (11.9+q_{c1N}/14.6)*\exp[1.63 - (9.7 / (FC + 2)) - (15.7 / (FC + 2))^2]$ (Boulanger&Idriss, 2014, Equation 2.22)

[11]$q_{c1Ncs} = q_{c1N} + Dq_{c1N}$ (Boulanger&Idriss, 2014, Equation 2.10)

[12]$C\sigma = 1 / (37.3 - 8.27 * q_{c1Ncs}$^0.264 where q_{C1Ncs}<=211 $K_s = 1-(C_s*\ln(s'_{vc}/106\ tsf))$ <=1.1 (Boulanger&Idriss,2014, Equations 2.16a, 2.16b)

[13]$a(z) = -1.012 - 1.126 * \sin(z / 11.73 + 5.133)$, where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14b)

[14]$b(z) = 0.106 + 0.118 * \sin(z /11.28 + 5.142)$, where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14c)

[15]r_d = shear stress reduction coefficient = exp[a(z) + b(z) * M] (Boulanger&Idriss, 2014, Equation 2.14a)

[16]$CRR_{M=7.5, \sigma'vc=1atm} = \exp((q_{c1Ncs}/113+q_{c1Ncs}/1000)^2-(q_{c1Ncs}/140)^3+(q_{c1Ncs}/137))^4-2.8)$ (Boulanger&Idriss, 2014, Equation, 2.24), say q_{c1Ncs} <= 300

[17]$MSF=1+(MSF_{max}-1)(8.64\exp(-M/4)-1.325)$ $MSF_{max}=1.09(q_{c1Ncs}/180)^2$<=2.2 (Boulanger&Idriss, Equations 2.19,2.20)

[18]$CRR_{corr.}=CRR_{M=7.5,\sigma'vc=1atm}*K_\sigma*MSF$ (Boulanger and Idriss,2014, Equation 2.7)

[19]$CSR_{M,\sigma'v} = 0.65*PHGA*(s_v/s'_{vc})*r_d$ (Boulanger and Idriss,2014, Equation 2.2)

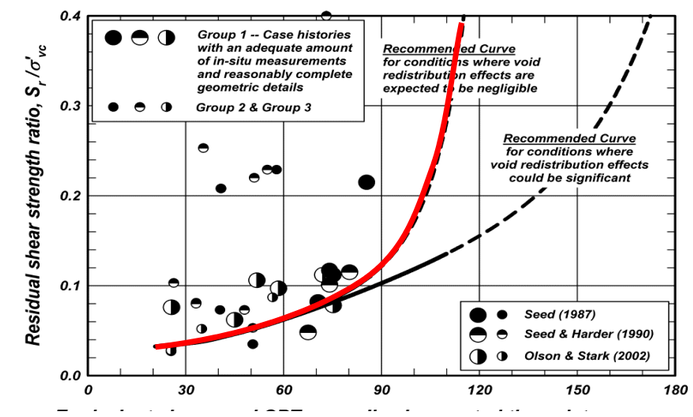
[21]State Param = state parameter index provided by Conetec and based on Been and Jefferies (1985). Positive = contractive soil, negative = dilative soil

[21]$Dq_{c1Ncs-Sr}$ is a function of fines content, values were estimated based on recommendations from Seed and Idriss, 2008

[22]$q_{c1Ncs-Sr} = q_{c1N} + Dq_{c1Ncs-Sr}$

[23]S_r/s'_{vo} estimated based on recommendations from Idriss and Boulanger, 2008, Equation 82

Idriss & Boulanger, 2008



$$\frac{S_r}{\sigma'_{vo}} = \exp\left(\frac{q_{c1Ncs-Sr}}{24.5} - \left(\frac{q_{c1Ncs-Sr}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs-Sr}}{106}\right)^3 - 4.42\right) \leq \tan\phi' \quad (82)$$

for conditions where void redistribution effects are expected to be negligible

ANALYSIS OF LIQUEFACTION POTENTIAL FOR EMBANKMENT AND FOUNDATION FOR 10000-YEAR RETURN INTERVAL

By: ZAO 1/5/2020
Checked: CDS 1/13/2020

Method: Boulanger&Idriss, CPT and SPT Based Liquefaction Triggering Procedures, April 2014
https://faculty.engineering.ucdavis.edu/boulanger/wp-content/uploads/sites/71/2014/09/Boulanger_Idriss_CPT_and_SPT_Liq_triggering_CGM-1

[1]Earthquake Magnitude, M: 7.3
[2]Peak Ground Acceleration, PHGA (g): 0.26

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	15.0	26.2	158.8	1.031	0.950	0.649	1.1	158.0	0	0	0.0	158.0	1.0	-0.2	0.0	1.0	0.351	1.052	0.378	0.162	2.330
NC-01	NB-02	Foundation Soils	15.1	26.1	149.2	1.015	0.810	0.680	1.1	148.6	0	0	0.0	148.6	1.0	-0.2	0.0	1.0	0.279	1.044	0.298	0.163	1.830
NC-01	NB-02	Foundation Soils	15.2	26.0	137.7	0.981	0.700	0.713	1.1	137.3	0	0	0.0	137.3	1.0	-0.2	0.0	1.0	0.223	1.036	0.235	0.163	1.443
NC-01	NB-02	Foundation Soils	15.3	25.9	125.6	0.934	0.910	0.743	1.1	125.5	3	0	0.0	125.5	1.0	-0.2	0.0	1.0	0.185	1.029	0.193	0.164	1.181
NC-01	NB-02	Foundation Soils	15.3	25.9	118.6	0.964	1.190	0.813	1.1	118.5	7	0	0.0	118.6	1.0	-0.2	0.0	1.0	0.168	1.026	0.175	0.164	1.068
NC-01	NB-02	Foundation Soils	15.4	25.8	99.3	1.015	1.190	1.022	1.1	99.6	16	0	0.4	100.0	1.0	-0.2	0.0	1.0	0.137	1.018	0.142	0.164	0.861
NC-01	NB-02	Foundation Soils	15.5	25.7	84.5	1.056	0.880	1.250	1.1	84.9	25	0	0.5	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.124	0.165	0.753
NC-01	NB-02	Foundation Soils	15.6	25.6	63.4	1.076	1.190	1.698	1.1	64.1	40	0	0.6	64.6	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.165	0.636
NC-01	NB-02	Foundation Soils	15.7	25.5	52.2	1.055	2.670	2.023	1.1	52.9	49	0	0.6	53.4	1.0	-0.3	0.0	1.0	0.095	1.008	0.096	0.165	0.582
NC-01	NB-02	Foundation Soils	15.7	25.4	49.3	0.967	5.540	1.962	1.1	49.9	50	0	0.6	50.5	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.166	0.567
NC-01	NB-02	Foundation Soils	15.8	25.4	48.9	0.914	7.050	1.868	1.1	49.5	49	0	0.6	50.1	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.166	0.564
NC-01	NB-02	Foundation Soils	15.9	25.3	49.6	0.812	8.620	1.636	1.1	50.1	46	0	0.6	50.7	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.167	0.566
NC-01	NB-02	Foundation Soils	16.0	25.2	49.6	0.733	12.530	1.477	1.1	50.1	44	0	0.5	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.167	0.564
NC-01	NB-02	Foundation Soils	16.1	25.1	48.2	0.571	16.320	1.185	1.1	48.6	40	0	0.5	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.167	0.556
NC-01	NB-02	Foundation Soils	16.2	25.0	47.9	0.307	18.630	0.642	1.1	48.1	28	0	0.5	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.168	0.553
NC-01	NB-02	Foundation Soils	16.2	25.0	48.4	0.228	19.450	0.471	1.1	48.6	23	0	0.4	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.093	0.168	0.553
NC-01	NB-02	Foundation Soils	16.3	24.9	47.1	0.242	15.570	0.514	1.1	47.2	25	0	0.4	47.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.168	0.546
NC-01	NB-02	Foundation Soils	16.4	24.8	42.8	0.337	18.200	0.788	1.1	42.9	36	0	0.5	43.4	1.0	-0.3	0.0	1.0	0.088	1.007	0.089	0.169	0.527
NC-01	NB-02	Foundation Soils	16.5	24.7	39.4	0.310	22.390	0.787	1.1	39.5	38	0	0.5	40.0	1.0	-0.3	0.0	1.0	0.085	1.007	0.086	0.169	0.511
NC-01	NB-02	Foundation Soils	16.6	24.6	33.7	0.274	68.340	0.814	1.1	33.8	44	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.169	0.487
NC-01	NB-02	Foundation Soils	16.7	24.5	31.8	0.232	103.200	0.729	1.1	31.9	43	0	0.5	32.4	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.170	0.479
NC-01	NB-02	Foundation Soils	16.7	24.5	31.4	0.227	95.170	0.723	1.1	31.4	44	0	0.5	31.9	1.0	-0.3	0.0	1.0	0.080	1.006	0.081	0.170	0.476
NC-01	NB-02	Foundation Soils	16.8	24.4	30.7	0.192	83.430	0.626	1.1	30.6	42	0	0.5	31.1	1.0	-0.3	0.0	1.0	0.080	1.006	0.080	0.170	0.472
NC-01	NB-02	Foundation Soils	16.9	24.3	29.4	0.182	83.430	0.619	1.1	29.3	43	0	0.5	29.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.171	0.466
NC-01	NB-02	Foundation Soils	17.0	24.2	30.4	0.203	81.570	0.668	1.1	30.3	44	0	0.5	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.171	0.468
NC-01	NB-02	Foundation Soils	17.1	24.1	31.9	0.275	72.130	0.863	1.1	31.7	47	0	0.5	32.2	1.0	-0.3	0.0	1.0	0.080	1.007	0.081	0.171	0.473
NC-01	NB-02	Foundation Soils	17.1	24.0	34.4	0.182	61.270	0.529	1.1	34.1	36	0	0.5	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.172	0.481
NC-01	NB-02	Foundation Soils	17.2	24.0	35.1	0.080	57.160	0.228	1.0	34.8	25	0	0.4	35.2	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.172	0.482
NC-01	NB-02	Foundation Soils	17.3	23.9	33.6	0.063	44.640	0.187	1.0	33.2	24	0	0.4	33.6	1.0	-0.3	0.0	1.0	0.081	1.007	0.082	0.172	0.475
NC-01	NB-02	Foundation Soils	17.4	23.8	27.9	0.062	33.880	0.222	1.0	27.6	32	0	0.4	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.173	0.453
NC-01	NB-02	Foundation Soils	17.5	23.7	20.2	0.069	63.890	0.342	1.0	19.9	48	0	0.5	20.4	1.0	-0.3	0.0	1.0	0.073	1.006	0.073	0.173	0.424
NC-01	NB-02	Foundation Soils	17.6	23.6	15.8	0.104	122.090	0.660	1.0	15.6	65	0	0.5	16.0	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.173	0.407
NC-01	NB-02	Foundation Soils	17.6	23.6	16.7	0.135	150.800	0.809	1.0	16.4	66	0	0.5	16.9	1.0	-0.3	0.0	1.0	0.071	1.006	0.071	0.174	0.410
NC-01	NB-02	Foundation Soils	17.7	23.5	19.4	0.121	105.960	0.624	1.0	19.1	57	0	0.5	19.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.174	0.418
NC-01	NB-02	Foundation Soils	17.8	23.4	24.7	0.138	65.740	0.560	1.0	24.2	48	0	0.5	24.7	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.174	0.436
NC-01	NB-02	Foundation Soils	17.9	23.3	29.3	0.150	43.100	0.512	1.0	28.6	41	0	0.5	29.1	1.0	-0.3	0.0	0.9	0.078	1.006	0.079	0.175	0.452
NC-01	NB-02	Foundation Soils	18.0	23.2	31.1	0.164	37.120	0.528	1.0	30.3	40	0	0.5	30.8	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.175	0.457
NC-01	NB-02	Foundation Soils	18.0	23.1	31.7	0.190	47.830	0.600	1.0	30.8	41	0	0.5	31.3	1.0	-0.3	0.0	0.9	0.080	1.006	0.080	0.175	0.458
NC-01	NB-02	Foundation Soils	18.1	23.1	36.9	0.240	40.130	0.650	1.0	35.8	38	0	0.5	36.3	1.0	-0.3	0.0	0.9	0.083	1.007	0.084	0.176	0.477
NC-01	NB-02	Foundation Soils	18.2	23.0	41.8	0.273	30.020	0.653	1.0	40.5	34	0	0.5	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.176	0.494
NC-01	NB-02	Foundation Soils	18.3	22.9	45.9	0.314	27.250	0.685	1.0	44.3	32	0	0.5	44.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.090	0.176	0.508
NC-01	NB-02	Foundation Soils	18.4	22.8	48.6	0.336	24.610	0.691	1.0	46.9	30	0	0.5	47.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.177	0.517
NC-01	NB-02	Foundation Soils	18.5	22.7	51.4	0.353	20.150	0.686	1.0	49.5	29	0	0.5	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.177	0.527
NC-01	NB-02	Foundation Soils	18.5	22.7	53.4	0.382	18.200	0.715	1.0	51.3	28	0	0.5	51.8	1.0	-0.3	0.0	0.9	0.094	1.008	0.094	0.177	0.533
NC-01	NB-02	Foundation Soils	18.6	22.6	56.6	0.398	15.010	0.703	1.0	54.3	26	0	0.5	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.097	0.177	0.545
NC-01	NB-02	Foundation Soils	18.7	22.5	58.6	0.422	14.770	0.720	1.0	56.1	26	0	0.5	56.5	1.0	-0.3	0.0	0.9	0.097	1.008	0.098	0.178	0.551
NC-01	NB-02	Foundation Soils	18.8	22.4	60.4	0.444	15.340	0.735	1.0	57.7	25	0	0.5	58.2	1.0	-0.3	0.0	0.9	0.098	1.008	0.099	0.178	0.557
NC-01	NB-02	Foundation Soils	18.9	22.3	61.6	0.474	14.050	0.770	1.0	58.8	25	0	0.5	59.3	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.178	0.561
NC-01	NB-02	Foundation Soils	18.9	22.2	62.7	0.497	11.380	0.792	1.0	59.8	26	0	0.5	60.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.101	0.179	0.564
NC-01	NB-02	Foundation Soils	19.0	22.2	64.1	0.513	8.410	0.800	1.0	61.0	25	0	0.5	61.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.179	0.568
NC-01	NB-02	Foundation Soils	19.1	22.1	64.9	0.537	8.000	0.828	1.0	61.6	26	0	0.5	62.1	1.0	-0.3	0.0	0.9	0.101	1.009	0.102	0.179	0.570
NC-01	NB-02	Foundation Soils	19.2	22.0	66.4	0.562	7.720	0.846	1.0	63.0	25	0	0.5	63.5	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.179	0.575
NC-01	NB-02	Foundation Soils	19.3	21.9	68.0	0.584	7.560	0.858	1.0	64.5	25	0	0.5	64.9	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.180	0.580

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	19.4	21.8	68.7	0.607	7.080	0.884	1.0	65.0	25	0	0.5	65.4	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.180	0.582
NC-01	NB-02	Foundation Soils	19.4	21.8	69.0	0.546	7.000	0.791	1.0	65.2	23	0	0.4	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.180	0.581
NC-01	NB-02	Foundation Soils	19.5	21.7	68.9	0.586	7.150	0.850	1.0	65.0	24	0	0.5	65.5	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.180	0.580
NC-01	NB-02	Foundation Soils	19.6	21.6	69.1	0.628	7.040	0.908	1.0	65.1	26	0	0.5	65.6	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.181	0.579
NC-01	NB-02	Foundation Soils	19.7	21.5	69.4	0.671	7.000	0.967	1.0	65.3	27	0	0.5	65.8	1.0	-0.3	0.0	0.9	0.104	1.009	0.105	0.181	0.579
NC-01	NB-02	Foundation Soils	19.8	21.4	67.5	0.687	3.430	1.019	1.0	63.4	29	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.181	0.570
NC-01	NB-02	Foundation Soils	19.8	21.3	67.4	0.701	5.670	1.040	1.0	63.2	29	0	0.5	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.182	0.568
NC-01	NB-02	Foundation Soils	19.9	21.3	67.7	0.705	6.190	1.042	1.0	63.4	29	0	0.5	63.9	1.0	-0.3	0.0	0.9	0.102	1.009	0.103	0.182	0.568
NC-01	NB-02	Foundation Soils	20.0	21.2	69.0	0.695	6.340	1.007	1.0	64.6	28	0	0.5	65.1	1.0	-0.3	0.0	0.9	0.103	1.009	0.104	0.182	0.572
NC-01	NB-02	Foundation Soils	20.1	21.1	70.0	0.681	6.340	0.973	1.0	65.4	27	0	0.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.182	0.575
NC-01	NB-02	Foundation Soils	20.2	21.0	70.8	0.688	6.810	0.972	1.0	66.1	27	0	0.5	66.6	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.183	0.577
NC-01	NB-02	Foundation Soils	20.3	20.9	72.2	0.696	7.720	0.964	1.0	67.3	26	0	0.5	67.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.183	0.582
NC-01	NB-02	Foundation Soils	20.3	20.9	73.0	0.692	8.100	0.948	1.0	68.0	25	0	0.5	68.5	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.183	0.584
NC-01	NB-02	Foundation Soils	20.4	20.8	73.6	0.700	8.450	0.951	1.0	68.5	25	0	0.5	68.9	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.183	0.585
NC-01	NB-02	Foundation Soils	20.5	20.7	73.9	0.729	8.620	0.987	1.0	68.6	26	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.184	0.585
NC-01	NB-02	Foundation Soils	20.6	20.6	74.0	0.760	8.560	1.027	1.0	68.6	27	0	0.5	69.1	1.0	-0.4	0.0	0.9	0.107	1.010	0.107	0.184	0.584
NC-01	NB-02	Foundation Soils	20.7	20.5	73.2	0.766	8.580	1.046	1.0	67.8	27	0	0.5	68.3	1.0	-0.4	0.0	0.9	0.106	1.010	0.107	0.184	0.579
NC-01	NB-02	Foundation Soils	20.8	20.4	72.0	0.772	8.580	1.073	1.0	66.5	29	0	0.5	67.0	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.184	0.573
NC-01	NB-02	Foundation Soils	20.8	20.4	68.8	0.771	8.880	1.121	1.0	63.5	31	0	0.5	64.0	1.0	-0.4	0.0	0.9	0.103	1.009	0.103	0.185	0.559
NC-01	NB-02	Foundation Soils	20.9	20.3	65.4	0.785	9.420	1.200	1.0	60.3	34	0	0.5	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.185	0.545
NC-01	NB-02	Foundation Soils	21.0	20.2	63.8	0.790	9.340	1.238	1.0	58.7	35	0	0.5	59.2	1.0	-0.4	0.0	0.9	0.099	1.009	0.099	0.185	0.538
NC-01	NB-02	Foundation Soils	21.1	20.1	60.6	0.780	9.430	1.288	1.0	55.6	37	0	0.5	56.2	1.0	-0.4	0.0	0.9	0.097	1.008	0.097	0.185	0.524
NC-01	NB-02	Foundation Soils	21.2	20.0	58.6	0.743	10.050	1.269	1.0	53.7	38	0	0.5	54.3	1.0	-0.4	0.0	0.9	0.095	1.008	0.096	0.186	0.516
NC-01	NB-02	Foundation Soils	21.2	19.9	56.1	0.704	11.580	1.255	1.0	51.4	39	0	0.5	51.9	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.186	0.506
NC-01	NB-02	Foundation Soils	21.3	19.9	54.9	0.671	12.530	1.222	1.0	50.2	39	0	0.5	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.186	0.501
NC-01	NB-02	Foundation Soils	21.4	19.8	54.0	0.633	12.670	1.172	1.0	49.3	39	0	0.5	49.8	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.186	0.497
NC-01	NB-02	Foundation Soils	21.5	19.7	53.1	0.618	12.670	1.164	1.0	48.4	39	0	0.5	48.9	1.0	-0.4	0.0	0.9	0.092	1.007	0.092	0.186	0.493
NC-01	NB-02	Foundation Soils	21.6	19.6	52.9	0.616	13.440	1.165	1.0	48.1	39	0	0.5	48.6	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.187	0.491
NC-01	NB-02	Foundation Soils	21.7	19.5	53.6	0.601	13.960	1.121	1.0	48.7	38	0	0.5	49.3	1.0	-0.4	0.0	0.9	0.092	1.008	0.092	0.187	0.493
NC-01	NB-02	Foundation Soils	21.7	19.5	56.1	0.575	13.780	1.026	1.0	50.9	35	0	0.5	51.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.187	0.500
NC-01	NB-02	Foundation Soils	21.8	19.4	58.5	0.551	13.720	0.941	1.0	53.1	32	0	0.5	53.6	1.0	-0.4	0.0	0.9	0.095	1.008	0.095	0.187	0.508
NC-01	NB-02	Foundation Soils	21.9	19.3	63.0	0.559	13.570	0.887	1.0	57.2	29	0	0.5	57.7	1.0	-0.4	0.0	0.9	0.098	1.008	0.098	0.188	0.523
NC-01	NB-02	Foundation Soils	22.0	19.2	66.4	0.561	12.570	0.844	1.0	60.2	26	0	0.5	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.188	0.534
NC-01	NB-02	Foundation Soils	22.1	19.1	66.8	0.586	11.700	0.877	1.0	60.5	27	0	0.5	61.0	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.188	0.535
NC-01	NB-02	Foundation Soils	22.1	19.0	66.5	0.599	9.960	0.901	1.0	60.1	28	0	0.5	60.6	1.0	-0.4	0.0	0.9	0.100	1.009	0.100	0.188	0.533
NC-01	NB-02	Foundation Soils	22.2	19.0	62.7	0.613	0.080	0.978	1.0	56.5	31	0	0.5	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.098	0.188	0.518
NC-01	NB-02	Foundation Soils	22.3	18.9	55.6	0.675	-1.290	1.213	1.0	50.0	39	0	0.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.189	0.492
NC-01	NB-02	Foundation Soils	22.4	18.8	47.1	0.697	3.130	1.480	0.9	42.2	48	0	0.5	42.7	1.0	-0.4	0.0	0.9	0.087	1.007	0.087	0.189	0.463
NC-01	NB-02	Foundation Soils	22.5	18.7	41.8	0.655	3.050	1.566	0.9	37.4	52	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.084	0.189	0.445
NC-01	NB-02	Foundation Soils	22.6	18.6	39.5	0.629	9.790	1.593	0.9	35.2	54	0	0.5	35.7	1.0	-0.4	0.0	0.9	0.083	1.007	0.083	0.189	0.437
NC-01	NB-02	Foundation Soils	22.6	18.6	39.4	0.593	7.100	1.506	0.9	35.0	53	0	0.5	35.6	1.0	-0.4	0.0	0.9	0.082	1.007	0.083	0.190	0.435
NC-01	NB-02	Foundation Soils	22.7	18.5	39.3	0.485	-0.820	1.235	0.9	34.9	49	0	0.5	35.4	1.0	-0.4	0.0	0.9	0.082	1.007	0.082	0.190	0.434
NC-01	NB-02	Foundation Soils	22.8	18.4	36.5	0.398	1.240	1.091	0.9	32.3	49	0	0.5	32.8	1.0	-0.4	0.0	0.9	0.081	1.007	0.081	0.190	0.425
NC-01	NB-02	Foundation Soils	22.9	18.3	33.9	0.354	4.170	1.044	0.9	30.0	51	0	0.5	30.5	1.0	-0.4	0.0	0.9	0.079	1.006	0.079	0.190	0.416
NC-01	NB-02	Foundation Soils	23.0	18.2	29.7	0.310	7.290	1.044	0.9	26.1	55	0	0.5	26.7	1.0	-0.4	0.0	0.9	0.077	1.006	0.077	0.190	0.403
NC-01	NB-02	Foundation Soils	23.0	18.1	26.5	0.300	7.120	1.131	0.9	23.3	60	0	0.5	23.8	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.191	0.393
NC-01	NB-02	Foundation Soils	23.1	18.1	24.8	0.284	8.580	1.146	0.9	21.7	62	0	0.5	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.191	0.387
NC-01	NB-02	Foundation Soils	23.2	18.0	25.7	0.270	11.890	1.049	0.9	22.5	59	0	0.5	23.0	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.191	0.390
NC-01	NB-02	Foundation Soils	23.3	17.9	27.4	0.253	11.410	0.922	0.9	24.0	55	0	0.5	24.5	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.191	0.394
NC-01	NB-02	Foundation Soils	23.4	17.8	26.9	0.249	14.010	0.925	0.9	23.5	56	0	0.5	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.191	0.392
NC-01	NB-02	Foundation Soils	23.5	17.7	26.3	0.252	16.390	0.958	0.9	22.9	57	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.192	0.389
NC-01	NB-02	Foundation Soils	23.5	17.7	25.8	0.247	18.340	0.959	0.9	22.4	58	0	0.5	22.9	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.192	0.387
NC-01	NB-02	Foundation Soils	23.6	17.6	25.1	0.252	17.880	1.004	0.9	21.8	59	0	0.5	22.3	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.192	0.385
NC-01	NB-02	Foundation Soils	23.7	17.5	24.1	0.258	18.060	1.072	0.9	20.8	62	0	0.5	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.192	0.381
NC-01	NB-02	Foundation Soils	23.8	17.4	22.9	0.263	18.490	1.147	0.9	20.3	65	30	47.4	67.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.192	0.548
NC-01	NB-02	Foundation Soils	23.9	17.3	20.9	0.264	18.540	1.265	0.9	18.4	74	30	47.5	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.104	0.193	0.540
NC-01	NB-02	Foundation Soils	23.9	17.2	19.3	0.262	18.720	1.358	0.9	17.0	77	30	47.4	64.4	1.0	-0.4	0.1	0.9	0.103	1.009	0.103	0.193	0.533
NC-01	NB-02	Foundation Soils	24.0	17.2	17.7	0.260	18.870	1.468	0.9	15.6	82	30	47.2	62.8	1.0	-0.4	0.1	0.9	0.102	1.009	0.102	0.193	0.526
NC-01	NB-02	Foundation Soils	24.1	17.1	15.9	0.261	19.200	1.646	0.9	13.9	88	30	47.0	60.9	1.0	-0.4	0.1	0.9	0.100	1.009	0.100	0.193	0.519
NC-01	NB-02	Foundation Soils	24.2	17.0	14.5	0.240	20.250	1.658	0.9	12.7	91	30	46.8	59.5	1.0	-0.5	0.1	0.9	0.099	1.009	0.099	0.193	0.512
NC-01	NB-02	Foundation Soils	24.3	16.9	12.8	0.205	29.540	1.601	0.9	11.2	95	30	46.5	57.7	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.193	0.505
NC-01	NB-02	Foundation Soils	24.4	16.8	12.7	0.158	35.010	1.247	0.9	11.1	91	30	46.4	57.4	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.194	0.504

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	24.4	16.7	13.2	0.115	32.350	0.871	0.9	11.5	84	30	46.3	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.194	0.504
NC-01	NB-02	Foundation Soils	24.5	16.7	13.5	0.083	31.410	0.614	0.9	11.8	78	30	46.1	57.9	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.194	0.504
NC-01	NB-02	Foundation Soils	24.6	16.6	13.6	0.068	34.690	0.500	0.9	11.8	75	30	46.0	57.8	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.194	0.503
NC-01	NB-02	Foundation Soils	24.7	16.5	13.8	0.072	32.160	0.522	0.9	12.0	75	30	46.0	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.194	0.504
NC-01	NB-02	Foundation Soils	24.8	16.4	13.8	0.076	32.590	0.551	0.9	12.0	76	30	46.1	58.0	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.195	0.503
NC-01	NB-02	Foundation Soils	24.9	16.3	13.2	0.090	32.280	0.683	0.9	11.4	81	30	46.1	57.6	1.0	-0.5	0.1	0.9	0.098	1.008	0.098	0.195	0.501
NC-01	NB-02	Foundation Soils	24.9	16.3	12.8	0.114	33.260	0.893	0.9	11.1	86	30	46.2	57.3	1.0	-0.5	0.1	0.9	0.098	1.008	0.097	0.195	0.499
NC-01	NB-02	Foundation Soils	25.0	16.2	12.5	0.131	29.490	1.048	0.9	10.8	89	30	46.3	57.1	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.195	0.498
NC-01	NB-02	Foundation Soils	25.1	16.1	12.8	0.085	32.160	0.663	0.9	11.1	82	30	46.1	57.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.195	0.498
NC-01	NB-02	Foundation Soils	25.2	16.0	12.1	0.066	28.230	0.543	0.9	10.5	81	30	45.9	56.4	1.0	-0.5	0.1	0.9	0.097	1.008	0.097	0.195	0.494
NC-01	NB-02	Foundation Soils	25.3	15.9	11.7	0.076	22.160	0.651	0.9	10.1	85	30	45.9	56.0	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.196	0.492
NC-01	NB-02	Foundation Soils	25.3	15.8	11.9	0.071	14.240	0.596	0.9	10.3	83	30	45.9	56.2	1.0	-0.5	0.1	0.9	0.097	1.008	0.096	0.196	0.492
NC-01	NB-02	Foundation Soils	25.4	15.8	11.3	0.070	21.920	0.620	0.9	9.7	86	30	45.9	55.6	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.196	0.490
NC-01	NB-02	Foundation Soils	25.5	15.7	10.8	0.063	27.590	0.586	0.9	9.2	87	30	45.8	55.0	1.0	-0.5	0.1	0.9	0.096	1.008	0.096	0.196	0.487
NC-01	NB-02	Foundation Soils	25.6	15.6	9.6	0.057	31.400	0.592	0.9	8.2	92	15	35.0	43.2	1.0	-0.5	0.1	0.9	0.088	1.007	0.087	0.196	0.444
NC-01	NB-02	Foundation Soils	25.7	15.5	8.2	0.036	30.020	0.439	0.9	7.0	95	15	34.8	41.8	1.0	-0.5	0.1	0.9	0.087	1.007	0.086	0.197	0.439
NC-01	NB-02	Foundation Soils	25.8	15.4	6.0	0.040	39.550	0.661	0.9	5.1	100	15	34.5	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.197	0.432
NC-01	NB-02	Foundation Soils	25.8	15.4	4.7	0.052	52.080	1.117	0.9	3.9	100	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.197	0.426
NC-01	NB-02	Foundation Soils	25.9	15.3	4.7	0.059	71.090	1.268	0.9	3.9	100	15	34.3	38.2	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.197	0.426
NC-01	NB-02	Foundation Soils	26.0	15.2	9.5	0.063	62.400	0.660	0.9	8.1	94	15	35.0	43.1	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.197	0.442
NC-01	NB-02	Foundation Soils	26.1	15.1	12.9	0.071	42.450	0.551	0.9	10.9	80	15	35.2	46.1	1.0	-0.5	0.1	0.9	0.090	1.007	0.089	0.197	0.452
NC-01	NB-02	Foundation Soils	26.2	15.0	15.8	0.068	29.210	0.431	0.9	13.4	63	15	34.9	48.3	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.198	0.459
NC-01	NB-02	Foundation Soils	26.2	14.9	16.7	0.075	34.860	0.449	0.9	14.2	61	15	34.9	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.198	0.462
NC-01	NB-02	Foundation Soils	26.3	14.9	19.0	0.082	15.200	0.431	0.9	16.1	57	15	34.9	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.198	0.468
NC-01	NB-02	Foundation Soils	26.4	14.8	19.3	0.071	19.520	0.368	0.9	16.3	54	15	34.7	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.198	0.468
NC-01	NB-02	Foundation Soils	26.5	14.7	19.7	0.075	16.440	0.381	0.9	16.7	54	15	34.8	51.4	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.198	0.469
NC-01	NB-02	Foundation Soils	26.6	14.6	19.7	0.065	27.060	0.330	0.9	16.6	52	15	34.6	51.2	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.198	0.468
NC-01	NB-02	Foundation Soils	26.7	14.5	19.8	0.053	34.240	0.268	0.9	16.7	50	15	34.3	51.0	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.198	0.466
NC-01	NB-02	Foundation Soils	26.7	14.5	20.4	0.057	40.350	0.280	0.9	17.2	49	15	34.4	51.5	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.199	0.468
NC-01	NB-02	Foundation Soils	26.8	14.4	20.8	0.065	37.690	0.312	0.9	17.6	50	15	34.5	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.199	0.469
NC-01	NB-02	Foundation Soils	26.9	14.3	19.7	0.060	40.280	0.304	0.9	16.6	51	15	34.5	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.199	0.465
NC-01	NB-02	Foundation Soils	27.0	14.2	18.4	0.054	51.090	0.294	0.9	15.4	54	15	34.5	49.9	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.199	0.461
NC-01	NB-02	Foundation Soils	27.1	14.1	17.5	0.047	59.890	0.269	0.9	14.6	54	15	34.4	49.1	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.199	0.458
NC-01	NB-02	Foundation Soils	27.1	14.0	17.5	0.037	55.410	0.212	0.9	14.6	52	15	34.2	48.9	1.0	-0.5	0.1	0.9	0.091	1.007	0.091	0.199	0.456
NC-01	NB-02	Foundation Soils	27.2	14.0	17.8	0.034	56.190	0.191	0.9	14.9	51	15	34.1	49.0	1.0	-0.5	0.1	0.9	0.092	1.007	0.091	0.199	0.457
NC-01	NB-02	Foundation Soils	27.3	13.9	19.3	0.029	52.030	0.151	0.9	16.1	46	15	33.7	49.8	1.0	-0.5	0.1	0.9	0.092	1.008	0.092	0.200	0.459
NC-01	NB-02	Foundation Soils	27.4	13.8	20.9	0.027	55.220	0.129	0.9	17.4	43	15	33.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.092	0.200	0.462
NC-01	NB-02	Foundation Soils	27.5	13.7	22.9	0.026	65.750	0.113	0.9	19.1	39	15	32.8	52.0	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.200	0.466
NC-01	NB-02	Foundation Soils	27.6	13.6	24.8	0.019	69.680	0.077	0.9	20.7	35	15	31.9	52.6	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.200	0.468
NC-01	NB-02	Foundation Soils	27.6	13.6	25.2	0.021	70.420	0.083	0.9	21.0	34	15	31.9	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.200	0.468
NC-01	NB-02	Foundation Soils	27.7	13.5	25.2	0.025	71.610	0.099	0.9	21.0	35	15	32.1	53.1	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.200	0.469
NC-01	NB-02	Foundation Soils	27.8	13.4	24.7	0.026	72.470	0.105	0.9	20.6	36	15	32.3	52.9	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.200	0.467
NC-01	NB-02	Foundation Soils	27.9	13.3	23.7	0.025	76.210	0.106	0.9	19.7	37	15	32.6	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.093	0.201	0.465
NC-01	NB-02	Foundation Soils	28.0	13.2	22.9	0.023	78.140	0.101	0.9	18.9	38	15	32.7	51.7	1.0	-0.5	0.1	0.9	0.093	1.008	0.093	0.201	0.463
NC-01	NB-02	Foundation Soils	28.1	13.1	21.7	0.019	81.420	0.088	0.9	17.9	40	15	32.9	50.8	1.0	-0.6	0.1	0.9	0.093	1.008	0.092	0.201	0.459
NC-01	NB-02	Foundation Soils	28.1	13.1	20.7	0.015	83.330	0.073	0.9	17.1	41	15	33.0	50.1	1.0	-0.6	0.1	0.9	0.092	1.008	0.092	0.201	0.456
NC-01	NB-02	Foundation Soils	28.2	13.0	19.8	0.010	86.460	0.050	0.9	16.3	42	15	33.1	49.5	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.201	0.454
NC-01	NB-02	Foundation Soils	28.3	12.9	19.3	0.010	89.240	0.052	0.9	15.9	43	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.201	0.452
NC-01	NB-02	Foundation Soils	28.4	12.8	19.2	0.011	91.430	0.057	0.9	15.8	43	15	33.2	49.0	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.201	0.452
NC-01	NB-02	Foundation Soils	28.5	12.7	19.4	0.012	93.050	0.062	0.9	15.9	43	15	33.2	49.1	1.0	-0.6	0.1	0.9	0.092	1.007	0.091	0.201	0.452
NC-01	NB-02	Foundation Soils	28.5	12.6	19.6	0.017	95.530	0.087	0.9	16.1	44	15	33.3	49.3	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.202	0.452
NC-01	NB-02	Foundation Soils	28.6	12.6	19.5	0.031	98.050	0.159	0.9	16.0	47	15	33.8	49.8	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.202	0.453
NC-01	NB-02	Foundation Soils	28.7	12.5	18.9	0.041	98.950	0.217	0.9	15.4	50	15	34.2	49.6	1.0	-0.6	0.1	0.9	0.092	1.008	0.091	0.202	0.452
NC-01	NB-02	Foundation Soils	28.8	12.4	16.7	0.037	102.290	0.222	0.9	13.6	55	15	34.3	47.9	1.0	-0.6	0.1	0.9	0.091	1.007	0.090	0.202	0.446
NC-01	NB-02	Foundation Soils	28.9	12.3	14.5	0.041	104.650	0.283	0.9	11.8	62	15	34.5	46.3	1.0	-0.6	0.1	0.9	0.090	1.007	0.089	0.202	0.440
NC-01	NB-02	Foundation Soils	29.0	12.2	11.8	0.048	111.250	0.405	0.9	9.6	82	15	35.0	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.202	0.434
NC-01	NB-02	Foundation Soils	29.0	12.2	9.4	0.052	127.860	0.555	0.9	7.6	96	15	34.9	42.5	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.202	0.427
NC-01	NB-02	Foundation Soils	29.1	12.1	8.3	0.042	139.790	0.504	0.9	6.7	100	15	34.8	41.6	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.202	0.424
NC-01	NB-02	Foundation Soils	29.2	12.0	8.3	0.040	139.360	0.480	0.9	6.7	99	15	34.8	41.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.203	0.423
NC-01	NB-02	Foundation Soils	29.3	11.9	8.8	0.081	127.640	0.918	0.9	7.1	100	15	34.9	42.0	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.203	0.425
NC-01	NB-02	Foundation Soils	29.4	11.8	9.5	0.099	132.060	1.044	0.9	7.7	100	15	35.0	42.7	1.0	-0.6	0.1	0.9	0.087	1.007	0.086	0.203	0.426
NC-01	NB-02	Foundation Soils	29.4	11.7	11.5	0.145	121.780	1.258	0.9	9.3	100	15	35.3	44.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.203	0.433

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	29.5	11.7	12.7	0.115	110.010	0.903	0.9	10.3	91	15	35.3	45.6	1.0	-0.6	0.1	0.9	0.089	1.007	0.088	0.203	0.436
NC-01	NB-02	Foundation Soils	29.6	11.6	20.0	0.187	52.550	0.937	0.9	16.2	75	15	36.0	52.2	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.203	0.457
NC-01	NB-02	Foundation Soils	29.7	11.5	23.6	0.173	82.330	0.734	0.9	19.2	58	15	35.6	54.8	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.203	0.466
NC-01	NB-02	Foundation Soils	29.8	11.4	35.3	0.163	143.140	0.462	0.9	28.8	38	15	34.4	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.203	0.496
NC-01	NB-02	Foundation Soils	29.9	11.3	47.3	0.176	68.040	0.372	0.9	38.8	26	15	30.6	69.4	1.0	-0.6	0.1	0.9	0.107	1.010	0.106	0.203	0.519
NC-01	NB-02	Foundation Soils	29.9	11.3	53.4	0.242	-0.810	0.453	0.9	43.9	25	15	30.6	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.110	0.204	0.539
NC-01	NB-02	Foundation Soils	30.0	11.2	59.7	0.088	10.430	0.148	0.9	48.1	8	15	4.1	52.3	1.0	-0.6	0.1	0.9	0.094	1.008	0.093	0.204	0.456
NC-01	NB-02	Foundation Soils	30.1	11.1	68.2	0.102	6.760	0.149	0.9	55.1	4	15	0.0	55.2	1.0	-0.6	0.1	0.9	0.096	1.008	0.095	0.204	0.466
NC-01	NB-02	Foundation Soils	30.2	11.0	74.6	0.177	10.010	0.237	0.9	60.5	5	15	0.5	61.0	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.204	0.487
NC-01	NB-02	Foundation Soils	30.3	10.9	74.4	0.149	4.470	0.200	0.9	60.3	4	15	0.0	60.3	1.0	-0.6	0.1	0.9	0.100	1.009	0.099	0.204	0.484
NC-01	NB-02	Foundation Soils	30.3	10.8	70.4	0.286	11.820	0.406	0.9	57.6	15	15	18.9	76.5	1.0	-0.6	0.1	0.9	0.113	1.011	0.111	0.204	0.546
NC-01	NB-02	Foundation Soils	30.4	10.8	73.1	0.271	11.650	0.371	0.9	59.7	12	15	13.4	73.1	1.0	-0.6	0.1	0.9	0.110	1.011	0.109	0.204	0.531
NC-01	NB-02	Foundation Soils	30.5	10.7	81.3	0.187	12.200	0.230	0.9	66.0	2	15	0.0	66.0	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.204	0.503
NC-01	NB-02	Foundation Soils	30.6	10.6	78.3	0.132	23.570	0.168	0.9	63.3	0	15	0.0	63.3	1.0	-0.6	0.1	0.9	0.102	1.009	0.101	0.204	0.493
NC-01	NB-02	Foundation Soils	30.7	10.5	70.1	0.183	23.490	0.261	0.9	56.6	9	15	5.4	62.0	1.0	-0.6	0.1	0.9	0.101	1.009	0.100	0.204	0.488
NC-01	NB-02	Foundation Soils	30.8	10.4	70.1	0.280	20.010	0.399	0.9	57.1	15	15	18.9	75.9	1.0	-0.6	0.1	0.9	0.112	1.011	0.111	0.205	0.542
NC-01	NB-02	Foundation Soils	30.8	10.4	76.9	0.242	11.980	0.315	0.9	62.1	8	15	4.6	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.205	0.505
NC-01	NB-02	Foundation Soils	30.9	10.3	80.3	0.197	12.260	0.245	0.9	64.7	4	15	0.0	64.7	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.205	0.497
NC-01	NB-02	Foundation Soils	31.0	10.2	83.1	0.202	5.100	0.243	0.9	67.0	2	15	0.0	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.104	0.205	0.505
NC-01	NB-02	Foundation Soils	31.1	10.1	79.5	0.268	41.260	0.337	0.9	64.2	8	15	4.6	68.7	1.0	-0.6	0.1	0.9	0.106	1.010	0.105	0.205	0.512
NC-01	NB-02	Foundation Soils	31.2	10.0	74.5	0.362	14.640	0.486	0.9	60.6	16	15	21.8	82.4	1.0	-0.6	0.1	0.9	0.118	1.013	0.117	0.205	0.568
NC-01	NB-02	Foundation Soils	31.2	9.9	74.5	0.275	17.590	0.369	0.9	60.1	12	15	12.6	72.8	1.0	-0.6	0.1	0.9	0.110	1.011	0.108	0.205	0.527
NC-01	NB-02	Foundation Soils	31.3	9.9	86.3	0.255	15.440	0.295	0.9	69.5	4	15	0.0	69.5	1.0	-0.6	0.1	0.9	0.107	1.010	0.105	0.205	0.514
NC-01	NB-02	Foundation Soils	31.4	9.8	82.0	0.249	27.920	0.304	0.8	65.7	6	15	1.0	66.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.205	0.503
NC-01	NB-02	Foundation Soils	31.5	9.7	80.5	0.241	8.750	0.299	0.8	64.4	6	15	1.4	65.8	1.0	-0.6	0.1	0.9	0.104	1.009	0.103	0.205	0.499
NC-01	NB-02	Foundation Soils	31.6	9.6	81.2	0.210	25.760	0.259	0.8	64.9	4	15	0.1	65.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.102	0.205	0.496
NC-01	NB-02	Foundation Soils	31.7	9.5	83.3	0.084	20.630	0.101	0.8	66.6	0	15	0.0	66.6	1.0	-0.6	0.1	0.9	0.105	1.010	0.103	0.206	0.502
NC-01	NB-02	Foundation Soils	31.7	9.4	83.4	0.068	18.720	0.082	0.8	66.6	0	15	0.0	66.6	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.206	0.501
NC-01	NB-02	Foundation Soils	31.8	9.4	84.0	0.045	18.240	0.054	0.8	67.0	0	15	0.0	67.0	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.206	0.503
NC-01	NB-02	Foundation Soils	31.9	9.3	83.1	0.031	20.730	0.037	0.8	66.2	0	15	0.0	66.2	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.206	0.499
NC-01	NB-02	Foundation Soils	32.0	9.2	78.4	0.045	25.970	0.057	0.8	62.2	0	15	0.0	62.2	1.0	-0.7	0.1	0.9	0.101	1.009	0.100	0.206	0.484
NC-01	NB-02	Foundation Soils	32.1	9.1	72.3	0.044	18.820	0.061	0.8	57.0	0	15	0.0	57.0	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.206	0.466
NC-01	NB-02	Foundation Soils	32.2	9.0	67.2	0.057	21.620	0.085	0.8	52.6	2	15	0.0	52.6	1.0	-0.7	0.1	0.9	0.094	1.008	0.093	0.206	0.451
NC-01	NB-02	Foundation Soils	32.2	9.0	64.0	0.058	14.200	0.091	0.8	49.9	4	15	0.0	50.0	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.206	0.442
NC-01	NB-02	Foundation Soils	32.3	8.9	58.7	0.065	21.860	0.111	0.8	45.7	8	15	3.3	49.0	1.0	-0.7	0.1	0.9	0.092	1.007	0.090	0.206	0.438
NC-01	NB-02	Foundation Soils	32.4	8.8	53.2	0.056	25.050	0.105	0.8	41.5	11	15	9.8	51.3	1.0	-0.7	0.1	0.9	0.093	1.008	0.092	0.206	0.446
NC-01	NB-02	Foundation Soils	32.5	8.7	57.4	0.034	18.470	0.059	0.8	44.4	7	15	1.9	46.4	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.206	0.429
NC-01	NB-02	Foundation Soils	32.6	8.6	59.6	0.031	5.720	0.052	0.8	46.1	6	15	0.7	46.8	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.206	0.430
NC-01	NB-02	Foundation Soils	32.6	8.5	63.7	0.067	10.420	0.105	0.8	49.4	5	15	0.2	49.7	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.206	0.439
NC-01	NB-02	Foundation Soils	32.7	8.5	63.2	0.070	10.860	0.111	0.8	49.0	5	15	0.5	49.5	1.0	-0.7	0.1	0.9	0.092	1.008	0.091	0.207	0.439
NC-01	NB-02	Foundation Soils	32.8	8.4	65.2	0.080	8.800	0.123	0.8	50.5	5	15	0.3	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.207	0.443
NC-01	NB-02	Foundation Soils	32.9	8.3	59.7	0.181	11.910	0.303	0.8	47.0	17	15	21.7	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.207	0.506
NC-01	NB-02	Foundation Soils	33.0	8.2	54.6	0.218	11.910	0.399	0.8	43.1	23	15	29.3	72.5	1.0	-0.7	0.1	0.9	0.109	1.011	0.107	0.207	0.520
NC-01	NB-02	Foundation Soils	33.1	8.1	57.6	0.175	33.020	0.304	0.8	45.3	18	15	23.4	68.7	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.207	0.505
NC-01	NB-02	Foundation Soils	33.1	8.1	65.7	0.191	6.580	0.291	0.8	51.6	13	15	15.3	66.8	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.207	0.498
NC-01	NB-02	Foundation Soils	33.2	8.0	72.7	0.171	21.620	0.235	0.8	56.6	7	15	2.6	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.207	0.470
NC-01	NB-02	Foundation Soils	33.3	7.9	73.8	0.181	10.280	0.245	0.8	57.4	7	15	2.6	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.207	0.473
NC-01	NB-02	Foundation Soils	33.4	7.8	70.9	0.172	20.920	0.243	0.8	55.1	9	15	4.9	60.0	1.0	-0.7	0.1	0.9	0.100	1.009	0.098	0.207	0.473
NC-01	NB-02	Foundation Soils	33.5	7.7	71.3	0.261	14.390	0.366	0.8	56.0	14	15	17.0	73.0	1.0	-0.7	0.1	0.9	0.110	1.011	0.108	0.207	0.521
NC-01	NB-02	Foundation Soils	33.5	7.6	66.9	0.344	17.340	0.514	0.8	52.9	21	15	28.3	81.2	1.0	-0.7	0.1	0.9	0.117	1.012	0.115	0.207	0.554
NC-01	NB-02	Foundation Soils	33.6	7.6	65.3	0.452	27.970	0.692	0.8	51.8	27	15	33.3	85.1	1.0	-0.7	0.1	0.9	0.121	1.013	0.118	0.207	0.571
NC-01	NB-02	Foundation Soils	33.7	7.5	63.2	0.217	18.770	0.343	0.8	49.5	17	15	22.0	71.5	1.0	-0.7	0.1	0.9	0.109	1.010	0.107	0.207	0.514
NC-01	NB-02	Foundation Soils	33.8	7.4	65.6	0.211	18.490	0.321	0.8	51.2	15	15	18.5	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.207	0.507
NC-01	NB-02	Foundation Soils	33.9	7.3	68.0	0.203	4.380	0.299	0.8	52.9	13	15	14.3	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.103	0.207	0.497
NC-01	NB-02	Foundation Soils	34.0	7.2	67.1	0.210	23.160	0.313	0.8	52.2	14	15	16.6	68.8	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.208	0.503
NC-01	NB-02	Foundation Soils	34.0	7.2	59.1	0.184	18.220	0.312	0.8	45.9	18	15	23.2	69.2	1.0	-0.7	0.1	0.9	0.107	1.010	0.105	0.208	0.504
NC-01	NB-02	Foundation Soils	34.1	7.1	57.7	0.175	18.490	0.303	0.8	44.8	18	15	23.7	68.6	1.0	-0.7	0.1	0.9	0.106	1.010	0.104	0.208	0.502
NC-01	NB-02	Foundation Soils	34.2	7.0	59.7	0.101	18.860	0.169	0.8	45.7	11	15	9.8	55.5	1.0	-0.7	0.1	0.9	0.096	1.008	0.095	0.208	0.455
NC-01	NB-02	Foundation Soils	34.3	6.9	62.2	0.034	35.490	0.055	0.8	47.0	5	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.208	0.428
NC-01	NB-02	Foundation Soils	34.4	6.8	62.3	0.036	19.920	0.058	0.8	47.1	5	15	0.2	47.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.089	0.208	0.428
NC-01	NB-02	Foundation Soils	34.4	6.7	63.8	0.020	11.780	0.031	0.8	48.2	6	15	0.6	48.8	1.0	-0.7	0.1	0.9	0.091	1.007	0.090	0.208	0.433
NC-01	NB-02	Foundation Soils	34.5	6.7	67.0	0.025	18.870	0.037	0.8	50.8	3	15	0.0	50.8	1.0	-0.7	0.1	0.9	0.093	1.008	0.091	0.208	0.439

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	34.6	6.6	70.9	0.111	16.910	0.157	0.8	53.9	5	15	0.1	54.0	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.208	0.449
NC-01	NB-02	Foundation Soils	34.7	6.5	72.0	0.055	14.220	0.076	0.8	54.7	0	15	0.0	54.7	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.208	0.452
NC-01	NB-02	Foundation Soils	34.8	6.4	71.7	0.054	18.470	0.075	0.8	54.4	0	15	0.0	54.4	1.0	-0.7	0.1	0.9	0.095	1.008	0.094	0.208	0.450
NC-01	NB-02	Foundation Soils	34.9	6.3	72.6	0.087	6.120	0.120	0.8	55.1	2	15	0.0	55.1	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.208	0.452
NC-01	NB-02	Foundation Soils	34.9	6.3	72.4	0.175	10.480	0.242	0.8	55.2	8	15	4.5	59.6	1.0	-0.7	0.1	0.9	0.099	1.009	0.097	0.208	0.468
NC-01	NB-02	Foundation Soils	35.0	6.2	72.6	0.045	19.030	0.062	0.8	54.9	0	15	0.0	54.9	1.0	-0.7	0.1	0.9	0.096	1.008	0.094	0.208	0.452
NC-01	NB-02	Foundation Soils	35.1	6.1	70.5	0.074	14.050	0.105	0.8	53.2	2	15	0.0	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.093	0.208	0.446
NC-01	NB-02	Foundation Soils	35.2	6.0	68.9	0.078	17.720	0.113	0.8	51.8	3	15	0.0	51.8	1.0	-0.7	0.1	0.9	0.094	1.008	0.092	0.208	0.441
NC-01	NB-02	Foundation Soils	35.3	5.9	66.5	0.095	7.240	0.143	0.8	49.9	6	15	1.2	51.1	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.208	0.438
NC-01	NB-02	Foundation Soils	35.4	5.8	65.6	0.099	13.860	0.151	0.8	49.2	7	15	2.3	51.5	1.0	-0.8	0.1	0.9	0.093	1.008	0.092	0.208	0.439
NC-01	NB-02	Foundation Soils	35.4	5.8	66.0	0.079	30.730	0.120	0.8	49.4	5	15	0.4	49.8	1.0	-0.8	0.1	0.9	0.092	1.008	0.090	0.209	0.434
NC-01	NB-02	Foundation Soils	35.5	5.7	69.0	0.138	11.510	0.200	0.8	52.0	8	15	3.8	55.8	1.0	-0.8	0.1	0.9	0.096	1.008	0.095	0.209	0.453
NC-01	NB-02	Foundation Soils	35.6	5.6	63.1	0.202	15.200	0.320	0.8	48.3	17	15	21.5	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.105	0.209	0.502
NC-01	NB-02	Foundation Soils	35.7	5.5	68.5	0.176	29.720	0.257	0.8	51.9	11	15	10.6	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.209	0.476
NC-01	NB-02	Foundation Soils	35.8	5.4	71.7	0.142	11.240	0.198	0.8	53.8	7	15	1.8	55.6	1.0	-0.8	0.1	0.9	0.096	1.008	0.094	0.209	0.452
NC-01	NB-02	Foundation Soils	35.8	5.3	70.4	0.090	20.330	0.128	0.8	52.6	4	15	0.0	52.6	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.209	0.442
NC-01	NB-02	Foundation Soils	35.9	5.3	68.0	0.052	19.720	0.077	0.8	50.6	3	15	0.0	50.6	1.0	-0.8	0.1	0.9	0.093	1.008	0.091	0.209	0.435
NC-01	NB-02	Foundation Soils	36.0	5.2	65.8	0.048	18.410	0.073	0.8	48.8	4	15	0.0	48.8	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.209	0.430
NC-01	NB-02	Foundation Soils	36.1	5.1	62.9	0.028	17.060	0.045	0.8	46.5	5	15	0.4	46.9	1.0	-0.8	0.1	0.9	0.090	1.007	0.088	0.209	0.423
NC-01	NB-02	Foundation Soils	36.2	5.0	56.3	0.026	15.650	0.046	0.8	41.6	9	15	5.7	47.3	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.209	0.424
NC-01	NB-02	Foundation Soils	36.3	4.9	54.5	0.026	15.700	0.048	0.8	40.2	10	15	8.1	48.3	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.209	0.427
NC-01	NB-02	Foundation Soils	36.3	4.9	54.3	0.031	11.010	0.057	0.8	40.1	10	15	8.0	48.1	1.0	-0.8	0.1	0.9	0.091	1.007	0.089	0.209	0.427
NC-01	NB-02	Foundation Soils	36.4	4.8	52.9	0.117	20.120	0.221	0.8	39.7	18	15	23.2	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.209	0.476
NC-01	NB-02	Foundation Soils	36.5	4.7	51.1	0.138	19.050	0.270	0.8	38.5	22	15	27.1	65.5	1.0	-0.8	0.1	0.9	0.104	1.009	0.101	0.209	0.485
NC-01	NB-02	Foundation Soils	36.6	4.6	50.9	0.194	25.780	0.381	0.8	38.4	26	15	30.8	69.3	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.209	0.498
NC-01	NB-02	Foundation Soils	36.7	4.5	52.3	0.151	28.640	0.289	0.8	39.4	22	15	27.2	66.6	1.0	-0.8	0.1	0.9	0.105	1.010	0.102	0.209	0.489
NC-01	NB-02	Foundation Soils	36.7	4.4	57.3	0.142	18.200	0.248	0.8	42.9	17	15	21.6	64.6	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.209	0.481
NC-01	NB-02	Foundation Soils	36.8	4.4	60.2	0.193	23.300	0.321	0.8	45.4	19	15	24.2	69.5	1.0	-0.8	0.1	0.9	0.107	1.010	0.104	0.209	0.499
NC-01	NB-02	Foundation Soils	36.9	4.3	62.5	0.260	21.960	0.416	0.8	47.4	21	15	27.5	74.8	1.0	-0.8	0.1	0.9	0.111	1.011	0.109	0.209	0.519
NC-01	NB-02	Foundation Soils	37.0	4.2	74.7	0.225	16.390	0.301	0.8	56.0	11	15	10.0	65.9	1.0	-0.8	0.1	0.9	0.104	1.009	0.102	0.209	0.486
NC-01	NB-02	Foundation Soils	37.1	4.1	81.7	0.121	13.510	0.148	0.8	60.7	0	15	0.0	60.7	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.209	0.467
NC-01	NB-02	Foundation Soils	37.2	4.0	85.0	0.103	17.870	0.121	0.8	63.4	0	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.209	0.476
NC-01	NB-02	Foundation Soils	37.2	4.0	85.1	0.087	30.300	0.102	0.8	63.4	0	15	0.0	63.4	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.209	0.476
NC-01	NB-02	Foundation Soils	37.3	3.9	82.9	0.097	29.160	0.117	0.8	61.5	0	15	0.0	61.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.210	0.469
NC-01	NB-02	Foundation Soils	37.4	3.8	72.5	0.113	28.030	0.156	0.8	53.2	5	15	0.2	53.3	1.0	-0.8	0.1	0.9	0.095	1.008	0.093	0.210	0.442
NC-01	NB-02	Foundation Soils	37.5	3.7	78.7	0.275	21.960	0.349	0.8	58.9	11	15	11.4	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.105	0.210	0.501
NC-01	NB-02	Foundation Soils	37.6	3.6	83.3	0.144	24.820	0.173	0.8	61.7	1	15	0.0	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.210	0.470
NC-01	NB-02	Foundation Soils	37.6	3.5	82.6	0.211	31.100	0.256	0.8	61.1	6	15	0.6	61.7	1.0	-0.8	0.1	0.9	0.101	1.009	0.098	0.210	0.470
NC-01	NB-02	Foundation Soils	37.7	3.5	77.9	0.317	22.480	0.407	0.8	58.5	14	15	17.6	76.1	1.0	-0.8	0.1	0.9	0.112	1.011	0.110	0.210	0.522
NC-01	NB-02	Foundation Soils	37.8	3.4	65.2	0.279	19.440	0.428	0.8	49.0	20	15	27.0	75.9	1.0	-0.8	0.1	0.9	0.112	1.011	0.109	0.210	0.521
NC-01	NB-02	Foundation Soils	37.9	3.3	59.9	0.172	15.340	0.287	0.8	44.5	18	15	22.8	67.3	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.210	0.489
NC-01	NB-02	Foundation Soils	38.0	3.2	53.3	0.136	24.590	0.255	0.8	39.5	20	15	25.4	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.210	0.480
NC-01	NB-02	Foundation Soils	38.1	3.1	52.8	0.103	12.340	0.195	0.8	38.8	18	15	22.2	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.210	0.467
NC-01	NB-02	Foundation Soils	38.1	3.1	54.2	0.104	9.670	0.192	0.8	39.8	17	15	20.8	60.6	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.210	0.465
NC-01	NB-02	Foundation Soils	38.2	3.0	57.2	0.118	28.590	0.206	0.8	42.0	16	15	19.1	61.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.098	0.210	0.467
NC-01	NB-02	Foundation Soils	38.3	2.9	66.3	0.188	30.780	0.284	0.8	49.0	14	15	17.4	66.3	1.0	-0.8	0.1	0.9	0.104	1.010	0.102	0.210	0.485
NC-01	NB-02	Foundation Soils	38.4	2.8	79.5	0.199	26.200	0.250	0.8	58.1	7	15	1.9	60.1	1.0	-0.8	0.1	0.9	0.100	1.009	0.097	0.210	0.463
NC-01	NB-02	Foundation Soils	38.5	2.7	87.4	0.217	28.320	0.248	0.8	64.3	4	15	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.100	0.210	0.477
NC-01	NB-02	Foundation Soils	38.5	2.6	91.1	0.279	24.210	0.306	0.8	67.1	5	15	0.4	67.5	1.0	-0.8	0.1	0.9	0.105	1.010	0.103	0.210	0.489
NC-01	NB-02	Foundation Soils	38.6	2.6	87.5	0.354	36.750	0.405	0.8	65.0	11	15	9.8	74.9	1.0	-0.8	0.1	0.9	0.111	1.011	0.108	0.210	0.516
NC-01	NB-02	Foundation Soils	38.7	2.5	84.1	0.363	32.540	0.431	0.8	62.7	13	15	15.2	77.9	1.0	-0.9	0.1	0.9	0.114	1.012	0.111	0.210	0.528
NC-01	NB-02	Foundation Soils	38.8	2.4	87.3	0.320	21.670	0.366	0.8	64.5	9	15	6.4	70.9	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.210	0.501
NC-01	NB-02	Foundation Soils	38.9	2.3	100.5	0.359	1.810	0.357	0.8	74.5	4	15	0.1	74.6	1.0	-0.9	0.1	0.9	0.111	1.011	0.108	0.210	0.514
NC-01	NB-02	Foundation Soils	39.0	2.2	110.1	0.239	-8.370	0.217	0.8	82.3	0	15	0.0	82.3	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.210	0.546
NC-01	NB-02	Foundation Soils	39.0	2.1	117.4	0.242	21.060	0.206	0.8	88.2	0	15	0.0	88.2	1.0	-0.9	0.1	0.9	0.124	1.014	0.120	0.210	0.572
NC-01	NB-02	Foundation Soils	39.1	2.1	115.4	0.178	19.950	0.154	0.8	86.5	0	15	0.0	86.5	1.0	-0.9	0.1	0.9	0.122	1.014	0.118	0.210	0.564
NC-01	NB-02	Foundation Soils	39.2	2.0	110.7	0.206	25.200	0.186	0.8	82.6	0	15	0.0	82.6	1.0	-0.9	0.1	0.9	0.118	1.013	0.115	0.210	0.546
NC-01	NB-02	Foundation Soils	39.3	1.9	102.5	0.170	28.110	0.166	0.8	75.8	0	15	0.0	75.8	1.0	-0.9	0.1	0.9	0.112	1.011	0.109	0.210	0.518
NC-01	NB-02	Foundation Soils	39.4	1.8	99.4	0.138	25.350	0.139	0.8	73.2	0	15	0.0	73.2	1.0	-0.9	0.1	0.9	0.110	1.011	0.107	0.210	0.508
NC-01	NB-02	Foundation Soils	39.5	1.7	96.8	0.092	11.600	0.095	0.8	71.0	0	15	0.0	71.0	1.0	-0.9	0.1	0.9	0.108	1.010	0.105	0.210	0.500
NC-01	NB-02	Foundation Soils	39.5	1.7	92.5	0.073	25.700	0.079	0.8	67.5	0	15	0.0	67.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.102	0.210	0.487
NC-01	NB-02	Foundation Soils	39.6	1.6	93.4	0.109	28.300	0.117	0.8	68.1	0	15	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.210	0.489

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
NC-01	NB-02	Foundation Soils	39.698	1.5	96.578	0.057	23.630	0.059	0.8	70.6	0	15	0.0	70.6	1.0	-0.9	0.1	0.8	0.108	1.010	0.105	0.210	0.498
NC-01	NB-02	Foundation Soils	39.8	1.4	104.0	0.127	15.750	0.122	0.8	76.6	0	15	0.0	76.6	1.0	-0.9	0.1	0.8	0.113	1.011	0.110	0.210	0.521
NC-01	NB-02	Foundation Soils	39.9	1.3	108.4	0.173	15.390	0.160	0.8	80.0	0	15	0.0	80.0	1.0	-0.9	0.1	0.8	0.116	1.012	0.112	0.210	0.535
NC-01	NB-02	Foundation Soils	39.9	1.2	115.5	0.261	12.150	0.226	0.8	85.8	0	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.210	0.559
NC-01	NB-02	Foundation Soils	40.0	1.2	113.4	0.267	27.250	0.235	0.8	84.0	0	15	0.0	84.0	1.0	-0.9	0.1	0.8	0.120	1.013	0.116	0.210	0.551
NC-01	NB-02	Foundation Soils	40.1	1.1	111.8	0.199	29.020	0.178	0.8	82.6	0	15	0.0	82.6	1.0	-0.9	0.1	0.8	0.118	1.013	0.115	0.210	0.545
NC-01	NB-02	Foundation Soils	40.2	1.0	115.9	0.133	18.300	0.115	0.8	85.8	0	15	0.0	85.8	1.0	-0.9	0.1	0.8	0.121	1.013	0.118	0.210	0.559
NC-01	NB-02	Foundation Soils	40.3	0.9	130.9	0.200	15.230	0.153	0.8	98.2	0	15	0.0	98.2	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.210	0.621
NC-01	NB-02	Foundation Soils	40.4	0.8	143.2	0.430	15.680	0.300	0.8	108.4	0	15	0.0	108.4	0.9	-0.9	0.1	0.8	0.149	1.021	0.145	0.210	0.687
NC-01	NB-02	Foundation Soils	40.4	0.8	144.3	0.379	17.220	0.263	0.8	109.3	0	15	0.0	109.3	0.9	-0.9	0.1	0.8	0.151	1.021	0.146	0.210	0.694
NC-01	NB-02	Foundation Soils	40.5	0.7	131.5	0.651	18.250	0.495	0.8	98.5	2	15	0.0	98.5	1.0	-0.9	0.1	0.8	0.135	1.017	0.131	0.210	0.623
NC-01	NB-02	Foundation Soils	40.6	0.6	127.3	0.879	31.250	0.690	0.8	95.8	9	15	8.2	104.0	0.9	-0.9	0.1	0.8	0.143	1.019	0.138	0.210	0.656
NC-01	NB-02	Foundation Soils	40.7	0.5	132.1	0.589	31.620	0.446	0.8	98.8	0	15	0.0	98.8	1.0	-0.9	0.1	0.8	0.136	1.017	0.131	0.210	0.624
NC-01	NB-02	Foundation Soils	40.8	0.4	136.0	0.581	20.020	0.427	0.8	102.0	0	15	0.0	102.0	0.9	-0.9	0.1	0.8	0.140	1.018	0.135	0.210	0.643
NC-01	NB-02	Foundation Soils	40.8	0.3	137.4	0.478	10.910	0.348	0.8	103.1	0	15	0.0	103.1	0.9	-0.9	0.1	0.8	0.141	1.019	0.137	0.211	0.650
NC-01	NB-02	Foundation Soils	40.9	0.3	134.9	0.419	-4.900	0.311	0.8	100.9	0	15	0.0	100.9	0.9	-0.9	0.1	0.8	0.138	1.018	0.134	0.211	0.636
NC-01	NB-02	Foundation Soils	41.0	0.2	120.1	0.516	4.280	0.430	0.8	88.5	2	15	0.0	88.5	1.0	-0.9	0.1	0.8	0.124	1.014	0.120	0.211	0.570
NC-01	NB-02	Foundation Soils	41.1	0.1	97.6	0.525	30.530	0.538	0.8	71.8	13	15	15.5	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.119	0.211	0.564
NC-01	NB-02	Foundation Soils	41.2	0.0	89.3	0.394	25.490	0.441	0.8	64.9	12	15	13.6	78.5	1.0	-0.9	0.1	0.8	0.114	1.012	0.111	0.211	0.527
NC-01	NB-02	Foundation Soils	41.3	-0.1	93.7	0.400	20.300	0.427	0.8	67.9	10	15	8.8	76.7	1.0	-0.9	0.1	0.8	0.113	1.011	0.109	0.211	0.519
NC-01	NB-02	Foundation Soils	41.3	-0.1	87.4	0.297	23.350	0.340	0.8	62.6	9	15	5.5	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.103	0.211	0.487
NC-01	NB-02	Foundation Soils	41.4	-0.2	83.7	0.192	26.160	0.229	0.7	59.1	5	15	0.3	59.4	1.0	-0.9	0.1	0.8	0.099	1.009	0.096	0.211	0.457
NC-01	NB-02	Foundation Soils	41.5	-0.3	80.3	0.191	20.150	0.238	0.7	56.6	7	15	1.9	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.211	0.454
NC-01	NB-02	Foundation Soils	41.6	-0.4	79.6	0.114	19.110	0.143	0.7	55.8	2	15	0.0	55.8	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.211	0.445
NC-01	NB-02	Foundation Soils	41.7	-0.5	81.1	0.072	17.490	0.089	0.7	56.9	0	15	0.0	56.9	1.0	-0.9	0.1	0.8	0.097	1.008	0.094	0.211	0.449
NC-01	NB-02	Foundation Soils	41.7	-0.6	79.6	0.067	4.070	0.084	0.7	55.7	0	15	0.0	55.7	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.211	0.445
NC-01	NB-02	Foundation Soils	41.8	-0.6	76.3	0.045	17.910	0.059	0.7	53.1	0	15	0.0	53.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.092	0.211	0.436
NC-01	NB-02	Foundation Soils	41.9	-0.7	74.4	0.034	24.100	0.046	0.7	51.6	1	15	0.0	51.6	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.211	0.431
NC-01	NB-02	Foundation Soils	42.0	-0.8	74.5	0.046	22.680	0.062	0.7	51.7	1	15	0.0	51.7	1.0	-0.9	0.1	0.8	0.093	1.008	0.091	0.211	0.431
NC-01	NB-02	Foundation Soils	42.1	-0.9	76.2	0.068	18.360	0.089	0.7	52.9	1	15	0.0	52.9	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.211	0.435
NC-01	NB-02	Foundation Soils	42.2	-1.0	77.4	0.061	24.110	0.079	0.7	53.8	0	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.211	0.438
NC-01	NB-02	Foundation Soils	42.2	-1.0	77.6	0.086	26.290	0.111	0.7	53.8	2	15	0.0	53.8	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.211	0.438
NC-01	NB-02	Foundation Soils	42.3	-1.1	78.9	0.066	21.490	0.084	0.7	54.8	0	15	0.0	54.8	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.211	0.441
NC-01	NB-02	Foundation Soils	42.4	-1.2	79.3	0.075	22.020	0.095	0.7	55.0	0	15	0.0	55.0	1.0	-1.0	0.1	0.8	0.096	1.008	0.093	0.211	0.442
NC-01	NB-02	Foundation Soils	42.5	-1.3	81.3	0.059	12.960	0.073	0.7	56.5	0	15	0.0	56.5	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.211	0.447
NC-01	NB-02	Foundation Soils	42.6	-1.4	83.1	0.055	8.120	0.066	0.7	57.8	0	15	0.0	57.8	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.211	0.451
NC-01	NB-02	Foundation Soils	42.7	-1.5	83.7	0.075	7.340	0.090	0.7	58.2	0	15	0.0	58.2	1.0	-1.0	0.1	0.8	0.098	1.008	0.095	0.211	0.452
NC-01	NB-02	Foundation Soils	42.7	-1.5	81.2	0.091	-7.150	0.112	0.7	56.2	0	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.211	0.446
NC-01	NB-02	Foundation Soils	42.8	-1.6	78.7	0.112	-0.430	0.142	0.7	54.3	3	15	0.0	54.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.211	0.439
NC-01	NB-02	Foundation Soils	42.9	-1.7	78.5	0.110	2.100	0.140	0.7	54.1	3	15	0.0	54.1	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.211	0.439
NC-01	NB-02	Foundation Soils	43.0	-1.8	78.2	0.127	-5.290	0.162	0.7	53.8	4	15	0.1	53.9	1.0	-1.0	0.1	0.8	0.095	1.008	0.092	0.211	0.438
NC-01	NB-02	Foundation Soils	43.1	-1.9	81.4	0.106	1.050	0.130	0.7	56.2	1	15	0.0	56.2	1.0	-1.0	0.1	0.8	0.097	1.008	0.094	0.211	0.445
NC-01	NB-02	Foundation Soils	43.1	-2.0	90.7	0.234	3.570	0.258	0.7	63.3	4	15	0.1	63.4	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.211	0.469
NC-01	NB-02	Foundation Soils	43.2	-2.0	96.5	0.315	2.950	0.326	0.7	67.8	6	15	0.6	68.4	1.0	-1.0	0.1	0.8	0.106	1.010	0.103	0.211	0.487
NC-01	NB-02	Foundation Soils	43.3	-2.1	107.2	0.396	18.430	0.369	0.8	76.1	4	15	0.1	76.2	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.211	0.515
NC-02	NB-02 & NB-03	Foundation Soils	15.0	25.6	48.6	0.952	2.220	1.961	1.1	49.6	50	4	14.2	63.8	1.0	-0.2	0.0	1.0	0.102	1.009	0.104	0.162	0.643
NC-02	NB-02 & NB-03	Foundation Soils	15.1	25.5	47.6	0.843	9.170	1.769	1.1	48.6	48	4	14.0	62.6	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.163	0.636
NC-02	NB-02 & NB-03	Foundation Soils	15.2	25.4	46.8	0.733	64.700	1.566	1.1	47.7	46	4	13.8	61.5	1.0	-0.2	0.0	1.0	0.101	1.009	0.103	0.163	0.629
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.3	50.5	0.684	3.660	1.353	1.1	51.4	41	4	13.7	65.0	1.0	-0.2	0.0	1.0	0.103	1.009	0.105	0.164	0.644
NC-02	NB-02 & NB-03	Foundation Soils	15.3	25.2	61.4	0.657	6.910	1.071	1.1	62.0	31	4	13.0	75.0	1.0	-0.2	0.0	1.0	0.111	1.011	0.114	0.164	0.695
NC-02	NB-02 & NB-03	Foundation Soils	15.4	25.2	76.6	0.644	-1.760	0.841	1.1	77.0	19	4	10.2	87.2	1.0	-0.2	0.0	1.0	0.123	1.014	0.126	0.164	0.766
NC-02	NB-02 & NB-03	Foundation Soils	15.5	25.1	86.2	0.674	-4.910	0.782	1.1	86.4	15	4	7.4	93.8	1.0	-0.2	0.0	1.0	0.130	1.016	0.133	0.165	0.810
NC-02	NB-02 & NB-03	Foundation Soils	15.6	25.0	93.2	0.702	-1.980	0.753	1.1	93.2	12	4	5.0	98.2	1.0	-0.2	0.0	1.0	0.135	1.017	0.139	0.165	0.842
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.9	102.8	0.698	0.950	0.679	1.1	102.5	7	4	0.8	103.4	1.0	-0.3	0.0	1.0	0.142	1.019	0.146	0.165	0.884
NC-02	NB-02 & NB-03	Foundation Soils	15.7	24.8	108.7	0.707	1.140	0.650	1.1	108.2	4	4	0.0	108.2	1.0	-0.3	0.0	1.0	0.149	1.021	0.154	0.166	0.930
NC-02	NB-02 & NB-03	Foundation Soils	15.8	24.8	114.9	0.726	1.330	0.632	1.1	114.1	2	4	0.0	114.1	1.0	-0.3	0.0	1.0	0.159	1.023	0.165	0.166	0.993
NC-02	NB-02 & NB-03	Foundation Soils	15.9	24.7	120.4	0.732	1.160	0.608	1.0	119.2	0	4	0.0	119.2	1.0	-0.3	0.0	1.0	0.169	1.026	0.176	0.167	1.057
NC-02	NB-02 & NB-03	Foundation Soils	16.0	24.6	123.0	0.734	1.100	0.597	1.0	121.6	0	4	0.0	121.6	1.0	-0.3	0.0	1.0	0.175	1.027	0.182	0.167	1.090
NC-02	NB-02 & NB-03	Foundation Soils	16.1	24.5	125.1	0.731	1.000	0.584	1.0	123.4	0	4	0.0	123.4	1.0	-0.3	0.0	1.0	0.179	1.028	0.187	0.167	1.116
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.4	125.4	0.653	0.890	0.521	1.0	123.6	0	4	0.0	123.6	1.0	-0.3	0.0	1.0	0.180	1.028	0.187	0.168	1.116
NC-02	NB-02 & NB-03	Foundation Soils	16.2	24.3	124.1	0.634	0.640	0.511	1.0	122.2	0	4	0.0	122.2	1.0	-0.3	0.0	1.0	0.176	1.027	0.183	0.168	1.091
NC-02	NB-02 & NB-03	Foundation Soils	16.3	24.3	120.1	0.614	0.380	0.511	1.0	118.2	0	4	0.0	118.2	1.0	-0.3	0.0	1.0	0.167	1.025	0.174	0.168	1.031

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-02	NB-02 & NB-03	Foundation Soils	16.4	24.2	115.6	0.592	0.040	0.512	1.0	113.8	0	4	0.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.164	0.169	0.972
NC-02	NB-02 & NB-03	Foundation Soils	16.5	24.1	95.4	0.554	-5.290	0.581	1.0	94.1	6	4	0.5	94.6	1.0	-0.3	0.0	1.0	0.131	1.016	0.134	0.169	0.792
NC-02	NB-02 & NB-03	Foundation Soils	16.6	24.0	90.1	0.529	-5.380	0.587	1.0	88.8	8	4	1.7	90.5	1.0	-0.3	0.0	1.0	0.126	1.015	0.129	0.169	0.762
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	70.5	0.502	-3.480	0.712	1.0	69.6	19	4	9.7	79.3	1.0	-0.3	0.0	1.0	0.115	1.012	0.117	0.170	0.692
NC-02	NB-02 & NB-03	Foundation Soils	16.7	23.9	60.8	0.522	-2.690	0.858	1.0	60.0	27	4	12.1	72.2	1.0	-0.3	0.0	1.0	0.109	1.010	0.111	0.170	0.652
NC-02	NB-02 & NB-03	Foundation Soils	16.8	23.8	44.2	0.521	-1.430	1.178	1.0	43.7	43	4	13.3	57.1	1.0	-0.3	0.0	1.0	0.097	1.008	0.099	0.170	0.579
NC-02	NB-02 & NB-03	Foundation Soils	16.9	23.7	37.6	0.519	-0.860	1.381	1.0	37.2	51	4	13.4	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.094	0.171	0.550
NC-02	NB-02 & NB-03	Foundation Soils	17.0	23.6	28.3	0.515	0.050	1.820	1.0	28.0	64	4	13.2	41.3	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.171	0.510
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.5	21.8	0.496	1.430	2.274	1.1	21.6	77	4	13.0	34.6	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.171	0.482
NC-02	NB-02 & NB-03	Foundation Soils	17.1	23.4	18.1	0.444	1.860	2.460	1.0	17.9	85	4	12.9	30.8	1.0	-0.3	0.0	1.0	0.079	1.006	0.080	0.172	0.466
NC-02	NB-02 & NB-03	Foundation Soils	17.2	23.4	15.6	0.402	3.240	2.582	1.0	15.4	90	4	12.8	28.2	1.0	-0.3	0.0	1.0	0.078	1.006	0.078	0.172	0.455
NC-02	NB-02 & NB-03	Foundation Soils	17.3	23.3	13.5	0.308	4.940	2.275	1.0	13.4	92	4	12.6	26.0	1.0	-0.3	0.0	1.0	0.076	1.006	0.077	0.172	0.446
NC-02	NB-02 & NB-03	Foundation Soils	17.4	23.2	11.2	0.257	10.390	2.285	1.0	11.1	99	4	12.5	23.6	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.173	0.437
NC-02	NB-02 & NB-03	Foundation Soils	17.5	23.1	10.8	0.204	18.200	1.897	1.0	10.6	97	4	12.5	23.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.173	0.434
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	10.4	0.175	22.060	1.683	1.0	10.2	96	4	12.4	22.7	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.173	0.431
NC-02	NB-02 & NB-03	Foundation Soils	17.6	23.0	9.6	0.144	27.870	1.496	1.0	9.5	97	4	12.4	21.9	1.0	-0.3	0.0	1.0	0.074	1.006	0.074	0.174	0.428
NC-02	NB-02 & NB-03	Foundation Soils	17.7	22.9	9.8	0.113	29.340	1.149	1.0	9.7	92	4	12.4	22.0	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.174	0.427
NC-02	NB-02 & NB-03	Foundation Soils	17.8	22.8	10.3	0.081	31.160	0.785	1.0	10.1	84	4	12.3	22.5	1.0	-0.3	0.0	0.9	0.074	1.006	0.075	0.174	0.428
NC-02	NB-02 & NB-03	Foundation Soils	17.9	22.7	11.6	0.191	32.210	1.645	1.0	11.4	92	4	12.5	23.9	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.175	0.432
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.6	12.8	1.007	37.000	7.848	1.0	12.5	100	4	12.6	25.2	1.0	-0.3	0.0	0.9	0.076	1.006	0.076	0.175	0.436
NC-02	NB-02 & NB-03	Foundation Soils	18.0	22.5	13.7	1.240	43.930	9.081	1.0	13.3	100	4	12.7	26.0	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.175	0.438
NC-02	NB-02 & NB-03	Foundation Soils	18.1	22.5	13.2	1.385	57.950	10.515	1.0	12.8	100	4	12.6	25.5	1.0	-0.3	0.0	0.9	0.076	1.006	0.077	0.176	0.436
NC-02	NB-02 & NB-03	Foundation Soils	18.2	22.4	36.8	1.505	90.670	4.095	1.0	35.6	76	4	14.0	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.176	0.528
NC-02	NB-02 & NB-03	Foundation Soils	18.3	22.3	122.2	1.745	76.740	1.428	1.0	117.2	20	4	12.1	129.3	1.0	-0.3	0.0	0.9	0.195	1.031	0.202	0.176	1.149
NC-02	NB-02 & NB-03	Foundation Soils	18.4	22.2	166.1	1.841	179.340	1.109	1.0	158.8	6	4	0.6	159.4	1.0	-0.3	0.0	0.9	0.365	1.053	0.387	0.177	2.194
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.1	169.7	2.012	130.830	1.185	1.0	162.2	7	4	1.4	163.6	1.0	-0.3	0.0	0.9	0.411	1.057	0.437	0.177	2.472
NC-02	NB-02 & NB-03	Foundation Soils	18.5	22.0	154.9	1.950	13.350	1.259	1.0	147.9	11	4	5.3	153.3	1.0	-0.3	0.0	0.9	0.312	1.048	0.328	0.177	1.853
NC-02	NB-02 & NB-03	Foundation Soils	18.6	22.0	143.4	1.633	13.850	1.139	1.0	136.9	11	4	4.6	141.5	1.0	-0.3	0.0	0.9	0.241	1.039	0.252	0.177	1.418
NC-02	NB-02 & NB-03	Foundation Soils	18.7	21.9	105.2	1.349	27.730	1.282	1.0	100.5	21	4	12.1	112.6	1.0	-0.3	0.0	0.9	0.156	1.023	0.161	0.178	0.903
NC-02	NB-02 & NB-03	Foundation Soils	18.8	21.8	81.5	0.961	37.950	1.179	1.0	77.8	26	4	12.8	90.7	1.0	-0.3	0.0	0.9	0.126	1.015	0.128	0.178	0.721
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.7	67.7	0.923	25.640	1.363	1.0	64.6	35	4	13.8	78.4	1.0	-0.3	0.0	0.9	0.114	1.012	0.116	0.178	0.650
NC-02	NB-02 & NB-03	Foundation Soils	18.9	21.6	64.6	1.005	20.060	1.555	1.0	61.6	39	4	14.1	75.7	1.0	-0.3	0.0	0.9	0.112	1.011	0.113	0.179	0.635
NC-02	NB-02 & NB-03	Foundation Soils	19.0	21.6	62.6	0.933	18.340	1.491	1.0	59.6	39	4	14.0	73.5	1.0	-0.3	0.0	0.9	0.110	1.011	0.112	0.179	0.623
NC-02	NB-02 & NB-03	Foundation Soils	19.1	21.5	55.3	0.883	10.040	1.597	1.0	52.6	44	4	14.0	66.6	1.0	-0.3	0.0	0.9	0.105	1.010	0.106	0.179	0.590
NC-02	NB-02 & NB-03	Foundation Soils	19.2	21.4	47.7	0.817	1.520	1.711	1.0	45.4	49	4	13.8	59.2	1.0	-0.3	0.0	0.9	0.099	1.009	0.100	0.179	0.557
NC-02	NB-02 & NB-03	Foundation Soils	19.3	21.3	41.6	0.719	4.530	1.726	1.0	39.5	53	4	13.7	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.095	0.180	0.531
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.2	35.6	0.672	3.480	1.889	1.0	33.7	60	4	13.5	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.180	0.506
NC-02	NB-02 & NB-03	Foundation Soils	19.4	21.1	29.3	0.497	3.670	1.698	1.0	27.7	63	4	13.2	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.087	0.180	0.480
NC-02	NB-02 & NB-03	Foundation Soils	19.5	21.1	26.0	0.389	3.960	1.498	1.0	24.5	64	4	13.0	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.084	0.181	0.467
NC-02	NB-02 & NB-03	Foundation Soils	19.6	21.0	21.4	0.283	1.760	1.325	1.0	20.2	68	4	12.8	32.9	1.0	-0.3	0.0	0.9	0.081	1.007	0.081	0.181	0.449
NC-02	NB-02 & NB-03	Foundation Soils	19.7	20.9	15.7	0.244	2.620	1.555	1.0	14.8	83	4	12.6	27.4	1.0	-0.3	0.0	0.9	0.077	1.006	0.078	0.181	0.429
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.8	9.5	0.156	-1.950	1.634	1.0	9.0	100	4	12.4	21.4	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.181	0.406
NC-02	NB-02 & NB-03	Foundation Soils	19.8	20.7	8.4	0.103	0.830	1.233	1.0	7.8	100	4	12.3	20.2	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.182	0.402
NC-02	NB-02 & NB-03	Foundation Soils	19.9	20.7	6.3	0.057	1.000	0.902	1.0	5.9	100	4	12.2	18.1	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.182	0.394
NC-02	NB-02 & NB-03	Foundation Soils	20.0	20.6	4.8	0.038	0.140	0.795	1.0	4.5	100	4	12.1	16.6	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.182	0.388
NC-02	NB-02 & NB-03	Foundation Soils	20.1	20.5	2.3	0.023	3.860	0.994	1.0	2.2	100	4	11.9	14.1	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.182	0.379
NC-02	NB-02 & NB-03	Foundation Soils	20.2	20.4	1.2	0.011	1.690	0.887	1.0	1.2	100	4	11.9	13.0	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.183	0.375
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.3	1.0	0.010	4.340	0.974	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.183	0.374
NC-02	NB-02 & NB-03	Foundation Soils	20.3	20.2	1.0	0.010	4.090	0.975	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.183	0.373
NC-02	NB-02 & NB-03	Foundation Soils	20.4	20.2	1.0	0.010	4.090	0.975	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.184	0.373
NC-02	NB-02 & NB-03	Foundation Soils	20.5	20.1	1.0	0.010	4.790	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.184	0.372
NC-02	NB-02 & NB-03	Foundation Soils	20.6	20.0	1.0	0.010	4.810	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.184	0.372
NC-02	NB-02 & NB-03	Foundation Soils	20.7	19.9	1.0	0.010	4.740	0.971	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.184	0.371
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	1.0	0.010	5.690	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.185	0.371
NC-02	NB-02 & NB-03	Foundation Soils	20.8	19.8	1.0	0.010	5.610	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.185	0.370
NC-02	NB-02 & NB-03	Foundation Soils	20.9	19.7	1.0	0.010	5.670	0.966	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.185	0.370
NC-02	NB-02 & NB-03	Foundation Soils	21.0	19.6	1.0	0.010	5.800	0.965	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.185	0.369
NC-02	NB-02 & NB-03	Foundation Soils	21.1	19.5	1.0	0.010	5.960	0.964	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.186	0.369
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.4	1.0	0.010	6.100	0.963	1.0	1.0	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.186	0.368
NC-02	NB-02 & NB-03	Foundation Soils	21.2	19.3	1.0	0.010	6.050	0.964	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.186	0.367
NC-02	NB-02 & NB-03	Foundation Soils	21.3	19.3	1.0	0.010	6.260	0.962	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.186	0.367
NC-02	NB-02 & NB-03	Foundation Soils	21.4	19.2	1.0	0.010	6.050	0.964	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.186	0.366

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-02	NB-02 & NB-03	Foundation Soils	21.5	19.1	1.0	0.010	6.190	0.963	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.187	0.366
NC-02	NB-02 & NB-03	Foundation Soils	21.6	19.0	1.0	0.010	6.460	0.961	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.187	0.365
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	1.0	0.010	6.610	0.960	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.187	0.365
NC-02	NB-02 & NB-03	Foundation Soils	21.7	18.9	1.0	0.010	6.620	0.960	1.0	0.9	100	4	11.8	12.8	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.187	0.364
NC-02	NB-02 & NB-03	Foundation Soils	21.8	18.8	1.4	0.010	6.530	0.724	1.0	1.2	100	4	11.9	13.1	1.0	-0.4	0.0	0.9	0.068	1.006	0.068	0.188	0.365
NC-02	NB-02 & NB-03	Foundation Soils	21.9	18.7	1.6	0.010	6.460	0.610	1.0	1.5	100	4	11.9	13.4	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.188	0.365
NC-02	NB-02 & NB-03	Foundation Soils	22.0	18.6	2.1	0.010	5.790	0.470	1.0	1.9	100	4	11.9	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.188	0.366
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.5	2.6	0.010	7.000	0.386	1.0	2.3	100	4	11.9	14.3	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.188	0.367
NC-02	NB-02 & NB-03	Foundation Soils	22.1	18.4	3.0	0.010	7.910	0.336	1.0	2.7	100	4	12.0	14.6	1.0	-0.4	0.0	0.9	0.069	1.006	0.069	0.189	0.368
NC-02	NB-02 & NB-03	Foundation Soils	22.2	18.4	3.6	0.010	9.280	0.278	1.0	3.2	100	4	12.0	15.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.189	0.369
NC-02	NB-02 & NB-03	Foundation Soils	22.3	18.3	4.1	0.011	10.720	0.270	1.0	3.7	100	4	12.0	15.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.070	0.189	0.370
NC-02	NB-02 & NB-03	Foundation Soils	22.4	18.2	5.2	0.013	8.430	0.252	0.9	4.6	100	4	12.1	16.7	1.0	-0.4	0.0	0.9	0.070	1.006	0.071	0.189	0.373
NC-02	NB-02 & NB-03	Foundation Soils	22.5	18.1	5.6	0.018	9.030	0.321	0.9	5.0	100	4	12.1	17.1	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.189	0.374
NC-02	NB-02 & NB-03	Foundation Soils	22.6	18.0	6.1	0.020	8.580	0.326	0.9	5.5	100	4	12.1	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.071	0.190	0.375
NC-02	NB-02 & NB-03	Foundation Soils	22.6	17.9	7.1	0.021	6.910	0.298	0.9	6.3	94	4	12.2	18.5	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.190	0.377
NC-02	NB-02 & NB-03	Foundation Soils	22.7	17.9	7.7	0.024	9.480	0.311	0.9	6.9	90	4	12.2	19.0	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.190	0.379
NC-02	NB-02 & NB-03	Foundation Soils	22.8	17.8	8.5	0.032	9.650	0.375	0.9	7.6	88	4	12.2	19.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.072	0.190	0.381
NC-02	NB-02 & NB-03	Foundation Soils	22.9	17.7	9.8	0.060	9.960	0.615	0.9	8.7	89	4	12.3	20.9	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.191	0.384
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.6	10.1	0.071	10.290	0.701	0.9	9.0	89	4	12.3	21.3	1.0	-0.4	0.0	0.9	0.073	1.006	0.073	0.191	0.385
NC-02	NB-02 & NB-03	Foundation Soils	23.0	17.5	11.1	0.078	9.240	0.703	0.9	9.8	86	4	12.3	22.2	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.191	0.387
NC-02	NB-02 & NB-03	Foundation Soils	23.1	17.5	11.8	0.087	9.900	0.737	0.9	10.4	84	4	12.4	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.074	0.191	0.389
NC-02	NB-02 & NB-03	Foundation Soils	23.2	17.4	13.0	0.094	9.040	0.725	0.9	11.5	80	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.191	0.392
NC-02	NB-02 & NB-03	Foundation Soils	23.3	17.3	13.2	0.103	10.310	0.782	0.9	11.6	81	4	12.4	24.0	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.192	0.392
NC-02	NB-02 & NB-03	Foundation Soils	23.4	17.2	13.3	0.113	10.200	0.848	0.9	11.7	82	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.192	0.392
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.1	13.0	0.114	10.060	0.877	0.9	11.4	83	4	12.4	23.9	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.192	0.390
NC-02	NB-02 & NB-03	Foundation Soils	23.5	17.0	13.4	0.118	11.200	0.881	0.9	11.8	82	4	12.4	24.2	1.0	-0.4	0.0	0.9	0.075	1.006	0.075	0.192	0.391
NC-02	NB-02 & NB-03	Foundation Soils	23.6	17.0	14.6	0.130	10.240	0.891	0.9	12.8	79	4	12.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.192	0.394
NC-02	NB-02 & NB-03	Foundation Soils	23.7	16.9	15.4	0.138	9.910	0.898	0.9	13.5	78	4	12.5	26.0	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.193	0.396
NC-02	NB-02 & NB-03	Foundation Soils	23.8	16.8	14.9	0.137	10.710	0.917	0.9	13.1	79	4	12.5	25.6	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.193	0.394
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.7	14.5	0.131	10.720	0.906	0.9	12.7	80	4	12.5	25.1	1.0	-0.4	0.0	0.9	0.076	1.006	0.076	0.193	0.392
NC-02	NB-02 & NB-03	Foundation Soils	23.9	16.6	13.8	0.124	9.430	0.897	0.9	12.1	82	4	12.5	24.5	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.193	0.390
NC-02	NB-02 & NB-03	Foundation Soils	24.0	16.6	13.5	0.112	10.060	0.831	0.9	11.7	82	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.193	0.388
NC-02	NB-02 & NB-03	Foundation Soils	24.1	16.5	13.6	0.105	9.600	0.774	0.9	11.8	80	4	12.4	24.2	1.0	-0.4	0.1	0.9	0.075	1.006	0.075	0.194	0.388
NC-02	NB-02 & NB-03	Foundation Soils	24.2	16.4	14.1	0.108	9.960	0.767	0.9	12.2	79	4	12.4	24.7	1.0	-0.5	0.1	0.9	0.075	1.006	0.075	0.194	0.389
NC-02	NB-02 & NB-03	Foundation Soils	24.3	16.3	14.5	0.119	10.960	0.822	0.9	12.6	79	4	12.5	25.0	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.194	0.390
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.2	15.2	0.120	11.300	0.789	0.9	13.2	77	4	12.5	25.7	1.0	-0.5	0.1	0.9	0.076	1.006	0.076	0.194	0.391
NC-02	NB-02 & NB-03	Foundation Soils	24.4	16.1	16.3	0.122	11.430	0.750	0.9	14.1	74	4	12.5	26.6	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.194	0.394
NC-02	NB-02 & NB-03	Foundation Soils	24.5	16.1	17.5	0.136	11.390	0.778	0.9	15.1	72	4	12.5	27.7	1.0	-0.5	0.1	0.9	0.077	1.006	0.077	0.195	0.397
NC-02	NB-02 & NB-03	Foundation Soils	24.6	16.0	19.5	0.142	11.670	0.730	0.9	16.9	62	4	12.5	29.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.078	0.195	0.402
NC-02	NB-02 & NB-03	Foundation Soils	24.7	15.9	20.6	0.145	11.210	0.703	0.9	17.9	60	4	12.5	30.3	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.195	0.405
NC-02	NB-02 & NB-03	Foundation Soils	24.8	15.8	20.7	0.154	11.200	0.743	0.9	17.9	61	4	12.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.079	0.195	0.405
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	21.7	0.172	11.670	0.793	0.9	18.7	60	4	12.5	31.3	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.195	0.407
NC-02	NB-02 & NB-03	Foundation Soils	24.9	15.7	22.4	0.181	11.570	0.808	0.9	19.3	60	4	12.6	31.9	1.0	-0.5	0.1	0.9	0.080	1.006	0.080	0.195	0.409
NC-03	NB-03	Foundation Soils	14.0	26.0	6.5	0.033	85.940	0.510	1.2	7.2	90	4	12.2	19.4	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.163	0.449
NC-03	NB-03	Foundation Soils	14.1	25.9	16.3	0.060	85.580	0.368	1.2	17.9	53	4	12.3	30.1	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.164	0.491
NC-03	NB-03	Foundation Soils	14.2	25.8	28.3	0.119	23.250	0.421	1.1	30.5	37	4	12.0	42.6	1.0	-0.2	0.0	1.0	0.087	1.007	0.089	0.164	0.542
NC-03	NB-03	Foundation Soils	14.3	25.7	27.2	0.189	6.150	0.695	1.1	29.3	46	4	12.6	42.0	1.0	-0.2	0.0	1.0	0.087	1.007	0.088	0.164	0.538
NC-03	NB-03	Foundation Soils	14.4	25.7	23.0	0.241	9.850	1.049	1.1	24.8	58	4	12.9	37.7	1.0	-0.2	0.0	1.0	0.084	1.007	0.085	0.165	0.519
NC-03	NB-03	Foundation Soils	14.4	25.6	16.0	0.341	12.340	2.129	1.2	17.4	81	4	12.8	30.2	1.0	-0.2	0.0	1.0	0.079	1.006	0.080	0.165	0.486
NC-03	NB-03	Foundation Soils	14.5	25.5	10.8	0.415	13.700	3.826	1.2	11.8	100	4	12.6	24.4	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.166	0.462
NC-03	NB-03	Foundation Soils	14.6	25.4	7.2	0.372	15.390	5.184	1.2	7.9	100	4	12.3	20.2	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.166	0.444
NC-03	NB-03	Foundation Soils	14.7	25.3	5.8	0.313	18.750	5.362	1.2	6.4	100	4	12.2	18.6	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.166	0.437
NC-03	NB-03	Foundation Soils	14.8	25.3	9.0	0.299	25.350	3.338	1.2	9.8	100	4	12.4	22.2	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.167	0.449
NC-03	NB-03	Foundation Soils	14.8	25.2	10.2	0.289	25.440	2.825	1.2	11.1	100	4	12.5	23.6	1.0	-0.2	0.0	1.0	0.075	1.006	0.076	0.167	0.454
NC-03	NB-03	Foundation Soils	14.9	25.1	9.4	0.307	27.590	3.262	1.1	10.2	100	4	12.5	22.7	1.0	-0.2	0.0	1.0	0.074	1.006	0.075	0.168	0.449
NC-03	NB-03	Foundation Soils	15.0	25.0	7.8	0.290	33.810	3.698	1.1	8.5	100	4	12.4	20.9	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.168	0.441
NC-03	NB-03	Foundation Soils	15.1	24.9	7.5	0.243	37.880	3.237	1.1	8.1	100	4	12.3	20.5	1.0	-0.2	0.0	1.0	0.073	1.006	0.074	0.168	0.438
NC-03	NB-03	Foundation Soils	15.2	24.8	6.1	0.201	43.450	3.311	1.1	6.6	100	4	12.2	18.8	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.169	0.431
NC-03	NB-03	Foundation Soils	15.3	24.8	4.4	0.160	31.950	3.604	1.1	4.8	100	4	12.1	16.9	1.0	-0.2	0.0	1.0	0.071	1.006	0.072	0.169	0.423
NC-03	NB-03	Foundation Soils	15.3	24.7	3.6	0.149	40.900	4.167	1.1	3.9	100	4	12.0	15.9	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.170	0.418
NC-03	NB-03	Foundation Soils	15.4	24.6	4.4	0.168	65.560	3.854	1.1	4.7	100	4	12.1	16.8	1.0	-0.2	0.0	1.0	0.070	1.006	0.071	0.170	0.420
NC-03	NB-03	Foundation Soils	15.5	24.5	6.5	0.151	67.990	2.307	1.1	7.0	100	4	12.3	19.3	1.0	-0.2	0.0	1.0	0.072	1.006	0.073	0.170	0.429

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-03	NB-03	Foundation Soils	15.6	24.4	5.8	0.119	38.600	2.051	1.1	6.2	100	4	12.2	18.4	1.0	-0.2	0.0	1.0	0.071	1.006	0.073	0.171	0.424
NC-03	NB-03	Foundation Soils	15.7	24.4	3.9	0.112	39.880	2.836	1.1	4.2	100	4	12.1	16.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.171	0.416
NC-03	NB-03	Foundation Soils	15.7	24.3	3.1	0.110	47.450	3.553	1.1	3.3	100	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.172	0.411
NC-03	NB-03	Foundation Soils	15.8	24.2	3.1	0.108	70.750	3.460	1.1	3.3	100	4	12.0	15.3	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.172	0.410
NC-03	NB-03	Foundation Soils	15.9	24.1	3.2	0.062	75.560	1.930	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.172	0.410
NC-03	NB-03	Foundation Soils	16.0	24.0	3.2	0.042	77.420	1.328	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.173	0.408
NC-03	NB-03	Foundation Soils	16.1	23.9	3.2	0.052	79.900	1.636	1.1	3.4	100	4	12.0	15.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.173	0.408
NC-03	NB-03	Foundation Soils	16.2	23.9	3.4	0.110	81.590	3.236	1.1	3.6	100	4	12.0	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.173	0.408
NC-03	NB-03	Foundation Soils	16.2	23.8	4.8	0.119	79.760	2.485	1.1	5.1	100	4	12.1	17.2	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.174	0.412
NC-03	NB-03	Foundation Soils	16.3	23.7	5.1	0.131	60.030	2.571	1.1	5.4	100	4	12.1	17.5	1.0	-0.3	0.0	1.0	0.071	1.006	0.072	0.174	0.413
NC-03	NB-03	Foundation Soils	16.4	23.6	4.4	0.129	47.550	2.947	1.1	4.6	100	4	12.1	16.7	1.0	-0.3	0.0	1.0	0.070	1.006	0.071	0.175	0.409
NC-03	NB-03	Foundation Soils	16.5	23.5	7.1	0.142	17.530	2.011	1.1	7.4	100	4	12.3	19.7	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.175	0.419
NC-03	NB-03	Foundation Soils	16.6	23.4	6.3	0.131	20.040	2.091	1.1	6.6	100	4	12.2	18.8	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.175	0.414
NC-03	NB-03	Foundation Soils	16.7	23.4	7.3	0.108	56.650	1.479	1.1	7.7	100	4	12.3	20.0	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.176	0.418
NC-03	NB-03	Foundation Soils	16.7	23.3	10.4	0.117	54.270	1.122	1.1	10.9	86	4	12.4	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.176	0.429
NC-03	NB-03	Foundation Soils	16.8	23.2	25.1	0.124	41.740	0.495	1.1	25.9	44	4	12.3	38.2	1.0	-0.3	0.0	1.0	0.084	1.007	0.085	0.176	0.485
NC-03	NB-03	Foundation Soils	16.9	23.1	36.7	0.191	29.720	0.520	1.1	37.6	33	4	12.0	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.177	0.529
NC-03	NB-03	Foundation Soils	17.0	23.0	35.3	0.275	-3.050	0.779	1.1	36.1	41	4	12.7	48.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.177	0.525
NC-03	NB-03	Foundation Soils	17.1	23.0	26.9	0.415	7.100	1.545	1.1	27.5	62	4	13.2	40.7	1.0	-0.3	0.0	1.0	0.086	1.007	0.087	0.177	0.491
NC-03	NB-03	Foundation Soils	17.1	22.9	21.2	0.442	10.290	2.088	1.1	21.7	75	4	13.0	34.8	1.0	-0.3	0.0	1.0	0.082	1.007	0.083	0.178	0.467
NC-03	NB-03	Foundation Soils	17.2	22.8	14.4	0.470	16.020	3.271	1.1	14.8	96	4	12.8	27.6	1.0	-0.3	0.0	1.0	0.077	1.006	0.078	0.178	0.439
NC-03	NB-03	Foundation Soils	17.3	22.7	10.9	0.451	22.300	4.134	1.1	11.2	100	4	12.5	23.8	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.178	0.425
NC-03	NB-03	Foundation Soils	17.4	22.6	10.5	0.387	17.060	3.687	1.1	10.8	100	4	12.5	23.3	1.0	-0.3	0.0	1.0	0.075	1.006	0.075	0.179	0.422
NC-03	NB-03	Foundation Soils	17.5	22.5	11.7	0.361	22.250	3.075	1.1	12.1	100	4	12.6	24.7	1.0	-0.3	0.0	1.0	0.075	1.006	0.076	0.179	0.426
NC-03	NB-03	Foundation Soils	17.6	22.5	10.2	0.262	26.410	2.567	1.1	10.5	100	4	12.5	23.0	1.0	-0.3	0.0	1.0	0.074	1.006	0.075	0.179	0.419
NC-03	NB-03	Foundation Soils	17.6	22.4	7.1	0.251	40.260	3.520	1.1	7.3	100	4	12.3	19.6	1.0	-0.3	0.0	1.0	0.072	1.006	0.073	0.180	0.406
NC-03	NB-03	Foundation Soils	17.7	22.3	6.2	0.230	54.510	3.710	1.1	6.4	100	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.180	0.402
NC-03	NB-03	Foundation Soils	17.8	22.2	5.9	0.189	63.560	3.216	1.1	6.0	100	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.180	0.400
NC-03	NB-03	Foundation Soils	17.9	22.1	4.6	0.135	83.260	2.929	1.1	4.7	100	4	12.1	16.8	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.181	0.394
NC-03	NB-03	Foundation Soils	18.0	22.1	4.5	0.103	88.430	2.288	1.1	4.6	100	4	12.1	16.7	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.181	0.393
NC-03	NB-03	Foundation Soils	18.0	22.0	5.3	0.076	93.780	1.443	1.1	5.4	100	4	12.1	17.5	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.181	0.395
NC-03	NB-03	Foundation Soils	18.1	21.9	5.9	0.064	75.140	1.076	1.1	6.0	100	4	12.2	18.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.182	0.397
NC-03	NB-03	Foundation Soils	18.2	21.8	6.2	0.071	68.590	1.144	1.1	6.3	100	4	12.2	18.5	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.182	0.397
NC-03	NB-03	Foundation Soils	18.3	21.7	6.3	0.080	54.310	1.264	1.1	6.4	100	4	12.2	18.6	1.0	-0.3	0.0	0.9	0.072	1.006	0.072	0.182	0.397
NC-03	NB-03	Foundation Soils	18.4	21.6	5.6	0.084	42.550	1.496	1.1	5.7	100	4	12.2	17.8	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.183	0.394
NC-03	NB-03	Foundation Soils	18.5	21.6	4.2	0.083	55.510	1.959	1.1	4.3	100	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.183	0.388
NC-03	NB-03	Foundation Soils	18.5	21.5	3.9	0.077	67.420	1.959	1.1	4.0	100	4	12.0	16.0	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.183	0.386
NC-03	NB-03	Foundation Soils	18.6	21.4	4.2	0.067	79.190	1.597	1.1	4.2	100	4	12.1	16.3	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.184	0.386
NC-03	NB-03	Foundation Soils	18.7	21.3	4.4	0.047	81.920	1.080	1.1	4.4	100	4	12.1	16.4	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.184	0.386
NC-03	NB-03	Foundation Soils	18.8	21.2	4.4	0.029	92.050	0.660	1.1	4.4	100	4	12.1	16.5	1.0	-0.3	0.0	0.9	0.070	1.006	0.071	0.184	0.385
NC-03	NB-03	Foundation Soils	18.9	21.2	5.1	0.048	88.520	0.944	1.1	5.1	100	4	12.1	17.2	1.0	-0.3	0.0	0.9	0.071	1.006	0.071	0.184	0.387
NC-03	NB-03	Foundation Soils	18.9	21.1	9.4	0.084	58.460	0.892	1.1	9.4	89	4	12.3	21.8	1.0	-0.3	0.0	0.9	0.074	1.006	0.074	0.185	0.402
NC-03	NB-03	Foundation Soils	19.0	21.0	11.7	0.164	15.340	1.405	1.1	11.6	89	4	12.5	24.1	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.185	0.410
NC-03	NB-03	Foundation Soils	19.1	20.9	11.6	0.191	2.190	1.653	1.1	11.5	92	4	12.5	24.0	1.0	-0.3	0.0	0.9	0.075	1.006	0.076	0.185	0.408
NC-03	NB-03	Foundation Soils	19.2	20.8	9.1	0.163	5.530	1.782	1.1	9.1	100	4	12.4	21.5	1.0	-0.3	0.0	0.9	0.073	1.006	0.074	0.186	0.399
NC-03	NB-03	Foundation Soils	19.3	20.7	8.1	0.160	16.960	1.981	1.1	8.0	100	4	12.3	20.3	1.0	-0.3	0.0	0.9	0.073	1.006	0.073	0.186	0.395
NC-03	NB-03	Foundation Soils	19.4	20.7	6.9	0.161	28.510	2.334	1.1	6.8	100	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.186	0.390
NC-03	NB-03	Foundation Soils	19.4	20.6	5.8	0.246	45.070	4.226	1.0	5.8	100	4	12.2	17.9	1.0	-0.3	0.0	0.9	0.071	1.006	0.072	0.187	0.385
NC-03	NB-03	Foundation Soils	19.5	20.5	7.0	0.325	75.090	4.664	1.0	6.9	100	4	12.2	19.1	1.0	-0.3	0.0	0.9	0.072	1.006	0.073	0.187	0.388
NC-03	NB-03	Foundation Soils	19.6	20.4	17.9	0.379	71.630	2.116	1.0	17.6	82	4	12.8	30.5	1.0	-0.3	0.0	0.9	0.079	1.006	0.080	0.187	0.427
NC-03	NB-03	Foundation Soils	19.7	20.3	25.9	0.580	71.720	2.237	1.0	25.4	72	4	13.2	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.085	0.187	0.456
NC-03	NB-03	Foundation Soils	19.8	20.3	37.6	0.676	-11.820	1.798	1.0	36.7	56	4	13.6	50.3	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.188	0.499
NC-03	NB-03	Foundation Soils	19.8	20.2	49.9	0.870	-14.840	1.744	1.0	48.5	48	4	14.0	62.5	1.0	-0.3	0.0	0.9	0.101	1.009	0.103	0.188	0.547
NC-03	NB-03	Foundation Soils	19.9	20.1	69.0	0.926	-14.480	1.342	1.0	66.9	33	4	13.7	80.6	1.0	-0.3	0.0	0.9	0.116	1.012	0.118	0.188	0.628
NC-03	NB-03	Foundation Soils	20.0	20.0	88.7	1.161	-18.530	1.308	1.0	85.7	26	4	13.2	98.9	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.188	0.737
NC-03	NB-03	Foundation Soils	20.1	19.9	91.1	1.337	-18.530	1.468	1.0	87.8	28	4	13.8	101.7	1.0	-0.4	0.0	0.9	0.140	1.018	0.143	0.189	0.756
NC-03	NB-03	Foundation Soils	20.2	19.8	92.9	1.590	-18.680	1.711	1.0	89.5	31	4	14.6	104.1	1.0	-0.4	0.0	0.9	0.143	1.019	0.146	0.189	0.774
NC-03	NB-03	Foundation Soils	20.3	19.8	92.7	1.793	-18.340	1.933	1.0	89.2	34	4	15.1	104.3	1.0	-0.4	0.0	0.9	0.143	1.019	0.147	0.189	0.775
NC-03	NB-03	Foundation Soils	20.3	19.7	85.2	1.856	-18.770	2.179	1.0	81.9	39	4	15.4	97.2	1.0	-0.4	0.0	0.9	0.134	1.017	0.137	0.189	0.721
NC-03	NB-03	Foundation Soils	20.4	19.6	81.7	1.853	-18.440	2.269	1.0	78.4	41	4	15.4	93.8	1.0	-0.4	0.0	0.9	0.130	1.016	0.132	0.190	0.697
NC-03	NB-03	Foundation Soils	20.5	19.5	86.5	1.743	-18.510	2.014	1.0	83.0	37	4	15.2	98.2	1.0	-0.4	0.0	0.9	0.135	1.017	0.138	0.190	0.725
NC-03	NB-03	Foundation Soils	20.6	19.4	92.4	1.623	-18.530	1.756	1.0	88.5	32	4	14.7	103.2	1.0	-0.4	0.0	0.9	0.142	1.019	0.145	0.190	0.761

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
NC-03	NB-03	Foundation Soils	20.7	19.3	100.3	1.406	-16.900	1.401	1.0	95.9	25	4	13.2	109.2	1.0	-0.4	0.0	0.9	0.151	1.021	0.154	0.190	0.810
NC-03	NB-03	Foundation Soils	20.8	19.3	105.4	1.124	-17.930	1.067	1.0	100.6	17	4	9.7	110.3	1.0	-0.4	0.0	0.9	0.153	1.022	0.156	0.191	0.820
NC-03	NB-03	Foundation Soils	20.8	19.2	104.0	0.998	-19.270	0.960	1.0	99.2	15	4	8.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.191	0.792
NC-03	NB-03	Foundation Soils	20.9	19.1	101.2	1.061	-19.300	1.048	1.0	96.4	18	4	10.1	106.5	1.0	-0.4	0.0	0.9	0.146	1.020	0.150	0.191	0.783
NC-03	NB-03	Foundation Soils	21.0	19.0	95.6	1.133	-18.840	1.185	1.0	91.0	22	4	12.1	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.191	0.754
NC-03	NB-03	Foundation Soils	21.1	18.9	94.0	1.205	-18.200	1.282	1.0	89.4	24	4	12.9	102.2	1.0	-0.4	0.0	0.9	0.140	1.019	0.143	0.192	0.747
NC-03	NB-03	Foundation Soils	21.2	18.9	98.2	1.189	-18.340	1.210	1.0	93.3	22	4	12.1	105.4	1.0	-0.4	0.0	0.9	0.145	1.020	0.148	0.192	0.770
NC-03	NB-03	Foundation Soils	21.2	18.8	102.9	1.017	-18.250	0.988	1.0	97.6	16	4	9.0	106.6	1.0	-0.4	0.0	0.9	0.147	1.020	0.150	0.192	0.779
NC-03	NB-03	Foundation Soils	21.3	18.7	106.8	0.944	-18.550	0.884	1.0	101.2	13	4	6.2	107.4	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.192	0.785
NC-03	NB-03	Foundation Soils	21.4	18.6	106.8	0.961	-18.680	0.900	1.0	101.0	13	4	6.6	107.7	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.193	0.786
NC-03	NB-03	Foundation Soils	21.5	18.5	105.4	1.004	-18.440	0.952	1.0	99.6	15	4	8.0	107.6	1.0	-0.4	0.0	0.9	0.148	1.021	0.151	0.193	0.785
NC-03	NB-03	Foundation Soils	21.6	18.4	109.4	1.136	-17.960	1.038	1.0	103.3	16	4	8.9	112.2	1.0	-0.4	0.0	0.9	0.156	1.023	0.159	0.193	0.825
NC-03	NB-03	Foundation Soils	21.7	18.4	116.7	1.146	-17.950	0.982	1.0	110.1	13	4	6.5	116.6	1.0	-0.4	0.0	0.9	0.164	1.025	0.168	0.193	0.869
NC-03	NB-03	Foundation Soils	21.7	18.3	118.5	1.091	-18.390	0.921	1.0	111.6	11	4	4.7	116.3	1.0	-0.4	0.0	0.9	0.163	1.024	0.167	0.194	0.865
NC-03	NB-03	Foundation Soils	21.8	18.2	119.6	1.011	-18.380	0.845	1.0	112.5	9	4	2.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.194	0.851
NC-03	NB-03	Foundation Soils	21.9	18.1	121.9	0.933	-18.340	0.766	1.0	114.5	6	4	0.6	115.1	1.0	-0.4	0.0	0.9	0.161	1.024	0.165	0.194	0.850
NC-03	NB-03	Foundation Soils	22.0	18.0	126.9	0.808	-18.300	0.637	1.0	119.1	1	4	0.0	119.1	1.0	-0.4	0.0	0.9	0.169	1.026	0.173	0.194	0.893
NC-03	NB-03	Foundation Soils	22.1	18.0	138.5	0.562	-18.010	0.406	1.0	129.9	0	4	0.0	129.9	1.0	-0.4	0.0	0.9	0.197	1.032	0.203	0.194	1.045
NC-03	NB-03	Foundation Soils	22.1	17.9	146.4	0.509	-18.320	0.348	1.0	137.2	0	4	0.0	137.2	1.0	-0.4	0.0	0.9	0.223	1.036	0.230	0.195	1.183
NC-03	NB-03	Foundation Soils	22.2	17.8	148.6	0.592	-18.870	0.398	1.0	139.2	0	4	0.0	139.2	1.0	-0.4	0.0	0.9	0.231	1.038	0.239	0.195	1.226
NC-03	NB-03	Foundation Soils	22.3	17.7	142.9	0.649	-19.090	0.454	1.0	133.6	0	4	0.0	133.6	1.0	-0.4	0.0	0.9	0.209	1.034	0.216	0.195	1.106
NC-03	NB-03	Foundation Soils	22.4	17.6	130.9	0.756	-18.720	0.578	1.0	122.2	0	4	0.0	122.2	1.0	-0.4	0.0	0.9	0.176	1.027	0.181	0.195	0.925
NC-03	NB-03	Foundation Soils	22.5	17.5	124.2	0.867	-18.000	0.698	1.0	115.8	4	4	0.0	115.9	1.0	-0.4	0.0	0.9	0.163	1.024	0.166	0.195	0.849
NC-03	NB-03	Foundation Soils	22.6	17.5	114.3	0.943	-16.440	0.825	1.0	106.5	10	4	3.5	110.0	1.0	-0.4	0.0	0.9	0.152	1.022	0.155	0.196	0.791
NC-03	NB-03	Foundation Soils	22.6	17.4	110.8	0.975	-15.210	0.880	1.0	103.1	12	4	5.7	108.8	1.0	-0.4	0.0	0.9	0.150	1.021	0.153	0.196	0.780
NC-03	NB-03	Foundation Soils	22.7	17.3	107.9	0.801	-14.580	0.742	1.0	100.2	9	4	2.9	103.1	1.0	-0.4	0.0	0.9	0.141	1.019	0.144	0.196	0.733
NC-03	NB-03	Foundation Soils	22.8	17.2	102.7	0.822	-14.060	0.800	1.0	95.3	12	4	5.7	101.0	1.0	-0.4	0.0	0.9	0.139	1.018	0.141	0.196	0.716
NC-03	NB-03	Foundation Soils	22.9	17.1	98.3	0.906	-14.250	0.922	1.0	91.0	17	4	9.1	100.1	1.0	-0.4	0.0	0.9	0.137	1.018	0.139	0.196	0.709
NC-03	NB-03	Foundation Soils	23.0	17.1	93.5	0.966	-14.100	1.033	1.0	86.5	21	4	11.1	97.7	1.0	-0.4	0.0	0.9	0.134	1.017	0.136	0.197	0.692
NC-03	NB-03	Foundation Soils	23.0	17.0	90.4	1.015	-8.030	1.123	1.0	83.5	23	4	12.2	95.7	1.0	-0.4	0.0	0.9	0.132	1.016	0.134	0.197	0.678
NC-03	NB-03	Foundation Soils	23.1	16.9	85.4	1.094	-15.680	1.281	1.0	78.8	28	4	13.3	92.1	1.0	-0.4	0.0	0.9	0.128	1.015	0.129	0.197	0.656
NC-03	NB-03	Foundation Soils	23.2	16.8	80.3	1.133	-16.910	1.412	1.0	73.9	32	4	13.8	87.8	1.0	-0.4	0.0	0.9	0.123	1.014	0.124	0.197	0.631
NC-03	NB-03	Foundation Soils	23.3	16.7	77.3	1.183	-16.340	1.530	1.0	71.1	35	4	14.1	85.3	1.0	-0.4	0.0	0.9	0.121	1.013	0.122	0.197	0.617
NC-03	NB-03	Foundation Soils	23.4	16.6	72.5	1.198	-16.830	1.653	1.0	66.5	38	4	14.3	80.9	1.0	-0.4	0.0	0.9	0.117	1.012	0.117	0.198	0.594
NC-03	NB-03	Foundation Soils	23.5	16.6	64.0	1.266	-16.820	1.978	1.0	58.6	46	4	14.5	73.1	1.0	-0.4	0.0	0.9	0.110	1.011	0.110	0.198	0.559
NC-03	NB-03	Foundation Soils	23.5	16.5	61.3	1.308	-17.250	2.133	1.0	56.1	48	4	14.5	70.6	1.0	-0.4	0.0	0.9	0.108	1.010	0.108	0.198	0.547
NC-03	NB-03	Foundation Soils	23.6	16.4	54.2	1.234	-17.200	2.277	1.0	49.5	53	4	14.3	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.198	0.519
NC-03	NB-03	Foundation Soils	23.7	16.3	49.0	1.033	-16.970	2.109	1.0	44.6	54	4	14.0	58.6	1.0	-0.4	0.0	0.9	0.099	1.008	0.099	0.198	0.498
NC-03	NB-03	Foundation Soils	23.8	16.2	42.5	0.938	-16.630	2.205	1.0	38.6	59	4	13.8	52.4	1.0	-0.4	0.0	0.9	0.094	1.008	0.094	0.199	0.475
NC-03	NB-03	Foundation Soils	23.9	16.1	35.5	0.827	-15.820	2.332	1.0	32.1	65	4	13.5	45.6	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.199	0.450
NC-03	NB-03	Foundation Soils	23.9	16.1	28.3	0.751	-14.580	2.657	1.0	25.5	77	4	13.3	38.8	1.0	-0.4	0.1	0.9	0.085	1.007	0.085	0.199	0.426
NC-03	NB-03	Foundation Soils	24.0	16.0	24.2	0.783	-10.680	3.238	1.0	21.8	86	4	13.1	34.9	1.0	-0.4	0.1	0.9	0.082	1.007	0.082	0.199	0.413
NC-03	NB-03	Foundation Soils	24.1	15.9	24.9	0.769	-6.100	3.083	1.0	22.4	84	4	13.2	35.6	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.199	0.415
NC-03	NB-03	Foundation Soils	24.2	15.8	27.7	0.638	-2.380	2.302	1.0	24.9	75	4	13.2	38.1	1.0	-0.5	0.1	0.9	0.084	1.007	0.084	0.200	0.423
NC-03	NB-03	Foundation Soils	24.3	15.7	32.3	0.532	0.760	1.645	1.0	29.1	61	4	13.2	42.3	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.200	0.436
NC-03	NB-03	Foundation Soils	24.4	15.7	35.3	0.377	-0.240	1.067	1.0	31.7	50	4	13.0	44.7	1.0	-0.5	0.1	0.9	0.089	1.007	0.089	0.200	0.444
NC-03	NB-03	Foundation Soils	24.4	15.6	34.7	0.297	-0.330	0.855	1.0	31.2	46	4	12.8	43.9	1.0	-0.5	0.1	0.9	0.088	1.007	0.088	0.200	0.441
NC-03	NB-03	Foundation Soils	24.5	15.5	33.6	0.310	1.550	0.921	0.9	30.1	49	4	12.8	43.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.088	0.200	0.437
NC-03	NB-03	Foundation Soils	24.6	15.4	32.5	0.366	6.400	1.127	0.9	29.0	53	4	13.0	42.0	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.200	0.434
NC-03	NB-03	Foundation Soils	24.7	15.3	29.9	0.437	21.820	1.461	0.9	26.7	61	4	13.1	39.7	1.0	-0.5	0.1	0.9	0.085	1.007	0.085	0.201	0.425
NC-03	NB-03	Foundation Soils	24.8	15.2	26.7	0.409	67.320	1.530	0.9	23.8	65	4	13.0	36.8	1.0	-0.5	0.1	0.9	0.083	1.007	0.083	0.201	0.415
NC-03	NB-03	Foundation Soils	24.9	15.2	33.1	0.424	134.790	1.281	0.9	29.5	55	4	13.1	42.6	1.0	-0.5	0.1	0.9	0.087	1.007	0.087	0.201	0.434
NC-03	NB-03	Foundation Soils	24.9	15.1	44.2	0.532	67.620	1.204	0.9	39.4	46	4	13.3	52.7	1.0	-0.5	0.1	0.9	0.094	1.008	0.094	0.201	0.469
PC-01	PB-01 & PB-02	Foundation Soils	11.1	33.4	4.9	0.079	40.120	1.612	1.4	6.5	100	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.165	0.568
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.4	5.1	0.078	42.040	1.517	1.4	6.7	100	21	40.4	47.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.166	0.568
PC-01	PB-01 & PB-02	Foundation Soils	11.2	33.3	5.3	0.087	44.450	1.636	1.4	7.0	100	21	40.5	47.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.167	0.567
PC-01	PB-01 & PB-02	Foundation Soils	11.3	33.2	5.2	0.087	44.310	1.661	1.4	6.8	100	21	40.4	47.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.167	0.564
PC-01	PB-01 & PB-02	Foundation Soils	11.4	33.1	5.1	0.097	43.590	1.897	1.4	6.7	100	21	40.4	47.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.168	0.561
PC-01	PB-01 & PB-02	Foundation Soils	11.5	33.0	5.0	0.110	40.690	2.211	1.4	6.5	100	21	40.4	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.168	0.558
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	5.0	0.106	39.070	2.110	1.4	6.5	100	21	40.4	46.9	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.169	0.556
PC-01	PB-01 & PB-02	Foundation Soils	11.6	32.9	5.4	0.101	40.310	1.856	1.4	7.1	100	21	40.5	47.5	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.169	0.557
PC-01	PB-01 & PB-02	Foundation Soils	11.7	32.8	6.1	0.099	44.740	1.613	1.4	7.9	99	21	40.7	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.170	0.559

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	11.8	32.7	6.2	0.092	40.500	1.488	1.4	8.0	97	21	40.6	48.6	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.171	0.557
PC-01	PB-01 & PB-02	Foundation Soils	11.9	32.6	5.7	0.087	25.590	1.526	1.4	7.3	100	21	40.5	47.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.171	0.552
PC-01	PB-01 & PB-02	Foundation Soils	12.0	32.5	4.9	0.077	20.260	1.576	1.4	6.3	100	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.172	0.545
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.5	4.4	0.076	17.630	1.712	1.4	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.172	0.540
PC-01	PB-01 & PB-02	Foundation Soils	12.1	32.4	4.2	0.080	20.950	1.900	1.4	5.4	100	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.173	0.536
PC-01	PB-01 & PB-02	Foundation Soils	12.2	32.3	4.1	0.084	24.880	2.071	1.4	5.2	100	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.173	0.533
PC-01	PB-01 & PB-02	Foundation Soils	12.3	32.2	4.0	0.085	27.280	2.130	1.4	5.1	100	21	40.0	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.174	0.531
PC-01	PB-01 & PB-02	Foundation Soils	12.4	32.1	3.9	0.092	29.540	2.368	1.4	5.0	100	21	40.0	45.0	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.175	0.528
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	3.7	0.091	28.410	2.468	1.4	4.7	100	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.175	0.525
PC-01	PB-01 & PB-02	Foundation Soils	12.5	32.0	3.7	0.088	29.060	2.384	1.4	4.7	100	21	40.0	44.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.176	0.524
PC-01	PB-01 & PB-02	Foundation Soils	12.6	31.9	3.6	0.085	29.970	2.343	1.3	4.6	100	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.176	0.521
PC-01	PB-01 & PB-02	Foundation Soils	12.7	31.8	3.6	0.083	31.160	2.284	1.3	4.6	100	21	39.9	44.6	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.177	0.520
PC-01	PB-01 & PB-02	Foundation Soils	12.8	31.7	3.6	0.080	30.400	2.235	1.3	4.5	100	21	39.9	44.5	1.0	-0.2	0.0	1.0	0.088	1.007	0.092	0.177	0.518
PC-01	PB-01 & PB-02	Foundation Soils	12.9	31.6	3.9	0.076	32.880	1.946	1.3	4.9	100	21	40.0	44.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.178	0.518
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.6	4.2	0.073	34.640	1.752	1.3	5.3	100	21	40.1	45.3	1.0	-0.2	0.0	1.0	0.089	1.007	0.092	0.178	0.518
PC-01	PB-01 & PB-02	Foundation Soils	13.0	31.5	4.4	0.074	37.140	1.666	1.3	5.6	100	21	40.2	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.179	0.518
PC-01	PB-01 & PB-02	Foundation Soils	13.1	31.4	4.6	0.098	39.210	2.142	1.3	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.093	0.179	0.517
PC-01	PB-01 & PB-02	Foundation Soils	13.2	31.3	4.9	0.164	39.160	3.351	1.3	6.1	100	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.180	0.518
PC-01	PB-01 & PB-02	Foundation Soils	13.3	31.2	4.9	0.447	39.160	9.133	1.3	6.1	100	21	40.3	46.4	1.0	-0.2	0.0	1.0	0.090	1.007	0.093	0.180	0.516
PC-01	PB-01 & PB-02	Foundation Soils	13.4	31.1	10.1	0.757	49.220	7.527	1.3	12.4	100	21	41.7	54.1	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.181	0.547
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.1	16.1	0.888	51.500	5.525	1.3	19.5	96	21	43.2	62.7	1.0	-0.2	0.0	1.0	0.102	1.009	0.106	0.181	0.584
PC-01	PB-01 & PB-02	Foundation Soils	13.5	31.0	20.9	0.787	25.490	3.759	1.3	25.2	79	21	43.9	69.1	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.182	0.613
PC-01	PB-01 & PB-02	Foundation Soils	13.6	30.9	45.9	0.739	14.630	1.609	1.2	53.4	43	21	46.2	99.5	1.0	-0.2	0.0	1.0	0.137	1.018	0.145	0.182	0.797
PC-01	PB-01 & PB-02	Foundation Soils	13.7	30.8	86.2	0.879	16.250	1.020	1.2	97.6	16	21	29.8	127.4	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.183	1.128
PC-01	PB-01 & PB-02	Foundation Soils	13.8	30.7	102.1	0.973	23.110	0.953	1.2	115.4	10	21	12.9	128.3	1.1	-0.2	0.0	1.0	0.192	1.031	0.209	0.183	1.141
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.7	75.6	1.027	2.100	1.358	1.2	85.3	26	21	43.7	129.0	1.1	-0.2	0.0	1.0	0.194	1.031	0.211	0.184	1.150
PC-01	PB-01 & PB-02	Foundation Soils	13.9	30.6	66.8	1.048	-1.760	1.568	1.2	75.7	33	21	46.7	122.4	1.1	-0.2	0.0	1.0	0.177	1.027	0.191	0.184	1.037
PC-01	PB-01 & PB-02	Foundation Soils	14.0	30.5	41.3	1.138	12.420	2.754	1.2	47.8	59	21	47.5	95.3	1.0	-0.2	0.0	1.0	0.131	1.016	0.139	0.185	0.753
PC-01	PB-01 & PB-02	Foundation Soils	14.1	30.4	27.6	1.122	5.340	4.060	1.2	32.4	74	21	45.3	77.8	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.185	0.644
PC-01	PB-01 & PB-02	Foundation Soils	14.2	30.3	22.8	0.952	1.950	4.170	1.3	27.0	80	21	44.4	71.3	1.0	-0.2	0.0	1.0	0.108	1.010	0.113	0.186	0.610
PC-01	PB-01 & PB-02	Foundation Soils	14.3	30.2	16.3	0.758	3.570	4.658	1.3	19.4	92	21	43.1	62.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.105	0.186	0.567
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.2	18.7	0.591	7.330	3.156	1.3	22.2	80	21	43.3	65.5	1.0	-0.2	0.0	1.0	0.104	1.009	0.108	0.186	0.579
PC-01	PB-01 & PB-02	Foundation Soils	14.4	30.1	26.7	0.590	18.300	2.210	1.2	31.2	66	21	44.5	75.7	1.0	-0.2	0.0	1.0	0.112	1.011	0.117	0.187	0.627
PC-01	PB-01 & PB-02	Foundation Soils	14.5	30.0	35.0	0.556	20.490	1.589	1.2	40.4	51	21	45.0	85.4	1.0	-0.2	0.0	1.0	0.121	1.013	0.127	0.187	0.678
PC-01	PB-01 & PB-02	Foundation Soils	14.6	29.9	41.3	0.531	13.880	1.285	1.2	47.4	42	21	44.6	92.1	1.0	-0.2	0.0	1.0	0.128	1.015	0.135	0.188	0.717
PC-01	PB-01 & PB-02	Foundation Soils	14.7	29.8	47.5	0.547	4.880	1.151	1.2	54.1	36	21	44.0	98.1	1.0	-0.2	0.0	1.0	0.135	1.017	0.143	0.188	0.758
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.8	51.4	0.540	1.380	1.050	1.2	58.4	32	21	42.8	101.2	1.0	-0.2	0.0	1.0	0.139	1.018	0.147	0.189	0.780
PC-01	PB-01 & PB-02	Foundation Soils	14.8	29.7	52.3	0.550	1.460	1.052	1.2	59.2	31	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.189	0.784
PC-01	PB-01 & PB-02	Foundation Soils	14.9	29.6	52.8	0.564	2.290	1.068	1.2	59.6	31	21	42.9	102.6	1.0	-0.2	0.0	1.0	0.141	1.019	0.149	0.189	0.787
PC-01	PB-01 & PB-02	Foundation Soils	15.0	29.5	53.1	0.574	3.460	1.081	1.2	59.9	32	21	43.0	102.9	1.0	-0.2	0.0	1.0	0.141	1.019	0.150	0.190	0.788
PC-01	PB-01 & PB-02	Foundation Soils	15.1	29.4	52.5	0.551	4.140	1.050	1.2	59.1	31	21	42.8	101.9	1.0	-0.2	0.0	1.0	0.140	1.018	0.148	0.190	0.777
PC-01	PB-01 & PB-02	Foundation Soils	15.2	29.3	49.5	0.551	4.880	1.114	1.2	55.7	34	21	43.6	99.4	1.0	-0.2	0.0	1.0	0.136	1.018	0.144	0.191	0.756
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.3	45.0	0.580	5.180	1.289	1.2	50.8	40	21	44.8	95.6	1.0	-0.2	0.0	1.0	0.132	1.016	0.139	0.191	0.726
PC-01	PB-01 & PB-02	Foundation Soils	15.3	29.2	36.7	0.632	5.760	1.723	1.2	41.6	52	21	45.4	87.0	1.0	-0.2	0.0	1.0	0.122	1.014	0.128	0.191	0.670
PC-01	PB-01 & PB-02	Foundation Soils	15.4	29.1	28.7	0.722	6.620	2.519	1.2	32.7	67	21	45.0	77.7	1.0	-0.2	0.0	1.0	0.114	1.012	0.119	0.192	0.618
PC-01	PB-01 & PB-02	Foundation Soils	15.5	29.0	22.3	0.768	7.450	3.441	1.2	25.6	78	21	44.0	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.111	0.192	0.578
PC-01	PB-01 & PB-02	Foundation Soils	15.6	28.9	15.7	0.599	9.050	3.821	1.2	18.1	90	21	42.7	60.9	1.0	-0.2	0.0	1.0	0.100	1.009	0.104	0.193	0.538
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	13.2	0.528	11.710	4.008	1.2	15.3	97	21	42.3	57.5	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.193	0.523
PC-01	PB-01 & PB-02	Foundation Soils	15.7	28.8	11.6	0.498	13.670	4.310	1.2	13.4	100	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.193	0.513
PC-01	PB-01 & PB-02	Foundation Soils	15.8	28.7	20.7	0.324	29.210	1.567	1.2	23.7	67	21	43.0	66.6	1.0	-0.3	0.0	1.0	0.105	1.010	0.108	0.194	0.559
PC-01	PB-01 & PB-02	Foundation Soils	15.9	28.6	59.1	0.261	49.980	0.441	1.2	66.6	12	21	16.2	82.8	1.0	-0.3	0.0	1.0	0.118	1.013	0.124	0.194	0.636
PC-01	PB-01 & PB-02	Foundation Soils	16.0	28.5	79.1	0.237	29.920	0.300	1.2	88.5	0	21	0.0	88.5	1.0	-0.3	0.0	1.0	0.124	1.014	0.130	0.195	0.667
PC-01	PB-01 & PB-02	Foundation Soils	16.1	28.4	80.8	0.273	6.770	0.338	1.2	90.2	0	21	0.0	90.2	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.195	0.675
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.4	78.2	0.410	6.330	0.524	1.2	87.2	7	21	2.5	89.6	1.0	-0.3	0.0	1.0	0.125	1.015	0.131	0.195	0.671
PC-01	PB-01 & PB-02	Foundation Soils	16.2	28.3	77.4	0.422	9.010	0.545	1.2	86.1	8	21	4.7	90.8	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.196	0.676
PC-01	PB-01 & PB-02	Foundation Soils	16.3	28.2	76.3	0.498	10.270	0.653	1.2	84.1	12	21	16.2	100.2	1.0	-0.3	0.0	1.0	0.138	1.018	0.145	0.196	0.738
PC-01	PB-01 & PB-02	Foundation Soils	16.4	28.1	75.3	0.621	10.480	0.824	1.2	82.3	17	21	29.3	111.6	1.0	-0.3	0.0	1.0	0.155	1.022	0.164	0.196	0.835
PC-01	PB-01 & PB-02	Foundation Soils	16.5	28.0	73.2	0.657	11.180	0.897	1.2	79.8	19	21	34.0	113.8	1.0	-0.3	0.0	1.0	0.159	1.023	0.168	0.197	0.855
PC-01	PB-01 & PB-02	Foundation Soils	16.6	27.9	74.0	0.711	8.910	0.961	1.2	80.3	21	21	36.1	116.4	1.0	-0.3	0.0	1.0	0.164	1.024	0.174	0.197	0.882
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.9	72.5	0.785	8.290	1.082	1.1	78.5	24	21	40.0	118.5	1.0	-0.3	0.0	1.0	0.168	1.025	0.179	0.197	0.904
PC-01	PB-01 & PB-02	Foundation Soils	16.7	27.8	69.1	0.826	6.750	1.195	1.1	74.7	27	21	42.8	117.6	1.0	-0.3	0.0	1.0	0.166	1.025	0.176	0.198	0.891
PC-01	PB-01 & PB-02	Foundation Soils	16.8	27.7	58.6	0.890	5.000	1.519	1.2	63.6	37	21	46.3	109.9	1.0	-0.3	0.0	1.0	0.152	1.022	0.160	0.198	0.809

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	16.9	27.6	44.6	0.907	3.720	2.032	1.2	48.8	51	21	46.8	95.6	1.0	-0.3	0.0	1.0	0.132	1.016	0.138	0.198	0.695
PC-01	PB-01 & PB-02	Foundation Soils	17.0	27.5	27.9	0.968	3.750	3.469	1.2	30.9	73	21	44.9	75.8	1.0	-0.3	0.0	1.0	0.112	1.011	0.116	0.199	0.585
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.5	17.7	0.907	6.430	5.124	1.2	19.8	95	21	43.2	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.199	0.527
PC-01	PB-01 & PB-02	Foundation Soils	17.1	27.4	11.9	0.782	15.340	6.579	1.2	13.4	100	21	41.9	55.3	1.0	-0.3	0.0	1.0	0.096	1.008	0.099	0.200	0.495
PC-01	PB-01 & PB-02	Foundation Soils	17.2	27.3	11.1	0.656	19.680	5.919	1.2	12.4	100	21	41.7	54.1	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.200	0.490
PC-01	PB-01 & PB-02	Foundation Soils	17.3	27.2	8.9	0.431	23.490	4.828	1.2	10.0	100	21	41.2	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.200	0.478
PC-01	PB-01 & PB-02	Foundation Soils	17.4	27.1	7.3	0.340	35.350	4.657	1.2	8.2	100	21	40.7	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.201	0.469
PC-01	PB-01 & PB-02	Foundation Soils	17.5	27.0	7.0	0.292	95.530	4.150	1.2	7.9	100	21	40.7	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.201	0.467
PC-01	PB-01 & PB-02	Foundation Soils	17.6	27.0	24.0	0.243	115.300	1.010	1.2	26.5	55	21	42.6	69.1	1.0	-0.3	0.0	1.0	0.107	1.010	0.110	0.201	0.547
PC-01	PB-01 & PB-02	Foundation Soils	17.6	26.9	92.7	0.270	88.090	0.291	1.1	99.9	0	21	0.0	99.9	1.0	-0.3	0.0	1.0	0.137	1.018	0.144	0.202	0.712
PC-01	PB-01 & PB-02	Foundation Soils	17.7	26.8	97.0	0.353	34.020	0.364	1.1	104.1	0	21	0.0	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.150	0.202	0.742
PC-01	PB-01 & PB-02	Foundation Soils	17.8	26.7	82.2	0.439	-0.340	0.534	1.1	88.8	7	21	2.0	90.9	1.0	-0.3	0.0	0.9	0.126	1.015	0.132	0.202	0.651
PC-01	PB-01 & PB-02	Foundation Soils	17.9	26.6	61.6	0.583	-2.920	0.946	1.1	65.9	26	21	40.2	106.1	1.0	-0.3	0.0	0.9	0.146	1.020	0.153	0.202	0.756
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.6	43.3	0.711	-2.580	1.642	1.1	46.6	48	21	45.7	92.3	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.203	0.657
PC-01	PB-01 & PB-02	Foundation Soils	18.0	26.5	27.3	0.765	-0.330	2.798	1.2	29.7	71	21	44.5	74.2	1.0	-0.3	0.0	0.9	0.111	1.011	0.114	0.203	0.563
PC-01	PB-01 & PB-02	Foundation Soils	18.1	26.4	18.7	0.780	1.810	4.166	1.2	20.5	90	21	43.3	63.7	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.203	0.518
PC-01	PB-01 & PB-02	Foundation Soils	18.2	26.3	11.8	0.667	6.790	5.651	1.2	13.0	100	21	41.8	54.8	1.0	-0.3	0.0	0.9	0.096	1.008	0.098	0.204	0.482
PC-01	PB-01 & PB-02	Foundation Soils	18.3	26.2	10.2	0.558	13.010	5.497	1.2	11.2	100	21	41.4	52.6	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.204	0.473
PC-01	PB-01 & PB-02	Foundation Soils	18.4	26.1	8.8	0.463	15.820	5.244	1.2	9.7	100	21	41.1	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.204	0.466
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.1	6.6	0.375	23.040	5.696	1.2	7.3	100	21	40.5	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.205	0.454
PC-01	PB-01 & PB-02	Foundation Soils	18.5	26.0	5.9	0.269	42.830	4.531	1.2	6.5	100	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.205	0.450
PC-01	PB-01 & PB-02	Foundation Soils	18.6	25.9	5.9	0.256	69.320	4.330	1.2	6.5	100	21	40.4	46.9	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.205	0.449
PC-01	PB-01 & PB-02	Foundation Soils	18.7	25.8	6.1	0.305	84.240	4.971	1.2	6.7	100	21	40.4	47.1	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.206	0.450
PC-01	PB-01 & PB-02	Foundation Soils	18.8	25.7	13.2	0.312	94.870	2.356	1.2	14.4	89	21	41.9	56.3	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.206	0.482
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	19.2	0.299	71.230	1.554	1.1	20.8	70	21	42.6	63.3	1.0	-0.3	0.0	0.9	0.102	1.009	0.105	0.206	0.508
PC-01	PB-01 & PB-02	Foundation Soils	18.9	25.6	11.0	0.253	32.120	2.302	1.2	11.9	95	21	41.5	53.4	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.206	0.470
PC-01	PB-01 & PB-02	Foundation Soils	19.0	25.5	7.7	0.237	25.440	3.062	1.2	8.4	100	21	40.8	49.2	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.207	0.454
PC-01	PB-01 & PB-02	Foundation Soils	19.1	25.4	7.5	0.173	39.150	2.296	1.2	8.2	100	21	40.7	48.9	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.207	0.452
PC-01	PB-01 & PB-02	Foundation Soils	19.2	25.3	6.2	0.089	66.420	1.432	1.2	6.8	100	21	40.4	47.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.207	0.445
PC-01	PB-01 & PB-02	Foundation Soils	19.3	25.2	5.7	0.038	84.530	0.670	1.2	6.2	100	21	40.3	46.4	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.208	0.442
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.2	5.8	0.033	103.340	0.568	1.1	6.3	98	21	40.3	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.208	0.442
PC-01	PB-01 & PB-02	Foundation Soils	19.4	25.1	5.9	0.044	100.290	0.751	1.1	6.3	100	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.208	0.441
PC-01	PB-01 & PB-02	Foundation Soils	19.5	25.0	5.9	0.038	95.150	0.646	1.1	6.4	99	21	40.3	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.208	0.441
PC-01	PB-01 & PB-02	Foundation Soils	19.6	24.9	6.9	0.036	97.350	0.523	1.1	7.4	90	21	40.3	47.8	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.209	0.444
PC-01	PB-01 & PB-02	Foundation Soils	19.7	24.8	7.5	0.048	82.570	0.643	1.1	8.0	89	21	40.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.209	0.446
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	8.4	0.058	63.310	0.688	1.1	9.0	86	21	40.6	49.6	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.209	0.449
PC-01	PB-01 & PB-02	Foundation Soils	19.8	24.7	8.3	0.064	66.560	0.770	1.1	8.9	88	21	40.6	49.5	1.0	-0.3	0.0	0.9	0.092	1.008	0.094	0.210	0.448
PC-01	PB-01 & PB-02	Foundation Soils	19.9	24.6	9.9	0.045	86.020	0.454	1.1	10.6	74	21	40.5	51.1	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.210	0.453
PC-01	PB-01 & PB-02	Foundation Soils	20.0	24.5	10.1	0.063	81.080	0.625	1.1	10.8	78	21	40.7	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.095	0.210	0.454
PC-01	PB-01 & PB-02	Foundation Soils	20.1	24.4	26.6	0.084	62.560	0.316	1.1	28.0	36	21	38.8	66.9	1.0	-0.4	0.0	0.9	0.105	1.010	0.107	0.210	0.511
PC-01	PB-01 & PB-02	Foundation Soils	20.2	24.3	41.7	0.123	48.980	0.295	1.1	43.8	20	21	29.8	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.211	0.537
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.3	38.7	0.189	7.350	0.488	1.1	40.4	29	21	38.2	78.6	1.0	-0.4	0.0	0.9	0.115	1.012	0.118	0.211	0.559
PC-01	PB-01 & PB-02	Foundation Soils	20.3	24.2	29.9	0.250	0.760	0.836	1.1	31.2	46	21	42.3	73.5	1.0	-0.4	0.0	0.9	0.110	1.011	0.113	0.211	0.536
PC-01	PB-01 & PB-02	Foundation Soils	20.4	24.1	19.0	0.338	5.500	1.777	1.1	20.0	74	21	42.5	62.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.211	0.491
PC-01	PB-01 & PB-02	Foundation Soils	20.5	24.0	14.5	0.432	8.290	2.975	1.1	15.3	93	21	42.2	57.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.212	0.471
PC-01	PB-01 & PB-02	Foundation Soils	20.6	23.9	9.6	0.411	14.080	4.269	1.1	10.1	100	21	41.2	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.212	0.449
PC-01	PB-01 & PB-02	Foundation Soils	20.7	23.8	7.7	0.340	17.200	4.423	1.1	8.1	100	21	40.7	48.8	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.212	0.440
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.8	6.3	0.282	21.770	4.508	1.1	6.6	100	21	40.4	47.0	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.212	0.433
PC-01	PB-01 & PB-02	Foundation Soils	20.8	23.7	5.0	0.207	29.680	4.119	1.1	5.3	100	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.213	0.427
PC-01	PB-01 & PB-02	Foundation Soils	20.9	23.6	5.0	0.107	46.020	2.124	1.1	5.3	100	21	40.1	45.4	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.213	0.426
PC-01	PB-01 & PB-02	Foundation Soils	21.0	23.5	5.4	0.053	64.460	0.987	1.1	5.6	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.213	0.427
PC-01	PB-01 & PB-02	Foundation Soils	21.1	23.4	6.8	0.034	71.180	0.499	1.1	7.1	92	21	40.3	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.213	0.432
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.4	7.8	0.031	62.650	0.398	1.1	8.1	84	21	40.3	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.214	0.435
PC-01	PB-01 & PB-02	Foundation Soils	21.2	23.3	8.5	0.038	45.780	0.449	1.1	8.8	82	21	40.4	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.214	0.437
PC-01	PB-01 & PB-02	Foundation Soils	21.3	23.2	9.7	0.040	37.120	0.411	1.1	10.1	75	21	40.5	50.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.214	0.441
PC-01	PB-01 & PB-02	Foundation Soils	21.4	23.1	10.8	0.041	31.370	0.380	1.1	11.2	69	21	40.4	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.214	0.444
PC-01	PB-01 & PB-02	Foundation Soils	21.5	23.0	9.0	0.064	26.130	0.708	1.1	9.4	85	21	40.7	50.0	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.215	0.438
PC-01	PB-01 & PB-02	Foundation Soils	21.6	22.9	7.5	0.090	24.950	1.193	1.1	7.8	100	21	40.7	48.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.215	0.432
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.9	6.0	0.084	28.680	1.391	1.1	6.3	100	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.215	0.425
PC-01	PB-01 & PB-02	Foundation Soils	21.7	22.8	6.1	0.070	33.890	1.157	1.1	6.3	100	21	40.3	46.6	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.215	0.425
PC-01	PB-01 & PB-02	Foundation Soils	21.8	22.7	7.5	0.066	35.210	0.881	1.1	7.7	96	21	40.6	48.3	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.215	0.430
PC-01	PB-01 & PB-02	Foundation Soils	21.9	22.6	10.5	0.066	33.070	0.627	1.1	10.8	78	21	40.7	51.6	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.216	0.441

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	22.0	22.5	13.8	0.070	20.770	0.506	1.1	14.2	64	21	40.7	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.216	0.452
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.5	16.8	0.073	15.480	0.435	1.1	17.2	56	21	40.7	57.8	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.216	0.462
PC-01	PB-01 & PB-02	Foundation Soils	22.1	22.4	22.2	0.098	11.290	0.442	1.1	22.6	47	21	40.6	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.216	0.481
PC-01	PB-01 & PB-02	Foundation Soils	22.2	22.3	27.2	0.150	12.240	0.552	1.1	27.6	43	21	41.0	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.216	0.500
PC-01	PB-01 & PB-02	Foundation Soils	22.3	22.2	43.7	0.147	11.200	0.336	1.1	44.2	21	21	31.4	75.7	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.217	0.528
PC-01	PB-01 & PB-02	Foundation Soils	22.4	22.1	46.4	0.093	10.960	0.200	1.1	47.0	13	21	17.2	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.217	0.483
PC-01	PB-01 & PB-02	Foundation Soils	22.5	22.0	41.7	0.110	11.150	0.263	1.1	42.2	20	21	29.2	71.4	1.0	-0.4	0.0	0.9	0.108	1.010	0.111	0.217	0.510
PC-01	PB-01 & PB-02	Foundation Soils	22.6	22.0	37.8	0.198	11.290	0.524	1.1	38.0	32	21	39.4	77.4	1.0	-0.4	0.0	0.9	0.114	1.012	0.116	0.217	0.534
PC-01	PB-01 & PB-02	Foundation Soils	22.6	21.9	43.8	0.227	13.340	0.519	1.1	43.9	28	21	37.7	81.6	1.0	-0.4	0.0	0.9	0.117	1.012	0.120	0.217	0.552
PC-01	PB-01 & PB-02	Foundation Soils	22.7	21.8	53.1	0.210	13.240	0.395	1.1	53.2	17	21	26.9	80.2	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.218	0.545
PC-01	PB-01 & PB-02	Foundation Soils	22.8	21.7	55.3	0.240	9.480	0.434	1.1	55.3	18	21	27.6	82.8	1.0	-0.4	0.0	0.9	0.118	1.013	0.121	0.218	0.556
PC-01	PB-01 & PB-02	Foundation Soils	22.9	21.6	51.0	0.232	8.380	0.455	1.1	51.0	21	21	32.1	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.218	0.557
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	49.7	0.126	9.550	0.254	1.1	49.8	14	21	18.8	68.6	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.218	0.496
PC-01	PB-01 & PB-02	Foundation Soils	23.0	21.5	59.6	0.052	15.680	0.087	1.1	59.8	0	21	0.0	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.218	0.463
PC-01	PB-01 & PB-02	Foundation Soils	23.1	21.4	72.7	0.084	11.620	0.116	1.1	72.5	0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.111	0.218	0.510
PC-01	PB-01 & PB-02	Foundation Soils	23.2	21.3	80.8	0.100	10.990	0.124	1.1	80.3	0	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.219	0.542
PC-01	PB-01 & PB-02	Foundation Soils	23.3	21.2	80.9	0.168	10.380	0.208	1.1	80.3	0	21	0.0	80.3	1.0	-0.4	0.0	0.9	0.116	1.012	0.118	0.219	0.541
PC-01	PB-01 & PB-02	Foundation Soils	23.4	21.1	77.5	0.225	9.910	0.290	1.1	76.9	1	21	0.0	76.9	1.0	-0.4	0.0	0.9	0.113	1.011	0.115	0.219	0.526
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.1	71.0	0.192	9.860	0.270	1.1	70.4	3	21	0.0	70.5	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.219	0.500
PC-01	PB-01 & PB-02	Foundation Soils	23.5	21.0	65.6	0.116	10.870	0.177	1.1	65.1	1	21	0.0	65.1	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.219	0.479
PC-01	PB-01 & PB-02	Foundation Soils	23.6	20.9	64.3	0.122	10.960	0.190	1.1	63.7	2	21	0.0	63.7	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.219	0.474
PC-01	PB-01 & PB-02	Foundation Soils	23.7	20.8	72.2	0.112	12.440	0.155	1.0	71.3	0	21	0.0	71.3	1.0	-0.4	0.0	0.9	0.108	1.010	0.110	0.220	0.502
PC-01	PB-01 & PB-02	Foundation Soils	23.8	20.7	85.9	0.130	12.980	0.151	1.0	84.5	0	21	0.0	84.5	1.0	-0.4	0.0	0.9	0.120	1.013	0.122	0.220	0.557
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	107.2	0.148	13.050	0.138	1.0	104.9	0	21	0.0	104.9	1.0	-0.4	0.0	0.9	0.144	1.020	0.148	0.220	0.673
PC-01	PB-01 & PB-02	Foundation Soils	23.9	20.6	116.4	0.161	11.720	0.138	1.0	113.6	0	21	0.0	113.6	1.0	-0.4	0.1	0.9	0.158	1.023	0.163	0.220	0.742
PC-01	PB-01 & PB-02	Foundation Soils	24.0	20.5	122.3	0.178	8.770	0.146	1.0	119.1	0	21	0.0	119.1	1.0	-0.4	0.1	0.9	0.169	1.026	0.175	0.220	0.795
PC-01	PB-01 & PB-02	Foundation Soils	24.1	20.4	127.9	0.200	6.230	0.156	1.0	124.4	0	21	0.0	124.4	1.0	-0.4	0.1	0.9	0.182	1.029	0.188	0.220	0.855
PC-01	PB-01 & PB-02	Foundation Soils	24.2	20.3	129.5	0.226	1.760	0.175	1.0	125.7	0	21	0.0	125.7	1.0	-0.5	0.1	0.9	0.185	1.029	0.192	0.221	0.871
PC-01	PB-01 & PB-02	Foundation Soils	24.3	20.2	127.6	0.237	-2.620	0.186	1.0	123.8	0	21	0.0	123.8	1.0	-0.5	0.1	0.9	0.180	1.028	0.187	0.221	0.846
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.2	119.0	0.205	-6.920	0.172	1.0	115.4	0	21	0.0	115.4	1.0	-0.5	0.1	0.9	0.162	1.024	0.167	0.221	0.755
PC-01	PB-01 & PB-02	Foundation Soils	24.4	20.1	110.2	0.156	-5.570	0.142	1.0	106.8	0	21	0.0	106.8	1.0	-0.5	0.1	0.9	0.147	1.020	0.151	0.221	0.683
PC-01	PB-01 & PB-02	Foundation Soils	24.5	20.0	102.2	0.109	-2.720	0.107	1.0	99.0	0	21	0.0	99.0	1.0	-0.5	0.1	0.9	0.136	1.017	0.139	0.221	0.630
PC-01	PB-01 & PB-02	Foundation Soils	24.6	19.9	95.4	0.128	-0.330	0.134	1.0	92.5	0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.221	0.592
PC-01	PB-01 & PB-02	Foundation Soils	24.7	19.8	90.9	0.184	2.490	0.202	1.0	88.1	0	21	0.0	88.1	1.0	-0.5	0.1	0.9	0.124	1.014	0.126	0.221	0.569
PC-01	PB-01 & PB-02	Foundation Soils	24.8	19.7	84.1	0.228	5.860	0.271	1.0	81.4	0	21	0.0	81.4	1.0	-0.5	0.1	0.9	0.117	1.012	0.119	0.222	0.537
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.7	81.6	0.233	9.950	0.286	1.0	78.9	0	21	0.0	78.9	1.0	-0.5	0.1	0.9	0.115	1.012	0.117	0.222	0.526
PC-01	PB-01 & PB-02	Foundation Soils	24.9	19.6	82.9	0.187	11.860	0.225	1.0	80.1	0	21	0.0	80.1	1.0	-0.5	0.1	0.9	0.116	1.012	0.118	0.222	0.531
PC-01	PB-01 & PB-02	Foundation Soils	25.0	19.5	89.6	0.204	8.860	0.228	1.0	86.3	0	21	0.0	86.3	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.222	0.558
PC-01	PB-01 & PB-02	Foundation Soils	25.1	19.4	93.7	0.177	7.000	0.189	1.0	90.1	0	21	0.0	90.1	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.222	0.576
PC-01	PB-01 & PB-02	Foundation Soils	25.2	19.3	94.5	0.156	8.390	0.165	1.0	90.7	0	21	0.0	90.7	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.222	0.579
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.3	96.6	0.138	6.380	0.143	1.0	92.7	0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.222	0.588
PC-01	PB-01 & PB-02	Foundation Soils	25.3	19.2	100.7	0.125	5.000	0.124	1.0	96.4	0	21	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.135	0.223	0.609
PC-01	PB-01 & PB-02	Foundation Soils	25.4	19.1	102.4	0.115	5.150	0.112	1.0	97.9	0	21	0.0	97.9	1.0	-0.5	0.1	0.9	0.135	1.017	0.137	0.223	0.617
PC-01	PB-01 & PB-02	Foundation Soils	25.5	19.0	108.3	0.104	6.190	0.096	1.0	103.4	0	21	0.0	103.4	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.223	0.651
PC-01	PB-01 & PB-02	Foundation Soils	25.6	18.9	114.7	0.119	7.360	0.104	1.0	109.3	0	21	0.0	109.3	1.0	-0.5	0.1	0.9	0.151	1.021	0.155	0.223	0.693
PC-01	PB-01 & PB-02	Foundation Soils	25.7	18.8	113.3	0.155	8.450	0.137	1.0	107.9	0	21	0.0	107.9	1.0	-0.5	0.1	0.9	0.149	1.021	0.152	0.223	0.682
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.8	108.9	0.135	12.200	0.124	1.0	103.6	0	21	0.0	103.6	1.0	-0.5	0.1	0.9	0.142	1.019	0.145	0.223	0.651
PC-01	PB-01 & PB-02	Foundation Soils	25.8	18.7	106.8	0.106	15.430	0.099	1.0	101.5	0	21	0.0	101.5	1.0	-0.5	0.1	0.9	0.139	1.018	0.142	0.223	0.636
PC-01	PB-01 & PB-02	Foundation Soils	25.9	18.6	105.8	0.112	15.910	0.106	1.0	100.5	0	21	0.0	100.5	1.0	-0.5	0.1	0.9	0.138	1.018	0.141	0.223	0.629
PC-01	PB-01 & PB-02	Foundation Soils	26.0	18.5	104.3	0.136	15.720	0.130	1.0	98.9	0	21	0.0	98.9	1.0	-0.5	0.1	0.9	0.136	1.017	0.138	0.224	0.619
PC-01	PB-01 & PB-02	Foundation Soils	26.1	18.4	101.5	0.118	17.100	0.116	1.0	96.1	0	21	0.0	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.224	0.603
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	96.9	0.085	19.150	0.088	1.0	91.7	0	21	0.0	91.7	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.224	0.578
PC-01	PB-01 & PB-02	Foundation Soils	26.2	18.3	92.3	0.172	21.060	0.186	1.0	87.2	0	21	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.124	0.224	0.556
PC-01	PB-01 & PB-02	Foundation Soils	26.3	18.2	83.3	0.164	16.380	0.197	1.0	78.6	0	21	0.0	78.6	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.224	0.518
PC-01	PB-01 & PB-02	Foundation Soils	26.4	18.1	86.0	0.133	21.920	0.155	1.0	81.0	0	21	0.0	81.0	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.224	0.527
PC-01	PB-01 & PB-02	Foundation Soils	26.5	18.0	84.2	0.133	25.010	0.158	1.0	79.2	0	21	0.0	79.2	1.0	-0.5	0.1	0.9	0.115	1.012	0.116	0.224	0.519
PC-01	PB-01 & PB-02	Foundation Soils	26.6	17.9	83.1	0.155	25.440	0.187	1.0	78.1	0	21	0.0	78.1	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.224	0.514
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.9	81.0	0.150	35.970	0.185	1.0	76.1	0	21	0.0	76.1	1.0	-0.5	0.1	0.9	0.112	1.011	0.114	0.224	0.506
PC-01	PB-01 & PB-02	Foundation Soils	26.7	17.8	82.1	0.129	36.020	0.157	1.0	76.9	0	21	0.0	76.9	1.0	-0.5	0.1	0.9	0.113	1.011	0.114	0.225	0.509
PC-01	PB-01 & PB-02	Foundation Soils	26.8	17.7	82.7	0.100	29.830	0.121	1.0	77.5	0	21	0.0	77.5	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.225	0.511
PC-01	PB-01 & PB-02	Foundation Soils	26.9	17.6	83.6	0.098	26.800	0.117	1.0	78.2	0	21	0.0	78.2	1.0	-0.5	0.1	0.9	0.114	1.012	0.115	0.225	0.513
PC-01	PB-01 & PB-02	Foundation Soils	27.0	17.5	85.9	0.087	29.040	0.101	1.0	80.2	0	21	0.0	80.2	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.225	0.521

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	93.3	0.036	21.110	0.039	1.0	87.0	0	21	0.0	87.0	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.225	0.551
PC-01	PB-01 & PB-02	Foundation Soils	27.1	17.4	97.0	0.025	16.200	0.026	1.0	90.4	0	21	0.0	90.4	1.0	-0.5	0.1	0.9	0.126	1.015	0.128	0.225	0.567
PC-01	PB-01 & PB-02	Foundation Soils	27.2	17.3	99.3	0.061	17.680	0.061	1.0	92.5	0	21	0.0	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.130	0.225	0.577
PC-01	PB-01 & PB-02	Foundation Soils	27.3	17.2	99.7	0.233	21.540	0.234	1.0	92.7	0	21	0.0	92.7	1.0	-0.5	0.1	0.9	0.129	1.015	0.130	0.225	0.578
PC-01	PB-01 & PB-02	Foundation Soils	27.4	17.1	95.9	0.263	36.200	0.274	1.0	89.1	0	21	0.0	89.1	1.0	-0.5	0.1	0.9	0.125	1.014	0.126	0.225	0.559
PC-01	PB-01 & PB-02	Foundation Soils	27.5	17.0	87.5	0.370	40.590	0.423	1.0	81.1	5	21	0.4	81.5	1.0	-0.5	0.1	0.9	0.117	1.012	0.118	0.226	0.525
PC-01	PB-01 & PB-02	Foundation Soils	27.6	17.0	76.0	0.439	42.830	0.577	1.0	70.5	15	21	23.4	93.9	1.0	-0.5	0.1	0.9	0.130	1.016	0.131	0.226	0.582
PC-01	PB-01 & PB-02	Foundation Soils	27.6	16.9	66.1	0.445	39.640	0.673	1.0	61.2	22	21	34.9	96.1	1.0	-0.5	0.1	0.9	0.132	1.016	0.134	0.226	0.594
PC-01	PB-01 & PB-02	Foundation Soils	27.7	16.8	54.8	0.435	55.420	0.793	1.0	50.7	31	21	40.8	91.5	1.0	-0.5	0.1	0.9	0.127	1.015	0.129	0.226	0.569
PC-01	PB-01 & PB-02	Foundation Soils	27.8	16.7	50.1	0.448	42.450	0.894	1.0	46.3	35	21	42.3	88.6	1.0	-0.5	0.1	0.9	0.124	1.014	0.125	0.226	0.555
PC-01	PB-01 & PB-02	Foundation Soils	27.9	16.6	47.2	0.398	45.120	0.843	1.0	43.5	36	21	42.1	85.6	1.0	-0.5	0.1	0.9	0.121	1.013	0.122	0.226	0.541
PC-01	PB-01 & PB-02	Foundation Soils	28.0	16.5	41.0	0.400	89.670	0.976	1.0	37.7	43	21	43.0	80.7	1.0	-0.5	0.1	0.9	0.116	1.012	0.117	0.226	0.519
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.5	32.6	0.404	119.270	1.238	1.0	30.0	55	21	43.3	73.2	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.226	0.489
PC-01	PB-01 & PB-02	Foundation Soils	28.1	16.4	26.7	0.420	150.320	1.574	1.0	24.5	65	21	43.0	67.5	1.0	-0.6	0.1	0.9	0.105	1.010	0.106	0.226	0.468
PC-01	PB-01 & PB-02	Foundation Soils	28.2	16.3	22.6	0.430	244.700	1.906	1.0	20.6	77	21	42.9	63.5	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.226	0.453
PC-01	PB-01 & PB-02	Foundation Soils	28.3	16.2	26.3	0.388	223.410	1.474	1.0	24.1	65	21	42.9	67.0	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.227	0.465
PC-01	PB-01 & PB-02	Foundation Soils	28.4	16.1	29.9	0.342	149.050	1.146	1.0	27.3	56	21	42.8	70.1	1.0	-0.6	0.1	0.9	0.107	1.010	0.108	0.227	0.476
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.1	28.8	0.299	110.970	1.038	1.0	26.3	55	21	42.5	68.8	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.227	0.471
PC-01	PB-01 & PB-02	Foundation Soils	28.5	16.0	23.6	0.333	146.170	1.411	1.0	21.5	67	21	42.5	64.0	1.0	-0.6	0.1	0.9	0.103	1.009	0.103	0.227	0.454
PC-01	PB-01 & PB-02	Foundation Soils	28.6	15.9	21.5	0.406	204.300	1.884	1.0	19.6	79	21	42.7	62.3	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.227	0.448
PC-01	PB-01 & PB-02	Foundation Soils	28.7	15.8	26.3	0.414	291.590	1.572	1.0	23.9	66	21	43.0	66.9	1.0	-0.6	0.1	0.9	0.105	1.010	0.105	0.227	0.464
PC-01	PB-01 & PB-02	Foundation Soils	28.8	15.7	39.6	0.384	198.630	0.969	1.0	36.1	44	21	42.9	79.0	1.0	-0.6	0.1	0.9	0.115	1.012	0.116	0.227	0.509
PC-01	PB-01 & PB-02	Foundation Soils	28.9	15.6	64.0	0.358	49.030	0.559	1.0	58.3	20	21	31.9	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.127	0.227	0.558
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.6	81.4	0.299	-17.440	0.367	1.0	73.9	6	21	0.8	74.7	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.227	0.491
PC-01	PB-01 & PB-02	Foundation Soils	29.0	15.5	88.9	0.258	-15.530	0.290	1.0	80.6	0	21	0.0	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.227	0.514
PC-01	PB-01 & PB-02	Foundation Soils	29.1	15.4	95.9	0.245	-16.820	0.256	1.0	87.0	0	21	0.0	87.0	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.227	0.542
PC-01	PB-01 & PB-02	Foundation Soils	29.2	15.3	98.6	0.271	-17.050	0.275	1.0	89.4	0	21	0.0	89.4	1.0	-0.6	0.1	0.9	0.125	1.014	0.126	0.228	0.553
PC-01	PB-01 & PB-02	Foundation Soils	29.3	15.2	101.8	0.254	-14.820	0.250	1.0	92.2	0	21	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.129	0.228	0.566
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.2	103.9	0.283	-10.360	0.272	1.0	94.0	0	21	0.0	94.0	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.228	0.575
PC-01	PB-01 & PB-02	Foundation Soils	29.4	15.1	103.9	0.439	-11.960	0.423	1.0	93.9	1	21	0.0	93.9	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.228	0.574
PC-01	PB-01 & PB-02	Foundation Soils	29.5	15.0	101.5	0.482	-15.170	0.475	1.0	91.6	3	21	0.0	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.228	0.562
PC-01	PB-01 & PB-02	Foundation Soils	29.6	14.9	92.4	0.560	-4.210	0.606	1.0	83.4	11	21	12.8	96.2	1.0	-0.6	0.1	0.9	0.133	1.016	0.134	0.228	0.586
PC-01	PB-01 & PB-02	Foundation Soils	29.7	14.8	89.4	0.672	-16.150	0.751	1.0	80.8	16	21	27.0	107.8	1.0	-0.6	0.1	0.9	0.149	1.021	0.150	0.228	0.658
PC-01	PB-01 & PB-02	Foundation Soils	29.8	14.7	84.1	0.700	-19.150	0.833	1.0	75.9	20	21	34.0	110.0	1.0	-0.6	0.1	0.9	0.152	1.022	0.154	0.228	0.673
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.7	82.3	0.681	-20.110	0.828	1.0	74.2	20	21	34.6	108.9	1.0	-0.6	0.1	0.9	0.150	1.021	0.152	0.228	0.665
PC-01	PB-01 & PB-02	Foundation Soils	29.9	14.6	79.5	0.581	-20.960	0.730	1.0	71.6	19	21	31.9	103.5	1.0	-0.6	0.1	0.9	0.142	1.019	0.143	0.228	0.627
PC-01	PB-01 & PB-02	Foundation Soils	30.0	14.5	73.0	0.556	-21.060	0.762	1.0	65.6	22	21	36.0	101.6	1.0	-0.6	0.1	0.9	0.139	1.018	0.140	0.228	0.615
PC-01	PB-01 & PB-02	Foundation Soils	30.1	14.4	68.1	0.516	-21.440	0.757	1.0	61.1	24	21	37.5	98.7	1.0	-0.6	0.1	0.9	0.136	1.017	0.136	0.228	0.598
PC-01	PB-01 & PB-02	Foundation Soils	30.2	14.3	64.9	0.542	-21.110	0.835	0.9	58.1	28	21	40.1	98.2	1.0	-0.6	0.1	0.9	0.135	1.017	0.136	0.228	0.595
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	60.4	0.800	-20.750	1.326	0.9	54.0	39	21	45.1	99.2	1.0	-0.6	0.1	0.9	0.136	1.017	0.137	0.228	0.600
PC-01	PB-01 & PB-02	Foundation Soils	30.3	14.2	54.7	0.873	-13.820	1.597	0.9	48.8	46	21	45.8	94.7	1.0	-0.6	0.1	0.9	0.131	1.016	0.131	0.229	0.575
PC-01	PB-01 & PB-02	Foundation Soils	30.4	14.1	48.4	0.864	-14.390	1.785	0.9	43.1	52	21	45.7	88.8	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.229	0.546
PC-01	PB-01 & PB-02	Foundation Soils	30.5	14.0	41.6	0.921	-8.960	2.216	0.9	36.9	61	21	45.4	82.3	1.0	-0.6	0.1	0.9	0.118	1.013	0.118	0.229	0.517
PC-01	PB-01 & PB-02	Foundation Soils	30.6	13.9	35.8	0.809	-3.060	2.258	0.9	31.7	65	21	44.6	76.4	1.0	-0.6	0.1	0.9	0.113	1.011	0.113	0.229	0.493
PC-01	PB-01 & PB-02	Foundation Soils	30.7	13.8	39.1	0.790	-0.240	2.022	0.9	34.6	61	21	44.9	79.5	1.0	-0.6	0.1	0.9	0.115	1.012	0.115	0.229	0.505
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.8	43.0	0.682	8.850	1.586	0.9	38.1	53	21	44.7	82.8	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.229	0.518
PC-01	PB-01 & PB-02	Foundation Soils	30.8	13.7	50.2	0.578	-8.200	1.151	0.9	44.5	42	21	44.0	88.5	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.229	0.543
PC-01	PB-01 & PB-02	Foundation Soils	30.9	13.6	53.8	0.502	-4.380	0.934	0.9	47.6	35	21	42.6	90.2	1.0	-0.6	0.1	0.9	0.126	1.015	0.126	0.229	0.551
PC-01	PB-01 & PB-02	Foundation Soils	31.0	13.5	51.9	0.517	-4.910	0.996	0.9	45.9	38	21	43.1	89.1	1.0	-0.6	0.1	0.9	0.125	1.014	0.125	0.229	0.545
PC-01	PB-01 & PB-02	Foundation Soils	31.1	13.4	54.5	0.394	-5.240	0.723	0.9	48.2	30	21	40.2	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.229	0.541
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	54.8	0.411	0.480	0.751	0.9	48.3	31	21	40.5	88.9	1.0	-0.6	0.1	0.9	0.124	1.014	0.125	0.229	0.544
PC-01	PB-01 & PB-02	Foundation Soils	31.2	13.3	50.8	0.538	11.070	1.059	0.9	44.8	40	21	43.5	88.3	1.0	-0.6	0.1	0.9	0.124	1.014	0.124	0.229	0.541
PC-01	PB-01 & PB-02	Foundation Soils	31.3	13.2	56.9	0.476	-4.290	0.837	0.9	50.2	32	21	41.4	91.6	1.0	-0.6	0.1	0.9	0.127	1.015	0.128	0.229	0.556
PC-01	PB-01 & PB-02	Foundation Soils	31.4	13.1	62.4	0.472	-2.460	0.757	0.9	55.0	27	21	39.3	94.3	1.0	-0.6	0.1	0.9	0.130	1.016	0.131	0.229	0.569
PC-01	PB-01 & PB-02	Foundation Soils	31.5	13.0	76.3	0.472	1.760	0.619	0.9	67.2	17	21	28.9	96.1	1.0	-0.6	0.1	0.9	0.132	1.016	0.133	0.229	0.579
PC-01	PB-01 & PB-02	Foundation Soils	31.6	12.9	84.7	0.470	2.520	0.555	0.9	74.5	12	21	17.3	91.8	1.0	-0.6	0.1	0.9	0.128	1.015	0.128	0.230	0.556
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.9	77.0	0.500	6.100	0.649	0.9	67.8	18	21	30.2	98.0	1.0	-0.6	0.1	0.9	0.135	1.017	0.135	0.230	0.588
PC-01	PB-01 & PB-02	Foundation Soils	31.7	12.8	74.8	0.446	6.080	0.596	0.9	65.7	18	21	28.8	94.4	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.230	0.569
PC-01	PB-01 & PB-02	Foundation Soils	31.8	12.7	71.5	0.383	13.870	0.536	0.9	62.6	17	21	27.4	90.0	1.0	-0.7	0.1	0.9	0.126	1.015	0.126	0.230	0.547
PC-01	PB-01 & PB-02	Foundation Soils	31.9	12.6	66.9	0.323	19.150	0.483	0.9	58.5	17	21	27.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.230	0.528
PC-01	PB-01 & PB-02	Foundation Soils	32.0	12.5	56.7	0.388	19.190	0.685	0.9	49.5	28	21	39.3	88.8	1.0	-0.7	0.1	0.9	0.124	1.014	0.124	0.230	0.541
PC-01	PB-01 & PB-02	Foundation Soils	32.1	12.4	48.9	0.450	22.250	0.921	0.9	42.6	38	21	42.7	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.230	0.525

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.4	39.1	0.470	27.920	1.203	0.9	33.9	50	21	43.5	77.4	1.0	-0.7	0.1	0.9	0.113	1.012	0.113	0.230	0.493
PC-01	PB-01 & PB-02	Foundation Soils	32.2	12.3	33.6	0.524	72.900	1.560	0.9	29.1	60	21	43.6	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.230	0.475
PC-01	PB-01 & PB-02	Foundation Soils	32.3	12.2	28.3	0.556	104.150	1.965	0.9	24.4	74	21	43.5	68.0	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.230	0.458
PC-01	PB-01 & PB-02	Foundation Soils	32.4	12.1	28.3	0.472	130.310	1.670	0.9	24.4	67	21	43.1	67.5	1.0	-0.7	0.1	0.9	0.105	1.010	0.105	0.230	0.456
PC-01	PB-01 & PB-02	Foundation Soils	32.5	12.0	31.2	0.321	124.400	1.030	0.9	26.9	54	21	42.6	69.4	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.230	0.462
PC-01	PB-01 & PB-02	Foundation Soils	32.6	12.0	34.0	0.227	113.000	0.669	0.9	29.2	44	21	41.5	70.7	1.0	-0.7	0.1	0.9	0.108	1.010	0.107	0.230	0.467
PC-01	PB-01 & PB-02	Foundation Soils	32.6	11.9	45.5	0.126	37.390	0.277	0.9	39.1	22	21	32.0	71.1	1.0	-0.7	0.1	0.9	0.108	1.010	0.108	0.230	0.468
PC-01	PB-01 & PB-02	Foundation Soils	32.7	11.8	52.6	0.160	26.590	0.304	0.9	45.2	19	21	28.1	73.3	1.0	-0.7	0.1	0.9	0.110	1.011	0.110	0.230	0.476
PC-01	PB-01 & PB-02	Foundation Soils	32.8	11.7	56.4	0.230	35.450	0.408	0.9	48.6	20	21	31.2	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.230	0.500
PC-01	PB-01 & PB-02	Foundation Soils	32.9	11.6	53.7	0.229	25.850	0.426	0.9	46.2	23	21	33.6	79.9	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.230	0.500
PC-01	PB-01 & PB-02	Foundation Soils	33.0	11.5	48.5	0.243	62.400	0.501	0.9	41.7	28	21	37.9	79.5	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.230	0.499
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.5	48.7	0.239	56.130	0.490	0.9	41.8	28	21	37.6	79.4	1.0	-0.7	0.1	0.9	0.115	1.012	0.115	0.230	0.498
PC-01	PB-01 & PB-02	Foundation Soils	33.1	11.4	53.2	0.268	49.790	0.504	0.9	45.6	26	21	36.5	82.1	1.0	-0.7	0.1	0.9	0.118	1.013	0.117	0.230	0.509
PC-01	PB-01 & PB-02	Foundation Soils	33.2	11.3	54.6	0.300	56.690	0.550	0.9	46.9	26	21	37.2	84.1	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.231	0.517
PC-01	PB-01 & PB-02	Foundation Soils	33.3	11.2	59.6	0.347	26.540	0.582	0.9	51.2	25	21	36.4	87.6	1.0	-0.7	0.1	0.9	0.123	1.014	0.123	0.231	0.532
PC-01	PB-01 & PB-02	Foundation Soils	33.4	11.1	60.5	0.328	35.590	0.543	0.9	51.9	23	21	34.9	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.122	0.231	0.528
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	58.3	0.317	50.220	0.544	0.9	49.9	24	21	35.8	85.7	1.0	-0.7	0.1	0.9	0.121	1.013	0.121	0.231	0.523
PC-01	PB-01 & PB-02	Foundation Soils	33.5	11.0	57.8	0.297	45.710	0.514	0.9	49.4	24	21	35.1	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.231	0.518
PC-01	PB-01 & PB-02	Foundation Soils	33.6	10.9	60.3	0.307	39.400	0.509	0.9	51.6	22	21	33.8	85.3	1.0	-0.7	0.1	0.9	0.121	1.013	0.120	0.231	0.521
PC-01	PB-01 & PB-02	Foundation Soils	33.7	10.8	64.0	0.301	24.870	0.470	0.9	54.6	19	21	29.9	84.5	1.0	-0.7	0.1	0.9	0.120	1.013	0.119	0.231	0.518
PC-01	PB-01 & PB-02	Foundation Soils	33.8	10.7	62.7	0.317	11.110	0.506	0.9	53.5	21	21	32.5	86.0	1.0	-0.7	0.1	0.9	0.121	1.014	0.121	0.231	0.524
PC-01	PB-01 & PB-02	Foundation Soils	33.9	10.6	54.9	0.298	26.370	0.542	0.9	46.8	26	21	37.0	83.8	1.0	-0.7	0.1	0.9	0.119	1.013	0.119	0.231	0.514
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.6	48.1	0.398	25.350	0.827	0.9	40.9	38	21	42.1	83.0	1.0	-0.7	0.1	0.9	0.119	1.013	0.118	0.231	0.511
PC-01	PB-01 & PB-02	Foundation Soils	34.0	10.5	43.0	0.469	22.870	1.090	0.9	36.5	46	21	43.4	79.8	1.0	-0.7	0.1	0.9	0.116	1.012	0.115	0.231	0.498
PC-01	PB-01 & PB-02	Foundation Soils	34.1	10.4	32.1	0.349	46.910	1.088	0.9	27.0	55	21	42.7	69.7	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.231	0.461
PC-01	PB-01 & PB-02	Foundation Soils	34.2	10.3	27.7	0.336	55.600	1.214	0.9	23.2	62	21	42.5	65.7	1.0	-0.7	0.1	0.9	0.104	1.009	0.103	0.231	0.447
PC-01	PB-01 & PB-02	Foundation Soils	34.3	10.2	35.6	0.345	43.070	0.968	0.9	30.0	50	21	42.6	72.6	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.231	0.471
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	52.0	0.227	22.620	0.437	0.9	43.9	25	21	35.3	79.1	1.0	-0.7	0.1	0.9	0.115	1.012	0.114	0.231	0.495
PC-01	PB-01 & PB-02	Foundation Soils	34.4	10.1	66.6	0.126	4.240	0.189	0.9	55.4	6	21	1.1	56.5	1.0	-0.7	0.1	0.9	0.097	1.008	0.096	0.231	0.417
PC-01	PB-01 & PB-02	Foundation Soils	34.5	10.0	71.8	0.047	11.340	0.065	0.9	59.8	0	21	0.0	59.8	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.231	0.427
PC-01	PB-01 & PB-02	Foundation Soils	34.6	9.9	76.0	0.079	15.660	0.104	0.9	63.3	0	21	0.0	63.3	1.0	-0.7	0.1	0.9	0.102	1.009	0.101	0.231	0.438
PC-01	PB-01 & PB-02	Foundation Soils	34.7	9.8	77.0	0.153	16.100	0.199	0.9	64.2	2	21	0.0	64.2	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.231	0.441
PC-01	PB-01 & PB-02	Foundation Soils	34.8	9.7	77.6	0.164	18.080	0.211	0.9	64.6	2	21	0.0	64.6	1.0	-0.7	0.1	0.9	0.103	1.009	0.102	0.231	0.442
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.7	80.6	0.130	17.390	0.161	0.9	67.1	0	21	0.0	67.1	1.0	-0.7	0.1	0.9	0.105	1.010	0.104	0.231	0.451
PC-01	PB-01 & PB-02	Foundation Soils	34.9	9.6	87.1	0.106	17.220	0.122	0.9	72.7	0	21	0.0	72.7	1.0	-0.7	0.1	0.9	0.109	1.011	0.109	0.231	0.470
PC-01	PB-01 & PB-02	Foundation Soils	35.0	9.5	83.7	0.148	17.340	0.177	0.9	69.6	0	21	0.0	69.6	1.0	-0.7	0.1	0.9	0.107	1.010	0.106	0.231	0.459
PC-01	PB-01 & PB-02	Foundation Soils	35.1	9.4	86.1	0.197	18.530	0.229	0.9	71.7	0	21	0.0	71.7	1.0	-0.7	0.1	0.9	0.109	1.010	0.108	0.231	0.466
PC-01	PB-01 & PB-02	Foundation Soils	35.2	9.3	81.8	0.245	18.200	0.300	0.9	67.8	5	21	0.4	68.2	1.0	-0.7	0.1	0.9	0.106	1.010	0.105	0.231	0.454
PC-01	PB-01 & PB-02	Foundation Soils	35.3	9.2	76.2	0.183	19.830	0.240	0.9	62.9	4	21	0.1	63.0	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.231	0.436
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.2	73.6	0.210	23.350	0.285	0.9	60.8	8	21	4.2	64.9	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.231	0.442
PC-01	PB-01 & PB-02	Foundation Soils	35.4	9.1	67.1	0.120	23.390	0.179	0.9	55.0	6	21	0.7	55.7	1.0	-0.8	0.1	0.9	0.096	1.008	0.096	0.231	0.413
PC-01	PB-01 & PB-02	Foundation Soils	35.5	9.0	60.7	0.054	24.350	0.089	0.9	49.4	4	21	0.1	49.6	1.0	-0.8	0.1	0.9	0.092	1.008	0.091	0.231	0.394
PC-01	PB-01 & PB-02	Foundation Soils	35.6	8.9	56.3	0.052	24.860	0.092	0.9	45.7	7	21	2.8	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.231	0.391
PC-01	PB-01 & PB-02	Foundation Soils	35.7	8.8	59.4	0.050	22.770	0.084	0.9	48.2	5	21	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.231	0.391
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.8	70.0	0.045	20.300	0.064	0.9	57.1	0	21	0.0	57.1	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.231	0.417
PC-01	PB-01 & PB-02	Foundation Soils	35.8	8.7	78.1	0.030	18.910	0.038	0.9	64.1	0	21	0.0	64.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.231	0.439
PC-01	PB-01 & PB-02	Foundation Soils	35.9	8.6	84.6	0.034	22.370	0.040	0.9	69.6	0	21	0.0	69.6	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.231	0.457
PC-01	PB-01 & PB-02	Foundation Soils	36.0	8.5	87.3	0.063	25.730	0.072	0.9	71.8	0	21	0.0	71.8	1.0	-0.8	0.1	0.9	0.109	1.010	0.108	0.231	0.465
PC-01	PB-01 & PB-02	Foundation Soils	36.1	8.4	86.3	0.079	24.030	0.092	0.9	70.9	0	21	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.231	0.462
PC-01	PB-01 & PB-02	Foundation Soils	36.2	8.3	85.1	0.114	24.900	0.134	0.9	69.7	0	21	0.0	69.7	1.0	-0.8	0.1	0.9	0.107	1.010	0.106	0.231	0.458
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.3	79.1	0.136	24.390	0.172	0.9	64.5	0	21	0.0	64.5	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.231	0.440
PC-01	PB-01 & PB-02	Foundation Soils	36.3	8.2	77.5	0.175	24.300	0.226	0.9	63.1	4	21	0.0	63.1	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.231	0.436
PC-01	PB-01 & PB-02	Foundation Soils	36.4	8.1	77.4	0.243	21.410	0.314	0.9	63.2	8	21	4.3	67.4	1.0	-0.8	0.1	0.9	0.105	1.010	0.104	0.231	0.450
PC-01	PB-01 & PB-02	Foundation Soils	36.5	8.0	78.3	0.134	21.060	0.171	0.9	63.7	0	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.231	0.437
PC-01	PB-01 & PB-02	Foundation Soils	36.6	7.9	78.2	0.080	26.060	0.102	0.9	63.5	0	21	0.0	63.5	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.231	0.436
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.9	78.6	0.076	17.220	0.097	0.9	63.7	0	21	0.0	63.7	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.231	0.437
PC-01	PB-01 & PB-02	Foundation Soils	36.7	7.8	79.9	0.056	18.460	0.070	0.9	64.8	0	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.231	0.441
PC-01	PB-01 & PB-02	Foundation Soils	36.8	7.7	80.4	0.063	16.250	0.078	0.9	65.1	0	21	0.0	65.1	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.231	0.442
PC-01	PB-01 & PB-02	Foundation Soils	36.9	7.6	76.6	0.081	19.770	0.106	0.9	61.8	0	21	0.0	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.231	0.431
PC-01	PB-01 & PB-02	Foundation Soils	37.0	7.5	73.9	0.054	24.010	0.073	0.9	59.5	0	21	0.0	59.5	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.231	0.423
PC-01	PB-01 & PB-02	Foundation Soils	37.1	7.4	78.0	0.061	23.440	0.078	0.9	62.9	0	21	0.0	62.9	1.0	-0.8	0.1	0.9	0.102	1.009	0.100	0.231	0.434
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.4	89.4	0.159	23.200	0.178	0.9	72.6	0	21	0.0	72.6	1.0	-0.8	0.1	0.9	0.109	1.011	0.108	0.231	0.466

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	37.2	7.3	91.1	0.150	20.440	0.165	0.9	73.9	0	21	0.0	73.9	1.0	-0.8	0.1	0.9	0.110	1.011	0.109	0.231	0.471
PC-01	PB-01 & PB-02	Foundation Soils	37.3	7.2	94.8	0.176	23.850	0.186	0.9	77.0	0	21	0.0	77.0	1.0	-0.8	0.1	0.9	0.113	1.011	0.112	0.231	0.482
PC-01	PB-01 & PB-02	Foundation Soils	37.4	7.1	106.5	0.131	22.680	0.123	0.9	87.0	0	21	0.0	87.0	1.0	-0.8	0.1	0.9	0.123	1.014	0.121	0.231	0.522
PC-01	PB-01 & PB-02	Foundation Soils	37.5	7.0	113.8	0.184	23.060	0.162	0.9	93.3	0	21	0.0	93.3	1.0	-0.8	0.1	0.9	0.129	1.016	0.128	0.231	0.551
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	114.8	0.228	20.490	0.199	0.9	94.0	0	21	0.0	94.0	1.0	-0.8	0.1	0.9	0.130	1.016	0.128	0.231	0.555
PC-01	PB-01 & PB-02	Foundation Soils	37.6	6.9	109.5	0.201	17.480	0.184	0.9	89.4	0	21	0.0	89.4	1.0	-0.8	0.1	0.9	0.125	1.014	0.123	0.231	0.533
PC-01	PB-01 & PB-02	Foundation Soils	37.7	6.8	95.0	0.168	22.580	0.177	0.9	76.7	0	21	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.111	0.231	0.481
PC-01	PB-01 & PB-02	Foundation Soils	37.8	6.7	81.0	0.051	25.200	0.063	0.8	64.8	0	21	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.102	0.231	0.440
PC-01	PB-01 & PB-02	Foundation Soils	37.9	6.6	80.5	0.060	23.820	0.075	0.8	64.3	0	21	0.0	64.3	1.0	-0.8	0.1	0.9	0.103	1.009	0.101	0.231	0.438
PC-01	PB-01 & PB-02	Foundation Soils	38.0	6.5	78.5	0.074	25.770	0.094	0.8	62.5	0	21	0.0	62.5	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.231	0.432
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.5	72.3	0.078	22.250	0.108	0.8	57.3	0	21	0.0	57.3	1.0	-0.8	0.1	0.9	0.097	1.008	0.096	0.231	0.415
PC-01	PB-01 & PB-02	Foundation Soils	38.1	6.4	68.7	0.085	22.740	0.124	0.8	54.1	3	21	0.0	54.1	1.0	-0.8	0.1	0.9	0.095	1.008	0.094	0.231	0.406
PC-01	PB-01 & PB-02	Foundation Soils	38.2	6.3	67.3	0.059	20.450	0.088	0.8	52.9	2	21	0.0	52.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.093	0.231	0.402
PC-01	PB-01 & PB-02	Foundation Soils	38.3	6.2	66.1	0.046	22.280	0.070	0.8	51.9	2	21	0.0	51.9	1.0	-0.8	0.1	0.9	0.094	1.008	0.092	0.231	0.399
PC-01	PB-01 & PB-02	Foundation Soils	38.4	6.1	62.3	0.047	28.210	0.075	0.8	48.6	4	21	0.1	48.7	1.0	-0.8	0.1	0.9	0.091	1.007	0.090	0.231	0.390
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	58.5	0.031	22.290	0.053	0.8	45.6	6	21	1.2	46.8	1.0	-0.8	0.1	0.9	0.090	1.007	0.089	0.231	0.384
PC-01	PB-01 & PB-02	Foundation Soils	38.5	6.0	54.9	0.010	24.060	0.018	0.8	43.4	14	21	18.5	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.231	0.430
PC-01	PB-01 & PB-02	Foundation Soils	38.6	5.9	55.4	0.010	23.440	0.018	0.8	43.7	14	21	18.1	61.8	1.0	-0.8	0.1	0.9	0.101	1.009	0.099	0.231	0.429
PC-01	PB-01 & PB-02	Foundation Soils	38.7	5.8	56.3	0.038	27.780	0.068	0.8	43.7	8	21	3.5	47.2	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.231	0.385
PC-01	PB-01 & PB-02	Foundation Soils	38.8	5.7	59.2	0.063	22.760	0.107	0.8	46.0	7	21	3.1	49.1	1.0	-0.9	0.1	0.9	0.092	1.007	0.090	0.231	0.390
PC-01	PB-01 & PB-02	Foundation Soils	38.9	5.6	60.1	0.035	23.060	0.058	0.8	46.5	5	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.231	0.384
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.6	60.1	0.037	24.540	0.062	0.8	46.5	5	21	0.5	47.0	1.0	-0.9	0.1	0.9	0.090	1.007	0.089	0.231	0.384
PC-01	PB-01 & PB-02	Foundation Soils	39.0	5.5	64.7	0.027	23.160	0.042	0.8	50.2	3	21	0.0	50.2	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.231	0.394
PC-01	PB-01 & PB-02	Foundation Soils	39.1	5.4	62.5	0.015	24.390	0.024	0.8	48.5	7	21	3.0	51.5	1.0	-0.9	0.1	0.9	0.093	1.008	0.092	0.231	0.397
PC-01	PB-01 & PB-02	Foundation Soils	39.2	5.3	64.8	0.015	25.350	0.023	0.8	50.2	6	21	1.6	51.8	1.0	-0.9	0.1	0.9	0.094	1.008	0.092	0.231	0.398
PC-01	PB-01 & PB-02	Foundation Soils	39.3	5.2	64.5	0.043	25.490	0.067	0.8	49.9	3	21	0.0	49.9	1.0	-0.9	0.1	0.9	0.092	1.008	0.091	0.231	0.392
PC-01	PB-01 & PB-02	Foundation Soils	39.4	5.1	65.2	0.062	26.010	0.095	0.8	50.3	4	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.231	0.394
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.1	65.3	0.055	27.690	0.084	0.8	50.4	3	21	0.0	50.4	1.0	-0.9	0.1	0.9	0.093	1.008	0.091	0.231	0.394
PC-01	PB-01 & PB-02	Foundation Soils	39.5	5.0	67.4	0.064	25.380	0.095	0.8	52.0	3	21	0.0	52.0	1.0	-0.9	0.1	0.8	0.094	1.008	0.092	0.231	0.399
PC-01	PB-01 & PB-02	Foundation Soils	39.6	4.9	73.9	0.118	29.680	0.160	0.8	57.3	3	21	0.0	57.3	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.231	0.415
PC-01	PB-01 & PB-02	Foundation Soils	39.7	4.8	78.1	0.131	28.680	0.168	0.8	60.8	1	21	0.0	60.8	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.231	0.425
PC-01	PB-01 & PB-02	Foundation Soils	39.8	4.7	77.8	0.068	25.680	0.087	0.8	60.4	0	21	0.0	60.4	1.0	-0.9	0.1	0.8	0.100	1.009	0.098	0.231	0.424
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.7	76.5	0.050	27.300	0.065	0.8	59.3	0	21	0.0	59.3	1.0	-0.9	0.1	0.8	0.099	1.009	0.097	0.231	0.421
PC-01	PB-01 & PB-02	Foundation Soils	39.9	4.6	78.8	0.077	27.400	0.098	0.8	61.1	0	21	0.0	61.1	1.0	-0.9	0.1	0.8	0.100	1.009	0.099	0.231	0.426
PC-01	PB-01 & PB-02	Foundation Soils	40.0	4.5	87.0	0.098	30.350	0.113	0.8	67.9	0	21	0.0	67.9	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.231	0.448
PC-01	PB-01 & PB-02	Foundation Soils	40.1	4.4	85.5	0.131	20.670	0.153	0.8	66.5	0	21	0.0	66.5	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.231	0.444
PC-01	PB-01 & PB-02	Foundation Soils	40.2	4.3	83.7	0.236	20.110	0.282	0.8	65.0	5	21	0.5	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.231	0.440
PC-01	PB-01 & PB-02	Foundation Soils	40.3	4.2	80.3	0.170	33.460	0.212	0.8	62.0	3	21	0.0	62.1	1.0	-0.9	0.1	0.8	0.101	1.009	0.099	0.231	0.429
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.2	81.1	0.152	27.820	0.187	0.8	62.7	1	21	0.0	62.7	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.231	0.431
PC-01	PB-01 & PB-02	Foundation Soils	40.4	4.1	88.4	0.131	28.780	0.148	0.8	68.6	0	21	0.0	68.6	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.231	0.451
PC-01	PB-01 & PB-02	Foundation Soils	40.5	4.0	89.7	0.134	18.820	0.149	0.8	69.6	0	21	0.0	69.6	1.0	-0.9	0.1	0.8	0.107	1.010	0.105	0.231	0.454
PC-01	PB-01 & PB-02	Foundation Soils	40.6	3.9	87.9	0.164	24.530	0.187	0.8	68.1	0	21	0.0	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.231	0.449
PC-01	PB-01 & PB-02	Foundation Soils	40.7	3.8	94.2	0.263	27.680	0.279	0.8	73.3	1	21	0.0	73.3	1.0	-0.9	0.1	0.8	0.110	1.011	0.108	0.231	0.466
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	84.9	0.211	21.760	0.248	0.8	65.5	3	21	0.0	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.231	0.440
PC-01	PB-01 & PB-02	Foundation Soils	40.8	3.7	83.5	0.245	23.300	0.294	0.8	64.3	6	21	1.2	65.5	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.231	0.440
PC-01	PB-01 & PB-02	Foundation Soils	40.9	3.6	81.9	0.243	26.230	0.297	0.8	63.1	7	21	2.3	65.3	1.0	-0.9	0.1	0.8	0.104	1.009	0.102	0.231	0.440
PC-01	PB-01 & PB-02	Foundation Soils	41.0	3.5	81.2	0.233	24.010	0.287	0.8	62.4	7	21	2.1	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.231	0.437
PC-01	PB-01 & PB-02	Foundation Soils	41.1	3.4	83.8	0.156	25.150	0.186	0.8	64.3	1	21	0.0	64.3	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.231	0.436
PC-01	PB-01 & PB-02	Foundation Soils	41.2	3.3	95.6	0.124	24.540	0.130	0.8	74.0	0	21	0.0	74.0	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.231	0.469
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.3	106.6	0.146	20.320	0.137	0.8	83.1	0	21	0.0	83.1	1.0	-0.9	0.1	0.8	0.119	1.013	0.116	0.231	0.503
PC-01	PB-01 & PB-02	Foundation Soils	41.3	3.2	118.9	0.082	16.390	0.069	0.8	93.5	0	21	0.0	93.5	1.0	-0.9	0.1	0.8	0.129	1.016	0.127	0.231	0.548
PC-01	PB-01 & PB-02	Foundation Soils	41.4	3.1	111.7	0.071	20.770	0.064	0.8	87.3	0	21	0.0	87.3	1.0	-0.9	0.1	0.8	0.123	1.014	0.120	0.231	0.520
PC-01	PB-01 & PB-02	Foundation Soils	41.5	3.0	96.1	0.086	31.400	0.090	0.8	74.1	0	21	0.0	74.1	1.0	-0.9	0.1	0.8	0.111	1.011	0.108	0.231	0.469
PC-01	PB-01 & PB-02	Foundation Soils	41.6	2.9	87.2	0.094	30.460	0.108	0.8	66.7	0	21	0.0	66.7	1.0	-0.9	0.1	0.8	0.105	1.010	0.103	0.231	0.444
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	84.5	0.129	30.250	0.153	0.8	64.4	0	21	0.0	64.4	1.0	-0.9	0.1	0.8	0.103	1.009	0.101	0.231	0.436
PC-01	PB-01 & PB-02	Foundation Soils	41.7	2.8	83.5	0.203	29.160	0.243	0.8	63.5	4	21	0.0	63.5	1.0	-0.9	0.1	0.8	0.102	1.009	0.100	0.231	0.433
PC-01	PB-01 & PB-02	Foundation Soils	41.8	2.7	76.1	0.158	34.160	0.208	0.8	57.4	5	21	0.5	57.9	1.0	-0.9	0.1	0.8	0.098	1.008	0.096	0.231	0.416
PC-01	PB-01 & PB-02	Foundation Soils	41.9	2.6	73.6	0.101	33.670	0.137	0.8	55.3	3	21	0.0	55.3	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.231	0.408
PC-01	PB-01 & PB-02	Foundation Soils	42.0	2.5	73.3	0.118	25.490	0.161	0.8	55.0	4	21	0.1	55.1	1.0	-0.9	0.1	0.8	0.096	1.008	0.094	0.231	0.407
PC-01	PB-01 & PB-02	Foundation Soils	42.1	2.4	72.1	0.121	18.070	0.168	0.8	54.0	5	21	0.3	54.4	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.231	0.405
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.4	69.5	0.105	24.970	0.151	0.8	51.9	5	21	0.6	52.4	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.231	0.399
PC-01	PB-01 & PB-02	Foundation Soils	42.2	2.3	67.3	0.113	23.350	0.168	0.8	50.2	7	21	3.2	53.4	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.231	0.402

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	42.3	2.2	65.4	0.087	15.060	0.133	0.8	48.6	7	21	1.7	50.3	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.231	0.393
PC-01	PB-01 & PB-02	Foundation Soils	42.4	2.1	63.4	0.119	17.770	0.188	0.8	47.5	10	21	10.4	58.0	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.231	0.416
PC-01	PB-01 & PB-02	Foundation Soils	42.5	2.0	61.7	0.115	21.200	0.186	0.8	46.3	11	21	12.7	59.0	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.231	0.419
PC-01	PB-01 & PB-02	Foundation Soils	42.6	1.9	63.2	0.085	20.250	0.135	0.8	46.8	8	21	4.1	50.9	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.231	0.395
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.9	69.4	0.069	28.870	0.099	0.8	51.4	3	21	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.091	0.231	0.396
PC-01	PB-01 & PB-02	Foundation Soils	42.7	1.8	82.5	0.059	-3.630	0.072	0.8	61.9	0	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.231	0.428
PC-01	PB-01 & PB-02	Foundation Soils	42.8	1.7	88.9	0.067	-12.150	0.075	0.8	67.0	0	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.231	0.445
PC-01	PB-01 & PB-02	Foundation Soils	42.9	1.6	88.9	0.071	12.670	0.080	0.8	67.0	0	21	0.0	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.103	0.231	0.445
PC-01	PB-01 & PB-02	Foundation Soils	43.0	1.5	82.7	0.054	24.110	0.065	0.8	61.9	0	21	0.0	61.9	1.0	-1.0	0.1	0.8	0.101	1.009	0.099	0.231	0.428
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.5	81.0	0.071	26.040	0.088	0.8	60.4	0	21	0.0	60.4	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.231	0.424
PC-01	PB-01 & PB-02	Foundation Soils	43.1	1.4	80.2	0.080	26.350	0.100	0.8	59.7	0	21	0.0	59.7	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.231	0.421
PC-01	PB-01 & PB-02	Foundation Soils	43.2	1.3	84.2	0.083	22.110	0.099	0.8	62.9	0	21	0.0	62.9	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.231	0.431
PC-01	PB-01 & PB-02	Foundation Soils	43.3	1.2	94.9	0.159	22.540	0.168	0.8	71.5	0	21	0.0	71.5	1.0	-1.0	0.1	0.8	0.109	1.010	0.106	0.230	0.460
PC-01	PB-01 & PB-02	Foundation Soils	43.4	1.1	99.7	0.203	20.730	0.204	0.8	75.4	0	21	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.109	0.230	0.473
PC-01	PB-01 & PB-02	Foundation Soils	43.5	1.0	101.6	0.278	26.820	0.274	0.8	76.9	0	21	0.0	76.9	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.230	0.479
PC-01	PB-01 & PB-02	Foundation Soils	43.6	1.0	101.0	0.456	31.490	0.452	0.8	76.6	8	21	3.8	80.4	1.0	-1.0	0.1	0.8	0.116	1.012	0.113	0.230	0.492
PC-01	PB-01 & PB-02	Foundation Soils	43.6	0.9	98.3	0.358	25.660	0.364	0.8	74.0	5	21	0.3	74.3	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.230	0.469
PC-01	PB-01 & PB-02	Foundation Soils	43.7	0.8	96.5	0.378	29.880	0.392	0.8	72.6	7	21	2.1	74.7	1.0	-1.0	0.1	0.8	0.111	1.011	0.108	0.230	0.471
PC-01	PB-01 & PB-02	Foundation Soils	43.8	0.7	87.7	0.456	25.630	0.520	0.8	67.0	14	21	21.9	88.9	1.0	-1.0	0.1	0.8	0.124	1.014	0.121	0.230	0.526
PC-01	PB-01 & PB-02	Foundation Soils	43.9	0.6	82.8	0.362	25.870	0.437	0.8	62.7	13	21	18.8	81.5	1.0	-1.0	0.1	0.8	0.117	1.012	0.114	0.230	0.496
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.6	84.2	0.267	24.500	0.317	0.8	62.6	8	21	4.3	67.0	1.0	-1.0	0.1	0.8	0.105	1.010	0.102	0.230	0.444
PC-01	PB-01 & PB-02	Foundation Soils	44.0	0.5	101.8	0.295	23.200	0.290	0.8	76.5	1	21	0.0	76.5	1.0	-1.0	0.1	0.8	0.113	1.011	0.110	0.230	0.477
PC-01	PB-01 & PB-02	Foundation Soils	44.1	0.4	114.7	0.382	21.390	0.333	0.8	87.1	0	21	0.0	87.1	1.0	-1.0	0.1	0.8	0.123	1.014	0.119	0.230	0.519
PC-01	PB-01 & PB-02	Foundation Soils	44.2	0.3	127.1	0.226	17.870	0.178	0.8	97.4	0	21	0.0	97.4	1.0	-1.0	0.1	0.8	0.134	1.017	0.130	0.230	0.567
PC-01	PB-01 & PB-02	Foundation Soils	44.3	0.2	143.1	0.109	14.800	0.076	0.8	110.9	0	21	0.0	110.9	1.0	-1.0	0.1	0.8	0.154	1.022	0.149	0.230	0.649
PC-01	PB-01 & PB-02	Foundation Soils	44.4	0.1	163.0	0.128	18.580	0.079	0.8	128.0	0	21	0.0	128.0	0.9	-1.0	0.1	0.8	0.192	1.031	0.187	0.230	0.811
PC-01	PB-01 & PB-02	Foundation Soils	44.5	0.1	181.4	0.133	1.410	0.073	0.8	144.1	0	21	0.0	144.1	0.9	-1.0	0.1	0.8	0.254	1.041	0.247	0.230	1.076
PC-01	PB-01 & PB-02	Foundation Soils	44.5	-0.0	166.9	0.088	17.580	0.053	0.8	131.2	0	21	0.0	131.2	0.9	-1.0	0.1	0.8	0.201	1.032	0.196	0.230	0.852
PC-01	PB-01 & PB-02	Foundation Soils	44.6	-0.1	120.8	0.130	26.960	0.108	0.8	91.7	0	21	0.0	91.7	1.0	-1.0	0.1	0.8	0.127	1.015	0.124	0.230	0.539
PC-01	PB-01 & PB-02	Foundation Soils	44.7	-0.2	105.8	0.152	23.390	0.144	0.8	79.2	0	21	0.0	79.2	1.0	-1.0	0.1	0.8	0.115	1.012	0.112	0.230	0.487
PC-01	PB-01 & PB-02	Foundation Soils	44.8	-0.3	93.1	0.114	16.600	0.122	0.8	68.8	0	21	0.0	68.8	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.230	0.451
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	88.5	0.092	-1.360	0.104	0.8	65.0	0	21	0.0	65.0	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.230	0.438
PC-01	PB-01 & PB-02	Foundation Soils	44.9	-0.4	89.1	0.122	-6.630	0.137	0.8	65.4	0	21	0.0	65.4	1.0	-1.0	0.1	0.8	0.104	1.009	0.101	0.230	0.439
PC-01	PB-01 & PB-02	Foundation Soils	45.0	-0.5	88.8	0.112	-0.670	0.126	0.8	65.1	0	21	0.0	65.1	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.230	0.439
PC-01	PB-01 & PB-02	Foundation Soils	45.1	-0.6	86.3	0.153	9.030	0.177	0.8	63.1	0	21	0.0	63.1	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.230	0.432
PC-01	PB-01 & PB-02	Foundation Soils	45.2	-0.7	84.4	0.157	11.520	0.186	0.8	61.5	2	21	0.0	61.5	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.230	0.427
PC-01	PB-01 & PB-02	Foundation Soils	45.3	-0.8	86.1	0.155	13.050	0.180	0.8	62.8	1	21	0.0	62.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.230	0.431
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.8	86.1	0.168	21.250	0.195	0.8	62.7	2	21	0.0	62.7	1.0	-1.0	0.1	0.8	0.102	1.009	0.099	0.230	0.431
PC-01	PB-01 & PB-02	Foundation Soils	45.4	-0.9	78.0	0.203	28.460	0.260	0.8	56.7	8	21	4.9	61.6	1.0	-1.0	0.1	0.8	0.101	1.009	0.098	0.230	0.427
PC-01	PB-01 & PB-02	Foundation Soils	45.5	-1.0	73.2	0.192	12.290	0.262	0.8	53.3	10	21	10.5	63.8	1.0	-1.0	0.1	0.8	0.102	1.009	0.100	0.230	0.435
PC-01	PB-01 & PB-02	Foundation Soils	45.6	-1.1	66.7	0.178	20.080	0.267	0.8	48.8	14	21	18.9	67.6	1.0	-1.1	0.1	0.8	0.105	1.010	0.103	0.230	0.447
PC-01	PB-01 & PB-02	Foundation Soils	45.7	-1.2	59.8	0.238	15.910	0.398	0.8	44.2	23	21	33.4	77.6	1.0	-1.1	0.1	0.8	0.114	1.012	0.110	0.229	0.481
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	55.6	0.553	13.660	0.995	0.8	41.4	41	21	43.1	84.5	1.0	-1.1	0.1	0.8	0.120	1.013	0.117	0.229	0.508
PC-01	PB-01 & PB-02	Foundation Soils	45.8	-1.3	49.1	2.187	18.150	4.452	0.8	36.5	85	21	46.6	83.2	1.0	-1.1	0.1	0.8	0.119	1.013	0.115	0.229	0.502
PC-01	PB-01 & PB-02	Foundation Soils	45.9	-1.4	51.8	3.372	14.250	6.507	0.8	38.6	92	21	47.4	86.0	1.0	-1.1	0.1	0.8	0.121	1.014	0.118	0.229	0.514
PC-01	PB-01 & PB-02	Foundation Soils	46.0	-1.5	78.8	3.907	16.420	4.957	0.8	60.2	75	21	51.4	111.7	0.9	-1.1	0.1	0.8	0.155	1.022	0.150	0.229	0.654
PC-01	PB-01 & PB-02	Foundation Soils	46.1	-1.6	137.9	4.454	22.440	3.229	0.8	110.1	44	21	57.9	168.0	0.9	-1.1	0.1	0.8	0.471	1.061	0.458	0.229	1.997
PC-01	PB-01 & PB-02	Foundation Soils	46.2	-1.7	257.6	2.926	69.300	1.136	0.9	211.0	2	21	0.0	211.0	0.9	-1.1	0.1	0.8	3.724	1.082	3.485	0.229	15.195
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.7	252.0	2.349	34.800	0.932	0.9	205.7	0	21	0.0	205.7	0.9	-1.1	0.1	0.8	2.650	1.082	2.503	0.229	10.917
PC-01	PB-01 & PB-02	Foundation Soils	46.3	-1.8	188.8	1.966	-6.240	1.041	0.8	149.0	8	21	5.5	154.5	0.9	-1.1	0.1	0.8	0.321	1.049	0.312	0.229	1.360
PC-01	PB-01 & PB-02	Foundation Soils	46.4	-1.9	189.3	1.102	-17.800	0.582	0.8	148.6	0	21	0.0	148.6	0.9	-1.1	0.1	0.8	0.280	1.044	0.271	0.229	1.184
PC-01	PB-01 & PB-02	Foundation Soils	46.5	-2.0	145.8	0.768	-19.200	0.527	0.8	110.9	0	21	0.0	110.9	0.9	-1.1	0.1	0.8	0.153	1.022	0.149	0.229	0.648
PC-01	PB-01 & PB-02	Foundation Soils	46.6	-2.1	136.6	0.633	-18.770	0.463	0.8	103.0	0	21	0.0	103.0	1.0	-1.1	0.1	0.8	0.141	1.019	0.137	0.229	0.597
PC-01	PB-01 & PB-02	Foundation Soils	46.7	-2.2	125.6	0.497	-18.580	0.396	0.8	93.7	0	21	0.0	93.7	1.0	-1.1	0.1	0.8	0.130	1.016	0.126	0.229	0.548
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.2	108.3	0.426	-16.160	0.394	0.8	79.4	4	21	0.1	79.5	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.229	0.488
PC-01	PB-01 & PB-02	Foundation Soils	46.8	-2.3	100.3	0.407	-1.630	0.406	0.8	73.2	7	21	2.5	75.8	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.229	0.475
PC-01	PB-01 & PB-02	Foundation Soils	46.9	-2.4	94.7	0.414	-6.710	0.437	0.8	69.3	10	21	10.0	79.3	1.0	-1.1	0.1	0.8	0.115	1.012	0.112	0.229	0.488
PC-01	PB-01 & PB-02	Foundation Soils	47.0	-2.5	82.8	0.242	-14.340	0.292	0.8	59.4	8	21	5.0	64.4	1.0	-1.1	0.1	0.8	0.103	1.009	0.100	0.229	0.437
PC-01	PB-01 & PB-02	Foundation Soils	47.1	-2.6	74.6	0.288	-3.150	0.386	0.8	54.5	16	21	23.5	78.0	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.229	0.483
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.6	67.4	0.268	-15.940	0.398	0.8	49.2	19	21	29.6	78.9	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.229	0.486
PC-01	PB-01 & PB-02	Foundation Soils	47.2	-2.7	51.6	0.175	-18.010	0.339	0.8	37.3	26	21	35.1	72.5	1.0	-1.1	0.1	0.8	0.109	1.011	0.106	0.229	0.463
PC-01	PB-01 & PB-02	Foundation Soils	47.3	-2.8	53.7	0.196	4.160	0.365	0.8	38.9	25	21	35.2	74.1	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.229	0.469

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	47.4	-2.9	44.7	0.199	6.720	0.446	0.8	32.2	34	21	39.2	71.4	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.229	0.460
PC-01	PB-01 & PB-02	Foundation Soils	47.5	-3.0	45.1	0.118	7.720	0.262	0.8	32.4	27	21	35.3	67.7	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.229	0.447
PC-01	PB-01 & PB-02	Foundation Soils	47.6	-3.1	48.2	0.240	19.150	0.498	0.8	34.8	34	21	39.4	74.2	1.0	-1.1	0.1	0.8	0.111	1.011	0.107	0.229	0.469
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.1	45.7	0.431	22.490	0.943	0.8	33.1	46	21	42.6	75.7	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.229	0.475
PC-01	PB-01 & PB-02	Foundation Soils	47.7	-3.2	45.7	0.483	25.970	1.058	0.8	33.1	48	21	43.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.109	0.229	0.476
PC-01	PB-01 & PB-02	Foundation Soils	47.8	-3.3	53.4	0.412	33.480	0.772	0.8	38.8	38	21	41.7	80.5	1.0	-1.1	0.1	0.8	0.116	1.012	0.113	0.229	0.492
PC-01	PB-01 & PB-02	Foundation Soils	47.9	-3.4	76.3	0.358	32.100	0.469	0.8	55.7	18	21	28.7	84.3	1.0	-1.1	0.1	0.8	0.120	1.013	0.116	0.228	0.507
PC-01	PB-01 & PB-02	Foundation Soils	48.0	-3.5	104.8	0.337	-9.430	0.322	0.8	75.6	2	21	0.0	75.6	1.0	-1.1	0.1	0.8	0.112	1.011	0.108	0.228	0.474
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.5	64.0	0.313	-0.570	0.489	0.8	46.5	24	21	35.4	81.9	1.0	-1.1	0.1	0.8	0.118	1.013	0.114	0.228	0.498
PC-01	PB-01 & PB-02	Foundation Soils	48.1	-3.6	59.9	0.291	-0.730	0.486	0.8	43.4	26	21	36.7	80.1	1.0	-1.1	0.1	0.8	0.116	1.012	0.112	0.228	0.491
PC-01	PB-01 & PB-02	Foundation Soils	48.2	-3.7	52.5	0.382	7.340	0.728	0.8	38.0	37	21	41.4	79.4	1.0	-1.1	0.1	0.8	0.115	1.012	0.111	0.228	0.488
PC-01	PB-01 & PB-02	Foundation Soils	48.3	-3.8	44.2	0.350	-0.330	0.791	0.8	31.7	44	21	42.0	73.7	1.0	-1.1	0.1	0.8	0.110	1.011	0.107	0.228	0.468
PC-01	PB-01 & PB-02	Foundation Soils	48.4	-3.9	38.4	0.338	14.770	0.879	0.8	27.4	50	21	42.2	69.6	1.0	-1.1	0.1	0.8	0.107	1.010	0.104	0.228	0.454
PC-01	PB-01 & PB-02	Foundation Soils	48.5	-4.0	36.1	0.089	-3.890	0.247	0.7	25.5	34	21	37.9	63.3	1.0	-1.1	0.1	0.8	0.102	1.009	0.099	0.228	0.434
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.0	52.2	0.156	-4.960	0.299	0.8	37.2	24	21	33.7	70.9	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.228	0.458
PC-01	PB-01 & PB-02	Foundation Soils	48.6	-4.1	66.4	0.118	-5.060	0.178	0.7	46.3	10	21	10.1	56.4	1.0	-1.1	0.1	0.8	0.097	1.008	0.094	0.228	0.412
PC-01	PB-01 & PB-02	Foundation Soils	48.7	-4.2	94.5	0.081	11.120	0.086	0.8	66.9	0	21	0.0	66.9	1.0	-1.1	0.1	0.8	0.105	1.010	0.102	0.228	0.445
PC-01	PB-01 & PB-02	Foundation Soils	48.8	-4.3	67.9	0.247	-3.050	0.364	0.8	48.6	18	21	27.9	76.6	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.228	0.478
PC-01	PB-01 & PB-02	Foundation Soils	48.9	-4.4	51.0	0.302	-5.150	0.592	0.8	36.5	35	21	40.2	76.8	1.0	-1.1	0.1	0.8	0.113	1.011	0.109	0.228	0.479
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	46.0	0.188	3.410	0.409	0.8	32.7	33	21	38.5	71.2	1.0	-1.1	0.1	0.8	0.108	1.010	0.105	0.228	0.459
PC-01	PB-01 & PB-02	Foundation Soils	49.0	-4.5	43.5	0.173	9.220	0.397	0.8	30.8	34	21	38.8	69.6	1.0	-1.2	0.1	0.8	0.107	1.010	0.104	0.228	0.454
PC-01	PB-01 & PB-02	Foundation Soils	49.1	-4.6	50.5	0.130	11.560	0.258	0.7	35.7	24	21	33.0	68.7	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.228	0.451
PC-01	PB-01 & PB-02	Foundation Soils	49.2	-4.7	61.2	0.097	14.910	0.158	0.7	42.5	12	21	15.0	57.5	1.0	-1.2	0.1	0.8	0.098	1.008	0.095	0.228	0.416
PC-01	PB-01 & PB-02	Foundation Soils	49.3	-4.8	40.2	0.096	18.110	0.239	0.7	28.2	31	21	36.7	64.9	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.228	0.439
PC-01	PB-01 & PB-02	Foundation Soils	49.4	-4.9	27.8	0.272	29.060	0.979	0.7	19.4	74	21	42.4	61.8	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.228	0.429
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-4.9	21.7	0.152	29.830	0.700	0.7	15.0	78	21	41.7	56.7	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.228	0.413
PC-01	PB-01 & PB-02	Foundation Soils	49.5	-5.0	18.6	0.084	33.990	0.451	0.7	12.8	78	21	41.2	54.0	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.228	0.405
PC-01	PB-01 & PB-02	Foundation Soils	49.6	-5.1	21.9	0.140	33.450	0.638	0.7	15.1	77	21	41.6	56.8	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.228	0.414
PC-01	PB-01 & PB-02	Foundation Soils	49.7	-5.2	43.4	0.330	35.490	0.760	0.7	30.7	44	21	41.8	72.5	1.0	-1.2	0.1	0.8	0.109	1.011	0.106	0.228	0.464
PC-01	PB-01 & PB-02	Foundation Soils	49.8	-5.3	66.5	0.527	40.450	0.792	0.8	48.1	32	21	41.1	89.2	1.0	-1.2	0.1	0.8	0.125	1.014	0.120	0.228	0.528
PC-01	PB-01 & PB-02	Foundation Soils	49.9	-5.4	80.5	0.664	22.790	0.825	0.8	58.8	27	21	39.9	98.6	0.9	-1.2	0.1	0.8	0.136	1.017	0.130	0.227	0.574
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.4	80.2	0.700	9.910	0.873	0.8	58.5	28	21	40.8	99.3	0.9	-1.2	0.1	0.8	0.136	1.018	0.131	0.227	0.577
PC-01	PB-01 & PB-02	Foundation Soils	50.0	-5.5	84.9	0.388	-14.150	0.457	0.8	60.7	15	21	22.8	83.5	1.0	-1.2	0.1	0.8	0.119	1.013	0.115	0.227	0.505
PC-01	PB-01 & PB-02	Foundation Soils	50.1	-5.6	90.0	0.269	-18.580	0.299	0.7	62.6	7	21	2.1	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.227	0.439
PC-01	PB-01 & PB-02	Foundation Soils	50.2	-5.7	94.6	0.207	-19.400	0.219	0.7	65.9	1	21	0.0	65.9	1.0	-1.2	0.1	0.8	0.104	1.009	0.101	0.227	0.443
PC-01	PB-01 & PB-02	Foundation Soils	50.3	-5.8	83.3	0.435	-23.200	0.522	0.8	59.8	18	21	28.6	88.5	0.9	-1.2	0.1	0.8	0.124	1.014	0.119	0.227	0.525
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.8	74.8	0.638	-21.960	0.853	0.8	54.2	30	21	41.1	95.3	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.227	0.557
PC-01	PB-01 & PB-02	Foundation Soils	50.4	-5.9	70.2	0.595	-20.060	0.848	0.8	50.6	32	21	41.5	92.1	0.9	-1.2	0.1	0.8	0.128	1.015	0.123	0.227	0.541
PC-01	PB-01 & PB-02	Foundation Soils	50.5	-6.0	58.3	0.517	-14.980	0.887	0.8	41.6	38	21	42.4	84.0	1.0	-1.2	0.1	0.8	0.120	1.013	0.115	0.227	0.507
PC-01	PB-01 & PB-02	Foundation Soils	50.6	-6.1	57.2	0.280	-11.240	0.490	0.7	40.4	29	21	37.8	78.2	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.227	0.485
PC-01	PB-01 & PB-02	Foundation Soils	50.7	-6.2	56.9	0.161	-9.350	0.283	0.7	39.7	21	21	31.0	70.7	1.0	-1.2	0.1	0.8	0.108	1.010	0.104	0.227	0.459
PC-01	PB-01 & PB-02	Foundation Soils	50.8	-6.3	58.5	0.207	-6.620	0.354	0.7	41.1	23	21	33.4	74.5	1.0	-1.2	0.1	0.8	0.111	1.011	0.107	0.227	0.472
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.3	60.3	0.261	0.630	0.433	0.7	42.5	25	21	35.5	78.0	1.0	-1.2	0.1	0.8	0.114	1.012	0.110	0.227	0.484
PC-01	PB-01 & PB-02	Foundation Soils	50.9	-6.4	64.4	0.193	-1.190	0.300	0.7	44.9	18	21	26.9	71.8	1.0	-1.2	0.1	0.8	0.109	1.010	0.105	0.227	0.463
PC-01	PB-01 & PB-02	Foundation Soils	51.0	-6.5	63.5	0.128	-11.920	0.202	0.7	43.6	14	21	18.7	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.227	0.431
PC-01	PB-01 & PB-02	Foundation Soils	51.1	-6.6	42.3	0.151	-17.720	0.357	0.7	29.3	34	21	38.5	67.8	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.227	0.449
PC-01	PB-01 & PB-02	Foundation Soils	51.2	-6.7	35.5	0.203	-14.680	0.572	0.7	24.5	47	21	40.9	65.4	1.0	-1.2	0.1	0.8	0.104	1.009	0.100	0.227	0.441
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.7	32.4	0.252	-2.290	0.779	0.7	22.2	55	21	41.6	63.8	1.0	-1.2	0.1	0.8	0.102	1.009	0.099	0.227	0.437
PC-01	PB-01 & PB-02	Foundation Soils	51.3	-6.8	29.1	0.148	12.150	0.509	0.7	19.9	51	21	40.7	60.6	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.227	0.426
PC-01	PB-01 & PB-02	Foundation Soils	51.4	-6.9	28.1	0.152	25.060	0.540	0.7	19.2	53	21	40.8	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.096	0.227	0.425
PC-01	PB-01 & PB-02	Foundation Soils	51.5	-7.0	30.9	0.242	30.770	0.784	0.7	21.1	56	21	41.6	62.7	1.0	-1.2	0.1	0.8	0.102	1.009	0.098	0.226	0.433
PC-01	PB-01 & PB-02	Foundation Soils	51.6	-7.1	40.4	0.226	31.260	0.559	0.7	27.9	42	21	40.7	68.6	1.0	-1.2	0.1	0.8	0.106	1.010	0.102	0.226	0.452
PC-01	PB-01 & PB-02	Foundation Soils	51.7	-7.2	48.8	0.362	17.370	0.741	0.7	34.1	41	21	41.7	75.7	1.0	-1.2	0.1	0.8	0.112	1.011	0.108	0.226	0.476
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.2	62.4	0.289	9.960	0.463	0.7	43.7	25	21	35.8	79.6	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.226	0.491
PC-01	PB-01 & PB-02	Foundation Soils	51.8	-7.3	72.5	0.112	-3.700	0.155	0.7	48.4	7	21	2.6	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.090	0.226	0.398
PC-01	PB-01 & PB-02	Foundation Soils	51.9	-7.4	60.2	0.088	3.190	0.146	0.7	40.6	13	21	16.6	57.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.226	0.416
PC-01	PB-01 & PB-02	Foundation Soils	52.0	-7.5	57.3	0.330	19.240	0.576	0.7	40.0	32	21	39.4	79.4	1.0	-1.2	0.1	0.8	0.115	1.012	0.111	0.226	0.490
PC-01	PB-01 & PB-02	Foundation Soils	52.1	-7.6	63.2	0.251	19.250	0.397	0.7	44.0	23	21	33.3	77.3	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.226	0.483
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	70.4	0.260	30.170	0.370	0.7	48.9	18	21	27.9	76.8	1.0	-1.2	0.1	0.8	0.113	1.011	0.109	0.226	0.481
PC-01	PB-01 & PB-02	Foundation Soils	52.2	-7.7	77.3	0.610	28.190	0.789	0.8	55.0	28	21	40.0	95.0	0.9	-1.2	0.1	0.8	0.131	1.016	0.126	0.226	0.556
PC-01	PB-01 & PB-02	Foundation Soils	52.3	-7.8	95.0	0.893	23.390	0.940	0.8	68.8	26	21	40.2	109.0	0.9	-1.2	0.1	0.8	0.150	1.021	0.144	0.226	0.636
PC-01	PB-01 & PB-02	Foundation Soils	52.4	-7.9	85.1	0.607	4.340	0.713	0.8	60.7	23	21	36.6	97.3	0.9	-1.2	0.1	0.8	0.134	1.017	0.128	0.226	0.568

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	52.5	-8.0	70.3	0.302	14.090	0.430	0.7	49.0	21	21	31.5	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.226	0.494
PC-01	PB-01 & PB-02	Foundation Soils	52.6	-8.1	60.0	0.290	-11.580	0.484	0.7	41.7	27	21	37.2	78.9	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.226	0.489
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.1	68.9	0.311	-1.020	0.451	0.7	48.0	22	21	33.1	81.2	0.9	-1.3	0.1	0.8	0.117	1.012	0.112	0.226	0.497
PC-01	PB-01 & PB-02	Foundation Soils	52.7	-8.2	71.7	0.266	-7.620	0.371	0.7	49.6	18	21	27.3	76.9	1.0	-1.3	0.1	0.8	0.113	1.011	0.109	0.226	0.482
PC-01	PB-01 & PB-02	Foundation Soils	52.8	-8.3	80.3	0.336	-11.190	0.419	0.7	55.8	16	21	24.7	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.226	0.495
PC-01	PB-01 & PB-02	Foundation Soils	52.9	-8.4	91.9	0.293	2.950	0.319	0.7	62.4	8	21	3.9	66.3	1.0	-1.3	0.1	0.8	0.104	1.010	0.100	0.226	0.446
PC-01	PB-01 & PB-02	Foundation Soils	53.0	-8.5	116.1	0.315	-1.000	0.271	0.7	80.5	0	21	0.0	80.5	0.9	-1.3	0.1	0.8	0.116	1.012	0.112	0.225	0.495
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	140.4	0.234	-0.910	0.167	0.8	100.0	0	21	0.0	100.0	0.9	-1.3	0.1	0.8	0.137	1.018	0.131	0.225	0.582
PC-01	PB-01 & PB-02	Foundation Soils	53.1	-8.6	124.7	0.110	-17.610	0.088	0.7	87.2	0	21	0.0	87.2	0.9	-1.3	0.1	0.8	0.123	1.014	0.118	0.225	0.522
PC-01	PB-01 & PB-02	Foundation Soils	53.2	-8.7	93.1	0.105	-21.680	0.113	0.7	62.6	0	21	0.0	62.6	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.225	0.434
PC-01	PB-01 & PB-02	Foundation Soils	53.3	-8.8	88.5	0.173	-22.340	0.195	0.7	59.1	3	21	0.0	59.1	1.0	-1.3	0.1	0.8	0.099	1.009	0.095	0.225	0.423
PC-01	PB-01 & PB-02	Foundation Soils	53.4	-8.9	84.9	0.201	-19.560	0.237	0.7	56.6	7	21	1.8	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.225	0.421
PC-01	PB-01 & PB-02	Foundation Soils	53.5	-9.0	71.5	0.141	-17.940	0.197	0.7	47.5	10	21	9.9	57.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.225	0.418
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.0	60.3	0.480	-14.770	0.796	0.7	41.8	36	21	41.7	83.5	0.9	-1.3	0.1	0.8	0.119	1.013	0.114	0.225	0.507
PC-01	PB-01 & PB-02	Foundation Soils	53.6	-9.1	61.9	0.223	-10.860	0.360	0.7	42.3	22	21	32.8	75.1	0.9	-1.3	0.1	0.8	0.111	1.011	0.107	0.225	0.476
PC-01	PB-01 & PB-02	Foundation Soils	53.7	-9.2	70.8	0.098	-10.480	0.138	0.7	46.2	8	21	3.5	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.089	0.225	0.396
PC-01	PB-01 & PB-02	Foundation Soils	53.8	-9.3	71.1	0.122	-12.480	0.172	0.7	46.8	9	21	7.2	54.0	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.225	0.408
PC-01	PB-01 & PB-02	Foundation Soils	53.9	-9.4	55.1	0.094	-9.010	0.171	0.7	36.8	18	21	25.9	62.8	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.225	0.435
PC-01	PB-01 & PB-02	Foundation Soils	54.0	-9.5	41.5	0.067	-10.800	0.162	0.7	27.7	27	21	34.6	62.3	1.0	-1.3	0.1	0.8	0.101	1.009	0.097	0.225	0.434
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.5	32.0	0.050	-7.000	0.156	0.7	21.2	36	21	37.7	58.9	1.0	-1.3	0.1	0.8	0.099	1.008	0.095	0.225	0.423
PC-01	PB-01 & PB-02	Foundation Soils	54.1	-9.6	28.6	0.077	-2.190	0.269	0.7	18.9	45	21	39.5	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.225	0.422
PC-01	PB-01 & PB-02	Foundation Soils	54.2	-9.7	20.7	0.153	13.050	0.738	0.7	13.6	84	21	41.6	55.2	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.225	0.412
PC-01	PB-01 & PB-02	Foundation Soils	54.3	-9.8	20.5	0.320	24.960	1.564	0.7	13.4	97	21	41.8	55.3	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.225	0.412
PC-01	PB-01 & PB-02	Foundation Soils	54.4	-9.9	24.6	0.331	34.880	1.347	0.7	16.2	87	21	42.2	58.4	1.0	-1.3	0.1	0.8	0.098	1.008	0.095	0.225	0.422
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-9.9	39.2	0.253	37.070	0.646	0.7	26.3	46	21	41.3	67.5	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.224	0.451
PC-01	PB-01 & PB-02	Foundation Soils	54.5	-10.0	63.3	0.236	34.190	0.373	0.7	43.0	22	21	32.8	75.9	0.9	-1.3	0.1	0.8	0.112	1.011	0.108	0.224	0.479
PC-01	PB-01 & PB-02	Foundation Soils	54.6	-10.1	87.3	0.251	25.700	0.287	0.7	58.1	8	21	5.3	63.4	1.0	-1.3	0.1	0.8	0.102	1.009	0.098	0.224	0.438
PC-01	PB-01 & PB-02	Foundation Soils	54.7	-10.2	56.2	0.172	14.340	0.306	0.7	37.9	24	21	33.4	71.2	0.9	-1.3	0.1	0.8	0.108	1.010	0.104	0.224	0.463
PC-01	PB-01 & PB-02	Foundation Soils	54.8	-10.3	45.1	0.124	17.100	0.275	0.7	30.1	30	21	36.6	66.7	1.0	-1.3	0.1	0.8	0.105	1.010	0.101	0.224	0.448
PC-01	PB-01 & PB-02	Foundation Soils	54.9	-10.4	28.9	0.031	20.620	0.107	0.7	18.9	37	21	37.7	56.6	1.0	-1.3	0.1	0.8	0.097	1.008	0.093	0.224	0.417
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.4	22.5	0.061	23.440	0.271	0.7	14.7	53	21	39.9	54.5	1.0	-1.3	0.1	0.8	0.096	1.008	0.092	0.224	0.411
PC-01	PB-01 & PB-02	Foundation Soils	55.0	-10.5	17.5	0.218	34.540	1.247	0.7	11.3	100	21	41.4	52.8	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.224	0.406
PC-01	PB-01 & PB-02	Foundation Soils	55.1	-10.6	16.9	0.157	37.590	0.930	0.7	10.9	97	21	41.3	52.2	1.0	-1.3	0.1	0.8	0.094	1.008	0.090	0.224	0.404
PC-01	PB-01 & PB-02	Foundation Soils	55.2	-10.7	19.2	0.068	39.830	0.355	0.7	12.4	78	21	41.1	53.5	1.0	-1.3	0.1	0.8	0.095	1.008	0.091	0.224	0.408
PC-01	PB-01 & PB-02	Foundation Soils	55.3	-10.8	24.2	0.181	41.310	0.749	0.7	15.8	79	21	41.8	57.6	1.0	-1.3	0.1	0.8	0.098	1.008	0.094	0.224	0.420
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.8	51.2	0.241	39.160	0.471	0.7	34.4	33	21	39.0	73.4	0.9	-1.3	0.1	0.8	0.110	1.011	0.105	0.224	0.471
PC-01	PB-01 & PB-02	Foundation Soils	55.4	-10.9	49.7	0.203	36.260	0.409	0.7	33.3	32	21	38.3	71.5	0.9	-1.3	0.1	0.8	0.109	1.010	0.104	0.224	0.465
PC-01	PB-01 & PB-02	Foundation Soils	55.5	-11.0	45.8	0.719	25.010	1.571	0.7	30.8	58	21	43.8	74.6	0.9	-1.3	0.1	0.8	0.111	1.011	0.106	0.224	0.475
PC-01	PB-01 & PB-02	Foundation Soils	55.6	-11.1	47.0	0.685	31.870	1.458	0.7	31.6	56	21	43.7	75.4	0.9	-1.3	0.1	0.8	0.112	1.011	0.107	0.224	0.478
PC-01	PB-01 & PB-02	Foundation Soils	55.7	-11.2	51.9	0.702	37.090	1.352	0.7	35.2	51	21	43.9	79.1	0.9	-1.3	0.1	0.8	0.115	1.012	0.110	0.224	0.492
PC-01	PB-01 & PB-02	Foundation Soils	55.8	-11.3	96.1	0.996	40.550	1.036	0.7	67.9	28	21	42.2	110.1	0.9	-1.3	0.1	0.8	0.152	1.022	0.145	0.224	0.647
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.3	214.9	0.990	40.590	0.461	0.8	160.2	0	21	0.0	160.2	0.9	-1.3	0.1	0.8	0.374	1.054	0.352	0.224	1.575
PC-01	PB-01 & PB-02	Foundation Soils	55.9	-11.4	258.4	0.789	34.690	0.305	0.8	199.3	0	21	0.0	199.3	0.8	-1.3	0.1	0.8	1.819	1.082	1.655	0.224	7.405
PC-01	PB-01 & PB-02	Foundation Soils	56.0	-11.5	209.6	0.636	-10.490	0.303	0.8	155.5	0	21	0.0	155.5	0.9	-1.4	0.1	0.8	0.329	1.050	0.310	0.223	1.389
PC-01	PB-01 & PB-02	Foundation Soils	56.1	-11.6	164.3	0.553	-6.810	0.337	0.8	116.8	0	21	0.0	116.8	0.9	-1.4	0.1	0.8	0.164	1.025	0.156	0.223	0.699
PC-01	PB-01 & PB-02	Foundation Soils	56.2	-11.7	129.5	0.438	14.960	0.338	0.7	88.6	0	21	0.0	88.6	0.9	-1.4	0.1	0.8	0.124	1.014	0.118	0.223	0.530
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	65.0	0.470	-0.300	0.723	0.7	44.2	33	21	40.7	84.9	0.9	-1.4	0.1	0.8	0.120	1.013	0.115	0.223	0.515
PC-01	PB-01 & PB-02	Foundation Soils	56.3	-11.8	57.0	0.132	-0.170	0.232	0.7	37.6	20	21	29.6	67.2	0.9	-1.4	0.1	0.8	0.105	1.010	0.101	0.223	0.451
PC-01	PB-01 & PB-02	Foundation Soils	56.4	-11.9	49.1	0.237	-4.720	0.483	0.7	32.6	35	21	39.5	72.1	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.223	0.468
PC-01	PB-01 & PB-02	Foundation Soils	56.5	-12.0	40.3	0.103	20.870	0.256	0.7	26.4	33	21	37.6	64.0	1.0	-1.4	0.2	0.8	0.103	1.009	0.098	0.223	0.441
PC-01	PB-01 & PB-02	Foundation Soils	56.6	-12.1	39.4	0.150	25.390	0.381	0.7	25.8	39	21	39.5	65.3	0.9	-1.4	0.2	0.8	0.104	1.009	0.099	0.223	0.445
PC-01	PB-01 & PB-02	Foundation Soils	56.7	-12.2	44.8	0.393	36.940	0.878	0.7	29.7	48	21	42.2	71.9	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.223	0.467
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.2	62.2	0.389	34.490	0.626	0.7	41.9	32	21	39.8	81.6	0.9	-1.4	0.2	0.8	0.117	1.012	0.112	0.223	0.502
PC-01	PB-01 & PB-02	Foundation Soils	56.8	-12.3	75.0	0.451	43.690	0.602	0.7	51.0	25	21	36.9	87.9	0.9	-1.4	0.2	0.8	0.123	1.014	0.118	0.223	0.528
PC-01	PB-01 & PB-02	Foundation Soils	56.9	-12.4	78.5	0.147	38.780	0.187	0.7	50.1	8	21	3.4	53.5	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.223	0.409
PC-01	PB-01 & PB-02	Foundation Soils	57.0	-12.5	74.3	0.106	37.870	0.143	0.7	47.0	7	21	2.5	49.4	1.0	-1.4	0.2	0.8	0.092	1.008	0.088	0.223	0.397
PC-01	PB-01 & PB-02	Foundation Soils	57.1	-12.6	84.4	0.147	41.070	0.174	0.7	53.8	4	21	0.1	54.0	1.0	-1.4	0.2	0.8	0.095	1.008	0.091	0.223	0.411
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	98.4	0.209	38.100	0.212	0.7	64.0	1	21	0.0	64.0	0.9	-1.4	0.2	0.8	0.103	1.009	0.098	0.223	0.442
PC-01	PB-01 & PB-02	Foundation Soils	57.2	-12.7	90.8	0.809	42.640	0.891	0.7	62.9	27	21	40.4	103.3	0.9	-1.4	0.2	0.8	0.142	1.019	0.135	0.222	0.605
PC-01	PB-01 & PB-02	Foundation Soils	57.3	-12.8	83.5	0.655	31.330	0.785	0.7	57.3	27	21	39.4	96.7	0.9	-1.4	0.2	0.8	0.133	1.017	0.127	0.222	0.569
PC-01	PB-01 & PB-02	Foundation Soils	57.4	-12.9	88.9	0.504	36.120	0.567	0.7	60.5	19	21	30.8	91.2	0.9	-1.4	0.2	0.8	0.127	1.015	0.121	0.222	0.543
PC-01	PB-01 & PB-02	Foundation Soils	57.5	-13.0	100.6	0.381	33.640	0.379	0.7	66.3	9	21	5.9	72.2	0.9	-1.4	0.2	0.8	0.109	1.010	0.104	0.222	0.469

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-01	PB-01 & PB-02	Foundation Soils	57.6	-13.1	162.8	0.242	37.350	0.149	0.7	114.2	0	21	0.0	114.2	0.9	-1.4	0.2	0.8	0.159	1.023	0.151	0.222	0.678
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.1	146.1	0.151	12.390	0.103	0.7	100.5	0	21	0.0	100.5	0.9	-1.4	0.2	0.8	0.138	1.018	0.131	0.222	0.589
PC-01	PB-01 & PB-02	Foundation Soils	57.7	-13.2	117.6	0.228	9.390	0.194	0.7	78.2	0	21	0.0	78.2	0.9	-1.4	0.2	0.8	0.114	1.012	0.109	0.222	0.490
PC-01	PB-01 & PB-02	Foundation Soils	57.8	-13.3	96.9	0.244	22.070	0.252	0.7	62.5	4	21	0.1	62.6	0.9	-1.4	0.2	0.8	0.101	1.009	0.097	0.222	0.438
PC-01	PB-01 & PB-02	Foundation Soils	57.9	-13.4	102.7	0.366	25.490	0.356	0.7	67.1	7	21	2.6	69.8	0.9	-1.4	0.2	0.8	0.107	1.010	0.102	0.222	0.461
PC-01	PB-01 & PB-02	Foundation Soils	58.0	-13.5	103.7	0.437	33.070	0.421	0.7	68.6	9	21	8.2	76.8	0.9	-1.4	0.2	0.8	0.113	1.011	0.108	0.222	0.486
PC-01	PB-01 & PB-02	Foundation Soils	58.1	-13.6	101.1	0.572	20.540	0.566	0.7	68.6	15	21	24.2	92.8	0.9	-1.4	0.2	0.8	0.129	1.015	0.122	0.222	0.551
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.6	96.7	0.788	22.770	0.815	0.7	66.7	23	21	37.7	104.4	0.9	-1.4	0.2	0.8	0.143	1.019	0.136	0.222	0.612
PC-01	PB-01 & PB-02	Foundation Soils	58.2	-13.7	82.9	1.156	17.820	1.394	0.7	57.0	39	21	45.7	102.7	0.9	-1.4	0.2	0.8	0.141	1.019	0.134	0.222	0.602
PC-01	PB-01 & PB-02	Foundation Soils	58.3	-13.8	82.1	2.773	28.300	3.379	0.7	56.6	60	21	49.6	106.2	0.9	-1.4	0.2	0.8	0.146	1.020	0.138	0.222	0.623
PC-01	PB-01 & PB-02	Foundation Soils	58.4	-13.9	91.2	1.602	33.110	1.757	0.7	63.3	42	21	47.8	111.1	0.9	-1.4	0.2	0.8	0.154	1.022	0.145	0.222	0.656
PC-01	PB-01 & PB-02	Foundation Soils	58.5	-14.0	83.1	1.846	49.790	2.221	0.7	57.2	50	21	48.3	105.5	0.9	-1.4	0.2	0.8	0.145	1.020	0.137	0.222	0.619
PC-01	PB-01 & PB-02	Foundation Soils	58.6	-14.0	129.6	3.065	33.350	2.365	0.8	93.8	40	21	53.3	147.2	0.9	-1.4	0.2	0.8	0.271	1.043	0.254	0.221	1.147
PC-02	PB-02 & PB-03	Foundation Soils	14.0	30.1	7.1	0.076	33.550	1.067	1.2	7.8	95	21	40.6	48.4	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.163	0.572
PC-02	PB-02 & PB-03	Foundation Soils	14.1	30.1	7.5	0.075	35.070	0.994	1.2	8.3	92	21	40.6	48.9	1.0	-0.2	0.0	1.0	0.091	1.007	0.094	0.164	0.573
PC-02	PB-02 & PB-03	Foundation Soils	14.2	30.0	7.7	0.073	37.340	0.953	1.2	8.4	91	21	40.6	49.0	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.164	0.572
PC-02	PB-02 & PB-03	Foundation Soils	14.3	29.9	7.7	0.089	38.160	1.156	1.2	8.4	94	21	40.7	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.164	0.570
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.8	9.2	0.080	46.120	0.869	1.2	10.0	83	21	40.7	50.7	1.0	-0.2	0.0	1.0	0.093	1.008	0.095	0.165	0.576
PC-02	PB-02 & PB-03	Foundation Soils	14.4	29.7	10.8	0.101	43.070	0.931	1.1	11.8	79	21	40.9	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.165	0.584
PC-02	PB-02 & PB-03	Foundation Soils	14.5	29.6	12.1	0.116	24.590	0.962	1.1	13.0	75	21	41.1	54.2	1.0	-0.2	0.0	1.0	0.095	1.008	0.098	0.166	0.589
PC-02	PB-02 & PB-03	Foundation Soils	14.6	29.6	12.1	0.091	23.540	0.754	1.1	13.0	72	21	40.9	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.097	0.166	0.586
PC-02	PB-02 & PB-03	Foundation Soils	14.7	29.5	10.6	0.082	14.530	0.773	1.1	11.5	77	21	40.8	52.3	1.0	-0.2	0.0	1.0	0.094	1.008	0.096	0.167	0.577
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.4	7.9	0.080	7.530	1.014	1.1	8.5	92	21	40.6	49.2	1.0	-0.2	0.0	1.0	0.092	1.007	0.094	0.167	0.562
PC-02	PB-02 & PB-03	Foundation Soils	14.8	29.3	6.7	0.084	10.830	1.252	1.1	7.2	100	21	40.5	47.8	1.0	-0.2	0.0	1.0	0.091	1.007	0.093	0.167	0.554
PC-02	PB-02 & PB-03	Foundation Soils	14.9	29.2	5.9	0.089	14.340	1.496	1.1	6.4	100	21	40.3	46.8	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.168	0.548
PC-02	PB-02 & PB-03	Foundation Soils	15.0	29.2	5.8	0.098	16.940	1.682	1.1	6.3	100	21	40.3	46.6	1.0	-0.2	0.0	1.0	0.090	1.007	0.092	0.168	0.546
PC-02	PB-02 & PB-03	Foundation Soils	15.1	29.1	5.5	0.088	19.770	1.608	1.1	5.9	100	21	40.2	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.091	0.169	0.542
PC-02	PB-02 & PB-03	Foundation Soils	15.2	29.0	5.3	0.085	19.180	1.610	1.1	5.7	100	21	40.2	45.9	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.169	0.540
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.9	5.2	0.085	19.680	1.627	1.1	5.6	100	21	40.2	45.8	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.169	0.538
PC-02	PB-02 & PB-03	Foundation Soils	15.3	28.8	5.1	0.085	20.750	1.651	1.1	5.5	100	21	40.1	45.7	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.170	0.536
PC-02	PB-02 & PB-03	Foundation Soils	15.4	28.7	5.0	0.081	21.870	1.605	1.1	5.4	100	21	40.1	45.5	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.170	0.534
PC-02	PB-02 & PB-03	Foundation Soils	15.5	28.7	5.0	0.077	23.040	1.545	1.1	5.3	100	21	40.1	45.4	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.171	0.533
PC-02	PB-02 & PB-03	Foundation Soils	15.6	28.6	4.8	0.077	22.680	1.607	1.1	5.1	100	21	40.1	45.2	1.0	-0.2	0.0	1.0	0.089	1.007	0.091	0.171	0.530
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.5	4.7	0.075	23.120	1.605	1.1	5.0	100	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.171	0.528
PC-02	PB-02 & PB-03	Foundation Soils	15.7	28.4	4.5	0.068	23.200	1.496	1.1	4.8	100	21	40.0	44.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.172	0.526
PC-02	PB-02 & PB-03	Foundation Soils	15.8	28.3	4.6	0.064	24.540	1.387	1.1	4.9	100	21	40.0	44.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.172	0.525
PC-02	PB-02 & PB-03	Foundation Soils	15.9	28.3	4.8	0.064	25.060	1.332	1.1	5.1	100	21	40.0	45.1	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.173	0.525
PC-02	PB-02 & PB-03	Foundation Soils	16.0	28.2	4.9	0.069	25.950	1.408	1.1	5.2	100	21	40.1	45.3	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.173	0.524
PC-02	PB-02 & PB-03	Foundation Soils	16.1	28.1	5.2	0.073	28.780	1.399	1.1	5.5	100	21	40.1	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.173	0.525
PC-02	PB-02 & PB-03	Foundation Soils	16.2	28.0	5.5	0.064	29.400	1.169	1.1	5.8	100	21	40.2	46.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.174	0.525
PC-02	PB-02 & PB-03	Foundation Soils	16.2	27.9	6.1	0.071	26.710	1.165	1.1	6.4	100	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.174	0.527
PC-02	PB-02 & PB-03	Foundation Soils	16.3	27.8	6.7	0.075	28.500	1.125	1.1	7.0	100	21	40.5	47.5	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.175	0.529
PC-02	PB-02 & PB-03	Foundation Soils	16.4	27.8	6.9	0.083	28.250	1.197	1.1	7.3	100	21	40.5	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.175	0.529
PC-02	PB-02 & PB-03	Foundation Soils	16.5	27.7	8.6	0.068	15.530	0.793	1.1	9.0	87	21	40.6	49.6	1.0	-0.3	0.0	1.0	0.092	1.008	0.094	0.175	0.535
PC-02	PB-02 & PB-03	Foundation Soils	16.6	27.6	7.8	0.046	15.380	0.587	1.1	8.2	86	21	40.4	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.176	0.530
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.5	7.2	0.041	16.010	0.571	1.1	7.5	90	21	40.4	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.092	0.176	0.525
PC-02	PB-02 & PB-03	Foundation Soils	16.7	27.4	6.5	0.044	19.960	0.677	1.1	6.8	96	21	40.3	47.1	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.176	0.521
PC-02	PB-02 & PB-03	Foundation Soils	16.8	27.4	6.1	0.052	28.770	0.846	1.1	6.4	100	21	40.3	46.8	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.177	0.519
PC-02	PB-02 & PB-03	Foundation Soils	16.9	27.3	5.9	0.046	31.640	0.775	1.1	6.2	100	21	40.3	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.177	0.516
PC-02	PB-02 & PB-03	Foundation Soils	17.0	27.2	5.9	0.044	32.490	0.749	1.1	6.1	100	21	40.3	46.4	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.177	0.515
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.1	5.8	0.049	35.130	0.851	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.178	0.513
PC-02	PB-02 & PB-03	Foundation Soils	17.1	27.0	5.8	0.048	34.540	0.834	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	1.0	0.090	1.007	0.091	0.178	0.512
PC-02	PB-02 & PB-03	Foundation Soils	17.2	26.9	5.5	0.045	34.970	0.817	1.1	5.7	100	21	40.2	45.9	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.178	0.510
PC-02	PB-02 & PB-03	Foundation Soils	17.3	26.9	5.2	0.045	40.740	0.871	1.1	5.3	100	21	40.1	45.4	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.179	0.507
PC-02	PB-02 & PB-03	Foundation Soils	17.4	26.8	4.8	0.047	41.690	0.977	1.1	5.0	100	21	40.0	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.090	0.179	0.504
PC-02	PB-02 & PB-03	Foundation Soils	17.5	26.7	5.5	0.049	48.220	0.897	1.1	5.6	100	21	40.2	45.8	1.0	-0.3	0.0	1.0	0.089	1.007	0.091	0.180	0.506
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.6	6.4	0.043	46.120	0.671	1.1	6.6	97	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.180	0.510
PC-02	PB-02 & PB-03	Foundation Soils	17.6	26.5	6.4	0.042	40.740	0.653	1.1	6.6	97	21	40.3	46.9	1.0	-0.3	0.0	1.0	0.090	1.007	0.092	0.180	0.509
PC-02	PB-02 & PB-03	Foundation Soils	17.7	26.4	5.8	0.047	35.650	0.804	1.1	6.0	100	21	40.2	46.2	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.181	0.505
PC-02	PB-02 & PB-03	Foundation Soils	17.8	26.4	5.3	0.071	35.640	1.349	1.1	5.4	100	21	40.1	45.5	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.181	0.501
PC-02	PB-02 & PB-03	Foundation Soils	17.9	26.3	5.7	0.092	35.550	1.622	1.1	5.8	100	21	40.2	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.091	0.181	0.502
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.2	8.5	0.094	39.500	1.101	1.1	8.7	94	21	40.7	49.4	1.0	-0.3	0.0	0.9	0.092	1.008	0.093	0.182	0.514

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-02	PB-02 & PB-03	Foundation Soils	18.0	26.1	13.4	0.068	37.190	0.509	1.1	13.6	65	21	40.7	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.097	0.182	0.533
PC-02	PB-02 & PB-03	Foundation Soils	18.1	26.0	19.1	0.107	33.690	0.561	1.1	19.3	55	21	41.0	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.182	0.558
PC-02	PB-02 & PB-03	Foundation Soils	18.2	26.0	24.0	0.135	23.670	0.562	1.1	24.3	48	21	41.1	65.3	1.0	-0.3	0.0	0.9	0.104	1.009	0.106	0.182	0.578
PC-02	PB-02 & PB-03	Foundation Soils	18.3	25.9	29.1	0.184	10.290	0.633	1.1	29.2	44	21	41.3	70.6	1.0	-0.3	0.0	0.9	0.108	1.010	0.110	0.183	0.601
PC-02	PB-02 & PB-03	Foundation Soils	18.4	25.8	42.5	0.235	10.120	0.553	1.1	42.6	29	21	38.7	81.3	1.0	-0.3	0.0	0.9	0.117	1.012	0.120	0.183	0.653
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.7	65.2	0.319	10.010	0.489	1.1	65.1	14	21	21.7	86.8	1.0	-0.3	0.0	0.9	0.122	1.014	0.125	0.183	0.683
PC-02	PB-02 & PB-03	Foundation Soils	18.5	25.6	79.1	0.411	9.590	0.519	1.1	78.9	10	21	9.0	87.9	1.0	-0.3	0.0	0.9	0.123	1.014	0.126	0.184	0.688
PC-02	PB-02 & PB-03	Foundation Soils	18.6	25.5	91.4	0.485	7.150	0.530	1.1	91.0	6	21	0.9	91.8	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.184	0.711
PC-02	PB-02 & PB-03	Foundation Soils	18.7	25.5	94.0	0.563	5.600	0.599	1.1	93.3	7	21	3.2	96.5	1.0	-0.3	0.0	0.9	0.133	1.017	0.136	0.184	0.741
PC-02	PB-02 & PB-03	Foundation Soils	18.8	25.4	95.3	0.633	5.670	0.664	1.0	94.4	9	21	7.4	101.8	1.0	-0.3	0.0	0.9	0.140	1.018	0.144	0.185	0.779
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.3	94.0	0.651	6.180	0.692	1.0	92.9	10	21	11.2	104.1	1.0	-0.3	0.0	0.9	0.143	1.019	0.147	0.185	0.796
PC-02	PB-02 & PB-03	Foundation Soils	18.9	25.2	91.9	0.653	6.620	0.711	1.0	90.6	11	21	15.0	105.7	1.0	-0.3	0.0	0.9	0.145	1.020	0.150	0.185	0.808
PC-02	PB-02 & PB-03	Foundation Soils	19.0	25.1	88.7	0.653	6.910	0.736	1.0	87.4	13	21	20.2	107.5	1.0	-0.3	0.0	0.9	0.148	1.021	0.153	0.185	0.823
PC-02	PB-02 & PB-03	Foundation Soils	19.1	25.1	85.8	0.643	7.340	0.750	1.0	84.4	14	21	23.7	108.1	1.0	-0.3	0.0	0.9	0.149	1.021	0.153	0.186	0.826
PC-02	PB-02 & PB-03	Foundation Soils	19.2	25.0	84.4	0.614	7.230	0.727	1.0	83.0	14	21	23.3	106.2	1.0	-0.3	0.0	0.9	0.146	1.020	0.150	0.186	0.808
PC-02	PB-02 & PB-03	Foundation Soils	19.3	24.9	81.8	0.594	6.770	0.726	1.0	80.3	15	21	25.3	105.6	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.186	0.801
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.8	80.5	0.586	6.670	0.728	1.0	78.9	16	21	26.5	105.4	1.0	-0.3	0.0	0.9	0.145	1.020	0.149	0.187	0.798
PC-02	PB-02 & PB-03	Foundation Soils	19.4	24.7	75.5	0.563	5.960	0.746	1.0	73.9	18	21	30.9	104.8	1.0	-0.3	0.0	0.9	0.144	1.020	0.148	0.187	0.792
PC-02	PB-02 & PB-03	Foundation Soils	19.5	24.6	69.9	0.498	6.370	0.713	1.0	68.4	20	21	32.6	101.0	1.0	-0.3	0.0	0.9	0.139	1.018	0.142	0.187	0.760
PC-02	PB-02 & PB-03	Foundation Soils	19.6	24.6	66.6	0.491	6.240	0.737	1.0	65.1	22	21	35.2	100.3	1.0	-0.3	0.0	0.9	0.138	1.018	0.141	0.187	0.754
PC-02	PB-02 & PB-03	Foundation Soils	19.7	24.5	65.7	0.464	6.380	0.706	1.0	64.2	21	21	34.5	98.7	1.0	-0.3	0.0	0.9	0.136	1.017	0.139	0.188	0.741
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.4	65.3	0.438	4.680	0.671	1.0	63.7	20	21	33.4	97.2	1.0	-0.3	0.0	0.9	0.134	1.017	0.137	0.188	0.728
PC-02	PB-02 & PB-03	Foundation Soils	19.8	24.3	65.3	0.424	4.000	0.649	1.0	63.6	20	21	32.6	96.2	1.0	-0.3	0.0	0.9	0.133	1.016	0.136	0.188	0.721
PC-02	PB-02 & PB-03	Foundation Soils	19.9	24.2	61.5	0.419	5.040	0.681	1.0	59.8	23	21	35.7	95.5	1.0	-0.3	0.0	0.9	0.132	1.016	0.135	0.189	0.715
PC-02	PB-02 & PB-03	Foundation Soils	20.0	24.2	53.2	0.432	4.050	0.811	1.0	51.8	30	21	40.8	92.6	1.0	-0.3	0.0	0.9	0.128	1.015	0.131	0.189	0.694
PC-02	PB-02 & PB-03	Foundation Soils	20.1	24.1	44.3	0.464	4.040	1.047	1.0	43.1	41	21	43.4	86.5	1.0	-0.4	0.0	0.9	0.122	1.014	0.124	0.189	0.657
PC-02	PB-02 & PB-03	Foundation Soils	20.2	24.0	39.9	0.530	4.340	1.327	1.0	38.8	48	21	44.2	83.0	1.0	-0.4	0.0	0.9	0.119	1.013	0.121	0.189	0.637
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.9	31.6	0.595	5.540	1.885	1.0	30.6	62	21	44.2	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.190	0.596
PC-02	PB-02 & PB-03	Foundation Soils	20.3	23.8	23.9	0.646	6.530	2.705	1.0	23.2	79	21	43.5	66.7	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.190	0.559
PC-02	PB-02 & PB-03	Foundation Soils	20.4	23.7	17.0	0.587	4.380	3.458	1.0	16.5	95	21	42.5	59.0	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.190	0.526
PC-02	PB-02 & PB-03	Foundation Soils	20.5	23.7	11.9	0.491	7.340	4.124	1.0	11.6	100	21	41.5	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.190	0.502
PC-02	PB-02 & PB-03	Foundation Soils	20.6	23.6	10.3	0.457	18.910	4.416	1.0	10.0	100	21	41.2	51.2	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.191	0.494
PC-02	PB-02 & PB-03	Foundation Soils	20.7	23.5	17.3	0.457	22.250	2.645	1.0	16.7	89	21	42.4	59.1	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.191	0.524
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.4	26.6	0.417	22.250	1.569	1.0	25.6	64	21	43.2	68.8	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.191	0.564
PC-02	PB-02 & PB-03	Foundation Soils	20.8	23.3	25.0	0.315	3.000	1.260	1.0	24.1	61	21	42.7	66.8	1.0	-0.4	0.0	0.9	0.105	1.010	0.106	0.191	0.554
PC-02	PB-02 & PB-03	Foundation Soils	20.9	23.2	18.4	0.279	-9.410	1.520	1.0	17.7	76	21	42.2	59.8	1.0	-0.4	0.0	0.9	0.099	1.009	0.101	0.192	0.524
PC-02	PB-02 & PB-03	Foundation Soils	21.0	23.2	27.4	0.268	-2.760	0.978	1.0	26.3	54	21	42.4	68.7	1.0	-0.4	0.0	0.9	0.106	1.010	0.108	0.192	0.561
PC-02	PB-02 & PB-03	Foundation Soils	21.1	23.1	33.8	0.288	-0.180	0.851	1.0	32.5	45	21	42.3	74.8	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.192	0.587
PC-02	PB-02 & PB-03	Foundation Soils	21.2	23.0	16.9	0.351	0.510	2.075	1.0	16.2	85	21	42.2	58.4	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.192	0.516
PC-02	PB-02 & PB-03	Foundation Soils	21.2	22.9	11.4	0.315	-2.100	2.757	1.0	11.0	100	21	41.4	52.3	1.0	-0.4	0.0	0.9	0.094	1.008	0.095	0.193	0.492
PC-02	PB-02 & PB-03	Foundation Soils	21.3	22.8	8.8	0.256	-0.140	2.909	1.0	8.4	100	21	40.8	49.2	1.0	-0.4	0.0	0.9	0.092	1.008	0.093	0.193	0.480
PC-02	PB-02 & PB-03	Foundation Soils	21.4	22.8	7.4	0.225	3.480	3.061	1.0	7.0	100	21	40.5	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.091	0.193	0.473
PC-02	PB-02 & PB-03	Foundation Soils	21.5	22.7	5.9	0.166	12.070	2.816	1.0	5.6	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.193	0.466
PC-02	PB-02 & PB-03	Foundation Soils	21.6	22.6	5.9	0.123	43.880	2.069	1.0	5.7	100	21	40.2	45.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.194	0.465
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.5	6.7	0.050	67.180	0.743	1.0	6.4	100	21	40.3	46.8	1.0	-0.4	0.0	0.9	0.090	1.007	0.091	0.194	0.468
PC-02	PB-02 & PB-03	Foundation Soils	21.7	22.4	10.5	0.035	69.200	0.334	1.0	10.0	75	21	40.4	50.4	1.0	-0.4	0.0	0.9	0.093	1.008	0.093	0.194	0.481
PC-02	PB-02 & PB-03	Foundation Soils	21.8	22.3	10.8	0.033	59.370	0.305	1.0	10.3	73	21	40.4	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.194	0.481
PC-02	PB-02 & PB-03	Foundation Soils	21.9	22.3	8.5	0.032	40.400	0.378	1.0	8.0	85	21	40.3	48.4	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.195	0.472
PC-02	PB-02 & PB-03	Foundation Soils	22.0	22.2	6.5	0.037	54.700	0.573	1.0	6.1	100	21	40.3	46.4	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.195	0.464
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.1	6.1	0.059	63.480	0.974	1.0	5.7	100	21	40.2	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.195	0.462
PC-02	PB-02 & PB-03	Foundation Soils	22.1	22.0	5.2	0.047	73.330	0.897	1.0	5.0	100	21	40.0	45.0	1.0	-0.4	0.0	0.9	0.089	1.007	0.089	0.195	0.458
PC-02	PB-02 & PB-03	Foundation Soils	22.2	21.9	5.5	0.053	77.660	0.959	1.0	5.2	100	21	40.1	45.3	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.196	0.458
PC-02	PB-02 & PB-03	Foundation Soils	22.3	21.9	6.3	0.037	82.430	0.586	1.0	6.0	100	21	40.2	46.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.090	0.196	0.461
PC-02	PB-02 & PB-03	Foundation Soils	22.4	21.8	12.1	0.025	77.760	0.207	1.0	11.4	61	21	39.9	51.3	1.0	-0.4	0.0	0.9	0.093	1.008	0.094	0.196	0.479
PC-02	PB-02 & PB-03	Foundation Soils	22.5	21.7	25.3	0.020	65.940	0.079	1.0	23.8	31	21	35.9	59.7	1.0	-0.4	0.0	0.9	0.099	1.009	0.100	0.196	0.510
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.6	31.7	0.022	38.970	0.069	1.0	29.8	22	21	30.9	60.7	1.0	-0.4	0.0	0.9	0.100	1.009	0.101	0.196	0.514
PC-02	PB-02 & PB-03	Foundation Soils	22.6	21.5	28.7	0.042	21.140	0.146	1.0	26.9	29	21	35.7	62.6	1.0	-0.4	0.0	0.9	0.101	1.009	0.102	0.197	0.520
PC-02	PB-02 & PB-03	Foundation Soils	22.7	21.4	25.9	0.088	20.390	0.340	1.0	24.2	41	21	39.7	63.9	1.0	-0.4	0.0	0.9	0.102	1.009	0.103	0.197	0.525
PC-02	PB-02 & PB-03	Foundation Soils	22.8	21.4	22.6	0.091	24.010	0.403	1.0	21.1	47	21	40.4	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.197	0.515
PC-02	PB-02 & PB-03	Foundation Soils	22.9	21.3	22.0	0.119	26.540	0.542	1.0	20.5	52	21	41.0	61.5	1.0	-0.4	0.0	0.9	0.101	1.009	0.101	0.197	0.514
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.2	24.0	0.103	22.930	0.430	1.0	22.4	46	21	40.5	62.8	1.0	-0.4	0.0	0.9	0.102	1.009	0.102	0.197	0.519
PC-02	PB-02 & PB-03	Foundation Soils	23.0	21.1	28.7	0.065	5.620	0.227	1.0	26.7	33	21	37.6	64.3	1.0	-0.4	0.0	0.9	0.103	1.009	0.104	0.198	0.524

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-02	PB-02 & PB-03	Foundation Soils	23.1	21.0	33.0	0.075	7.100	0.227	1.0	30.7	28	21	35.8	66.5	1.0	-0.4	0.0	0.9	0.105	1.010	0.105	0.198	0.532
PC-02	PB-02 & PB-03	Foundation Soils	23.2	21.0	51.7	0.087	8.900	0.168	1.0	48.0	10	21	10.1	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.099	0.198	0.499
PC-02	PB-02 & PB-03	Foundation Soils	23.3	20.9	70.9	0.105	10.150	0.148	1.0	65.9	0	21	0.0	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.105	0.198	0.528
PC-02	PB-02 & PB-03	Foundation Soils	23.4	20.8	81.0	0.142	9.430	0.175	1.0	75.2	0	21	0.0	75.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.113	0.198	0.567
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.7	86.9	0.145	8.380	0.167	1.0	80.5	0	21	0.0	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.117	0.199	0.591
PC-02	PB-02 & PB-03	Foundation Soils	23.5	20.6	89.5	0.161	12.650	0.180	1.0	82.9	0	21	0.0	82.9	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.199	0.601
PC-02	PB-02 & PB-03	Foundation Soils	23.6	20.5	87.6	0.169	10.050	0.193	1.0	81.1	0	21	0.0	81.1	1.0	-0.4	0.0	0.9	0.117	1.012	0.118	0.199	0.592
PC-02	PB-02 & PB-03	Foundation Soils	23.7	20.5	81.3	0.195	13.820	0.240	1.0	75.0	0	21	0.0	75.0	1.0	-0.4	0.0	0.9	0.111	1.011	0.112	0.199	0.564
PC-02	PB-02 & PB-03	Foundation Soils	23.8	20.4	78.6	0.170	14.390	0.216	1.0	72.5	0	21	0.0	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.110	0.199	0.552
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.3	86.1	0.186	17.260	0.216	1.0	79.3	0	21	0.0	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.116	0.200	0.582
PC-02	PB-02 & PB-03	Foundation Soils	23.9	20.2	103.6	0.142	8.670	0.137	1.0	95.5	0	21	0.0	95.5	1.0	-0.4	0.1	0.9	0.132	1.016	0.133	0.200	0.667
PC-02	PB-02 & PB-03	Foundation Soils	24.0	20.1	117.4	0.118	5.380	0.101	1.0	108.2	0	21	0.0	108.2	1.0	-0.4	0.1	0.9	0.149	1.021	0.151	0.200	0.757
PC-02	PB-02 & PB-03	Foundation Soils	24.1	20.1	127.1	0.156	-3.420	0.123	1.0	117.2	0	21	0.0	117.2	1.0	-0.4	0.1	0.9	0.165	1.025	0.168	0.200	0.841
PC-02	PB-02 & PB-03	Foundation Soils	24.2	20.0	135.1	0.189	-3.760	0.140	1.0	124.5	0	21	0.0	124.5	1.0	-0.5	0.1	0.9	0.182	1.029	0.186	0.200	0.928
PC-02	PB-02 & PB-03	Foundation Soils	24.3	19.9	146.4	0.192	-3.760	0.131	1.0	135.0	0	21	0.0	135.0	1.0	-0.5	0.1	0.9	0.214	1.035	0.220	0.201	1.096
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.8	163.4	0.182	-3.650	0.111	1.0	150.7	0	21	0.0	150.7	1.0	-0.5	0.1	0.9	0.293	1.046	0.304	0.201	1.513
PC-02	PB-02 & PB-03	Foundation Soils	24.4	19.7	174.4	0.140	-4.190	0.080	1.0	160.8	0	21	0.0	160.8	1.0	-0.5	0.1	0.9	0.379	1.055	0.396	0.201	1.971
PC-02	PB-02 & PB-03	Foundation Soils	24.5	19.6	176.6	0.133	-5.670	0.075	1.0	162.7	0	21	0.0	162.7	1.0	-0.5	0.1	0.9	0.401	1.056	0.419	0.201	2.084
PC-02	PB-02 & PB-03	Foundation Soils	24.6	19.6	173.1	0.150	-6.720	0.087	1.0	159.3	0	21	0.0	159.3	1.0	-0.5	0.1	0.9	0.365	1.053	0.380	0.201	1.887
PC-02	PB-02 & PB-03	Foundation Soils	24.7	19.5	168.6	0.191	-7.250	0.113	1.0	155.0	0	21	0.0	155.0	1.0	-0.5	0.1	0.9	0.325	1.049	0.337	0.201	1.675
PC-02	PB-02 & PB-03	Foundation Soils	24.8	19.4	159.7	0.195	-7.770	0.122	1.0	146.5	0	21	0.0	146.5	1.0	-0.5	0.1	0.9	0.267	1.043	0.275	0.202	1.367
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.3	155.2	0.216	-7.290	0.139	1.0	142.2	0	21	0.0	142.2	1.0	-0.5	0.1	0.9	0.244	1.040	0.251	0.202	1.247
PC-02	PB-02 & PB-03	Foundation Soils	24.9	19.2	147.9	0.246	-7.480	0.166	1.0	135.2	0	21	0.0	135.2	1.0	-0.5	0.1	0.9	0.215	1.035	0.220	0.202	1.091
PC-03	PB-03 & PB-04	Foundation Soils	10.0	34.4	49.2	0.414	-7.290	0.842	1.3	61.4	26	25	41.6	103.0	1.1	-0.1	0.0	1.0	0.141	1.019	0.153	0.165	0.925
PC-03	PB-03 & PB-04	Foundation Soils	10.1	34.3	53.0	0.470	-1.810	0.886	1.3	65.8	25	25	41.2	107.0	1.1	-0.1	0.0	1.0	0.147	1.020	0.160	0.166	0.962
PC-03	PB-03 & PB-04	Foundation Soils	10.2	34.2	56.9	0.502	1.290	0.882	1.3	70.3	22	25	39.5	109.8	1.1	-0.1	0.0	1.0	0.152	1.022	0.165	0.167	0.989
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	59.9	0.563	1.480	0.941	1.3	73.4	22	25	40.0	113.4	1.1	-0.1	0.0	1.0	0.158	1.023	0.172	0.167	1.030
PC-03	PB-03 & PB-04	Foundation Soils	10.3	34.1	60.6	0.637	1.950	1.052	1.3	73.9	25	25	42.6	116.5	1.1	-0.1	0.0	1.0	0.164	1.025	0.179	0.168	1.067
PC-03	PB-03 & PB-04	Foundation Soils	10.4	34.0	61.7	0.674	3.830	1.092	1.3	75.0	25	25	43.2	118.2	1.1	-0.1	0.0	1.0	0.167	1.025	0.183	0.169	1.087
PC-03	PB-03 & PB-04	Foundation Soils	10.5	33.9	62.2	0.701	5.430	1.127	1.3	75.4	25	25	43.8	119.2	1.1	-0.1	0.0	1.0	0.170	1.026	0.186	0.169	1.097
PC-03	PB-03 & PB-04	Foundation Soils	10.6	33.8	61.7	0.712	6.340	1.153	1.3	74.7	26	25	44.5	119.2	1.1	-0.1	0.0	1.0	0.169	1.026	0.185	0.170	1.092
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	63.3	0.748	9.100	1.181	1.3	76.4	26	25	44.7	121.0	1.1	-0.1	0.0	1.0	0.174	1.027	0.190	0.170	1.116
PC-03	PB-03 & PB-04	Foundation Soils	10.7	33.7	67.0	0.779	9.300	1.162	1.3	80.4	24	25	43.4	123.8	1.1	-0.2	0.0	1.0	0.180	1.028	0.198	0.171	1.158
PC-03	PB-03 & PB-04	Foundation Soils	10.8	33.6	71.6	0.803	8.340	1.122	1.3	85.5	22	25	40.9	126.4	1.1	-0.2	0.0	1.0	0.187	1.030	0.206	0.172	1.199
PC-03	PB-03 & PB-04	Foundation Soils	10.9	33.5	75.9	0.828	8.340	1.091	1.3	90.3	20	25	38.1	128.4	1.1	-0.2	0.0	1.0	0.193	1.031	0.212	0.172	1.233
PC-03	PB-03 & PB-04	Foundation Soils	11.0	33.4	83.0	0.881	8.100	1.061	1.3	98.4	17	25	32.7	131.1	1.1	-0.2	0.0	1.0	0.201	1.032	0.222	0.173	1.285
PC-03	PB-03 & PB-04	Foundation Soils	11.1	33.3	93.4	0.956	7.880	1.024	1.3	110.3	13	25	22.5	132.8	1.1	-0.2	0.0	1.0	0.206	1.033	0.229	0.173	1.317
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	99.1	1.103	7.910	1.113	1.2	116.0	13	25	24.5	140.5	1.1	-0.2	0.0	1.0	0.237	1.038	0.264	0.174	1.518
PC-03	PB-03 & PB-04	Foundation Soils	11.2	33.2	108.2	1.240	8.290	1.147	1.2	125.8	12	25	19.9	145.7	1.1	-0.2	0.0	1.0	0.263	1.042	0.295	0.175	1.691
PC-03	PB-03 & PB-04	Foundation Soils	11.3	33.1	118.6	1.255	7.990	1.058	1.2	138.1	8	25	5.1	143.2	1.1	-0.2	0.0	1.0	0.249	1.040	0.279	0.175	1.594
PC-03	PB-03 & PB-04	Foundation Soils	11.4	33.0	125.9	1.457	7.720	1.157	1.2	145.2	8	25	7.6	152.7	1.1	-0.2	0.0	1.0	0.308	1.048	0.349	0.176	1.985
PC-03	PB-03 & PB-04	Foundation Soils	11.5	32.9	142.4	1.616	8.770	1.134	1.2	162.6	5	25	0.4	163.0	1.1	-0.2	0.0	1.0	0.405	1.057	0.466	0.176	2.644
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	173.4	1.945	10.040	1.122	1.2	193.4	0	25	0.0	193.4	1.1	-0.2	0.0	1.0	1.325	1.082	1.577	0.177	8.915
PC-03	PB-03 & PB-04	Foundation Soils	11.6	32.8	184.6	2.062	3.480	1.117	1.2	204.2	0	25	0.0	204.2	1.1	-0.2	0.0	1.0	2.413	1.082	2.871	0.177	16.182
PC-03	PB-03 & PB-04	Foundation Soils	11.7	32.7	183.8	2.072	0.380	1.128	1.2	203.1	0	25	0.0	203.1	1.1	-0.2	0.0	1.0	2.263	1.082	2.692	0.178	15.125
PC-03	PB-03 & PB-04	Foundation Soils	11.8	32.6	181.5	2.026	0.670	1.116	1.2	200.7	0	25	0.0	200.7	1.1	-0.2	0.0	1.0	1.967	1.082	2.340	0.178	13.110
PC-03	PB-03 & PB-04	Foundation Soils	11.9	32.5	173.1	1.917	-4.170	1.107	1.2	192.2	0	25	0.0	192.2	1.1	-0.2	0.0	1.0	1.253	1.082	1.491	0.179	8.326
PC-03	PB-03 & PB-04	Foundation Soils	12.0	32.4	181.8	1.886	-17.440	1.037	1.2	200.5	0	25	0.0	200.5	1.1	-0.2	0.0	1.0	1.947	1.082	2.316	0.180	12.900
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	190.6	1.745	-16.720	0.916	1.2	208.9	0	25	0.0	208.9	1.1	-0.2	0.0	1.0	3.238	1.082	3.852	0.180	21.392
PC-03	PB-03 & PB-04	Foundation Soils	12.1	32.3	193.5	1.473	-16.390	0.761	1.2	211.5	0	25	0.0	211.5	1.1	-0.2	0.0	1.0	3.854	1.082	4.585	0.181	25.390
PC-03	PB-03 & PB-04	Foundation Soils	12.2	32.2	191.7	1.540	-16.600	0.803	1.2	209.6	0	25	0.0	209.6	1.1	-0.2	0.0	1.0	3.383	1.082	4.025	0.181	22.221
PC-03	PB-03 & PB-04	Foundation Soils	12.3	32.1	187.3	1.574	-13.340	0.840	1.2	205.0	0	25	0.0	205.0	1.1	-0.2	0.0	1.0	2.536	1.082	3.017	0.182	16.612
PC-03	PB-03 & PB-04	Foundation Soils	12.4	32.0	177.9	1.643	-10.040	0.924	1.2	195.6	0	25	0.0	195.6	1.1	-0.2	0.0	1.0	1.486	1.082	1.768	0.182	9.707
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.9	168.3	1.784	-7.290	1.060	1.2	186.0	0	25	0.0	186.0	1.1	-0.2	0.0	1.0	0.934	1.081	1.111	0.183	6.081
PC-03	PB-03 & PB-04	Foundation Soils	12.5	31.8	161.5	1.843	-3.270	1.141	1.2	179.0	3	25	0.0	179.0	1.1	-0.2	0.0	1.0	0.697	1.073	0.818	0.183	4.466
PC-03	PB-03 & PB-04	Foundation Soils	12.6	31.8	152.0	1.832	1.330	1.205	1.2	169.2	5	25	1.0	170.2	1.1	-0.2	0.0	1.0	0.507	1.064	0.585	0.184	3.186
PC-03	PB-03 & PB-04	Foundation Soils	12.7	31.7	145.9	1.811	3.580	1.241	1.2	162.6	7	25	4.5	167.0	1.1	-0.2	0.0	1.0	0.457	1.060	0.525	0.184	2.852
PC-03	PB-03 & PB-04	Foundation Soils	12.8	31.6	138.7	1.713	6.240	1.235	1.2	154.8	8	25	8.0	162.8	1.1	-0.2	0.0	1.0	0.402	1.056	0.458	0.185	2.479
PC-03	PB-03 & PB-04	Foundation Soils	12.9	31.5	139.3	1.298	6.580	0.932	1.2	155.9	1	25	0.0	155.9	1.1	-0.2	0.0	1.0	0.332	1.050	0.375	0.185	2.025
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	137.3	1.293	5.810	0.942	1.2	153.6	2	25	0.0	153.6	1.1	-0.2	0.0	1.0	0.315	1.048	0.353	0.186	1.904
PC-03	PB-03 & PB-04	Foundation Soils	13.0	31.4	126.8	1.281	5.170	1.010	1.2	142.7	6	25	1.3	144.0	1.1	-0.2	0.0	1.0	0.254	1.041	0.281	0.186	1.511
PC-03	PB-03 & PB-04	Foundation Soils	13.1	31.3	120.2	1.272	4.670	1.059	1.2	135.2	8	25	7.4	142.6	1.1	-0.2	0.0	1.0	0.246	1.040	0.272	0.186	1.461

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	13.2	31.2	106.0	1.239	-4.000	1.169	1.2	118.7	14	25	27.0	145.8	1.1	-0.2	0.0	1.0	0.263	1.042	0.292	0.187	1.561
PC-03	PB-03 & PB-04	Foundation Soils	13.3	31.1	104.9	1.261	-4.900	1.202	1.2	117.3	15	25	29.9	147.2	1.1	-0.2	0.0	1.0	0.271	1.043	0.301	0.187	1.608
PC-03	PB-03 & PB-04	Foundation Soils	13.4	31.0	103.6	1.263	-1.330	1.220	1.2	115.6	16	25	31.9	147.5	1.1	-0.2	0.0	1.0	0.273	1.043	0.303	0.188	1.613
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	100.5	1.245	5.360	1.238	1.2	112.1	17	25	34.7	146.8	1.1	-0.2	0.0	1.0	0.269	1.043	0.298	0.188	1.582
PC-03	PB-03 & PB-04	Foundation Soils	13.5	30.9	97.0	1.212	5.520	1.249	1.2	108.1	18	25	37.0	145.1	1.1	-0.2	0.0	1.0	0.260	1.042	0.287	0.189	1.522
PC-03	PB-03 & PB-04	Foundation Soils	13.6	30.8	93.9	1.191	5.100	1.268	1.2	104.6	19	25	39.2	143.8	1.1	-0.2	0.0	1.0	0.253	1.041	0.279	0.189	1.474
PC-03	PB-03 & PB-04	Foundation Soils	13.7	30.7	90.9	1.158	4.290	1.275	1.2	101.2	20	25	40.7	141.9	1.1	-0.2	0.0	1.0	0.243	1.039	0.267	0.190	1.411
PC-03	PB-03 & PB-04	Foundation Soils	13.8	30.6	83.7	1.043	4.840	1.246	1.2	93.5	22	25	42.3	135.8	1.1	-0.2	0.0	1.0	0.217	1.035	0.237	0.190	1.249
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	79.2	0.991	6.680	1.252	1.2	88.5	23	25	43.8	132.2	1.1	-0.2	0.0	1.0	0.205	1.033	0.223	0.190	1.169
PC-03	PB-03 & PB-04	Foundation Soils	13.9	30.5	76.6	0.934	6.770	1.219	1.2	85.6	24	25	43.7	129.4	1.1	-0.2	0.0	1.0	0.195	1.031	0.212	0.191	1.111
PC-03	PB-03 & PB-04	Foundation Soils	14.0	30.4	74.4	0.912	7.000	1.225	1.2	83.2	25	25	44.4	127.6	1.1	-0.2	0.0	1.0	0.190	1.030	0.206	0.191	1.077
PC-03	PB-03 & PB-04	Foundation Soils	14.1	30.3	72.7	0.889	7.450	1.223	1.2	81.2	25	25	44.8	126.0	1.0	-0.2	0.0	1.0	0.186	1.029	0.201	0.192	1.048
PC-03	PB-03 & PB-04	Foundation Soils	14.2	30.2	71.4	0.876	7.720	1.227	1.2	79.7	26	25	45.1	124.8	1.0	-0.2	0.0	1.0	0.183	1.029	0.197	0.192	1.027
PC-03	PB-03 & PB-04	Foundation Soils	14.3	30.1	69.7	0.860	7.860	1.234	1.2	77.8	27	25	45.6	123.4	1.0	-0.2	0.0	1.0	0.179	1.028	0.193	0.193	1.002
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	68.8	0.846	7.960	1.230	1.2	76.7	27	25	45.7	122.4	1.0	-0.2	0.0	1.0	0.177	1.027	0.190	0.193	0.985
PC-03	PB-03 & PB-04	Foundation Soils	14.4	30.0	67.4	0.839	7.960	1.245	1.2	75.1	28	25	46.2	121.3	1.0	-0.2	0.0	1.0	0.174	1.027	0.187	0.193	0.967
PC-03	PB-03 & PB-04	Foundation Soils	14.5	29.9	65.8	0.844	8.240	1.282	1.2	73.3	29	25	46.9	120.2	1.0	-0.2	0.0	1.0	0.172	1.026	0.184	0.194	0.950
PC-03	PB-03 & PB-04	Foundation Soils	14.6	29.8	64.4	0.844	8.530	1.310	1.2	71.7	30	25	47.4	119.1	1.0	-0.2	0.0	1.0	0.169	1.026	0.181	0.194	0.934
PC-03	PB-03 & PB-04	Foundation Soils	14.7	29.7	62.1	0.839	8.580	1.352	1.2	69.1	32	25	48.0	117.0	1.0	-0.2	0.0	1.0	0.165	1.025	0.176	0.195	0.907
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	58.2	0.824	8.810	1.417	1.2	64.8	35	25	48.6	113.4	1.0	-0.2	0.0	1.0	0.158	1.023	0.168	0.195	0.863
PC-03	PB-03 & PB-04	Foundation Soils	14.8	29.6	55.4	0.794	8.720	1.434	1.2	61.7	37	25	48.7	110.4	1.0	-0.2	0.0	1.0	0.153	1.022	0.162	0.195	0.831
PC-03	PB-03 & PB-04	Foundation Soils	14.9	29.5	53.1	0.761	8.720	1.433	1.2	59.2	38	25	48.7	107.9	1.0	-0.2	0.0	1.0	0.149	1.021	0.158	0.196	0.805
PC-03	PB-03 & PB-04	Foundation Soils	15.0	29.4	51.8	0.674	8.580	1.301	1.2	57.8	36	25	47.8	105.6	1.0	-0.2	0.0	1.0	0.145	1.020	0.154	0.196	0.783
PC-03	PB-03 & PB-04	Foundation Soils	15.1	29.3	51.5	0.612	8.270	1.187	1.2	57.4	35	25	47.0	104.4	1.0	-0.2	0.0	1.0	0.143	1.019	0.152	0.196	0.772
PC-03	PB-03 & PB-04	Foundation Soils	15.2	29.2	51.9	0.570	8.200	1.099	1.2	57.7	33	25	46.2	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.197	0.766
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	51.7	0.586	7.640	1.134	1.2	57.4	34	25	46.5	103.9	1.0	-0.2	0.0	1.0	0.143	1.019	0.151	0.197	0.764
PC-03	PB-03 & PB-04	Foundation Soils	15.3	29.1	49.1	0.637	7.000	1.299	1.2	54.5	38	25	47.8	102.3	1.0	-0.2	0.0	1.0	0.140	1.019	0.148	0.198	0.749
PC-03	PB-03 & PB-04	Foundation Soils	15.4	29.0	42.9	0.710	6.540	1.655	1.2	47.8	47	25	48.8	96.6	1.0	-0.2	0.0	1.0	0.133	1.017	0.140	0.198	0.706
PC-03	PB-03 & PB-04	Foundation Soils	15.5	28.9	32.0	0.756	7.770	2.364	1.2	35.9	63	25	48.3	84.2	1.0	-0.2	0.0	1.0	0.120	1.013	0.125	0.198	0.630
PC-03	PB-03 & PB-04	Foundation Soils	15.6	28.8	21.3	0.793	10.330	3.722	1.2	24.2	82	25	46.6	70.8	1.0	-0.2	0.0	1.0	0.108	1.010	0.112	0.199	0.564
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.7	15.4	0.708	10.580	4.608	1.2	17.5	96	25	45.5	63.0	1.0	-0.3	0.0	1.0	0.102	1.009	0.105	0.199	0.529
PC-03	PB-03 & PB-04	Foundation Soils	15.7	28.6	11.6	0.512	12.140	4.396	1.2	13.3	100	25	44.6	57.9	1.0	-0.3	0.0	1.0	0.098	1.008	0.101	0.199	0.507
PC-03	PB-03 & PB-04	Foundation Soils	15.8	28.6	10.8	0.354	13.100	3.280	1.2	12.3	100	25	44.3	56.7	1.0	-0.3	0.0	1.0	0.097	1.008	0.100	0.200	0.501
PC-03	PB-03 & PB-04	Foundation Soils	15.9	28.5	11.3	0.268	20.120	2.368	1.2	12.9	92	25	44.3	57.2	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.200	0.502
PC-03	PB-03 & PB-04	Foundation Soils	16.0	28.4	20.7	0.194	50.790	0.936	1.2	23.4	58	25	44.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.110	0.201	0.547
PC-03	PB-03 & PB-04	Foundation Soils	16.1	28.3	34.9	0.173	47.490	0.496	1.2	38.8	31	25	41.4	80.2	1.0	-0.3	0.0	1.0	0.116	1.012	0.121	0.201	0.601
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	48.2	0.147	25.820	0.305	1.2	53.8	14	25	20.5	74.3	1.0	-0.3	0.0	1.0	0.111	1.011	0.115	0.201	0.571
PC-03	PB-03 & PB-04	Foundation Soils	16.2	28.2	49.9	0.122	14.380	0.244	1.2	56.1	10	25	9.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.202	0.533
PC-03	PB-03 & PB-04	Foundation Soils	16.3	28.1	48.3	0.201	13.960	0.416	1.2	53.4	18	25	30.1	83.6	1.0	-0.3	0.0	1.0	0.119	1.013	0.124	0.202	0.614
PC-03	PB-03 & PB-04	Foundation Soils	16.4	28.0	46.0	0.284	12.050	0.618	1.2	50.5	26	25	40.1	90.6	1.0	-0.3	0.0	1.0	0.126	1.015	0.132	0.202	0.652
PC-03	PB-03 & PB-04	Foundation Soils	16.5	27.9	41.4	0.362	6.040	0.874	1.2	45.4	36	25	44.9	90.4	1.0	-0.3	0.0	1.0	0.126	1.015	0.131	0.203	0.649
PC-03	PB-03 & PB-04	Foundation Soils	16.6	27.8	37.4	0.446	8.200	1.192	1.2	41.0	45	25	46.8	87.8	1.0	-0.3	0.0	1.0	0.123	1.014	0.129	0.203	0.634
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	29.0	0.482	9.590	1.660	1.2	32.0	59	25	47.0	79.0	1.0	-0.3	0.0	1.0	0.115	1.012	0.119	0.203	0.587
PC-03	PB-03 & PB-04	Foundation Soils	16.7	27.7	22.8	0.495	10.720	2.169	1.2	25.3	70	25	46.3	71.6	1.0	-0.3	0.0	1.0	0.109	1.010	0.112	0.204	0.552
PC-03	PB-03 & PB-04	Foundation Soils	16.8	27.6	12.8	0.506	13.190	3.949	1.2	14.3	99	25	44.8	59.1	1.0	-0.3	0.0	1.0	0.099	1.009	0.102	0.204	0.500
PC-03	PB-03 & PB-04	Foundation Soils	16.9	27.5	8.0	0.476	22.820	5.919	1.2	9.0	100	25	43.6	52.6	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.204	0.474
PC-03	PB-03 & PB-04	Foundation Soils	17.0	27.4	6.6	0.383	36.240	5.789	1.2	7.4	100	25	43.2	50.6	1.0	-0.3	0.0	1.0	0.093	1.008	0.095	0.205	0.466
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	6.0	0.272	54.600	4.525	1.2	6.7	100	25	43.0	49.8	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.205	0.462
PC-03	PB-03 & PB-04	Foundation Soils	17.1	27.3	6.4	0.153	69.980	2.392	1.2	7.2	100	25	43.1	50.3	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.205	0.463
PC-03	PB-03 & PB-04	Foundation Soils	17.2	27.2	5.5	0.067	66.180	1.229	1.2	6.1	100	25	42.9	49.0	1.0	-0.3	0.0	1.0	0.092	1.007	0.094	0.205	0.457
PC-03	PB-03 & PB-04	Foundation Soils	17.3	27.1	4.7	0.101	71.040	2.143	1.2	5.3	100	25	42.7	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.206	0.453
PC-03	PB-03 & PB-04	Foundation Soils	17.4	27.0	4.6	0.050	79.520	1.078	1.2	5.2	100	25	42.6	47.8	1.0	-0.3	0.0	1.0	0.091	1.007	0.093	0.206	0.452
PC-03	PB-03 & PB-04	Foundation Soils	17.5	26.9	7.6	0.028	86.520	0.371	1.2	8.4	80	25	42.8	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.206	0.463
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	25.6	0.038	67.370	0.148	1.2	28.0	29	25	37.8	65.9	1.0	-0.3	0.0	1.0	0.104	1.009	0.107	0.207	0.518
PC-03	PB-03 & PB-04	Foundation Soils	17.6	26.8	38.3	0.075	44.400	0.196	1.2	41.8	17	25	26.8	68.6	1.0	-0.3	0.0	1.0	0.106	1.010	0.109	0.207	0.529
PC-03	PB-03 & PB-04	Foundation Soils	17.7	26.7	45.0	0.139	16.090	0.309	1.1	48.8	17	25	27.4	76.1	1.0	-0.3	0.0	0.9	0.112	1.011	0.116	0.207	0.560
PC-03	PB-03 & PB-04	Foundation Soils	17.8	26.6	45.8	0.247	16.690	0.539	1.1	49.2	25	25	38.5	87.7	1.0	-0.3	0.0	0.9	0.123	1.014	0.128	0.208	0.616
PC-03	PB-03 & PB-04	Foundation Soils	17.9	26.5	44.5	0.275	18.010	0.618	1.1	47.7	28	25	41.0	88.7	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.208	0.621
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	42.2	0.334	18.800	0.791	1.1	45.2	34	25	44.2	89.3	1.0	-0.3	0.0	0.9	0.125	1.014	0.130	0.208	0.623
PC-03	PB-03 & PB-04	Foundation Soils	18.0	26.4	41.5	0.390	19.980	0.939	1.1	44.4	38	25	45.5	89.9	1.0	-0.3	0.0	0.9	0.125	1.015	0.130	0.208	0.625
PC-03	PB-03 & PB-04	Foundation Soils	18.1	26.3	42.5	0.475	20.39	1.117193	1.1	45.3	40	25	46.6	91.9	1.0	-0.3	0.0	0.9	0.128	1.015	0.133	0.209	0.635
PC-03	PB-03 & PB-04	Foundation Soils	18.2	26.2	42.4	0.629	19.730	1.484	1.1	45.0	46	25	48.1	93.1	1.0	-0.3	0.0	0.9	0.129	1.016	0.134	0.209	0.641

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	18.3	26.1	37.8	0.677	18.480	1.789	1.1	40.2	54	25	48.2	88.5	1.0	-0.3	0.0	0.9	0.124	1.014	0.129	0.209	0.614
PC-03	PB-03 & PB-04	Foundation Soils	18.4	26.0	27.9	0.697	19.360	2.499	1.1	30.0	70	15	38.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.109	0.210	0.520
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	21.2	0.717	20.230	3.378	1.1	22.9	82	15	37.5	60.4	1.0	-0.3	0.0	0.9	0.100	1.009	0.102	0.210	0.488
PC-03	PB-03 & PB-04	Foundation Soils	18.5	25.9	17.7	0.694	21.060	3.916	1.1	19.2	91	15	37.0	56.2	1.0	-0.3	0.0	0.9	0.097	1.008	0.099	0.210	0.472
PC-03	PB-03 & PB-04	Foundation Soils	18.6	25.8	22.0	0.679	21.330	3.090	1.1	23.6	80	15	37.6	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.210	0.490
PC-03	PB-03 & PB-04	Foundation Soils	18.7	25.7	20.1	0.612	18.060	3.050	1.1	21.6	82	15	37.3	58.9	1.0	-0.3	0.0	0.9	0.099	1.008	0.101	0.211	0.480
PC-03	PB-03 & PB-04	Foundation Soils	18.8	25.6	12.1	0.534	19.870	4.412	1.1	13.1	100	15	36.1	49.1	1.0	-0.3	0.0	0.9	0.092	1.007	0.094	0.211	0.444
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	8.7	0.446	28.490	5.151	1.1	9.4	100	15	35.3	44.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.211	0.428
PC-03	PB-03 & PB-04	Foundation Soils	18.9	25.5	8.2	0.372	36.240	4.555	1.1	8.8	100	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.212	0.426
PC-03	PB-03 & PB-04	Foundation Soils	19.0	25.4	7.0	0.240	57.460	3.434	1.1	7.6	100	15	35.0	42.6	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.212	0.420
PC-03	PB-03 & PB-04	Foundation Soils	19.1	25.3	6.4	0.156	69.080	2.429	1.1	6.9	100	15	34.9	41.8	1.0	-0.3	0.0	0.9	0.087	1.007	0.088	0.212	0.417
PC-03	PB-03 & PB-04	Foundation Soils	19.2	25.2	5.7	0.107	77.480	1.869	1.1	6.2	100	15	34.7	40.9	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.212	0.413
PC-03	PB-03 & PB-04	Foundation Soils	19.3	25.1	5.8	0.054	85.620	0.934	1.1	6.2	100	15	34.7	41.0	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.213	0.413
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	6.3	0.029	75.090	0.463	1.1	6.8	93	15	34.7	41.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.213	0.414
PC-03	PB-03 & PB-04	Foundation Soils	19.4	25.0	6.7	0.057	31.020	0.845	1.1	7.2	98	15	34.9	42.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.213	0.416
PC-03	PB-03 & PB-04	Foundation Soils	19.5	24.9	7.5	0.078	31.020	1.039	1.1	8.0	97	15	35.0	43.1	1.0	-0.3	0.0	0.9	0.087	1.007	0.089	0.213	0.418
PC-03	PB-03 & PB-04	Foundation Soils	19.6	24.8	8.3	0.080	30.970	0.968	1.1	8.8	92	15	35.1	43.9	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.214	0.420
PC-03	PB-03 & PB-04	Foundation Soils	19.7	24.7	9.0	0.162	30.870	1.797	1.1	9.6	99	15	35.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.214	0.423
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.6	9.7	0.186	23.180	1.913	1.1	10.4	98	15	35.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.214	0.426
PC-03	PB-03 & PB-04	Foundation Soils	19.8	24.5	9.6	0.200	34.300	2.087	1.1	10.2	100	15	35.5	45.7	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.214	0.425
PC-03	PB-03 & PB-04	Foundation Soils	19.9	24.5	8.3	0.178	39.460	2.143	1.1	8.8	100	15	35.2	44.1	1.0	-0.3	0.0	0.9	0.088	1.007	0.090	0.215	0.419
PC-03	PB-03 & PB-04	Foundation Soils	20.0	24.4	6.0	0.128	49.230	2.131	1.1	6.4	100	15	34.8	41.1	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.215	0.408
PC-03	PB-03 & PB-04	Foundation Soils	20.1	24.3	5.3	0.108	71.480	2.035	1.1	5.6	100	15	34.6	40.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.215	0.405
PC-03	PB-03 & PB-04	Foundation Soils	20.2	24.2	12.0	0.166	86.760	1.389	1.1	12.6	85	15	35.6	48.2	1.0	-0.4	0.0	0.9	0.091	1.007	0.093	0.215	0.431
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	18.0	0.193	83.870	1.075	1.1	18.8	67	15	36.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.216	0.453
PC-03	PB-03 & PB-04	Foundation Soils	20.3	24.1	11.3	0.166	17.530	1.465	1.1	11.9	88	15	35.6	47.5	1.0	-0.4	0.0	0.9	0.091	1.007	0.092	0.216	0.427
PC-03	PB-03 & PB-04	Foundation Soils	20.4	24.0	8.3	0.161	20.150	1.943	1.1	8.7	100	15	35.2	43.9	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.216	0.415
PC-03	PB-03 & PB-04	Foundation Soils	20.5	23.9	6.0	0.152	26.870	2.522	1.1	6.4	100	15	34.7	41.1	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.216	0.405
PC-03	PB-03 & PB-04	Foundation Soils	20.6	23.8	5.2	0.183	56.390	3.525	1.1	5.5	100	15	34.6	40.0	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.217	0.401
PC-03	PB-03 & PB-04	Foundation Soils	20.7	23.7	5.5	0.153	83.900	2.785	1.1	5.8	100	15	34.6	40.4	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.217	0.402
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	6.1	0.103	96.720	1.676	1.1	6.4	100	15	34.8	41.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.217	0.404
PC-03	PB-03 & PB-04	Foundation Soils	20.8	23.6	7.4	0.097	88.620	1.307	1.1	7.8	100	15	35.0	42.8	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.217	0.409
PC-03	PB-03 & PB-04	Foundation Soils	20.9	23.5	7.3	0.112	85.580	1.533	1.1	7.6	100	15	35.0	42.6	1.0	-0.4	0.0	0.9	0.087	1.007	0.089	0.218	0.408
PC-03	PB-03 & PB-04	Foundation Soils	21.0	23.4	6.7	0.142	98.390	2.109	1.1	7.0	100	15	34.9	41.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.088	0.218	0.405
PC-03	PB-03 & PB-04	Foundation Soils	21.1	23.3	9.1	0.145	96.290	1.586	1.1	9.5	98	15	35.3	44.8	1.0	-0.4	0.0	0.9	0.089	1.007	0.090	0.218	0.414
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	13.4	0.166	77.120	1.240	1.1	13.9	80	15	35.7	49.6	1.0	-0.4	0.0	0.9	0.092	1.008	0.094	0.218	0.429
PC-03	PB-03 & PB-04	Foundation Soils	21.2	23.2	16.7	0.135	63.960	0.808	1.1	17.3	65	15	35.7	53.0	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.219	0.440
PC-03	PB-03 & PB-04	Foundation Soils	21.3	23.1	18.6	0.143	73.800	0.770	1.1	19.1	61	15	35.8	54.9	1.0	-0.4	0.0	0.9	0.096	1.008	0.098	0.219	0.446
PC-03	PB-03 & PB-04	Foundation Soils	21.4	23.0	20.7	0.149	83.050	0.719	1.1	21.3	56	15	35.8	57.1	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.219	0.453
PC-03	PB-03 & PB-04	Foundation Soils	21.5	22.9	24.0	0.202	92.780	0.842	1.1	24.6	54	15	36.2	60.8	1.0	-0.4	0.0	0.9	0.100	1.009	0.102	0.219	0.466
PC-03	PB-03 & PB-04	Foundation Soils	21.6	22.8	26.6	0.233	89.000	0.876	1.1	27.1	52	15	36.4	63.6	1.0	-0.4	0.0	0.9	0.102	1.009	0.104	0.219	0.475
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	27.3	0.296	100.820	1.085	1.1	27.8	55	15	36.9	64.7	1.0	-0.4	0.0	0.9	0.103	1.009	0.105	0.220	0.479
PC-03	PB-03 & PB-04	Foundation Soils	21.7	22.7	28.2	0.364	102.720	1.292	1.1	28.7	57	15	37.3	65.9	1.0	-0.4	0.0	0.9	0.104	1.009	0.106	0.220	0.483
PC-03	PB-03 & PB-04	Foundation Soils	21.8	22.6	34.2	0.445	95.080	1.300	1.1	34.7	51	15	37.8	72.5	1.0	-0.4	0.0	0.9	0.109	1.011	0.112	0.220	0.508
PC-03	PB-03 & PB-04	Foundation Soils	21.9	22.5	37.9	0.356	91.530	0.939	1.1	38.3	42	15	36.9	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.114	0.220	0.518
PC-03	PB-03 & PB-04	Foundation Soils	22.0	22.4	43.5	0.273	77.850	0.627	1.1	43.9	31	15	34.2	78.1	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.220	0.530
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	54.2	0.210	76.040	0.387	1.1	54.6	16	15	21.6	76.2	1.0	-0.4	0.0	0.9	0.112	1.011	0.115	0.220	0.521
PC-03	PB-03 & PB-04	Foundation Soils	22.1	22.3	73.9	0.220	36.250	0.298	1.1	74.4	3	15	0.0	74.4	1.0	-0.4	0.0	0.9	0.111	1.011	0.113	0.221	0.513
PC-03	PB-03 & PB-04	Foundation Soils	22.2	22.2	81.8	0.178	39.070	0.218	1.1	82.0	0	15	0.0	82.0	1.0	-0.4	0.0	0.9	0.118	1.013	0.120	0.221	0.545
PC-03	PB-03 & PB-04	Foundation Soils	22.3	22.1	91.5	0.139	25.660	0.152	1.1	91.4	0	15	0.0	91.4	1.0	-0.4	0.0	0.9	0.127	1.015	0.130	0.221	0.590
PC-03	PB-03 & PB-04	Foundation Soils	22.4	22.0	109.2	0.142	19.220	0.130	1.1	108.5	0	15	0.0	108.5	1.0	-0.4	0.0	0.9	0.150	1.021	0.155	0.221	0.699
PC-03	PB-03 & PB-04	Foundation Soils	22.5	21.9	123.9	0.171	13.020	0.138	1.0	122.6	0	15	0.0	122.6	1.0	-0.4	0.0	0.9	0.177	1.028	0.185	0.221	0.834
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	134.0	0.203	0.140	0.151	1.0	132.2	0	15	0.0	132.2	1.0	-0.4	0.0	0.9	0.204	1.033	0.214	0.221	0.967
PC-03	PB-03 & PB-04	Foundation Soils	22.6	21.8	135.8	0.320	4.360	0.236	1.0	133.7	0	15	0.0	133.7	1.0	-0.4	0.0	0.9	0.210	1.034	0.220	0.222	0.992
PC-03	PB-03 & PB-04	Foundation Soils	22.7	21.7	135.7	0.323	13.290	0.238	1.0	133.5	0	15	0.0	133.5	1.0	-0.4	0.0	0.9	0.209	1.034	0.219	0.222	0.986
PC-03	PB-03 & PB-04	Foundation Soils	22.8	21.6	136.4	0.326	0.340	0.239	1.0	134.0	0	15	0.0	134.0	1.0	-0.4	0.0	0.9	0.211	1.034	0.221	0.222	0.994
PC-03	PB-03 & PB-04	Foundation Soils	22.9	21.5	135.5	0.431	-8.480	0.318	1.0	133.0	0	15	0.0	133.0	1.0	-0.4	0.0	0.9	0.207	1.034	0.217	0.222	0.976
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.4	132.3	0.477	-18.770	0.361	1.0	129.7	0	15	0.0	129.7	1.0	-0.4	0.0	0.9	0.197	1.032	0.205	0.222	0.923
PC-03	PB-03 & PB-04	Foundation Soils	23.0	21.3	136.0	0.420	-15.930	0.309	1.0	133.1	0	15	0.0	133.1	1.0	-0.4	0.0	0.9	0.208	1.034	0.217	0.222	0.976
PC-03	PB-03 & PB-04	Foundation Soils	23.1	21.3	139.6	0.297	-20.850	0.213	1.0	136.5	0	15	0.0	136.5	1.0	-0.4	0.0	0.9	0.220	1.036	0.230	0.223	1.035
PC-03	PB-03 & PB-04	Foundation Soils	23.2	21.2	139.1	0.232	-22.110	0.167	1.0	135.9	0	15	0.0	135.9	1.0	-0.4	0.0	0.9	0.218	1.035	0.228	0.223	1.023
PC-03	PB-03 & PB-04	Foundation Soils	23.3	21.1	132.1	0.258	-23.250	0.195	1.0	129.0	0	15	0.0	129.0	1.0	-0.4	0.0	0.9	0.194	1.031	0.203	0.223	0.909

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
PC-03	PB-03 & PB-04	Foundation Soils	23.4	21.0	120.5	0.328	-20.820	0.272	1.0	117.8	0	15	0.0	117.8	1.0	-0.4	0.0	0.9	0.166	1.025	0.172	0.223	0.772
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	105.2	0.397	-9.910	0.377	1.0	102.9	0	15	0.0	102.9	1.0	-0.4	0.0	0.9	0.141	1.019	0.145	0.223	0.650
PC-03	PB-03 & PB-04	Foundation Soils	23.5	20.9	106.2	0.496	-4.860	0.467	1.0	103.7	0	15	0.0	103.7	1.0	-0.4	0.0	0.9	0.142	1.019	0.146	0.223	0.654
PC-03	PB-03 & PB-04	Foundation Soils	23.6	20.8	118.4	0.484	-6.380	0.409	1.0	115.3	0	15	0.0	115.3	1.0	-0.4	0.0	0.9	0.161	1.024	0.167	0.223	0.746
PC-03	PB-03 & PB-04	Foundation Soils	23.7	20.7	142.3	0.428	-16.840	0.301	1.0	138.0	0	15	0.0	138.0	1.0	-0.4	0.0	0.9	0.226	1.037	0.236	0.224	1.057
PC-03	PB-03 & PB-04	Foundation Soils	23.8	20.6	157.5	0.341	-19.680	0.216	1.0	152.4	0	15	0.0	152.4	1.0	-0.4	0.0	0.9	0.305	1.047	0.323	0.224	1.443
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.5	170.2	0.241	-19.300	0.142	1.0	164.3	0	15	0.0	164.3	1.0	-0.4	0.0	0.9	0.420	1.058	0.450	0.224	2.008
PC-03	PB-03 & PB-04	Foundation Soils	23.9	20.4	168.5	0.210	-18.300	0.125	1.0	162.5	0	15	0.0	162.5	1.0	-0.4	0.1	0.9	0.399	1.056	0.426	0.224	1.899
PC-03	PB-03 & PB-04	Foundation Soils	24.0	20.4	161.1	0.217	-16.820	0.135	1.0	155.3	0	15	0.0	155.3	1.0	-0.4	0.1	0.9	0.328	1.050	0.347	0.224	1.550
PC-03	PB-03 & PB-04	Foundation Soils	24.1	20.3	152.5	0.272	-13.200	0.178	1.0	147.0	0	15	0.0	147.0	1.0	-0.4	0.1	0.9	0.270	1.043	0.284	0.224	1.266
PC-03	PB-03 & PB-04	Foundation Soils	24.2	20.2	139.3	0.347	-10.790	0.249	1.0	134.3	0	15	0.0	134.3	1.0	-0.5	0.1	0.9	0.212	1.034	0.220	0.224	0.982
PC-03	PB-03 & PB-04	Foundation Soils	24.3	20.1	126.5	0.444	-9.530	0.351	1.0	122.0	0	15	0.0	122.0	1.0	-0.5	0.1	0.9	0.176	1.027	0.182	0.225	0.809
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	112.0	0.465	-7.930	0.415	1.0	108.0	0	15	0.0	108.0	1.0	-0.5	0.1	0.9	0.149	1.021	0.153	0.225	0.679
PC-03	PB-03 & PB-04	Foundation Soils	24.4	20.0	104.7	0.374	-7.620	0.357	1.0	100.9	0	15	0.0	100.9	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.225	0.630
PC-03	PB-03 & PB-04	Foundation Soils	24.5	19.9	96.8	0.346	-13.170	0.358	1.0	93.2	0	15	0.0	93.2	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.225	0.585
PC-03	PB-03 & PB-04	Foundation Soils	24.6	19.8	89.5	0.289	-16.300	0.323	1.0	86.2	0	15	0.0	86.2	1.0	-0.5	0.1	0.9	0.122	1.014	0.124	0.225	0.550
PC-03	PB-03 & PB-04	Foundation Soils	24.7	19.7	85.9	0.242	-17.250	0.282	1.0	82.6	0	15	0.0	82.6	1.0	-0.5	0.1	0.9	0.118	1.013	0.120	0.225	0.533
PC-03	PB-03 & PB-04	Foundation Soils	24.8	19.6	78.1	0.247	-13.530	0.316	1.0	75.0	3	15	0.0	75.0	1.0	-0.5	0.1	0.9	0.111	1.011	0.113	0.225	0.501
UC-01	UB-02	Foundation Soils	9.5	31.8	31.7	0.228	-9.670	0.718	1.7	50.1	32	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.204	0.484
UC-01	UB-02	Foundation Soils	9.6	31.7	34.9	0.131	-0.330	0.376	1.6	54.2	19	0	0.4	54.6	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.205	0.498
UC-01	UB-02	Foundation Soils	9.7	31.7	34.5	0.135	1.430	0.391	1.6	53.6	20	0	0.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.205	0.494
UC-01	UB-02	Foundation Soils	9.8	31.6	33.3	0.179	1.670	0.538	1.6	51.8	26	0	0.5	52.2	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.206	0.486
UC-01	UB-02	Foundation Soils	9.8	31.5	31.5	0.207	2.290	0.657	1.7	49.2	31	0	0.5	49.7	1.1	-0.1	0.0	1.0	0.092	1.008	0.098	0.207	0.474
UC-01	UB-02	Foundation Soils	9.9	31.4	30.8	0.213	0.770	0.692	1.7	48.1	33	0	0.5	48.6	1.1	-0.1	0.0	1.0	0.091	1.007	0.097	0.207	0.468
UC-01	UB-02	Foundation Soils	10.0	31.3	29.0	0.231	-1.240	0.797	1.7	45.5	37	0	0.5	46.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.095	0.208	0.457
UC-01	UB-02	Foundation Soils	10.1	31.2	27.4	0.272	-0.100	0.992	1.7	43.2	43	0	0.5	43.7	1.1	-0.1	0.0	1.0	0.088	1.007	0.093	0.208	0.447
UC-01	UB-02	Foundation Soils	10.2	31.2	28.4	0.375	-1.290	1.319	1.7	44.4	48	0	0.5	45.0	1.1	-0.1	0.0	1.0	0.089	1.007	0.094	0.209	0.450
UC-01	UB-02	Foundation Soils	10.3	31.1	32.7	0.448	-3.480	1.372	1.6	50.1	45	0	0.5	50.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.210	0.470
UC-01	UB-02	Foundation Soils	10.3	31.0	42.0	0.497	-13.290	1.182	1.6	62.3	34	0	0.5	62.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.210	0.517
UC-01	UB-02	Foundation Soils	10.4	30.9	49.9	0.468	-20.580	0.938	1.5	72.1	25	0	0.5	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.118	0.211	0.558
UC-01	UB-02	Foundation Soils	10.5	30.8	55.2	0.418	-22.080	0.757	1.5	78.5	18	0	0.4	78.9	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.211	0.587
UC-01	UB-02	Foundation Soils	10.6	30.8	60.1	0.312	-23.600	0.519	1.5	84.3	8	0	0.1	84.4	1.1	-0.1	0.0	1.0	0.120	1.013	0.130	0.212	0.614
UC-01	UB-02	Foundation Soils	10.7	30.7	62.4	0.233	-24.250	0.373	1.5	87.0	1	0	0.0	87.0	1.1	-0.1	0.0	1.0	0.122	1.014	0.133	0.212	0.626
UC-01	UB-02	Foundation Soils	10.7	30.6	60.7	0.182	-23.300	0.300	1.5	84.6	0	0	0.0	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.130	0.213	0.611
UC-01	UB-02	Foundation Soils	10.8	30.5	57.5	0.236	-21.630	0.410	1.5	80.7	6	0	0.0	80.7	1.1	-0.2	0.0	1.0	0.116	1.012	0.126	0.213	0.589
UC-01	UB-02	Foundation Soils	10.9	30.4	50.6	0.317	-19.110	0.626	1.5	72.0	17	0	0.3	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.117	0.214	0.547
UC-01	UB-02	Foundation Soils	11.0	30.3	47.6	0.330	-17.720	0.694	1.5	68.0	21	0	0.4	68.4	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.214	0.529
UC-01	UB-02	Foundation Soils	11.1	30.3	42.0	0.317	-13.480	0.755	1.5	60.8	26	0	0.5	61.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.215	0.498
UC-01	UB-02	Foundation Soils	11.2	30.2	40.6	0.279	-9.950	0.687	1.5	58.8	25	0	0.5	59.3	1.1	-0.2	0.0	1.0	0.099	1.009	0.105	0.215	0.489
UC-01	UB-02	Foundation Soils	11.2	30.1	43.0	0.248	-7.960	0.576	1.5	61.8	21	0	0.4	62.2	1.1	-0.2	0.0	1.0	0.101	1.009	0.108	0.216	0.499
UC-01	UB-02	Foundation Soils	11.3	30.0	44.0	0.238	-5.050	0.541	1.5	62.9	19	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.216	0.502
UC-01	UB-02	Foundation Soils	11.4	29.9	44.1	0.230	-1.570	0.521	1.5	62.8	18	0	0.4	63.2	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.217	0.500
UC-01	UB-02	Foundation Soils	11.5	29.8	45.5	0.252	2.100	0.554	1.5	64.4	19	0	0.4	64.8	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.217	0.505
UC-01	UB-02	Foundation Soils	11.6	29.8	48.1	0.285	2.620	0.592	1.5	67.5	18	0	0.4	67.9	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.218	0.517
UC-01	UB-02	Foundation Soils	11.6	29.7	50.3	0.319	2.190	0.634	1.5	70.0	18	0	0.4	70.4	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.218	0.526
UC-01	UB-02	Foundation Soils	11.7	29.6	54.9	0.353	1.980	0.643	1.5	75.5	16	0	0.3	75.8	1.1	-0.2	0.0	1.0	0.112	1.011	0.120	0.219	0.549
UC-01	UB-02	Foundation Soils	11.8	29.5	58.7	0.402	1.520	0.684	1.4	79.9	15	0	0.3	80.2	1.1	-0.2	0.0	1.0	0.116	1.012	0.125	0.219	0.568
UC-01	UB-02	Foundation Soils	11.9	29.4	63.2	0.440	1.190	0.696	1.4	85.0	13	0	0.2	85.3	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.220	0.592
UC-01	UB-02	Foundation Soils	12.0	29.4	66.1	0.477	1.240	0.722	1.4	88.2	13	0	0.2	88.5	1.1	-0.2	0.0	1.0	0.124	1.014	0.134	0.220	0.608
UC-01	UB-02	Foundation Soils	12.1	29.3	68.0	0.507	1.300	0.745	1.4	90.3	13	0	0.2	90.5	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.221	0.618
UC-01	UB-02	Foundation Soils	12.1	29.2	70.0	0.518	1.190	0.740	1.4	92.4	12	0	0.2	92.6	1.1	-0.2	0.0	1.0	0.128	1.015	0.139	0.221	0.628
UC-01	UB-02	Foundation Soils	12.2	29.1	71.5	0.535	1.380	0.749	1.4	93.9	12	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.221	0.636
UC-01	UB-02	Foundation Soils	12.3	29.0	72.6	0.528	1.380	0.727	1.4	95.0	11	0	0.2	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.222	0.641
UC-01	UB-02	Foundation Soils	12.4	28.9	72.8	0.523	1.520	0.718	1.4	95.0	10	0	0.1	95.2	1.1	-0.2	0.0	1.0	0.131	1.016	0.142	0.222	0.640
UC-01	UB-02	Foundation Soils	12.5	28.9	72.0	0.518	1.570	0.719	1.4	94.0	11	0	0.2	94.1	1.1	-0.2	0.0	1.0	0.130	1.016	0.141	0.223	0.632
UC-01	UB-02	Foundation Soils	12.5	28.8	70.6	0.504	1.680	0.713	1.4	92.2	11	0	0.2	92.4	1.1	-0.2	0.0	1.0	0.128	1.015	0.138	0.223	0.620
UC-01	UB-02	Foundation Soils	12.6	28.7	69.4	0.482	1.720	0.695	1.4	90.5	11	0	0.2	90.7	1.1	-0.2	0.0	1.0	0.126	1.015	0.136	0.224	0.609
UC-01	UB-02	Foundation Soils	12.7	28.6	67.5	0.464	2.020	0.687	1.4	88.2	12	0	0.2	88.4	1.1	-0.2	0.0	1.0	0.124	1.014	0.133	0.224	0.595
UC-01	UB-02	Foundation Soils	12.8	28.5	66.0	0.436	2.050	0.660	1.4	86.3	12	0	0.2	86.5	1.1	-0.2	0.0	1.0	0.122	1.014	0.131	0.224	0.584
UC-01	UB-02	Foundation Soils	12.9	28.5	65.4	0.411	2.150	0.629	1.4	85.4	11	0	0.2	85.5	1.1	-0.2	0.0	1.0	0.121	1.013	0.130	0.225	0.577
UC-01	UB-02	Foundation Soils	13.0	28.4	64.7	0.379	2.380	0.586	1.4	84.4	10	0	0.1	84.6	1.1	-0.2	0.0	1.0	0.120	1.013	0.129	0.225	0.571
UC-01	UB-02	Foundation Soils	13.0	28.3	64.5	0.375	2.430	0.582	1.4	84.0	10	0	0.1	84.1	1.1	-0.2	0.0	1.0	0.120	1.013	0.128	0.226	0.568

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	13.1	28.2	64.3	0.364	2.480	0.566	1.4	83.6	10	0	0.1	83.7	1.1	-0.2	0.0	1.0	0.119	1.013	0.128	0.226	0.565
UC-01	UB-02	Foundation Soils	13.2	28.1	60.0	0.361	6.380	0.601	1.4	78.5	13	0	0.2	78.7	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.226	0.540
UC-01	UB-02	Foundation Soils	13.3	28.0	62.8	0.370	2.380	0.589	1.4	81.5	11	0	0.2	81.7	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.227	0.553
UC-01	UB-02	Foundation Soils	13.4	28.0	62.4	0.366	2.330	0.587	1.4	80.9	12	0	0.2	81.0	1.1	-0.2	0.0	1.0	0.117	1.012	0.125	0.227	0.549
UC-01	UB-02	Foundation Soils	13.5	27.9	61.4	0.358	2.540	0.583	1.4	79.6	12	0	0.2	79.8	1.1	-0.2	0.0	1.0	0.116	1.012	0.123	0.227	0.542
UC-01	UB-02	Foundation Soils	13.5	27.8	59.9	0.346	2.720	0.578	1.4	77.6	13	0	0.2	77.9	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.228	0.532
UC-01	UB-02	Foundation Soils	13.6	27.7	58.8	0.347	2.940	0.590	1.4	76.3	14	0	0.3	76.5	1.1	-0.2	0.0	1.0	0.113	1.011	0.120	0.228	0.525
UC-01	UB-02	Foundation Soils	13.7	27.6	58.3	0.374	3.050	0.641	1.4	75.5	16	0	0.3	75.8	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.228	0.521
UC-01	UB-02	Foundation Soils	13.8	27.6	58.1	0.458	3.150	0.789	1.4	75.1	20	0	0.4	75.5	1.0	-0.2	0.0	1.0	0.112	1.011	0.119	0.229	0.519
UC-01	UB-02	Foundation Soils	13.9	27.5	57.4	0.517	3.150	0.900	1.4	74.2	23	0	0.5	74.6	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.229	0.514
UC-01	UB-02	Foundation Soils	13.9	27.4	56.0	0.548	3.190	0.978	1.4	72.4	25	0	0.5	72.9	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.229	0.506
UC-01	UB-02	Foundation Soils	14.0	27.3	53.2	0.477	3.330	0.896	1.4	69.0	25	0	0.5	69.5	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.230	0.491
UC-01	UB-02	Foundation Soils	14.1	27.2	50.5	0.465	3.780	0.920	1.4	65.7	27	0	0.5	66.1	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.230	0.477
UC-01	UB-02	Foundation Soils	14.2	27.1	55.0	0.458	4.340	0.832	1.4	70.8	23	0	0.4	71.2	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.230	0.496
UC-01	UB-02	Foundation Soils	14.3	27.1	70.2	0.457	4.220	0.651	1.3	88.0	11	0	0.2	88.1	1.1	-0.2	0.0	1.0	0.124	1.014	0.132	0.231	0.572
UC-01	UB-02	Foundation Soils	14.4	27.0	79.7	0.492	2.890	0.617	1.3	98.4	6	0	0.0	98.4	1.1	-0.2	0.0	1.0	0.135	1.017	0.145	0.231	0.629
UC-01	UB-02	Foundation Soils	14.4	26.9	75.4	0.530	2.150	0.703	1.3	93.4	10	0	0.1	93.5	1.1	-0.2	0.0	1.0	0.129	1.016	0.139	0.231	0.599
UC-01	UB-02	Foundation Soils	14.5	26.8	65.5	0.555	0.710	0.847	1.3	82.2	18	0	0.4	82.5	1.0	-0.2	0.0	1.0	0.118	1.013	0.125	0.232	0.541
UC-01	UB-02	Foundation Soils	14.6	26.7	54.3	0.587	0.620	1.080	1.4	69.2	29	0	0.5	69.7	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.232	0.486
UC-01	UB-02	Foundation Soils	14.7	26.6	37.4	0.621	2.050	1.659	1.4	49.2	48	0	0.6	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.232	0.414
UC-01	UB-02	Foundation Soils	14.8	26.6	25.5	0.658	3.850	2.578	1.4	34.5	69	0	0.5	35.1	1.0	-0.2	0.0	1.0	0.082	1.007	0.085	0.233	0.367
UC-01	UB-02	Foundation Soils	14.8	26.5	15.7	0.640	6.340	4.087	1.5	21.9	88	0	0.5	22.4	1.0	-0.2	0.0	1.0	0.074	1.006	0.076	0.233	0.328
UC-01	UB-02	Foundation Soils	14.9	26.4	10.4	0.555	8.790	5.339	1.5	14.6	100	0	0.5	15.1	1.0	-0.2	0.0	1.0	0.069	1.006	0.072	0.233	0.307
UC-01	UB-02	Foundation Soils	15.0	26.3	8.7	0.457	9.480	5.235	1.5	12.2	100	0	0.5	12.7	1.0	-0.2	0.0	1.0	0.068	1.006	0.070	0.234	0.300
UC-01	UB-02	Foundation Soils	15.1	26.2	7.3	0.404	9.200	5.567	1.5	10.1	100	0	0.5	10.6	1.0	-0.2	0.0	1.0	0.067	1.006	0.069	0.234	0.294
UC-01	UB-02	Foundation Soils	15.2	26.2	6.8	0.295	12.530	4.314	1.5	9.5	100	0	0.5	10.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.234	0.292
UC-01	UB-02	Foundation Soils	15.3	26.1	6.2	0.225	29.660	3.655	1.5	8.6	100	0	0.5	9.0	1.0	-0.2	0.0	1.0	0.066	1.006	0.068	0.235	0.288
UC-01	UB-02	Foundation Soils	15.3	26.0	3.9	0.135	59.460	3.425	1.5	5.5	100	0	0.5	5.9	1.0	-0.2	0.0	1.0	0.064	1.006	0.066	0.235	0.280
UC-01	UB-02	Foundation Soils	15.4	25.9	3.3	0.057	77.330	1.736	1.5	4.5	100	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.235	0.277
UC-01	UB-02	Foundation Soils	15.5	25.8	3.2	0.044	80.420	1.357	1.5	4.5	100	0	0.5	5.0	1.0	-0.2	0.0	1.0	0.064	1.006	0.065	0.236	0.276
UC-01	UB-02	Foundation Soils	15.6	25.7	3.2	0.027	80.950	0.848	1.5	4.4	100	0	0.5	4.9	1.0	-0.2	0.0	1.0	0.063	1.006	0.065	0.236	0.276
UC-01	UB-02	Foundation Soils	15.7	25.7	3.2	0.023	79.850	0.724	1.5	4.4	100	0	0.5	4.8	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.236	0.275
UC-01	UB-02	Foundation Soils	15.7	25.6	3.1	0.025	80.950	0.802	1.5	4.3	100	0	0.5	4.7	1.0	-0.3	0.0	1.0	0.063	1.006	0.065	0.237	0.275
UC-01	UB-02	Foundation Soils	15.8	25.5	3.5	0.017	85.770	0.492	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.237	0.275
UC-01	UB-02	Foundation Soils	15.9	25.4	11.1	0.017	88.220	0.154	1.4	15.1	54	0	0.5	15.6	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.237	0.302
UC-01	UB-02	Foundation Soils	16.0	25.3	23.1	0.066	70.800	0.286	1.4	30.5	34	0	0.5	31.0	1.0	-0.3	0.0	1.0	0.079	1.006	0.082	0.238	0.346
UC-01	UB-02	Foundation Soils	16.1	25.3	25.9	0.094	16.520	0.363	1.4	33.8	34	0	0.5	34.3	1.0	-0.3	0.0	1.0	0.082	1.007	0.084	0.238	0.355
UC-01	UB-02	Foundation Soils	16.2	25.2	18.8	0.171	10.290	0.909	1.4	25.1	58	0	0.5	25.6	1.0	-0.3	0.0	1.0	0.076	1.006	0.078	0.238	0.329
UC-01	UB-02	Foundation Soils	16.2	25.1	16.1	0.230	18.480	1.430	1.4	21.6	71	0	0.5	22.1	1.0	-0.3	0.0	1.0	0.074	1.006	0.076	0.238	0.319
UC-01	UB-02	Foundation Soils	16.3	25.0	15.3	0.310	22.870	2.024	1.4	20.6	75	0	0.5	21.1	1.0	-0.3	0.0	1.0	0.073	1.006	0.075	0.239	0.316
UC-01	UB-02	Foundation Soils	16.4	24.9	11.9	0.287	25.020	2.421	1.4	15.9	87	0	0.5	16.4	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.239	0.302
UC-01	UB-02	Foundation Soils	16.5	24.8	9.2	0.263	11.650	2.849	1.4	12.4	98	0	0.5	12.9	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.239	0.292
UC-01	UB-02	Foundation Soils	16.6	24.8	10.2	0.261	30.940	2.563	1.4	13.6	93	0	0.5	14.1	1.0	-0.3	0.0	1.0	0.069	1.006	0.071	0.240	0.295
UC-01	UB-02	Foundation Soils	16.7	24.7	11.7	0.244	21.440	2.090	1.4	15.6	85	0	0.5	16.1	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.240	0.300
UC-01	UB-02	Foundation Soils	16.7	24.6	8.9	0.208	26.560	2.338	1.4	11.8	96	0	0.5	12.3	1.0	-0.3	0.0	1.0	0.068	1.006	0.070	0.240	0.290
UC-01	UB-02	Foundation Soils	16.8	24.5	5.5	0.155	36.080	2.810	1.4	7.3	100	0	0.5	7.8	1.0	-0.3	0.0	1.0	0.065	1.006	0.067	0.241	0.278
UC-01	UB-02	Foundation Soils	16.9	24.4	4.1	0.138	51.740	3.331	1.4	5.5	100	0	0.5	6.0	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.241	0.273
UC-01	UB-02	Foundation Soils	17.0	24.4	3.9	0.096	62.650	2.461	1.4	5.2	100	0	0.5	5.6	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.241	0.271
UC-01	UB-02	Foundation Soils	17.1	24.3	3.8	0.083	71.180	2.187	1.4	5.0	100	0	0.5	5.5	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.241	0.271
UC-01	UB-02	Foundation Soils	17.1	24.2	3.6	0.057	66.940	1.580	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.242	0.270
UC-01	UB-02	Foundation Soils	17.2	24.1	3.6	0.016	70.700	0.441	1.4	4.8	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.242	0.269
UC-01	UB-02	Foundation Soils	17.3	24.0	3.6	0.020	77.710	0.555	1.4	4.7	100	0	0.5	5.2	1.0	-0.3	0.0	1.0	0.064	1.006	0.065	0.242	0.269
UC-01	UB-02	Foundation Soils	17.4	23.9	4.4	0.021	79.710	0.473	1.4	5.8	100	0	0.5	6.3	1.0	-0.3	0.0	1.0	0.064	1.006	0.066	0.242	0.271
UC-01	UB-02	Foundation Soils	17.5	23.9	7.7	0.039	82.140	0.506	1.4	10.0	78	0	0.5	10.5	1.0	-0.3	0.0	1.0	0.067	1.006	0.068	0.243	0.282
UC-01	UB-02	Foundation Soils	17.6	23.8	10.3	0.121	26.730	1.175	1.4	13.4	79	0	0.5	13.9	1.0	-0.3	0.0	1.0	0.069	1.006	0.070	0.243	0.290
UC-01	UB-02	Foundation Soils	17.6	23.7	11.8	0.168	19.730	1.426	1.4	15.3	78	0	0.5	15.8	1.0	-0.3	0.0	1.0	0.070	1.006	0.072	0.243	0.295
UC-01	UB-02	Foundation Soils	17.7	23.6	6.7	0.177	9.510	2.646	1.4	8.7	100	0	0.5	9.1	1.0	-0.3	0.0	0.9	0.066	1.006	0.068	0.243	0.277
UC-01	UB-02	Foundation Soils	17.8	23.5	5.3	0.169	22.960	3.187	1.4	6.8	100	0	0.5	7.3	1.0	-0.3	0.0	0.9	0.065	1.006	0.066	0.244	0.272
UC-01	UB-02	Foundation Soils	17.9	23.5	4.6	0.160	27.560	3.462	1.4	6.0	100	0	0.5	6.4	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.244	0.270
UC-01	UB-02	Foundation Soils	18.0	23.4	4.2	0.108	40.740	2.569	1.4	5.4	100	0	0.5	5.9	1.0	-0.3	0.0	0.9	0.064	1.006	0.066	0.244	0.268
UC-01	UB-02	Foundation Soils	18.0	23.3	3.9	0.095	59.000	2.443	1.3	4.8	100	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.245	0.358
UC-01	UB-02	Foundation Soils	18.1	23.2	4.6	0.075	69.130	1.616	1.3	5.7	100	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.245	0.361

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	18.2	23.1	5.6	0.078	66.510	1.404	1.3	6.8	100	15	34.8	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.245	0.365
UC-01	UB-02	Foundation Soils	18.3	23.0	5.3	0.076	8.950	1.435	1.3	6.5	100	15	34.8	41.2	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.245	0.363
UC-01	UB-02	Foundation Soils	18.4	23.0	4.8	0.077	29.940	1.595	1.3	5.9	100	15	34.7	40.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.246	0.361
UC-01	UB-02	Foundation Soils	18.5	22.9	4.1	0.069	41.450	1.663	1.3	5.1	100	15	34.5	39.6	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.246	0.357
UC-01	UB-02	Foundation Soils	18.5	22.8	3.8	0.052	51.870	1.385	1.3	4.6	100	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.246	0.355
UC-01	UB-02	Foundation Soils	18.6	22.7	3.6	0.038	62.470	1.061	1.3	4.4	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.246	0.354
UC-01	UB-02	Foundation Soils	18.7	22.6	3.6	0.028	71.900	0.785	1.3	4.3	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.246	0.353
UC-01	UB-02	Foundation Soils	18.8	22.5	3.6	0.035	71.280	0.982	1.3	4.3	100	15	34.4	38.7	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.247	0.353
UC-01	UB-02	Foundation Soils	18.9	22.5	3.5	0.028	72.820	0.794	1.3	4.3	100	15	34.3	38.6	1.0	-0.3	0.0	0.9	0.084	1.007	0.087	0.247	0.352
UC-01	UB-02	Foundation Soils	18.9	22.4	3.8	0.018	76.870	0.475	1.3	4.6	100	15	34.4	39.0	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.247	0.353
UC-01	UB-02	Foundation Soils	19.0	22.3	4.2	0.023	74.230	0.552	1.3	5.0	100	15	34.5	39.5	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.247	0.354
UC-01	UB-02	Foundation Soils	19.1	22.2	5.1	0.019	68.390	0.369	1.3	6.2	94	15	34.6	40.8	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.248	0.358
UC-01	UB-02	Foundation Soils	19.2	22.1	5.8	0.025	56.600	0.435	1.3	6.9	91	15	34.7	41.6	1.0	-0.3	0.0	0.9	0.086	1.007	0.089	0.248	0.359
UC-01	UB-02	Foundation Soils	19.3	22.1	4.8	0.027	43.120	0.563	1.3	5.7	100	15	34.6	40.4	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.248	0.356
UC-01	UB-02	Foundation Soils	19.4	22.0	4.0	0.023	56.410	0.578	1.3	4.8	100	15	34.4	39.2	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.248	0.352
UC-01	UB-02	Foundation Soils	19.4	21.9	4.1	0.051	73.490	1.253	1.3	4.9	100	15	34.5	39.3	1.0	-0.3	0.0	0.9	0.085	1.007	0.087	0.248	0.352
UC-01	UB-02	Foundation Soils	19.5	21.8	4.5	0.076	73.980	1.684	1.3	5.4	100	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.249	0.353
UC-01	UB-02	Foundation Soils	19.6	21.7	4.8	0.175	71.040	3.666	1.3	5.7	100	15	34.6	40.3	1.0	-0.3	0.0	0.9	0.086	1.007	0.088	0.249	0.354
UC-01	UB-02	Foundation Soils	19.7	21.6	4.5	0.123	65.130	2.742	1.3	5.3	100	15	34.6	39.9	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.249	0.352
UC-01	UB-02	Foundation Soils	19.8	21.6	4.6	0.094	59.750	2.025	1.3	5.5	100	15	34.6	40.1	1.0	-0.3	0.0	0.9	0.085	1.007	0.088	0.249	0.353
UC-01	UB-02	Foundation Soils	19.8	21.5	13.4	0.063	83.310	0.470	1.2	15.6	61	15	35.2	50.8	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.249	0.384
UC-01	UB-02	Foundation Soils	19.9	21.4	54.2	0.063	98.530	0.116	1.2	62.2	0	0	0.0	62.2	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.250	0.419
UC-01	UB-02	Foundation Soils	20.0	21.3	62.0	0.090	-0.200	0.145	1.2	70.5	0	0	0.0	70.5	1.0	-0.3	0.0	0.9	0.108	1.010	0.112	0.250	0.447
UC-01	UB-02	Foundation Soils	20.1	21.2	47.1	0.135	0.380	0.287	1.2	54.3	13	0	0.2	54.5	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.250	0.394
UC-01	UB-02	Foundation Soils	20.2	21.2	37.1	0.171	6.730	0.461	1.2	43.2	28	0	0.4	43.7	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.250	0.362
UC-01	UB-02	Foundation Soils	20.3	21.1	22.4	0.256	18.200	1.145	1.3	26.7	59	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.250	0.315
UC-01	UB-02	Foundation Soils	20.3	21.0	20.1	0.344	25.510	1.708	1.3	24.1	70	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.250	0.308
UC-01	UB-02	Foundation Soils	20.4	20.9	27.8	0.416	26.820	1.498	1.2	32.6	58	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.251	0.331
UC-01	UB-02	Foundation Soils	20.5	20.8	30.6	0.384	26.520	1.257	1.2	35.7	52	0	0.5	36.2	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.251	0.339
UC-01	UB-02	Foundation Soils	20.6	20.7	16.4	0.277	16.910	1.686	1.3	19.7	74	0	0.5	20.2	1.0	-0.4	0.0	0.9	0.073	1.006	0.074	0.251	0.296
UC-01	UB-02	Foundation Soils	20.7	20.7	13.2	0.210	18.250	1.593	1.3	15.7	80	0	0.5	16.2	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.251	0.285
UC-01	UB-02	Foundation Soils	20.8	20.6	23.7	0.132	21.150	0.558	1.2	27.8	45	0	0.5	28.3	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.251	0.317
UC-01	UB-02	Foundation Soils	20.8	20.5	48.4	0.112	21.720	0.231	1.2	54.8	10	0	0.1	55.0	1.0	-0.4	0.0	0.9	0.096	1.008	0.099	0.251	0.393
UC-01	UB-02	Foundation Soils	20.9	20.4	72.9	0.114	11.480	0.156	1.2	80.6	0	0	0.0	80.6	1.0	-0.4	0.0	0.9	0.116	1.012	0.121	0.251	0.481
UC-01	UB-02	Foundation Soils	21.0	20.3	75.9	0.151	9.770	0.199	1.2	83.6	0	0	0.0	83.6	1.0	-0.4	0.0	0.9	0.119	1.013	0.124	0.252	0.493
UC-01	UB-02	Foundation Soils	21.1	20.3	51.3	0.300	8.910	0.584	1.2	57.7	22	0	0.4	58.1	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.252	0.402
UC-01	UB-02	Foundation Soils	21.2	20.2	33.3	0.354	8.580	1.064	1.2	38.1	46	0	0.5	38.6	1.0	-0.4	0.0	0.9	0.084	1.007	0.087	0.252	0.344
UC-01	UB-02	Foundation Soils	21.2	20.1	19.5	0.345	14.680	1.766	1.2	22.8	70	0	0.5	23.3	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.252	0.302
UC-01	UB-02	Foundation Soils	21.3	20.0	15.2	0.444	15.910	2.927	1.2	17.8	89	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.252	0.289
UC-01	UB-02	Foundation Soils	21.4	19.9	15.7	0.417	30.110	2.658	1.2	18.3	86	0	0.5	18.8	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.252	0.290
UC-01	UB-02	Foundation Soils	21.5	19.8	37.5	0.279	22.870	0.745	1.2	42.4	36	0	0.5	42.9	1.0	-0.4	0.0	0.9	0.087	1.007	0.090	0.252	0.355
UC-01	UB-02	Foundation Soils	21.6	19.8	41.6	0.307	13.390	0.738	1.2	46.7	33	0	0.5	47.2	1.0	-0.4	0.0	0.9	0.090	1.007	0.093	0.253	0.367
UC-01	UB-02	Foundation Soils	21.7	19.7	34.9	0.300	18.800	0.861	1.2	39.4	41	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.253	0.346
UC-01	UB-02	Foundation Soils	21.7	19.6	35.3	0.224	20.160	0.635	1.2	39.7	35	0	0.5	40.2	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.253	0.347
UC-01	UB-02	Foundation Soils	21.8	19.5	35.0	0.294	20.890	0.841	1.2	39.3	41	0	0.5	39.9	1.0	-0.4	0.0	0.9	0.085	1.007	0.087	0.253	0.345
UC-01	UB-02	Foundation Soils	21.9	19.4	39.5	0.503	17.960	1.273	1.2	44.1	45	0	0.5	44.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.253	0.359
UC-01	UB-02	Foundation Soils	22.0	19.3	52.4	0.449	19.850	0.857	1.2	57.7	29	0	0.5	58.2	1.0	-0.4	0.0	0.9	0.098	1.008	0.101	0.253	0.399
UC-01	UB-02	Foundation Soils	22.1	19.3	65.8	0.600	16.480	0.912	1.2	71.6	24	0	0.5	72.0	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.253	0.444
UC-01	UB-02	Foundation Soils	22.1	19.2	73.2	0.433	17.530	0.592	1.1	79.1	12	0	0.2	79.3	1.0	-0.4	0.0	0.9	0.115	1.012	0.119	0.253	0.470
UC-01	UB-02	Foundation Soils	22.2	19.1	70.7	0.376	7.340	0.532	1.1	76.4	11	0	0.2	76.5	1.0	-0.4	0.0	0.9	0.113	1.011	0.116	0.253	0.460
UC-01	UB-02	Foundation Soils	22.3	19.0	70.4	0.290	24.020	0.412	1.1	76.0	7	0	0.0	76.1	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.254	0.458
UC-01	UB-02	Foundation Soils	22.4	18.9	71.9	0.378	13.870	0.526	1.1	77.4	11	0	0.1	77.6	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.254	0.463
UC-01	UB-02	Foundation Soils	22.5	18.9	68.5	0.469	11.860	0.685	1.1	73.7	17	0	0.3	74.1	1.0	-0.4	0.0	0.9	0.111	1.011	0.114	0.254	0.450
UC-01	UB-02	Foundation Soils	22.6	18.8	64.2	0.485	20.770	0.756	1.1	69.2	21	0	0.4	69.6	1.0	-0.4	0.0	0.9	0.107	1.010	0.110	0.254	0.434
UC-01	UB-02	Foundation Soils	22.6	18.7	56.6	0.443	19.700	0.783	1.1	61.3	25	0	0.5	61.7	1.0	-0.4	0.0	0.9	0.101	1.009	0.104	0.254	0.408
UC-01	UB-02	Foundation Soils	22.7	18.6	52.8	0.304	22.390	0.576	1.1	57.2	22	0	0.4	57.6	1.0	-0.4	0.0	0.9	0.098	1.008	0.100	0.254	0.395
UC-01	UB-02	Foundation Soils	22.8	18.5	58.4	0.300	22.060	0.514	1.1	62.9	17	0	0.3	63.2	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.254	0.412
UC-01	UB-02	Foundation Soils	22.9	18.4	76.4	0.354	16.510	0.463	1.1	81.3	7	0	0.0	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.254	0.475
UC-01	UB-02	Foundation Soils	23.0	18.4	76.7	0.356	16.320	0.464	1.1	81.4	7	0	0.0	81.4	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.254	0.476
UC-01	UB-02	Foundation Soils	23.0	18.3	73.0	0.362	17.010	0.496	1.1	77.6	10	0	0.1	77.7	1.0	-0.4	0.0	0.9	0.114	1.012	0.117	0.254	0.461
UC-01	UB-02	Foundation Soils	23.1	18.2	75.4	0.386	19.210	0.512	1.1	79.9	9	0	0.1	80.0	1.0	-0.4	0.0	0.9	0.116	1.012	0.119	0.254	0.470
UC-01	UB-02	Foundation Soils	23.2	18.1	80.6	0.379	19.300	0.470	1.1	85.0	6	0	0.0	85.0	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.254	0.489

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-01	UB-02	Foundation Soils	23.3	18.0	81.6	0.411	22.390	0.504	1.1	85.9	7	0	0.0	85.9	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.255	0.493
UC-01	UB-02	Foundation Soils	23.4	18.0	80.6	0.515	23.110	0.639	1.1	84.8	11	0	0.2	85.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.255	0.488
UC-01	UB-02	Foundation Soils	23.5	17.9	78.0	0.561	22.910	0.719	1.1	82.0	15	0	0.3	82.3	1.0	-0.4	0.0	0.9	0.118	1.013	0.122	0.255	0.477
UC-01	UB-02	Foundation Soils	23.5	17.8	76.3	0.586	24.350	0.768	1.1	80.2	17	0	0.3	80.5	1.0	-0.4	0.0	0.9	0.116	1.012	0.120	0.255	0.470
UC-01	UB-02	Foundation Soils	23.6	17.7	73.2	0.566	24.060	0.773	1.1	76.9	18	0	0.4	77.3	1.0	-0.4	0.0	0.9	0.113	1.011	0.117	0.255	0.458
UC-01	UB-02	Foundation Soils	23.7	17.6	77.4	0.574	23.420	0.742	1.1	81.0	16	0	0.3	81.3	1.0	-0.4	0.0	0.9	0.117	1.012	0.121	0.255	0.473
UC-01	UB-02	Foundation Soils	23.8	17.5	82.8	0.632	19.680	0.763	1.1	86.3	14	0	0.3	86.6	1.0	-0.4	0.0	0.9	0.122	1.014	0.126	0.255	0.494
UC-01	UB-02	Foundation Soils	23.9	17.5	81.7	0.653	15.390	0.799	1.1	85.0	16	0	0.3	85.4	1.0	-0.4	0.0	0.9	0.121	1.013	0.125	0.255	0.489
UC-01	UB-02	Foundation Soils	23.9	17.4	78.7	0.592	17.120	0.752	1.1	81.9	16	0	0.3	82.3	1.0	-0.4	0.1	0.9	0.118	1.013	0.121	0.255	0.476
UC-01	UB-02	Foundation Soils	24.0	17.3	77.0	0.581	20.020	0.755	1.1	80.1	16	0	0.3	80.4	1.0	-0.4	0.1	0.9	0.116	1.012	0.120	0.255	0.468
UC-01	UB-02	Foundation Soils	24.1	17.2	90.4	0.558	20.490	0.617	1.1	93.4	8	0	0.1	93.4	1.0	-0.4	0.1	0.9	0.129	1.016	0.134	0.255	0.524
UC-01	UB-02	Foundation Soils	24.2	17.1	102.2	0.491	18.960	0.480	1.1	105.0	0	0	0.0	105.0	1.0	-0.5	0.1	0.9	0.144	1.020	0.150	0.255	0.587
UC-01	UB-02	Foundation Soils	24.3	17.1	101.9	0.487	17.410	0.478	1.1	104.5	0	0	0.0	104.5	1.0	-0.5	0.1	0.9	0.143	1.019	0.149	0.255	0.583
UC-01	UB-02	Foundation Soils	24.4	17.0	97.3	0.500	17.960	0.514	1.1	99.9	2	0	0.0	99.9	1.0	-0.5	0.1	0.9	0.137	1.018	0.142	0.255	0.556
UC-01	UB-02	Foundation Soils	24.4	16.9	91.8	0.498	20.490	0.543	1.1	94.2	5	0	0.0	94.2	1.0	-0.5	0.1	0.9	0.130	1.016	0.135	0.256	0.527
UC-01	UB-02	Foundation Soils	24.5	16.8	84.8	0.445	20.630	0.525	1.1	87.1	7	0	0.0	87.2	1.0	-0.5	0.1	0.9	0.123	1.014	0.126	0.256	0.494
UC-01	UB-02	Foundation Soils	24.6	16.7	80.8	0.435	21.060	0.538	1.1	83.1	9	0	0.1	83.2	1.0	-0.5	0.1	0.9	0.119	1.013	0.122	0.256	0.478
UC-01	UB-02	Foundation Soils	24.7	16.6	71.3	0.463	22.540	0.649	1.1	73.5	16	0	0.3	73.8	1.0	-0.5	0.1	0.9	0.110	1.011	0.113	0.256	0.442
UC-01	UB-02	Foundation Soils	24.8	16.6	63.9	0.492	21.150	0.770	1.1	65.9	23	0	0.4	66.4	1.0	-0.5	0.1	0.9	0.104	1.010	0.107	0.256	0.417
UC-01	UB-02	Foundation Soils	24.9	16.5	49.9	0.523	22.730	1.048	1.1	51.8	36	0	0.5	52.3	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.256	0.374
UC-01	UB-02	Foundation Soils	24.9	16.4	42.5	0.513	27.350	1.206	1.1	44.3	43	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.256	0.352
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.7	21.2	0.217	-0.090	1.023	1.6	32.9	49	20	42.3	75.2	1.1	-0.1	0.0	1.0	0.112	1.011	0.122	0.168	0.726
UC-02A	UB-02 & UB-03	Foundation Soils	7.1	34.6	20.7	0.205	-0.110	0.989	1.6	32.1	49	20	42.2	74.3	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.168	0.716
UC-02A	UB-02 & UB-03	Foundation Soils	7.2	34.5	19.8	0.184	-0.050	0.931	1.6	30.7	50	20	42.0	72.6	1.1	-0.1	0.0	1.0	0.109	1.011	0.119	0.169	0.702
UC-02A	UB-02 & UB-03	Foundation Soils	7.3	34.5	19.1	0.158	-0.050	0.829	1.6	29.6	49	20	41.6	71.2	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.170	0.690
UC-02A	UB-02 & UB-03	Foundation Soils	7.4	34.4	19.1	0.139	-0.240	0.727	1.6	29.6	47	20	41.3	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.171	0.684
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.3	19.5	0.124	-0.100	0.636	1.6	30.1	44	20	40.8	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.172	0.680
UC-02A	UB-02 & UB-03	Foundation Soils	7.5	34.2	19.8	0.117	-0.050	0.590	1.6	30.5	43	20	40.6	71.1	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.173	0.677
UC-02A	UB-02 & UB-03	Foundation Soils	7.6	34.1	19.7	0.110	-0.100	0.560	1.6	30.2	42	20	40.4	70.6	1.1	-0.1	0.0	1.0	0.108	1.010	0.117	0.174	0.671
UC-02A	UB-02 & UB-03	Foundation Soils	7.7	34.0	19.3	0.099	-0.010	0.513	1.6	29.6	42	20	40.1	69.7	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.175	0.663
UC-02A	UB-02 & UB-03	Foundation Soils	7.8	34.0	18.7	0.105	-0.050	0.562	1.6	28.6	44	20	40.5	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.176	0.656
UC-02A	UB-02 & UB-03	Foundation Soils	7.9	33.9	18.5	0.112	-0.050	0.604	1.6	28.3	45	20	40.7	69.1	1.1	-0.1	0.0	1.0	0.107	1.010	0.115	0.176	0.652
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.8	18.0	0.112	-0.050	0.621	1.6	27.5	47	20	40.8	68.3	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.177	0.645
UC-02A	UB-02 & UB-03	Foundation Soils	8.0	33.7	17.5	0.119	0.000	0.679	1.6	26.7	49	20	41.0	67.7	1.1	-0.1	0.0	1.0	0.105	1.010	0.114	0.178	0.639
UC-02A	UB-02 & UB-03	Foundation Soils	8.1	33.6	17.1	0.127	-0.050	0.741	1.6	26.1	51	20	41.2	67.3	1.1	-0.1	0.0	1.0	0.105	1.010	0.113	0.179	0.633
UC-02A	UB-02 & UB-03	Foundation Soils	8.2	33.5	16.3	0.129	-0.330	0.791	1.6	24.8	54	20	41.3	66.1	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.180	0.624
UC-02A	UB-02 & UB-03	Foundation Soils	8.3	33.5	15.8	0.124	0.000	0.786	1.6	24.0	55	20	41.2	65.2	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.180	0.617
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.4	15.4	0.119	-0.140	0.775	1.6	23.3	56	20	41.2	64.5	1.1	-0.1	0.0	1.0	0.103	1.009	0.111	0.181	0.610
UC-02A	UB-02 & UB-03	Foundation Soils	8.4	33.3	15.0	0.114	0.000	0.761	1.6	22.7	56	20	41.1	63.8	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.182	0.604
UC-02A	UB-02 & UB-03	Foundation Soils	8.5	33.2	14.9	0.110	0.000	0.741	1.6	22.4	56	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.183	0.600
UC-02A	UB-02 & UB-03	Foundation Soils	8.6	33.1	14.9	0.109	0.000	0.731	1.6	22.5	56	20	41.0	63.5	1.1	-0.1	0.0	1.0	0.102	1.009	0.110	0.183	0.597
UC-02A	UB-02 & UB-03	Foundation Soils	8.7	33.1	14.8	0.112	-0.190	0.757	1.6	22.2	57	20	41.1	63.3	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.184	0.594
UC-02A	UB-02 & UB-03	Foundation Soils	8.8	33.0	14.3	0.117	0.000	0.816	1.6	21.5	59	20	41.1	62.7	1.1	-0.1	0.0	1.0	0.102	1.009	0.109	0.185	0.588
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.9	13.8	0.110	-0.290	0.799	1.6	20.7	60	20	41.0	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.108	0.186	0.581
UC-02A	UB-02 & UB-03	Foundation Soils	8.9	32.8	13.3	0.088	0.000	0.662	1.6	19.9	58	20	40.7	60.7	1.1	-0.1	0.0	1.0	0.100	1.009	0.107	0.186	0.574
UC-02A	UB-02 & UB-03	Foundation Soils	9.0	32.7	12.6	0.082	-0.050	0.653	1.6	18.8	60	20	40.6	59.5	1.1	-0.1	0.0	1.0	0.099	1.009	0.106	0.187	0.566
UC-02A	UB-02 & UB-03	Foundation Soils	9.1	32.6	11.5	0.081	0.000	0.702	1.6	17.3	64	20	40.6	57.9	1.1	-0.1	0.0	1.0	0.098	1.008	0.105	0.188	0.557
UC-02A	UB-02 & UB-03	Foundation Soils	9.2	32.6	11.0	0.080	-0.190	0.725	1.6	16.5	66	20	40.6	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.189	0.551
UC-02A	UB-02 & UB-03	Foundation Soils	9.3	32.5	11.2	0.081	1.750	0.726	1.6	16.7	66	20	40.6	57.3	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.189	0.549
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.4	11.2	0.089	2.570	0.792	1.6	16.7	67	20	40.7	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.190	0.548
UC-02A	UB-02 & UB-03	Foundation Soils	9.4	32.3	11.2	0.103	4.510	0.922	1.6	16.6	70	20	40.8	57.4	1.1	-0.1	0.0	1.0	0.098	1.008	0.104	0.191	0.545
UC-02A	UB-02 & UB-03	Foundation Soils	9.5	32.2	11.0	0.121	5.490	1.102	1.6	16.3	69	20	40.7	57.0	1.1	-0.1	0.0	1.0	0.097	1.008	0.104	0.191	0.542
UC-02A	UB-02 & UB-03	Foundation Soils	9.6	32.2	10.4	0.124	6.200	1.192	1.6	15.4	72	20	40.7	56.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.103	0.192	0.536
UC-02A	UB-02 & UB-03	Foundation Soils	9.7	32.1	9.7	0.134	5.340	1.378	1.6	14.4	72	20	40.5	54.9	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.193	0.528
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	32.0	9.0	0.141	4.820	1.565	1.6	13.4	77	20	40.5	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.193	0.522
UC-02A	UB-02 & UB-03	Foundation Soils	9.8	31.9	8.2	0.133	3.760	1.613	1.6	12.2	81	20	40.4	52.6	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.194	0.515
UC-02A	UB-02 & UB-03	Foundation Soils	9.9	31.8	9.3	0.119	2.420	1.283	1.6	13.7	73	20	40.3	54.0	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.195	0.519
UC-02A	UB-02 & UB-03	Foundation Soils	10.0	31.7	10.1	0.117	-2.520	1.157	1.6	14.8	73	20	40.6	55.4	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.195	0.523
UC-02A	UB-02 & UB-03	Foundation Soils	10.1	31.7	9.7	0.114	-3.380	1.173	1.6	14.2	74	20	40.5	54.8	1.1	-0.1	0.0	1.0	0.096	1.008	0.102	0.196	0.518
UC-02A	UB-02 & UB-03	Foundation Soils	10.2	31.6	9.6	0.108	1.650	1.128	1.5	14.0	74	20	40.5	54.5	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.196	0.515
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.5	9.3	0.095	5.250	1.026	1.5	13.5	74	20	40.4	53.9	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.197	0.511
UC-02A	UB-02 & UB-03	Foundation Soils	10.3	31.4	9.2	0.098	4.910	1.064	1.5	13.4	75	20	40.4	53.8	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.198	0.509

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	10.4	31.3	9.3	0.101	2.070	1.092	1.5	13.4	71	20	40.2	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.198	0.507
UC-02A	UB-02 & UB-03	Foundation Soils	10.5	31.3	9.4	0.122	1.720	1.292	1.5	13.7	74	20	40.4	54.1	1.1	-0.1	0.0	1.0	0.095	1.008	0.101	0.199	0.507
UC-02A	UB-02 & UB-03	Foundation Soils	10.6	31.2	9.2	0.131	3.220	1.425	1.5	13.3	76	20	40.4	53.7	1.1	-0.1	0.0	1.0	0.095	1.008	0.100	0.199	0.504
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.1	8.4	0.132	5.190	1.575	1.5	12.1	81	20	40.4	52.5	1.0	-0.1	0.0	1.0	0.094	1.008	0.099	0.200	0.497
UC-02A	UB-02 & UB-03	Foundation Soils	10.7	31.0	8.1	0.133	8.160	1.640	1.5	11.7	83	20	40.3	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.201	0.494
UC-02A	UB-02 & UB-03	Foundation Soils	10.8	30.9	9.4	0.124	8.860	1.316	1.5	13.5	75	20	40.4	53.9	1.0	-0.2	0.0	1.0	0.095	1.008	0.101	0.201	0.500
UC-02A	UB-02 & UB-03	Foundation Soils	10.9	30.8	10.7	0.112	3.690	1.044	1.5	15.3	70	20	40.6	55.8	1.0	-0.2	0.0	1.0	0.096	1.008	0.102	0.202	0.506
UC-02A	UB-02 & UB-03	Foundation Soils	11.0	30.8	12.6	0.121	0.330	0.963	1.5	17.7	68	20	41.0	58.7	1.1	-0.2	0.0	1.0	0.099	1.008	0.104	0.202	0.516
UC-02A	UB-02 & UB-03	Foundation Soils	11.1	30.7	13.4	0.139	-0.450	1.036	1.5	18.8	67	20	41.1	60.0	1.1	-0.2	0.0	1.0	0.100	1.009	0.105	0.203	0.520
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.6	13.7	0.137	1.240	0.999	1.5	19.2	66	20	41.1	60.3	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.203	0.520
UC-02A	UB-02 & UB-03	Foundation Soils	11.2	30.5	13.7	0.127	4.670	0.925	1.5	19.2	65	20	41.1	60.2	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.204	0.518
UC-02A	UB-02 & UB-03	Foundation Soils	11.3	30.4	14.4	0.135	5.860	0.939	1.5	20.0	64	20	41.2	61.1	1.1	-0.2	0.0	1.0	0.100	1.009	0.106	0.204	0.520
UC-02A	UB-02 & UB-03	Foundation Soils	11.4	30.4	15.9	0.149	1.200	0.935	1.5	22.0	60	20	41.3	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.205	0.528
UC-02A	UB-02 & UB-03	Foundation Soils	11.5	30.3	16.7	0.172	0.240	1.030	1.5	22.9	61	20	41.6	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.206	0.531
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.2	16.8	0.201	0.670	1.199	1.5	23.0	63	20	41.8	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.206	0.531
UC-02A	UB-02 & UB-03	Foundation Soils	11.6	30.1	17.1	0.240	3.110	1.405	1.4	23.3	66	20	42.0	65.3	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.207	0.532
UC-02A	UB-02 & UB-03	Foundation Soils	11.7	30.0	17.8	0.231	4.750	1.298	1.4	24.2	63	20	42.0	66.2	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.207	0.534
UC-02A	UB-02 & UB-03	Foundation Soils	11.8	29.9	18.6	0.228	5.380	1.227	1.4	25.1	61	20	42.0	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.111	0.208	0.537
UC-02A	UB-02 & UB-03	Foundation Soils	11.9	29.9	19.9	0.240	5.960	1.204	1.4	26.8	59	20	42.2	69.0	1.1	-0.2	0.0	1.0	0.106	1.010	0.113	0.208	0.543
UC-02A	UB-02 & UB-03	Foundation Soils	12.0	29.8	21.2	0.218	5.650	1.030	1.4	28.3	54	20	42.0	70.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.114	0.209	0.548
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.7	22.2	0.198	3.430	0.892	1.4	29.6	50	20	41.7	71.3	1.1	-0.2	0.0	1.0	0.108	1.010	0.115	0.209	0.551
UC-02A	UB-02 & UB-03	Foundation Soils	12.1	29.6	23.2	0.188	3.290	0.812	1.4	30.8	47	20	41.5	72.3	1.1	-0.2	0.0	1.0	0.109	1.011	0.116	0.209	0.554
UC-02A	UB-02 & UB-03	Foundation Soils	12.2	29.5	24.1	0.194	5.270	0.804	1.4	31.9	46	20	41.5	73.4	1.1	-0.2	0.0	1.0	0.110	1.011	0.117	0.210	0.557
UC-02A	UB-02 & UB-03	Foundation Soils	12.3	29.4	24.6	0.238	5.880	0.967	1.4	32.4	48	20	42.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.210	0.561
UC-02A	UB-02 & UB-03	Foundation Soils	12.4	29.4	24.6	0.261	6.190	1.062	1.4	32.3	50	20	42.3	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.211	0.560
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.3	24.0	0.356	7.190	1.483	1.4	31.5	58	20	43.1	74.5	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.211	0.558
UC-02A	UB-02 & UB-03	Foundation Soils	12.5	29.2	24.1	0.350	7.880	1.450	1.4	31.6	57	20	43.0	74.6	1.1	-0.2	0.0	1.0	0.111	1.011	0.118	0.212	0.557
UC-02A	UB-02 & UB-03	Foundation Soils	12.6	29.1	27.9	0.344	10.290	1.235	1.4	36.1	50	20	43.0	79.1	1.1	-0.2	0.0	1.0	0.115	1.012	0.122	0.212	0.577
UC-02A	UB-02 & UB-03	Foundation Soils	12.7	29.0	27.1	0.335	17.770	1.235	1.4	35.1	50	20	43.0	78.1	1.1	-0.2	0.0	1.0	0.114	1.012	0.121	0.213	0.571
UC-02A	UB-02 & UB-03	Foundation Soils	12.8	29.0	24.3	0.335	6.170	1.378	1.4	31.6	56	20	42.9	74.5	1.0	-0.2	0.0	1.0	0.111	1.011	0.118	0.213	0.553
UC-02A	UB-02 & UB-03	Foundation Soils	12.9	28.9	23.2	0.288	3.910	1.239	1.4	30.2	55	20	42.6	72.8	1.0	-0.2	0.0	1.0	0.110	1.011	0.116	0.214	0.544
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.8	21.7	0.259	6.670	1.193	1.4	28.3	57	20	42.3	70.6	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.214	0.533
UC-02A	UB-02 & UB-03	Foundation Soils	13.0	28.7	20.7	0.331	9.480	1.598	1.4	26.9	64	20	42.6	69.6	1.0	-0.2	0.0	1.0	0.107	1.010	0.113	0.214	0.527
UC-02A	UB-02 & UB-03	Foundation Soils	13.1	28.6	18.1	0.380	9.600	2.096	1.4	23.7	70	20	42.4	66.0	1.0	-0.2	0.0	1.0	0.104	1.009	0.110	0.215	0.511
UC-02A	UB-02 & UB-03	Foundation Soils	13.2	28.5	15.2	0.398	3.020	2.617	1.4	20.0	77	20	41.9	61.8	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.215	0.493
UC-02A	UB-02 & UB-03	Foundation Soils	13.3	28.5	13.2	0.263	5.340	1.989	1.4	17.4	76	20	41.3	58.7	1.0	-0.2	0.0	1.0	0.099	1.008	0.104	0.216	0.480
UC-02A	UB-02 & UB-03	Foundation Soils	13.4	28.4	12.1	0.197	11.400	1.627	1.4	16.0	75	20	40.9	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.216	0.472
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.3	17.8	0.135	20.680	0.759	1.4	23.1	55	20	41.1	64.2	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.217	0.499
UC-02A	UB-02 & UB-03	Foundation Soils	13.5	28.2	20.5	0.061	7.310	0.297	1.4	26.6	38	20	38.5	65.1	1.0	-0.2	0.0	1.0	0.103	1.009	0.109	0.217	0.502
UC-02A	UB-02 & UB-03	Foundation Soils	13.6	28.1	17.6	0.041	-5.620	0.233	1.4	22.9	40	20	38.5	61.4	1.0	-0.2	0.0	1.0	0.101	1.009	0.106	0.217	0.486
UC-02A	UB-02 & UB-03	Foundation Soils	13.7	28.1	15.4	0.049	-2.530	0.319	1.4	20.0	48	20	39.5	59.5	1.0	-0.2	0.0	1.0	0.099	1.009	0.104	0.218	0.478
UC-02A	UB-02 & UB-03	Foundation Soils	13.8	28.0	12.5	0.049	2.140	0.392	1.4	16.3	58	20	39.9	56.2	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.218	0.465
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.9	10.5	0.070	22.000	0.665	1.4	13.8	70	20	40.2	54.0	1.0	-0.2	0.0	1.0	0.095	1.008	0.100	0.219	0.456
UC-02A	UB-02 & UB-03	Foundation Soils	13.9	27.8	9.6	0.091	26.680	0.948	1.4	12.5	74	20	40.1	52.7	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.219	0.450
UC-02A	UB-02 & UB-03	Foundation Soils	14.0	27.7	10.1	0.101	27.490	0.999	1.4	13.2	73	20	40.2	53.4	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.219	0.452
UC-02A	UB-02 & UB-03	Foundation Soils	14.1	27.6	11.9	0.122	20.960	1.023	1.4	15.4	70	20	40.6	56.0	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.220	0.460
UC-02A	UB-02 & UB-03	Foundation Soils	14.2	27.6	12.6	0.109	14.850	0.864	1.4	16.3	69	20	40.7	56.9	1.0	-0.2	0.0	1.0	0.097	1.008	0.102	0.220	0.463
UC-02A	UB-02 & UB-03	Foundation Soils	14.3	27.5	12.3	0.122	8.720	0.992	1.4	15.8	69	20	40.6	56.4	1.0	-0.2	0.0	1.0	0.097	1.008	0.101	0.220	0.460
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.4	13.3	0.124	11.770	0.935	1.4	17.0	69	20	40.8	57.8	1.0	-0.2	0.0	1.0	0.098	1.008	0.102	0.221	0.464
UC-02A	UB-02 & UB-03	Foundation Soils	14.4	27.3	18.4	0.139	9.710	0.757	1.3	23.2	55	20	41.1	64.3	1.0	-0.2	0.0	1.0	0.103	1.009	0.108	0.221	0.487
UC-02A	UB-02 & UB-03	Foundation Soils	14.5	27.2	22.2	0.170	9.370	0.767	1.3	27.8	49	20	41.3	69.0	1.0	-0.2	0.0	1.0	0.106	1.010	0.112	0.222	0.505
UC-02A	UB-02 & UB-03	Foundation Soils	14.6	27.2	31.1	0.212	10.390	0.682	1.3	38.4	37	20	40.5	78.9	1.0	-0.2	0.0	1.0	0.115	1.012	0.121	0.222	0.546
UC-02A	UB-02 & UB-03	Foundation Soils	14.7	27.1	39.3	0.271	8.340	0.690	1.3	47.9	30	20	39.2	87.0	1.0	-0.2	0.0	1.0	0.123	1.014	0.130	0.222	0.585
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	27.0	47.7	0.379	7.770	0.794	1.3	57.5	27	20	38.6	96.1	1.0	-0.2	0.0	1.0	0.132	1.016	0.141	0.223	0.635
UC-02A	UB-02 & UB-03	Foundation Soils	14.8	26.9	59.4	0.426	6.920	0.718	1.3	70.9	19	20	30.6	101.6	1.1	-0.2	0.0	1.0	0.139	1.018	0.149	0.223	0.669
UC-02A	UB-02 & UB-03	Foundation Soils	14.9	26.8	67.3	0.479	6.960	0.712	1.3	80.1	15	20	23.8	103.9	1.1	-0.2	0.0	1.0	0.143	1.019	0.153	0.223	0.684
UC-02A	UB-02 & UB-03	Foundation Soils	15.0	26.7	76.0	0.511	6.640	0.672	1.3	90.4	10	20	11.4	101.8	1.1	-0.2	0.0	1.0	0.140	1.018	0.149	0.224	0.668
UC-02A	UB-02 & UB-03	Foundation Soils	15.1	26.7	85.4	0.607	6.480	0.711	1.3	101.0	8	20	5.4	106.4	1.1	-0.2	0.0	1.0	0.146	1.020	0.157	0.224	0.701
UC-02A	UB-02 & UB-03	Foundation Soils	15.2	26.6	91.2	0.740	6.220	0.811	1.2	106.8	9	20	8.4	115.2	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.224	0.777
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.5	94.9	0.739	5.860	0.779	1.2	110.9	7	20	3.4	114.3	1.1	-0.2	0.0	1.0	0.160	1.024	0.172	0.225	0.768
UC-02A	UB-02 & UB-03	Foundation Soils	15.3	26.4	94.5	0.755	5.620	0.799	1.2	110.2	8	20	5.1	115.3	1.1	-0.2	0.0	1.0	0.161	1.024	0.174	0.225	0.776
UC-02A	UB-02 & UB-03	Foundation Soils	15.4	26.3	86.7	0.827	5.380	0.954	1.2	100.2	14	20	23.9	124.1	1.1	-0.2	0.0	1.0	0.181	1.028	0.197	0.225	0.874

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	15.5	26.2	73.3	0.829	5.530	1.132	1.2	84.6	23	20	38.6	123.1	1.1	-0.2	0.0	1.0	0.179	1.028	0.194	0.225	0.861
UC-02A	UB-02 & UB-03	Foundation Soils	15.6	26.2	58.6	0.792	5.720	1.351	1.2	68.2	33	20	44.3	112.4	1.1	-0.2	0.0	1.0	0.156	1.023	0.168	0.226	0.744
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.1	43.3	0.722	6.420	1.669	1.2	51.0	46	20	45.3	96.3	1.0	-0.3	0.0	1.0	0.133	1.017	0.141	0.226	0.624
UC-02A	UB-02 & UB-03	Foundation Soils	15.7	26.0	34.8	0.651	7.190	1.868	1.3	41.4	54	20	44.7	86.2	1.0	-0.3	0.0	1.0	0.122	1.014	0.128	0.226	0.567
UC-02A	UB-02 & UB-03	Foundation Soils	15.8	25.9	29.6	0.637	8.000	2.155	1.3	35.3	62	20	44.3	79.6	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.227	0.536
UC-02A	UB-02 & UB-03	Foundation Soils	15.9	25.8	20.9	0.617	8.400	2.955	1.3	25.3	74	20	42.9	68.2	1.0	-0.3	0.0	1.0	0.106	1.010	0.111	0.227	0.487
UC-02A	UB-02 & UB-03	Foundation Soils	16.0	25.8	15.6	0.534	9.180	3.432	1.3	19.0	86	20	42.0	61.0	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.227	0.460
UC-02A	UB-02 & UB-03	Foundation Soils	16.1	25.7	10.4	0.479	9.340	4.615	1.3	12.8	100	20	41.0	53.7	1.0	-0.3	0.0	1.0	0.095	1.008	0.099	0.228	0.433
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.6	9.5	0.280	14.770	2.940	1.3	11.7	99	20	40.7	52.4	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.228	0.428
UC-02A	UB-02 & UB-03	Foundation Soils	16.2	25.5	7.7	0.182	37.600	2.375	1.3	9.4	100	20	40.2	49.7	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.228	0.418
UC-02A	UB-02 & UB-03	Foundation Soils	16.3	25.4	8.2	0.161	74.090	1.970	1.3	10.0	96	20	40.3	50.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.229	0.420
UC-02A	UB-02 & UB-03	Foundation Soils	16.4	25.3	15.6	0.116	90.430	0.743	1.3	18.9	61	20	40.7	59.6	1.0	-0.3	0.0	1.0	0.099	1.009	0.103	0.229	0.451
UC-02A	UB-02 & UB-03	Foundation Soils	16.5	25.3	18.6	0.092	18.490	0.495	1.3	22.4	49	20	40.2	62.6	1.0	-0.3	0.0	1.0	0.101	1.009	0.106	0.229	0.461
UC-02A	UB-02 & UB-03	Foundation Soils	16.6	25.2	16.7	0.108	15.440	0.645	1.3	20.1	57	20	40.6	60.8	1.0	-0.3	0.0	1.0	0.100	1.009	0.104	0.229	0.454
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.1	20.4	0.171	47.000	0.838	1.3	24.4	55	20	41.3	65.6	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.230	0.471
UC-02A	UB-02 & UB-03	Foundation Soils	16.7	25.0	20.2	0.221	36.780	1.095	1.3	24.0	60	20	41.7	65.8	1.0	-0.3	0.0	1.0	0.104	1.009	0.108	0.230	0.471
UC-02A	UB-02 & UB-03	Foundation Soils	16.8	24.9	13.9	0.232	14.530	1.673	1.3	16.7	76	20	41.1	57.8	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.230	0.441
UC-02A	UB-02 & UB-03	Foundation Soils	16.9	24.9	9.6	0.236	23.160	2.447	1.3	11.7	96	20	40.6	52.3	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.231	0.422
UC-02A	UB-02 & UB-03	Foundation Soils	17.0	24.8	7.7	0.188	58.390	2.450	1.3	9.3	100	20	40.2	49.5	1.0	-0.3	0.0	1.0	0.092	1.008	0.095	0.231	0.412
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.7	9.6	0.142	69.470	1.477	1.3	11.6	86	20	40.4	52.0	1.0	-0.3	0.0	1.0	0.094	1.008	0.097	0.231	0.420
UC-02A	UB-02 & UB-03	Foundation Soils	17.1	24.6	10.8	0.122	62.770	1.130	1.3	12.9	78	20	40.4	53.3	1.0	-0.3	0.0	1.0	0.095	1.008	0.098	0.231	0.424
UC-02A	UB-02 & UB-03	Foundation Soils	17.2	24.5	10.6	0.118	41.470	1.113	1.3	12.7	78	20	40.4	53.1	1.0	-0.3	0.0	1.0	0.094	1.008	0.098	0.232	0.422
UC-02A	UB-02 & UB-03	Foundation Soils	17.3	24.4	9.0	0.108	42.400	1.198	1.3	10.8	85	20	40.2	51.0	1.0	-0.3	0.0	1.0	0.093	1.008	0.096	0.232	0.415
UC-02A	UB-02 & UB-03	Foundation Soils	17.4	24.4	7.1	0.108	28.680	1.515	1.3	8.6	98	20	40.0	48.6	1.0	-0.3	0.0	1.0	0.091	1.007	0.094	0.232	0.406
UC-02A	UB-02 & UB-03	Foundation Soils	17.5	24.3	5.5	0.112	37.470	2.020	1.3	6.7	100	20	39.6	46.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.233	0.398
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.2	5.2	0.117	51.120	2.268	1.3	6.2	100	20	39.5	45.7	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.233	0.396
UC-02A	UB-02 & UB-03	Foundation Soils	17.6	24.1	4.6	0.136	64.690	2.929	1.3	5.6	100	20	39.4	45.0	1.0	-0.3	0.0	1.0	0.089	1.007	0.092	0.233	0.393
UC-02A	UB-02 & UB-03	Foundation Soils	17.7	24.0	4.8	0.112	72.470	2.342	1.3	5.7	100	20	39.4	45.2	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.233	0.393
UC-02A	UB-02 & UB-03	Foundation Soils	17.8	24.0	5.6	0.085	76.690	1.529	1.3	6.6	100	20	39.6	46.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.234	0.396
UC-02A	UB-02 & UB-03	Foundation Soils	17.9	23.9	6.3	0.071	59.080	1.127	1.3	7.5	99	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.234	0.399
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.8	10.8	0.065	52.980	0.603	1.3	12.7	69	20	39.9	52.7	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.234	0.416
UC-02A	UB-02 & UB-03	Foundation Soils	18.0	23.7	16.6	0.061	36.500	0.367	1.2	19.4	50	20	39.7	59.1	1.0	-0.3	0.0	0.9	0.099	1.009	0.102	0.234	0.437
UC-02A	UB-02 & UB-03	Foundation Soils	18.1	23.6	13.1	0.064	6.850	0.490	1.2	15.3	62	20	40.0	55.3	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.235	0.423
UC-02A	UB-02 & UB-03	Foundation Soils	18.2	23.5	8.8	0.071	-6.620	0.805	1.2	10.4	81	20	40.0	50.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.235	0.407
UC-02A	UB-02 & UB-03	Foundation Soils	18.3	23.5	7.0	0.071	1.190	1.012	1.2	8.3	94	20	39.9	48.1	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.235	0.399
UC-02A	UB-02 & UB-03	Foundation Soils	18.4	23.4	6.4	0.078	41.980	1.222	1.2	7.5	100	20	39.8	47.3	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.235	0.396
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.3	9.7	0.067	59.910	0.688	1.2	11.4	75	20	40.0	51.4	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.236	0.408
UC-02A	UB-02 & UB-03	Foundation Soils	18.5	23.2	11.6	0.067	48.450	0.578	1.2	13.5	69	20	40.1	53.5	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.236	0.415
UC-02A	UB-02 & UB-03	Foundation Soils	18.6	23.1	14.5	0.072	30.590	0.495	1.2	16.8	59	20	40.1	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.236	0.426
UC-02A	UB-02 & UB-03	Foundation Soils	18.7	23.1	16.7	0.053	16.560	0.318	1.2	19.2	49	20	39.5	58.7	1.0	-0.3	0.0	0.9	0.099	1.008	0.102	0.236	0.431
UC-02A	UB-02 & UB-03	Foundation Soils	18.8	23.0	12.9	0.063	11.670	0.488	1.2	14.9	63	20	40.0	54.9	1.0	-0.3	0.0	0.9	0.096	1.008	0.099	0.237	0.418
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.9	11.2	0.096	15.150	0.854	1.2	13.0	74	20	40.2	53.2	1.0	-0.3	0.0	0.9	0.095	1.008	0.098	0.237	0.412
UC-02A	UB-02 & UB-03	Foundation Soils	18.9	22.8	11.0	0.115	21.090	1.046	1.2	12.7	78	20	40.4	53.0	1.0	-0.3	0.0	0.9	0.094	1.008	0.097	0.237	0.411
UC-02A	UB-02 & UB-03	Foundation Soils	19.0	22.7	7.4	0.126	19.660	1.704	1.2	8.6	100	20	40.0	48.6	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.237	0.396
UC-02A	UB-02 & UB-03	Foundation Soils	19.1	22.6	5.6	0.123	30.300	2.213	1.2	6.4	100	20	39.6	46.0	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.238	0.388
UC-02A	UB-02 & UB-03	Foundation Soils	19.2	22.6	4.7	0.117	44.640	2.469	1.2	5.5	100	20	39.4	44.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.238	0.384
UC-02A	UB-02 & UB-03	Foundation Soils	19.3	22.5	4.5	0.071	62.910	1.570	1.2	5.2	100	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.238	0.382
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.4	4.5	0.057	73.750	1.275	1.2	5.2	100	20	39.3	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.238	0.382
UC-02A	UB-02 & UB-03	Foundation Soils	19.4	22.3	4.8	0.082	83.050	1.691	1.2	5.6	100	20	39.4	45.0	1.0	-0.3	0.0	0.9	0.089	1.007	0.091	0.238	0.383
UC-02A	UB-02 & UB-03	Foundation Soils	19.5	22.2	5.4	0.088	82.660	1.622	1.2	6.2	100	20	39.5	45.8	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.239	0.385
UC-02A	UB-02 & UB-03	Foundation Soils	19.6	22.1	5.6	0.084	72.530	1.513	1.2	6.4	100	20	39.6	45.9	1.0	-0.3	0.0	0.9	0.089	1.007	0.092	0.239	0.385
UC-02A	UB-02 & UB-03	Foundation Soils	19.7	22.1	6.9	0.068	69.660	0.981	1.2	7.9	96	20	39.8	47.7	1.0	-0.3	0.0	0.9	0.091	1.007	0.093	0.239	0.390
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	22.0	9.9	0.091	6.340	0.923	1.2	11.2	81	20	40.1	51.3	1.0	-0.3	0.0	0.9	0.093	1.008	0.096	0.239	0.401
UC-02A	UB-02 & UB-03	Foundation Soils	19.8	21.9	8.7	0.100	14.720	1.152	1.2	9.9	90	20	40.1	50.0	1.0	-0.3	0.0	0.9	0.092	1.008	0.095	0.240	0.396
UC-02A	UB-02 & UB-03	Foundation Soils	19.9	21.8	7.3	0.078	23.250	1.062	1.2	8.3	95	20	39.9	48.2	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.240	0.390
UC-02A	UB-02 & UB-03	Foundation Soils	20.0	21.7	6.1	0.066	44.340	1.077	1.2	7.0	100	20	39.7	46.7	1.0	-0.3	0.0	0.9	0.090	1.007	0.092	0.240	0.385
UC-02A	UB-02 & UB-03	Foundation Soils	20.1	21.7	10.4	0.059	62.940	0.567	1.2	12.2	72	0	0.5	12.7	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.240	0.289
UC-02A	UB-02 & UB-03	Foundation Soils	20.2	21.6	22.2	0.151	71.950	0.681	1.2	25.8	51	0	0.5	26.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.240	0.325
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.5	18.7	0.237	21.870	1.264	1.2	21.9	67	0	0.5	22.4	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.241	0.314
UC-02A	UB-02 & UB-03	Foundation Soils	20.3	21.4	13.8	0.198	22.930	1.437	1.2	16.1	78	0	0.5	16.6	1.0	-0.4	0.0	0.9	0.070	1.006	0.072	0.241	0.298
UC-02A	UB-02 & UB-03	Foundation Soils	20.4	21.3	9.4	0.182	42.210	1.942	1.2	10.9	97	0	0.5	11.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.241	0.284
UC-02A	UB-02 & UB-03	Foundation Soils	20.5	21.2	15.3	0.215	64.950	1.407	1.2	17.8	74	0	0.5	18.3	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.241	0.302

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-02A	UB-02 & UB-03	Foundation Soils	20.6	21.2	57.1	0.254	87.190	0.445	1.2	63.1	14	0	0.3	63.3	1.0	-0.4	0.0	0.9	0.102	1.009	0.105	0.241	0.436
UC-02A	UB-02 & UB-03	Foundation Soils	20.7	21.1	65.0	0.497	22.660	0.765	1.2	71.2	20	0	0.4	71.6	1.0	-0.4	0.0	0.9	0.109	1.010	0.112	0.241	0.464
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	21.0	47.0	0.755	7.290	1.608	1.2	52.2	45	0	0.6	52.7	1.0	-0.4	0.0	0.9	0.094	1.008	0.097	0.242	0.400
UC-02A	UB-02 & UB-03	Foundation Soils	20.8	20.9	30.0	0.683	13.100	2.274	1.2	34.0	65	0	0.5	34.5	1.0	-0.4	0.0	0.9	0.082	1.007	0.084	0.242	0.346
UC-02A	UB-02 & UB-03	Foundation Soils	20.9	20.8	25.1	0.659	21.010	2.631	1.2	28.5	72	0	0.5	29.0	1.0	-0.4	0.0	0.9	0.078	1.006	0.080	0.242	0.330
UC-02A	UB-02 & UB-03	Foundation Soils	21.0	20.8	90.9	0.761	39.020	0.837	1.1	97.4	13	0	0.2	97.6	1.0	-0.4	0.0	0.9	0.134	1.017	0.140	0.242	0.579
UC-02A	UB-02 & UB-03	Foundation Soils	21.1	20.7	218.9	0.883	37.450	0.403	1.1	222.5	0	0	0.0	222.5	1.1	-0.4	0.0	0.9	8.684	1.082	10.094	0.242	41.659
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.6	259.1	1.050	18.530	0.405	1.1	260.8	0	0	0.0	260.8	1.1	-0.4	0.0	0.9	518.132	1.082	601.719	0.242	2481.900
UC-02A	UB-02 & UB-03	Foundation Soils	21.2	20.5	275.3	1.167	14.110	0.424	1.1	276.9	0	0	0.0	276.9	1.1	-0.4	0.0	0.9	5888.862	1.082	6832.903	0.243	28168.053
UC-02A	UB-02 & UB-03	Foundation Soils	21.3	20.4	280.1	1.218	12.250	0.435	1.1	281.5	0	0	0.0	281.5	1.1	-0.4	0.0	0.9	12926.975	1.082	14985.879	0.243	61746.156
UC-02A	UB-02 & UB-03	Foundation Soils	21.4	20.3	278.3	1.250	8.960	0.449	1.1	279.4	0	0	0.0	279.4	1.1	-0.4	0.0	0.9	8958.875	1.082	10376.732	0.243	42732.238
UC-02A	UB-02 & UB-03	Foundation Soils	21.5	20.3	270.5	1.224	11.000	0.453	1.1	271.3	0	0	0.0	271.3	1.1	-0.4	0.0	0.9	2397.744	1.082	2774.867	0.243	11420.780
UC-02A	UB-02 & UB-03	Foundation Soils	21.6	20.2	252.6	1.148	13.660	0.454	1.1	253.3	0	0	0.0	253.3	1.1	-0.4	0.0	0.9	193.153	1.082	223.344	0.243	918.735
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.1	240.0	1.038	11.670	0.433	1.1	241.2	0	0	0.0	241.2	1.1	-0.4	0.0	0.9	48.660	1.082	56.218	0.243	231.131
UC-02A	UB-02 & UB-03	Foundation Soils	21.7	20.0	224.9	0.949	14.050	0.422	1.1	226.7	0	0	0.0	226.7	1.1	-0.4	0.0	0.9	12.292	1.082	14.189	0.243	58.305
UC-02A	UB-02 & UB-03	Foundation Soils	21.8	19.9	214.8	0.852	12.430	0.397	1.1	216.9	0	0	0.0	216.9	1.1	-0.4	0.0	0.9	5.661	1.082	6.529	0.243	26.816
UC-02A	UB-02 & UB-03	Foundation Soils	21.9	19.9	197.3	0.787	12.840	0.399	1.1	200.0	0	0	0.0	200.0	1.1	-0.4	0.0	0.9	1.890	1.082	2.161	0.244	8.870
UC-02A	UB-02 & UB-03	Foundation Soils	22.0	19.8	173.5	0.732	12.820	0.422	1.1	176.9	0	0	0.0	176.9	1.0	-0.4	0.0	0.9	0.643	1.071	0.719	0.244	2.950
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.7	146.4	0.676	12.290	0.462	1.1	150.4	0	0	0.0	150.4	1.0	-0.4	0.0	0.9	0.291	1.046	0.315	0.244	1.291
UC-02A	UB-02 & UB-03	Foundation Soils	22.1	19.6	118.5	0.704	12.780	0.594	1.1	122.9	0	0	0.0	122.9	1.0	-0.4	0.0	0.9	0.178	1.028	0.188	0.244	0.769
UC-02A	UB-02 & UB-03	Foundation Soils	22.2	19.5	98.6	0.561	13.150	0.569	1.1	103.0	3	0	0.0	103.0	1.0	-0.4	0.0	0.9	0.141	1.019	0.147	0.244	0.603
UC-02A	UB-02 & UB-03	Foundation Soils	22.3	19.4	78.7	0.530	13.530	0.673	1.1	82.9	13	0	0.2	83.1	1.0	-0.4	0.0	0.9	0.119	1.013	0.122	0.244	0.501
UC-02A	UB-02 & UB-03	Foundation Soils	22.4	19.4	64.9	0.557	14.390	0.858	1.1	68.7	24	0	0.5	69.2	1.0	-0.4	0.0	0.9	0.107	1.010	0.109	0.244	0.448
UC-02A	UB-02 & UB-03	Foundation Soils	22.5	19.3	52.6	0.576	15.800	1.094	1.1	56.1	35	0	0.5	56.6	1.0	-0.4	0.0	0.9	0.097	1.008	0.099	0.244	0.406
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.2	40.6	0.579	14.910	1.425	1.1	43.6	47	0	0.5	44.1	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.245	0.368
UC-02A	UB-02 & UB-03	Foundation Soils	22.6	19.1	34.8	0.600	16.300	1.722	1.1	37.5	56	0	0.5	38.0	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.245	0.350
UC-02A	UB-02 & UB-03	Foundation Soils	22.7	19.0	28.6	0.447	18.620	1.565	1.1	30.9	60	0	0.5	31.4	1.0	-0.4	0.0	0.9	0.080	1.006	0.081	0.245	0.331
UC-02A	UB-02 & UB-03	Foundation Soils	22.8	18.9	24.8	0.421	19.280	1.697	1.1	26.9	65	0	0.5	27.4	1.0	-0.4	0.0	0.9	0.077	1.006	0.078	0.245	0.320
UC-02A	UB-02 & UB-03	Foundation Soils	22.9	18.9	15.9	0.332	31.920	2.083	1.2	17.4	83	0	0.5	17.9	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.245	0.295
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.8	13.3	0.284	41.160	2.142	1.2	14.4	90	0	0.5	14.9	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.245	0.287
UC-02A	UB-02 & UB-03	Foundation Soils	23.0	18.7	17.2	0.213	17.500	1.236	1.2	18.7	71	0	0.5	19.2	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.245	0.298
UC-02A	UB-02 & UB-03	Foundation Soils	23.1	18.6	30.6	0.145	48.030	0.474	1.1	32.7	37	0	0.5	33.2	1.0	-0.4	0.0	0.9	0.081	1.007	0.082	0.246	0.335
UC-02A	UB-02 & UB-03	Foundation Soils	23.2	18.5	44.4	0.131	20.440	0.295	1.1	46.9	18	0	0.3	47.3	1.0	-0.4	0.0	0.9	0.090	1.007	0.092	0.246	0.375
UC-02A	UB-02 & UB-03	Foundation Soils	23.3	18.5	49.8	0.140	10.100	0.281	1.1	52.4	14	0	0.2	52.6	1.0	-0.4	0.0	0.9	0.094	1.008	0.096	0.246	0.391
UC-02A	UB-02 & UB-03	Foundation Soils	23.4	18.4	48.0	0.159	9.740	0.331	1.1	50.4	17	0	0.3	50.7	1.0	-0.4	0.0	0.9	0.093	1.008	0.095	0.246	0.385
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.3	41.1	0.197	15.960	0.479	1.1	43.3	28	0	0.4	43.8	1.0	-0.4	0.0	0.9	0.088	1.007	0.090	0.246	0.364
UC-02A	UB-02 & UB-03	Foundation Soils	23.5	18.2	38.0	0.203	19.580	0.534	1.1	40.1	32	0	0.5	40.5	1.0	-0.4	0.0	0.9	0.086	1.007	0.087	0.246	0.355
UC-02A	UB-02 & UB-03	Foundation Soils	23.6	18.1	35.0	0.214	23.650	0.612	1.1	36.8	37	0	0.5	37.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.246	0.345
UC-02A	UB-02 & UB-03	Foundation Soils	23.7	18.0	34.5	0.210	26.440	0.609	1.1	36.3	37	0	0.5	36.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.246	0.344
UC-02A	UB-02 & UB-03	Foundation Soils	23.8	18.0	35.7	0.193	24.200	0.541	1.1	37.4	34	0	0.5	37.9	1.0	-0.4	0.0	0.9	0.084	1.007	0.085	0.246	0.347
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.9	36.6	0.172	25.350	0.470	1.1	38.3	31	0	0.5	38.8	1.0	-0.4	0.0	0.9	0.085	1.007	0.086	0.246	0.349
UC-02A	UB-02 & UB-03	Foundation Soils	23.9	17.8	37.6	0.175	24.820	0.465	1.1	39.3	30	0	0.5	39.7	1.0	-0.4	0.1	0.9	0.085	1.007	0.087	0.247	0.351
UC-02A	UB-02 & UB-03	Foundation Soils	24.0	17.7	39.2	0.203	24.260	0.518	1.1	40.8	31	0	0.5	41.3	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.247	0.356
UC-02A	UB-02 & UB-03	Foundation Soils	24.1	17.6	39.5	0.231	22.770	0.585	1.1	41.0	32	0	0.5	41.5	1.0	-0.4	0.1	0.9	0.086	1.007	0.088	0.247	0.356
UC-02A	UB-02 & UB-03	Foundation Soils	24.2	17.6	39.5	0.238	24.920	0.602	1.1	41.0	33	0	0.5	41.5	1.0	-0.5	0.1	0.9	0.086	1.007	0.088	0.247	0.356
UC-02A	UB-02 & UB-03	Foundation Soils	24.3	17.5	42.9	0.243	27.440	0.566	1.1	44.4	29	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.247	0.365
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.4	46.3	0.237	26.300	0.511	1.1	47.7	25	0	0.4	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.247	0.375
UC-02A	UB-02 & UB-03	Foundation Soils	24.4	17.3	49.4	0.238	22.960	0.482	1.1	50.7	22	0	0.4	51.1	1.0	-0.5	0.1	0.9	0.093	1.008	0.095	0.247	0.383
UC-02A	UB-02 & UB-03	Foundation Soils	24.5	17.2	49.1	0.278	22.460	0.567	1.1	50.3	25	0	0.4	50.8	1.0	-0.5	0.1	0.9	0.093	1.008	0.094	0.247	0.382
UC-02A	UB-02 & UB-03	Foundation Soils	24.6	17.1	46.6	0.312	22.220	0.670	1.1	47.8	30	0	0.5	48.2	1.0	-0.5	0.1	0.9	0.091	1.007	0.093	0.247	0.374
UC-02A	UB-02 & UB-03	Foundation Soils	24.7	17.1	43.2	0.337	23.350	0.779	1.1	44.3	35	0	0.5	44.8	1.0	-0.5	0.1	0.9	0.089	1.007	0.090	0.247	0.364
UC-02A	UB-02 & UB-03	Foundation Soils	24.8	17.0	39.2	0.333	23.250	0.849	1.1	40.2	39	0	0.5	40.7	1.0	-0.5	0.1	0.9	0.086	1.007	0.087	0.248	0.352
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.9	35.2	0.330	24.090	0.937	1.1	36.1	44	0	0.5	36.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.248	0.341
UC-02A	UB-02 & UB-03	Foundation Soils	24.9	16.8	34.3	0.342	24.850	0.996	1.1	35.2	46	0	0.5	35.7	1.0	-0.5	0.1	0.9	0.083	1.007	0.084	0.248	0.338
UC-03	UB-03	Foundation Soils	6.1	36.1	32.7	0.402	-3.290	1.228	1.7	51.7	38	30	49.9	101.7	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.168	0.928
UC-03	UB-03	Foundation Soils	6.2	36.0	33.3	0.388	-1.020	1.165	1.7	52.4	37	30	49.5	101.9	1.1	-0.1	0.0	1.0	0.140	1.018	0.157	0.169	0.924
UC-03	UB-03	Foundation Soils	6.2	35.9	33.9	0.388	-1.050	1.144	1.7	53.1	36	30	49.3	102.4	1.1	-0.1	0.0	1.0	0.141	1.019	0.157	0.171	0.923
UC-03	UB-03	Foundation Soils	6.3	35.8	34.3	0.340	-1.100	0.990	1.7	53.7	33	30	47.8	101.6	1.1	-0.1	0.0	1.0	0.139	1.018	0.156	0.172	0.910
UC-03	UB-03	Foundation Soils	6.4	35.8	33.8	0.342	-0.910	1.011	1.7	52.9	34	30	48.1	101.0	1.1	-0.1	0.0	1.0	0.139	1.018	0.155	0.173	0.899
UC-03	UB-03	Foundation Soils	6.5	35.7	31.1	0.356	-0.950	1.145	1.7	48.7	39	30	49.5	98.2	1.1	-0.1	0.0	1.0	0.135	1.017	0.151	0.174	0.869
UC-03	UB-03	Foundation Soils	6.6	35.6	29.7	0.380	-1.000	1.280	1.7	46.5	42	30	50.1	96.7	1.1	-0.1	0.0	1.0	0.133	1.017	0.149	0.175	0.852
UC-03	UB-03	Foundation Soils	6.6	35.5	27.3	0.388	-1.180	1.422	1.7	43.0	47	30	50.5	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.145	0.176	0.822

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	6.7	35.4	27.5	0.370	-0.620	1.347	1.7	43.1	46	30	50.2	93.4	1.1	-0.1	0.0	1.0	0.129	1.016	0.144	0.177	0.817
UC-03	UB-03	Foundation Soils	6.8	35.4	27.8	0.363	-0.330	1.304	1.7	43.5	45	30	50.1	93.7	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.178	0.815
UC-03	UB-03	Foundation Soils	6.9	35.3	28.7	0.365	-0.670	1.270	1.6	44.7	43	30	50.0	94.7	1.1	-0.1	0.0	1.0	0.131	1.016	0.146	0.179	0.818
UC-03	UB-03	Foundation Soils	7.0	35.2	28.5	0.361	-1.740	1.266	1.6	44.2	44	30	50.0	94.2	1.1	-0.1	0.0	1.0	0.130	1.016	0.145	0.180	0.810
UC-03	UB-03	Foundation Soils	7.1	35.1	24.1	0.345	-1.750	1.434	1.7	37.8	51	30	50.0	87.8	1.1	-0.1	0.0	1.0	0.123	1.014	0.137	0.181	0.757
UC-03	UB-03	Foundation Soils	7.1	35.0	20.6	0.340	-1.670	1.647	1.7	32.7	58	30	49.8	82.5	1.1	-0.1	0.0	1.0	0.118	1.013	0.130	0.181	0.718
UC-03	UB-03	Foundation Soils	7.2	34.9	14.3	0.349	-1.240	2.445	1.7	22.9	72	30	48.5	71.4	1.1	-0.1	0.0	1.0	0.108	1.010	0.118	0.182	0.649
UC-03	UB-03	Foundation Soils	7.3	34.9	11.1	0.350	-1.160	3.167	1.7	17.7	78	30	47.6	65.3	1.1	-0.1	0.0	1.0	0.104	1.009	0.113	0.183	0.614
UC-03	UB-03	Foundation Soils	7.4	34.8	8.1	0.332	-0.620	4.101	1.7	13.0	93	30	46.9	59.9	1.1	-0.1	0.0	1.0	0.099	1.009	0.108	0.184	0.584
UC-03	UB-03	Foundation Soils	7.5	34.7	6.6	0.309	-0.190	4.661	1.7	10.6	100	30	46.5	57.1	1.1	-0.1	0.0	1.0	0.097	1.008	0.105	0.185	0.568
UC-03	UB-03	Foundation Soils	7.5	34.6	5.3	0.269	-0.050	5.028	1.7	8.6	100	30	46.0	54.5	1.1	-0.1	0.0	1.0	0.096	1.008	0.103	0.186	0.553
UC-03	UB-03	Foundation Soils	7.6	34.5	4.4	0.230	9.740	5.214	1.7	7.1	100	30	45.6	52.7	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.187	0.542
UC-03	UB-03	Foundation Soils	7.7	34.5	4.0	0.210	13.670	5.283	1.7	6.4	100	30	45.4	51.8	1.1	-0.1	0.0	1.0	0.094	1.008	0.101	0.188	0.536
UC-03	UB-03	Foundation Soils	7.8	34.4	3.3	0.193	14.150	5.887	1.7	5.3	100	30	45.1	50.4	1.1	-0.1	0.0	1.0	0.093	1.008	0.099	0.189	0.527
UC-03	UB-03	Foundation Soils	7.9	34.3	2.8	0.167	34.730	5.908	1.7	4.5	100	30	44.9	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.190	0.520
UC-03	UB-03	Foundation Soils	8.0	34.2	2.8	0.178	37.590	6.257	1.7	4.6	100	30	45.0	49.5	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.190	0.518
UC-03	UB-03	Foundation Soils	8.0	34.1	3.2	0.182	34.920	5.656	1.7	5.2	100	30	45.1	50.3	1.1	-0.1	0.0	1.0	0.092	1.008	0.099	0.191	0.519
UC-03	UB-03	Foundation Soils	8.1	34.0	3.9	0.203	31.540	5.209	1.7	6.2	100	30	45.4	51.6	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.192	0.522
UC-03	UB-03	Foundation Soils	8.2	34.0	3.7	0.229	29.760	6.213	1.7	5.9	100	30	45.3	51.2	1.1	-0.1	0.0	1.0	0.093	1.008	0.100	0.193	0.518
UC-03	UB-03	Foundation Soils	8.3	33.9	4.0	0.225	35.830	5.564	1.7	6.5	100	30	45.4	51.9	1.1	-0.1	0.0	1.0	0.094	1.008	0.100	0.194	0.519
UC-03	UB-03	Foundation Soils	8.4	33.8	5.3	0.215	46.980	4.085	1.7	8.4	100	30	45.9	54.4	1.1	-0.1	0.0	1.0	0.095	1.008	0.102	0.194	0.527
UC-03	UB-03	Foundation Soils	8.4	33.7	9.4	0.169	50.500	1.805	1.7	15.0	74	30	46.7	61.7	1.1	-0.1	0.0	1.0	0.101	1.009	0.109	0.195	0.557
UC-03	UB-03	Foundation Soils	8.5	33.6	19.1	0.156	14.610	0.817	1.6	29.3	49	30	47.6	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.196	0.629
UC-03	UB-03	Foundation Soils	8.6	33.6	22.0	0.178	-0.140	0.809	1.6	33.4	44	30	47.7	81.0	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.197	0.649
UC-03	UB-03	Foundation Soils	8.7	33.5	22.4	0.181	-0.660	0.807	1.6	33.9	44	30	47.7	81.5	1.1	-0.1	0.0	1.0	0.117	1.012	0.128	0.197	0.649
UC-03	UB-03	Foundation Soils	8.8	33.4	21.4	0.203	-0.990	0.949	1.6	32.3	48	30	48.2	80.5	1.1	-0.1	0.0	1.0	0.116	1.012	0.127	0.198	0.641
UC-03	UB-03	Foundation Soils	8.9	33.3	19.7	0.206	-0.730	1.048	1.6	29.8	53	30	48.4	78.1	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.199	0.625
UC-03	UB-03	Foundation Soils	8.9	33.2	18.7	0.251	-0.950	1.344	1.6	28.3	59	30	48.8	77.0	1.1	-0.1	0.0	1.0	0.113	1.011	0.123	0.200	0.617
UC-03	UB-03	Foundation Soils	9.0	33.1	17.2	0.272	-2.240	1.580	1.6	26.1	65	30	48.8	74.9	1.1	-0.1	0.0	1.0	0.111	1.011	0.121	0.200	0.603
UC-03	UB-03	Foundation Soils	9.1	33.1	14.4	0.253	-1.130	1.763	1.6	22.0	67	30	48.0	70.0	1.1	-0.1	0.0	1.0	0.107	1.010	0.116	0.201	0.577
UC-03	UB-03	Foundation Soils	9.2	33.0	11.8	0.198	-0.150	1.680	1.6	18.2	72	30	47.4	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.202	0.554
UC-03	UB-03	Foundation Soils	9.3	32.9	11.9	0.180	-0.670	1.511	1.6	18.3	70	30	47.3	65.6	1.1	-0.1	0.0	1.0	0.104	1.009	0.112	0.202	0.552
UC-03	UB-03	Foundation Soils	9.4	32.8	15.6	0.172	-0.800	1.099	1.6	23.6	61	30	47.9	71.5	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.203	0.578
UC-03	UB-03	Foundation Soils	9.4	32.7	18.7	0.161	-0.670	0.862	1.6	27.9	51	30	47.7	75.6	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.204	0.595
UC-03	UB-03	Foundation Soils	9.5	32.6	21.6	0.174	-1.470	0.804	1.6	31.9	46	30	47.6	79.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.125	0.204	0.614
UC-03	UB-03	Foundation Soils	9.6	32.6	22.0	0.120	-1.380	0.546	1.6	32.4	39	30	45.9	78.4	1.1	-0.1	0.0	1.0	0.114	1.012	0.124	0.205	0.605
UC-03	UB-03	Foundation Soils	9.7	32.5	22.0	0.129	-1.290	0.587	1.6	32.3	40	30	46.3	78.6	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.206	0.604
UC-03	UB-03	Foundation Soils	9.8	32.4	21.4	0.163	-1.190	0.761	1.6	31.4	45	30	47.4	78.8	1.1	-0.1	0.0	1.0	0.115	1.012	0.124	0.206	0.603
UC-03	UB-03	Foundation Soils	9.8	32.3	17.1	0.198	-1.050	1.156	1.6	25.3	59	30	48.2	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.207	0.575
UC-03	UB-03	Foundation Soils	9.9	32.2	19.4	0.222	-0.950	1.146	1.6	28.4	56	30	48.5	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.208	0.589
UC-03	UB-03	Foundation Soils	10.0	32.2	18.4	0.229	-0.710	1.248	1.6	26.9	59	30	48.5	75.4	1.1	-0.1	0.0	1.0	0.112	1.011	0.121	0.208	0.580
UC-03	UB-03	Foundation Soils	10.1	32.1	17.1	0.245	-0.180	1.435	1.6	25.0	64	30	48.5	73.5	1.1	-0.1	0.0	1.0	0.110	1.011	0.119	0.209	0.569
UC-03	UB-03	Foundation Soils	10.2	32.0	16.0	0.301	1.430	1.880	1.6	23.5	67	30	48.3	71.8	1.1	-0.1	0.0	1.0	0.109	1.010	0.117	0.209	0.560
UC-03	UB-03	Foundation Soils	10.3	31.9	15.4	0.262	1.520	1.705	1.6	22.5	71	30	48.4	70.9	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.210	0.553
UC-03	UB-03	Foundation Soils	10.3	31.8	14.3	0.265	3.200	1.848	1.6	21.1	70	30	48.0	69.0	1.1	-0.1	0.0	1.0	0.106	1.010	0.114	0.211	0.543
UC-03	UB-03	Foundation Soils	10.4	31.7	15.5	0.288	3.950	1.864	1.5	22.6	68	30	48.2	70.8	1.1	-0.1	0.0	1.0	0.108	1.010	0.116	0.211	0.549
UC-03	UB-03	Foundation Soils	10.5	31.7	19.3	0.304	1.430	1.574	1.5	27.8	62	30	49.0	76.8	1.1	-0.1	0.0	1.0	0.113	1.011	0.122	0.212	0.576
UC-03	UB-03	Foundation Soils	10.6	31.6	22.7	0.278	-3.810	1.223	1.5	32.3	53	30	49.0	81.3	1.1	-0.1	0.0	1.0	0.117	1.012	0.127	0.212	0.596
UC-03	UB-03	Foundation Soils	10.7	31.5	18.4	0.319	-4.320	1.736	1.5	26.4	66	30	49.0	75.3	1.1	-0.1	0.0	1.0	0.112	1.011	0.120	0.213	0.565
UC-03	UB-03	Foundation Soils	10.7	31.4	13.2	0.315	-2.570	2.391	1.5	19.2	74	30	47.7	66.9	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.213	0.526
UC-03	UB-03	Foundation Soils	10.8	31.3	9.7	0.327	12.580	3.372	1.6	14.3	90	30	47.2	61.4	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.214	0.502
UC-03	UB-03	Foundation Soils	10.9	31.3	10.6	0.303	22.510	2.864	1.6	15.5	84	30	47.3	62.7	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.215	0.505
UC-03	UB-03	Foundation Soils	11.0	31.2	9.9	0.245	8.610	2.464	1.6	14.6	83	30	47.0	61.5	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.215	0.499
UC-03	UB-03	Foundation Soils	11.1	31.1	9.5	0.179	4.050	1.879	1.6	13.9	79	30	46.7	60.6	1.1	-0.2	0.0	1.0	0.100	1.009	0.107	0.216	0.494
UC-03	UB-03	Foundation Soils	11.2	31.0	7.4	0.175	5.700	2.376	1.6	10.8	92	30	46.4	57.2	1.1	-0.2	0.0	1.0	0.097	1.008	0.104	0.216	0.479
UC-03	UB-03	Foundation Soils	11.2	30.9	5.2	0.177	8.480	3.376	1.6	7.8	100	30	45.8	53.5	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.217	0.464
UC-03	UB-03	Foundation Soils	11.3	30.8	3.9	0.192	18.680	4.953	1.6	5.8	100	30	45.3	51.0	1.1	-0.2	0.0	1.0	0.093	1.008	0.099	0.217	0.453
UC-03	UB-03	Foundation Soils	11.4	30.8	4.5	0.184	31.450	4.120	1.6	6.6	100	30	45.5	52.1	1.1	-0.2	0.0	1.0	0.094	1.008	0.099	0.218	0.456
UC-03	UB-03	Foundation Soils	11.5	30.7	5.4	0.166	22.440	3.091	1.6	7.9	100	30	45.8	53.7	1.1	-0.2	0.0	1.0	0.095	1.008	0.101	0.218	0.461
UC-03	UB-03	Foundation Soils	11.6	30.6	7.9	0.154	22.200	1.937	1.5	11.5	87	30	46.4	57.9	1.1	-0.2	0.0	1.0	0.098	1.008	0.104	0.219	0.475
UC-03	UB-03	Foundation Soils	11.6	30.5	10.5	0.153	5.100	1.460	1.5	15.0	72	30	46.6	61.7	1.1	-0.2	0.0	1.0	0.101	1.009	0.107	0.220	0.489
UC-03	UB-03	Foundation Soils	11.7	30.4	11.0	0.150	2.000	1.358	1.5	15.8	73	30	46.9	62.6	1.1	-0.2	0.0	1.0	0.102	1.009	0.108	0.220	0.491

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	11.8	30.4	11.6	0.146	3.100	1.263	1.5	16.5	71	30	46.9	63.3	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.221	0.493
UC-03	UB-03	Foundation Soils	11.9	30.3	11.9	0.143	4.380	1.200	1.5	16.9	69	30	46.9	63.8	1.1	-0.2	0.0	1.0	0.102	1.009	0.109	0.221	0.493
UC-03	UB-03	Foundation Soils	12.0	30.2	12.1	0.154	4.860	1.268	1.5	17.2	70	30	47.0	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.221	0.493
UC-03	UB-03	Foundation Soils	12.1	30.1	12.3	0.148	4.810	1.206	1.5	17.3	68	30	46.9	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.222	0.493
UC-03	UB-03	Foundation Soils	12.1	30.0	12.4	0.164	4.910	1.318	1.5	17.5	70	30	47.1	64.5	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.222	0.493
UC-03	UB-03	Foundation Soils	12.2	29.9	12.8	0.157	5.050	1.223	1.5	18.0	67	30	47.0	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.223	0.493
UC-03	UB-03	Foundation Soils	12.3	29.9	13.4	0.155	4.510	1.153	1.5	18.7	69	30	47.3	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.223	0.496
UC-03	UB-03	Foundation Soils	12.4	29.8	13.2	0.158	3.860	1.196	1.5	18.4	70	30	47.3	65.7	1.1	-0.2	0.0	1.0	0.104	1.009	0.110	0.224	0.494
UC-03	UB-03	Foundation Soils	12.5	29.7	12.5	0.166	4.030	1.331	1.5	17.4	70	30	47.1	64.4	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.224	0.487
UC-03	UB-03	Foundation Soils	12.5	29.6	12.3	0.177	4.190	1.436	1.5	17.1	72	30	47.1	64.2	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.225	0.486
UC-03	UB-03	Foundation Soils	12.6	29.5	12.3	0.183	4.900	1.494	1.5	17.0	73	30	47.1	64.1	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.225	0.484
UC-03	UB-03	Foundation Soils	12.7	29.4	12.7	0.200	5.290	1.581	1.5	17.5	73	30	47.3	64.7	1.1	-0.2	0.0	1.0	0.103	1.009	0.109	0.226	0.485
UC-03	UB-03	Foundation Soils	12.8	29.4	13.5	0.240	5.880	1.778	1.5	18.6	74	30	47.6	66.1	1.1	-0.2	0.0	1.0	0.104	1.009	0.111	0.226	0.490
UC-03	UB-03	Foundation Soils	12.9	29.3	14.2	0.300	6.150	2.106	1.5	19.5	72	30	47.7	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.226	0.493
UC-03	UB-03	Foundation Soils	13.0	29.2	14.2	0.353	7.950	2.486	1.4	19.4	76	30	47.9	67.2	1.1	-0.2	0.0	1.0	0.105	1.010	0.112	0.227	0.492
UC-03	UB-03	Foundation Soils	13.0	29.1	12.6	0.440	8.620	3.488	1.5	17.3	87	30	47.8	65.0	1.1	-0.2	0.0	1.0	0.103	1.009	0.110	0.227	0.482
UC-03	UB-03	Foundation Soils	13.1	29.0	9.7	0.479	11.930	4.961	1.5	13.3	100	30	47.2	60.5	1.0	-0.2	0.0	1.0	0.100	1.009	0.106	0.228	0.464
UC-03	UB-03	Foundation Soils	13.2	29.0	7.7	0.508	6.100	6.608	1.5	10.6	100	30	46.5	57.1	1.0	-0.2	0.0	1.0	0.097	1.008	0.103	0.228	0.451
UC-03	UB-03	Foundation Soils	13.3	28.9	6.2	0.515	14.190	8.282	1.5	8.6	100	30	46.0	54.6	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.229	0.441
UC-03	UB-03	Foundation Soils	13.4	28.8	4.7	0.522	36.640	11.133	1.5	6.5	100	30	45.5	52.0	1.0	-0.2	0.0	1.0	0.094	1.008	0.099	0.229	0.431
UC-03	UB-03	Foundation Soils	13.5	28.7	4.1	0.497	34.830	12.100	1.5	5.7	100	30	45.2	51.0	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.229	0.426
UC-03	UB-03	Foundation Soils	13.5	28.6	3.6	0.419	42.500	11.494	1.5	5.1	100	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.230	0.423
UC-03	UB-03	Foundation Soils	13.6	28.5	3.4	0.406	49.020	11.955	1.5	4.7	100	30	45.0	49.7	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.230	0.420
UC-03	UB-03	Foundation Soils	13.7	28.5	3.1	0.399	50.170	12.816	1.5	4.3	100	30	44.9	49.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.096	0.231	0.418
UC-03	UB-03	Foundation Soils	13.8	28.4	3.5	0.381	50.690	10.866	1.5	4.8	100	30	45.0	49.9	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.231	0.419
UC-03	UB-03	Foundation Soils	13.9	28.3	3.7	0.360	21.150	9.724	1.5	5.1	100	30	45.1	50.2	1.0	-0.2	0.0	1.0	0.092	1.008	0.097	0.231	0.419
UC-03	UB-03	Foundation Soils	13.9	28.2	3.1	0.328	9.560	10.685	1.5	4.2	100	30	44.9	49.1	1.0	-0.2	0.0	1.0	0.092	1.007	0.096	0.232	0.415
UC-03	UB-03	Foundation Soils	14.0	28.1	2.2	0.298	10.050	13.347	1.5	3.1	100	30	44.6	47.7	1.0	-0.2	0.0	1.0	0.091	1.007	0.095	0.232	0.409
UC-03	UB-03	Foundation Soils	14.1	28.1	1.4	0.250	27.490	17.342	1.5	2.0	100	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.232	0.404
UC-03	UB-03	Foundation Soils	14.2	28.0	1.4	0.193	36.070	13.448	1.5	2.0	100	30	44.3	46.3	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.233	0.403
UC-03	UB-03	Foundation Soils	14.3	27.9	1.3	0.339	49.690	25.874	1.5	1.8	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.233	0.402
UC-03	UB-03	Foundation Soils	14.4	27.8	1.3	0.338	55.840	25.063	1.5	1.8	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.234	0.401
UC-03	UB-03	Foundation Soils	14.4	27.7	1.4	0.369	57.410	27.164	1.4	1.9	100	30	44.3	46.1	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.234	0.401
UC-03	UB-03	Foundation Soils	14.5	27.6	1.4	0.370	53.730	26.515	1.4	1.9	100	30	44.3	46.2	1.0	-0.2	0.0	1.0	0.090	1.007	0.094	0.234	0.400
UC-03	UB-03	Foundation Soils	14.6	27.6	4.4	0.395	-0.820	8.988	1.4	5.9	100	30	45.3	51.2	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.235	0.416
UC-03	UB-03	Foundation Soils	14.7	27.5	4.4	0.433	12.910	9.953	1.4	5.8	100	30	45.3	51.1	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.235	0.415
UC-03	UB-03	Foundation Soils	14.8	27.4	4.6	0.447	27.110	9.719	1.4	6.1	100	30	45.4	51.5	1.0	-0.2	0.0	1.0	0.093	1.008	0.098	0.235	0.416
UC-03	UB-03	Foundation Soils	14.8	27.3	5.1	0.408	26.390	7.946	1.4	6.8	100	30	45.5	52.4	1.0	-0.2	0.0	1.0	0.094	1.008	0.098	0.236	0.418
UC-03	UB-03	Foundation Soils	14.9	27.2	6.0	0.375	17.150	6.284	1.4	7.9	100	30	45.8	53.7	1.0	-0.2	0.0	1.0	0.095	1.008	0.099	0.236	0.422
UC-03	UB-03	Foundation Soils	15.0	27.2	7.2	0.355	7.050	4.942	1.4	9.5	100	30	46.2	55.7	1.0	-0.2	0.0	1.0	0.096	1.008	0.101	0.236	0.428
UC-03	UB-03	Foundation Soils	15.1	27.1	10.7	0.301	3.260	2.813	1.4	13.9	90	30	47.1	61.0	1.0	-0.2	0.0	1.0	0.100	1.009	0.105	0.237	0.445
UC-03	UB-03	Foundation Soils	15.2	27.0	17.4	0.267	-8.530	1.534	1.4	22.3	69	30	48.2	70.5	1.0	-0.2	0.0	1.0	0.108	1.010	0.114	0.237	0.479
UC-03	UB-03	Foundation Soils	15.3	26.9	21.6	0.237	-8.770	1.096	1.3	27.4	56	30	48.2	75.6	1.0	-0.2	0.0	1.0	0.112	1.011	0.118	0.237	0.499
UC-03	UB-03	Foundation Soils	15.3	26.8	22.6	0.253	-5.720	1.120	1.3	28.5	55	30	48.4	76.9	1.0	-0.2	0.0	1.0	0.113	1.011	0.120	0.238	0.504
UC-03	UB-03	Foundation Soils	15.4	26.7	24.1	0.266	5.140	1.103	1.3	30.3	53	30	48.5	78.8	1.0	-0.2	0.0	1.0	0.115	1.012	0.122	0.238	0.511
UC-03	UB-03	Foundation Soils	15.5	26.7	25.1	0.268	6.670	1.068	1.3	31.4	51	30	48.5	79.9	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.238	0.515
UC-03	UB-03	Foundation Soils	15.6	26.6	25.7	0.259	6.860	1.006	1.3	32.1	49	30	48.4	80.5	1.0	-0.2	0.0	1.0	0.116	1.012	0.123	0.238	0.517
UC-03	UB-03	Foundation Soils	15.7	26.5	25.5	0.252	6.620	0.989	1.3	31.8	49	30	48.3	80.1	1.0	-0.3	0.0	1.0	0.116	1.012	0.123	0.239	0.514
UC-03	UB-03	Foundation Soils	15.7	26.4	24.5	0.244	6.230	0.997	1.3	30.5	51	30	48.2	78.7	1.0	-0.3	0.0	1.0	0.115	1.012	0.121	0.239	0.508
UC-03	UB-03	Foundation Soils	15.8	26.3	20.4	0.230	6.240	1.129	1.3	25.5	59	30	48.1	73.6	1.0	-0.3	0.0	1.0	0.110	1.011	0.116	0.239	0.486
UC-03	UB-03	Foundation Soils	15.9	26.3	18.1	0.211	6.500	1.166	1.3	22.7	63	30	47.8	70.6	1.0	-0.3	0.0	1.0	0.108	1.010	0.113	0.240	0.473
UC-03	UB-03	Foundation Soils	16.0	26.2	13.8	0.192	6.960	1.390	1.3	17.5	72	30	47.2	64.6	1.0	-0.3	0.0	1.0	0.103	1.009	0.108	0.240	0.451
UC-03	UB-03	Foundation Soils	16.1	26.1	8.6	0.183	7.590	2.139	1.4	10.9	94	30	46.4	57.3	1.0	-0.3	0.0	1.0	0.098	1.008	0.102	0.240	0.425
UC-03	UB-03	Foundation Soils	16.2	26.0	6.7	0.133	7.720	1.992	1.4	8.5	100	30	46.0	54.5	1.0	-0.3	0.0	1.0	0.095	1.008	0.100	0.240	0.415
UC-03	UB-03	Foundation Soils	16.2	25.9	4.6	0.139	8.120	3.034	1.4	5.9	100	30	45.3	51.2	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.241	0.403
UC-03	UB-03	Foundation Soils	16.3	25.8	3.3	0.132	8.240	3.998	1.4	4.2	100	30	44.9	49.1	1.0	-0.3	0.0	1.0	0.092	1.007	0.096	0.241	0.396
UC-03	UB-03	Foundation Soils	16.4	25.8	2.6	0.125	8.560	4.783	1.4	3.4	100	30	44.7	48.0	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.241	0.392
UC-03	UB-03	Foundation Soils	16.5	25.7	2.2	0.112	7.080	5.175	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.242	0.389
UC-03	UB-03	Foundation Soils	16.6	25.6	2.2	0.106	10.480	4.895	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.242	0.388
UC-03	UB-03	Foundation Soils	16.7	25.5	2.2	0.097	15.970	4.410	1.4	2.8	100	30	44.5	47.3	1.0	-0.3	0.0	1.0	0.090	1.007	0.094	0.243	0.388
UC-03	UB-03	Foundation Soils	16.7	25.4	2.5	0.092	17.580	3.637	1.4	3.2	100	30	44.6	47.9	1.0	-0.3	0.0	1.0	0.091	1.007	0.095	0.243	0.388
UC-03	UB-03	Foundation Soils	16.8	25.3	3.9	0.107	17.120	2.767	1.4	4.9	100	30	45.0	50.0	1.0	-0.3	0.0	1.0	0.092	1.008	0.096	0.244	0.394

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	16.9	25.3	7.0	0.139	14.390	1.974	1.3	8.9	100	30	46.0	55.0	1.0	-0.3	0.0	1.0	0.096	1.008	0.100	0.244	0.410
UC-03	UB-03	Foundation Soils	17.0	25.2	20.6	0.167	6.100	0.809	1.4	27.5	53	0	0.5	28.0	1.0	-0.3	0.0	1.0	0.078	1.006	0.080	0.244	0.328
UC-03	UB-03	Foundation Soils	17.1	25.1	27.3	0.203	7.050	0.745	1.4	35.6	43	0	0.5	36.1	1.0	-0.3	0.0	1.0	0.083	1.007	0.086	0.244	0.351
UC-03	UB-03	Foundation Soils	17.1	25.0	29.2	0.273	6.380	0.936	1.4	37.8	45	0	0.5	38.3	1.0	-0.3	0.0	1.0	0.084	1.007	0.087	0.245	0.357
UC-03	UB-03	Foundation Soils	17.2	24.9	30.1	0.277	8.000	0.919	1.4	38.8	44	0	0.5	39.4	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.245	0.360
UC-03	UB-03	Foundation Soils	17.3	24.9	30.6	0.282	8.240	0.922	1.4	39.3	43	0	0.5	39.8	1.0	-0.3	0.0	1.0	0.085	1.007	0.088	0.245	0.360
UC-03	UB-03	Foundation Soils	17.4	24.8	31.8	0.270	8.430	0.849	1.4	40.6	41	0	0.5	41.2	1.0	-0.3	0.0	1.0	0.086	1.007	0.089	0.245	0.364
UC-03	UB-03	Foundation Soils	17.5	24.7	36.4	0.263	9.010	0.722	1.3	46.0	34	0	0.5	46.5	1.0	-0.3	0.0	1.0	0.090	1.007	0.093	0.246	0.380
UC-03	UB-03	Foundation Soils	17.6	24.6	40.7	0.253	8.910	0.621	1.3	50.9	28	0	0.5	51.3	1.0	-0.3	0.0	1.0	0.093	1.008	0.097	0.246	0.394
UC-03	UB-03	Foundation Soils	17.6	24.5	44.9	0.260	8.410	0.580	1.3	55.5	24	0	0.4	56.0	1.0	-0.3	0.0	1.0	0.097	1.008	0.101	0.246	0.409
UC-03	UB-03	Foundation Soils	17.7	24.4	49.6	0.303	8.750	0.611	1.3	60.8	22	0	0.4	61.2	1.0	-0.3	0.0	0.9	0.100	1.009	0.105	0.246	0.425
UC-03	UB-03	Foundation Soils	17.8	24.4	53.9	0.351	8.850	0.651	1.3	65.6	20	0	0.4	66.0	1.0	-0.3	0.0	0.9	0.104	1.009	0.109	0.246	0.441
UC-03	UB-03	Foundation Soils	17.9	24.3	57.6	0.392	8.580	0.681	1.3	69.5	19	0	0.4	69.9	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.247	0.455
UC-03	UB-03	Foundation Soils	18.0	24.2	58.1	0.421	8.310	0.725	1.3	69.9	20	0	0.4	70.3	1.0	-0.3	0.0	0.9	0.107	1.010	0.112	0.247	0.456
UC-03	UB-03	Foundation Soils	18.0	24.1	56.3	0.443	8.240	0.786	1.3	67.8	23	0	0.4	68.3	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.247	0.448
UC-03	UB-03	Foundation Soils	18.1	24.0	53.7	0.449	8.240	0.837	1.3	64.7	25	0	0.5	65.2	1.0	-0.3	0.0	0.9	0.103	1.009	0.108	0.247	0.437
UC-03	UB-03	Foundation Soils	18.2	24.0	50.7	0.451	8.380	0.890	1.3	61.2	28	0	0.5	61.7	1.0	-0.3	0.0	0.9	0.101	1.009	0.105	0.247	0.425
UC-03	UB-03	Foundation Soils	18.3	23.9	47.8	0.442	8.650	0.925	1.3	57.9	31	0	0.5	58.4	1.0	-0.3	0.0	0.9	0.098	1.008	0.102	0.248	0.413
UC-03	UB-03	Foundation Soils	18.4	23.8	45.4	0.435	8.810	0.959	1.3	55.1	33	0	0.5	55.6	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.248	0.404
UC-03	UB-03	Foundation Soils	18.5	23.7	45.0	0.470	8.960	1.045	1.3	54.5	35	0	0.5	55.1	1.0	-0.3	0.0	0.9	0.096	1.008	0.100	0.248	0.402
UC-03	UB-03	Foundation Soils	18.5	23.6	46.7	0.477	9.290	1.021	1.3	56.4	34	0	0.5	56.9	1.0	-0.3	0.0	0.9	0.097	1.008	0.101	0.248	0.407
UC-03	UB-03	Foundation Soils	18.6	23.5	48.6	0.417	9.500	0.859	1.3	58.3	29	0	0.5	58.8	1.0	-0.3	0.0	0.9	0.099	1.008	0.103	0.248	0.413
UC-03	UB-03	Foundation Soils	18.7	23.5	53.2	0.447	9.910	0.841	1.3	63.3	26	0	0.5	63.8	1.0	-0.3	0.0	0.9	0.102	1.009	0.107	0.249	0.429
UC-03	UB-03	Foundation Soils	18.8	23.4	58.5	0.469	10.050	0.802	1.3	69.1	22	0	0.4	69.5	1.0	-0.3	0.0	0.9	0.107	1.010	0.111	0.249	0.448
UC-03	UB-03	Foundation Soils	18.9	23.3	64.5	0.502	9.460	0.778	1.2	75.5	19	0	0.4	75.9	1.0	-0.3	0.0	0.9	0.112	1.011	0.117	0.249	0.471
UC-03	UB-03	Foundation Soils	18.9	23.2	68.1	0.516	9.020	0.757	1.2	79.3	17	0	0.3	79.6	1.0	-0.3	0.0	0.9	0.115	1.012	0.121	0.249	0.485
UC-03	UB-03	Foundation Soils	19.0	23.1	66.1	0.528	9.200	0.799	1.2	76.9	19	0	0.4	77.3	1.0	-0.3	0.0	0.9	0.113	1.011	0.119	0.249	0.476
UC-03	UB-03	Foundation Soils	19.1	23.1	64.0	0.512	9.340	0.799	1.2	74.6	20	0	0.4	75.0	1.0	-0.3	0.0	0.9	0.111	1.011	0.116	0.249	0.467
UC-03	UB-03	Foundation Soils	19.2	23.0	61.0	0.494	9.790	0.810	1.2	71.1	22	0	0.4	71.6	1.0	-0.3	0.0	0.9	0.109	1.010	0.113	0.249	0.453
UC-03	UB-03	Foundation Soils	19.3	22.9	58.7	0.474	9.840	0.807	1.2	68.6	23	0	0.4	69.0	1.0	-0.3	0.0	0.9	0.106	1.010	0.111	0.250	0.444
UC-03	UB-03	Foundation Soils	19.4	22.8	56.5	0.469	9.960	0.830	1.2	66.0	24	0	0.5	66.5	1.0	-0.3	0.0	0.9	0.104	1.010	0.109	0.250	0.435
UC-03	UB-03	Foundation Soils	19.4	22.7	53.9	0.427	10.010	0.793	1.2	63.0	25	0	0.5	63.4	1.0	-0.3	0.0	0.9	0.102	1.009	0.106	0.250	0.424
UC-03	UB-03	Foundation Soils	19.5	22.6	51.1	0.385	10.110	0.754	1.2	59.8	26	0	0.5	60.3	1.0	-0.3	0.0	0.9	0.100	1.009	0.103	0.250	0.413
UC-03	UB-03	Foundation Soils	19.6	22.6	48.4	0.381	10.200	0.786	1.2	56.8	28	0	0.5	57.3	1.0	-0.3	0.0	0.9	0.098	1.008	0.101	0.250	0.404
UC-03	UB-03	Foundation Soils	19.7	22.5	45.8	0.373	10.150	0.814	1.2	53.8	30	0	0.5	54.3	1.0	-0.3	0.0	0.9	0.095	1.008	0.099	0.250	0.394
UC-03	UB-03	Foundation Soils	19.8	22.4	40.7	0.368	8.760	0.905	1.3	48.0	36	0	0.5	48.5	1.0	-0.3	0.0	0.9	0.091	1.007	0.094	0.251	0.376
UC-03	UB-03	Foundation Soils	19.8	22.3	39.0	0.400	9.770	1.026	1.3	46.1	40	0	0.5	46.6	1.0	-0.3	0.0	0.9	0.090	1.007	0.093	0.251	0.370
UC-03	UB-03	Foundation Soils	19.9	22.2	37.2	0.442	9.670	1.188	1.3	44.0	44	0	0.5	44.5	1.0	-0.3	0.0	0.9	0.088	1.007	0.091	0.251	0.363
UC-03	UB-03	Foundation Soils	20.0	22.2	31.0	0.487	9.560	1.569	1.3	37.0	55	0	0.5	37.5	1.0	-0.3	0.0	0.9	0.084	1.007	0.086	0.251	0.343
UC-03	UB-03	Foundation Soils	20.1	22.1	22.1	0.542	9.960	2.458	1.3	26.7	72	0	0.5	27.2	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.251	0.314
UC-03	UB-03	Foundation Soils	20.2	22.0	14.9	0.529	10.290	3.561	1.3	18.2	92	0	0.5	18.7	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.251	0.292
UC-03	UB-03	Foundation Soils	20.3	21.9	10.8	0.483	11.100	4.456	1.3	13.2	100	0	0.5	13.7	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.252	0.279
UC-03	UB-03	Foundation Soils	20.3	21.8	8.9	0.379	11.530	4.262	1.3	10.8	100	0	0.5	11.3	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.252	0.273
UC-03	UB-03	Foundation Soils	20.4	21.7	7.2	0.284	12.290	3.968	1.3	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.252	0.267
UC-03	UB-03	Foundation Soils	20.5	21.7	6.0	0.215	24.770	3.575	1.3	7.3	100	0	0.5	7.8	1.0	-0.4	0.0	0.9	0.065	1.006	0.066	0.252	0.264
UC-03	UB-03	Foundation Soils	20.6	21.6	6.2	0.148	56.980	2.404	1.3	7.5	100	0	0.5	7.9	1.0	-0.4	0.0	0.9	0.065	1.006	0.067	0.252	0.264
UC-03	UB-03	Foundation Soils	20.7	21.5	7.2	0.087	93.900	1.209	1.3	8.7	97	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.253	0.266
UC-03	UB-03	Foundation Soils	20.8	21.4	20.8	0.083	68.890	0.400	1.3	24.8	45	0	0.5	25.3	1.0	-0.4	0.0	0.9	0.076	1.006	0.078	0.253	0.307
UC-03	UB-03	Foundation Soils	20.8	21.3	30.1	0.124	67.850	0.412	1.2	35.3	33	0	0.5	35.8	1.0	-0.4	0.0	0.9	0.083	1.007	0.085	0.253	0.335
UC-03	UB-03	Foundation Soils	20.9	21.2	22.4	0.188	8.100	0.839	1.3	26.6	53	0	0.5	27.1	1.0	-0.4	0.0	0.9	0.077	1.006	0.079	0.253	0.311
UC-03	UB-03	Foundation Soils	21.0	21.2	14.3	0.249	14.320	1.744	1.3	17.1	79	0	0.5	17.6	1.0	-0.4	0.0	0.9	0.071	1.006	0.073	0.253	0.286
UC-03	UB-03	Foundation Soils	21.1	21.1	9.5	0.257	31.490	2.703	1.3	11.4	100	0	0.5	11.9	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.253	0.272
UC-03	UB-03	Foundation Soils	21.2	21.0	7.3	0.213	57.890	2.905	1.3	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.254	0.265
UC-03	UB-03	Foundation Soils	21.2	20.9	6.8	0.214	66.020	3.155	1.3	8.1	100	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.254	0.264
UC-03	UB-03	Foundation Soils	21.3	20.8	19.3	0.218	96.300	1.127	1.3	22.9	63	0	0.5	23.4	1.0	-0.4	0.0	0.9	0.075	1.006	0.076	0.254	0.300
UC-03	UB-03	Foundation Soils	21.4	20.8	28.6	0.285	103.870	0.998	1.2	33.1	49	0	0.5	33.7	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.254	0.327
UC-03	UB-03	Foundation Soils	21.5	20.7	20.5	0.338	7.150	1.648	1.2	24.1	69	0	0.5	24.6	1.0	-0.4	0.0	0.9	0.075	1.006	0.077	0.254	0.303
UC-03	UB-03	Foundation Soils	21.6	20.6	12.3	0.277	3.670	2.248	1.3	14.5	90	0	0.5	15.0	1.0	-0.4	0.0	0.9	0.069	1.006	0.071	0.254	0.279
UC-03	UB-03	Foundation Soils	21.7	20.5	9.6	0.254	22.110	2.655	1.2	11.3	100	0	0.5	11.8	1.0	-0.4	0.0	0.9	0.067	1.006	0.069	0.254	0.270
UC-03	UB-03	Foundation Soils	21.7	20.4	7.4	0.236	40.070	3.193	1.2	8.7	100	0	0.5	9.2	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.255	0.264
UC-03	UB-03	Foundation Soils	21.8	20.3	8.5	0.239	52.080	2.827	1.2	9.9	100	0	0.5	10.4	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.255	0.267
UC-03	UB-03	Foundation Soils	21.9	20.3	33.1	0.224	96.480	0.676	1.2	37.8	38	0	0.5	38.3	1.0	-0.4	0.0	0.9	0.084	1.007	0.086	0.255	0.339

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	22.0	20.2	58.9	0.187	48.600	0.318	1.2	65.2	8	0	0.1	65.3	1.0	-0.4	0.0	0.9	0.104	1.009	0.107	0.255	0.419
UC-03	UB-03	Foundation Soils	22.1	20.1	68.6	0.184	7.000	0.268	1.2	75.3	1	0	0.0	75.3	1.0	-0.4	0.0	0.9	0.112	1.011	0.116	0.255	0.453
UC-03	UB-03	Foundation Soils	22.1	20.0	77.2	0.223	-3.030	0.289	1.2	84.0	0	0	0.0	84.0	1.0	-0.4	0.0	0.9	0.120	1.013	0.124	0.255	0.486
UC-03	UB-03	Foundation Soils	22.2	19.9	64.5	0.302	2.860	0.468	1.2	70.8	12	0	0.2	70.9	1.0	-0.4	0.0	0.9	0.108	1.010	0.112	0.255	0.437
UC-03	UB-03	Foundation Soils	22.3	19.9	54.8	0.378	4.920	0.690	1.2	60.5	23	0	0.4	60.9	1.0	-0.4	0.0	0.9	0.100	1.009	0.103	0.255	0.404
UC-03	UB-03	Foundation Soils	22.4	19.8	36.4	0.467	7.130	1.285	1.2	40.8	48	0	0.5	41.3	1.0	-0.4	0.0	0.9	0.086	1.007	0.088	0.255	0.346
UC-03	UB-03	Foundation Soils	22.5	19.7	25.7	0.602	9.620	2.347	1.2	29.1	70	0	0.5	29.7	1.0	-0.4	0.0	0.9	0.079	1.006	0.080	0.256	0.314
UC-03	UB-03	Foundation Soils	22.6	19.6	18.2	0.668	12.150	3.663	1.2	20.9	89	0	0.5	21.5	1.0	-0.4	0.0	0.9	0.073	1.006	0.075	0.256	0.292
UC-03	UB-03	Foundation Soils	22.6	19.5	14.4	0.575	14.140	4.005	1.2	16.5	98	0	0.5	17.0	1.0	-0.4	0.0	0.9	0.071	1.006	0.072	0.256	0.281
UC-03	UB-03	Foundation Soils	22.7	19.4	11.3	0.317	15.720	2.801	1.2	13.0	99	0	0.5	13.5	1.0	-0.4	0.0	0.9	0.068	1.006	0.070	0.256	0.272
UC-03	UB-03	Foundation Soils	22.8	19.4	8.5	0.248	21.170	2.913	1.2	9.7	100	0	0.5	10.2	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.256	0.264
UC-03	UB-03	Foundation Soils	22.9	19.3	7.1	0.234	55.510	3.293	1.2	8.1	100	0	0.5	8.6	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.256	0.260
UC-03	UB-03	Foundation Soils	23.0	19.2	19.6	0.163	75.800	0.830	1.2	22.3	59	0	0.5	22.8	1.0	-0.4	0.0	0.9	0.074	1.006	0.076	0.256	0.295
UC-03	UB-03	Foundation Soils	23.0	19.1	41.3	0.140	61.130	0.339	1.2	45.5	21	0	0.4	45.9	1.0	-0.4	0.0	0.9	0.089	1.007	0.092	0.257	0.357
UC-03	UB-03	Foundation Soils	23.1	19.0	44.5	0.156	6.770	0.351	1.2	48.7	19	0	0.4	49.1	1.0	-0.4	0.0	0.9	0.092	1.007	0.094	0.257	0.366
UC-03	UB-03	Foundation Soils	23.2	19.0	41.2	0.260	10.590	0.631	1.2	45.3	31	0	0.5	45.7	1.0	-0.4	0.0	0.9	0.089	1.007	0.091	0.257	0.356
UC-03	UB-03	Foundation Soils	23.3	18.9	30.1	0.378	14.180	1.255	1.2	33.4	53	0	0.5	33.9	1.0	-0.4	0.0	0.9	0.081	1.007	0.083	0.257	0.323
UC-03	UB-03	Foundation Soils	23.4	18.8	25.3	0.540	16.910	2.131	1.2	28.2	69	0	0.5	28.7	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.257	0.309
UC-03	UB-03	Foundation Soils	23.5	18.7	17.0	0.564	21.180	3.325	1.2	19.1	90	0	0.5	19.6	1.0	-0.4	0.0	0.9	0.072	1.006	0.073	0.257	0.286
UC-03	UB-03	Foundation Soils	23.5	18.6	11.9	0.475	27.310	3.995	1.2	13.3	100	0	0.5	13.8	1.0	-0.4	0.0	0.9	0.069	1.006	0.070	0.257	0.272
UC-03	UB-03	Foundation Soils	23.6	18.5	9.4	0.389	32.780	4.119	1.2	10.6	100	0	0.5	11.1	1.0	-0.4	0.0	0.9	0.067	1.006	0.068	0.257	0.265
UC-03	UB-03	Foundation Soils	23.7	18.5	7.4	0.344	56.980	4.670	1.2	8.2	100	0	0.5	8.7	1.0	-0.4	0.0	0.9	0.066	1.006	0.067	0.257	0.259
UC-03	UB-03	Foundation Soils	23.8	18.4	11.5	0.319	98.280	2.785	1.2	12.8	99	0	0.5	13.3	1.0	-0.4	0.0	0.9	0.068	1.006	0.069	0.258	0.270
UC-03	UB-03	Foundation Soils	23.9	18.3	25.3	0.319	86.250	1.261	1.2	27.9	59	0	0.5	28.4	1.0	-0.4	0.0	0.9	0.078	1.006	0.079	0.258	0.307
UC-03	UB-03	Foundation Soils	23.9	18.2	31.0	0.265	23.770	0.855	1.2	33.9	45	0	0.5	34.4	1.0	-0.4	0.1	0.9	0.082	1.007	0.083	0.258	0.323
UC-03	UB-03	Foundation Soils	24.0	18.1	34.9	0.210	23.960	0.601	1.2	38.0	36	0	0.5	38.4	1.0	-0.4	0.1	0.9	0.084	1.007	0.086	0.258	0.334
UC-03	UB-03	Foundation Soils	24.1	18.0	44.9	0.130	20.610	0.290	1.1	48.2	17	0	0.3	48.5	1.0	-0.4	0.1	0.9	0.091	1.007	0.093	0.258	0.362
UC-03	UB-03	Foundation Soils	24.2	18.0	55.2	0.097	15.340	0.176	1.1	58.8	5	0	0.0	58.8	1.0	-0.5	0.1	0.9	0.099	1.008	0.101	0.258	0.392
UC-03	UB-03	Foundation Soils	24.3	17.9	63.0	0.119	-2.570	0.189	1.1	66.6	1	0	0.0	66.6	1.0	-0.5	0.1	0.9	0.105	1.010	0.107	0.258	0.416
UC-03	UB-03	Foundation Soils	24.4	17.8	57.3	0.151	2.140	0.263	1.1	60.8	8	0	0.1	60.8	1.0	-0.5	0.1	0.9	0.100	1.009	0.103	0.258	0.397
UC-03	UB-03	Foundation Soils	24.4	17.7	48.3	0.231	11.010	0.478	1.1	51.4	22	0	0.4	51.8	1.0	-0.5	0.1	0.9	0.094	1.008	0.096	0.258	0.370
UC-03	UB-03	Foundation Soils	24.5	17.6	39.5	0.276	16.630	0.699	1.1	42.2	35	0	0.5	42.7	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.258	0.345
UC-03	UB-03	Foundation Soils	24.6	17.6	32.6	0.327	18.130	1.002	1.1	35.0	47	0	0.5	35.6	1.0	-0.5	0.1	0.9	0.082	1.007	0.084	0.258	0.325
UC-03	UB-03	Foundation Soils	24.7	17.5	28.9	0.371	20.490	1.282	1.1	31.1	55	0	0.5	31.7	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.258	0.315
UC-03	UB-03	Foundation Soils	24.8	17.4	25.8	0.408	22.710	1.582	1.1	27.8	63	0	0.5	28.3	1.0	-0.5	0.1	0.9	0.078	1.006	0.079	0.258	0.306
UC-03	UB-03	Foundation Soils	24.9	17.3	24.4	0.365	25.010	1.494	1.1	26.3	64	0	0.5	26.8	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.258	0.302
UC-03	UB-03	Foundation Soils	24.9	17.2	24.9	0.266	26.360	1.070	1.1	26.7	57	0	0.5	27.2	1.0	-0.5	0.1	0.9	0.077	1.006	0.078	0.259	0.303
UC-03	UB-03	Foundation Soils	25.0	17.1	27.5	0.209	24.110	0.760	1.1	29.4	48	0	0.5	29.9	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.259	0.309
UC-03	UB-03	Foundation Soils	25.1	17.1	29.2	0.178	9.310	0.610	1.1	31.1	42	0	0.5	31.6	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.259	0.314
UC-03	UB-03	Foundation Soils	25.2	17.0	28.1	0.205	0.910	0.729	1.1	29.9	46	0	0.5	30.4	1.0	-0.5	0.1	0.9	0.079	1.006	0.080	0.259	0.311
UC-03	UB-03	Foundation Soils	25.3	16.9	23.1	0.243	0.380	1.050	1.1	24.7	59	0	0.5	25.2	1.0	-0.5	0.1	0.9	0.076	1.006	0.077	0.259	0.297
UC-03	UB-03	Foundation Soils	25.3	16.8	19.8	0.245	13.460	1.240	1.1	21.1	67	0	0.5	21.6	1.0	-0.5	0.1	0.9	0.073	1.006	0.075	0.259	0.288
UC-03	UB-03	Foundation Soils	25.4	16.7	16.7	0.273	31.210	1.639	1.1	17.8	78	0	0.5	18.3	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.259	0.280
UC-03	UB-03	Foundation Soils	25.5	16.7	14.7	0.266	35.160	1.811	1.1	15.7	84	0	0.5	16.2	1.0	-0.5	0.1	0.9	0.070	1.006	0.071	0.259	0.274
UC-03	UB-03	Foundation Soils	25.6	16.6	11.9	0.276	51.840	2.319	1.1	12.7	97	0	0.5	13.2	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.259	0.267
UC-03	UB-03	Foundation Soils	25.7	16.5	10.2	0.280	74.370	2.757	1.1	10.8	100	0	0.5	11.3	1.0	-0.5	0.1	0.9	0.067	1.006	0.068	0.259	0.263
UC-03	UB-03	Foundation Soils	25.8	16.4	11.2	0.278	110.440	2.480	1.1	11.9	100	0	0.5	12.4	1.0	-0.5	0.1	0.9	0.068	1.006	0.069	0.259	0.265
UC-03	UB-03	Foundation Soils	25.8	16.3	13.8	0.252	84.050	1.828	1.1	14.6	87	0	0.5	15.1	1.0	-0.5	0.1	0.9	0.069	1.006	0.070	0.259	0.271
UC-03	UB-03	Foundation Soils	25.9	16.2	16.1	0.226	69.620	1.406	1.1	17.0	77	0	0.5	17.5	1.0	-0.5	0.1	0.9	0.071	1.006	0.072	0.259	0.277
UC-03	UB-03	Foundation Soils	26.0	16.2	21.9	0.272	60.510	1.241	1.1	23.1	64	0	0.5	23.6	1.0	-0.5	0.1	0.9	0.075	1.006	0.076	0.260	0.292
UC-03	UB-03	Foundation Soils	26.1	16.1	30.2	0.305	28.400	1.010	1.1	31.5	50	0	0.5	32.0	1.0	-0.5	0.1	0.9	0.080	1.006	0.081	0.260	0.313
UC-03	UB-03	Foundation Soils	26.2	16.0	35.3	0.283	24.820	0.802	1.1	36.6	41	0	0.5	37.1	1.0	-0.5	0.1	0.9	0.083	1.007	0.085	0.260	0.326
UC-03	UB-03	Foundation Soils	26.2	15.9	40.7	0.265	19.820	0.650	1.1	42.1	33	0	0.5	42.5	1.0	-0.5	0.1	0.9	0.087	1.007	0.089	0.260	0.341
UC-03	UB-03	Foundation Soils	26.3	15.8	53.0	0.260	1.330	0.490	1.1	54.3	20	0	0.4	54.7	1.0	-0.5	0.1	0.9	0.096	1.008	0.097	0.260	0.375
UC-03	UB-03	Foundation Soils	26.4	15.8	70.6	0.280	6.430	0.397	1.1	71.7	8	0	0.1	71.8	1.0	-0.5	0.1	0.9	0.109	1.010	0.111	0.260	0.427
UC-03	UB-03	Foundation Soils	26.5	15.7	85.8	0.336	7.900	0.392	1.1	86.5	2	0	0.0	86.5	1.0	-0.5	0.1	0.9	0.122	1.014	0.125	0.260	0.482
UC-03	UB-03	Foundation Soils	26.6	15.6	94.2	0.378	12.770	0.401	1.1	94.6	0	0	0.0	94.6	1.0	-0.5	0.1	0.9	0.131	1.016	0.134	0.260	0.518
UC-03	UB-03	Foundation Soils	26.7	15.5	96.0	0.458	9.100	0.477	1.1	96.4	2	0	0.0	96.4	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.260	0.526
UC-03	UB-03	Foundation Soils	26.7	15.4	97.4	0.528	14.270	0.542	1.1	97.6	4	0	0.0	97.6	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.260	0.532
UC-03	UB-03	Foundation Soils	26.8	15.3	97.6	0.543	18.140	0.556	1.1	97.6	4	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.260	0.532
UC-03	UB-03	Foundation Soils	26.9	15.3	97.8	0.575	19.110	0.588	1.1	97.7	6	0	0.0	97.7	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.260	0.532
UC-03	UB-03	Foundation Soils	27.0	15.2	101.0	0.601	21.540	0.595	1.1	100.6	5	0	0.0	100.6	1.0	-0.5	0.1	0.9	0.138	1.018	0.142	0.260	0.547

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	27.1	15.1	108.8	0.630	19.680	0.579	1.1	108.1	2	0	0.0	108.1	1.0	-0.5	0.1	0.9	0.149	1.021	0.154	0.260	0.592
UC-03	UB-03	Foundation Soils	27.1	15.0	112.0	0.680	19.930	0.607	1.1	111.0	2	0	0.0	111.0	1.0	-0.5	0.1	0.9	0.154	1.022	0.159	0.260	0.612
UC-03	UB-03	Foundation Soils	27.2	14.9	109.6	0.702	19.580	0.640	1.1	108.6	4	0	0.0	108.6	1.0	-0.5	0.1	0.9	0.150	1.021	0.155	0.260	0.595
UC-03	UB-03	Foundation Soils	27.3	14.9	105.3	0.718	18.030	0.682	1.1	104.3	7	0	0.0	104.4	1.0	-0.5	0.1	0.9	0.143	1.019	0.148	0.260	0.568
UC-03	UB-03	Foundation Soils	27.4	14.8	98.1	0.717	21.520	0.731	1.1	97.2	10	0	0.1	97.4	1.0	-0.5	0.1	0.9	0.134	1.017	0.138	0.260	0.529
UC-03	UB-03	Foundation Soils	27.5	14.7	96.2	0.675	22.590	0.702	1.0	95.2	10	0	0.1	95.3	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.260	0.519
UC-03	UB-03	Foundation Soils	27.6	14.6	97.6	0.678	23.870	0.695	1.0	96.5	9	0	0.1	96.6	1.0	-0.5	0.1	0.9	0.133	1.017	0.137	0.260	0.525
UC-03	UB-03	Foundation Soils	27.6	14.5	96.9	0.692	23.110	0.714	1.0	95.7	10	0	0.1	95.8	1.0	-0.5	0.1	0.9	0.132	1.016	0.135	0.260	0.521
UC-03	UB-03	Foundation Soils	27.7	14.4	93.6	0.698	18.630	0.746	1.0	92.3	12	0	0.2	92.5	1.0	-0.5	0.1	0.9	0.128	1.015	0.131	0.260	0.505
UC-03	UB-03	Foundation Soils	27.8	14.4	90.0	0.652	24.590	0.724	1.0	88.8	12	0	0.2	89.0	1.0	-0.5	0.1	0.9	0.125	1.014	0.127	0.260	0.489
UC-03	UB-03	Foundation Soils	27.9	14.3	91.5	0.618	23.110	0.676	1.0	90.1	11	0	0.2	90.2	1.0	-0.5	0.1	0.9	0.126	1.015	0.129	0.260	0.495
UC-03	UB-03	Foundation Soils	28.0	14.2	95.0	0.644	22.520	0.678	1.0	93.3	10	0	0.1	93.5	1.0	-0.5	0.1	0.9	0.129	1.016	0.132	0.260	0.509
UC-03	UB-03	Foundation Soils	28.1	14.1	95.8	0.665	20.490	0.694	1.0	94.0	10	0	0.1	94.1	1.0	-0.6	0.1	0.9	0.130	1.016	0.133	0.260	0.512
UC-03	UB-03	Foundation Soils	28.1	14.0	92.5	0.677	22.220	0.732	1.0	90.7	12	0	0.2	90.9	1.0	-0.6	0.1	0.9	0.127	1.015	0.129	0.260	0.497
UC-03	UB-03	Foundation Soils	28.2	13.9	90.0	0.681	25.300	0.757	1.0	88.1	14	0	0.3	88.4	1.0	-0.6	0.1	0.9	0.124	1.014	0.127	0.260	0.486
UC-03	UB-03	Foundation Soils	28.3	13.9	91.0	0.666	25.600	0.732	1.0	89.0	13	0	0.2	89.2	1.0	-0.6	0.1	0.9	0.125	1.014	0.127	0.260	0.490
UC-03	UB-03	Foundation Soils	28.4	13.8	95.1	0.636	25.540	0.669	1.0	92.8	10	0	0.1	92.9	1.0	-0.6	0.1	0.9	0.129	1.015	0.132	0.260	0.506
UC-03	UB-03	Foundation Soils	28.5	13.7	101.4	0.625	23.100	0.616	1.0	98.8	6	0	0.0	98.8	1.0	-0.6	0.1	0.9	0.136	1.017	0.139	0.260	0.534
UC-03	UB-03	Foundation Soils	28.5	13.6	108.9	0.613	17.630	0.563	1.0	105.8	2	0	0.0	105.8	1.0	-0.6	0.1	0.9	0.145	1.020	0.149	0.260	0.574
UC-03	UB-03	Foundation Soils	28.6	13.5	109.8	0.617	20.340	0.562	1.0	106.6	2	0	0.0	106.6	1.0	-0.6	0.1	0.9	0.147	1.020	0.150	0.260	0.578
UC-03	UB-03	Foundation Soils	28.7	13.5	105.7	0.642	19.680	0.608	1.0	102.5	5	0	0.0	102.5	1.0	-0.6	0.1	0.9	0.141	1.019	0.144	0.260	0.554
UC-03	UB-03	Foundation Soils	28.8	13.4	101.0	0.636	21.620	0.630	1.0	97.9	7	0	0.0	97.9	1.0	-0.6	0.1	0.9	0.135	1.017	0.138	0.260	0.529
UC-03	UB-03	Foundation Soils	28.9	13.3	98.8	0.599	22.920	0.606	1.0	95.7	7	0	0.0	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.260	0.518
UC-03	UB-03	Foundation Soils	29.0	13.2	100.0	0.583	24.870	0.583	1.0	96.6	6	0	0.0	96.7	1.0	-0.6	0.1	0.9	0.133	1.017	0.136	0.260	0.523
UC-03	UB-03	Foundation Soils	29.0	13.1	101.3	0.623	23.350	0.615	1.0	97.8	6	0	0.0	97.8	1.0	-0.6	0.1	0.9	0.135	1.017	0.137	0.260	0.528
UC-03	UB-03	Foundation Soils	29.1	13.0	99.2	0.657	18.890	0.663	1.0	95.7	9	0	0.1	95.7	1.0	-0.6	0.1	0.9	0.132	1.016	0.135	0.260	0.518
UC-03	UB-03	Foundation Soils	29.2	13.0	90.5	0.773	20.110	0.854	1.0	87.3	16	0	0.3	87.6	1.0	-0.6	0.1	0.9	0.123	1.014	0.125	0.260	0.481
UC-03	UB-03	Foundation Soils	29.3	12.9	84.3	0.704	21.200	0.835	1.0	81.2	18	0	0.4	81.6	1.0	-0.6	0.1	0.9	0.117	1.012	0.119	0.260	0.458
UC-03	UB-03	Foundation Soils	29.4	12.8	65.0	0.845	21.730	1.301	1.0	62.6	35	0	0.5	63.2	1.0	-0.6	0.1	0.9	0.102	1.009	0.103	0.260	0.396
UC-03	UB-03	Foundation Soils	29.4	12.7	52.4	0.962	23.540	1.835	1.0	50.5	48	0	0.6	51.1	1.0	-0.6	0.1	0.9	0.093	1.008	0.094	0.260	0.361
UC-03	UB-03	Foundation Soils	29.5	12.6	39.7	0.955	27.350	2.406	1.0	38.3	62	0	0.5	38.8	1.0	-0.6	0.1	0.9	0.085	1.007	0.085	0.260	0.328
UC-03	UB-03	Foundation Soils	29.6	12.6	32.1	0.811	13.190	2.529	1.0	30.9	69	0	0.5	31.4	1.0	-0.6	0.1	0.9	0.080	1.006	0.080	0.260	0.309
UC-03	UB-03	Foundation Soils	29.7	12.5	34.8	0.618	35.260	1.774	1.0	33.5	59	0	0.5	34.0	1.0	-0.6	0.1	0.9	0.081	1.007	0.082	0.260	0.315
UC-03	UB-03	Foundation Soils	29.8	12.4	41.6	0.505	40.640	1.213	1.0	39.9	46	0	0.5	40.5	1.0	-0.6	0.1	0.9	0.086	1.007	0.086	0.260	0.332
UC-03	UB-03	Foundation Soils	29.9	12.3	70.5	0.446	28.740	0.633	1.0	67.4	18	0	0.4	67.7	1.0	-0.6	0.1	0.9	0.105	1.010	0.107	0.260	0.410
UC-03	UB-03	Foundation Soils	29.9	12.2	83.7	0.466	18.150	0.557	1.0	79.9	10	0	0.1	80.0	1.0	-0.6	0.1	0.9	0.116	1.012	0.117	0.260	0.451
UC-03	UB-03	Foundation Soils	30.0	12.1	84.4	0.511	8.67	0.605134	1.0	80.4	12	0	0.2	80.6	1.0	-0.6	0.1	0.9	0.116	1.012	0.118	0.260	0.453
UC-03	UB-03	Foundation Soils	30.1	12.1	80.9	0.543	15.340	0.671	1.0	77.0	15	0	0.3	77.3	1.0	-0.6	0.1	0.9	0.113	1.011	0.115	0.260	0.441
UC-03	UB-03	Foundation Soils	30.2	12.0	77.2	0.548	18.410	0.710	1.0	73.3	18	0	0.4	73.7	1.0	-0.6	0.1	0.9	0.110	1.011	0.112	0.260	0.429
UC-03	UB-03	Foundation Soils	30.3	11.9	73.8	0.563	21.250	0.763	1.0	70.1	20	0	0.4	70.5	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.260	0.418
UC-03	UB-03	Foundation Soils	30.3	11.8	74.5	0.573	24.250	0.769	1.0	70.6	20	0	0.4	71.0	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.260	0.420
UC-03	UB-03	Foundation Soils	30.4	11.7	78.4	0.583	24.920	0.744	1.0	74.2	18	0	0.4	74.5	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.260	0.431
UC-03	UB-03	Foundation Soils	30.5	11.7	77.8	0.579	25.610	0.744	1.0	73.6	18	0	0.4	74.0	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.260	0.429
UC-03	UB-03	Foundation Soils	30.6	11.6	76.3	0.558	26.630	0.732	1.0	72.0	19	0	0.4	72.4	1.0	-0.6	0.1	0.9	0.109	1.011	0.110	0.260	0.424
UC-03	UB-03	Foundation Soils	30.7	11.5	74.7	0.522	27.790	0.698	1.0	70.4	18	0	0.4	70.8	1.0	-0.6	0.1	0.9	0.108	1.010	0.109	0.260	0.419
UC-03	UB-03	Foundation Soils	30.8	11.4	77.8	0.460	28.400	0.591	1.0	73.2	14	0	0.3	73.5	1.0	-0.6	0.1	0.9	0.110	1.011	0.111	0.260	0.427
UC-03	UB-03	Foundation Soils	30.8	11.3	83.1	0.378	26.690	0.455	1.0	78.1	8	0	0.0	78.2	1.0	-0.6	0.1	0.9	0.114	1.012	0.115	0.260	0.443
UC-03	UB-03	Foundation Soils	30.9	11.2	90.1	0.319	23.250	0.354	1.0	84.7	1	0	0.0	84.7	1.0	-0.6	0.1	0.9	0.120	1.013	0.122	0.260	0.467
UC-03	UB-03	Foundation Soils	31.0	11.2	95.8	0.211	17.170	0.220	1.0	89.9	0	0	0.0	89.9	1.0	-0.6	0.1	0.9	0.125	1.015	0.127	0.260	0.488
UC-03	UB-03	Foundation Soils	31.1	11.1	98.9	0.159	13.440	0.161	1.0	92.6	0	0	0.0	92.6	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.260	0.500
UC-03	UB-03	Foundation Soils	31.2	11.0	98.5	0.124	11.990	0.126	1.0	92.2	0	0	0.0	92.2	1.0	-0.6	0.1	0.9	0.128	1.015	0.130	0.260	0.498
UC-03	UB-03	Foundation Soils	31.2	10.9	96.7	0.121	14.630	0.125	1.0	90.3	0	0	0.0	90.3	1.0	-0.6	0.1	0.9	0.126	1.015	0.128	0.260	0.490
UC-03	UB-03	Foundation Soils	31.3	10.8	92.4	0.115	13.570	0.124	1.0	86.2	0	0	0.0	86.2	1.0	-0.6	0.1	0.9	0.122	1.014	0.123	0.260	0.473
UC-03	UB-03	Foundation Soils	31.4	10.7	87.9	0.113	15.200	0.129	1.0	81.9	0	0	0.0	81.9	1.0	-0.6	0.1	0.9	0.118	1.013	0.119	0.260	0.456
UC-03	UB-03	Foundation Soils	31.5	10.7	80.4	0.129	18.770	0.161	1.0	74.8	0	0	0.0	74.8	1.0	-0.6	0.1	0.9	0.111	1.011	0.112	0.260	0.431
UC-03	UB-03	Foundation Soils	31.6	10.6	73.5	0.202	24.770	0.275	1.0	68.2	4	0	0.0	68.2	1.0	-0.6	0.1	0.9	0.106	1.010	0.107	0.260	0.410
UC-03	UB-03	Foundation Soils	31.7	10.5	66.8	0.259	27.140	0.388	1.0	61.9	12	0	0.2	62.1	1.0	-0.6	0.1	0.9	0.101	1.009	0.102	0.260	0.391
UC-03	UB-03	Foundation Soils	31.7	10.4	57.1	0.296	29.300	0.518	1.0	52.8	22	0	0.4	53.2	1.0	-0.7	0.1	0.9	0.095	1.008	0.095	0.260	0.365
UC-03	UB-03	Foundation Soils	31.8	10.3	49.6	0.306	38.090	0.616	1.0	45.8	29	0	0.5	46.3	1.0	-0.7	0.1	0.9	0.090	1.007	0.090	0.260	0.346
UC-03	UB-03	Foundation Soils	31.9	10.3	43.4	0.363	62.560	0.836	1.0	40.0	39	0	0.5	40.5	1.0	-0.7	0.1	0.9	0.086	1.007	0.086	0.260	0.331
UC-03	UB-03	Foundation Soils	32.0	10.2	41.2	0.341	95.400	0.828	1.0	37.8	40	0	0.5	38.3	1.0	-0.7	0.1	0.9	0.084	1.007	0.085	0.260	0.325
UC-03	UB-03	Foundation Soils	32.1	10.1	42.5	0.237	93.480	0.558	1.0	39.0	32	0	0.5	39.4	1.0	-0.7	0.1	0.9	0.085	1.007	0.085	0.260	0.328

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	32.2	10.0	48.0	0.231	83.270	0.481	1.0	44.1	26	0	0.4	44.5	1.0	-0.7	0.1	0.9	0.088	1.007	0.089	0.260	0.341
UC-03	UB-03	Foundation Soils	32.2	9.9	57.7	0.101	46.160	0.175	1.0	52.9	7	0	0.0	52.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.095	0.260	0.364
UC-03	UB-03	Foundation Soils	32.3	9.8	63.8	0.150	42.530	0.235	1.0	58.5	7	0	0.0	58.5	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.260	0.380
UC-03	UB-03	Foundation Soils	32.4	9.8	63.4	0.208	59.030	0.328	1.0	58.0	12	0	0.2	58.2	1.0	-0.7	0.1	0.9	0.098	1.008	0.099	0.260	0.379
UC-03	UB-03	Foundation Soils	32.5	9.7	60.0	0.301	69.240	0.502	1.0	54.8	20	0	0.4	55.2	1.0	-0.7	0.1	0.9	0.096	1.008	0.096	0.260	0.371
UC-03	UB-03	Foundation Soils	32.6	9.6	55.9	0.267	84.710	0.477	1.0	51.0	21	0	0.4	51.4	1.0	-0.7	0.1	0.9	0.093	1.008	0.094	0.260	0.360
UC-03	UB-03	Foundation Soils	32.6	9.5	53.3	0.244	85.000	0.458	1.0	48.5	22	0	0.4	48.9	1.0	-0.7	0.1	0.9	0.092	1.007	0.092	0.260	0.353
UC-03	UB-03	Foundation Soils	32.7	9.4	56.6	0.279	78.760	0.493	1.0	51.5	22	0	0.4	51.9	1.0	-0.7	0.1	0.9	0.094	1.008	0.094	0.260	0.361
UC-03	UB-03	Foundation Soils	32.8	9.4	64.7	0.259	64.370	0.400	1.0	58.8	14	0	0.2	59.1	1.0	-0.7	0.1	0.9	0.099	1.009	0.099	0.260	0.382
UC-03	UB-03	Foundation Soils	32.9	9.3	74.4	0.216	37.740	0.290	1.0	67.7	5	0	0.0	67.7	1.0	-0.7	0.1	0.9	0.105	1.010	0.106	0.260	0.407
UC-03	UB-03	Foundation Soils	33.0	9.2	79.2	0.182	53.930	0.230	1.0	72.0	0	0	0.0	72.0	1.0	-0.7	0.1	0.9	0.109	1.010	0.109	0.260	0.421
UC-03	UB-03	Foundation Soils	33.1	9.1	82.8	0.244	58.460	0.295	1.0	75.2	2	0	0.0	75.2	1.0	-0.7	0.1	0.9	0.112	1.011	0.112	0.260	0.431
UC-03	UB-03	Foundation Soils	33.1	9.0	84.9	0.228	56.720	0.269	1.0	77.0	0	0	0.0	77.0	1.0	-0.7	0.1	0.9	0.113	1.011	0.114	0.260	0.438
UC-03	UB-03	Foundation Soils	33.2	8.9	87.3	0.217	63.030	0.248	1.0	79.2	0	0	0.0	79.2	1.0	-0.7	0.1	0.9	0.115	1.012	0.116	0.260	0.445
UC-03	UB-03	Foundation Soils	33.3	8.9	94.4	0.169	53.270	0.179	1.0	85.6	0	0	0.0	85.6	1.0	-0.7	0.1	0.9	0.121	1.013	0.122	0.260	0.469
UC-03	UB-03	Foundation Soils	33.4	8.8	109.2	0.157	20.090	0.144	1.0	99.2	0	0	0.0	99.2	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.260	0.529
UC-03	UB-03	Foundation Soils	33.5	8.7	117.6	0.312	33.640	0.265	1.0	106.8	0	0	0.0	106.8	1.0	-0.7	0.1	0.9	0.147	1.020	0.149	0.260	0.572
UC-03	UB-03	Foundation Soils	33.5	8.6	114.4	0.453	47.070	0.396	1.0	103.7	0	0	0.0	103.7	1.0	-0.7	0.1	0.9	0.142	1.019	0.144	0.260	0.554
UC-03	UB-03	Foundation Soils	33.6	8.5	109.1	0.498	53.120	0.457	1.0	98.7	1	0	0.0	98.7	1.0	-0.7	0.1	0.9	0.136	1.017	0.137	0.260	0.527
UC-03	UB-03	Foundation Soils	33.7	8.5	98.5	0.689	61.770	0.700	1.0	88.8	12	0	0.2	89.0	1.0	-0.7	0.1	0.9	0.125	1.014	0.125	0.260	0.482
UC-03	UB-03	Foundation Soils	33.8	8.4	95.9	0.802	51.980	0.836	1.0	86.4	16	0	0.3	86.7	1.0	-0.7	0.1	0.9	0.122	1.014	0.123	0.260	0.473
UC-03	UB-03	Foundation Soils	33.9	8.3	103.9	0.901	39.120	0.867	1.0	93.7	15	0	0.3	94.0	1.0	-0.7	0.1	0.9	0.130	1.016	0.131	0.260	0.504
UC-03	UB-03	Foundation Soils	34.0	8.2	113.2	1.077	34.070	0.951	1.0	102.1	14	0	0.3	102.4	1.0	-0.7	0.1	0.9	0.140	1.019	0.142	0.260	0.546
UC-03	UB-03	Foundation Soils	34.0	8.1	137.2	1.015	11.630	0.740	1.0	124.1	4	0	0.0	124.1	1.0	-0.7	0.1	0.9	0.181	1.028	0.184	0.260	0.708
UC-03	UB-03	Foundation Soils	34.1	8.0	175.6	0.929	-1.910	0.529	1.0	159.6	0	0	0.0	159.6	1.0	-0.7	0.1	0.9	0.368	1.053	0.381	0.259	1.467
UC-03	UB-03	Foundation Soils	34.2	8.0	217.0	0.913	-8.130	0.421	1.0	198.1	0	0	0.0	198.1	1.0	-0.7	0.1	0.9	1.703	1.082	1.795	0.259	6.918
UC-03	UB-03	Foundation Soils	34.3	7.9	223.5	0.779	2.950	0.348	1.0	204.1	0	0	0.0	204.1	1.0	-0.7	0.1	0.9	2.404	1.082	2.528	0.259	9.744
UC-03	UB-03	Foundation Soils	34.4	7.8	220.7	0.718	5.820	0.325	1.0	201.3	0	0	0.0	201.3	1.0	-0.7	0.1	0.9	2.037	1.082	2.142	0.259	8.260
UC-03	UB-03	Foundation Soils	34.4	7.7	198.7	0.681	32.640	0.343	1.0	180.6	0	0	0.0	180.6	1.0	-0.7	0.1	0.9	0.743	1.075	0.780	0.259	3.008
UC-03	UB-03	Foundation Soils	34.5	7.6	190.2	0.585	47.960	0.308	1.0	172.5	0	0	0.0	172.5	1.0	-0.7	0.1	0.9	0.548	1.066	0.572	0.259	2.206
UC-03	UB-03	Foundation Soils	34.6	7.6	171.6	0.490	34.020	0.286	1.0	155.0	0	0	0.0	155.0	1.0	-0.7	0.1	0.9	0.325	1.049	0.335	0.259	1.293
UC-03	UB-03	Foundation Soils	34.7	7.5	152.6	0.435	15.900	0.285	1.0	137.3	0	0	0.0	137.3	1.0	-0.7	0.1	0.9	0.223	1.036	0.227	0.259	0.877
UC-03	UB-03	Foundation Soils	34.8	7.4	149.6	0.480	-10.340	0.321	1.0	134.4	0	0	0.0	134.4	1.0	-0.7	0.1	0.9	0.212	1.034	0.216	0.259	0.833
UC-03	UB-03	Foundation Soils	34.9	7.3	150.2	0.367	-13.350	0.244	1.0	134.9	0	0	0.0	134.9	1.0	-0.7	0.1	0.9	0.214	1.035	0.217	0.259	0.839
UC-03	UB-03	Foundation Soils	34.9	7.2	149.4	0.373	22.850	0.250	1.0	134.0	0	0	0.0	134.0	1.0	-0.7	0.1	0.9	0.211	1.034	0.214	0.259	0.827
UC-03	UB-03	Foundation Soils	35.0	7.1	135.4	0.384	34.900	0.284	0.9	121.0	0	0	0.0	121.0	1.0	-0.7	0.1	0.9	0.173	1.027	0.175	0.259	0.677
UC-03	UB-03	Foundation Soils	35.1	7.1	120.0	0.420	35.400	0.350	0.9	106.7	0	0	0.0	106.7	1.0	-0.7	0.1	0.9	0.147	1.020	0.148	0.259	0.570
UC-03	UB-03	Foundation Soils	35.2	7.0	118.2	0.369	40.180	0.312	0.9	104.9	0	0	0.0	104.9	1.0	-0.7	0.1	0.9	0.144	1.020	0.145	0.259	0.559
UC-03	UB-03	Foundation Soils	35.3	6.9	116.9	0.290	27.020	0.248	0.9	103.7	0	0	0.0	103.7	1.0	-0.8	0.1	0.9	0.142	1.019	0.143	0.259	0.552
UC-03	UB-03	Foundation Soils	35.4	6.8	118.3	0.273	28.680	0.231	0.9	104.9	0	0	0.0	104.9	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.259	0.559
UC-03	UB-03	Foundation Soils	35.4	6.7	118.7	0.186	2.810	0.157	0.9	105.1	0	0	0.0	105.1	1.0	-0.8	0.1	0.9	0.144	1.020	0.145	0.259	0.560
UC-03	UB-03	Foundation Soils	35.5	6.6	114.3	0.334	23.510	0.292	0.9	101.0	0	0	0.0	101.0	1.0	-0.8	0.1	0.9	0.139	1.018	0.139	0.259	0.538
UC-03	UB-03	Foundation Soils	35.6	6.6	109.1	0.344	22.340	0.315	0.9	96.1	0	0	0.0	96.1	1.0	-0.8	0.1	0.9	0.132	1.016	0.133	0.259	0.513
UC-03	UB-03	Foundation Soils	35.7	6.5	103.5	0.389	17.680	0.376	0.9	90.9	0	0	0.0	90.9	1.0	-0.8	0.1	0.9	0.127	1.015	0.127	0.259	0.490
UC-03	UB-03	Foundation Soils	35.8	6.4	102.1	0.360	24.250	0.352	0.9	89.6	0	0	0.0	89.6	1.0	-0.8	0.1	0.9	0.125	1.014	0.125	0.259	0.484
UC-03	UB-03	Foundation Soils	35.8	6.3	103.2	0.286	30.890	0.277	0.9	90.5	0	0	0.0	90.5	1.0	-0.8	0.1	0.9	0.126	1.015	0.126	0.259	0.488
UC-03	UB-03	Foundation Soils	35.9	6.2	112.5	0.211	33.590	0.188	0.9	98.8	0	0	0.0	98.8	1.0	-0.8	0.1	0.9	0.136	1.017	0.136	0.259	0.526
UC-03	UB-03	Foundation Soils	36.0	6.2	110.8	0.238	33.490	0.215	0.9	97.2	0	0	0.0	97.2	1.0	-0.8	0.1	0.9	0.134	1.017	0.134	0.259	0.518
UC-03	UB-03	Foundation Soils	36.1	6.1	117.2	0.228	34.970	0.194	0.9	102.9	0	0	0.0	102.9	1.0	-0.8	0.1	0.9	0.141	1.019	0.142	0.259	0.547
UC-03	UB-03	Foundation Soils	36.2	6.0	114.6	0.175	27.790	0.153	0.9	100.3	0	0	0.0	100.3	1.0	-0.8	0.1	0.9	0.138	1.018	0.138	0.258	0.534
UC-03	UB-03	Foundation Soils	36.3	5.9	111.9	0.149	26.060	0.133	0.9	97.8	0	0	0.0	97.8	1.0	-0.8	0.1	0.9	0.135	1.017	0.135	0.258	0.521
UC-03	UB-03	Foundation Soils	36.3	5.8	102.1	0.138	26.110	0.135	0.9	88.9	0	0	0.0	88.9	1.0	-0.8	0.1	0.9	0.124	1.014	0.124	0.258	0.481
UC-03	UB-03	Foundation Soils	36.4	5.7	96.3	0.111	35.260	0.115	0.9	83.6	0	0	0.0	83.6	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.258	0.460
UC-03	UB-03	Foundation Soils	36.5	5.7	96.2	0.106	16.580	0.110	0.9	83.4	0	0	0.0	83.4	1.0	-0.8	0.1	0.9	0.119	1.013	0.119	0.258	0.459
UC-03	UB-03	Foundation Soils	36.6	5.6	95.9	0.083	19.390	0.087	0.9	83.0	0	0	0.0	83.0	1.0	-0.8	0.1	0.9	0.119	1.013	0.118	0.258	0.458
UC-03	UB-03	Foundation Soils	36.7	5.5	92.7	0.053	28.630	0.057	0.9	80.1	0	0	0.0	80.1	1.0	-0.8	0.1	0.9	0.116	1.012	0.116	0.258	0.448
UC-03	UB-03	Foundation Soils	36.7	5.4	89.0	0.115	29.640	0.129	0.9	76.7	0	0	0.0	76.7	1.0	-0.8	0.1	0.9	0.113	1.011	0.113	0.258	0.436
UC-03	UB-03	Foundation Soils	36.8	5.3	90.8	0.151	27.090	0.166	0.9	78.2	0	0	0.0	78.2	1.0	-0.8	0.1	0.9	0.114	1.012	0.114	0.258	0.441
UC-03	UB-03	Foundation Soils	36.9	5.3	85.5	0.149	32.880	0.174	0.9	73.4	0	0	0.0	73.4	1.0	-0.8	0.1	0.9	0.110	1.011	0.110	0.258	0.425
UC-03	UB-03	Foundation Soils	37.0	5.2	84.2	0.136	28.120	0.162	0.9	72.2	0	0	0.0	72.2	1.0	-0.8	0.1	0.9	0.109	1.010	0.109	0.258	0.421
UC-03	UB-03	Foundation Soils	37.1	5.1	82.9	0.110	31.350	0.133	0.9	70.9	0	0	0.0	70.9	1.0	-0.8	0.1	0.9	0.108	1.010	0.108	0.258	0.417
UC-03	UB-03	Foundation Soils	37.2	5.0	82.4	0.062	21.150	0.075	0.9	70.3	0	0	0.0	70.3	1.0	-0.8	0.1	0.9	0.108	1.010	0.107	0.258	0.415

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	37.2	4.9	81.8	0.088	13.200	0.108	0.9	69.8	0	0	0.0	69.8	1.0	-0.8	0.1	0.9	0.107	1.010	0.107	0.258	0.413
UC-03	UB-03	Foundation Soils	37.3	4.8	80.0	0.092	19.270	0.115	0.9	68.1	0	0	0.0	68.1	1.0	-0.8	0.1	0.9	0.106	1.010	0.105	0.258	0.408
UC-03	UB-03	Foundation Soils	37.4	4.8	77.9	0.068	25.200	0.087	0.9	66.1	0	0	0.0	66.1	1.0	-0.8	0.1	0.9	0.104	1.009	0.104	0.258	0.402
UC-03	UB-03	Foundation Soils	37.5	4.7	76.5	0.109	27.560	0.143	0.9	64.8	0	0	0.0	64.8	1.0	-0.8	0.1	0.9	0.103	1.009	0.103	0.258	0.398
UC-03	UB-03	Foundation Soils	37.6	4.6	74.2	0.127	41.640	0.171	0.9	62.8	1	0	0.0	62.8	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.258	0.392
UC-03	UB-03	Foundation Soils	37.6	4.5	74.1	0.122	43.090	0.165	0.9	62.6	1	0	0.0	62.6	1.0	-0.8	0.1	0.9	0.102	1.009	0.101	0.258	0.392
UC-03	UB-03	Foundation Soils	37.7	4.4	70.9	0.117	44.070	0.165	0.9	59.7	2	0	0.0	59.7	1.0	-0.8	0.1	0.9	0.099	1.009	0.099	0.258	0.383
UC-03	UB-03	Foundation Soils	37.8	4.4	70.5	0.116	41.110	0.165	0.9	59.3	3	0	0.0	59.3	1.0	-0.8	0.1	0.9	0.099	1.009	0.098	0.257	0.382
UC-03	UB-03	Foundation Soils	37.9	4.3	72.5	0.144	37.690	0.199	0.9	61.0	3	0	0.0	61.0	1.0	-0.8	0.1	0.9	0.100	1.009	0.100	0.257	0.387
UC-03	UB-03	Foundation Soils	38.0	4.2	73.1	0.186	59.350	0.255	0.9	61.4	6	0	0.0	61.4	1.0	-0.8	0.1	0.9	0.101	1.009	0.100	0.257	0.388
UC-03	UB-03	Foundation Soils	38.1	4.1	71.8	0.223	59.170	0.311	0.9	60.2	9	0	0.1	60.3	1.0	-0.8	0.1	0.9	0.100	1.009	0.099	0.257	0.385
UC-03	UB-03	Foundation Soils	38.1	4.0	68.6	0.239	58.990	0.348	0.9	57.3	12	0	0.2	57.5	1.0	-0.8	0.1	0.9	0.098	1.008	0.097	0.257	0.377
UC-03	UB-03	Foundation Soils	38.2	3.9	61.9	0.194	57.330	0.314	0.9	51.4	14	0	0.2	51.7	1.0	-0.8	0.1	0.9	0.093	1.008	0.093	0.257	0.361
UC-03	UB-03	Foundation Soils	38.3	3.9	58.2	0.273	55.330	0.469	0.9	48.2	22	0	0.4	48.6	1.0	-0.8	0.1	0.9	0.091	1.007	0.091	0.257	0.353
UC-03	UB-03	Foundation Soils	38.4	3.8	51.3	0.233	78.710	0.454	0.9	42.3	26	0	0.4	42.7	1.0	-0.8	0.1	0.9	0.087	1.007	0.087	0.257	0.337
UC-03	UB-03	Foundation Soils	38.5	3.7	49.5	0.208	75.320	0.420	0.9	40.7	26	0	0.4	41.1	1.0	-0.8	0.1	0.9	0.086	1.007	0.086	0.257	0.333
UC-03	UB-03	Foundation Soils	38.5	3.6	47.0	0.184	85.090	0.392	0.9	38.5	26	0	0.4	38.9	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.257	0.327
UC-03	UB-03	Foundation Soils	38.6	3.5	47.2	0.149	77.040	0.316	0.9	38.6	23	0	0.4	39.0	1.0	-0.8	0.1	0.9	0.085	1.007	0.084	0.257	0.328
UC-03	UB-03	Foundation Soils	38.7	3.4	47.8	0.135	65.080	0.282	0.9	39.1	22	0	0.4	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.257	0.329
UC-03	UB-03	Foundation Soils	38.8	3.4	49.5	0.120	50.970	0.243	0.9	40.4	19	0	0.3	40.8	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.257	0.332
UC-03	UB-03	Foundation Soils	38.9	3.3	49.0	0.093	65.080	0.190	0.9	40.0	17	0	0.3	40.3	1.0	-0.9	0.1	0.9	0.086	1.007	0.085	0.257	0.331
UC-03	UB-03	Foundation Soils	39.0	3.2	48.1	0.112	70.420	0.233	0.9	39.2	19	0	0.3	39.5	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.257	0.329
UC-03	UB-03	Foundation Soils	39.0	3.1	47.4	0.166	84.880	0.350	0.9	38.5	25	0	0.4	38.9	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.257	0.327
UC-03	UB-03	Foundation Soils	39.1	3.0	47.9	0.253	80.690	0.528	0.9	38.9	31	0	0.5	39.3	1.0	-0.9	0.1	0.9	0.085	1.007	0.084	0.257	0.329
UC-03	UB-03	Foundation Soils	39.2	3.0	45.9	0.237	90.720	0.516	0.9	37.2	32	0	0.5	37.7	1.0	-0.9	0.1	0.9	0.084	1.007	0.083	0.257	0.324
UC-03	UB-03	Foundation Soils	39.3	2.9	42.9	0.234	90.140	0.546	0.9	34.6	35	0	0.5	35.1	1.0	-0.9	0.1	0.9	0.082	1.007	0.081	0.256	0.318
UC-03	UB-03	Foundation Soils	39.4	2.8	44.5	0.231	75.430	0.519	0.9	35.9	33	0	0.5	36.3	1.0	-0.9	0.1	0.9	0.083	1.007	0.082	0.256	0.321
UC-03	UB-03	Foundation Soils	39.5	2.7	52.7	0.200	2.480	0.379	0.9	42.8	23	0	0.4	43.1	1.0	-0.9	0.1	0.9	0.088	1.007	0.087	0.256	0.339
UC-03	UB-03	Foundation Soils	39.5	2.6	57.2	0.209	69.510	0.366	0.9	46.4	20	0	0.4	46.8	1.0	-0.9	0.1	0.8	0.090	1.007	0.089	0.256	0.348
UC-03	UB-03	Foundation Soils	39.6	2.5	63.1	0.283	54.790	0.449	0.9	51.4	19	0	0.4	51.8	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.256	0.362
UC-03	UB-03	Foundation Soils	39.7	2.5	61.6	0.402	56.140	0.653	0.9	50.1	27	0	0.5	50.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.256	0.358
UC-03	UB-03	Foundation Soils	39.8	2.4	59.2	0.589	66.510	0.995	0.9	48.0	36	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.256	0.353
UC-03	UB-03	Foundation Soils	39.9	2.3	59.2	0.628	73.620	1.061	0.9	47.9	37	0	0.5	48.5	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.256	0.353
UC-03	UB-03	Foundation Soils	39.9	2.2	64.2	0.586	51.450	0.913	0.9	52.1	32	0	0.5	52.6	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.256	0.364
UC-03	UB-03	Foundation Soils	40.0	2.1	69.6	0.534	-7.200	0.767	0.9	56.6	26	0	0.5	57.1	1.0	-0.9	0.1	0.8	0.097	1.008	0.096	0.256	0.377
UC-03	UB-03	Foundation Soils	40.1	2.1	71.4	0.474	-20.490	0.664	0.9	58.1	23	0	0.4	58.5	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.256	0.381
UC-03	UB-03	Foundation Soils	40.2	2.0	70.1	0.436	-8.210	0.622	0.9	57.0	22	0	0.4	57.4	1.0	-0.9	0.1	0.8	0.098	1.008	0.097	0.256	0.377
UC-03	UB-03	Foundation Soils	40.3	1.9	66.3	0.426	32.880	0.643	0.9	53.6	24	0	0.4	54.1	1.0	-0.9	0.1	0.8	0.095	1.008	0.094	0.256	0.368
UC-03	UB-03	Foundation Soils	40.4	1.8	64.2	0.493	27.110	0.768	0.9	51.8	28	0	0.5	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.256	0.363
UC-03	UB-03	Foundation Soils	40.4	1.7	63.3	0.593	-1.330	0.937	0.9	51.0	33	0	0.5	51.5	1.0	-0.9	0.1	0.8	0.093	1.008	0.092	0.256	0.361
UC-03	UB-03	Foundation Soils	40.5	1.6	61.7	0.616	-4.760	0.998	0.9	49.6	35	0	0.5	50.1	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.256	0.358
UC-03	UB-03	Foundation Soils	40.6	1.6	59.2	0.578	-19.060	0.976	0.8	47.4	36	0	0.5	47.9	1.0	-0.9	0.1	0.8	0.091	1.007	0.090	0.256	0.352
UC-03	UB-03	Foundation Soils	40.7	1.5	60.9	0.466	-21.200	0.766	0.8	48.8	30	0	0.5	49.2	1.0	-0.9	0.1	0.8	0.092	1.008	0.091	0.256	0.355
UC-03	UB-03	Foundation Soils	40.8	1.4	68.1	0.397	31.350	0.583	0.9	54.8	22	0	0.4	55.2	1.0	-0.9	0.1	0.8	0.096	1.008	0.095	0.255	0.372
UC-03	UB-03	Foundation Soils	40.8	1.3	83.6	0.409	17.050	0.489	0.9	67.9	13	0	0.2	68.1	1.0	-0.9	0.1	0.8	0.106	1.010	0.104	0.255	0.409
UC-03	UB-03	Foundation Soils	40.9	1.2	94.5	0.254	1.910	0.269	0.9	77.2	0	0	0.0	77.2	1.0	-0.9	0.1	0.8	0.113	1.011	0.112	0.255	0.438
UC-03	UB-03	Foundation Soils	41.0	1.2	103.8	0.196	20.200	0.189	0.9	85.1	0	0	0.0	85.1	1.0	-0.9	0.1	0.8	0.121	1.013	0.119	0.255	0.467
UC-03	UB-03	Foundation Soils	41.1	1.1	118.7	0.125	6.910	0.105	0.9	98.0	0	0	0.0	98.0	1.0	-0.9	0.1	0.8	0.135	1.017	0.133	0.255	0.522
UC-03	UB-03	Foundation Soils	41.2	1.0	128.9	0.143	13.830	0.111	0.9	106.9	0	0	0.0	106.9	1.0	-0.9	0.1	0.8	0.147	1.020	0.146	0.255	0.571
UC-03	UB-03	Foundation Soils	41.3	0.9	131.4	0.243	31.780	0.185	0.9	109.0	0	0	0.0	109.0	1.0	-0.9	0.1	0.8	0.150	1.021	0.149	0.255	0.584
UC-03	UB-03	Foundation Soils	41.3	0.8	123.7	0.233	32.680	0.188	0.9	102.1	0	0	0.0	102.1	1.0	-0.9	0.1	0.8	0.140	1.019	0.139	0.255	0.543
UC-03	UB-03	Foundation Soils	41.4	0.7	95.3	0.205	34.090	0.215	0.9	77.4	0	0	0.0	77.4	1.0	-0.9	0.1	0.8	0.113	1.012	0.112	0.255	0.439
UC-03	UB-03	Foundation Soils	41.5	0.7	77.3	0.224	36.020	0.290	0.8	62.0	7	0	0.0	62.0	1.0	-0.9	0.1	0.8	0.101	1.009	0.100	0.255	0.391
UC-03	UB-03	Foundation Soils	41.6	0.6	65.6	0.215	34.830	0.328	0.8	52.0	14	0	0.2	52.3	1.0	-0.9	0.1	0.8	0.094	1.008	0.093	0.255	0.364
UC-03	UB-03	Foundation Soils	41.7	0.5	56.3	0.194	36.780	0.344	0.8	44.3	20	0	0.4	44.6	1.0	-0.9	0.1	0.8	0.089	1.007	0.088	0.255	0.344
UC-03	UB-03	Foundation Soils	41.7	0.4	55.0	0.236	34.600	0.429	0.8	43.2	24	0	0.4	43.6	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.255	0.341
UC-03	UB-03	Foundation Soils	41.8	0.3	52.5	0.241	33.490	0.459	0.8	41.0	26	0	0.4	41.4	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.255	0.335
UC-03	UB-03	Foundation Soils	41.9	0.3	51.7	0.217	36.350	0.420	0.8	40.3	26	0	0.4	40.8	1.0	-0.9	0.1	0.8	0.086	1.007	0.085	0.255	0.334
UC-03	UB-03	Foundation Soils	42.0	0.2	53.0	0.169	28.310	0.319	0.8	41.4	21	0	0.4	41.7	1.0	-0.9	0.1	0.8	0.087	1.007	0.086	0.254	0.336
UC-03	UB-03	Foundation Soils	42.1	0.1	56.0	0.135	34.490	0.241	0.8	43.7	16	0	0.3	44.0	1.0	-0.9	0.1	0.8	0.088	1.007	0.087	0.254	0.342
UC-03	UB-03	Foundation Soils	42.2	0.0	58.3	0.092	23.060	0.158	0.8	45.5	10	0	0.1	45.7	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.254	0.347
UC-03	UB-03	Foundation Soils	42.2	-0.1	57.0	0.064	30.150	0.112	0.8	44.4	9	0	0.1	44.5	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.254	0.343

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	42.3	-0.2	51.0	0.111	35.810	0.218	0.8	39.5	18	0	0.3	39.8	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.254	0.331
UC-03	UB-03	Foundation Soils	42.4	-0.2	50.2	0.124	33.690	0.247	0.8	38.8	20	0	0.3	39.1	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.254	0.330
UC-03	UB-03	Foundation Soils	42.5	-0.3	52.9	0.122	35.400	0.230	0.8	40.9	17	0	0.3	41.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.254	0.335
UC-03	UB-03	Foundation Soils	42.6	-0.4	55.7	0.099	32.300	0.178	0.8	43.2	13	0	0.2	43.4	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.254	0.341
UC-03	UB-03	Foundation Soils	42.7	-0.5	57.9	0.065	38.010	0.112	0.8	44.9	8	0	0.1	44.9	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.254	0.345
UC-03	UB-03	Foundation Soils	42.7	-0.6	62.1	0.064	26.970	0.103	0.8	48.3	6	0	0.0	48.3	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.254	0.354
UC-03	UB-03	Foundation Soils	42.8	-0.7	65.6	0.061	29.610	0.093	0.8	51.1	3	0	0.0	51.1	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.254	0.362
UC-03	UB-03	Foundation Soils	42.9	-0.7	66.1	0.061	33.380	0.092	0.8	51.4	3	0	0.0	51.4	1.0	-1.0	0.1	0.8	0.093	1.008	0.092	0.254	0.362
UC-03	UB-03	Foundation Soils	43.0	-0.8	67.0	0.045	36.210	0.067	0.8	52.1	2	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.254	0.364
UC-03	UB-03	Foundation Soils	43.1	-0.9	67.0	0.042	33.880	0.063	0.8	52.1	2	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.254	0.364
UC-03	UB-03	Foundation Soils	43.1	-1.0	63.8	0.014	34.930	0.022	0.8	49.4	7	0	0.0	49.4	1.0	-1.0	0.1	0.8	0.092	1.008	0.091	0.253	0.357
UC-03	UB-03	Foundation Soils	43.2	-1.1	63.1	0.017	32.400	0.027	0.8	48.8	6	0	0.0	48.8	1.0	-1.0	0.1	0.8	0.091	1.007	0.090	0.253	0.356
UC-03	UB-03	Foundation Soils	43.3	-1.1	59.1	0.074	36.300	0.125	0.8	45.5	9	0	0.1	45.5	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.253	0.347
UC-03	UB-03	Foundation Soils	43.4	-1.2	60.7	0.090	41.310	0.148	0.8	46.7	9	0	0.1	46.8	1.0	-1.0	0.1	0.8	0.090	1.007	0.089	0.253	0.350
UC-03	UB-03	Foundation Soils	43.5	-1.3	59.3	0.137	37.920	0.231	0.8	45.5	14	0	0.2	45.8	1.0	-1.0	0.1	0.8	0.089	1.007	0.088	0.253	0.348
UC-03	UB-03	Foundation Soils	43.6	-1.4	57.4	0.168	37.640	0.293	0.8	43.9	18	0	0.3	44.2	1.0	-1.0	0.1	0.8	0.088	1.007	0.087	0.253	0.344
UC-03	UB-03	Foundation Soils	43.6	-1.5	52.6	0.143	36.120	0.272	0.8	39.9	20	0	0.3	40.3	1.0	-1.0	0.1	0.8	0.086	1.007	0.084	0.253	0.333
UC-03	UB-03	Foundation Soils	43.7	-1.6	43.6	0.195	36.280	0.447	0.8	32.7	33	0	0.5	33.2	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.253	0.315
UC-03	UB-03	Foundation Soils	43.8	-1.6	44.3	0.188	35.260	0.424	0.8	33.3	31	0	0.5	33.7	1.0	-1.0	0.1	0.8	0.081	1.007	0.080	0.253	0.317
UC-03	UB-03	Foundation Soils	43.9	-1.7	48.3	0.194	33.970	0.402	0.8	36.4	28	0	0.4	36.8	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.253	0.325
UC-03	UB-03	Foundation Soils	44.0	-1.8	54.2	0.160	25.950	0.295	0.8	41.1	20	0	0.4	41.5	1.0	-1.0	0.1	0.8	0.086	1.007	0.085	0.253	0.337
UC-03	UB-03	Foundation Soils	44.0	-1.9	69.3	0.124	20.340	0.179	0.8	53.3	6	0	0.0	53.3	1.0	-1.0	0.1	0.8	0.095	1.008	0.093	0.253	0.368
UC-03	UB-03	Foundation Soils	44.1	-2.0	87.9	0.086	26.260	0.098	0.8	68.6	0	0	0.0	68.6	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.253	0.413
UC-03	UB-03	Foundation Soils	44.2	-2.0	99.8	0.077	32.400	0.077	0.8	78.5	0	0	0.0	78.5	1.0	-1.0	0.1	0.8	0.114	1.012	0.112	0.253	0.445
UC-03	UB-03	Foundation Soils	44.3	-2.1	101.5	0.065	36.950	0.064	0.8	79.9	0	0	0.0	79.9	1.0	-1.0	0.1	0.8	0.116	1.012	0.114	0.253	0.450
UC-03	UB-03	Foundation Soils	44.4	-2.2	96.3	0.056	38.880	0.058	0.8	75.4	0	0	0.0	75.4	1.0	-1.0	0.1	0.8	0.112	1.011	0.110	0.252	0.434
UC-03	UB-03	Foundation Soils	44.5	-2.3	93.1	0.086	39.130	0.092	0.8	72.6	0	0	0.0	72.6	1.0	-1.0	0.1	0.8	0.109	1.011	0.107	0.252	0.426
UC-03	UB-03	Foundation Soils	44.5	-2.4	92.3	0.094	37.310	0.102	0.8	71.8	0	0	0.0	71.8	1.0	-1.0	0.1	0.8	0.109	1.010	0.107	0.252	0.423
UC-03	UB-03	Foundation Soils	44.6	-2.5	87.7	0.094	36.280	0.107	0.8	67.9	0	0	0.0	67.9	1.0	-1.0	0.1	0.8	0.106	1.010	0.104	0.252	0.411
UC-03	UB-03	Foundation Soils	44.7	-2.5	84.0	0.035	34.830	0.042	0.8	64.8	0	0	0.0	64.8	1.0	-1.0	0.1	0.8	0.103	1.009	0.101	0.252	0.402
UC-03	UB-03	Foundation Soils	44.8	-2.6	79.6	0.035	34.400	0.044	0.8	61.1	0	0	0.0	61.1	1.0	-1.0	0.1	0.8	0.100	1.009	0.099	0.252	0.391
UC-03	UB-03	Foundation Soils	44.9	-2.7	78.3	0.031	31.060	0.040	0.8	60.0	0	0	0.0	60.0	1.0	-1.0	0.1	0.8	0.100	1.009	0.098	0.252	0.388
UC-03	UB-03	Foundation Soils	44.9	-2.8	77.8	0.029	31.800	0.037	0.8	59.6	0	0	0.0	59.6	1.0	-1.0	0.1	0.8	0.099	1.009	0.097	0.252	0.387
UC-03	UB-03	Foundation Soils	45.0	-2.9	75.2	0.010	34.540	0.013	0.8	57.4	8	0	0.0	57.4	1.0	-1.0	0.1	0.8	0.098	1.008	0.096	0.252	0.381
UC-03	UB-03	Foundation Soils	45.1	-2.9	73.5	0.027	36.090	0.037	0.8	55.9	0	0	0.0	55.9	1.0	-1.0	0.1	0.8	0.097	1.008	0.095	0.252	0.376
UC-03	UB-03	Foundation Soils	45.2	-3.0	68.9	0.045	34.210	0.065	0.8	52.1	1	0	0.0	52.1	1.0	-1.0	0.1	0.8	0.094	1.008	0.092	0.252	0.366
UC-03	UB-03	Foundation Soils	45.3	-3.1	60.4	0.051	35.360	0.085	0.8	45.2	7	0	0.0	45.2	1.0	-1.0	0.1	0.8	0.089	1.007	0.087	0.252	0.347
UC-03	UB-03	Foundation Soils	45.4	-3.2	52.9	0.070	36.540	0.132	0.8	39.2	13	0	0.2	39.4	1.0	-1.0	0.1	0.8	0.085	1.007	0.084	0.252	0.332
UC-03	UB-03	Foundation Soils	45.4	-3.3	48.5	0.142	36.850	0.293	0.8	35.7	24	0	0.4	36.1	1.0	-1.0	0.1	0.8	0.083	1.007	0.081	0.252	0.324
UC-03	UB-03	Foundation Soils	45.5	-3.4	49.1	0.084	37.920	0.171	0.8	36.1	18	0	0.3	36.4	1.0	-1.0	0.1	0.8	0.083	1.007	0.082	0.251	0.325
UC-03	UB-03	Foundation Soils	45.6	-3.4	56.1	0.026	39.630	0.046	0.8	41.6	9	0	0.1	41.7	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.251	0.339
UC-03	UB-03	Foundation Soils	45.7	-3.5	56.6	0.072	37.780	0.127	0.8	42.0	11	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.251	0.340
UC-03	UB-03	Foundation Soils	45.8	-3.6	53.8	0.228	35.530	0.424	0.8	39.7	26	0	0.4	40.1	1.0	-1.1	0.1	0.8	0.085	1.007	0.084	0.251	0.335
UC-03	UB-03	Foundation Soils	45.8	-3.7	52.6	0.301	39.120	0.572	0.8	38.8	31	0	0.5	39.2	1.0	-1.1	0.1	0.8	0.085	1.007	0.083	0.251	0.332
UC-03	UB-03	Foundation Soils	45.9	-3.8	55.9	0.488	37.730	0.873	0.8	41.3	37	0	0.5	41.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.251	0.339
UC-03	UB-03	Foundation Soils	46.0	-3.9	74.0	0.404	40.020	0.546	0.8	55.7	20	0	0.4	56.0	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.251	0.377
UC-03	UB-03	Foundation Soils	46.1	-3.9	74.5	0.281	35.070	0.377	0.8	56.0	14	0	0.2	56.3	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.251	0.378
UC-03	UB-03	Foundation Soils	46.2	-4.0	55.0	0.242	34.150	0.440	0.8	40.4	26	0	0.4	40.8	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.251	0.337
UC-03	UB-03	Foundation Soils	46.3	-4.1	48.0	0.155	38.780	0.323	0.8	34.9	26	0	0.4	35.3	1.0	-1.1	0.1	0.8	0.082	1.007	0.081	0.251	0.323
UC-03	UB-03	Foundation Soils	46.3	-4.2	56.3	0.059	48.650	0.105	0.8	41.3	10	0	0.1	41.4	1.0	-1.1	0.1	0.8	0.086	1.007	0.085	0.251	0.338
UC-03	UB-03	Foundation Soils	46.4	-4.3	70.1	0.045	38.550	0.064	0.8	52.2	1	0	0.0	52.2	1.0	-1.1	0.1	0.8	0.094	1.008	0.092	0.251	0.367
UC-03	UB-03	Foundation Soils	46.5	-4.3	65.3	0.066	33.400	0.101	0.8	48.4	5	0	0.0	48.4	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.251	0.357
UC-03	UB-03	Foundation Soils	46.6	-4.4	57.5	0.039	34.920	0.068	0.8	42.1	8	0	0.1	42.1	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.250	0.340
UC-03	UB-03	Foundation Soils	46.7	-4.5	50.7	0.043	36.690	0.085	0.8	36.8	13	0	0.2	37.0	1.0	-1.1	0.1	0.8	0.083	1.007	0.082	0.250	0.327
UC-03	UB-03	Foundation Soils	46.8	-4.6	55.7	0.062	39.450	0.111	0.8	40.6	11	0	0.1	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.250	0.337
UC-03	UB-03	Foundation Soils	46.8	-4.7	76.6	0.059	35.400	0.077	0.8	57.2	0	0	0.0	57.2	1.0	-1.1	0.1	0.8	0.097	1.008	0.095	0.250	0.381
UC-03	UB-03	Foundation Soils	46.9	-4.8	86.4	0.095	29.490	0.110	0.8	65.0	0	0	0.0	65.0	1.0	-1.1	0.1	0.8	0.103	1.009	0.101	0.250	0.404
UC-03	UB-03	Foundation Soils	47.0	-4.8	92.5	0.064	31.780	0.069	0.8	69.9	0	0	0.0	69.9	1.0	-1.1	0.1	0.8	0.107	1.010	0.105	0.250	0.419
UC-03	UB-03	Foundation Soils	47.1	-4.9	97.4	0.087	32.540	0.089	0.8	73.8	0	0	0.0	73.8	1.0	-1.1	0.1	0.8	0.110	1.011	0.108	0.250	0.432
UC-03	UB-03	Foundation Soils	47.2	-5.0	102.4	0.135	25.910	0.132	0.8	77.9	0	0	0.0	77.9	1.0	-1.1	0.1	0.8	0.114	1.012	0.111	0.250	0.445
UC-03	UB-03	Foundation Soils	47.2	-5.1	114.4	0.166	1.760	0.145	0.8	87.9	0	0	0.0	87.9	1.0	-1.1	0.1	0.8	0.123	1.014	0.120	0.250	0.482
UC-03	UB-03	Foundation Soils	47.3	-5.2	121.1	0.155	18.160	0.128	0.8	93.4	0	0	0.0	93.4	1.0	-1.1	0.1	0.8	0.129	1.016	0.126	0.250	0.505

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	47.4	-5.2	128.0	0.130	17.900	0.102	0.8	99.1	0	0	0.0	99.1	1.0	-1.1	0.1	0.8	0.136	1.017	0.133	0.250	0.532
UC-03	UB-03	Foundation Soils	47.5	-5.3	130.4	0.136	28.780	0.104	0.8	101.1	0	0	0.0	101.1	1.0	-1.1	0.1	0.8	0.139	1.018	0.135	0.250	0.542
UC-03	UB-03	Foundation Soils	47.6	-5.4	116.6	0.146	32.260	0.125	0.8	89.3	0	0	0.0	89.3	1.0	-1.1	0.1	0.8	0.125	1.014	0.122	0.249	0.488
UC-03	UB-03	Foundation Soils	47.7	-5.5	116.2	0.133	28.650	0.114	0.8	88.9	0	0	0.0	88.9	1.0	-1.1	0.1	0.8	0.124	1.014	0.121	0.249	0.487
UC-03	UB-03	Foundation Soils	47.7	-5.6	108.7	0.016	27.010	0.015	0.8	82.6	0	0	0.0	82.6	1.0	-1.1	0.1	0.8	0.118	1.013	0.115	0.249	0.462
UC-03	UB-03	Foundation Soils	47.8	-5.7	110.1	0.010	24.010	0.009	0.8	83.7	2	0	0.0	83.7	1.0	-1.1	0.1	0.8	0.119	1.013	0.116	0.249	0.466
UC-03	UB-03	Foundation Soils	47.9	-5.7	100.9	0.010	29.420	0.010	0.8	76.1	3	0	0.0	76.1	1.0	-1.1	0.1	0.8	0.112	1.011	0.110	0.249	0.440
UC-03	UB-03	Foundation Soils	48.0	-5.8	91.1	0.046	30.030	0.050	0.8	68.0	0	0	0.0	68.0	1.0	-1.1	0.1	0.8	0.106	1.010	0.103	0.249	0.414
UC-03	UB-03	Foundation Soils	48.1	-5.9	79.6	0.032	34.450	0.040	0.8	58.7	0	0	0.0	58.7	1.0	-1.1	0.1	0.8	0.099	1.008	0.096	0.249	0.387
UC-03	UB-03	Foundation Soils	48.1	-6.0	66.5	0.045	27.300	0.068	0.8	48.2	4	0	0.0	48.2	1.0	-1.1	0.1	0.8	0.091	1.007	0.089	0.249	0.358
UC-03	UB-03	Foundation Soils	48.2	-6.1	63.0	0.027	30.330	0.043	0.8	45.4	6	0	0.0	45.4	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.249	0.351
UC-03	UB-03	Foundation Soils	48.3	-6.1	59.5	0.047	35.890	0.079	0.8	42.7	8	0	0.0	42.8	1.0	-1.1	0.1	0.8	0.087	1.007	0.085	0.249	0.344
UC-03	UB-03	Foundation Soils	48.4	-6.2	56.3	0.052	31.400	0.092	0.8	40.1	10	0	0.1	40.3	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.249	0.337
UC-03	UB-03	Foundation Soils	48.5	-6.3	56.5	0.172	39.020	0.304	0.8	40.3	20	0	0.4	40.7	1.0	-1.1	0.1	0.8	0.086	1.007	0.084	0.249	0.338
UC-03	UB-03	Foundation Soils	48.6	-6.4	62.1	0.226	39.000	0.364	0.8	44.5	20	0	0.4	44.9	1.0	-1.1	0.1	0.8	0.089	1.007	0.087	0.249	0.349
UC-03	UB-03	Foundation Soils	48.6	-6.5	69.6	0.186	38.020	0.267	0.8	50.3	12	0	0.2	50.5	1.0	-1.1	0.1	0.8	0.093	1.008	0.091	0.248	0.365
UC-03	UB-03	Foundation Soils	48.7	-6.6	79.3	0.150	38.160	0.189	0.8	57.9	4	0	0.0	57.9	1.0	-1.1	0.1	0.8	0.098	1.008	0.096	0.248	0.385
UC-03	UB-03	Foundation Soils	48.8	-6.6	96.4	0.119	38.730	0.123	0.8	71.6	0	0	0.0	71.6	1.0	-1.1	0.1	0.8	0.109	1.010	0.106	0.248	0.426
UC-03	UB-03	Foundation Soils	48.9	-6.7	115.2	0.085	39.940	0.074	0.8	87.0	0	0	0.0	87.0	1.0	-1.1	0.1	0.8	0.122	1.014	0.119	0.248	0.480
UC-03	UB-03	Foundation Soils	49.0	-6.8	115.4	0.082	31.490	0.071	0.8	87.1	0	0	0.0	87.1	1.0	-1.1	0.1	0.8	0.123	1.014	0.119	0.248	0.480
UC-03	UB-03	Foundation Soils	49.0	-6.9	111.0	0.091	39.020	0.082	0.8	83.3	0	0	0.0	83.3	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.248	0.466
UC-03	UB-03	Foundation Soils	49.1	-7.0	107.0	0.047	34.880	0.044	0.8	80.0	0	0	0.0	80.0	1.0	-1.2	0.1	0.8	0.116	1.012	0.113	0.248	0.454
UC-03	UB-03	Foundation Soils	49.2	-7.0	113.6	0.064	36.470	0.056	0.8	85.3	0	0	0.0	85.3	1.0	-1.2	0.1	0.8	0.121	1.013	0.117	0.248	0.474
UC-03	UB-03	Foundation Soils	49.3	-7.1	104.2	0.065	43.170	0.062	0.8	77.5	0	0	0.0	77.5	1.0	-1.2	0.1	0.8	0.114	1.012	0.111	0.248	0.446
UC-03	UB-03	Foundation Soils	49.4	-7.2	112.9	0.091	43.690	0.081	0.8	84.6	0	0	0.0	84.6	1.0	-1.2	0.1	0.8	0.120	1.013	0.117	0.248	0.471
UC-03	UB-03	Foundation Soils	49.5	-7.3	111.6	0.079	40.400	0.071	0.8	83.4	0	0	0.0	83.4	1.0	-1.2	0.1	0.8	0.119	1.013	0.116	0.248	0.467
UC-03	UB-03	Foundation Soils	49.5	-7.4	115.6	0.063	38.500	0.054	0.8	86.7	0	0	0.0	86.7	1.0	-1.2	0.1	0.8	0.122	1.014	0.119	0.247	0.479
UC-03	UB-03	Foundation Soils	49.6	-7.5	117.2	0.102	40.220	0.087	0.8	87.9	0	0	0.0	87.9	1.0	-1.2	0.1	0.8	0.123	1.014	0.120	0.247	0.484
UC-03	UB-03	Foundation Soils	49.7	-7.5	118.8	0.094	29.250	0.079	0.8	89.1	0	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.247	0.489
UC-03	UB-03	Foundation Soils	49.8	-7.6	118.9	0.095	34.000	0.080	0.8	89.1	0	0	0.0	89.1	1.0	-1.2	0.1	0.8	0.125	1.014	0.121	0.247	0.490
UC-03	UB-03	Foundation Soils	49.9	-7.7	118.7	0.048	28.210	0.040	0.8	88.9	0	0	0.0	88.9	1.0	-1.2	0.1	0.8	0.124	1.014	0.121	0.247	0.489
UC-03	UB-03	Foundation Soils	50.0	-7.8	104.8	0.071	21.990	0.068	0.8	77.4	0	0	0.0	77.4	1.0	-1.2	0.1	0.8	0.113	1.012	0.110	0.247	0.446
UC-03	UB-03	Foundation Soils	50.0	-7.9	93.8	0.149	29.450	0.159	0.8	68.5	0	0	0.0	68.5	1.0	-1.2	0.1	0.8	0.106	1.010	0.103	0.247	0.418
UC-03	UB-03	Foundation Soils	50.1	-8.0	86.3	0.120	24.980	0.139	0.8	62.5	0	0	0.0	62.5	1.0	-1.2	0.1	0.8	0.101	1.009	0.099	0.247	0.400
UC-03	UB-03	Foundation Soils	50.2	-8.0	76.6	0.163	24.250	0.213	0.8	54.7	7	0	0.0	54.8	1.0	-1.2	0.1	0.8	0.096	1.008	0.093	0.247	0.378
UC-03	UB-03	Foundation Soils	50.3	-8.1	84.3	0.183	30.550	0.217	0.8	60.7	4	0	0.0	60.7	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.247	0.395
UC-03	UB-03	Foundation Soils	50.4	-8.2	92.3	0.181	37.350	0.196	0.8	67.0	0	0	0.0	67.0	1.0	-1.2	0.1	0.8	0.105	1.010	0.102	0.247	0.413
UC-03	UB-03	Foundation Soils	50.4	-8.3	71.8	0.167	36.360	0.233	0.8	50.9	10	0	0.1	51.0	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.247	0.368
UC-03	UB-03	Foundation Soils	50.5	-8.4	65.0	0.086	36.730	0.132	0.7	45.6	8	0	0.1	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.246	0.354
UC-03	UB-03	Foundation Soils	50.6	-8.4	60.9	0.108	38.880	0.177	0.7	42.4	13	0	0.2	42.6	1.0	-1.2	0.1	0.8	0.087	1.007	0.085	0.246	0.345
UC-03	UB-03	Foundation Soils	50.7	-8.5	67.4	0.259	33.590	0.384	0.7	47.4	19	0	0.3	47.7	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.246	0.359
UC-03	UB-03	Foundation Soils	50.8	-8.6	75.1	0.289	21.320	0.385	0.8	53.2	15	0	0.3	53.5	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.246	0.375
UC-03	UB-03	Foundation Soils	50.9	-8.7	75.5	0.201	31.730	0.266	0.8	53.5	10	0	0.1	53.6	1.0	-1.2	0.1	0.8	0.095	1.008	0.092	0.246	0.375
UC-03	UB-03	Foundation Soils	50.9	-8.8	73.2	0.153	34.160	0.209	0.7	51.6	8	0	0.1	51.7	1.0	-1.2	0.1	0.8	0.093	1.008	0.091	0.246	0.370
UC-03	UB-03	Foundation Soils	51.0	-8.9	79.2	0.106	37.690	0.134	0.8	56.2	2	0	0.0	56.2	1.0	-1.2	0.1	0.8	0.097	1.008	0.094	0.246	0.383
UC-03	UB-03	Foundation Soils	51.1	-8.9	89.5	0.122	39.020	0.136	0.8	64.2	0	0	0.0	64.2	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.246	0.406
UC-03	UB-03	Foundation Soils	51.2	-9.0	90.2	0.092	32.350	0.102	0.8	64.7	0	0	0.0	64.7	1.0	-1.2	0.1	0.8	0.103	1.009	0.100	0.246	0.408
UC-03	UB-03	Foundation Soils	51.3	-9.1	84.2	0.112	41.200	0.133	0.8	60.0	0	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.099	1.009	0.097	0.246	0.394
UC-03	UB-03	Foundation Soils	51.3	-9.2	82.9	0.168	45.020	0.203	0.8	58.8	4	0	0.0	58.8	1.0	-1.2	0.1	0.8	0.099	1.008	0.096	0.246	0.391
UC-03	UB-03	Foundation Soils	51.4	-9.3	84.5	0.169	38.140	0.200	0.8	60.0	3	0	0.0	60.0	1.0	-1.2	0.1	0.8	0.100	1.009	0.097	0.245	0.394
UC-03	UB-03	Foundation Soils	51.5	-9.3	87.4	0.087	26.970	0.100	0.8	62.3	0	0	0.0	62.3	1.0	-1.2	0.1	0.8	0.101	1.009	0.098	0.245	0.401
UC-03	UB-03	Foundation Soils	51.6	-9.4	71.1	0.078	36.150	0.110	0.7	49.6	4	0	0.0	49.6	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.245	0.365
UC-03	UB-03	Foundation Soils	51.7	-9.5	68.5	0.054	32.830	0.079	0.7	47.6	4	0	0.0	47.6	1.0	-1.2	0.1	0.8	0.091	1.007	0.088	0.245	0.360
UC-03	UB-03	Foundation Soils	51.8	-9.6	64.4	0.106	38.350	0.165	0.7	44.4	11	0	0.1	44.5	1.0	-1.2	0.1	0.8	0.088	1.007	0.086	0.245	0.352
UC-03	UB-03	Foundation Soils	51.8	-9.7	66.2	0.065	34.590	0.098	0.7	45.7	6	0	0.0	45.7	1.0	-1.2	0.1	0.8	0.089	1.007	0.087	0.245	0.355
UC-03	UB-03	Foundation Soils	51.9	-9.8	71.6	0.102	39.840	0.142	0.7	49.8	6	0	0.0	49.8	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.245	0.366
UC-03	UB-03	Foundation Soils	52.0	-9.8	70.5	0.164	42.310	0.233	0.7	48.9	11	0	0.1	49.0	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.245	0.364
UC-03	UB-03	Foundation Soils	52.1	-9.9	70.6	0.124	41.450	0.176	0.7	48.9	8	0	0.1	48.9	1.0	-1.2	0.1	0.8	0.092	1.007	0.089	0.245	0.364
UC-03	UB-03	Foundation Soils	52.2	-10.0	68.4	0.036	44.930	0.053	0.7	47.1	4	0	0.0	47.1	1.0	-1.2	0.1	0.8	0.090	1.007	0.088	0.245	0.359
UC-03	UB-03	Foundation Soils	52.2	-10.1	65.6	0.043	42.590	0.066	0.7	45.0	6	0	0.0	45.0	1.0	-1.2	0.1	0.8	0.089	1.007	0.086	0.245	0.354
UC-03	UB-03	Foundation Soils	52.3	-10.2	71.7	0.053	42.260	0.074	0.7	49.5	3	0	0.0	49.5	1.0	-1.2	0.1	0.8	0.092	1.008	0.089	0.244	0.366
UC-03	UB-03	Foundation Soils	52.4	-10.2	72.5	0.036	41.310	0.050	0.7	50.1	2	0	0.0	50.1	1.0	-1.2	0.1	0.8	0.092	1.008	0.090	0.244	0.368

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	52.5	-10.3	72.9	0.032	40.450	0.044	0.7	50.3	2	0	0.0	50.3	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.244	0.368
UC-03	UB-03	Foundation Soils	52.6	-10.4	75.4	0.012	37.590	0.016	0.7	52.2	8	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.244	0.374
UC-03	UB-03	Foundation Soils	52.7	-10.5	72.0	0.012	32.930	0.017	0.7	49.6	9	0	0.1	49.7	1.0	-1.3	0.1	0.8	0.092	1.008	0.090	0.244	0.367
UC-03	UB-03	Foundation Soils	52.7	-10.6	59.3	0.019	29.210	0.032	0.7	40.1	10	0	0.1	40.2	1.0	-1.3	0.1	0.8	0.086	1.007	0.083	0.244	0.342
UC-03	UB-03	Foundation Soils	52.8	-10.7	55.5	0.010	27.970	0.018	0.7	37.2	17	0	0.3	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.244	0.335
UC-03	UB-03	Foundation Soils	52.9	-10.7	54.0	0.041	37.730	0.076	0.7	36.1	13	0	0.2	36.3	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.244	0.332
UC-03	UB-03	Foundation Soils	53.0	-10.8	50.8	0.064	38.930	0.126	0.7	33.8	17	0	0.3	34.1	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.244	0.326
UC-03	UB-03	Foundation Soils	53.1	-10.9	51.3	0.085	44.450	0.166	0.7	34.1	19	0	0.3	34.4	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.244	0.327
UC-03	UB-03	Foundation Soils	53.1	-11.0	55.7	0.082	42.83	0.147171	0.7	37.2	15	0	0.2	37.5	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.244	0.335
UC-03	UB-03	Foundation Soils	53.2	-11.1	63.8	0.034	42.260	0.053	0.7	43.1	7	0	0.0	43.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.085	0.244	0.350
UC-03	UB-03	Foundation Soils	53.3	-11.2	68.1	0.080	36.020	0.118	0.7	46.3	7	0	0.0	46.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.243	0.358
UC-03	UB-03	Foundation Soils	53.4	-11.2	66.6	0.098	37.210	0.147	0.7	45.1	9	0	0.1	45.2	1.0	-1.3	0.1	0.8	0.089	1.007	0.087	0.243	0.355
UC-03	UB-03	Foundation Soils	53.5	-11.3	69.4	0.129	34.100	0.186	0.7	47.2	10	0	0.1	47.3	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.243	0.361
UC-03	UB-03	Foundation Soils	53.6	-11.4	69.0	0.066	28.820	0.096	0.7	46.8	5	0	0.0	46.8	1.0	-1.3	0.1	0.8	0.090	1.007	0.088	0.243	0.360
UC-03	UB-03	Foundation Soils	53.6	-11.5	78.2	0.067	31.100	0.086	0.7	53.7	0	0	0.0	53.7	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.243	0.379
UC-03	UB-03	Foundation Soils	53.7	-11.6	88.9	0.108	14.150	0.121	0.7	61.9	0	0	0.0	61.9	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.243	0.402
UC-03	UB-03	Foundation Soils	53.8	-11.6	88.6	0.085	12.080	0.096	0.7	61.6	0	0	0.0	61.6	1.0	-1.3	0.1	0.8	0.101	1.009	0.098	0.243	0.401
UC-03	UB-03	Foundation Soils	53.9	-11.7	86.3	0.137	-6.720	0.159	0.7	59.7	1	0	0.0	59.7	1.0	-1.3	0.1	0.8	0.099	1.009	0.096	0.243	0.396
UC-03	UB-03	Foundation Soils	54.0	-11.8	81.7	0.184	18.580	0.225	0.7	56.1	6	0	0.0	56.2	1.0	-1.3	0.1	0.8	0.097	1.008	0.094	0.243	0.386
UC-03	UB-03	Foundation Soils	54.1	-11.9	78.5	0.124	1.910	0.158	0.7	53.6	4	0	0.0	53.6	1.0	-1.3	0.1	0.8	0.095	1.008	0.092	0.243	0.379
UC-03	UB-03	Foundation Soils	54.1	-12.0	76.7	0.146	19.050	0.190	0.7	52.2	7	0	0.0	52.3	1.0	-1.3	0.1	0.8	0.094	1.008	0.091	0.243	0.376
UC-03	UB-03	Foundation Soils	54.2	-12.1	70.6	0.124	2.050	0.176	0.7	47.6	9	0	0.1	47.7	1.0	-1.3	0.1	0.8	0.091	1.007	0.088	0.242	0.363
UC-03	UB-03	Foundation Soils	54.3	-12.1	68.3	0.119	-16.340	0.174	0.7	45.9	10	0	0.1	46.0	1.0	-1.3	0.1	0.8	0.090	1.007	0.087	0.242	0.359
UC-03	UB-03	Foundation Soils	54.4	-12.2	71.9	0.057	11.270	0.079	0.7	48.5	3	0	0.0	48.5	1.0	-1.3	0.1	0.8	0.091	1.007	0.089	0.242	0.366
UC-03	UB-03	Foundation Soils	54.5	-12.3	80.4	0.073	28.650	0.091	0.7	54.9	0	0	0.0	54.9	1.0	-1.3	0.1	0.8	0.096	1.008	0.093	0.242	0.383
UC-03	UB-03	Foundation Soils	54.5	-12.4	75.1	0.029	18.770	0.039	0.7	50.8	2	0	0.0	50.8	1.0	-1.3	0.1	0.8	0.093	1.008	0.090	0.242	0.372
UC-03	UB-03	Foundation Soils	54.6	-12.5	62.6	0.070	19.150	0.112	0.7	41.5	10	0	0.1	41.6	1.0	-1.3	0.1	0.8	0.086	1.007	0.084	0.242	0.347
UC-03	UB-03	Foundation Soils	54.7	-12.5	55.2	0.147	25.680	0.266	0.7	36.1	22	0	0.4	36.5	1.0	-1.3	0.1	0.8	0.083	1.007	0.081	0.242	0.334
UC-03	UB-03	Foundation Soils	54.8	-12.6	51.5	0.130	24.820	0.253	0.7	33.4	23	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.242	0.327
UC-03	UB-03	Foundation Soils	54.9	-12.7	48.6	0.044	38.450	0.090	0.7	31.4	17	0	0.3	31.7	1.0	-1.3	0.1	0.8	0.080	1.006	0.078	0.242	0.322
UC-03	UB-03	Foundation Soils	55.0	-12.8	49.9	0.017	35.450	0.034	0.7	32.3	17	0	0.3	32.5	1.0	-1.3	0.1	0.8	0.080	1.007	0.078	0.242	0.324
UC-03	UB-03	Foundation Soils	55.0	-12.9	58.5	0.011	39.090	0.019	0.7	38.3	15	0	0.3	38.6	1.0	-1.3	0.1	0.8	0.084	1.007	0.082	0.242	0.340
UC-03	UB-03	Foundation Soils	55.1	-13.0	66.4	0.013	36.500	0.020	0.7	44.0	11	0	0.1	44.2	1.0	-1.3	0.1	0.8	0.088	1.007	0.086	0.241	0.355
UC-03	UB-03	Foundation Soils	55.2	-13.0	54.7	0.034	40.590	0.062	0.7	35.6	13	0	0.2	35.7	1.0	-1.3	0.1	0.8	0.083	1.007	0.080	0.241	0.333
UC-03	UB-03	Foundation Soils	55.3	-13.1	51.8	0.107	41.330	0.207	0.7	33.5	21	0	0.4	33.8	1.0	-1.3	0.1	0.8	0.081	1.007	0.079	0.241	0.328
UC-03	UB-03	Foundation Soils	55.4	-13.2	47.1	0.033	45.200	0.070	0.7	30.1	18	0	0.3	30.4	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.241	0.319
UC-03	UB-03	Foundation Soils	55.4	-13.3	43.2	0.010	44.500	0.023	0.7	27.4	24	0	0.4	27.7	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.241	0.313
UC-03	UB-03	Foundation Soils	55.5	-13.4	47.7	0.016	42.550	0.034	0.7	30.5	18	0	0.3	30.8	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.241	0.320
UC-03	UB-03	Foundation Soils	55.6	-13.4	54.2	0.051	42.710	0.094	0.7	35.0	14	0	0.2	35.2	1.0	-1.3	0.1	0.8	0.082	1.007	0.080	0.241	0.332
UC-03	UB-03	Foundation Soils	55.7	-13.5	48.3	0.058	44.680	0.120	0.7	30.8	19	0	0.3	31.1	1.0	-1.3	0.1	0.8	0.080	1.006	0.077	0.241	0.322
UC-03	UB-03	Foundation Soils	55.8	-13.6	43.8	0.073	46.170	0.167	0.7	27.6	25	0	0.4	28.0	1.0	-1.3	0.1	0.8	0.078	1.006	0.076	0.241	0.314
UC-03	UB-03	Foundation Soils	55.9	-13.7	42.3	0.170	46.650	0.402	0.7	26.6	36	0	0.5	27.1	1.0	-1.3	0.1	0.8	0.077	1.006	0.075	0.241	0.312
UC-03	UB-03	Foundation Soils	55.9	-13.8	46.5	0.119	46.880	0.256	0.7	29.5	27	0	0.4	29.9	1.0	-1.3	0.1	0.8	0.079	1.006	0.077	0.241	0.319
UC-03	UB-03	Foundation Soils	56.0	-13.9	53.4	0.195	43.050	0.365	0.7	34.3	27	0	0.4	34.7	1.0	-1.4	0.1	0.8	0.082	1.007	0.080	0.241	0.331
UC-03	UB-03	Foundation Soils	56.1	-13.9	65.7	0.354	46.450	0.538	0.7	43.1	26	0	0.4	43.5	1.0	-1.4	0.1	0.8	0.088	1.007	0.085	0.240	0.354
UC-03	UB-03	Foundation Soils	56.2	-14.0	84.9	0.539	35.100	0.634	0.7	57.2	21	0	0.4	57.6	1.0	-1.4	0.1	0.8	0.098	1.008	0.094	0.240	0.393
UC-03	UB-03	Foundation Soils	56.3	-14.1	85.9	0.707	41.400	0.823	0.7	57.9	26	0	0.5	58.3	1.0	-1.4	0.1	0.8	0.098	1.008	0.095	0.240	0.395
UC-03	UB-03	Foundation Soils	56.3	-14.2	108.1	0.475	28.800	0.439	0.7	74.8	7	0	0.0	74.9	1.0	-1.4	0.1	0.8	0.111	1.011	0.107	0.240	0.446
UC-03	UB-03	Foundation Soils	56.4	-14.3	107.6	0.173	28.640	0.161	0.7	74.3	0	0	0.0	74.3	1.0	-1.4	0.2	0.8	0.111	1.011	0.107	0.240	0.444
UC-03	UB-03	Foundation Soils	56.5	-14.3	119.5	0.175	16.300	0.146	0.7	83.7	0	0	0.0	83.7	0.9	-1.4	0.2	0.8	0.119	1.013	0.114	0.240	0.477
UC-03	UB-03	Foundation Soils	56.6	-14.4	127.6	0.209	-14.390	0.164	0.7	90.0	0	0	0.0	90.0	0.9	-1.4	0.2	0.8	0.126	1.015	0.120	0.240	0.502
UC-03	UB-03	Foundation Soils	56.7	-14.5	118.7	0.252	13.940	0.212	0.7	82.9	0	0	0.0	82.9	0.9	-1.4	0.2	0.8	0.118	1.013	0.114	0.240	0.474
UC-03	UB-03	Foundation Soils	56.8	-14.6	106.5	0.337	36.450	0.316	0.7	73.2	3	0	0.0	73.2	1.0	-1.4	0.2	0.8	0.110	1.011	0.106	0.240	0.441
UC-03	UB-03	Foundation Soils	56.8	-14.7	88.2	0.395	33.880	0.448	0.7	59.2	14	0	0.2	59.4	1.0	-1.4	0.2	0.8	0.099	1.009	0.096	0.240	0.399
UC-03	UB-03	Foundation Soils	56.9	-14.8	69.6	0.136	28.920	0.195	0.7	45.4	11	0	0.1	45.5	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.239	0.361
UC-03	UB-03	Foundation Soils	57.0	-14.8	60.2	0.064	8.160	0.106	0.7	38.6	11	0	0.1	38.7	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.239	0.343
UC-03	UB-03	Foundation Soils	57.1	-14.9	58.2	0.063	16.630	0.108	0.7	37.2	13	0	0.2	37.4	1.0	-1.4	0.2	0.8	0.084	1.007	0.081	0.239	0.339
UC-03	UB-03	Foundation Soils	57.2	-15.0	61.0	0.059	11.440	0.097	0.7	39.1	11	0	0.1	39.2	1.0	-1.4	0.2	0.8	0.085	1.007	0.082	0.239	0.344
UC-03	UB-03	Foundation Soils	57.2	-15.1	54.2	0.077	26.900	0.142	0.7	34.3	17	0	0.3	34.6	1.0	-1.4	0.2	0.8	0.082	1.007	0.079	0.239	0.332
UC-03	UB-03	Foundation Soils	57.3	-15.2	53.0	0.148	36.470	0.279	0.7	33.4	24	0	0.4	33.8	1.0	-1.4	0.2	0.8	0.081	1.007	0.079	0.239	0.330
UC-03	UB-03	Foundation Soils	57.4	-15.3	77.6	0.161	48.410	0.207	0.7	51.0	8	0	0.1	51.0	1.0	-1.4	0.2	0.8	0.093	1.008	0.090	0.239	0.376
UC-03	UB-03	Foundation Soils	57.5	-15.3	90.1	0.207	44.500	0.230	0.7	60.2	4	0	0.0	60.2	1.0	-1.4	0.2	0.8	0.100	1.009	0.096	0.239	0.402

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]$FS_{LIQ} = CRR_{corr.} / CSR_{M,\sigma'v}$
UC-03	UB-03	Foundation Soils	57.6	-15.4	103.3	0.285	37.010	0.276	0.7	70.1	2	0	0.0	70.1	1.0	-1.4	0.2	0.8	0.107	1.010	0.103	0.239	0.432
UC-03	UB-03	Foundation Soils	57.7	-15.5	104.0	0.291	34.230	0.280	0.7	70.7	2	0	0.0	70.7	1.0	-1.4	0.2	0.8	0.108	1.010	0.104	0.239	0.434
UC-03	UB-03	Foundation Soils	57.7	-15.6	89.0	0.232	34.540	0.261	0.7	59.2	6	0	0.0	59.2	1.0	-1.4	0.2	0.8	0.099	1.009	0.095	0.239	0.400
UC-03	UB-03	Foundation Soils	57.8	-15.7	79.2	0.205	14.100	0.259	0.7	51.9	10	0	0.1	52.0	1.0	-1.4	0.2	0.8	0.094	1.008	0.091	0.238	0.380
UC-03	UB-03	Foundation Soils	57.9	-15.7	75.0	0.083	18.040	0.111	0.7	48.7	4	0	0.0	48.7	1.0	-1.4	0.2	0.8	0.091	1.007	0.088	0.238	0.371
UC-03	UB-03	Foundation Soils	58.0	-15.8	82.5	0.046	26.200	0.056	0.7	54.2	0	0	0.0	54.2	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.238	0.386
UC-03	UB-03	Foundation Soils	58.1	-15.9	84.0	0.031	16.910	0.037	0.7	55.3	0	0	0.0	55.3	1.0	-1.4	0.2	0.8	0.096	1.008	0.093	0.238	0.389
UC-03	UB-03	Foundation Soils	58.2	-16.0	85.0	0.050	13.860	0.059	0.7	55.9	0	0	0.0	55.9	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.238	0.391
UC-03	UB-03	Foundation Soils	58.2	-16.1	82.1	0.185	23.110	0.225	0.7	53.8	7	0	0.0	53.8	1.0	-1.4	0.2	0.8	0.095	1.008	0.092	0.238	0.385
UC-03	UB-03	Foundation Soils	58.3	-16.2	68.3	0.082	40.550	0.120	0.7	43.7	8	0	0.1	43.8	1.0	-1.4	0.2	0.8	0.088	1.007	0.085	0.238	0.358
UC-03	UB-03	Foundation Soils	58.4	-16.2	70.6	0.017	45.170	0.024	0.7	45.3	8	0	0.0	45.4	1.0	-1.4	0.2	0.8	0.089	1.007	0.086	0.238	0.362
UC-03	UB-03	Foundation Soils	58.5	-16.3	73.3	0.021	47.840	0.029	0.7	47.2	5	0	0.0	47.2	1.0	-1.4	0.2	0.8	0.090	1.007	0.087	0.238	0.367
UC-03	UB-03	Foundation Soils	58.6	-16.4	85.4	0.010	46.450	0.012	0.7	56.1	9	0	0.1	56.1	1.0	-1.4	0.2	0.8	0.097	1.008	0.093	0.238	0.392
UC-03	UB-03	Foundation Soils	58.6	-16.5	66.8	0.010	42.400	0.015	0.7	42.5	14	0	0.2	42.7	1.0	-1.4	0.2	0.8	0.087	1.007	0.084	0.238	0.355
UC-03	UB-03	Foundation Soils	58.7	-16.6	47.0	0.011	47.650	0.023	0.6	28.7	22	0	0.4	29.1	1.0	-1.4	0.2	0.8	0.078	1.006	0.076	0.237	0.320

CPT ID	Adjacent Boring(s)	Strata	Depth	Elev	[3]Avg qt (tsf)	Avg fs	Avg u	Avg Rf	[7]C_N	[8]q_{c1N}	[9]% finer than No 200 seive, FC	[9]% finer than No 200 seive, FC	[10]Δq_{c1N}	[11]q_{c1Ncs}	[12]K_σ	[13]$\alpha(z)$	[14]$\beta(z)$	[15]r_d	[16]$CRR_{M=7.5, \sigma'vc=1atm}$	[17]MSF	[18]$CRR_{corr.}$	[19]$CSR_{M, \sigma'vc}$	[20]FS_{LIQ} = $CRR_{corr.}$ / $CSR_{M,\sigma'v}$

FS<=1.0

1.0<FS<=1.5

FS>1.5

[1]Earthquake magnitude taken as modal event for the deaggregation of the 5,000 year peak ground accleration

[2]PGA estimated from 2014 USGS seismic hazard maps for a 5,000-year return period earthquake

[3]Averaged corrected tip resistence cone tip resistance corrected for unequal end area effects. See Conetec report for additional info.

[4]Unit weight of soil based on Soil Behavior Type. See Conetec report for additional info.

[5]Equilibrium pore water pressure based on Pore Pressure Dissipation Tests. See Conetec report for additional info.

[6]$m = 1.338 - 0.249 * q_{c1Ncs}$ ^0.264 where $21 < q_{c1Ncs} < 254$ (Boulanger&Idriss, 2014, Equation 2.15b)

[7]C_N = overburden correction factor = $(1.06\ tsf/s'_{vc})^m$, where C_N <=1.7 (Boulanger&Idriss, 2014, Equation 2.15a)

[8]$q_{c1N} = C_N * qt/1.06$ tsf (Boulanger&Idriss, 2014, Equation 2.4)

[9]Values based sieve test results and boring log descriptions

[10]$Dq_{c1N} = (11.9+q_{c1N}/14.6)*\exp[1.63 - (9.7 / (FC + 2)) - (15.7 / (FC + 2))^2]$ (Boulanger&Idriss, 2014, Equation 2.22)

[11]$q_{c1Ncs} = q_{c1N} + Dq_{c1N}$ (Boulanger&Idriss, 2014, Equation 2.10)

[12]$C\sigma = 1 / (37.3 - 8.27 * q_{c1Ncs}$^0.264 where q_{C1Ncs}<=211 $K_s = 1-(C_s*\ln(s'_{vc}/106\ tsf))$ <=1.1 (Boulanger&Idriss,2014, Equations 2.16a, 2.16b)

[13]$a(z) = -1.012 - 1.126 * \sin(z / 11.73 + 5.133)$, where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14b)

[14]$b(z) = 0.106 + 0.118 * \sin(z /11.28 + 5.142)$, where z is the depth in meters and the arguments inside the sine term are in radians (Boulanger&Idriss, 2014, Equation 2.14c)

[15]r_d = shear stress reduction coefficient = exp[a(z) + b(z) * M] (Boulanger&Idriss, 2014, Equation 2.14a)

[16]$CRR_{M=7.5, \sigma'vc=1atm} = \exp((q_{c1Ncs}/113+q_{c1Ncs}/1000)^2-(q_{c1Ncs}/140)^3+(q_{c1Ncs}/137))^4-2.8)$ (Boulanger&Idriss, 2014, Equation, 2.24), say q_{c1Ncs} <= 300

[17]$MSF=1+(MSF_{max}-1)(8.64\exp(-M/4)-1.325)$ $MSF_{max}=1.09(q_{c1Ncs}/180)^2$<=2.2 (Boulanger&Idriss, Equations 2.19,2.20)

[18]$CRR_{corr.}=CRR_{M=7.5,\sigma'vc=1atm}*K_\sigma*MSF$ (Boulanger and Idriss,2014, Equation 2.7)

[19]$CSR_{M,\sigma'v} = 0.65*PHGA*(s_v/s'_{vc})*r_d$ (Boulanger and Idriss,2014, Equation 2.2)

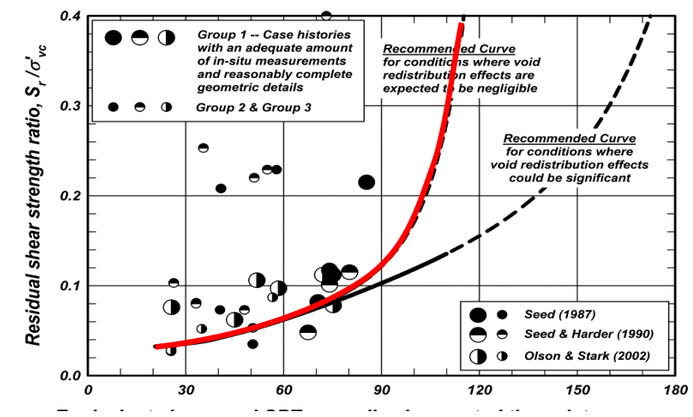
[21]State Param = state parameter index provided by Conetec and based on Been and Jefferies (1985). Positive = contractive soil, negative = dilative soil

[21]$Dq_{c1Ncs-Sr}$ is a function of fines content, values were estimated based on recommendations from Seed and Idriss, 2008

[22]$q_{c1Ncs-Sr} = q_{c1N} + Dq_{c1Ncs-Sr}$

[23]S_r/s'_{vo} estimated based on recommendations from Idriss and Boulanger, 2008, Equation 82

Idriss & Boulanger, 2008



$$\frac{S_r}{\sigma'_{vo}} = \exp\left(\frac{q_{c1Ncs-Sr}}{24.5} - \left(\frac{q_{c1Ncs-Sr}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs-Sr}}{106}\right)^3 - 4.42\right) \leq \tan\phi' \quad (82)$$

for conditions where void redistribution effects are expected to be negligible

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project Boiling Spring Lakes Dams Construction/Reconstruction	**Project Number** 19C21022
Title Geotechnical Recommendations for Structural Analysis and Design	
Computer Programs Used Microsoft Excel	**Version/Release No.** 2016
Purpose and Objective Provide geotechnical parameters and recommendations for use in structural analysis and design of proposed spillway structures at Sanford Dam, North Lake Dam, Pine Lake Dam, and Upper Lake Dam.	
Summary of Conclusions See attached memorandum and calculations.	

Originator Corey Schaal, PE, GIT		Dec 22, 2020
Print	Sign	Date
Checked Adam Paisley, PE		Jan 8, 2021
Print	Sign	Date

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TECHNICAL MEMORANDUM

BY:	Corey Schaal, PE, GIT	**DATE:**	December 22, 2020
PROJECT:	Boiling Spring Lakes Dams Construction/Reconstruction	**SUBJECT:**	Geotechnical Recommendations for Structural Analysis and Design
LOCATION:	Boiling Spring Lakes, North Carolina	**PROJECT NO.:**	19C21022
CHECKED BY:	Adam Paisley, PE	**DATE:**	

INTRODUCTION

Sanford Dam (SD), North Lake Dam (NLD), Pine Lake Dam (PLD), and Upper Lake Dam (ULD) (collectively herein referred to as the BSL Dams) breached during Hurricane Florence in September 2018. The four BSL Dams are part of a system of dams where NLD, PLD, and ULD are situated upstream of SD and independent of each other. NLD and PLD are directly upstream, such that the Sanford Dam headwater is the tailwater for NLD and PLD. A fifth dam named Middle Lake Dam (MLD) is founded between SD and ULD and also breached during Hurricane Florence, but is not part of this project.

As part of the rehabilitation of the BSL Dams, the existing culverts at NLD and PLD and existing spillways at SD and ULD will be removed and replaced with new spillways. The new spillways will be constructed of cast-in-place concrete and will include an inlet structure, spillway culverts, and an outlet structure. The inlet and outlet structures will be embedded in each embankment. Each inlet structure will have a headwall which will extend above the inlet structure weir walls to retain embankment earthfill downstream of the weir walls. At SD, the natural Foundation Soils beneath the proposed spillway will be removed, and the spillway excavation will extend to top of rock. The NLD, PLD, and ULD structures, which will be founded on Foundation Soils, will be underlain by a 6-inch-thick layer of flowable fill (mudmat). The purpose of the mudmat is to protect the subgrade and to provide a firm surface against which earthfill can be placed and compacted after construction of the spillway elements. The excavations will be backfilled with engineered fill.

This memorandum defines geotechnical parameters and constraints which apply to the structural analyses and design of the structures described above.

EXTERNAL INFORMATION

The “Soil and Rock Properties” memorandum includes definitions of the geotechnical materials and describes the selection of geotechnical properties. The materials and corresponding shear strength parameters to be used in the structural analyses and design are summarized in Table 1. Descriptions of how the strength parameters are applied to various load cases are provided in the memorandum entitled, “Stability Analysis of Spillway Structures.”

Table 1 – Geotechnical Materials and Properties

Site	Material	Unit Weight		Effective Stress Shear Strength Parameters		Total Stress Shear Strength Parameters	
		Moist	Saturated				
		γ_m (pcf)	γ_{sat} (pcf)	ϕ' (deg)	c' (psf)	ϕ (deg)	c (psf)
All	Proposed Common Fill / Proposed Core Fill (Backfill)	120	125	32	0	--	--
NLD, PLD, ULD	Foundation Soils (Foundation)	--	--	29	0	20	100
SD (inlet and outlet structures only)	Proposed Select Common Fill (Foundation)	--	--	32	0	24	50
SD (box culverts only)	Proposed Select Core Fill (Foundation)	--	--	--	--	--	--

Table 1 Note: "--" = not used in structural analyses

Seismic parameters which should be used in the design of structures are defined in the memorandum entitled "Seismic Hazard." The design ground motion for the SD spillway structures is 0.20 g, and the design ground motion for NLD, PLD, and ULD structures is 0.14 g.

SHEAR STRENGTH OF FAILURE PLANES

As described above, the Foundation Soils at NLD, PLD, and ULD will be over-excavated below the proposed excavation grade, and a mudmat will be installed on top of the Foundation Soils. The mudmat will remain in place, and the spillway and embankment will be constructed on top of it. For global stability calculations, failure surfaces should be assumed to occur at the bottom of the mudmat, as opposed to failure occurring along the contact of the concrete and mudmat.

The Proposed Select Common Fill beneath the spillway structure at SD and the Foundation Soils beneath the mudmat at NLD, PLD, and ULD will be roughened to reduce the likelihood of failure occurring along a smooth interface. Therefore, the interface friction angle at the base of each structure should equal the full friction angle of the respective foundation material (as shown in Table 1).

The footing for the lower-most energy dissipation step of the SD outlet structure will be founded on bedrock. The interface friction angle between the footing and foundation bedrock is assumed to be equal to the friction angle for the Proposed Select Fill.

LATERAL EARTH PRESSURE COEFFICIENT CALCULATIONS

At-rest, Rankine active, and seismically-induced lateral earth pressure coefficients were computed for level backfill and 2.5H:1V, 3H:1V, and negative 3H:1V backfill slopes. A wall batter angle of zero degrees was used in the calculations based on the structural design at the time of the performance of the calculations described herein. Although backfill soils will likely exhibit some cohesive strength, cohesion was conservatively ignored when evaluating lateral soil loads.

A general distribution of lateral earth pressures is shown in Attachment 1. The calculated at-rest and Rankine active lateral earth pressure coefficients are summarized in Table 2, and additional details are provided in Attachment 2. Dynamic lateral earth pressure coefficients for SD are summarized in Table 3 with additional details provided in Attachment 3. Dynamic lateral earth pressure coefficients for NLD, PLD, and ULD are summarized in Table 4 with additional details in Attachment 4.

Table 2: Summary of Active and At-Rest Lateral Earth Pressure Coefficients

Site	Backfill Slope	Active lateral earth pressure coefficient K_a	At-Rest Lateral Earth Pressure Coefficient K_o
All	Level	0.28	0.47
	Pos. 2.5:1V	0.39	0.64
	Pos. 3H:1V	0.36	0.62
	Neg. 3H:1V	0.23	0.32

Table 3: Summary of Seismically-Induced Lateral Earth Pressure Coefficients – Sanford Dam

Site	Backfill Slope	Dynamic Earth Pressure Coefficient ΔK_{ae}	Dynamic Earth Pressure Δp_{ae}
SD	Level	0.14	$9.0 \cdot H^2$
	Pos. 2.5:1V	0.62	$39 \cdot H^2$
	Pos. 3H:1V	0.36	$22 \cdot H^2$
	Neg. 3H:1V	0.10	$6.1 \cdot H^2$

Table 4: Summary of Dynamic Lateral Earth Pressure Coefficients – North Lake, Pine Lake, and Upper Lake Dams

Site	Backfill Slope	Dynamic Earth Pressure Coefficient ΔK_{ae}	Dynamic Earth Pressure Δp_{ae}
NLD, PLD, ULD	Level	0.09	$5.9 \cdot H^2$
	Pos. 2.5:1V	0.27	$17 \cdot H^2$
	Pos. 3H:1V	0.19	$12 \cdot H^2$
	Neg. 3H:1V	0.07	$4.0 \cdot H^2$

Tables 2 through 4 Notes:

1. Interface friction angle between Backfill and concrete, δ_a = 17° and is based on NAVFAC (1986). This should be applied to the active earth pressure calculations only.
2. ΔK_{ae} and Δp_{ae} are based on Mononobe Okabe theory; see Kramer (1996) for additional information.
3. H = wall height.

USE OF LATERAL EARTH PRESSURE FOR RESISTING FORCES

Resisting earth forces acting at the toes of the inlet and outlet structures should be conservatively ignored unless front fill will be placed on the resisting side of the wall and the front fill can be expected to remain in place during the analyzed load case. In these cases, resisting earth forces should be calculated using at-rest (K_o) lateral earth pressure coefficients.

COMPACTION-INDUCED EARTH PRESSURES

The calculated compaction-induced earth pressures are based on using hand operated plate compactors within five feet of structures. Compaction loads were selected based on "Estimation Earth Pressures due to Compaction" by Duncan et al. (1991). Although the compaction induced earth pressures will vary slightly for different load cases and walls, for structural and stability analyses, an equivalent compaction induced force of 172 pounds/foot located 1.4 feet from the top of backfill should be applied (see Attachment 1). For long-term loading under active conditions, however, compaction-induced earth pressures need not be considered for design due to backfill relaxation and pressure relief.

SUBGRADE MODULUS

Due to the relatively large size of the proposed SD inlet structure and the anticipated lateral earth pressures and uplift pressures, the slab base pressures may be zero or less (i.e., full compression is not achieved). Consequently, the bending moments in the slab may be high. The slab base pressures are a function of subgrade modulus, also known as modulus of subgrade reaction. Subgrade modulus for the SD inlet structure foundation was calculated using a proprietary spreadsheet developed by Schnabel. The spreadsheet calculates subgrade modulus based on the elastic theories developed by Steinbrenner (1934) and Mayne and Poulos (1999) and presented by Bowles (1996) and Das et al. (2009). Spreadsheet inputs include slab geometry, foundation material elastic and secant moduli, and Poisson's ratio. Elastic modulus and Poisson's ratio were selected based on our experience with similar materials. Secant modulus was selected based on consolidated, drained (CD) triaxial test results performed on remolded soil samples which are similar to anticipated fill materials. The CD triaxial test results are presented in the Phase 1 and Phase 2 Geotechnical Data Report (GDR) (Schnabel, 2021) and included in Attachment 5. Although the subgrade modulus will vary slightly for different load cases and between discrete locations beneath the slab, an average value of 160 ksf per foot (93 psi per inch) may be applied. The SD inlet structure subgrade modulus calculations are included as Attachment 5.

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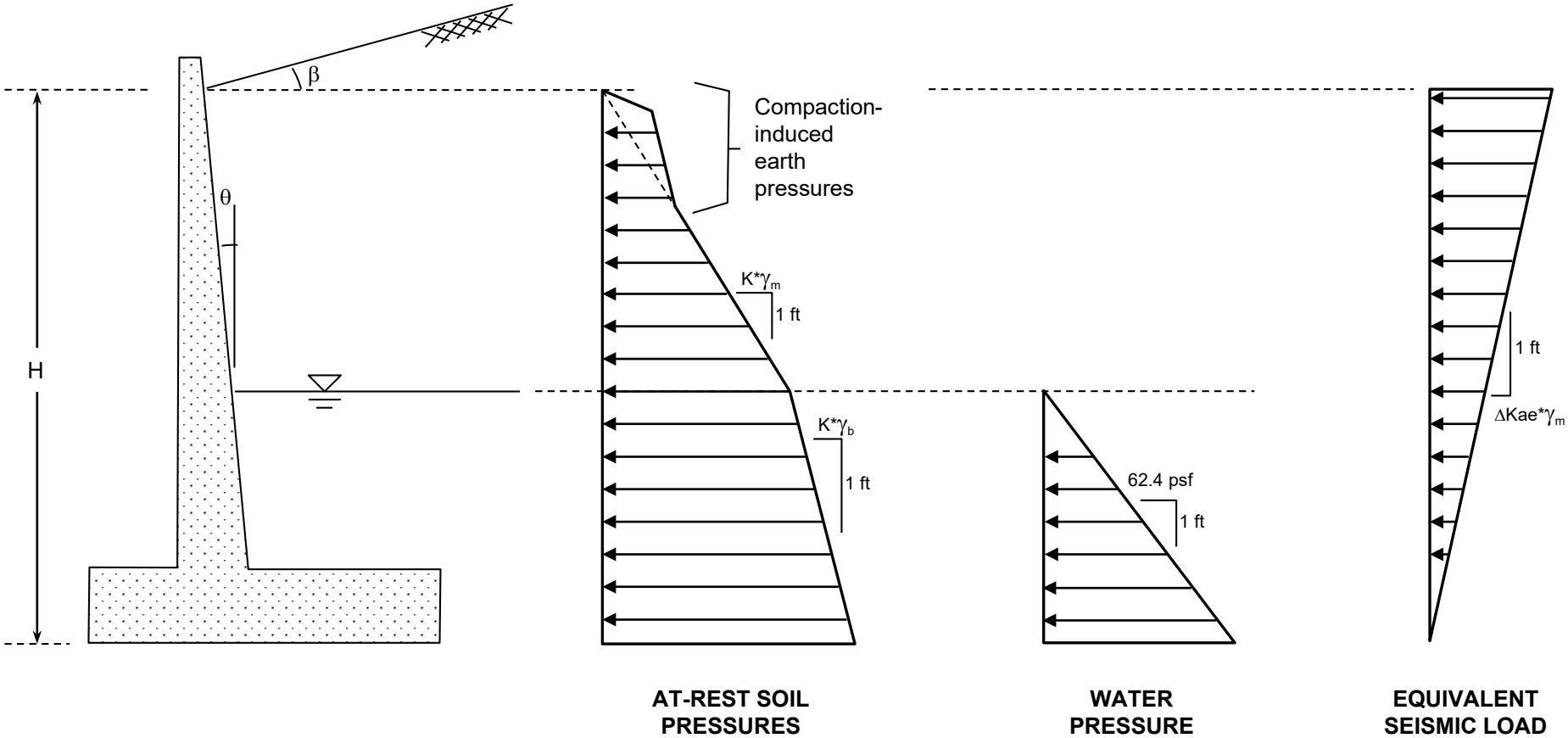
ATTACHMENTS

1) General Application of Lateral Earth Pressures
2) Active and At-Rest Lateral Earth Pressure Coefficient Calculations
3) Dynamic Lateral Loading Calculations – Sanford Dam
4) Dynamic Lateral Loading Calculations – North Lake, Pine Lake, and Upper Lake Dams
5) Subgrade Modulus Calculations – Sanford Dam



NOTES:

K may be at-rest (K_0) or active (K_a) depending on load case and wall being analyzed.

$\gamma_b = \gamma_{sat} - \gamma_{water}$

Equivalent Compaction-Induced Load (approximate): Load = 172 lb/ft, 1.4 ft from top of backfill

Compaction-induced earth pressures are based on using hand operated plate compactors within five feet of wall. Compaction loads are selected based on "Estimation Earth Pressures due to Compaction" by Duncan et al. (1991)

Schnabel ENGINEERING	BOILING SPRING LAKES DAMS	GENERAL APPLICATION OF LATERAL EARTH PRESSURES FOR WALLS
	BOILING SPRING LAKES, NORTH CAROLINA	**ATTACHMENT 1**

Calculate Lateral Earth Pressure Coefficients - Level Backfill

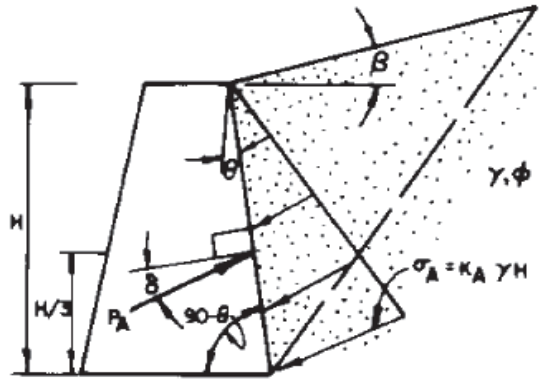
Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:** CDS	**Date:** 6/29/2020
Date:	06/29/20	**Checked By:** RLJ	**Date:** 6/29/2020
Contract No.:	19C21022	**Sheet No.:** 1	**of** 3

Input angles in degrees	ϕ =	32.0
	β =	0.0
	δ (for active) =	17.0
	θ =	0.0
Coefficient of active earth pressure	K_a =	0.28
Coefficient of at-rest earth pressure	K_0 =	0.47

		For Active
Factors in formula	$\cos^2(\phi+\theta)$ =	0.72
	$\cos^2(\phi-\theta)$ =	0.72
	$\cos^2(\theta)$ =	1.00
	$\cos(\theta-\delta)$ =	0.96
	$\cos(\theta+\delta)$ =	0.96
	$\sin(\phi+\delta)$ =	0.75
	$\sin(\phi+\beta)$ =	0.53
	$\sin(\phi-\beta)$ =	0.53
	$\cos(\theta-\delta)$ =	0.96
	$\cos(\theta+\delta)$ =	0.96
	$\cos(\theta-\beta)$ =	1.00
	radians/degrees =	0.0174533

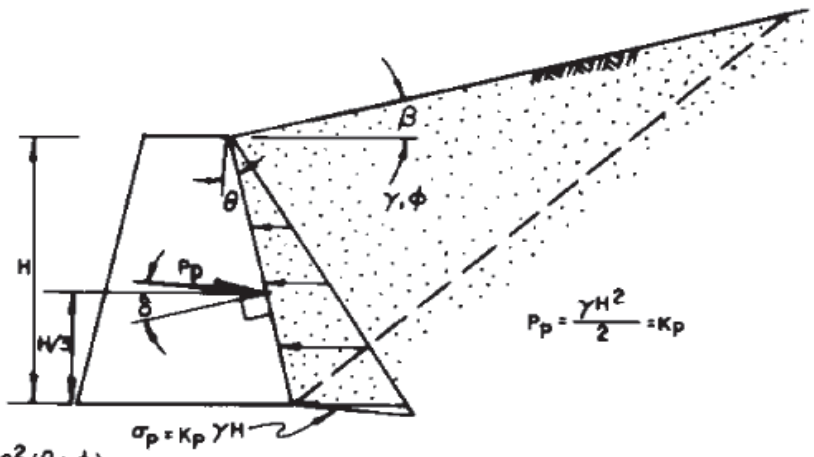
$$K_0 \approx (1-\sin\phi)(1+\sin\beta)$$

$$K_A = \frac{\cos^2(\phi-\theta)}{\cos^2\theta * \cos(\theta+\delta) * \left[1+\sqrt{\frac{\sin(\phi+\delta)*\sin(\phi-\beta)}{\cos(\theta+\delta)*\cos(\theta-\beta)}}\right]^2}$$



$$P_A = \frac{\gamma H^2}{2} K_A$$

$$K_A = \frac{\cos^2(\phi-\theta)}{\cos^2\theta\cos(\theta+\delta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\beta)}{\cos(\theta+\delta)\cos(\theta-\beta)}}\right]^2}$$



$$P_p = \frac{\gamma H^2}{2} = K_p$$

$$K_p = \frac{\cos^2(\theta+\phi)}{\cos^2\theta\cos(\theta-\delta)\left[1-\sqrt{\frac{\sin(\phi+\delta)\sin(\phi+\beta)}{\cos(\theta-\delta)\cos(\theta-\beta)}}\right]^2}$$

K_p VALUES ARE SATISFACTORY FOR $\delta \leq \phi/3$ BUT ARE UNCONSERVATIVE FOR $\delta > \phi/3$ AND THEREFORE SHOULD NOT BE USED.

FIGURE 8
Coefficients K_A and K_p for Walls with Sloping Wall and Friction, and Sloping Backfill

TABLE 1
Ultimate Friction Factors and Adhesion for Dissimilar Materials

Interface Materials	Friction factor, tan [delta]	Friction angle [delta] degrees
Mass concrete on the following foundation materials:		
Clean sound rock	0.70	35
Clean gravel, gravel-sand mixtures, coarse sand	0.55 to 0.60	29 to 31
Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	0.45 to 0.55	24 to 29
Clean fine sand, silty or clayey fine to medium sand	0.35 to 0.45	19 to 24
Fine sandy silt, nonplastic silt	0.30 to 0.35	17 to 19
Very stiff and hard residual or preconsolidated clay	0.40 to 0.50	22 to 26
Medium stiff and stiff clay and silty clay	0.30 to 0.35	17 to 19
(Masonry on foundation materials has same friction factors.)		
Steel sheet piles against the following soils:		
Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	0.40	22
Clean sand, silty sand-gravel mixture, single size hard rock fill	0.30	17
Silty sand, gravel or sand mixed with silt or clay	0.25	14
Fine sandy silt, nonplastic silt	0.20	11
Formed concrete or concrete sheet piling against the following soils:		
Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	0.40 to 0.50	22 to 26
Clean sand, silty sand-gravel mixture, single size hard rock fill	0.30 to 0.40	17 to 22
Silty sand, gravel or sand mixed with silt or clay	0.30	17
Fine sandy silt, nonplastic silt	0.25	14
Various structural materials:		
Masonry on masonry, igneous and metamorphic rocks:		
Dressed soft rock on dressed soft rock	0.70	35
Dressed hard rock on dressed soft rock	0.65	33
Dressed hard rock on dressed hard rock	0.55	29
Masonry on wood (cross grain)	0.50	26
Steel on steel at sheet pile interlocks	0.30	17

Interface Materials (Cohesion)	Adhesion c+a, (psf)
Very soft cohesive soil (0 - 250 psf)	0 - 250
Soft cohesive soil (250 - 500 psf)	250 - 500
Medium stiff cohesive soil (500 - 1000 psf)	500 - 750
Stiff cohesive soil (1000 - 2000 psf)	750 - 950
Very stiff cohesive soil (2000 - 4000 psf)	950 - 1,300

Calculate Lateral Earth Pressure Coefficients - Pos. 2.5H:1V Backfill

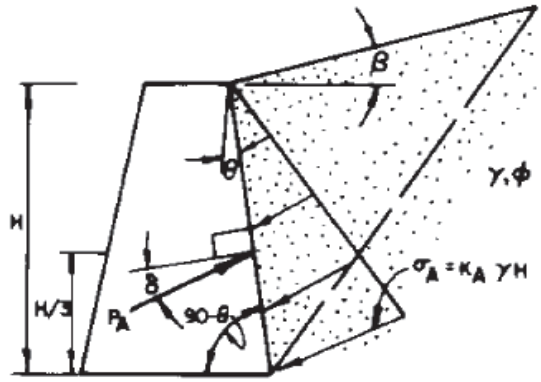
Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:** CDS	**Date:** 6/29/2020
Date:	06/29/20	**Checked By:** RLJ	**Date:** 6/29/2020
Contract No.:	19C21022	**Sheet No.:** 1	**of** 3

Input angles in degrees	ϕ =	32.0
	β =	21.8
	δ (for active) =	17.0
	θ =	0.0
Coefficient of active earth pressure	K_a =	0.39
Coefficient of at-rest earth pressure	K_0 =	0.64

		For Active
Factors in formula	$\cos^2(\phi+\theta)$ =	0.72
	$\cos^2(\phi-\theta)$ =	0.72
	$\cos^2(\theta)$ =	1.00
	$\cos(\theta-\delta)$ =	0.96
	$\cos(\theta+\delta)$ =	0.96
	$\sin(\phi+\delta)$ =	0.75
	$\sin(\phi+\beta)$ =	0.81
	$\sin(\phi-\beta)$ =	0.18
	$\cos(\theta-\delta)$ =	0.96
	$\cos(\theta+\delta)$ =	0.96
	$\cos(\theta-\beta)$ =	0.93
	radians/degrees =	0.0174533

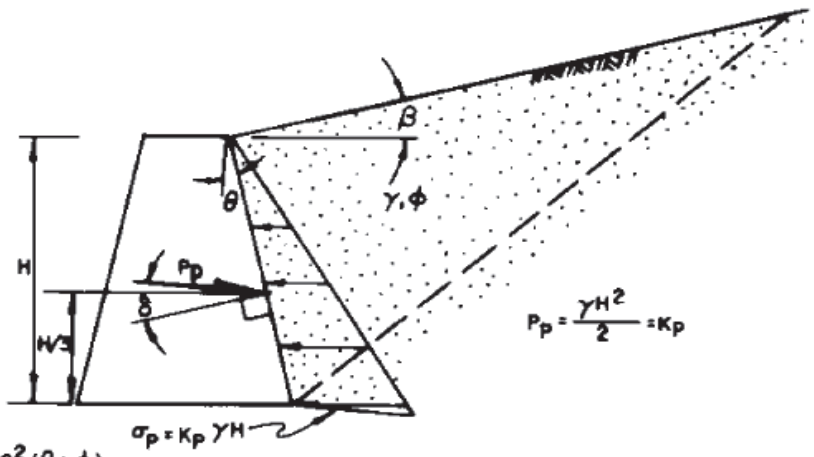
$$K_0 \approx (1-\sin\phi)(1+\sin\beta)$$

$$K_A = \frac{\cos^2(\phi-\theta)}{\cos^2\theta * \cos(\theta+\delta) * \left[1+\sqrt{\frac{\sin(\phi+\delta)*\sin(\phi-\beta)}{\cos(\theta+\delta)*\cos(\theta-\beta)}}\right]^2}$$



$$P_A = \frac{\gamma H^2}{2} K_A$$

$$K_A = \frac{\cos^2(\phi-\theta)}{\cos^2\theta\cos(\theta+\delta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\beta)}{\cos(\theta+\delta)\cos(\theta-\beta)}}\right]^2}$$



$$P_p = \frac{\gamma H^2}{2} = K_p$$

$$K_p = \frac{\cos^2(\theta+\phi)}{\cos^2\theta\cos(\theta-\delta)\left[1-\sqrt{\frac{\sin(\phi+\delta)\sin(\phi+\beta)}{\cos(\theta-\delta)\cos(\theta-\beta)}}\right]^2}$$

K_p VALUES ARE SATISFACTORY FOR $\delta \leq \phi/3$ BUT ARE UNCONSERVATIVE FOR $\delta > \phi/3$ AND THEREFORE SHOULD NOT BE USED.

FIGURE 8
Coefficients K_A and K_p for Walls with Sloping Wall and Friction, and Sloping Backfill

TABLE 1
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Interface Materials	Friction factor, tan [delta]	Friction angle [delta] degrees
Mass concrete on the following foundation materials:		
Clean sound rock	0.70	35
Clean gravel, gravel-sand mixtures, coarse sand	0.55 to 0.60	29 to 31
Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	0.45 to 0.55	24 to 29
Clean fine sand, silty or clayey fine to medium sand	0.35 to 0.45	19 to 24
Fine sandy silt, nonplastic silt	0.30 to 0.35	17 to 19
Very stiff and hard residual or preconsolidated clay	0.40 to 0.50	22 to 26
Medium stiff and stiff clay and silty clay	0.30 to 0.35	17 to 19
(Masonry on foundation materials has same friction factors.)		
Steel sheet piles against the following soils:		
Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	0.40	22
Clean sand, silty sand-gravel mixture, single size hard rock fill	0.30	17
Silty sand, gravel or sand mixed with silt or clay	0.25	14
Fine sandy silt, nonplastic silt	0.20	11
Formed concrete or concrete sheet piling against the following soils:		
Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	0.40 to 0.50	22 to 26
Clean sand, silty sand-gravel mixture, single size hard rock fill	0.30 to 0.40	17 to 22
Silty sand, gravel or sand mixed with silt or clay	0.30	17
Fine sandy silt, nonplastic silt	0.25	14
Various structural materials:		
Masonry on masonry, igneous and metamorphic rocks:		
Dressed soft rock on dressed soft rock	0.70	35
Dressed hard rock on dressed soft rock	0.65	33
Dressed hard rock on dressed hard rock	0.55	29
Masonry on wood (cross grain)	0.50	26
Steel on steel at sheet pile interlocks	0.30	17

Interface Materials (Cohesion)	Adhesion c+a, (psf)
Very soft cohesive soil (0 - 250 psf)	0 - 250
Soft cohesive soil (250 - 500 psf)	250 - 500
Medium stiff cohesive soil (500 - 1000 psf)	500 - 750
Stiff cohesive soil (1000 - 2000 psf)	750 - 950
Very stiff cohesive soil (2000 - 4000 psf)	950 - 1,300

Schnabel ENGINEERING

Calculate Lateral Earth Pressure Coefficients - Pos. 3H:1V Backfill

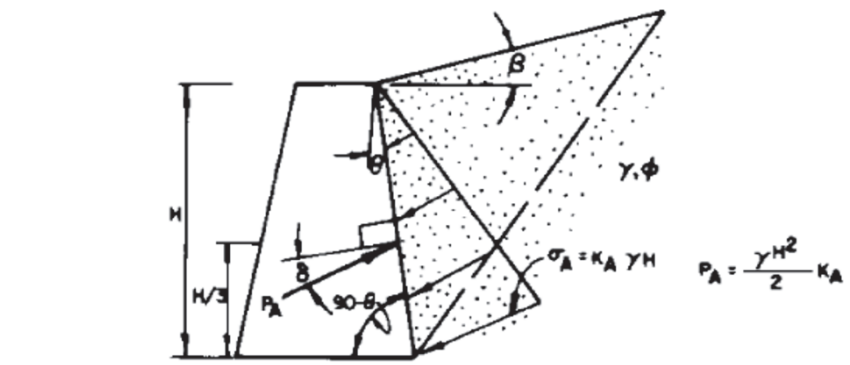
Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:**	CDS	**Date:**	6/29/2020
Date:	06/29/20	**Checked By:**	RLJ	**Date:**	6/29/2020
Contract No.:	19C21022	**Sheet No.:**	1	**of**	3

Input angles in degrees	ϕ =	32.0
	β =	18.4
	δ (for active) =	17.0
	θ =	0.0
Coefficient of active earth pressure	K_a =	0.36
Coefficient of at-rest earth pressure	K_0 =	0.62

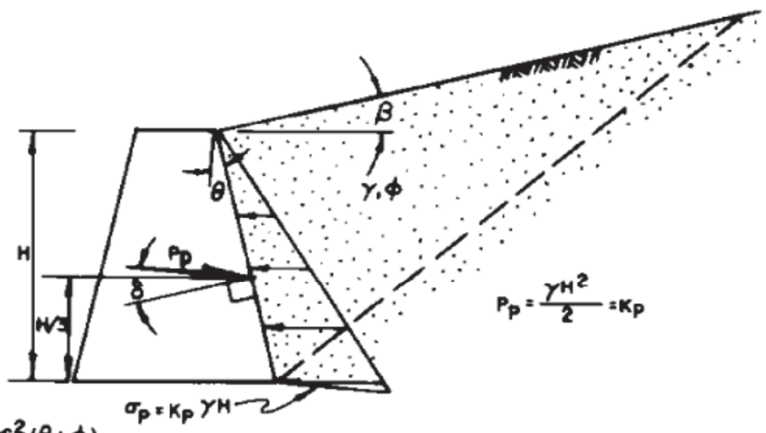
		For Active
Factors in formula	$\cos^2(\phi+\theta)$ =	0.72
	$\cos^2(\phi-\theta)$ =	0.72
	$\cos^2(\theta)$ =	1.00
	$\cos(\theta-\delta)$ =	0.96
	$\cos(\theta+\delta)$ =	0.96
	$\sin(\phi+\delta)$ =	0.75
	$\sin(\phi+\beta)$ =	0.77
	$\sin(\phi-\beta)$ =	0.23
	$\cos(\theta-\delta)$ =	0.96
	$\cos(\theta+\delta)$ =	0.96
	$\cos(\theta-\beta)$ =	0.95
	radians/degrees =	0.0174533

$$K_0 \approx (1 - \sin\phi)(1 + \sin\beta)$$

$$K_A = \frac{\cos^2(\phi-\theta)}{\cos^2\theta * \cos(\theta+\delta) * \left[1 + \sqrt{\frac{\sin(\phi+\delta) * \sin(\phi-\beta)}{\cos(\theta+\delta) * \cos(\theta-\beta)}}\right]^2}$$



$$K_A = \frac{\cos^2(\phi-\theta)}{\cos^2\theta\cos(\theta+\delta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\beta)}{\cos(\theta+\delta)\cos(\theta-\beta)}}\right]^2}$$



$$K_p = \frac{\cos^2(\theta+\phi)}{\cos^2\theta\cos(\theta-\delta)\left[1-\sqrt{\frac{\sin(\phi+\delta)\sin(\phi+\beta)}{\cos(\theta-\delta)\cos(\theta-\beta)}}\right]^2}$$

K_p VALUES ARE SATISFACTORY FOR $\delta \leq \phi/3$ BUT ARE UNCONSERVATIVE FOR $\delta > \phi/3$ AND THEREFORE SHOULD NOT BE USED.

FIGURE 8
Coefficients K_A and K_p for Walls with Sloping Wall and Friction, and Sloping Backfill

TABLE 1
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Interface Materials	Friction factor, tan [delta]	Friction angle [delta] degrees
Mass concrete on the following foundation materials:		
Clean sound rock	0.70	35
Clean gravel, gravel-sand mixtures, coarse sand	0.55 to 0.60	29 to 31
Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	0.45 to 0.55	24 to 29
Clean fine sand, silty or clayey fine to medium sand	0.35 to 0.45	19 to 24
Fine sandy silt, nonplastic silt	0.30 to 0.35	17 to 19
Very stiff and hard residual or preconsolidated clay	0.40 to 0.50	22 to 26
Medium stiff and stiff clay and silty clay	0.30 to 0.35	17 to 19
(Masonry on foundation materials has same friction factors.)		
Steel sheet piles against the following soils:		
Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	0.40	22
Clean sand, silty sand-gravel mixture, single size hard rock fill	0.30	17
Silty sand, gravel or sand mixed with silt or clay	0.25	14
Fine sandy silt, nonplastic silt	0.20	11
Formed concrete or concrete sheet piling against the following soils:		
Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	0.40 to 0.50	22 to 26
Clean sand, silty sand-gravel mixture, single size hard rock fill	0.30 to 0.40	17 to 22
Silty sand, gravel or sand mixed with silt or clay	0.30	17
Fine sandy silt, nonplastic silt	0.25	14
Various structural materials:		
Masonry on masonry, igneous and metamorphic rocks:		
Dressed soft rock on dressed soft rock	0.70	35
Dressed hard rock on dressed soft rock	0.65	33
Dressed hard rock on dressed hard rock	0.55	29
Masonry on wood (cross grain)	0.50	26
Steel on steel at sheet pile interlocks	0.30	17

Interface Materials (Cohesion)	Adhesion c+a, (psf)
Very soft cohesive soil (0 - 250 psf)	0 - 250
Soft cohesive soil (250 - 500 psf)	250 - 500
Medium stiff cohesive soil (500 - 1000 psf)	500 - 750
Stiff cohesive soil (1000 - 2000 psf)	750 - 950
Very stiff cohesive soil (2000 - 4000 psf)	950 - 1,300

Calculate Lateral Earth Pressure Coefficients - Neg. 3H:1V Backfill

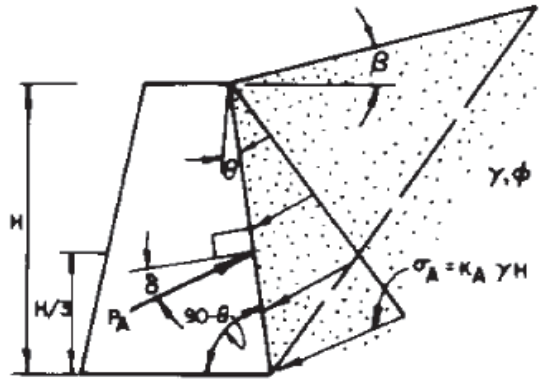
Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:** CDS	**Date:** 6/29/2020
Date:	06/29/20	**Checked By:** RLJ	**Date:** 6/29/2020
Contract No.:	19C21022	**Sheet No.:** 1	**of** 3

Input angles in degrees	ϕ =	32.0
	β =	-18.4
	δ (for active) =	17.0
	θ =	0.0
Coefficient of active earth pressure	K_a =	0.23
Coefficient of at-rest earth pressure	K_0 =	0.32

		For Active
Factors in formula	$\cos^2(\phi+\theta)$ =	0.72
	$\cos^2(\phi-\theta)$ =	0.72
	$\cos^2(\theta)$ =	1.00
	$\cos(\theta-\delta)$ =	0.96
	$\cos(\theta+\delta)$ =	0.96
	$\sin(\phi+\delta)$ =	0.75
	$\sin(\phi+\beta)$ =	0.23
	$\sin(\phi-\beta)$ =	0.77
	$\cos(\theta-\delta)$ =	0.96
	$\cos(\theta+\delta)$ =	0.96
	$\cos(\theta-\beta)$ =	0.95
	radians/degrees =	0.0174533

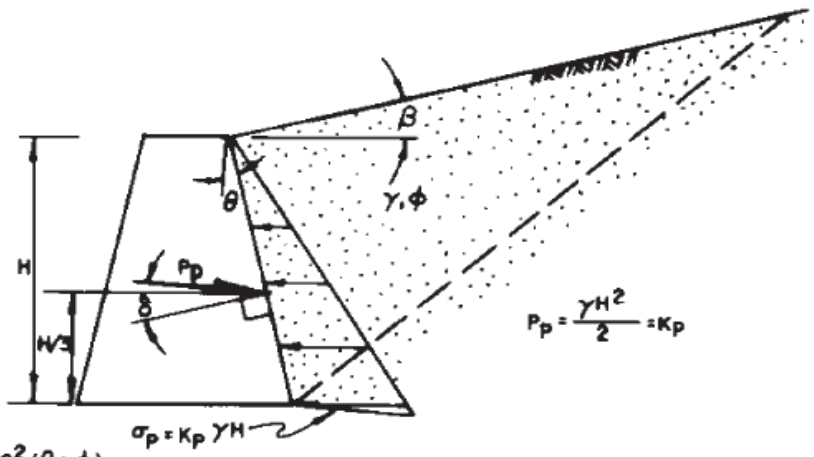
$$K_0 \approx (1-\sin\phi)(1+\sin\beta)$$

$$K_A = \frac{\cos^2(\phi-\theta)}{\cos^2\theta * \cos(\theta+\delta) * \left[1+\sqrt{\frac{\sin(\phi+\delta)*\sin(\phi-\beta)}{\cos(\theta+\delta)*\cos(\theta-\beta)}}\right]^2}$$



$$P_A = \frac{\gamma H^2}{2} K_A$$

$$K_A = \frac{\cos^2(\phi-\theta)}{\cos^2\theta\cos(\theta+\delta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\beta)}{\cos(\theta+\delta)\cos(\theta-\beta)}}\right]^2}$$



$$P_p = \frac{\gamma H^2}{2} = K_p$$

$$K_p = \frac{\cos^2(\theta+\phi)}{\cos^2\theta\cos(\theta-\delta)\left[1-\sqrt{\frac{\sin(\phi+\delta)\sin(\phi+\beta)}{\cos(\theta-\delta)\cos(\theta-\beta)}}\right]^2}$$

K_p VALUES ARE SATISFACTORY FOR $\delta \leq \phi/3$ BUT ARE UNCONSERVATIVE FOR $\delta > \phi/3$ AND THEREFORE SHOULD NOT BE USED.

FIGURE 8
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TABLE 1
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Interface Materials	Friction factor, tan [delta]	Friction angle [delta] degrees
Mass concrete on the following foundation materials:		
Clean sound rock	0.70	35
Clean gravel, gravel-sand mixtures, coarse sand	0.55 to 0.60	29 to 31
Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	0.45 to 0.55	24 to 29
Clean fine sand, silty or clayey fine to medium sand	0.35 to 0.45	19 to 24
Fine sandy silt, nonplastic silt	0.30 to 0.35	17 to 19
Very stiff and hard residual or preconsolidated clay	0.40 to 0.50	22 to 26
Medium stiff and stiff clay and silty clay	0.30 to 0.35	17 to 19
(Masonry on foundation materials has same friction factors.)		
Steel sheet piles against the following soils:		
Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	0.40	22
Clean sand, silty sand-gravel mixture, single size hard rock fill	0.30	17
Silty sand, gravel or sand mixed with silt or clay	0.25	14
Fine sandy silt, nonplastic silt	0.20	11
Formed concrete or concrete sheet piling against the following soils:		
Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	0.40 to 0.50	22 to 26
Clean sand, silty sand-gravel mixture, single size hard rock fill	0.30 to 0.40	17 to 22
Silty sand, gravel or sand mixed with silt or clay	0.30	17
Fine sandy silt, nonplastic silt	0.25	14
Various structural materials:		
Masonry on masonry, igneous and metamorphic rocks:		
Dressed soft rock on dressed soft rock	0.70	35
Dressed hard rock on dressed soft rock	0.65	33
Dressed hard rock on dressed hard rock	0.55	29
Masonry on wood (cross grain)	0.50	26
Steel on steel at sheet pile interlocks	0.30	17

Interface Materials (Cohesion)	Adhesion c+a, (psf)
Very soft cohesive soil (0 - 250 psf)	0 - 250
Soft cohesive soil (250 - 500 psf)	250 - 500
Medium stiff cohesive soil (500 - 1000 psf)	500 - 750
Stiff cohesive soil (1000 - 2000 psf)	750 - 950
Very stiff cohesive soil (2000 - 4000 psf)	950 - 1,300

Calculate Dynamic Lateral Loading - Level Backfill
SD
Active Earth Pressure

Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:**	CDS	**Date:**	6/29/2020
Date:	06/29/20	**Checked By:**	RLJ	**Date:**	6/29/2020
Contract No.:	19C21022	**Sheet No.:**	1	**of**	2

Use the Mononobe-Okabe Theory to estimate seismic earth forces

Estimated Design PGA = 0.2 g

Horizontal Acceleration Coefficient: K_h = 0.2 g

Vertical Acceleration Coefficient: K_v = 0 g

		Degrees	Radians	
Soil Friction Angle:	ϕ =	32.0	0.559	
Slope of Backfill:	β =	0.0	0.000	
Seismic Parameter:	ψ =	11.3	0.197	= arctan[k_h/(1-k_v)]
Wall Friction Angle:	δ =	17.0	0.297	
Wall Inclination from Vertical:	θ =	0.0	0.000	

Soil Unit Weight: γ = 125 pcf 19.65 kN/m^3

The active force exerted on the wall (P_{ae}) due to the combined static and earthquake pressures is:

$$P_{ae} = \frac{1}{2} K_{ae} \gamma (1 - k_v) H^2$$

0.302874

P_{ae} = 26.4 H^2 (lb/ft) or 4.14 H^2 (kN/m) 2.403553

where:

$$K_{ae} = \frac{\cos^2(\phi - \theta - \psi)}{\left[\cos\psi \cdot \cos^2\theta \cdot \cos(\delta + \theta + \psi)\left[1 + \sqrt{\frac{\sin(\delta + \phi) \cdot \sin(\phi - \beta - \psi)}{\cos(\delta + \theta + \psi) \cdot \cos(\beta - \theta)}}\right]^2\right]}$$

K_{ae} = 0.875 / (0.863 x 2.404)

K_{ae} = 0.422

The static active earth pressure coefficient (K_a) is calculated as:

$$K_a = \frac{\cos^2(\phi-\theta)}{\left[\cos^2\theta\cdot\cos(\delta+\theta)\left[1+\sqrt{\frac{\sin(\delta+\phi)\cdot\sin(\phi-\beta)}{\cos(\delta+\theta)\cdot\cos(\beta-\theta)}}\right]^2\right]}$$

0.418209

Ka = 0.7192 / 0.956 * 2.712 2.71159

Ka = 0.2773

Separate the combined static and earthquate pressure (P_{ae}) into the static component (P_a) and the dynamic component (ΔP_{ae})

$K_{ae} = K_a + \Delta K_{ae}$

where: $\Delta K_{ae} = K_{ae} - K_a$

$\Delta K_{ae} =$ 0.144

$$\Delta P_{ae} = \frac{1}{2}\gamma H^2 \cdot \Delta K_{ae}$$

$\Delta P_{ae} =$ 9.0 H^2 (lb/ft) or 1.42 H^2 (kN/m)

Notes: Notation consistent with Greek symbols used in Kramer 1996. Seed 1970 and FHWA use different notation.

Calculate Dynamic Lateral Loading - Pos. 2.5H:1V Backfill
SD
Active Earth Pressure

Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:**	CDS	**Date:**	6/29/2020
Date:	06/29/20	**Checked By:**	RLJ	**Date:**	6/29/2020
Contract No.:	19C21022	**Sheet No.:**	1	**of**	2

Use the Mononobe-Okabe Theory to estimate seismic earth forces

Estimated Design PGA = 0.2 g

Horizontal Acceleration Coefficient: K_h = 0.2 g

Vertical Acceleration Coefficient: K_v = 0 g

		Degrees	Radians	
Soil Friction Angle:	ϕ =	32.0	0.559	
Slope of Backfill:	β =	21.8	0.381	
Seismic Parameter:	ψ =	11.3	0.197	= arctan[k_h/(1-k_v)]
Wall Friction Angle:	δ =	17.0	0.297	
Wall Inclination from Vertical:	θ =	0.0	0.000	

Soil Unit Weight: γ = 125 pcf 19.65 kN/m^3

The active force exerted on the wall (P_{ae}) due to the combined static and earthquake pressures is:

$$P_{ae} = \frac{1}{2} K_{ae} \gamma (1 - k_v) H^2$$

0

P_{ae} = 63.4 H^2 (lb/ft) or 9.96 H^2 (kN/m) 1

where:

$$K_{ae} = \frac{\cos^2(\phi - \theta - \psi)}{\left[\cos\psi \cdot \cos^2\theta \cdot \cos(\delta + \theta + \psi)\left[1 + \sqrt{\frac{\sin(\delta + \phi) \cdot \sin(\phi - \beta - \psi)}{\cos(\delta + \theta + \psi) \cdot \cos(\beta - \theta)}}\right]^2\right]}$$

K_{ae} = 0.875 / (0.863 x 1.000)

K_{ae} = 1.014

The static active earth pressure coefficient (K_a) is calculated as:

$$K_a = \frac{\cos^2(\phi-\theta)}{\left[\cos^2\theta\cdot\cos(\delta+\theta)\left[1+\sqrt{\frac{\sin(\delta+\phi)\cdot\sin(\phi-\beta)}{\cos(\delta+\theta)\cdot\cos(\beta-\theta)}}\right]^2\right]}$$

						0.150499
Ka =	0.7192	/	0.956	*	1.926	1.926384
Ka =	0.3904					

Separate the combined static and earthquate pressure (P_{ae}) into the static component (P_a) and the dynamic component (ΔP_{ae})

$K_{ae} = K_a + \Delta K_{ae}$

where: $\Delta K_{ae} = K_{ae} - K_a$

$\Delta K_{ae} =$ 0.623

$$\Delta P_{ae} = \frac{1}{2}\gamma H^2 \cdot \Delta K_{ae}$$

$\Delta P_{ae} =$ 39.0 H^2 (lb/ft) or 6.13 H^2 (kN/m)

Notes: Notation consistent with Greek symbols used in Kramer 1996. Seed 1970 and FHWA use different notation.

Calculate Dynamic Lateral Loading - Pos. 3H:1V Backfill
SD
Active Earth Pressure

Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:**	CDS	**Date:**	6/29/2020
Date:	06/29/20	**Checked By:**	RLJ	**Date:**	6/29/2020
Contract No.:	19C21022	**Sheet No.:**	1	**of**	2

Use the Mononobe-Okabe Theory to estimate seismic earth forces

Estimated Design PGA = 0.2 g

Horizontal Acceleration Coefficient: K_h = 0.2 g

Vertical Acceleration Coefficient: K_v = 0 g

		Degrees	Radians	
Soil Friction Angle:	ϕ =	32.0	0.559	
Slope of Backfill:	β =	18.4	0.322	
Seismic Parameter:	ψ =	11.3	0.197	= arctan[k_h/(1-k_v)]
Wall Friction Angle:	δ =	17.0	0.297	
Wall Inclination from Vertical:	θ =	0.0	0.000	

Soil Unit Weight: γ = 125 pcf 19.65 kN/m^3

The active force exerted on the wall (P_{ae}) due to the combined static and earthquake pressures is:

$$P_{ae} = \frac{1}{2} K_{ae} \gamma (1 - k_v) H^2$$

0.035556

P_{ae} = 44.9 H^2 (lb/ft) or 7.05 H^2 (kN/m) 1.412683

where:

$$K_{ae} = \frac{\cos^2(\phi - \theta - \psi)}{\left[\cos\psi \cdot \cos^2\theta \cdot \cos(\delta + \theta + \psi)\left[1 + \sqrt{\frac{\sin(\delta + \phi) \cdot \sin(\phi - \beta - \psi)}{\cos(\delta + \theta + \psi) \cdot \cos(\beta - \theta)}}\right]^2\right]}$$

K_{ae} = 0.875 / (0.863 x 1.413)

K_{ae} = 0.718

The static active earth pressure coefficient (K_a) is calculated as:

$$K_a = \frac{\cos^2(\phi-\theta)}{\left[\cos^2\theta\cdot\cos(\delta+\theta)\left[1+\sqrt{\frac{\sin(\delta+\phi)\cdot\sin(\phi-\beta)}{\cos(\delta+\theta)\cdot\cos(\beta-\theta)}}\right]^2\right]}$$

						0.195118
Ka =	0.7192	/	0.956	*	2.079	2.07856
Ka =	0.3618					

Separate the combined static and earthquate pressure (P_{ae}) into the static component (P_a) and the dynamic component (ΔP_{ae})

$K_{ae} = K_a + \Delta K_{ae}$

where: $\Delta K_{ae} = K_{ae} - K_a$

$\Delta K_{ae} =$ 0.356

$$\Delta P_{ae} = \frac{1}{2}\gamma H^2 \cdot \Delta K_{ae}$$

$\Delta P_{ae} =$ 22.2 H^2 (lb/ft) or 3.50 H^2 (kN/m)

Notes: Notation consistent with Greek symbols used in Kramer 1996. Seed 1970 and FHWA use different notation.

Calculate Dynamic Lateral Loading - Neg. 3H:1V Backfill
SD
Active Earth Pressure

Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:**	CDS	**Date:**	6/29/2020
Date:	06/29/20	**Checked By:**	RLJ	**Date:**	6/29/2020
Contract No.:	19C21022	**Sheet No.:**	1	**of**	2

Use the Mononobe-Okabe Theory to estimate seismic earth forces

Estimated Design PGA = 0.2 g

Horizontal Acceleration Coefficient: K_h = 0.2 g

Vertical Acceleration Coefficient: K_v = 0 g

		Degrees	Radians	
Soil Friction Angle:	ϕ =	32.0	0.559	
Slope of Backfill:	β =	-18.4	-0.322	
Seismic Parameter:	ψ =	11.3	0.197	= arctan[k_h/(1-k_v)]
Wall Friction Angle:	δ =	17.0	0.297	
Wall Inclination from Vertical:	θ =	0.0	0.000	

Soil Unit Weight: γ = 125 pcf 19.65 kN/m^3

The active force exerted on the wall (P_{ae}) due to the combined static and earthquake pressures is:

$$P_{ae} = \frac{1}{2} K_{ae} \gamma (1 - k_v) H^2$$

0.570191

P_{ae} = 20.6 H^2 (lb/ft) or 3.23 H^2 (kN/m) 3.080411

where:

$$K_{ae} = \frac{\cos^2(\phi - \theta - \psi)}{\left[\cos\psi \cdot \cos^2\theta \cdot \cos(\delta + \theta + \psi)\left[1 + \sqrt{\frac{\sin(\delta + \phi) \cdot \sin(\phi - \beta - \psi)}{\cos(\delta + \theta + \psi) \cdot \cos(\beta - \theta)}}\right]^2\right]}$$

K_{ae} = 0.875 / (0.863 x 3.080)

K_{ae} = 0.329

The static active earth pressure coefficient (K_a) is calculated as:

$$K_a = \frac{\cos^2(\phi-\theta)}{\left[\cos^2\theta\cdot\cos(\delta+\theta)\left[1+\sqrt{\frac{\sin(\delta+\phi)\cdot\sin(\phi-\beta)}{\cos(\delta+\theta)\cdot\cos(\beta-\theta)}}\right]^2\right]}$$

						0.6413
Ka =	0.7192	/	0.956	*	3.243	3.242925
Ka =	0.2319					

Separate the combined static and earthquate pressure (P_{ae}) into the static component (P_a) and the dynamic component (ΔP_{ae})

$K_{ae} = K_a + \Delta K_{ae}$

where: $\Delta K_{ae} = K_{ae} - K_a$

$\Delta K_{ae} =$ 0.097

$$\Delta P_{ae} = \frac{1}{2}\gamma H^2 \cdot \Delta K_{ae}$$

$\Delta P_{ae} =$ 6.1 H^2 (lb/ft) or 0.96 H^2 (kN/m)

Notes: Notation consistent with Greek symbols used in Kramer 1996. Seed 1970 and FHWA use different notation.

Calculate Dynamic Lateral Loading - Level Backfill
NLD, PLD, & ULD
Active Earth Pressure

Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:**	CDS	**Date:**	6/29/2020
Date:	06/29/20	**Checked By:**	RLJ	**Date:**	6/29/2020
Contract No.:	19C21022	**Sheet No.:**	1	**of**	2

Use the Mononobe-Okabe Theory to estimate seismic earth forces

Estimated Design PGA = 0.14 g

Horizontal Acceleration Coefficient: K_h = 0.14 g

Vertical Acceleration Coefficient: K_v = 0 g

		Degrees	Radians	
Soil Friction Angle:	ϕ =	32.0	0.559	
Slope of Backfill:	β =	0.0	0.000	
Seismic Parameter:	ψ =	8.0	0.139	= arctan[k_h/(1-k_v)]
Wall Friction Angle:	δ =	17.0	0.297	
Wall Inclination from Vertical:	θ =	0.0	0.000	

Soil Unit Weight: γ = 125 pcf 19.65 kN/m^3

The active force exerted on the wall (P_{ae}) due to the combined static and earthquake pressures is:

$$P_{ae} = \frac{1}{2} K_{ae} \gamma (1 - k_v) H^2$$

0.339021

P_{ae} = 23.2 H^2 (lb/ft) or 3.65 H^2 (kN/m) 2.503532

where:

$$K_{ae} = \frac{\cos^2(\phi - \theta - \psi)}{\left[\cos\psi \cdot \cos^2\theta \cdot \cos(\delta + \theta + \psi)\left[1 + \sqrt{\frac{\sin(\delta + \phi) \cdot \sin(\phi - \beta - \psi)}{\cos(\delta + \theta + \psi) \cdot \cos(\beta - \theta)}}\right]^2\right]}$$

K_{ae} = 0.834 / (0.898 x 2.504)

K_{ae} = 0.371

The static active earth pressure coefficient (K_a) is calculated as:

$$K_a = \frac{\cos^2(\phi-\theta)}{\left[\cos^2\theta\cdot\cos(\delta+\theta)\left[1+\sqrt{\frac{\sin(\delta+\phi)\cdot\sin(\phi-\beta)}{\cos(\delta+\theta)\cdot\cos(\beta-\theta)}}\right]^2\right]}$$

0.418209

Ka = 0.7192 / 0.956 * 2.712 2.71159

Ka = 0.2773

Separate the combined static and earthquate pressure (P_{ae}) into the static component (P_a) and the dynamic component (ΔP_{ae})

$K_{ae} = K_a + \Delta K_{ae}$

where: $\Delta K_{ae} = K_{ae} - K_a$

$\Delta K_{ae} =$ 0.094

$$\Delta P_{ae} = \frac{1}{2}\gamma H^2 \cdot \Delta K_{ae}$$

$\Delta P_{ae} =$ 5.9 H^2 (lb/ft) or 0.92 H^2 (kN/m)

Notes: Notation consistent with Greek symbols used in Kramer 1996. Seed 1970 and FHWA use different notation.

Calculate Dynamic Lateral Loading - Pos. 2.5H:1V Backfill
NLD, PLD, & ULD
Active Earth Pressure

Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:**	CDS	**Date:**	6/29/2020
Date:	06/29/20	**Checked By:**	RLJ	**Date:**	6/29/2020
Contract No.:	19C21022	**Sheet No.:**	1	**of**	2

Use the Mononobe-Okabe Theory to estimate seismic earth forces

Estimated Design PGA = 0.14 g

Horizontal Acceleration Coefficient: K_h = 0.14 g

Vertical Acceleration Coefficient: K_v = 0 g

		Degrees	Radians	
Soil Friction Angle:	ϕ =	32.0	0.559	
Slope of Backfill:	β =	21.8	0.381	
Seismic Parameter:	ψ =	8.0	0.139	= arctan[k_h/(1-k_v)]
Wall Friction Angle:	δ =	17.0	0.297	
Wall Inclination from Vertical:	θ =	0.0	0.000	

Soil Unit Weight: γ = 125 pcf 19.65 kN/m^3

The active force exerted on the wall (P_{ae}) due to the combined static and earthquake pressures is:

$$P_{ae} = \frac{1}{2} K_{ae} \gamma (1 - k_v) H^2$$

0.034874

P_{ae} = 41.2 H^2 (lb/ft) or 6.48 H^2 (kN/m) 1.408365

where:

$$K_{ae} = \frac{\cos^2(\phi - \theta - \psi)}{\left[\cos\psi \cdot \cos^2\theta \cdot \cos(\delta + \theta + \psi)\left[1 + \sqrt{\frac{\sin(\delta + \phi) \cdot \sin(\phi - \beta - \psi)}{\cos(\delta + \theta + \psi) \cdot \cos(\beta - \theta)}}\right]^2\right]}$$

K_{ae} = 0.834 / (0.898 x 1.408)

K_{ae} = 0.660

The static active earth pressure coefficient (K_a) is calculated as:

$$K_a = \frac{\cos^2(\phi-\theta)}{\left[\cos^2\theta\cdot\cos(\delta+\theta)\left[1+\sqrt{\frac{\sin(\delta+\phi)\cdot\sin(\phi-\beta)}{\cos(\delta+\theta)\cdot\cos(\beta-\theta)}}\right]^2\right]}$$

						0.150499
Ka =	0.7192	/	0.956	*	1.926	1.926384
Ka =	0.3904					

Separate the combined static and earthquate pressure (P_{ae}) into the static component (P_a) and the dynamic component (ΔP_{ae})

$K_{ae} = K_a + \Delta K_{ae}$

where: $\Delta K_{ae} = K_{ae} - K_a$

$\Delta K_{ae} =$ 0.269

$$\Delta P_{ae} = \frac{1}{2}\gamma H^2 \cdot \Delta K_{ae}$$

$\Delta P_{ae} =$ 16.8 H^2 (lb/ft) or 2.65 H^2 (kN/m)

Notes: Notation consistent with Greek symbols used in Kramer 1996. Seed 1970 and FHWA use different notation.

Calculate Dynamic Lateral Loading - Pos. 3H:1V Backfill
NLD, PLD, & ULD
Active Earth Pressure

Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:**	CDS	**Date:**	6/29/2020
Date:	06/29/20	**Checked By:**	RLJ	**Date:**	6/29/2020
Contract No.:	19C21022	**Sheet No.:**	1	**of**	2

Use the Mononobe-Okabe Theory to estimate seismic earth forces

Estimated Design PGA = 0.14 g

Horizontal Acceleration Coefficient: K_h = 0.14 g

Vertical Acceleration Coefficient: K_v = 0 g

		Degrees	Radians	
Soil Friction Angle:	ϕ =	32.0	0.559	
Slope of Backfill:	β =	18.4	0.322	
Seismic Parameter:	ψ =	8.0	0.139	= arctan[k_h/(1-k_v)]
Wall Friction Angle:	δ =	17.0	0.297	
Wall Inclination from Vertical:	θ =	0.0	0.000	

Soil Unit Weight: γ = 125 pcf 19.65 kN/m^3

The active force exerted on the wall (P_{ae}) due to the combined static and earthquake pressures is:

$$P_{ae} = \frac{1}{2} K_{ae} \gamma (1 - k_v) H^2$$

0.085565

P_{ae} = 34.8 H^2 (lb/ft) or 5.47 H^2 (kN/m) 1.670595

where:

$$K_{ae} = \frac{\cos^2(\phi - \theta - \psi)}{\left[\cos\psi \cdot \cos^2\theta \cdot \cos(\delta + \theta + \psi)\left[1 + \sqrt{\frac{\sin(\delta + \phi) \cdot \sin(\phi - \beta - \psi)}{\cos(\delta + \theta + \psi) \cdot \cos(\beta - \theta)}}\right]^2\right]}$$

K_{ae} = 0.834 / (0.898 x 1.671)

K_{ae} = 0.556

The static active earth pressure coefficient (K_a) is calculated as:

$$K_a = \frac{\cos^2(\phi-\theta)}{\left[\cos^2\theta\cdot\cos(\delta+\theta)\left[1+\sqrt{\frac{\sin(\delta+\phi)\cdot\sin(\phi-\beta)}{\cos(\delta+\theta)\cdot\cos(\beta-\theta)}}\right]^2\right]}$$

						0.195118
Ka =	0.7192	/	0.956	*	2.079	2.07856
Ka =	0.3618					

Separate the combined static and earthquate pressure (P_{ae}) into the static component (P_a) and the dynamic component (ΔP_{ae})

$K_{ae} = K_a + \Delta K_{ae}$

where: $\Delta K_{ae} = K_{ae} - K_a$

$\Delta K_{ae} =$ 0.194

$$\Delta P_{ae} = \frac{1}{2}\gamma H^2 \cdot \Delta K_{ae}$$

$\Delta P_{ae} =$ 12.1 H^2 (lb/ft) or 1.91 H^2 (kN/m)

Notes: Notation consistent with Greek symbols used in Kramer 1996. Seed 1970 and FHWA use different notation.

Calculate Dynamic Lateral Loading - Neg. 3H:1V Backfill
NLD, PLD, & ULD
Active Earth Pressure

Project:	Boiling Spring Lakes Dams Rehabilitation	**Calculations By:**	CDS	**Date:**	6/29/2020
Date:	06/29/20	**Checked By:**	RLJ	**Date:**	6/29/2020
Contract No.:	19C21022	**Sheet No.:**	1	**of**	2

Use the Mononobe-Okabe Theory to estimate seismic earth forces

Estimated Design PGA = 0.14 g

Horizontal Acceleration Coefficient: K_h = 0.14 g

Vertical Acceleration Coefficient: K_v = 0 g

		Degrees	Radians	
Soil Friction Angle:	ϕ =	32.0	0.559	
Slope of Backfill:	β =	-18.4	-0.322	
Seismic Parameter:	ψ =	8.0	0.139	= arctan[k_h/(1-k_v)]
Wall Friction Angle:	δ =	17.0	0.297	
Wall Inclination from Vertical:	θ =	0.0	0.000	

Soil Unit Weight: γ = 125 pcf 19.65 kN/m^3

The active force exerted on the wall (P_{ae}) due to the combined static and earthquake pressures is:

$$P_{ae} = \frac{1}{2} K_{ae} \gamma (1 - k_v) H^2$$

0.592478

P_{ae} = 18.5 H^2 (lb/ft) or 2.92 H^2 (kN/m) 3.131929

where:

$$K_{ae} = \frac{\cos^2(\phi - \theta - \psi)}{\left[\cos\psi \cdot \cos^2\theta \cdot \cos(\delta + \theta + \psi)\left[1 + \sqrt{\frac{\sin(\delta + \phi) \cdot \sin(\phi - \beta - \psi)}{\cos(\delta + \theta + \psi) \cdot \cos(\beta - \theta)}}\right]^2\right]}$$

K_{ae} = 0.834 / (0.898 x 3.132)

K_{ae} = 0.297

The static active earth pressure coefficient (K_a) is calculated as:

$$K_a = \frac{\cos^2(\phi-\theta)}{\left[\cos^2\theta\cdot\cos(\delta+\theta)\left[1+\sqrt{\frac{\sin(\delta+\phi)\cdot\sin(\phi-\beta)}{\cos(\delta+\theta)\cdot\cos(\beta-\theta)}}\right]^2\right]}$$

						0.6413
Ka =	0.7192	/	0.956	*	3.243	3.242925
Ka =	0.2319					

Separate the combined static and earthquate pressure (P_{ae}) into the static component (P_a) and the dynamic component (ΔP_{ae})

$K_{ae} = K_a + \Delta K_{ae}$

where: $\Delta K_{ae} = K_{ae} - K_a$

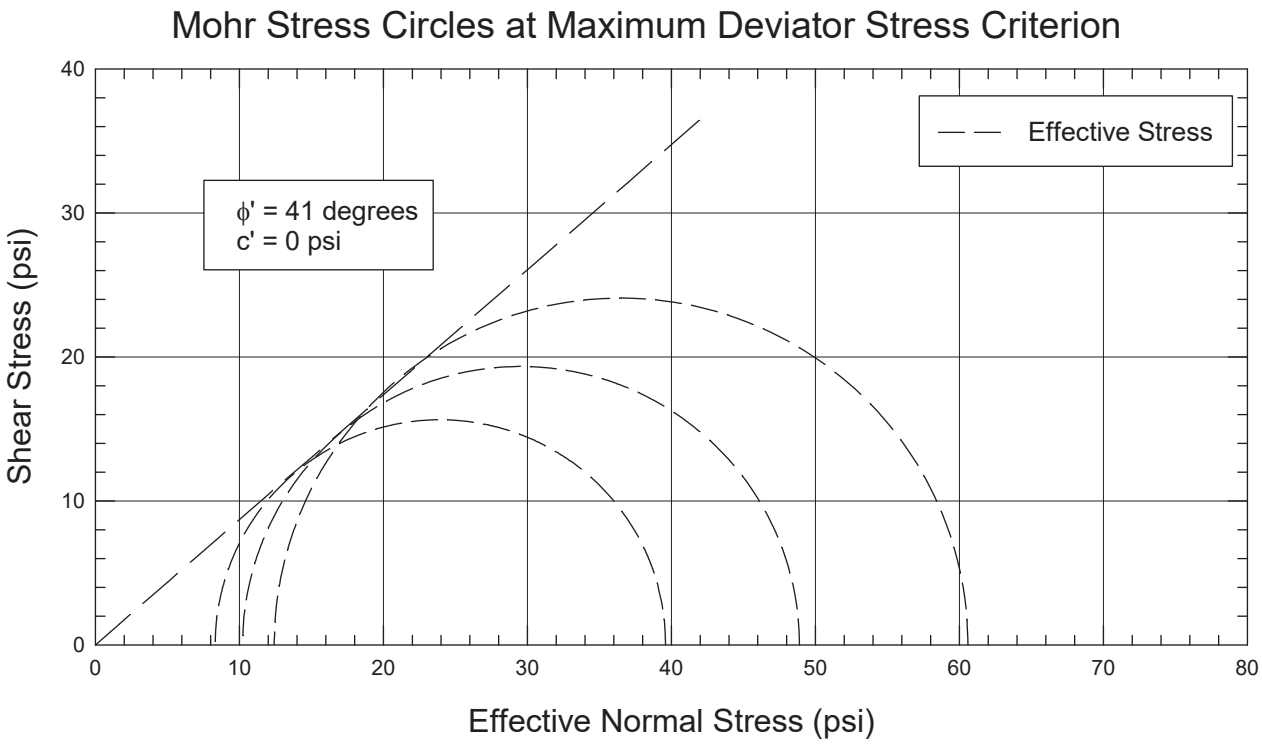
$\Delta K_{ae} =$ 0.065

$$\Delta P_{ae} = \frac{1}{2}\gamma H^2 \cdot \Delta K_{ae}$$

$\Delta P_{ae} =$ 4.0 H^2 (lb/ft) or 0.64 H^2 (kN/m)

Notes: Notation consistent with Greek symbols used in Kramer 1996. Seed 1970 and FHWA use different notation.

Consolidated Drained (CD) Triaxial Shear



Testing Lab: BLAC

Boring No.: *ULD-TP-1/SD-TP-2* Depth: *7-10 ft.* Elevation *-- ft.* SE Contract: *19C21022.01* Date: *1/7/21*

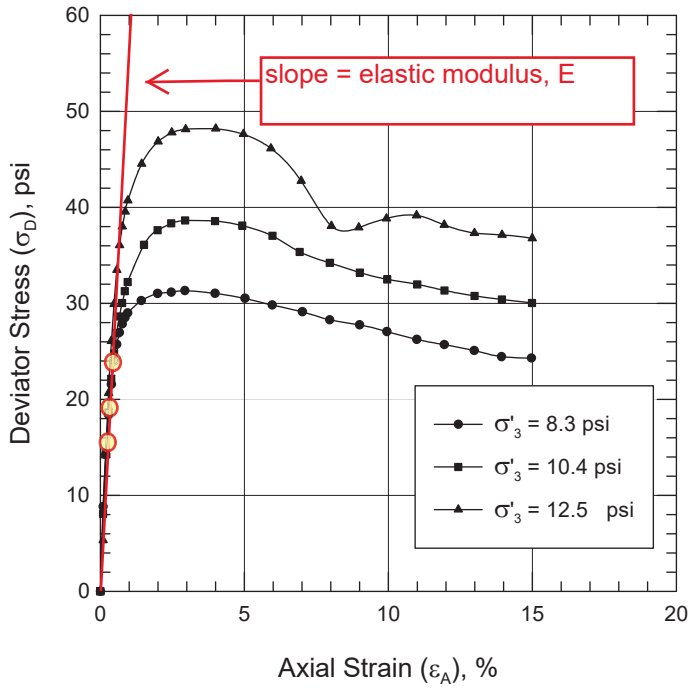
Sample Description: *SILTY SAND (SM), fine sand, trace gravel, brown* Reviewed By: *TTM*

Specimen Type: *Reconstituted to 95% $\gamma_{d,max}$ @ OMC +2% (D1557A)* Gs: *2.65* LL: *NP* PI: *NP* %<200: *14.9*

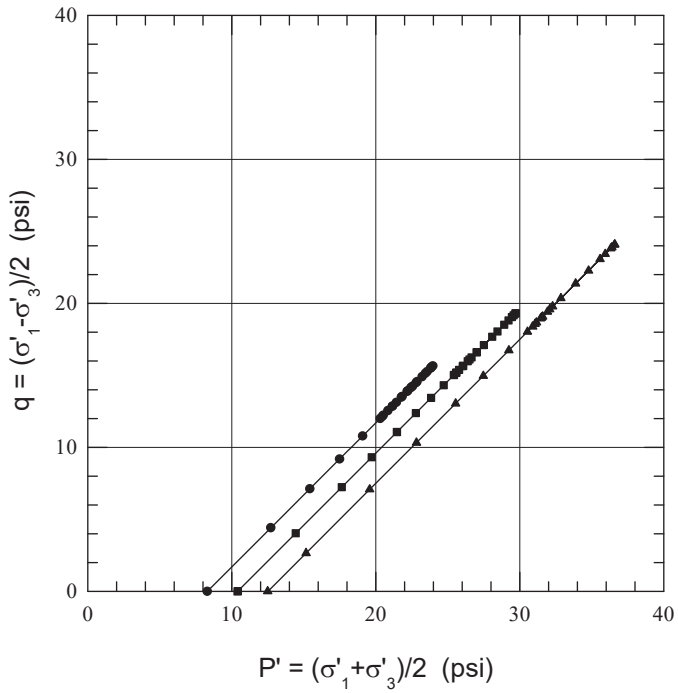
Schnabel ENGINEERING

Boiling Springs Lake Dams Remediation
Brunswick County
Boiling Springs, NC

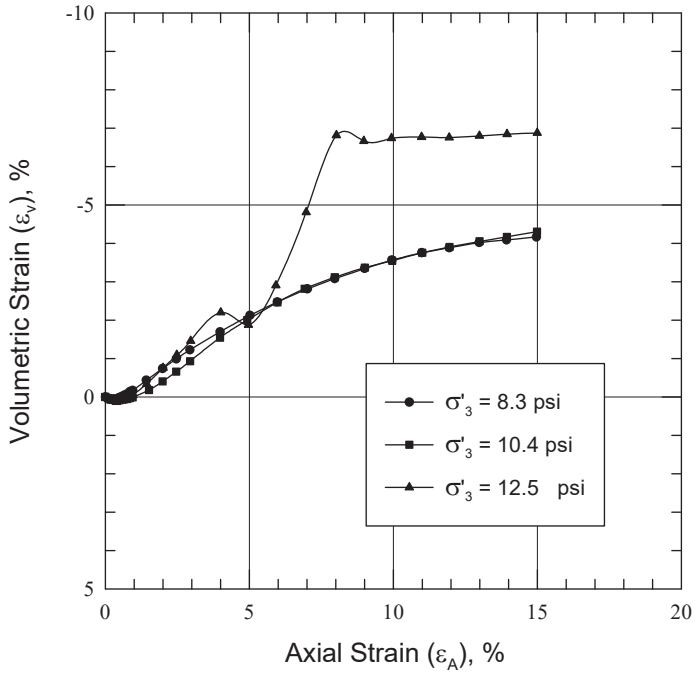
Deviator Stress vs. Axial Strain



Stress Paths



Volumetric Strain vs. Axial Strain



E = 55 psi / 1% = 5,500 psi

Testing Lab: BLAC

Boring No.: *ULD-TP-1/SD-TP-2* Depth: *7-10 ft.* Elevation *-- ft.* SE Contract: *19C21022.01* Date: *1/7/21*

Sample Description: *SILTY SAND (SM), fine sand, trace gravel, brown* Reviewed By: *TTM*

Specimen Type: *Reconstituted to 95% $\gamma_{d,max}$ @ OMC +2% (D1557A)* Gs: *2.65* LL: *NP* PI: *NP* %<200: *14.9*

Schnabel ENGINEERING

Boiling Springs Lake Dams Remediation
Brunswick County
Boiling Springs Lakes, NC

Schnabel ENGINEERING

Consolidated Drained Triaxial Compression Test

ASTM D7181

Project: *Boiling Spring Lake Dams Remediation*
Brunswick County
Location: *Boiling Springs Lakes, NC*

Schnabel Contract: *19C21022.01* Date: *1/7/2021*
Boring No.: *ULD-TP-1/SD-TP-2*
Depth: *7-10 ft.*
Elevation: --
Reviewed by: *TTM*
Confining Stress (psi): *8.3*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.900	2.90
Height (in)	5.867	5.86
Area (in^2)	6.61	6.60
Moisture (%)	14.7	
W_{solids} (lbs)	2.36	
ρ_{wet} (pcf)	120.6	
ρ_{dry} (pcf)	105.1	105.3
Void Ratio	0.57	0.57
Saturation, %	68	100

Shear Testing Conditions	
Cell Pressure (psi):	83.3
Back Pressure (psi):	75.0
Eff. Confining Stress (psi):	8.3
Final B check	1.00
t_{90} (min.):	0.3
Rate of Strain (%/min):	0.0204

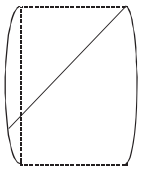
Filter strips used? *NO*

Specimen Type: *Reconstituted Sample*

Soil Description: *SILTY SAND (SM), fine sand, trace gravel, brown*

Liquid Limit: *NP*
Plasticity Index: *NP*
% finer than No. 200: *14.9*
Specific Gravity: *2.65*

Failure Sketch



Remarks: *Compacted to 95% max. dry density at OMC + 2% target conditions (D-1557A).*

Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Change in Volume (cm^3)	Volumetric Strain (%)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	75.0	0.0	0.0	0.00	6.60	8.3	8.3	8.3	8.3	0.0	8.3	8.3	0.0
1	58.4	58.4	0.005	0.09	75.0	0.0	0.2	0.04	6.61	17.1	8.3	17.1	8.3	8.8	12.7	12.7	4.4
2	94.2	94.2	0.011	0.19	75.0	0.0	0.3	0.05	6.61	22.5	8.3	22.5	8.3	14.2	15.4	15.4	7.1
3	121.7	121.6	0.016	0.28	75.0	0.0	0.3	0.05	6.62	26.7	8.3	26.7	8.3	18.4	17.5	17.5	9.2
4	143.0	142.9	0.022	0.38	75.0	0.0	0.3	0.05	6.62	29.9	8.3	29.9	8.3	21.6	19.1	19.1	10.8
5	159.4	159.3	0.028	0.47	75.0	0.0	0.2	0.02	6.63	32.3	8.3	32.3	8.3	24.0	20.3	20.3	12.0
6	171.0	170.8	0.033	0.56	75.1	0.1	0.0	-0.01	6.64	34.0	8.3	34.0	8.2	25.7	21.2	21.1	12.9
7	179.4	179.3	0.039	0.66	75.1	0.1	-0.3	-0.05	6.65	35.3	8.3	35.2	8.2	27.0	21.8	21.7	13.5
8	185.7	185.5	0.044	0.75	75.0	0.0	-0.5	-0.08	6.66	36.2	8.3	36.1	8.3	27.9	22.2	22.2	13.9
9	190.3	190.1	0.050	0.85	75.0	0.0	-0.9	-0.14	6.67	36.8	8.3	36.8	8.3	28.5	22.6	22.5	14.3
10	193.9	193.7	0.055	0.94	75.0	0.0	-1.1	-0.17	6.68	37.3	8.3	37.3	8.3	29.0	22.8	22.8	14.5
11	204.0	203.7	0.083	1.42	75.0	0.0	-2.7	-0.43	6.73	38.6	8.3	38.6	8.3	30.3	23.4	23.4	15.1
12	211.0	210.6	0.116	1.99	75.0	0.0	-4.7	-0.74	6.79	39.3	8.3	39.3	8.3	31.0	23.8	23.8	15.5
13	213.6	213.1	0.144	2.46	75.0	0.0	-6.3	-0.99	6.84	39.5	8.3	39.5	8.3	31.2	23.9	23.9	15.6
14	216.4	215.7	0.172	2.93	75.0	0.0	-7.8	-1.22	6.88	39.6	8.3	39.6	8.3	31.3	24.0	24.0	15.7
15	218.0	217.1	0.233	3.98	75.0	0.0	-10.8	-1.69	6.99	39.4	8.3	39.4	8.3	31.1	23.8	23.9	15.5
16	217.8	216.7	0.294	5.02	75.0	0.0	-13.5	-2.12	7.10	38.8	8.3	38.8	8.3	30.5	23.6	23.5	15.3
17	215.9	214.6	0.350	5.96	75.1	0.1	-15.7	-2.47	7.19	38.1	8.3	38.0	8.2	29.8	23.2	23.1	14.9
18	214.2	212.7	0.411	7.01	75.2	0.2	-17.8	-2.81	7.30	37.4	8.3	37.2	8.1	29.1	22.9	22.6	14.6
19	210.9	209.2	0.466	7.95	75.2	0.2	-19.5	-3.08	7.39	36.6	8.3	36.4	8.1	28.3	22.4	22.2	14.1
20	210.2	208.2	0.528	9.00	75.2	0.2	-21.2	-3.34	7.50	36.1	8.3	35.9	8.1	27.8	22.2	22.0	13.9
21	207.7	205.5	0.583	9.94	75.2	0.2	-22.6	-3.56	7.59	35.4	8.3	35.2	8.1	27.1	21.8	21.7	13.5
22					75.2	0.2	-23.8	-3.75	7.69	34.6	8.3	34.3	8.1	26.3	21.4	21.2	13.1
23					75.2	0.2	-24.6	-3.88	7.79	34.0	8.3	33.8	8.1	25.7	21.2	20.9	12.9
24					75.2	0.2	-25.5	-4.02	7.89	33.4	8.3	33.2	8.1	25.1	20.8	20.7	12.5
25	198.3	195.3	0.816	13.92	75.2	0.2	-25.9	-4.09	7.98	32.8	8.3	32.6	8.1	24.5	20.5	20.4	12.2
26	199.9	196.6	0.878	14.97	75.2	0.2	-26.4	-4.16	8.09	32.6	8.3	32.4	8.1	24.3	20.5	20.3	12.2

Peak strength = 31.3 psi
1/2 peak strength = 15.7 psi

Notes:
1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method
3. Positive volumetric strain represents compression of the sample.

Testing Lab: BLAC
CD 8/2008 Rev. 1

Schnabel ENGINEERING

Consolidated Drained Triaxial Compression Test

ASTM D7181

Project: *Boiling Spring Lake Dams Remediation*
Brunswick County
Location: *Boiling Springs Lakes, NC*

Schnabel Contract: *19C21022.01* Date: *1/7/2021*
Boring No.: *ULD-TP-1/SD-TP-2*
Depth: *7-10 ft.*
Elevation: *--* Reviewed by: *TTM*
Confining Stress (psi): *10.4*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.899	2.90
Height (in)	5.860	5.86
Area (in^2)	6.60	6.59
Moisture (%)	14.2	
W_{solids} (lbs)	2.35	
ρ_{wet} (pcf)	120.0	
ρ_{dry} (pcf)	105.1	105.3
Void Ratio	0.57	0.57
Saturation, %	66	100

Shear Testing Conditions	
Cell Pressure (psi):	80.4
Back Pressure (psi):	70.0
Eff. Confining Stress (psi):	10.4
Final B check	0.96
t_{90} (min.):	0.1
Rate of Strain (%/min):	0.0204

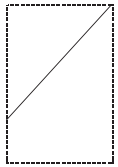
Filter strips used? *NO*

Specimen Type: *Reconstituted Sample*

Soil Description: *SILTY SAND (SM), fine sand, trace gravel, brown*

Liquid Limit: *NP*
Plasticity Index: *NP*
% finer than No. 200: *14.9*
Specific Gravity: *2.65*

Failure Sketch



Remarks: *Compacted to 95% max. dry density at OMC + 2% target conditions (D-1557A).*

Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Change in Volume (cm^3)	Volumetric Strain (%)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	70.0	0.0	0.0	0.00	6.59	10.4	10.4	10.4	10.4	0.0	10.4	10.4	0.0
1	53.4	53.4	0.005	0.09	70.0	0.0	0.2	0.03	6.59	18.5	10.4	18.5	10.4	8.1	14.4	14.4	4.0
2	95.6	95.6	0.011	0.18	70.1	0.1	0.4	0.07	6.60	24.9	10.4	24.8	10.3	14.5	17.6	17.6	7.2
3	123.3	123.2	0.016	0.28	70.1	0.1	0.5	0.08	6.60	29.1	10.4	29.0	10.3	18.7	19.7	19.6	9.3
4	146.5	146.5	0.022	0.37	70.1	0.1	0.6	0.09	6.61	32.6	10.4	32.5	10.3	22.2	21.5	21.4	11.1
5	164.2	164.1	0.027	0.47	70.0	0.0	0.4	0.07	6.62	35.2	10.4	35.2	10.4	24.8	22.8	22.8	12.4
6	178.4	178.3	0.033	0.56	70.2	0.2	0.3	0.05	6.62	37.3	10.4	37.1	10.2	26.9	23.9	23.7	13.5
7	190.2	190.0	0.038	0.66	70.1	0.1	0.4	0.06	6.63	39.1	10.4	38.9	10.3	28.7	24.7	24.6	14.3
8	199.7	199.5	0.044	0.75	70.1	0.1	0.3	0.05	6.64	40.5	10.4	40.4	10.3	30.1	25.4	25.3	15.0
9	208.0	207.9	0.050	0.85	70.1	0.1	0.2	0.03	6.64	41.7	10.4	41.6	10.3	31.3	26.0	26.0	15.6
10	214.6	214.4	0.055	0.94	70.1	0.1	0.1	0.01	6.65	42.6	10.4	42.5	10.3	32.2	26.5	26.4	16.1
11	242.4	242.1	0.088	1.51	70.1	0.1	-1.1	-0.18	6.70	46.5	10.4	46.4	10.3	36.1	28.5	28.4	18.1
12	254.5	254.1	0.116	1.98	70.1	0.1	-2.5	-0.40	6.75	48.0	10.4	47.9	10.3	37.6	29.2	29.1	18.8
13	261.4	260.9	0.144	2.46	70.2	0.2	-4.2	-0.66	6.80	48.8	10.4	48.6	10.2	38.4	29.6	29.4	19.2
14	265.4	264.8	0.172	2.93	70.2	0.2	-5.9	-0.93	6.85	49.0	10.4	48.9	10.2	38.6	29.7	29.6	19.3
15	269.9	269.0	0.233	3.98	70.2	0.2	-9.8	-1.54	6.97	49.0	10.4	48.8	10.2	38.6	29.7	29.5	19.3
16	270.6	269.5	0.288	4.93	70.1	0.1	-12.7	-2.00	7.07	48.5	10.4	48.4	10.3	38.1	29.5	29.3	19.1
17	267.4	266.1	0.350	5.97	70.2	0.2	-15.6	-2.46	7.18	47.4	10.4	47.3	10.2	37.0	28.9	28.8	18.5
18	259.0	257.5	0.405	6.92	70.2	0.2	-17.8	-2.82	7.28	45.8	10.4	45.6	10.2	35.4	28.1	27.9	17.7
19	254.5	252.8	0.466	7.96	70.2	0.2	-19.7	-3.12	7.38	44.6	10.4	44.4	10.2	34.2	27.5	27.3	17.1
20	250.7	248.7	0.527	9.01	70.1	0.1	-21.3	-3.37	7.49	43.6	10.4	43.5	10.3	33.2	27.0	26.9	16.6
21	248.6	246.5	0.583	9.95	70.1	0.1	-22.4	-3.55	7.58	42.9	10.4	42.8	10.3	32.5	26.7	26.5	16.3
22					70.2	0.2	-23.7	-3.75	7.68	42.4	10.4	42.2	10.2	32.0	26.4	26.2	16.0
23					70.2	0.2	-24.7	-3.90	7.78	41.8	10.4	41.6	10.2	31.4	26.1	25.9	15.7
24					70.2	0.2	-25.6	-4.05	7.88	41.2	10.4	41.0	10.2	30.8	25.8	25.6	15.4
25	245.7	242.7	0.816	13.94	70.1	0.1	-26.4	-4.17	7.98	40.8	10.4	40.7	10.3	30.4	25.6	25.5	15.2
26	246.3	243.0	0.877	14.98	70.1	0.1	-27.2	-4.30	8.09	40.5	10.4	40.3	10.3	30.1	25.4	25.3	15.0

Peak strength = 38.6 psi
1/2 peak strength = 19.3 psi

Notes:
1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method
3. Positive volumetric strain represents compression of the sample.

Testing Lab: BLAC
CD 8/2008 Rev. 1

Schnabel ENGINEERING

Consolidated Drained Triaxial Compression Test

ASTM D7181

Project: *Boiling Spring Lake Dams Remediation*
Brunswick County
Location: *Boiling Springs Lakes, NC*

Schnabel Contract: *19C21022.01* Date: *1/7/2021*
Boring No.: *ULD-TP-1/SD-TP-2*
Depth: *7-10 ft.*
Elevation: *--* Reviewed by: *TTM*
Confining Stress (psi): *12.5*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.903	2.90
Height (in)	5.818	5.82
Area (in^2)	6.62	6.60
Moisture (%)	14.6	
W_{solids} (lbs)	2.40	
ρ_{wet} (pcf)	123.1	
ρ_{dry} (pcf)	107.4	107.8
Void Ratio	0.54	0.53
Saturation, %	72	100

Shear Testing Conditions	
Cell Pressure (psi):	82.5
Back Pressure (psi):	70.0
Eff. Confining Stress (psi):	12.5
Final B check	0.96
t_{90} (min.):	4.9
Rate of Strain (%/min):	0.0204

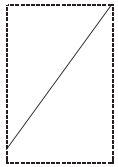
Filter strips used? *NO*

Specimen Type: *Reconstituted Sample*

Soil Description: *SILTY SAND (SM), fine sand, trace gravel, brown*

Liquid Limit: *NP*
Plasticity Index: *NP*
% finer than No. 200: *14.9*
Specific Gravity: *2.65*

Failure Sketch



Remarks: *Compacted to 95% max. dry density at OMC + 2% target conditions (D-1557A).*

Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Change in Volume (cm^3)	Volumetric Strain (%)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	70.0	0.0	0.0	0.00	6.60	12.5	12.5	12.5	12.5	0.0	12.5	12.5	0.0
1	35.2	35.2	0.005	0.09	70.1	0.1	0.2	0.03	6.61	17.8	12.5	17.7	12.4	5.3	15.2	15.1	2.7
2	93.7	93.6	0.011	0.19	70.1	0.1	0.6	0.09	6.61	26.7	12.5	26.5	12.4	14.2	19.6	19.5	7.1
3	136.8	136.7	0.016	0.28	70.1	0.1	0.6	0.10	6.62	33.2	12.5	33.0	12.4	20.7	22.8	22.7	10.3
4	172.9	172.8	0.022	0.38	70.1	0.1	0.8	0.13	6.62	38.6	12.5	38.5	12.4	26.1	25.5	25.4	13.0
5	198.5	198.4	0.027	0.47	70.1	0.1	0.7	0.12	6.63	42.4	12.5	42.3	12.4	29.9	27.5	27.3	15.0
6	222.3	222.2	0.033	0.57	70.1	0.1	0.6	0.10	6.63	46.0	12.5	45.9	12.4	33.5	29.2	29.1	16.7
7	239.8	239.6	0.039	0.66	70.1	0.1	0.5	0.07	6.64	48.6	12.5	48.5	12.4	36.1	30.5	30.4	18.0
8	253.0	252.9	0.044	0.76	70.1	0.1	0.3	0.04	6.65	50.5	12.5	50.4	12.4	38.0	31.5	31.4	19.0
9	263.8	263.6	0.050	0.85	70.1	0.1	0.0	0.00	6.66	52.1	12.5	52.0	12.4	39.6	32.3	32.2	19.8
10	271.9	271.6	0.055	0.95	70.1	0.1	-0.3	-0.04	6.67	53.2	12.5	53.1	12.4	40.7	32.9	32.7	20.4
11	299.8	299.5	0.083	1.43	70.1	0.1	-2.1	-0.34	6.72	57.1	12.5	56.9	12.4	44.6	34.8	34.7	22.3
12	318.6	318.2	0.116	2.00	70.2	0.2	-4.7	-0.75	6.79	59.4	12.5	59.2	12.3	46.9	35.9	35.8	23.4
13	327.8	327.2	0.144	2.48	70.1	0.1	-6.9	-1.09	6.85	60.3	12.5	60.2	12.4	47.8	36.4	36.3	23.9
14	333.1	332.5	0.172	2.96	70.1	0.1	-9.2	-1.46	6.90	60.7	12.5	60.6	12.4	48.2	36.6	36.5	24.1
15	339.8	338.9	0.233	4.01	70.1	0.1	-13.8	-2.20	7.03	60.7	12.5	60.6	12.4	48.2	36.6	36.5	24.1
16	338.3	337.2	0.289	4.96	70.1	0.1	-11.8	-1.87	7.08	60.1	12.5	60.1	12.4	47.6	36.3	36.2	23.8
17	334.7	333.4	0.344	5.92	70.0	0.0	-18.3	-2.90	7.22	58.7	12.5	58.6	12.5	46.2	35.6	35.5	23.1
18	319.7	318.2	0.405	6.97	70.0	0.0	-30.3	-4.81	7.44	55.3	12.5	55.3	12.5	42.8	33.9	33.9	21.4
19	293.6	291.9	0.466	8.02	70.0	0.0	-42.9	-6.81	7.67	50.6	12.5	50.5	12.5	38.1	31.5	31.5	19.0
20	295.3	293.3	0.522	8.97	70.1	0.1	-41.9	-6.66	7.74	50.4	12.5	50.3	12.4	37.9	31.5	31.4	19.0
21	306.2	304.0	0.577	9.93	70.1	0.1	-42.4	-6.74	7.83	51.3	12.5	51.3	12.4	38.8	31.9	31.8	19.4
22					70.0	0.0	-42.6	-6.77	7.92	51.7	12.5	51.6	12.5	39.2	32.1	32.0	19.6
23					70.0	0.0	-42.5	-6.75	8.01	50.7	12.5	50.6	12.5	38.2	31.6	31.6	19.1
24					70.0	0.0	-42.8	-6.80	8.11	49.8	12.5	49.9	12.5	37.3	31.2	31.2	18.7
25	307.6	304.6	0.811	13.94	69.9	-0.1	-43.1	-6.84	8.20	49.7	12.5	49.8	12.6	37.2	31.1	31.2	18.6
26	308.7	305.5	0.872	14.99	69.8	-0.2	-43.2	-6.87	8.30	49.3	12.5	49.5	12.7	36.8	30.9	31.1	18.4

Peak strength = 48.2 psi
1/2 peak strength = 24.1 psi

Notes:
1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method
3. Positive volumetric strain represents compression of the sample.

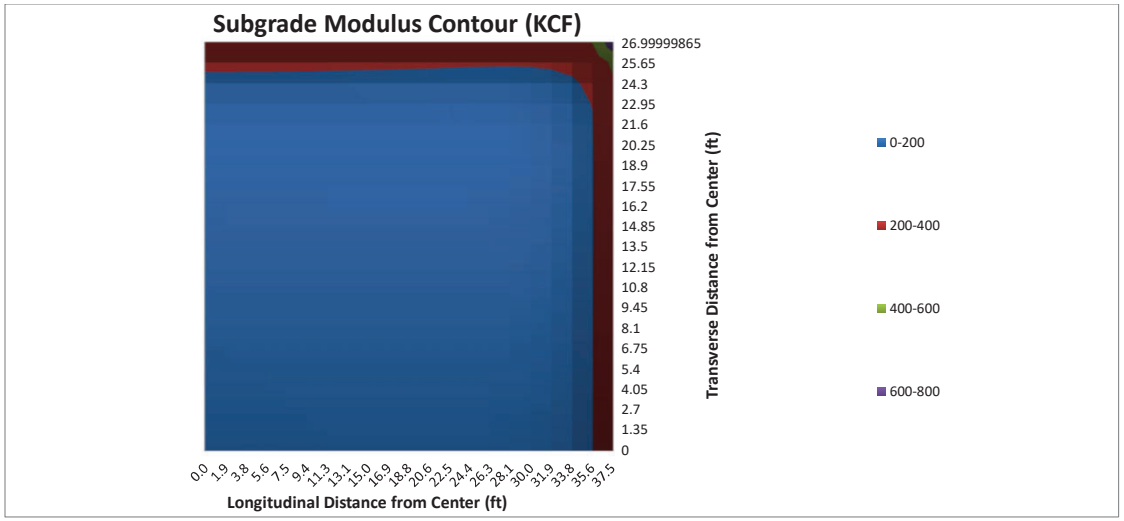
Testing Lab: BLAC
CD 8/2008 Rev. 1

SUBGRADE MODULUS CALCULATION

Based on Elastic Theories Developed by Steinbrenner (1934), Mayne and Poulos (1999), and presented by Bowles (1996) and Das et. al. (2009)

Foundation Width (Leaset Dimension)	B =	54	ft
Foundation Length	L =	75	ft
Foundation Thickness	t =	6	ft
Foundation Material Elastic Modulus	E =	3600	ksi
Foundation depth below ground surface	D_f =	0.5	ft
Soil Modulus over depth of 4B	E_s =	792	ksf
Soil Poisson's Ratio over depth of 4B	ν =	0.35	
Thickness of Compressible Soil Layer	H =	11	ft

Equivalent Width	B_e =	71.81	ft
Embedment Factor	I_E =	1.00	
Rigidity/Stiffness Factor	I_R =	0.81	



Transverse Distance from Center, ft (Width) \ Longitudinal Distance from Center, ft (Length)	0	1.875	3.75	5.625	7.5	9.375	11.25	13.125	15	16.875	18.75	20.625	22.5	24.375	26.25	28.125	30	31.875	33.75	35.625	37.49813
0	163.7	163.7	163.6	163.4	163.2	162.8	162.4	161.9	161.3	160.6	159.8	158.9	157.9	157.0	156.3	156.1	156.9	160.3	169.4	194.8	337.7
1.35	163.7	163.7	163.6	163.4	163.1	162.8	162.4	161.9	161.2	160.5	159.7	158.9	157.9	157.0	156.3	156.0	156.9	160.3	169.4	194.7	337.6
2.7	163.6	163.5	163.4	163.3	163.0	162.7	162.2	161.7	161.1	160.4	159.6	158.7	157.8	156.9	156.2	155.9	156.8	160.2	169.3	194.6	337.3
4.05	163.4	163.3	163.2	163.0	162.8	162.5	162.0	161.5	160.9	160.2	159.4	158.6	157.6	156.7	156.0	155.8	156.7	160.1	169.2	194.4	336.8
5.4	163.1	163.0	162.9	162.7	162.5	162.2	161.8	161.3	160.7	160.0	159.2	158.3	157.4	156.5	155.8	155.6	156.5	159.9	169.0	194.2	336.1
6.75	162.7	162.6	162.5	162.4	162.1	161.8	161.4	160.9	160.3	159.6	158.9	158.0	157.1	156.2	155.5	155.3	156.2	159.6	168.7	193.9	335.2
8.1	162.2	162.2	162.1	161.9	161.7	161.3	160.9	160.5	159.9	159.2	158.5	157.6	156.7	155.9	155.2	155.0	155.9	159.3	168.4	193.5	334.2
9.45	161.7	161.6	161.5	161.4	161.1	160.8	160.4	160.0	159.4	158.7	158.0	157.2	156.3	155.5	154.8	154.6	155.6	159.0	168.0	193.1	332.9
10.8	161.1	161.0	160.9	160.8	160.6	160.2	159.9	159.4	158.9	158.2	157.5	156.7	155.8	155.0	154.4	154.2	155.2	158.6	167.6	192.6	331.6
12.15	160.4	160.4	160.3	160.2	159.9	159.6	159.3	158.8	158.3	157.7	156.9	156.2	155.3	154.5	153.9	153.8	154.8	158.2	167.2	192.0	330.1
13.5	159.8	159.8	159.7	159.5	159.3	159.0	158.7	158.2	157.7	157.1	156.4	155.6	154.8	154.1	153.5	153.4	154.4	157.8	166.8	191.5	328.6
14.85	159.2	159.2	159.1	158.9	158.7	158.5	158.1	157.7	157.2	156.6	155.9	155.2	154.4	153.7	153.1	153.0	154.0	157.5	166.4	191.0	327.3
16.2	158.8	158.7	158.7	158.5	158.3	158.0	157.7	157.3	156.8	156.2	155.6	154.9	154.1	153.4	152.9	152.8	153.8	157.3	166.2	190.7	326.2
17.55	158.6	158.6	158.5	158.4	158.2	157.9	157.6	157.2	156.7	156.2	155.5	154.9	154.1	153.4	152.9	152.9	153.9	157.3	166.3	190.7	325.8
18.9	159.1	159.0	159.0	158.8	158.6	158.4	158.0	157.7	157.2	156.7	156.1	155.4	154.7	154.0	153.5	153.5	154.5	157.9	166.8	191.2	326.5
20.25	160.5	160.5	160.4	160.2	160.1	159.8	159.5	159.1	158.6	158.1	157.5	156.9	156.2	155.5	155.0	155.0	156.0	159.4	168.2	192.7	329.3
21.6	163.7	163.7	163.6	163.4	163.2	163.0	162.7	162.3	161.8	161.3	160.7	160.1	159.4	158.7	158.2	158.2	159.2	162.5	171.3	195.9	335.9
22.95	170.2	170.2	170.1	169.9	169.7	169.5	169.1	168.7	168.3	167.7	167.1	166.4	165.7	165.0	164.5	164.4	165.4	168.7	177.5	202.5	349.4
24.3	183.4	183.4	183.3	183.1	182.9	182.6	182.3	181.8	181.3	180.7	180.0	179.2	178.4	177.7	177.1	176.9	177.8	181.1	190.2	216.2	377.1
25.65	213.8	213.8	213.6	213.4	213.2	212.8	212.3	211.7	211.1	210.3	209.4	208.4	207.4	206.4	205.5	205.2	206.1	209.8	219.8	248.5	441.3
27	349.8	349.7	349.4	348.9	348.1	347.2	346.0	344.5	342.8	340.9	338.7	336.3	333.7	331.2	329.0	327.9	329.3	336.1	355.5	410.7	738.3

Longitudinal Distance from Center, ft (Length)

Sub. Modulus at the Center of Foundation:	**163.7**	KCF
Sub. Modulus at the Corner of Foundation:	**738.3**	KCF
Sub. Modulus at the Longitudinal End:	**337.7**	KCF
Sub. Modulus at theTransverse End:	**349.8**	KCF

Average subgrade modulus ~ 160 kcf

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CALCULATION MEMORANDUM

BY:	Adam Paisley, PE; Robert Jarnigan	**DATE:**	January 15th, 2021
TO:	File	**SUBJECT:**	Stability Analysis of Spillway Structures
PROJECT:	Boiling Spring Lakes Dams Rehabilitation: Sanford Dam, North Lake Dam, Pine Lake Dam, Upper Lake Dam	**PROJECT NO.:**	19C21022

INTRODUCTION

Sanford Dam (SD), North Lake Dam (NLD), Pine Lake Dam (PLD), and Upper Lake Dam (ULD) (BSL Dams) breached during Hurricane Florence in September 2018. Subsequently, NCDOT repaired the breach and installed corrugated metal culverts at NLD and PLD, including upstream and downstream corrugated metal headwalls, though the presence of the culverts prevents impoundment of a reservoir. SD and ULD currently remain in breached condition. McGill Associates, P.A. (McGill) was hired by the City of Boiling Spring Lakes to develop designs for rehabilitating the BSL Dams, and McGill retained Schnabel Engineering South, P.C. (Schnabel) to provide geotechnical, structural, and general dam design services.

The four BSL Dams are part of a system of dams where NLD, PLD, and ULD are situated upstream of Sanford Dam and independent of each other. NLD and PLD are directly upstream, such that Sanford Dam headwater is the tailwater for NLD and PLD. A fifth dam named Middle Lake Dam (MLD) is founded between SD and ULD and also breached during Hurricane Florence, but is not part of the BSL Dams rehabilitation project. The ULD rehabilitation design will be prepared assuming MLD is reconstructed.

As part of the rehabilitation of the BSL Dams, the existing culverts at NLD and PLD and existing spillways at SD and ULD will be removed and replaced with new spillways. The new spillways will be constructed of cast-in-place concrete and will include an inlet structure, spillway box culverts, and an outlet structure. The inlet structure and outlet structure will be embedded in the embankment. The inlet structure will have a headwall which will extend above the inlet structure weir walls to retain embankment earthfill downstream of the weir walls. The existing culvert will be removed and an excavation will be created based on hydraulic design of the spillway and the geometry of the spillway elements, as determined by the analyses described herein. After the excavation is completed, a 12-inch-thick layer of flowable fill will be placed on the subgrade to protect the subgrade and to provide a firm surface against which earthfill can be placed and compacted subsequent to construction of the spillway elements. This memorandum presents our assumptions, the methodology used to analyze structural stability of the spillway components, and the analysis results, which are used to define the geometry of the proposed SD, NLD, PLD, and ULD spillway components.

EXTERNAL INFORMATION

The structural stability analyses incorporate external information which is not explicitly defined herein. The sources of such information are described below.

SD, NLD, PLD, and ULD are defined as high hazard dams by the North Carolina Department of Environmental Quality, Dam Safety (NC Dam Safety). Based on NC Dam Safety regulations, the proposed SD spillway must be capable of passing the 1/2 Probable Maximum Precipitation (PMP) storm and the proposed NLD, PLD, and ULD spillways must be capable of passing the 1/3 PMP storm.

Hydraulic constraints, such as elevation values for weir crest, culvert inverts, headwater, and tailwater, were provided to Schnabel by McGill. The constraints were determined based on the hydrologic and hydraulic analyses which McGill performed based on the storm constraints described above. The hazard classifications and hydrologic and hydraulic analyses are described in the Preliminary Analysis Report (McGill, 2020).

Geotechnical parameters which are used in the structural stability analyses are defined in the technical memorandum entitled “Geotechnical Recommendations for Structural Analysis and Design.” The memorandum presents a summary of soil properties and seismic parameters, calculations for lateral earth pressure coefficients, and recommendations for application of geotechnical parameters to the structural analyses discussed in this memorandum.

METHODOLOGY

Inlet structure and Outlet Structure

Stability analyses for the inlet structure and outlet structure were performed in general accordance with USACE Engineering and Design Manual EM 1110-2-2100 – Stability Analysis of Concrete Structures (Dec, 2005). Based on these classification guidelines, a Site Information Category of “Well Defined”, “Ordinary”, or “Limited” must be defined for the site in order to establish the appropriate safety factors for use in stability analyses of the concrete structures. The Site Information Category for design of the reinforced concrete structures for all four BSL Dams was determined to be “Ordinary” based on available geotechnical information. Based on EM 1110-2-2100 classification guidelines, a structure must be designated as a "Critical Structure" or "Normal Structure" in establishing safety factors for use in stability analyses, where a critical structure is a structure on high-hazard projects when failure will result in loss of life. Since SD is classified by NC Dam Safety as a high hazard dam and the failure of SD is expected to result in a potential loss of life, the SD spillway is considered to be a “Critical Structure.” As the failure of NLD, PLD, and ULD is not expected to result in a loss of life and the combined failure of the three dams is not expected to result in the failure of SD, then NLD, PLD, and ULD are considered to be “Normal Structures.”

Static global stability analyses for flotation, sliding, and rotational stability were performed using service loads for each considered load case in accordance with guidelines in EM 1110-2-2100. Loading conditions were assigned a load condition category of “Usual”, “Unusual” or “Extreme” to establish minimum required safety factors. These categories are based on the expected frequency of occurrence of the loading condition during the service life of the structure. A minimum factor of safety (FS) was assigned for each analysis based on the load condition category and the type of failure analyzed.

Seismic loading was applied in the form of a resultant force equivalent to a distributed load. Seismic loading was developed using guidance from ASCE 7-16 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) (ASCE, 2016) and EM 1110-2-2100. Loading parameters applied in seismic stability analyses are defined in the memorandum entitled “Geotechnical Recommendations for Structural Analysis and Design.”

Structural geometries for the inlet structure and outlet structure were developed such that the analyses performed for each load case described herein resulted in a calculated FS which is greater than the minimum value assigned for each load case. Additionally, a minimum thickness of 12 inches was selected for structural walls in accordance with the requirements for water-retaining structures presented in ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary (ACI, 2006).

Global stability analyses for flotation and sliding of the inlet structure were performed using PTC MathCAD Version 15 for each dam. Spillway retaining walls and base slabs were analyzed using Schnabel's proprietary Retwall spreadsheet program. This program is used to compute both the overturning (foundation bearing pressure distribution), sliding stability safety factors and design the steel reinforcement of these structures. Descriptions of analyses performed for each load case are presented below. Results from global stability analyses for flotation and sliding are displayed below while results for retaining wall analyses are presented in Appendix 4.

Box Culverts: Description of Analyses

The geometry of the box culverts for each dam were determined from hydraulic analysis performed by McGill, these sizes are shown below in Tables 2-5. The given geometry was input into Eriksson Culvert Software v4.7. 2 and analyzed as a cast-in-place system based on AASHTO LRFD Bridge Construction Specifications 6th Edition (2012). The box culvert systems were modeled with vertical exterior wall faces however will be constructed with a 1:10 battered face to assist in compaction of backfill. Environmental durability factors (Sd) are applied to determine reinforcement requirements in accordance with ACI 350-06 "Code Requirements for Environmental Engineering Concrete Structures and Commentary". Each box culvert system was loaded with overhead and lateral soil pressures based on their respective height of fill. The culverts were also designed for moving vehicular live and surcharge loads in accordance with AASHTO HL-93 truck design specifications. Interior fluid pressures within the box culverts were analyzed based on their respective hydraulic design head pressure. The self-weight of the structures was also considered due to the potential of uplift on the structures. Eriksson Culvert Software calculates the maximum bending moment and the maximum shear force in each member of the culvert system. Maximum bending moment and shear force are calculated by the program at critical sections in each member based on AASHTO LRFD specified load combinations. Refer to Appendix 4 for a detailed analysis report for each dam culvert. The report includes culvert properties, physical dimensions, material properties, design loads, load and resistance factors and assigned reinforcement. In addition, each report specifies the various analysis options selected and provides an output of the critical analysis results for flexure and shear for each member. The program also calculates safety factors against flotation as listed in Table 1.

Table 1: Box Culvert Analyses for Sanford Dam (SD), North Lake Dam (NLD), Pine Lake Dam (PLD) and Upper Lake Dam (ULD)

Dam ID	Top Slab Thickness (in.)	Bottom Slab Thickness (in.)	Exterior Wall Thickness (in.)	Interior Wall Thickness (in.)	Design Fill Depth (ft.)	Interior Fluid Pressure Head (ft)	Factor of Safety Against Flotation (FS)
SD	16	16	12	12	14.67	13.00	4.28
NLD	12	12	12	12	9.50	15.50	3.44
PLD	12	12	12	N/A	14.50	15.83	6.30
ULD	12	12	12	12	3.25	7.00	1.95

Note: Exterior culvert walls faces have a 1:10 battered slope and vary in width.

Assumptions and Material Properties

- Sliding stability analyses of the inlet headwalls using Schnabel's proprietary Retwall excel software program are two-dimensional and based on a one foot unit width of headwall.
- Unit weight of moist and saturated soils along with lateral earth pressure coefficients are described in the memorandum entitled "Geotechnical Recommendations for Structural Analysis and Design.".
- Based on design flood headwater/tailwater elevations and the structure geometries, the structures are expected to be submerged and stable during the design flood event.
- Reinforced concrete is assumed to have a unit weight of 150 pounds per cubic foot (pcf).
- Normal weight concrete compressive strength (fc') = 4500 pounds per square inch (psi) with a Modulus of Elasticity (Ec) = 4067 kips per square inch (ksi).
- Steel rebar reinforcement yield strength (σ_y) = 60 kips per square inch (ksi) with a Modulus of Elasticity (Es) = 29,000 kips per square inch (ksi).
- For the design of box culverts using Eriksson Culvert Software, the following parameters were used: Saturated Unit weight of soil = 125 pounds per cubic foot (pcf), Poisson's ratio = .35, Slope factor = 1.15 for granular soils, Soil-structure Interaction factor (Fe) = 1.15 for compacted fill and an Exposure factor = 1.0 for Class 1 Exposure.

SUMMARY OF KEY DESIGN FEATURES

A summary of relevant design features for the BSL Dams structures are provided in the tables below.

Table 2: Summary of Key Design Features – Sanford Dam (SD)

FEATURE	VALUE
Hydraulics	
Normal Operating Conditions – Headwater Elevation	30.0 feet
Normal Operating Conditions – Tailwater Elevation	11.0 feet
Flood (1/2 PMP) Conditions – Peak Headwater Elevation	36.39 feet
Flood (1/2 PMP) Conditions – Peak Tailwater Elevation	19.93 feet
Embankment	
Crest Elevation	38.4 feet
Upstream Slope	3H:1V
Downstream Slope	2.5H:1V
Principal Spillway	
Type	Inlet structure with Box Culverts
Material	Reinforced Concrete
Weir Crest Elevation	30.0 feet
Low-Level Drain Elevation	17.0 feet
Culvert Inlet Invert Elevation	17.0 feet
Culvert Outlet Invert Elevation	15.0 feet
Number of Culverts	6
Culvert Interior Width	7.5 feet
Culvert Interior Height	6.5 feet

Table 3: Summary of Key Design Features – North Lake Dam (NLD)

FEATURE	VALUE
Hydraulics	
Normal Operating Conditions – Headwater Elevation	35.0 feet
Normal Operating Conditions – Tailwater Elevation	30.0 feet
Flood (1/3 PMP) Conditions – Peak Headwater Elevation	40.0 feet
Flood (1/3 PMP) Conditions – Peak Tailwater Elevation	33.84 feet
Embankment	
Crest Elevation	40.0 feet
Upstream Slope	3H:1V
Downstream Slope	3H:1V
Principal Spillway	
Type	Inlet structure with Box Culverts
Material	Reinforced Concrete
Weir Crest Elevation	35.0 feet
Low-Level Drain Elevation	24.5 feet
Culvert Inlet Invert Elevation	24.5 feet
Culvert Outlet Invert Elevation	24.1 feet
Number of Culverts	2
Culvert Interior Width	6.0 feet
Culvert Interior Height	6.0 feet

Table 4: Summary of Key Design Features – Pine Lake Dam (PLD)

FEATURE	VALUE
Hydraulics	
Normal Operating Conditions – Headwater Elevation	35.0 feet
Normal Operating Conditions – Tailwater Elevation	30.0 feet
Flood (1/3 PMP) Conditions – Peak Headwater Elevation	40.81 feet
Flood (1/3 PMP) Conditions – Peak Tailwater Elevation	33.85 feet
Embankment	
Crest Elevation	44.0 feet
Upstream Slope	3H:1V
Downstream Slope	3H:1V
Principal Spillway	
Type	Inlet structure with Box Culverts
Material	Reinforced Concrete
Weir Crest Elevation	35.0 feet
Low-Level Drain Elevation	25.0 feet
Culvert Inlet Invert Elevation	25.0 feet
Culvert Outlet Invert Elevation	24.6 feet
Number of Culverts	1
Culvert Interior Width	5.0 feet
Culvert Interior Height	4.0 feet

Table 5: Summary of Key Design Features – Upper Lake Dam (ULD)

FEATURE	VALUE
Hydraulics	
Normal Operating Conditions – Headwater Elevation	38.0 feet, 38.0 feet
Normal Operating Conditions – Tailwater Elevation	30.0 feet, 35.0 feet
Flood (1/3 PMP) Conditions – Peak Headwater Elevation	40.0 feet, 40.0 feet
Flood (1/3 PMP) Conditions – Peak Tailwater Elevation	36.48 feet, 38.42 feet
Embankment	
Crest Elevation	41.3 feet
Upstream Slope	3H:1V
Downstream Slope	3H:1V
Principal Spillway	
Type	Inlet structure with Box Culverts
Material	Reinforced Concrete
Weir Crest Elevation	38.0 feet
Low-Level Drain Elevation	33.0 feet
Culvert Inlet Invert Elevation	33.0 feet
Culvert Outlet Invert Elevation	32.4 feet
Number of Culverts	5
Culvert Interior Width	6.0 feet
Culvert Interior Height	5.0 feet

Note: Headwater and tailwater elevations are provided for the cases where MLD is not reconstructed (tailwater at EL 30.0 feet) and is reconstructed (tailwater at EL 35.0 feet), respectively. The value which produces the lowest factor of safety is used in each analysis.

SUMMARY OF LOAD CASES AND RESULTS

The following subsections include descriptions of the load cases (LC) analyzed that include loads and design constraints, geotechnical parameters and water levels for the structural analysis and design of the inlet structure headwalls, weir walls and the outlet structure sidewalls.

Sliding and Overturning Stability – Inlet Structure for All Dams

- **LC1 – Normal Operating Condition (Usual Load)**: The spillway and embankment have been constructed as designed and headwater/tailwater are at normal operating levels.
    - Effective stress (drained) friction angle along failure plane between foundation soils and structure
    - At-rest earth pressures are applied for the appropriate backfill slope angle
    - Compaction induced earth pressures are applied
    - Water elevation on both sides of headwall is at the normal operating headwater/tailwater elevation
    - Moist and buoyant unit weights are used for backfill soils above and below groundwater, respectively
    - Uplift pressures are considered to act along the base of footing varying linearly from total head pressure at the heel to total head pressure at the toe of the footing.

- **LC2 – Maintenance Condition (Unusual Load)**: Headwater or tailwater is drained from normal operating condition to the top of inlet slab footing. Backfill behind headwalls remains partially saturated.
    - Effective stress (drained) friction angle along failure plane between foundation soils and structure
    - At-rest earth pressures are applied for the appropriate backfill slope angle
    - Compaction induced earth pressures are applied
    - Groundwater level in the headwall backfill is at the elevation equal to the low-level drain invert elevation plus 2/3 times the elevation difference between normal operating pool elevation and the low-level drain invert elevation.
    - Water level on toe side of headwall is at top of footing
    - Moist and buoyant unit weights are used for backfill soils above and below groundwater, respectively
    - Uplift pressures are considered to act along the base of footing varying linearly from total head pressure at the heel to total head pressure at the toe of the footing.

- **LC3 – Post-Flood Condition (Extreme)**: The structure is subjected to the design flood. The flood headwater/tailwater returns to normal operating condition but the water elevation in backfill behind headwalls remains above normal operating condition.
    - Effective stress (drained) friction angle along failure plane between foundation soils and structure
    - At-rest earth pressures are applied for the appropriate backfill slope angle
    - Compaction induced earth pressures are applied
    - Groundwater level in the headwall backfill is at the elevation equal to 2/3 times the elevation difference between top of backfill above the heel and normal operating pool elevation on the toe side of headwall
    - Moist and buoyant unit weights are used for backfill soils above and below groundwater, respectively
    - Uplift pressures are considered to act along the base of footing varying linearly from total head pressure at the heel to total head pressure at the toe of the footing.

- **LC4 – Seismic Loading (Extreme)**: The design seismic event occurs during normal operating condition.
    - Total stress friction angle along failure plane between foundation soils and structure
    - Coulomb static active earth pressures are applied for the appropriate backfill slope angle. Moist and buoyant unit weights are used for backfill soils above and below groundwater, respectively
    - Compaction induced earth pressure is ignored
    - Water elevation on both sides of headwall are at the normal operating headwater/tailwater elevation
    - Uplift pressures:
        - Do not apply uplift pressure along the base of footing for sliding stability as total stress base friction strengths are used.
        - For rotational stability, use the same uplift pressures as used in the Normal Operating Conditions load case.
    - Apply seismic generated dynamic lateral earth pressure using Mononobe-Okabe pseudo-static method. Determine ΔKae (page 6 of Attachment 2) for the appropriate backfill slope angle and wall batter based on the effective stress friction angle of the Embankment Fill. The earth pressure distribution is an inverted triangle equal to $\Delta Kae*\gamma*H$ where backfill intersects the wall stem and decreases to zero at the base of the footing. H is equal to the vertical distance from the base of the footing to height of backfill at the wall stem (see Attachment 1).
    - Apply seismic generated inertial forces. The inertial force is computed as the product of the mass of the structure, including any water or soil contained within the structure, and the seismic acceleration. The line of action for the horizontal component of the inertial force is assumed to act at the center of mass of the structure based on the assumption that the structure is a rigid body.

A global stability analysis for sliding was performed in PTC MathCAD Version 15 for the Sanford Dam inlet structure for load cases LC1 and LC3. Global stability analyses were also performed for North Lake Dam, Pine Lake Dam and Upper Lake Dam inlet structures for load case LC3. The approximate weight of various structural concrete components such as base slab, weir walls, headwalls and length of box culvert section supported by the inlet base slab were included. The estimated weight of soil and water above the structures including uplift forces acting on the base of the structures were considered.

Table 6: Inlet Structure Global Sliding Stability Analysis Results for North Lake Dam (NLD), Pine Lake Dam (PLD) and Upper Lake Dam (ULD)

Load Case	Failure mode	Loading Condition	Loading Condition Category	Minimum Required FS	Calculated FS (NLD)	Calculated FS (PLD)	Calculated FS (ULD)
LC3	Sliding	Post-Flood	Extreme	1.1	4.03	3.40	12.44

Table 7: Inlet Structure Global Sliding Stability Analysis Results for Sanford Dam (SD)

Load Cases	Failure Mode	Loading Condition	Loading Condition Category	Minimum Required FS	Calculated FS
LC1	Sliding	Normal Operating	Usual	2.0	3.18
LC3	Sliding	Post-Flood	Extreme	1.1	2.17

Sliding and Overturning Stability –Outlet Structure Sidewalls for Sanford Dam (SD)

- **LC1 – Normal Operating Condition (Usual Load)**: The spillway and embankment have been constructed and as designed and tailwater is at normal operating levels.
    - Effective stress (drained) friction angle along failure plane between foundation soils and structure
    - At-rest earth pressures are applied for the appropriate backfill slope angle
    - Compaction induced earth pressures are applied
    - Water elevation on both sides of headwall is at the normal operating tailwater elevation
    - Moist and buoyant unit weights are used for backfill soils above and below groundwater, respectively
    - Uplift pressures are uniformly distributed along the base of footing equal to tailwater total head pressure.

- **LC2 – Maintenance Condition (Unusual)**: Tailwater is drained at the normal operating condition to the bottom of the lowest slab (EL 0.0). Backfill behind the sidewalls is moist. Interior slabs are considered compromised and do not provide lateral resistance against both sliding and overturning.
    - Effective stress (drained) friction angle along failure plane between foundation soils and structure
    - At-rest earth pressures are applied for the appropriate backfill slope angle
    - Compaction induced earth pressures are applied
    - Groundwater level in the sidewall backfill is at the bottom of the lowest slab (EL 0.0)
    - Moist unit weights are used for backfill soils
    - Uplift pressures are not present

- **LC3 – Post-Flood Condition (Extreme)**: The structure is subjected to the design flood. Tailwater returns to the normal operating condition but sidewall backfill remains partially to fully saturated.
    - Effective stress (drained) friction angle along failure plane between foundation soils and structure
    - At-rest earth pressures are applied for the appropriate backfill slope angle
    - Compaction induced earth pressures are applied
    - Groundwater level in the sidewall backfill is at an elevation equal to 2/3 the elevation difference between the 1/2 PMP flood tailwater elevation and normal operating condition tailwater or at the elevation where backfill is fully saturated
    - Water level on toe side of sidewall/wingwall is at normal operating condition
    - Moist and buoyant unit weights are used for backfill soils above and below groundwater, respectively
    - Uplift pressures are uniformly distributed along the base of footing equal to groundwater head pressure in the backfill.

- **LC4 – Seismic Loading (Extreme)**: The design seismic event occurs during normal operating condition.
    - Total stress friction angle along failure plane between foundation soils and structure
    - Active earth pressures are applied for the appropriate backfill slope angle
    - Compaction induced earth pressures are ignored
    - Water elevation on both sides of sidewall/wingwall is at the normal operating tailwater elevation
    - Uplift pressures:
        - Do not apply uplift pressure along the base of the footing for sliding stability because total stress strengths are used.
        - For rotational stability, use the same uplift pressures as used in the Normal Operating Conditions load case.
    - Apply seismic generated dynamic lateral earth pressure using Mononobe-Okabe pseudo-static method. Determine ΔKae (page 6 of Attachment 2) for the appropriate backfill slope angle and wall batter based on the effective stress friction angle of the Embankment Fill. The earth pressure distribution is an inverted triangle equal to $\Delta Kae*\gamma*H$ where backfill intersects the wall stem and decreases to zero at the base of the footing. H is equal to the vertical distance from the base of the footing to height of backfill at meets the wall stem (see Attachment 1).
    - Apply seismic generated inertial forces. The inertial force is computed as the product of the mass of the structure, including any water or soil contained within the structure, and the seismic acceleration. The line of action for the horizontal component of the inertial force is assumed to act at the center of mass of the structure based on the assumption that the structure is a rigid body.

The outlet sidewalls at Sanford Dam were analyzed for load cases LC1, LC3 and LC4. The sidewall footings may move independently from the interior invert slabs due to a contraction joint provided between the footing and invert slab. The interior invert slabs are considered to provide adequate resistance to prevent both sliding and overturning of the outlet sidewalls based on USACE ERDC/ITL TR-04-3 Simple Methods Used to Estimate the Limit-State Axial Load Capacity of Spillway Invert Slabs. This research paper concludes that a two-foot thick slab cast against earth has a limit state axial load capacity of approximately 236 kips per foot width of slab. This capacity exceeds the maximum required resistance of approximately four kips per foot generated during a seismic event. Therefore, the proposed invert slab is sufficient to provide the required resistance against sliding to maintain required factors of safety for the above load cases. As such, factors of safety for global stability are not presented in this memorandum for these load cases. Required slab resistance and calculated factors of safety for LC1, LC3 and LC4 are reported in Appendix 4. However, load case LC2 was considered due to the possibility that the interior slabs may require repair or replacement in the future. Factors of safety for sliding stability are presented below in Table 8 for this load case only.

Table 8: Summary of Outlet Structure Stability Load Cases and Analysis Results for Sanford Dam (SD)

Load Cases	Section	Failure Mode	Loading Condition	Loading Condition Category	Minimum Required FS	Calculated FS
LC2	Sidewall (L1&R1)	Sliding	Maintenance	Unusual	1.5	2.82
LC2	Sidewall (L2&R2)	Sliding	Maintenance	Unusual	1.5	2.15
LC2	Sidewall (L3&R3)	Sliding	Maintenance	Unusual	1.5	1.83

Sliding and Overturning Stability – Outlet Structure Sidewalls for North Lake Dam (NLD), Pine Lake Dam (PLD) and Upper Lake Dam (ULD)

The outlet structures for NLD, ULD and PLD were all analyzed as a rigid body “U” framed structure constructed with a monolithic footing base slab for load cases LC1, LC3 and LC4 as previously described for the Sanford Dam outlet structure load cases. Due to the inherent stability of this type of structure, the outlet sidewalls are stable in both sliding and overturning. Factors of safety for sliding stability are not applicable assuming the left and right sidewalls of the outlet structure resist equal but opposite loading conditions.

Limits on Resultant Force Location for All Dams

In accordance with USACE EM 1110-2-2100, limits on the location of the resultant of applied forces acting on the base of the structure are specified for each load condition category. The location of the resultant can be determined by static analysis. The rotational behavior of the structure must comply with the limits given in Table 9.

Table 9: Requirements for Location of Resultant – All Structures

Site Information Category	Load Condition Categories		
	Usual	**Unusual**	**Extreme**
All Categories	100% of Base in Compression	75% of Base in Compression	Resultant Within Base

Each dam was analyzed for the specified load cases for both the inlet and outlet structures. The location of the resultant forces are within the allowable limits for the respective loading condition for all dams. Therefore, all inlet and outlet structures were determined to be stable against overturning. Refer to Appendix 4 for results.

Flotation – Inlet structure for All Dams

Factors of safety for uplift (flotation) stability were calculated for all dam inlet structures in accordance with USACE EM 1110-2-2100 for load cases presented in Table 10 below. The factor of safety calculated for flotation stability is defined by the following equation. Based on analysis results, the calculated factor of safety for all dam inlet structures exceed the minimum required. Refer to Appendix 4 for supporting calculations.

$$FS_{FLOTATION} = \frac{W_S + W_C + S}{U - W_G}$$

Where:

W_S = weight of the structure, including weights of the fixed equipment and soil above the top surface of the structure

W_C = weight of the water contained within the structure

S = surcharge loads

U = uplift forces acting on the base of the structure

W_G = weight of water above top surface of the structure

Table 10: Summary of Inlet Structure Flotation Stability Load Cases and Analysis Results for All Dams

Load Case	Failure mode	Loading Condition	Loading Condition Category	Minimum Required FS	Calculated FS (NLD)	Calculated FS (PLD)	Calculated FS (ULD)	Calculated FS (SD)
LC1	Flotation	Normal Operating	Usual	1.3	2.30	3.60	1.54	1.53
LC3	Flotation	Post Flood	Extreme	1.1	2.36	3.30	1.44	1.45

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- USACE (2005). "Stability Analysis of Concrete Structures." *EM 1110-2-2100.* U.S. Army Corps of Engineers, Washington D.C.
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ATTACHMENTS

1) General Application of Lateral Earth Pressures for Spillway Walls
2) Lateral Earth Pressure Coefficient Calculations

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project	Project Number
Boiling Spring Lakes Dams	19C21022_00

Title

Boiling Spring Lakes Dams Inlet Structure Global Stability Analysis

Computer Programs Used	Version/Release No.
PTC MathCad	15

Purpose and Objective

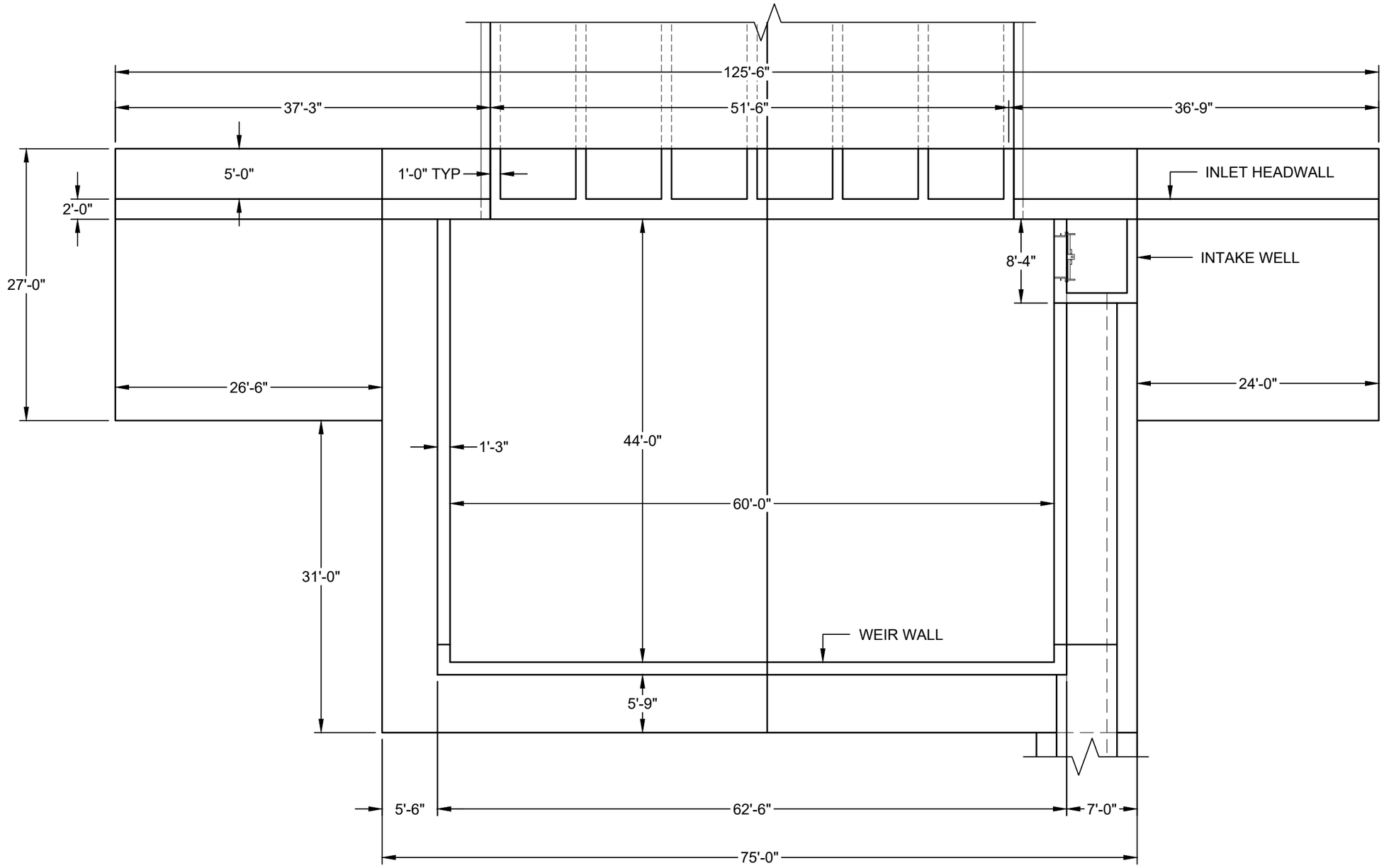
Determine the sliding resistance of Sanford Dam Inlet structure based on the Normal Operating Condition (LC-1) and the Post Flood Condition (LC-3). Determine the sliding resistance of the inlet structures for Pine Lake Dam, North Lake Dam and Upper Lake Dam based on the Post Flood Condition (LC-3).

Determine the resistance to flotation for the inlet structures of Sanford Dam, Pine Lake Dam, North Lake Dam and Upper Lake Dam based on a Normal Operating Condition (LC-1) and the Post Flood Condition (LC-3).

Summary of Conclusions

See Stability Analysis of Structures Memorandum. The inlet structures for all dams were determined to be stable against sliding and uplift based on the calculated factors of safety which meet or exceed the minimum requirements for stability in accordance with USACE EM 1110-2-2100 Stability Analysis of Concrete Structures.

	Print	Sign	Date
Originator	Cristian T. Franklin		Jan 11, 2021
Checked	Robert L. Jarnigan		Jan 13, 2021



FLOW

1 INLET PLAN

SCALE: 3/32"=1'0"

0 8' 16'

NOTE:

1. THIS DRAWING IS TO BE USED FOR REFERENCING WITH REGARDS TO NORTH LAKE DAM GLOBAL SLIDING STABILITY CALCULATIONS ONLY.

Schnabel ENGINEERING

BOILING SPRING LAKES DAMS REMEDIATION
BOILING SPRING LAKES, NORTH CAROLINA
MCGILL ASSOCIATES, P.A.
SCHNABEL PROJECT NO. 19C21022.00

SANFORD DAM SPILLWAY
PLAN AND SECTIONS

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Calculation Objective

The purpose of the following calculation is to check both the stability against sliding and flotation at the base of the inlet structure for the Sanford Dam Hurricane Repair project in Boiling Spring Lake, North Carolina.

Design Basis

The following documents are the design basis for this calculation:

Fluid Loads and Elevations: Schnabel Design Report

Assumptions

1. As shown in the body of the calculation.

References

1. U.S. Army Corps of Engineers. (2005). EM 1110-2-2100, Stability Analysis of Concrete Structure.

Methodology

The stability against sliding and flotation at the base of the inlet structure was evaluated in accordance with USACE EM 1110-2-2100 stability criteria. Calculations were performed using Mathcad vs 15.0 software.

Calculation

Material Properties and Geometry:

Water Unit Weight:	$\gamma_w := 62.4 \cdot pcf$
Concrete Unit Weight:	$\gamma_c := 145 \cdot pcf$
Moist Unit Weight of Embankment Soil:	$\gamma_m := 120 \cdot pcf$
Saturated Unit Weight of Embankment Soil:	$\gamma_s := 125 \cdot pcf$
Submerged Embankment Soil Unit Weight:	$\gamma_b := \gamma_s - \gamma_w = 62.6 \cdot pcf$
At-rest soil pressure coefficient level backfill:	$K_u := 0.47$ (not used)
At-rest soil pressure coefficient 1.3 negative sloped backfill:	$K_{u2} := 0.32$
At-rest soil pressure coefficient 1:3 positive sloped backfill:	$K_d := 0.62$
Effective soil friction angle at foundation:	$\phi_{e.e} := 34deg$

Inlet Structure Dimensions:

Length of inlet slab at front weir wall: $L_{front} := 75ft$

Length of inlet slab at headwall: $L_{head} := 125.5ft$

Width of inlet at front weir wall: $W_{front} := 31ft$

Width of inlet at headwall: $W_{head} := 27.0ft$

Footing thickness main slab: $t_{ftg.main} := 6.ft$

Footing thickness of wings: $t_{ftg.wing} := 4ft$

Area of main slab: $A_{ftg.main} := L_{front} \cdot (W_{front} + W_{head}) = 4350 \cdot ft^2$

Area of wing slab: $A_{ftg.wings} := (L_{head} - L_{front}) \cdot W_{head} = 1363.5 \cdot ft^2$

Total area of footing: $A_{ftg} := A_{ftg.main} + A_{ftg.wings} = 5713.5 \cdot ft^2$

Concrete Components

Top of weir wall elevation $EL_{weir} := 30ft$

Top of slab elevation: $EL_{slab} := 17ft$

Top of headwall elevation: $EL_{hwall} := 35.5ft$

Front weir wall area (plan view): $A_{front} := 62.5ft \cdot 1.25ft = 78.125 \cdot ft^2$

Front weir wall height: $h_{front} := EL_{weir} - EL_{slab} = 13.0 \cdot ft$

Side weir walls area (plan view): $A_{weir} := 44ft \cdot 1.25ft = 55 \cdot ft^2$

Side weir walls height: $h_{weir} := EL_{weir} - EL_{slab} = 13.0 \cdot ft$

Thickness of headwall: $t_{hw} := 2.0ft$

Headwall area (plan view): $A_{head} := L_{head} \cdot t_{hw} = 251 \cdot ft^2$

Head wall height: $h_{head} := EL_{hwall} - EL_{slab} = 18.5 \cdot ft$

Basin area: $A_{basin} := 44ft \cdot 60ft = 2640 \cdot ft^2$

Area of 6 box culvert (open sections): $A_{culvert} := 6.5ft \cdot 7.5ft \cdot 6 = 292.5 \cdot ft^2$

Length of culvert on footing: $L_{culvert.heel} := 5ft$

Total area of culvert section above top of inlet slab: $A_{total.culvert} := 0.5 \cdot (52ft + 53.57ft) \cdot (7.0ft + 10in) = 413.483 \cdot ft^2$

Length of headwall beyond weir sidewalls $L_{hw1} := 32ft + 31ft = 63 \cdot ft$

Length of full height headwall beyond culvert: $L_{hw2} := 37.25ft + 36.25ft = 73.5 \cdot ft$

Height of culvert above inlet slab $h_{cul} := 7ft + 10in = 7.833 \cdot ft$

Width of culvert: $W_{cul} := 52.0ft$

Voulme of culvert on footing:

$$V_{culvert.heel} := \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel} = 604.9 \cdot ft^3$$

Weight of front weir wall: $W_{front.wall} := \gamma_c \cdot A_{front} \cdot h_{front} = 147.3 \cdot kip$

Weight of side weir walls: $W_{weir.wall} := 2\gamma_c \cdot A_{weir} \cdot h_{weir} = 207.4 \cdot kip$

Weight of head wall: $W_{head.wall} := \gamma_c \cdot A_{head} \cdot h_{head} = 673.3 \cdot kip$

Weight of main footing: $W_{ftg.main} := \gamma_c \cdot A_{ftg.main} \cdot t_{ftg.main} = 3784.5 \cdot kip$

Weight of wing footings: $W_{ftg.wings} := \gamma_c \cdot A_{ftg.wings} \cdot t_{ftg.wing} = 790.83 \cdot kip$

Weight of footing: $W_{ftg} := W_{ftg.main} + W_{ftg.wings} = 4575 \cdot kip$

<u>Total weight of walls and footing :</u>

$$W_{walls} := W_{front.wall} + W_{weir.wall} + W_{head.wall} + W_{ftg} = 5603 \cdot kip$$

<u>Weight of culvert inside the headwall :</u>

$$W_{culvert.head} := \gamma_c \cdot A_{culvert} \cdot t_{hw} = 84.8 \cdot kip$$

<u>Weight of culvert on footing:</u>

$$W_{culvert.heel} := \gamma_c \cdot V_{culvert.heel} = 88 \cdot kip$$

Total weight of concrete structures:

$W_{concrete} := W_{walls} - W_{culvert.head} + W_{culvert.heel} = 5606 \cdot kip$

Soil Profiles:

Soil area on heel of front weir wall: $A_{soil.front} := 75.0ft \cdot 5.75ft = 431.25 \cdot ft^2$

Soil height on heel of front weir wall: $h_{soil.front} := 3ft$

Soil area on heel of weir sidewalls: $A_{soil.weir} := 45.25ft \cdot 5.5ft + 37ft \cdot 2ft = 322.875 \cdot ft^2$

Avg soil height wier sidewalls:
(based on CAD dwgs) $h_{soil.weir} := 0.5(26.0ft + 20ft) - EL_{slab} = 6 \cdot ft$

Soil area on toe of headwall: $A_{soil.head.toe} := 20ft \cdot 26.5ft + 24ft \cdot 20ft = 1010 \cdot ft^2$

Avg soil height on toe of headwalls:
(based on CAD dwgs) $h_{soil.head.toe} := 0.5(27.8ft + 27.8ft) - EL_{slab} = 10.8 \cdot ft$

Soil area on headwall heel: $A_{soil.head} := L_{head} \cdot L_{culvert.heel} = 627.5 \cdot ft^2$

Height of backfill at headwall:
(based on CAD dwgs) $h_{soil.heel.1} := 35ft - EL_{slab} = 18 \cdot ft$

Angle of sloping fill: $\beta_{head} := 18.43deg$

Height of sloping backfill at heel:

$h_{soil.heel.2} := h_{soil.heel.1} + L_{culvert.heel} \cdot \tan(\beta_{head}) = 19.7 \cdot ft$

$h_{soil.heel.avg} := (h_{soil.heel.1} + h_{soil.heel.2}) \div 2 = 18.833 \cdot ft$

Load Case I :Normal Operating Condition:

Water level reservoir: $h_{w1} := EL_{weir} - EL_{slab} = 13.0 \cdot ft$

Water level inside riser: $h_{w2} := 0ft$

Assumed phreatic surface embankment: $h_{w3} := EL_{weir} - EL_{slab} = 13.0 \cdot ft$

Horizontal forces:

Resistant soil pressure along inlet slab:

$F_{s1} := -0.5 \cdot \gamma_b \cdot (h_{soil.front} + t_{ftg.main})^2 \cdot L_{front} \cdot K_{u2} = -61 \cdot kip$

Resistant soil pressure along inlet headwall:

$F_{s2} := -0.5 \cdot \gamma_b \cdot \left[\left(27.8ft - EL_{slab}\right) + t_{ftg.wing}\right]^2 \cdot L_{hw1} \cdot K_{u2} = -138 \cdot kip$ Soil height of 27.8 ft based on proposed CAD grading plan.

Resistant water pressure on the upstream side:

$F_{h.w.u.II.m} := -0.5 \cdot \gamma_w \cdot \left(h_{w1} + t_{ftg.main}\right)^2 \cdot \left(L_{head} - 50.5ft\right) = -845 \cdot kip$ 50.5 ft is the length of wing walls

$F_{h.w.u.II.w} := -0.5 \cdot \gamma_w \cdot \left(h_{w1} + t_{ftg.wing}\right)^2 \cdot (50.5ft) = -455 \cdot kip$

$F_{h.w.u.II} := F_{h.w.u.II.m} + F_{h.w.u.II.w} = -1300.09 \cdot kip$

Sliding soil pressure from embankment backfill behind headwall:

$F_{1.s.II} := 0.5 \cdot \gamma_m \cdot \left(h_{soil.heel.2} - h_{w3}\right)^2 \cdot L_{hw2} \cdot K_d = 122 \cdot kip$

$F_{2.s.II} := \gamma_m \cdot \left(h_{soil.heel.2} - h_{w3}\right) \cdot \left(h_{w3} + t_{ftg.wing}\right) \cdot L_{hw2} \cdot K_d = 620 \cdot kip$

$F_{3.s.II} := 0.5 \cdot \gamma_b \left(h_{w3} + t_{ftg.wing}\right)^2 \cdot L_{hw2} \cdot K_d = 412 \cdot kip$

$F_{4.s.II} := 0.5 \cdot \gamma_m \cdot \left(h_{soil.heel.2} - h_{w3}\right)^2 \cdot W_{cul} \cdot K_d = 86 \cdot kip$

$F_{5.s.II} := \gamma_m \cdot \left(h_{soil.heel.2} - h_{w3}\right) \cdot \left(h_{w3} - h_{cul}\right) \cdot W_{cul} \cdot K_d = 133 \cdot kip$

$F_{6.s.II} := 0.5 \cdot \gamma_b \cdot \left(h_{w3} - h_{cul}\right)^2 \cdot W_{cul} \cdot K_d = 27 \cdot kip$

$F_{h.s.d.II} := \left(F_{1.s.II} + F_{2.s.II} + F_{3.s.II} + F_{4.s.II} + F_{5.s.II} + F_{6.s.II}\right) \cdot \cos\left(\beta_{head}\right) = 1328 \cdot kip$

Sliding water pressure on the downstream side:

$F_{1.w.II} := 0.5 \cdot \gamma_w \cdot \left(h_{w3} + t_{ftg.wing}\right)^2 \cdot L_{hw2} = 663 \cdot kip$

$F_{2.w.II} := 0.5 \cdot \gamma_w \cdot \left(h_{w3} - h_{cul}\right)^2 \cdot W_{cul} = 43 \cdot kip$

$F_{h.w.II} := F_{1.w.II} + F_{2.w.II} = 706 \cdot kip$

Summation of horizontal forces:

$F_{h.II} := F_{s1} + F_{s2} + F_{h.w.u.II} + F_{h.s.d.II} + F_{h.w.II} = 535 \cdot kip$

Vertical forces:

Weight of soil behind front weir wall:

$W_{s.front.II} := \gamma_b \cdot A_{soil.front} \cdot h_{soil.front} = 81 \cdot kip$

Weight of soil behind side weir walls:

$W_{s.weir.II} := \gamma_b \cdot A_{soil.weir} \cdot h_{soil.weir} = 121.3 \cdot kip$

Weight of soil on toe of headwall:

$W_{s.toe.head.II} := \gamma_b \cdot A_{soil.head.toe} \cdot h_{soil.head.toe} = 683 \cdot kip$

Weight of soil on heel of headwall:

$W_{b.s.heel.II} := \gamma_b \cdot \left(A_{soil.head} \cdot h_{w3} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 381 \cdot kip$

$W_{m.s.heel.II} := \gamma_m \cdot A_{soil.head} \cdot \left(h_{soil.heel.avg} - h_{w3}\right) = 439 \cdot kip$

$W_{s.heel.II} := W_{b.s.heel.II} + W_{m.s.heel.II} = 820 \cdot kip$

Total weight of soil:

$W_{soil.II} := W_{s.front.II} + W_{s.weir.II} + W_{s.toe.head.II} + W_{s.heel.II} = 1706 \cdot kip$

Weight of water behind front weir wall:

$W_{w.front.II} := \gamma_w \cdot A_{soil.front} \cdot h_{w1} = 350 \cdot kip$

Weight of water on heel of side weir walls:

$W_{w.weir.II} := \gamma_w \cdot A_{soil.weir} \cdot h_{w1} = 262 \cdot kip$

Weight of water inside the riser basin:

$W_{w.basin.II} := \gamma_w \cdot A_{basin} \cdot h_{w2} = 0 \cdot kip$

Weight of water on toe of headwall:

$W_{w.toe.head.II} := \gamma_w \cdot A_{soil.head.toe} \cdot h_{w1} = 819 \cdot kip$

Weight of water on heel of headwall:

$$W_{w.heel.head.II} := \gamma_w \cdot \left(A_{soil.head} \cdot h_{w3} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 380 \cdot kip$$

Total weight of water:

$$W_{w.total.front.II} := W_{w.front.II} + W_{w.weir.II} + W_{w.basin.II} = 612 \cdot kip$$

$$W_{w.total.head.II} := W_{w.toe.head.II} + W_{w.heel.head.II} = 1199 \cdot kip$$

$$W_{w.II} := W_{w.total.front.II} + W_{w.total.head.II} = 1811 \cdot kip$$

Uplift pressure under main slab:

$$U_{main.II} := \left(h_{w1} + t_{ftg.main}\right) \cdot \gamma_w = 1185.6 \cdot psf$$

Uplift pressure under wing slabs:

$$U_{wing.II} := \left(h_{w3} + t_{ftg.wing}\right) \cdot \gamma_w = 1060.8 \cdot psf$$

Total Uplift force:

$$U_{uplift.II} := U_{main.II} \cdot A_{ftg.main} + U_{wing.II} \cdot A_{ftg.wings} = 6604 \cdot kip$$

Summation of vertical forces:

$$N_{.1} := W_{concrete} + W_{soil.II} + W_{w.II} - U_{uplift.II} = 2519 \cdot kip$$

FOS against sliding:

$N_2 := 0kip$ additional horizontal resisting force required to obtain required FOS

$$FS_I := \frac{\left(N_{.1}\right) \cdot \tan\left(\phi_{e.e}\right) + N_2}{F_{h.II}} = 3.18$$

SlidingCheck :=	"OK"	if $FS_I > 2.0$	= "OK"
	"NG"	otherwise	

FOS against flotation:

$$FS_L := \frac{W_{concrete} + W_{soil.II}}{U_{uplift.II} - W_{w.II}} = 1.53$$

FlotationCheck :=	"OK"	if $FS_I > 1.3$	= "OK"
	"NG"	otherwise	

Load Case III :Post Flood Condition:

Assumed phreatic surface elevation behind headwall: $EL_{w.heel} := 33.33\,ft$

Water level reservoir: $h_{w1} := EL_{weir} - EL_{slab} = 13.0 \cdot ft$

Water level inside riser structure: $h_{w2} := 0\,ft$

Water level embankment behind headwall: $h_{w3} := EL_{w.heel} - EL_{slab} = 16.33 \cdot ft$

Horizontal forces:

Resistant soil pressure along inlet slab:

$$F_{s1} := -0.5 \cdot \gamma_b \cdot \left(h_{soil.front} + t_{ftg.main}\right)^2 \cdot L_{front} \cdot K_{u2} = -61 \cdot kip$$

Resistant soil pressure along inlet headwall:

$$F_{s2} := -0.5 \cdot \gamma_b \cdot \left[\left(27.8ft - EL_{slab}\right) + t_{ftg.wing}\right]^2 \cdot L_{hw1} \cdot K_{u2} = -138 \cdot kip$$

Soil height of 27.8 ft based on proposed CAD grading plan.

Resistant water pressure on the upstream side:

$$F_{h.w.u.V.m} := -0.5 \cdot \gamma_w \cdot \left(h_{w1} + t_{ftg.main}\right)^2 \cdot \left(L_{head} - 50.5ft\right) = -845 \cdot kip$$

50.5 ft is the length of wing walls

$$F_{h.w.u.V.w} := -0.5 \cdot \gamma_w \cdot \left(h_{w1} + t_{ftg.wing}\right)^2 \cdot (50.5ft) = -455 \cdot kip$$

$$F_{h.w.u.V} := F_{h.w.u.II.m} + F_{h.w.u.II.w} = -1300.09 \cdot kip$$

Sliding soil pressure from embankment backfill behind headwall:

$$F_{1.s.V} := 0.5 \cdot \gamma_m \cdot \left(h_{soil.heel.2} - h_{w3}\right)^2 \cdot L_{hw2} \cdot K_d = 30 \cdot kip$$

$$F_{2.s.V} := \gamma_m \cdot \left(h_{soil.heel.2} - h_{w3}\right) \cdot \left(h_{w3} + t_{ftg.wing}\right) \cdot L_{hw2} \cdot K_d = 371 \cdot kip$$

$$F_{3.s.V} := 0.5 \cdot \gamma_b \left(h_{w3} + t_{ftg.wing}\right)^2 \cdot L_{hw2} \cdot K_d = 590 \cdot kip$$

$$F_{4.s.V} := 0.5 \cdot \gamma_m \cdot \left(h_{soil.heel.2} - h_{w3}\right)^2 \cdot W_{cul} \cdot K_d = 22 \cdot kip$$

$$F_{5.s.V} := \gamma_m \cdot \left(h_{soil.heel.2} - h_{w3}\right) \cdot \left(h_{w3} - h_{cul}\right) \cdot W_{cul} \cdot K_d = 110 \cdot kip$$

$F_{6.s.V} := 0.5 \cdot \gamma_b \cdot (h_{w3} - h_{cul})^2 \cdot W_{cul} \cdot K_d = 73 \cdot kip$

$F_{h.s.d.V} := (F_{1.s.V} + F_{2.s.V} + F_{3.s.V} + F_{4.s.V} + F_{5.s.V} + F_{6.s.V}) \cdot \cos(\beta_{head}) = 1134 \cdot kip$

Sliding water pressure on the downstream side:

$F_{1.w.V} := 0.5 \cdot \gamma_w \cdot (h_{w3} + t_{ftg.wing})^2 \cdot L_{hw2} = 948 \cdot kip$ along full height of headwalls

$F_{2.w.V} := 0.5 \cdot \gamma_w \cdot (h_{w3} - h_{cul})^2 \cdot W_{cul} = 117 \cdot kip$ along top of culvert headwall

$F_{h.w.d.V} := F_{1.w.V} + F_{2.w.V} = 1065 \cdot kip$

Summation of horizontal forces:

$F_{h.V} := F_{s1} + F_{s2} + F_{h.w.u.V} + F_{h.s.d.V} + F_{h.w.d.V} = 699 \cdot kip$

Vertical forces:

Weight of soil behind front weir wall:

$W_{s.front.V} := \gamma_b \cdot A_{soil.front} \cdot h_{soil.front} = 81 \cdot kip$

Weight of soil behind side weir walls:

$W_{s.weir.V} := \gamma_b \cdot A_{soil.weir} \cdot h_{soil.weir} = 121 \cdot kip$

Weight of soil on toe of headwall:

$W_{s.toe.head.V} := \gamma_b \cdot A_{soil.head.toe} \cdot h_{soil.head.toe} = 683 \cdot kip$

Weight of soil on heel of headwall:

$W_{b.s.heel.V} := \gamma_b \cdot (A_{soil.head} \cdot h_{w3} - A_{total.culvert} \cdot L_{culvert.heel}) = 512 \cdot kip$

$W_{m.s.heel.V} := \gamma_m \cdot A_{soil.head} \cdot (h_{soil.heel.avg} - h_{w3}) = 188 \cdot kip$

$W_{s.heel.V} := W_{b.s.heel.V} + W_{m.s.heel.V} = 701 \cdot kip$

Total weight of soil:

$W_{soil.V} := W_{s.front.V} + W_{s.weir.V} + W_{s.toe.head.V} + W_{s.heel.V} = 1586 \cdot kip$

Weight of water behind front weir wall:

$W_{w.front.V} := \gamma_w \cdot A_{soil.front} \cdot h_{w1} = 350 \cdot kip$

Weight of water on heel of side weir walls:

$W_{w.weir.V} := \gamma_w \cdot A_{soil.weir} \cdot h_{w1} = 262 \cdot kip$

Weight of water inside the riser basin:

$W_{w.basin.V} := \gamma_w \cdot A_{basin} \cdot h_{w2} = 0 \cdot kip$

Weight of water on toe of headwall:

$W_{w.toe.head.V} := \gamma_w \cdot A_{soil.head.toe} \cdot h_{w1} = 819 \cdot kip$

Weight of water on heel of headwall:

$W_{w.heel.head.V} := \gamma_w \cdot \left(A_{soil.head} \cdot h_{w3} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 510 \cdot kip$

Total weight of water:

$W_{w.total.front.V} := W_{w.front.V} + W_{w.weir.V} + W_{w.basin.V} = 612 \cdot kip$

$W_{w.total.head.V} := W_{w.toe.head.V} + W_{w.heel.head.V} = 1330 \cdot kip$

$W_{w.V} := W_{w.total.front.V} + W_{w.total.head.V} = 1941 \cdot kip$

Uplift pressure under main slab:

$U_{main.V} := \left(h_{w1} + t_{ftg.main}\right) \cdot \gamma_w = 1185.6 \cdot psf$

Uplift pressure under wing slabs:

$U_{wing.V} := \left(h_{w3} + t_{ftg.wing}\right) \cdot \gamma_w = 1268.6 \cdot psf$

Total Uplift force:

$U_{uplift.V} := U_{main.V} \cdot A_{ftg.main} + U_{wing.V} \cdot A_{ftg.wings} = 6887 \cdot kip$

Summation of vertical forces:

$N_{.1} := W_{concrete} + W_{soil.V} + W_{w.V} - U_{uplift.V} = 2246 \cdot kip$

FOS against sliding:

$N_2 := 0kip$ additional horizontal resisting force required to obtain required FOS

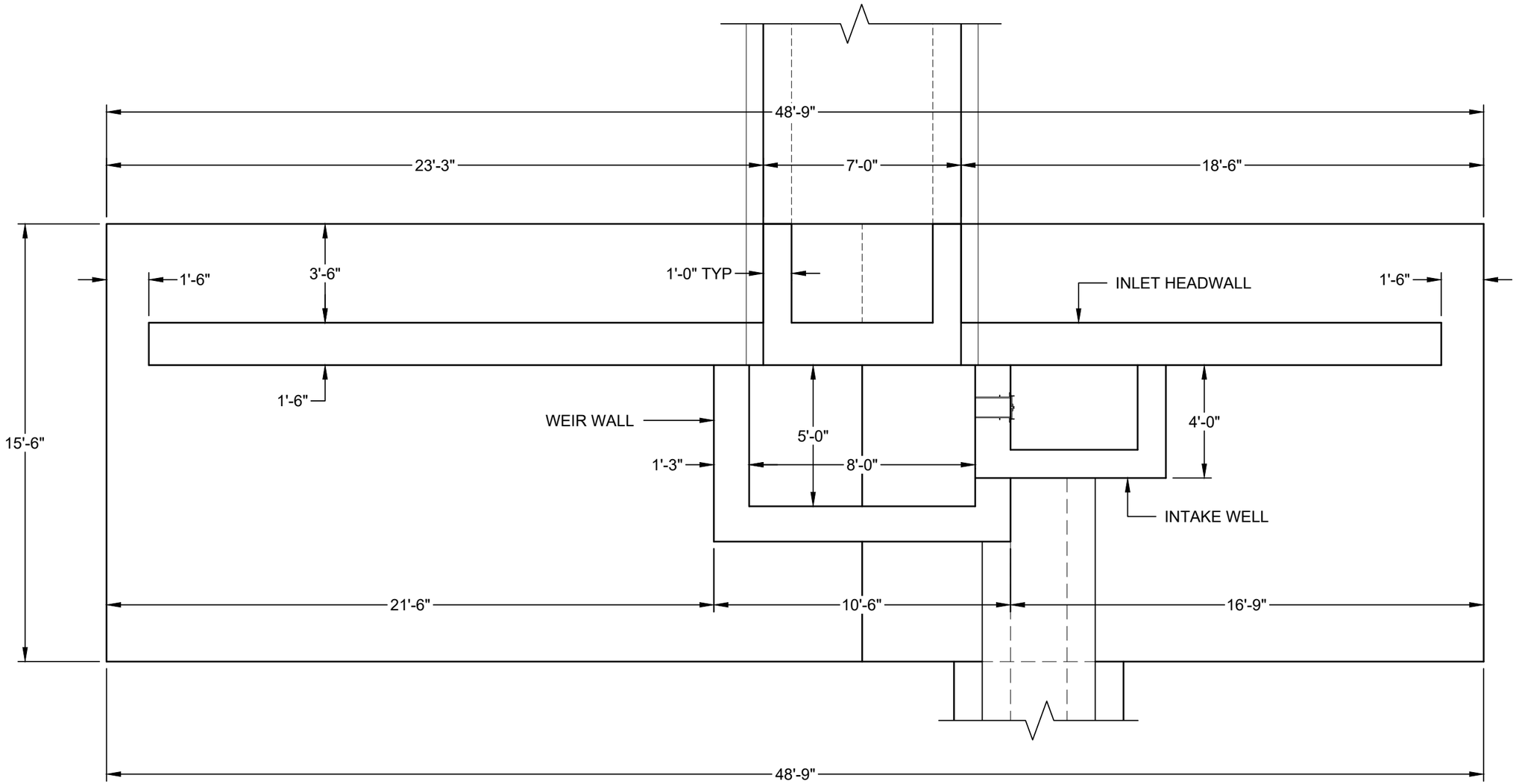
$$FS_{III} := \frac{(N_{.1}) \cdot \tan(\phi_{e.e}) + N_2}{F_{h.V}} = 2.17$$

$SlidingCheck_{III} :=$	"OK" if $FS_{III} > 1.1$ = "OK" "NG" otherwise

FOS against flotation:

$$FS_{III} := \frac{W_{concrete} + W_{soil.V}}{U_{uplift.V} - W_{w.V}} = 1.45$$

$FlotationCheck_V :=$	"OK" if $FS_{III} > 1.1$ = "OK" "NG" otherwise



FLOW

1 INLET PLAN

SCALE: 1/4"=1'0"

0 4' 8'

NOTE:

1. THIS DRAWING IS TO BE USED FOR REFERENCING WITH REGARDS TO PINE LAKE DAM GLOBAL SLIDING STABILITY CALCULATIONS ONLY.

Schnabel ENGINEERING

BOILING SPRING LAKES DAMS REMEDIATION
BOILING SPRING LAKES, NORTH CAROLINA
MCGILL ASSOCIATES, P.A.
SCHNABEL PROJECT NO. 19C21022.00

PINE LAKE DAM SPILLWAY
PLAN AND SECTIONS

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Calculation Objective

The purpose of the following calculation is to check the stability against sliding at the base of the inlet structure for the Pine Lake Dam Hurricane Repair project in Boiling Spring Lake, North Carolina.

Design Basis

The following documents are the design basis for this calculation:

Fluid Loads and Elevations: Schnabel Design Report

Assumptions

1. As shown in the body of the calculation.

References

1. U.S. Army Corps of Engineers. (2005). EM 1110-2-2100, Stability Analysis of Concrete Structure.

Methodology

The stability against flotation at the base of the inlet structure was evaluated in accordance with USACE EM 1110-2-2100 stability criteria. This calculation was performed using Mathcad vs 15.0 software.

Calculation

Material Properties and Geometry:

Water Unit Weight: $\gamma_w := 62.4 \cdot \frac{lbf}{ft^3}$

Concrete Unit Weight: $\gamma_c := 150 \cdot \frac{lbf}{ft^3}$

Moist Unit Weight of Embankment Soil: $\gamma_m := 120 \cdot pcf$

Saturated Unit Weight of Embankment Soil: $\gamma_s := 125 \cdot pcf$

Submerged Embankment Soil Unit Weight: $\gamma_b := \gamma_s - \gamma_w = 62.6 \cdot pcf$

Soil friction angle at embankment: $\phi_{e.e} := 32deg$

Soil friction angle at foundation: $\phi_{e.f} := 29deg$

Inlet Structure Dimensions:

Length of inlet structure: $L_{inlet} := 48.75ft$

Width of inlet structure: $W_{inlet} := 15.5ft$

Footing thickness: $t_{footing} := 3.5ft$

Total area of footing:

$A_{total.footing} := L_{inlet} \cdot W_{inlet} = 755.625 \cdot ft^2$

Concrete Components

Front weir wall area : $A_{front} := 13.1ft^2$

Front weir wall height: $h_{front} := 10ft$

Side weir walls area: $A_{weir} := 6.2ft^2$

Side weir walls height: $h_{weir} := 10ft$

Head wall area: $A_{head} := 68.62ft^2$

Head wall height: $h_{head} := 14ft$

Footing area: $A_{footing} := L_{inlet} \cdot W_{inlet} = 755.62 \cdot ft^2$

Basin area: $A_{basin} := 40ft^2$

Area of culvert (empty section): $A_{culvert} := 20ft^2$

Thickness of culvert inside headwall: $t_{culvert.head} := 1.5ft$

Length of culvert on footing: $L_{culvert.heel} := 3.5ft$

Total Area of culvert section: $A_{total.culvert} := 46ft^2$

Length of headwall: $L_{head} := 32ft$

Length of headwall on upstrem side: $L_{head.upstream} := 14.25ft$

Length of front weir wall: $L_{front} := 10.5ft$

Height of headwall on top of culvert: $h_{head.culvert} := 10ft$

Inise width of riser basin: $W_{riser} := 8ft$

Width of culvert: $W_{cul} := 7ft$

Height of culvert: $h_{culvert} := 6ft$

Voulme of culvert on footing:

$$V_{culvert.heel} := \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel} = 91 \cdot ft^3$$

Weight of front weir wall: $W_{front.wall} := \gamma_c \cdot A_{front} \cdot h_{front} = 19.7 \cdot kip$

Weight of side weir walls: $W_{weir.wall} := 2\gamma_c \cdot A_{weir} \cdot h_{weir} = 18.6 \cdot kip$

Weight of headwall: $W_{head.wall} := \gamma_c \cdot A_{head} \cdot h_{head} = 144 \cdot kip$

Weight of footing: $W_{footing} := \gamma_c \cdot A_{footing} \cdot t_{footing} = 396.7 \cdot kip$

Total weight of walls and footing :

$W_{walls} := W_{front.wall} + W_{weir.wall} + W_{head.wall} + W_{footing} = 579 \cdot kip$

Weight of culvert inside the headwall :

$W_{culvert.head} := \gamma_c \cdot A_{culvert} \cdot t_{culvert.head} = 4.5 \cdot kip$

Weight of culvert on footing:

$W_{culvert.heel} := \gamma_c \cdot \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel} = 13.7 \cdot kip$

Total weight of concrete components:

$W_{concrete} := W_{walls} - W_{culvert.head} + W_{culvert.heel} = 588 \cdot kip$

Soil Profiles:

Soil area on heel of front weir wall: $A_{soil.front} := 207.19 ft^2$

Soil height on heel of front weir wall: $h_{soil.front} := 8 ft$

Soil area on heel of side weir walls: $A_{soil.weir} := 120 ft^2$

Soil height on heel of side weir walls: $h_{soil.weir} := 9.5 ft$

Soil area at end of headwall: $A_{soil.head.side} := 2.25 ft^2$

Soil height on side of headwall: $h_{soil.head.side} := 9.5 ft$

Soil area on headwall heel: $A_{soil.head} := 170.62 ft^2$

Height of backfill at headwall: $h_{soil.heel.1} := 13 ft$

Angle of sloping fill: $\beta_{head} := 18.43\,deg$

Height of sloping backfill at heel:

$h_{soil.heel.2} := h_{soil.heel.1} + L_{culvert.heel} \cdot \tan(\beta_{head}) = 14.2 \cdot ft$

Horizontal soil pressure coefficient on downstream: $K_d := 0.62$

Horizontal soil pressure coefficient on upstream: $K_u := 0.62$

Load Case III :Post flood Condition:

Water level behind front wall: $h_{water.front.V} := 10ft$

Water level behind weir walls: $h_{water.weir.V} := 10ft$

Water level inside the riser structure : $h_{water.riser.V} := 5ft$

Water level on the side of headwall: $h_{water.side.head.V} := 10ft$

Water level on the back of headwall : $h_{water.head.V} := 12ft$

Uplift head under the front weir wall: $h_{gw.front.V} := 10ft$

Uplift head under the headwall: $h_{gw.head.V} := 12ft$

Weight of soil behind front weir wall:

$W_{soil.front.V} := \gamma_b \cdot A_{soil.front} \cdot h_{soil.front} = 104 \cdot kip$

Weight of soil behind side weir walls:

$W_{soil.weir.V} := 2 \cdot \gamma_b \cdot A_{soil.weir} \cdot h_{soil.weir} = 143 \cdot kip$

Weight of soil on the side of headwall:

$W_{soil.side.head.V} := 2 \cdot \gamma_b \cdot A_{soil.head.side} \cdot h_{soil.head.side} = 2.7 \cdot kip$

Weight of soil on heel of headwall:

$$V_{soil.head} := A_{soil.head} \cdot \left(h_{soil.heel.1}\right) = 2218 \cdot ft^3$$

$$W_{soil.heel.V} := \gamma_b \cdot \left(V_{soil.head} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 129 \cdot kip$$

Total weight of soil:

$$W_{soil.V} := W_{soil.front.V} + W_{soil.weir.V} + W_{soil.side.head.V} + W_{soil.heel.V} = 378 \cdot kip$$

Weight of water behind front weir wall:

$$W_{w.front.V} := \gamma_w \cdot A_{soil.front} \cdot h_{water.front.V} = 129 \cdot kip$$

Weight of water on heel of side weir walls:

$$W_{w.weir.V} := 2\gamma_w \cdot A_{soil.weir} \cdot h_{water.weir.V} = 150 \cdot kip$$

Weight of water inside the riser basin:

$$W_{w.basin.V} := \gamma_w \cdot A_{basin} \cdot h_{water.riser.V} = 12 \cdot kip$$

Weight of water on side of headwall:

$$W_{w.side.head.V} := 2\gamma_w \cdot A_{soil.head.side} \cdot h_{water.side.head.V} = 2.8 \cdot kip$$

Weight of water on heel of headwall:

$$W_{w.heel.head.V} := \gamma_w \cdot \left(A_{soil.head} \cdot h_{water.head.V} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 118 \cdot kip$$

Total weight of water:

$$W_{w.V} := W_{w.front.V} + W_{w.weir.V} + W_{w.basin.V} + W_{w.side.head.V} + W_{w.heel.head.V} = 412 \cdot kip$$

Horizontal forces:

Resistant soil pressure on the upstream side:

$$F_{h.1} := \frac{-1}{2} \cdot 2 \cdot \gamma_b \cdot \left(h_{soil.weir} + t_{footing}\right)^2 \cdot L_{head.upstream} \cdot K_u = -93 \cdot kip$$

$$F_{h.2} := \frac{-1}{2} \cdot \gamma_b \cdot \left(h_{soil.front} + t_{footing}\right)^2 \cdot L_{front} \cdot K_u = -27 \cdot kip$$

$$F_{h.s.u.V} := F_{h.1} + F_{h.2} = -120.4 \cdot kip$$

Resistant water pressure on the upstream side:

$$F_{h.w.u.V} := \frac{-1}{2} \cdot \gamma_w \cdot \left(h_{water.front.V} + t_{footing}\right)^2 \cdot L_{inlet} = -277 \cdot kip$$

Sliding soil pressure on the downstream side:

$$F_{1.s} := \frac{1}{2} \cdot \gamma_m \cdot \left(h_{soil.heel.2} - h_{water.head.V}\right)^2 \cdot L_{head} \cdot K_d = 5.6 \cdot kip$$

$$F_{2.s} := \gamma_m \cdot \left(h_{soil.heel.2} - h_{water.head.V}\right) \cdot \left(h_{water.head.V} + t_{footing}\right) \cdot L_{head} \cdot K_d = 80 \cdot kip$$

$$F_{3.s} := \frac{1}{2} \cdot \gamma_b \cdot \left(h_{water.head.V} + t_{footing}\right)^2 \cdot L_{head} \cdot K_d = 149 \cdot kip$$

$$F_{4.s} := \frac{1}{2} \cdot \gamma_m \cdot \left(h_{soil.heel.2} - h_{water.head.V}\right)^2 \cdot W_{cul} \cdot K_d = 1.2 \cdot kip$$

$$F_{5.s} := \gamma_m \cdot \left(h_{soil.heel.2} - h_{water.head.V}\right) \cdot \left(h_{water.head.V} + t_{footing} - h_{culvert}\right) \cdot W_{cul} \cdot K_d = 10.7 \cdot kip$$

$$F_{6.s} := \frac{1}{2} \cdot \gamma_b \cdot \left(h_{water.head.V} + t_{footing} - h_{culvert}\right)^2 \cdot W_{cul} \cdot K_d = 12.3 \cdot kip$$

$$F_{h.s.d.V} := \left(F_{1.s} + F_{2.s} + F_{3.s} + F_{4.s} + F_{5.s} + F_{6.s}\right) = 259 \cdot kip$$

Sliding water pressure on the downstream side:

$$F_{1.w} := \frac{1}{2} \cdot \gamma_w \cdot \left(h_{water.head.V} + t_{footing}\right)^2 \cdot L_{head} = 240 \cdot kip$$

$$F_{2.w} := \frac{1}{2} \cdot \gamma_w \cdot \left(h_{water.head.V} + t_{footing} - h_{culvert}\right)^2 \cdot W_{cul} = 20 \cdot kip$$

$$F_{h.w.d.V} := F_{1.w} + F_{2.w} = 260 \cdot kip$$

Sliding water pressure inside the riser basin:

$$F_{h.w.riser} := \frac{1}{2} \cdot \gamma_w \cdot W_{riser} \cdot h_{water.riser.V}^{2} = 6.2 \cdot kip$$

Summation of horizontal forces:

$$F_{h.V} := F_{h.s.u.V} + F_{h.w.u.V} + F_{h.s.d.V} + F_{h.w.d.V} + F_{h.w.riser} = 127 \cdot kip$$

Uplift pressure at front wall:

$$U_{front.V} := \left(h_{water.front.V} + t_{footing}\right) \cdot \gamma_w = 842 \cdot psf$$

Uplift pressure at headwall:

$$U_{head.V} := \left(h_{water.head.V} + t_{footing}\right) \cdot \gamma_w = 967 \cdot psf$$

Total Uplift force:

$$U_{uplift.V} := \left(U_{head.V} + U_{front.V}\right) \cdot 0.5 \cdot A_{total.footing} = 684 \cdot kip$$

Summation of vertical forces:

$$N_V := W_{concrete} + W_{soil.V} + W_{w.V} - U_{uplift.V} + F_{h.s.d.V} \cdot \tan\left(\beta_{head}\right) = 781 \cdot kip$$

Factor of safety against sliding:

$$FS_{III} := \frac{N_V \cdot \tan\left(\phi_{e.f}\right)}{F_{h.V}} = 3.4$$

$$SlidingCheck_{.III} := \begin{cases} \text{"OK"} & \text{if } FS_{.III} > 1.1 \\ \text{"NG"} & \text{otherwise} \end{cases} = \text{"OK"}$$

Calculation Objective

The purpose of the following calculation is to check the stability against flotation at the base of the inlet structure for the Pine Lake Dam Hurricane Repair project in Boiling Spring Lake, North Carolina.

Design Basis

The following documents are the design basis for this calculation:

Fluid Loads and Elevations: Schnabel Design Report

Assumptions

1. As shown in the body of the calculation.

References

1. U.S. Army Corps of Engineers. (2005). EM 1110-2-2100, Stability Analysis of Concrete Structure.

Methodology

The stability against flotation at the base of the inlet structure was evaluated in accordance with USACE EM 1110-2-2100 stability criteria. This calculation was performed using Mathcad vs 15.0 software.

Calculation

Material Properties and Geometry:

Water Unit Weight: $\gamma_w := 62.4 \cdot \frac{lbf}{ft^3}$ (Design Report)

Concrete Unit Weight: $\gamma_c := 145 \cdot \frac{lbf}{ft^3}$ (Design Report)

Moist Unit Weight of Embankment Soil: $\gamma_m := 120 \cdot pcf$ (Design Report)

Saturated Unit Weight of Embankment Soil: $\gamma_s := 125 \cdot pcf$ (Design Report)

Submerged Embankment Soil Unit Weight: $\gamma_b := \gamma_s - \gamma_w = 62.6 \cdot pcf$ (Design Report)

Inlet Structure Dimensions:

Length of inlet structure: $L_{inlet} := 48.75 ft$ (Design Report)

Width of inlet structure: $W_{inlet} := 15.5 ft$ (Design Report)

Footing thickness: $t_{footing} := 3.5 ft$ (Design Report)

Total area of footing:

$A_{total.footing} := L_{inlet} \cdot W_{inlet} = 755.625 \cdot ft^2$

Concrete Components

Front weir wall area : $A_{front} := 13.1 ft^2$ (Design Report)

Front weir wall height: $h_{front} := 10 ft$ (Design Report)

Side weir walls area: $A_{weir} := 6.2 ft^2$ (Design Report)

Side weir walls height: $h_{weir} := 10 ft$ (Design Report)

Head wall area: $A_{head} := 68.625 ft^2$ (Design Report)

Head wall height: $h_{head} := 14 ft$ (Design Report)

Footing area: $A_{total.footing} = 755.625 \cdot ft^2$ (Design Report)

Basin area: $A_{basin} := 40ft^2$ (Design Report)

Area of culvert (empty section): $A_{culvert} := 20ft^2$ (Design Report)

Thickness of culvert inside headwall: $t_{culvert.head} := 1.5ft$ (Design Report)

Length of culvert on footing: $L_{culvert.heel} := 3.5ft$ (Design Report)

Total Area of culvert section: $A_{total.culvert} := 45.63ft^2$ (Design Report)

Voulme of culvert on footing:

$$V_{culvert.heel} := \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel} = 89.705 \cdot ft^3$$

Weight of front weir wall: $W_{front.wall} := \gamma_c \cdot A_{front} \cdot h_{front} = 19 \cdot kip$

Weight of side weir walls: $W_{weir.wall} := 2\gamma_c \cdot A_{weir} \cdot h_{weir} = 18 \cdot kip$

Weight of head wall: $W_{head.wall} := \gamma_c \cdot A_{head} \cdot h_{head} = 139.3 \cdot kip$

Weight of footing: $W_{footing} := \gamma_c \cdot A_{total.footing} \cdot t_{footing} = 383.5 \cdot kip$

<u>Total weight of walls and footing :</u>

$$W_{walls} := W_{front.wall} + W_{weir.wall} + W_{head.wall} + W_{footing} = 560 \cdot kip$$

<u>Weight of culvert inside the headwall :</u>

$$W_{culvert.head} := \gamma_c \cdot A_{culvert} \cdot t_{culvert.head} = 4.35 \cdot kip$$

<u>Weight of culvert on footing:</u>

$$W_{culvert.heel} := \gamma_c \cdot \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel} = 13 \cdot kip$$

Total weight of concrete components:

$W_{concrete} := W_{walls} - W_{culvert.head} + W_{culvert.heel} = 568 \cdot kip$

Soil Profiles:

Soil area on heel of front weir wall:	$A_{soil.front} := 207.19 ft^2$	(Design Report)
Soil height on heel of front weir wall:	$h_{soil.front} := 8 ft$	(Design Report)
Soil area on heel of side weir walls:	$A_{soil.weir} := 217.1 ft^2$	(Design Report)
Soil height on heel of side weir walls:	$h_{soil.weir} := 9.5 ft$	(Design Report)
Soil height on side of headwall:	$h_{soil.head.side} := 10 ft$	(Design Report)
Soil area on headwall heel:	$A_{soil.head} := 170.625 ft^2$	(Design Report)
Soil height on headwall heel:	$h_{soil.heel} := 14 ft$	(Design Report)

Load Case I :Normal Operating Condition:

Water level behind front wall:	$h_{water.front.II} := 10 ft$	(Design Report)
Water level behind weir walls:	$h_{water.weir.II} := 10 ft$	(Design Report)
Water level inside the riser structure :	$h_{water.riser.II} := 0 ft$	(Design Report)
Water level on the back of head wall :	$h_{water.head.II} := 10 ft$	(Design Report)

Weight of soil behind front weir wall:

$W_{soil.front.II} := \gamma_b \cdot A_{soil.front} \cdot h_{soil.front} = 104 \cdot kip$

Weight of soil behind side weir walls:

$W_{soil.weir.II} := \gamma_b \cdot A_{soil.weir} \cdot h_{soil.weir} = 129 \cdot kip$

Weight of soil on heel of headwall:

$$W_{b.soil.heel.II} := \gamma_b \cdot \left(A_{soil.head} \cdot h_{water.head.II} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 97 \cdot kip$$

$$W_{m.soil.heel.II} := \gamma_m \cdot A_{soil.head} \cdot \left(h_{soil.heel} - h_{water.head.II}\right) = 82 \cdot kip$$

$$W_{soil.heel.II} := W_{m.soil.heel.II} + W_{b.soil.heel.II} = 179 \cdot kip$$

Total weight of soil:

$$W_{soil.II} := W_{soil.front.II} + W_{soil.weir.II} + W_{soil.heel.II} = 412 \cdot kip$$

Weight of water behind front weir wall:

$$W_{w.front.II} := \gamma_w \cdot A_{soil.front} \cdot h_{water.front.II} = 129 \cdot kip$$

Weight of water on heel of side weir walls:

$$W_{w.weir.II} := \gamma_w \cdot A_{soil.weir} \cdot h_{water.weir.II} = 135 \cdot kip$$

Weight of water inside the riser basin:

$$W_{w.basin.II} := \gamma_w \cdot A_{basin} \cdot h_{water.riser.II} = 0 \cdot kip$$

Weight of water on heel of headwall:

$$W_{w.heel.head.II} := \gamma_w \cdot \left(A_{soil.head} \cdot h_{water.head.II} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 96.5 \cdot kip$$

Total weight of water:

$$W_{w.II} := W_{w.front.II} + W_{w.weir.II} + W_{w.basin.II} + W_{w.heel.head.II} = 361 \cdot kip$$

Uplift pressure at front wall:

$$U_{front.II} := \left(h_{water.front.II} + t_{footing}\right) \cdot \gamma_w = 842 \cdot psf$$

Uplift pressure at headwall:

$$U_{head.II} := \left(h_{water.head.II} + t_{footing}\right)\cdot\gamma_w = 842\cdot psf$$

Total Uplift force:

$$U_{uplift} := \left(U_{head.II} + U_{front.II}\right)\cdot 0.5\cdot A_{total.footing} = 637\cdot kip$$

Factor of safety against flotation:

$$FS_I := \frac{W_{concrete} + W_{soil.II}}{U_{uplift} - W_{w.II}} = 3.6$$

$FlotationCheck_I :=$	"OK"	if $FS_I > 1.3$	= "OK"
	"NG"	otherwise	

Load Case III :Post Flood Condition:

Water level behind front weir wall:	$h_{water.front.V} := 10ft$	(Design Report)
Water level behind side weir walls:	$h_{water.weir.V} := 10ft$	(Design Report)
Water level inside the riser structure :	$h_{water.riser.V} := 5ft$	(Design Report)
Water level on the side of head wall:	$h_{water.head.side.V} := 10ft$	(Design Report)
Water level on the back of head wall :	$h_{water.head.V} := 12.67ft$	(Design Report)
Groundwater head behind front weir wall :	$h_{gw.front.V} := 10ft$	(Design Report)
Groundwater head behind headwall :	$h_{gw.head.V} := 12.67ft$	(Design Report)

Weight of soil behind front weir wall:

$$W_{soil.front.V} := \gamma_b\cdot A_{soil.front}\cdot h_{soil.front} = 104\cdot kip$$

Weight of soil behind side weir walls:

$$W_{soil.weir.V} := \gamma_b \cdot A_{soil.weir} \cdot h_{soil.weir} = 129 \cdot kip$$

Weight of soil on heel of headwall:

$$W_{soil.heel.V} := \gamma_b \cdot \left(A_{soil.head} \cdot h_{water.head.V} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 125 \cdot kip$$

$$W_{soil.heelVm} := \gamma_m \cdot A_{soil.head} \cdot \left(h_{soil.heel} - h_{water.head.V}\right) = 27.232 \cdot kip$$

Total weight of soil:

$$W_{soil.V} := W_{soil.front.V} + W_{soil.weir.V} + W_{soil.heelVm} + W_{soil.heel.V} = 385 \cdot kip$$

Weight of water behind front weir wall:

$$W_{w.front.V} := \gamma_w \cdot A_{soil.front} \cdot h_{water.front.V} = 129 \cdot kip$$

Weight of water on heel of side weir walls:

$$W_{w.weir.V} := \gamma_w \cdot A_{soil.weir} \cdot h_{water.weir.V} = 135 \cdot kip$$

Weight of water inside the riser basin:

$$W_{w.riser.V} := \gamma_w \cdot A_{basin} \cdot h_{water.riser.V} = 12 \cdot kip$$

Weight of water on heel of headwall:

$$W_{w.heel.head.V} := \gamma_w \cdot \left[A_{soil.head} \cdot h_{water.head.V} - \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel}\right] = 129 \cdot kip$$

Total weight of water:

$$W_{w.V} := W_{w.front.V} + W_{w.weir.V} + W_{w.riser.V} + W_{w.heel.head.V} = 407 \cdot kip$$

Uplift pressure at front weir wall:

$$U_{front.V} := \left(h_{gw.front.V} + t_{footing}\right)\cdot\gamma_w = 842.4\cdot psf$$

Uplift pressure at head wall:

$$U_{head.V} := \left(h_{gw.head.V} + t_{footing}\right)\cdot\gamma_w = 1009\cdot psf$$

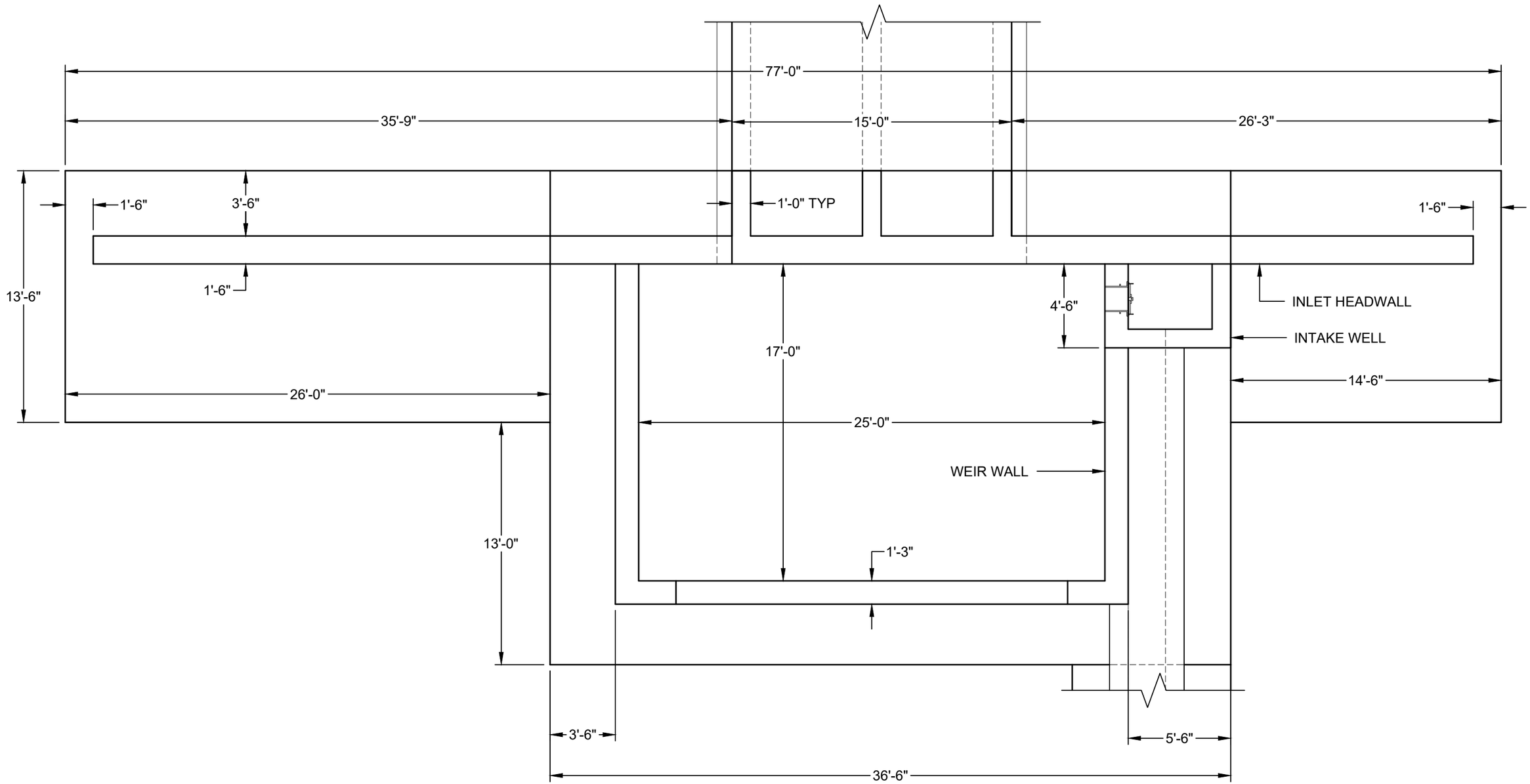
Total Uplift force:

$$U_{uplift.V} := \left(\left(U_{head.V} + U_{front.V}\right)\right)\cdot\frac{1}{2}\cdot A_{total.footing} = 699.5\cdot kip$$

Factor of safety against flotation:

$$FS_{III} := \frac{W_{concrete} + W_{soil.V}}{U_{uplift.V} - W_{w.V}} = 3.3$$

$FlotationCheck_{III} :=$	"OK" if $FS_{III} > 1.1$ = "OK" "NG" otherwise



FLOW

1 INLET PLAN

SCALE: 3/16"=1'0"

0 4' 8'

NOTE:

1. THIS DRAWING IS TO BE USED FOR REFERENCING WITH REGARDS TO NORTH LAKE DAM GLOBAL SLIDING STABILITY CALCULATIONS ONLY.

Schnabel ENGINEERING

BOILING SPRING LAKES DAMS REMEDIATION
BOILING SPRING LAKES, NORTH CAROLINA
MCGILL ASSOCIATES, P.A.
SCHNABEL PROJECT NO. 19C21022.00

NORTH LAKE DAM SPILLWAY
PLAN AND SECTIONS

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Calculation Objective

The purpose of the following calculation is to check the stability against sliding at the base of the inlet structure for the North Lake Dam Hurricane Repair project in Boiling Spring Lake, North Carolina.

Design Basis

The following documents are the design basis for this calculation:

Fluid Loads and Elevations: Schnabel Design Report

Assumptions

1. As shown in the body of the calculation.
2. At-Rest earth pressures

References

1. U.S. Army Corps of Engineers. (2005). EM 1110-2-2100, Stability Analysis of Concrete Structure.

Methodology

The stability against flotation at the base of the inlet structure was evaluated in accordance with USACE EM 1110-2-2100 stability criteria. This calculation was performed using Mathcad vs 15.0 software.

Calculation

Material Properties and Geometry:

Unit Weight of Water: $\gamma_w := 62.4 \cdot \frac{lbf}{ft^3}$

Concrete Unit Weight: $\gamma_c := 150 \cdot \frac{lbf}{ft^3}$

Moist Unit Weight of Embankment Soil: $\gamma_m := 120 \cdot pcf$

Saturated Unit Weight of Embankment Soil: $\gamma_s := 125 \cdot pcf$

Submerged Embankment Soil Unit Weight: $\gamma_b := \gamma_s - \gamma_w = 62.6 \cdot pcf$

Soil friction angle at embankment: $\phi_{e.e} := 32deg$

Soil friction angle at foundation: $\phi_{e.f} := 29deg$

Inlet Structure Dimensions:

Plan area of inlet slab: $A_{slab} := 1514ft^2$

Slab thickness: $t_{slab} := 3.5ft$

Concrete Components:

Front weir wall plan area: $A_1 := 34.375ft^2$

Height of front weir wall: $h_1 := 10.5ft$

Side weir wall plan area: $A_2 := 21.25ft^2$

Height of side weir walls: $h_2 := 10.5ft$

Headwall plan area: $A_3 := 111ft^2$

Height of headwall: $h_3 := 16.25ft$

Basin area: $A_4 := 425ft^2$

Area of empty culvert: $A_5 := 2\cdot(6ft\cdot 6ft) = 72\cdot ft^2$

Total area of culvert: $A_6 := 126.4ft^2$

Headwall thickness: $t_{hw} := 1.5ft$

Length of heel: $L_{heel} := 3.5ft$

Weight of slab: $W_{slab} := \gamma_c\cdot A_{slab}\cdot t_{slab} = 794.85\cdot kip$

Weight of front weir wall: $W_1 := \gamma_c\cdot A_1\cdot h_1 = 54.14\cdot kip$

Weight of side weir walls: $W_2 := 2\gamma_c\cdot A_2\cdot h_2 = 66.94\cdot kip$

Total Weight of headwall: $W_3 := \gamma_c\cdot\left(A_3\cdot h_3 - A_6\cdot t_{hw}\right) = 242.12\cdot kip$

"Weight" of open culvert: $W_4 := \gamma_c\cdot A_5\cdot\left(t_{hw} + L_{heel}\right) = 54\cdot kip$

Total weight of culvert: $W_5 := \gamma_c\cdot A_6\cdot\left(t_{hw} + L_{heel}\right) = 94.8\cdot kip$

Total weight of concrete:

$$W_{conc} := W_{slab} + W_1 + W_2 + W_3 - W_4 + W_5 = 1198.85\cdot kip$$

Soil profiles:

Area of soil at front weir wall: $A_7 := 118.5ft^2$

Height of soil at front weir wall: $h_7 := 6.75ft$

Length of slab at front weir wall: $L_7 := 36.5ft$

Area of soil at side weir walls: $A_8 := 63.81ft^2 + 100.35ft^2 = 164.16 \cdot ft^2$

Height of soil at side weir walls: $h_8 := 8.65ft$

Area of soil on toe side of HW: $A_9 := 220.9ft^2 + 123.2ft^2 = 344.1 \cdot ft^2$

Height of soil on toe side of HW: $h_9 := 11.3ft$

Length of slab at toe of HW: $L_9 := 28ft + 18.5ft = 46.5 \cdot ft$

Area of soil on heel side of HW: $A_{10} := 269.5ft^2$

Height of soil on heel side of HW: $h_{10} := 15.75ft$

Length of slab at heel of HW: $L_{10} := 74ft$

Lenght of culvert: $L_{11} := 16.67ft$

Height of culvert: $h_{11} := 7ft$

Horizontal soil pressure coeficient (level backfill): $K_0 := .47 \quad (at - rest)$

Horizontal soil pressure coeficient (Pos 3H:1V) $K_3 := .62 \quad (at - rest)$

Backfill slope: $\beta := 18.43deg$

Load Case III: Post Flood Condition:

Water level at front weir wall: $h_{7w} := 10.5ft$

Water level at side weir walls: $h_{8w} := 10.5ft$

Water level at toe side of HW: $h_{9w} := 10.5ft$

Water level at heel side on HW: $h_{10w} := 14ft$

Water level inside riser: $h_4 := 5.5ft$

Weight of soil at front weir wall:

$$W_{s1V} := \gamma_b \cdot A_7 \cdot h_7 = 50.07 \cdot kip$$

Weight of soil at side weir walls:

$$W_{s2V} := \gamma_b \cdot A_8 \cdot h_8 = 88.89 \cdot kip$$

Weight of soil on toe side of HW:

$$W_{s3V} := \gamma_b \cdot A_9 \cdot h_9 = 243.41 \cdot kip$$

Weight of soil on heel side of HW:

$$W_{s4V} := \gamma_b \cdot \left(A_{10} \cdot h_{10} - A_6 \cdot L_{heel}\right) = 238.02 \cdot kip$$

Total weight of soil:

$$W_{soil} := W_{s1V} + W_{s2V} + W_{s3V} + W_{s4V} = 620.39 \cdot kip$$

Weight of water at front weir wall:

$$W_{w1V} := \gamma_w \cdot A_7 \cdot h_{7w} = 77.64 \cdot kip$$

Weight of water at side weir walls:

$$W_{w2V} := \gamma_w \cdot A_8 \cdot h_{8w} = 107.56 \cdot kip$$

Weight of water on toe side of HW:

$$W_{w3V} := \gamma_w \cdot A_9 \cdot h_{9w} = 225.45 \cdot kip$$

Weight of water on heel side of HW:

$$W_{w4V} := \gamma_w \cdot \left(A_{10} \cdot h_{10w} - A_6 \cdot L_{heel}\right) = 207.83 \cdot kip$$

Weight of water inside riser:

$$W_{w5V} := \gamma_w \cdot A_4 \cdot h_4 = 145.86 \cdot kip$$

Total weight of water:

$$W_{water} := W_{w1V} + W_{w2V} + W_{w3V} + W_{w4V} + W_{w5V} = 764.34 \cdot kip$$

Horizontal Forces:

Resistant soil force at front weir wall:

$$F_{h1V} := -.5 \cdot \gamma_b \cdot \left(h_7 + t_{slab}\right)^2 \cdot K_3 \cdot L_7 = -74.42 \cdot kip$$

Resistant soil force at toe side of weir wall:

$$F_{h2V} := -.5 \cdot \gamma_b \cdot \left(h_9 + t_{slab}\right)^2 \cdot K_3 \cdot L_9 = -197.66 \cdot kip$$

Resistant water force at upsteam side of HW:

$$F_{h3V} := -.5 \cdot \gamma_w \cdot \left(h_{7w} + t_{slab}\right)^2 \cdot L_{10} = -452.52 \cdot kip$$

Sliding soil force on the downstream side:

Moist soil:

$$F_{h4V} := .5 \cdot \gamma_m \cdot \left(h_{10} - h_{10w}\right)^2 \cdot L_{10} \cdot K_0 = 6.39 \cdot kip$$

Saturated soil:

$$F_{h5V} := \gamma_m \cdot \left(h_{10} - h_{10w}\right) \cdot \left(h_{10w} + t_{slab}\right) \cdot \left(L_{10} - L_{11}\right) \cdot K_0 = 99.02 \cdot kip$$ On sides of culvert

$$F_{h6V} := .5 \cdot \gamma_b \cdot \left(h_{10w}\right)^2 \cdot \left(L_{10} - L_{11}\right) \cdot K_0 = 165.3 \cdot kip$$ On sides of culvert

$$F_{h7V} := \gamma_m \cdot \left(h_{10} - h_{10w}\right) \cdot \left(h_{10w} + t_{slab} - h_{11}\right) \cdot L_{11} \cdot K_0 = 17.28 \cdot kip$$ Above culvert

$$F_{h8V} := .5 \cdot \gamma_b \cdot \left(h_{10w} + t_{slab} - h_{11}\right)^2 \cdot L_{11} \cdot K_0 = 27.04 \cdot kip$$ Above culvert

$$F_{h.soil} := \left(F_{h1V} + F_{h2V} + F_{h3V}\right) + \left(F_{h4V} + F_{h5V} + F_{h6V} + F_{h7V} + F_{h8V}\right) \cdot \cos(\beta) = -425.73 \cdot kip$$

Sliding water force on downstream side:

$$F_{h9V} := .5 \cdot \gamma_w \cdot \left(h_{10w} + t_{slab}\right)^2 \cdot \left(L_{10} - L_{11}\right) = 547.79 \cdot kip$$ On sides of culvert

$$F_{h10V} := .5 \cdot \gamma_w \cdot \left(h_{10w} + t_{slab} - h_{11}\right)^2 \cdot L_{11} = 57.34 \cdot kip$$ Above culvert

Summation of Horizontal Forces:

$$F_{hV} := F_{h.soil} + F_{h9V} + F_{h10V} = 179.4 \cdot kip$$

Uplift pressure at front weir wall:

Front slab area: $A_{slab1} := 1129ft^2$

Heel slab area: $A_{slab2} := A_{10} = 269.5 \cdot ft^2$

$U_{1V} := \gamma_w \cdot (h_{7w} + t_{slab}) = 873.6 \cdot psf$

$U_{2V} := \gamma_w \cdot (h_{10w} + t_{slab}) = 1092 \cdot psf$

$U_{totalV} := U_{1V} \cdot A_{slab1} + U_{2V} \cdot A_{slab2} = 1280.59 \cdot kip$

Summation of Vertical Forces:

$F_{vV} := W_{conc} + W_{soil} + W_{water} - U_{totalV} = 1303 \cdot kip$

$$FS_{III} := \frac{F_{vV} \cdot \tan(\phi_{e.f})}{F_{hV}} = 4.03$$

$SlidingCheck_{III} :=$	"OK" if $FS_{III} > 1.1$ = "OK" "NG" otherwise

Calculation Objective

The purpose of the following calculation is to check the stability against flotation at the base of the inlet structure for the North Lake Dam Hurricane Repair project in Boiling Spring Lake, North Carolina.

Design Basis

The following documents are the design basis for this calculation:

Fluid Loads and Elevations: Schnabel Design Report

Assumptions

1. As shown in the body of the calculation.

References

1. U.S. Army Corps of Engineers. (2005). EM 1110-2-2100, Stability Analysis of Concrete Structure.

Methodology

The stability against flotation at the base of the inlet structure was evaluated in accordance with USACE EM 1110-2-2100 stability criteria. This calculation was performed using Mathcad vs 15.0 software.

Calculation

Material Properties and Geometry:

Water Unit Weight: $\gamma_w := 62.4 \cdot \frac{lbf}{ft^3}$

Concrete Unit Weight: $\gamma_c := 145 \cdot \frac{lbf}{ft^3}$

Moist Unit Weight of Embankment Soil: $\gamma_m := 120 \cdot pcf$

Saturated Unit Weight of Embankment Soil: $\gamma_s := 125 \cdot pcf$

Submerged Embankment Soil Unit Weight: $\gamma_b := \gamma_s - \gamma_w = 62.6 \cdot pcf$

Inlet Structure Dimensions:

Length of inlet at front weir wall: $L_{front} := 36.5ft$

Length of inlet at headwall: $L_{head} := 77ft$

Width of inlet at front weir wall: $W_{front} := 13ft$

Width of inlet at headwall: $W_{head} := 13.5ft$

Footing thickness: $t_{footing} := 3.5ft$

Total area of footing:

$A_{total.footing} := L_{front} \cdot W_{front} + L_{head} \cdot W_{head} = 1514 \cdot ft^2$

Concrete Components

Front weir wall area : $A_{front} := 34.375ft^2$

Front weir wall height: $h_{front} := 10.5ft$

Side weir walls area: $A_{weir} := 21.25ft^2$

Side weir walls height: $h_{weir} := 10.5ft$

Head wall area: $A_{head} := 111ft^2$

Head wall height: $h_{head} := 16.25ft$

Footing area: $A_{footing} := A_{total.footing} = 1514 \cdot ft^2$

Basin area: $A_{basin} := 425ft^2$

Area of culvert (empty section): $A_{culvert} := 72ft^2$

Thickness of culvert inside headwall: $t_{culvert.head} := 1.5ft$

Length of culvert on footing: $L_{culvert.heel} := 3.5ft$

Total Area of culvert section: $A_{total.culvert} := 126.4ft^2$

Voulme of culvert on footing:

$$V_{culvert.heel} := \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel} = 190 \cdot ft^3$$

Weight of front weir wall: $W_{front.wall} := \gamma_c \cdot A_{front} \cdot h_{front} = 52.3 \cdot kip$

Weight of side weir walls: $W_{weir.wall} := 2\gamma_c \cdot A_{weir} \cdot h_{weir} = 64.7 \cdot kip$

Weight of head wall: $W_{head.wall} := \gamma_c \cdot A_{head} \cdot h_{head} = 261.5 \cdot kip$

Weight of footing: $W_{footing} := \gamma_c \cdot A_{footing} \cdot t_{footing} = 768.4 \cdot kip$

Total weight of walls (head +weir) :

$$W_{walls} := W_{front.wall} + W_{weir.wall} + W_{head.wall} + W_{footing} = 1146.94 \cdot kip$$

Weight of culvert inside the headwall :

$$W_{culvert.head} := \gamma_c \cdot A_{culvert} \cdot t_{culvert.head} = 15.66 \cdot kip$$

Weight of culvert on footing:

$$W_{culvert.heel} := \gamma_c \cdot \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel} = 27.6 \cdot kip$$

Total weight of concrete structures:

$$W_{concrete} := W_{walls} - W_{culvert.head} + W_{culvert.heel} = 1158.89 \cdot kip$$

Soil Profiles:

Soil area on heel of front weir wall: $A_{soil.front} := 118.5ft^2$

Soil height on heel of front weir wall: $h_{soil.front} := 6.5ft$

Soil area on heel of side weir walls: $A_{soil.weir} := 87.76ft^2$

Soil height on weir walls heel: $h_{soil.weir} := 8.5ft$

Soil area on toe of headwall: $A_{S3} := 395.89ft^2$

Soil height on toe of headwall: $h_{S3} := 10.5ft$

Soil area on side of headwall: $A_{soil.head.side} := 2.25ft^2$

Soil height on side of headwall: $h_{soil.head.side} := 11.5ft$

Soil area on headwall heel: $A_{soil.head} := 269.67ft^2$

Soil height on headwall heel: $h_{soil.heel} := 14.5ft$

Load Case I :Normal Operating Condition:

Water level behind front weir wall: $h_{water.front.II} := 10.5ft$

Water level behind side weir walls: $h_{water.weir.II} := 10.5ft$

Water level inside the riser structure : $h_{water.riser.II} := 0ft$

Water level on the side of head wall: $h_{water.side.head.II} := 10.5ft$

Water level on the back of head wall : $h_{water.head.II} := 10.5ft$

Groundwater head behind front weir wall : $h_{gw.front.II} := 10.5ft$

Groundwater head behind headwall : $h_{gw.head.II} := 10.5ft$

Weight of soil behind front weir wall:

$$W_{soil.front.II} := \gamma_b \cdot A_{soil.front} \cdot h_{soil.front} = 48.2 \cdot kip$$

Weight of soil behind side weir walls:

$$W_{soil.weir.II} := \gamma_b \cdot A_{soil.weir} \cdot h_{soil.weir} = 46.7 \cdot kip$$

Weight of soil on toe side of headwall:

$$W_{S3} := \gamma_b \cdot A_{S3} \cdot h_{S3} = 260.22 \cdot kip$$

Weight of soil on heel of headwall:

$$W_{b.soil.heel.II} := \gamma_b \cdot \left(A_{soil.head} \cdot h_{water.head.II} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 150 \cdot kip$$

$$W_{m.soil.heel.II} := \gamma_m \cdot A_{soil.head} \cdot \left(h_{soil.heel} - h_{water.head.II}\right) = 129 \cdot kip$$

$$W_{soil.heel.II} := W_{b.soil.heel.II} + W_{m.soil.heel.II} = 279 \cdot kip$$

Total weight of soil:

$$W_{soil.II} := W_{soil.front.II} + W_{soil.weir.II} + W_{S3} + W_{soil.heel.II} = 634 \cdot kip$$

Weight of water behind front weir wall:

$$W_{w.front.II} := \gamma_w \cdot A_{soil.front} \cdot h_{water.front.II} = 77.6 \cdot kip$$

Weight of water on heel of side weir walls:

$$W_{w.weir.II} := \gamma_w \cdot A_{soil.weir} \cdot h_{water.weir.II} = 58 \cdot kip$$

Weight of water on toe side of headwall:

$$W_{W3} := \gamma_w \cdot A_{S3} \cdot h_{water.weir.II} = 259.39 \cdot kip$$

Weight of water inside the riser basin:

$$W_{w.basin.II} := \gamma_w \cdot A_{basin} \cdot h_{water.riser.II} = 0 \cdot kip$$

Weight of water on heel of headwall:

$$W_{w.heel.head.II} := \gamma_w \cdot \left[A_{soil.head} \cdot h_{water.head.II} - \left(A_{total.culvert}\right) \cdot L_{culvert.heel}\right] = 149 \cdot kip$$

Total weight of water:

$$W_{w.II} := W_{w.front.II} + W_{w.weir.II} + W_{w.basin.II} + W_{W3} + W_{w.heel.head.II} = 544 \cdot kip$$

Uplift pressure at front wall:

$$U_{front.II} := \left(h_{gw.front.II} + t_{footing}\right) \cdot \gamma_w = 873.6 \cdot psf$$

Uplift pressure at headwall:

$$U_{head.II} := \left(h_{gw.head.II} + t_{footing}\right) \cdot \gamma_w = 873.6 \cdot psf$$

Total Uplift force:

$$F_{uplift} := \left(U_{head.II} + U_{front.II}\right) \cdot 0.5 \cdot A_{total.footing} = 1323 \cdot kip$$

Factor of safety against flotation:

$$FS_I := \frac{W_{concrete} + W_{soil.II}}{F_{uplift} - W_{w.II}} = 2.3$$

$FlotationCheck_I :=$	"OK" if $FS_I > 1.3$ = "OK" "NG" otherwise

Load Case III :Post Flood Condition:

Water level behind front weir wall: $h_{water.front.V} := 10.5ft$

Water level behind side weir walls: $h_{water.weir.V} := 10.5ft$

Water level inside the riser structure : $h_{water.riser.V} := 5.5ft$

Water level on the side of head wall: $h_{water.head.side.V} := 10.5ft$

Water level on the back of head wall : $h_{water.head.V} := 14.33ft$

Groundwater head behind front weir wall : $h_{gw.front.V} := 10.5ft$

Groundwater head behind headwall : $h_{gw.head.V} := 14.33ft$

Weight of soil behind front weir wall:

$$W_{soil.front.V} := \gamma_b \cdot A_{soil.front} \cdot h_{soil.front} = 48 \cdot kip$$

Weight of soil behind side weir walls:

$$W_{soil.weir.V} := \gamma_b \cdot A_{soil.weir} \cdot h_{soil.weir} = 47 \cdot kip$$

Weight of soil on toe side of headwall:

$$W_{S3} := \gamma_b \cdot A_{S3} \cdot h_{S3} = 260.22 \cdot kip$$

Weight of soil on heel of headwall:

$$W_{soil.heel.V} := \gamma_b \cdot \left(A_{soil.head} \cdot h_{soil.heel} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 217 \cdot kip$$

Total weight of soil:

$$W_{soil.V} := W_{soil.front.V} + W_{soil.weir.V} + W_{S3} + W_{soil.heel.V} = 572 \cdot kip$$

Weight of water behind front weir wall:

$W_{w.front.V} := \gamma_w \cdot A_{soil.front} \cdot h_{water.front.V} = 78 \cdot kip$

Weight of water on heel of side weir walls:

$W_{w.weir.V} := \gamma_w \cdot A_{soil.weir} \cdot h_{water.weir.V} = 58 \cdot kip$

Weight of water inside the riser basin:

$W_{w.riser.V} := \gamma_w \cdot A_{basin} \cdot h_{water.riser.V} = 146 \cdot kip$

Weight of water on heel of headwall:

$W_{w.heel.head.V} := \gamma_w \cdot \left[A_{soil.head} \cdot h_{water.head.V} - \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel}\right] = 229 \cdot kip$

Weight of water on toe of headwall:

$W_{W3} := \gamma_w \cdot A_{S3} \cdot h_{water.weir.V} = 259.39 \cdot kip$

Total weight of water:

$W_{water.V} := W_{w.front.V} + W_{w.weir.V} + W_{w.riser.V} + W_{W3} + W_{w.heel.head.V} = 770 \cdot kip$

Uplift pressure at front weir wall:

$U_{front.V} := \left(h_{gw.front.V} + t_{footing}\right) \cdot \gamma_w = 873.6 \cdot psf$

Uplift pressure at head wall:

$U_{head.V} := \left(h_{gw.head.V} + t_{footing}\right) \cdot \gamma_w = 1112.59 \cdot psf$

Total Uplift force:

$U_{head.avg} := \left(U_{front.V} + U_{head.V}\right) \div 2 = 993.1 \cdot psf$

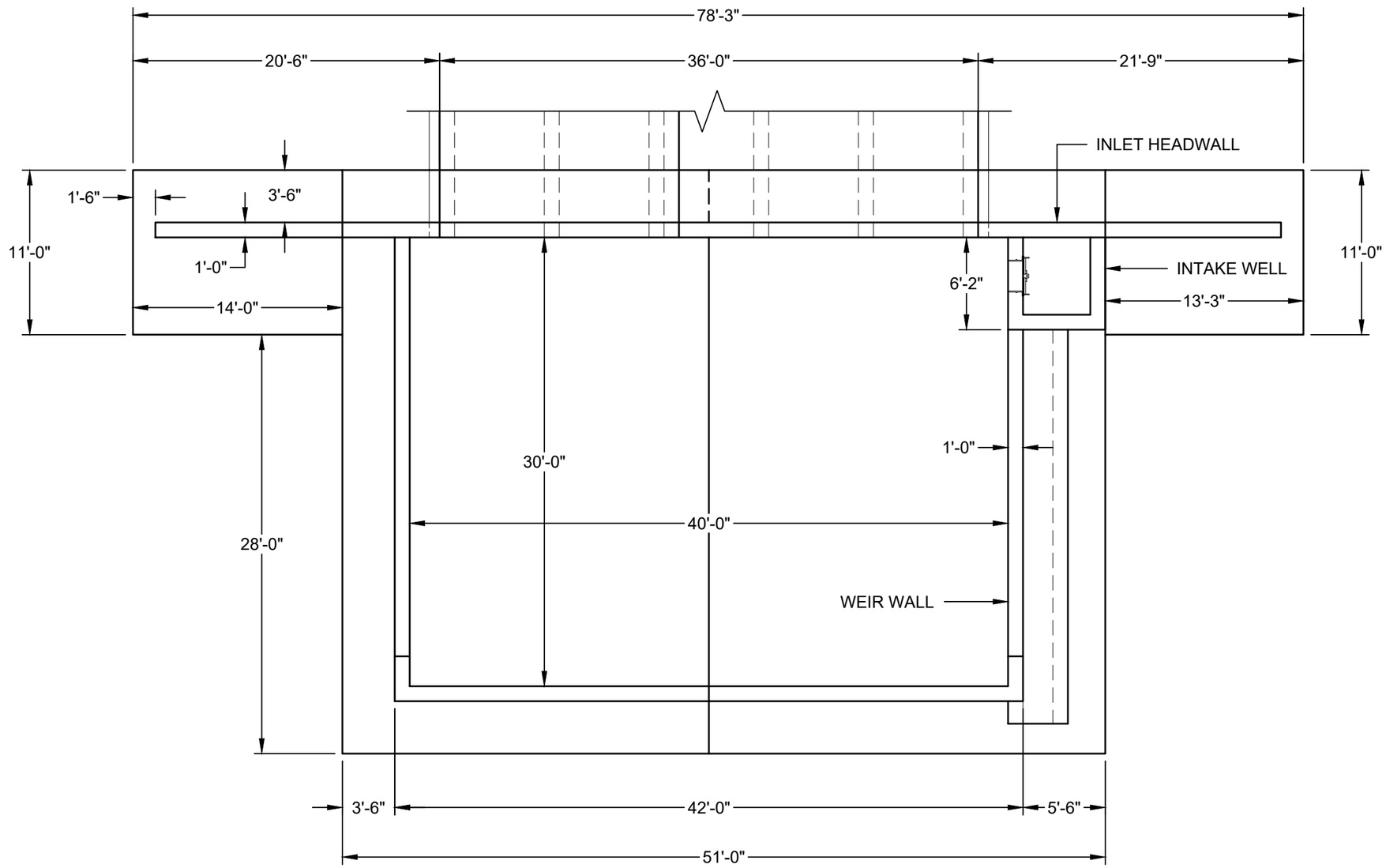
$A_{total.footing} = 1514 \cdot ft^2$

$F_{uplift.V} := U_{head.avg} \cdot A_{total.footing} = 1503.55 \cdot kip$

Factor of safety against flotation:

$$FS_{III} := \frac{W_{concrete} + W_{soil.V}}{F_{uplift.V} - W_{water.V}} = 2.36$$

$FlotationCheck_{III} :=$	"OK" if $FS_{III} > 1.1$ = "OK" "NG" otherwise



FLOW

1 INLET PLAN

SCALE: 1/8"=1'0"

0 8' 16'

NOTE:

1. THIS DRAWING IS TO BE USED FOR REFERENCING WITH REGARDS TO UPPER LAKE DAM GLOBAL SLIDING STABILITY CALCULATIONS ONLY.

Schnabel ENGINEERING

BOILING SPRING LAKES DAMS REMEDIATION
BOILING SPRING LAKES, NORTH CAROLINA
MCGILL ASSOCIATES, P.A.
SCHNABEL PROJECT NO. 19C21022.00

UPPER LAKE DAM SPILLWAY
PLAN AND SECTION

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Calculation Objective

The purpose of the following calculation is to check the stability against sliding at the base of the inlet structure for the Upper Lake Dam Hurricane Repair project in Boiling Spring Lake, North Carolina.

Design Basis

The following documents are the design basis for this calculation:

Fluid Loads and Elevations: Schnabel Design Report

Assumptions

1. As shown in the body of the calculation.
2. At-Rest earth pressures

References

1. U.S. Army Corps of Engineers. (2005). EM 1110-2-2100, Stability Analysis of Concrete Structure.

Methodology

The stability against flotation at the base of the inlet structure was evaluated in accordance with USACE EM 1110-2-2100 stability criteria. This calculation was performed using Mathcad vs 15.0 software.

Calculation

Material Properties and Geometry:

Unit Weight of Water: $\gamma_w := 62.4 \cdot \frac{lbf}{ft^3}$

Concrete Unit Weight: $\gamma_c := 150 \cdot \frac{lbf}{ft^3}$

Moist Unit Weight of Embankment Soil: $\gamma_m := 120 \cdot pcf$

Saturated Unit Weight of Embankment Soil: $\gamma_s := 125 \cdot pcf$

Submerged Embankment Soil Unit Weight: $\gamma_b := \gamma_s - \gamma_w = 62.6 \cdot pcf$

Soil friction angle at embankment: $\phi_{e.e} := 32deg$

Soil friction angle at foundation: $\phi_{e.f} := 29deg$

Inlet Structure Dimensions:

Plan area of inlet slab: $A_{slab} := 2289ft^2$

Slab thickness: $t_{slab} := 4ft$

Concrete Components:

Front weir wall plan area: $A_1 := 42ft^2$

Height of front weir wall: $h_1 := 5ft$

Side weir wall plan area: $A_2 := 30ft^2$

Height of side weir walls: $h_2 := 5ft$

Headwall plan area: $A_3 := 75.25ft^2$

Height of headwall: $h_3 := 9ft$

Basin area: $A_4 := 1200ft^2$

Area of empty culvert: $A_5 := 5 \cdot (5ft \cdot 6ft) = 150 \cdot ft^2$

Total area of culvert: $A_6 := 256.85ft^2$

Headwall thickness: $t_{hw} := 1ft$

Length of heel: $L_{heel} := 3.5ft$

Weight of slab: $W_{slab} := \gamma_c \cdot A_{slab} \cdot t_{slab} = 1373.4 \cdot kip$

Weight of front weir wall: $W_1 := \gamma_c \cdot A_1 \cdot h_1 = 31.5 \cdot kip$

Weight of side weir walls: $W_2 := 2\gamma_c \cdot A_2 \cdot h_2 = 45 \cdot kip$

Total Weight of headwall: $W_3 := \gamma_c \cdot (A_3 \cdot h_3 - A_6 \cdot t_{hw}) = 63.06 \cdot kip$

"Weight" of open culvert: $W_4 := \gamma_c \cdot A_5 \cdot (t_{hw} + L_{heel}) = 101.25 \cdot kip$

Total weight of culvert: $W_5 := \gamma_c \cdot A_6 \cdot (t_{hw} + L_{heel}) = 173.37 \cdot kip$

Total weight of concrete:

$$W_{conc} := W_{slab} + W_1 + W_2 + W_3 - W_4 + W_5 = 1585.08 \cdot kip$$

Soil profiles:

Area of soil at front weir wall: $A_7 := 178.63ft^2$

Height of soil at front weir wall: $h_7 := 0ft$

Length of slab at front weir wall: $L_7 := 51ft$

Area of soil at side weir walls: $A_8 := 108.5ft^2 + 170.5ft^2 = 279 \cdot ft^2$

Height of soil at side weir walls: $h_8 := 2ft$

Area of soil on toe side of HW: $A_9 := 91ft^2 + 86.11ft^2 = 177.11 \cdot ft^2$

Height of soil on toe side of HW: $h_9 := 4.5ft$

Length of slab at toe of HW: $L_9 := 14ft + 13.25ft = 27.25 \cdot ft$

Area of soil on heel side of HW: $A_{10} := 273.9ft^2$

Height of soil on heel side of HW: $h_{10} := 8.25ft$

Length of slab at heel of HW: $L_{10} := 75.25ft$

Lenght of culvert: $L_{11} := 37.4ft$

Height of culvert: $h_{11} := 6ft$

Horizontal soil pressure coeficient (level backfill): $K_0 := .47$

Load Case III: Post Flood Condition:

Water level at front weir wall: $h_{7w} := 5ft$

Water level at side weir walls: $h_{8w} := 5ft$

Water level at toe side of HW: $h_{9w} := 5ft$

Water level at heel side on HW: $h_{10w} := 7.3ft$

Water level inside riser: $h_4 := 0ft$

Weight of soil at front weir wall:

$W_{s1V} := \gamma_b \cdot A_7 \cdot h_7 = 0 \cdot kip$

Weight of soil at side weir walls:

$$W_{s2V} := \gamma_b \cdot A_8 \cdot h_8 = 34.93 \cdot kip$$

Weight of soil on toe side of HW:

$$W_{s3V} := \gamma_b \cdot A_9 \cdot h_9 = 49.89 \cdot kip$$

Weight of soil on heel side of HW:

$$W_{s4V} := \gamma_b \cdot \left(A_{10} \cdot h_{10} - A_6 \cdot L_{heel}\right) = 85.18 \cdot kip$$

Total weight of soil:

$$W_{soil} := W_{s1V} + W_{s2V} + W_{s3V} + W_{s4V} = 170 \cdot kip$$

Weight of water at front weir wall:

$$W_{w1V} := \gamma_w \cdot A_7 \cdot h_{7w} = 55.73 \cdot kip$$

Weight of water at side weir walls:

$$W_{w2V} := \gamma_w \cdot A_8 \cdot h_{8w} = 87.05 \cdot kip$$

Weight of water on toe side of HW:

$$W_{w3V} := \gamma_w \cdot A_9 \cdot h_{9w} = 55.26 \cdot kip$$

Weight of water on heel side of HW:

$$W_{w4V} := \gamma_w \cdot \left(A_{10} \cdot h_{10w} - A_6 \cdot L_{heel}\right) = 68.67 \cdot kip$$

Weight of water inside riser:

$$W_{w5V} := \gamma_w \cdot A_4 \cdot h_4 = 0 \cdot kip$$

Total weight of water:

$$W_{water} := W_{w1V} + W_{w2V} + W_{w3V} + W_{w4V} + W_{w5V} = 266.71 \cdot kip$$

Horizontal Forces:

Resistant soil force at front weir wall:

$$F_{h1V} := -.5 \cdot \gamma_b \cdot \left(h_7 + t_{slab}\right)^2 \cdot K_0 \cdot L_7 = -12 \cdot kip$$

Resistant soil force at toe side of weir wall:

$$F_{h2V} := -.5 \cdot \gamma_b \cdot \left(h_9 + t_{slab}\right)^2 \cdot K_0 \cdot L_9 = -28.96 \cdot kip$$

Resistant water force at upsteam side of HW:

$$F_{h3V} := -.5 \cdot \gamma_w \cdot \left(h_{7w} + t_{slab}\right)^2 \cdot L_{10} = -190.17 \cdot kip$$

Sliding soil force on the downstream side:

Moist soil:

$$F_{h4V} := .5 \cdot \gamma_m \cdot \left(h_{10} - h_{10w}\right)^2 \cdot L_{10} \cdot K_0 = 1.92 \cdot kip$$

Saturated soil:

$$F_{h5V} := \gamma_m \cdot \left(h_{10} - h_{10w}\right) \cdot \left(h_{10w} + t_{slab}\right) \cdot \left(L_{10} - L_{11}\right) \cdot K_0 = 22.92 \cdot kip$$ On sides of culvert

$$F_{h6V} := .5 \cdot \gamma_b \cdot \left(h_{10w}\right)^2 \cdot \left(L_{10} - L_{11}\right) \cdot K_0 = 29.67 \cdot kip$$ On sides of culvert

$$F_{h7V} := \gamma_m \cdot \left(h_{10} - h_{10w}\right) \cdot \left(h_{10w} + t_{slab} - h_{11}\right) \cdot L_{11} \cdot K_0 = 10.62 \cdot kip$$ Above culvert

$$F_{h8V} := .5 \cdot \gamma_b \cdot \left(h_{10w} + t_{slab} - h_{11}\right)^2 \cdot L_{11} \cdot K_0 = 15.45 \cdot kip$$ Above culvert

Sliding water force on downstream side:

$$F_{h9V} := .5 \cdot \gamma_w \cdot \left(h_{10w} + t_{slab}\right)^2 \cdot \left(L_{10} - L_{11}\right) = 150.79 \cdot kip$$ On sides of culvert

$$F_{h10V} := .5 \cdot \gamma_w \cdot \left(h_{10w} + t_{slab} - h_{11}\right)^2 \cdot L_{11} = 32.78 \cdot kip$$ Above culvert

Summation of Horizontal Forces:

$$F_{hV} := F_{h1V} + F_{h2V} + F_{h3V} + F_{h4V} + F_{h5V} + F_{h6V} + F_{h7V} + F_{h8V} + F_{h9V} + F_{h10V} = 33.01 \cdot kip$$

Uplift pressure at front weir wall:

Front slab area: $A_{slab1} := 1936.75 ft^2$

Heel slab area: $A_{slab2} := A_{10} = 273.9 \cdot ft^2$

$U_{1V} := \gamma_w \cdot (h_{7w} + t_{slab}) = 561.6 \cdot psf$

$U_{2V} := \gamma_w \cdot (h_{10w} + t_{slab}) = 705.12 \cdot psf$

$U_{totalV} := U_{1V} \cdot A_{slab1} + U_{2V} \cdot A_{slab2} = 1280.81 \cdot kip$

Summation of Vertical Forces:

$F_{vV} := W_{conc} + W_{soil} + W_{water} - U_{totalV} = 740.98 \cdot kip$

$$FS_{III} := \frac{F_{vV} \cdot \tan(\phi_{e.f})}{F_{hV}} = 12.44$$

$SlidingCheck_{.III} :=$	"OK" if $FS_{.III} > 1.1$ = "OK" ▮
	"NG" otherwise

Calculation Objective

The purpose of the following calculation is to check the stability against flotation at the base of the inlet structure for the Upper Lake Dam Hurricane Repair project in Boiling Spring Lake, North Carolina.

Design Basis

The following documents are the design basis for this calculation:

Fluid Loads and Elevations: Schnabel Design Report

Assumptions

1. As shown in the body of the calculation.

References

1. U.S. Army Corps of Engineers. (2005). EM 1110-2-2100, Stability Analysis of Concrete Structure.

Methodology

The stability against flotation at the base of the inlet structure was evaluated in accordance with USACE EM 1110-2-2100 stability criteria. This calculation was performed using Mathcad vs 15.0 software.

Calculation

Material Properties and Geometry:

Water Unit Weight: $\gamma_w := 62.4 \cdot \frac{lbf}{ft^3}$

Concrete Unit Weight: $\gamma_c := 145 \cdot \frac{lbf}{ft^3}$

Moist Unit Weight of Embankment Soil: $\gamma_m := 120 \cdot pcf$

Saturated Unit Weight of Embankment Soil: $\gamma_s := 125 \cdot pcf$

Submerged Embankment Soil Unit Weight: $\gamma_b := \gamma_s - \gamma_w = 62.6 \cdot pcf$

Inlet Structure Dimensions:

Length of inlet at front weir wall: $L_{front} := 51ft$

Length of inlet at headwall: $L_{head} := 78.25ft$

Width of inlet at front weir wall: $W_{front} := 28ft$

Width of inlet at headwall: $W_{head} := 11ft$

Footing thickness: $t_{footing} := 4ft$

Total area of footing:

$A_{total.footing} := L_{front} \cdot W_{front} + L_{head} \cdot W_{head} = 2288.8 \cdot ft^2$

Concrete Components

Front weir wall area : $A_{front} := 42ft^2$

Front weir wall height: $h_{front} := 5ft$

Side weir walls area: $A_{weir} := 30ft^2$

Side weir walls height: $h_{weir} := 5ft$

Head wall area: $A_{head} := 75.25ft^2$

Head wall height: $h_{head} := 9ft$

Footing area: $A_{footing} := A_{total.footing}$

Basin area: $A_{basin} := 1200ft^2$

Area of culvert (empty section): $A_{culvert} := 150ft^2$

Thickness of culvert inside headwall: $t_{culvert.head} := 1ft$

Length of culvert on footing: $L_{culvert.heel} := 3.5ft$

Total Area of culvert section: $A_{total.culvert} := 256.86ft^2$

Voulme of culvert on footing:

$$V_{culvert.heel} := \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel} = 374.01 \cdot ft^3$$

Weight of front weir wall: $W_{front.wall} := \gamma_c \cdot A_{front} \cdot h_{front} = 30 \cdot kip$

Weight of side weir walls: $W_{weir.wall} := 2\gamma_c \cdot A_{weir} \cdot h_{weir} = 44 \cdot kip$

Weight of head wall: $W_{head.wall} := \gamma_c \cdot A_{head} \cdot h_{head} = 98 \cdot kip$

Weight of footing: $W_{footing} := \gamma_c \cdot A_{footing} \cdot t_{footing} = 1327 \cdot kip$

Total weight of walls and footing :

$$W_{walls} := W_{front.wall} + W_{weir.wall} + W_{head.wall} + W_{footing} = 1500 \cdot kip$$

Weight of culvert inside the headwall :

$$W_{culvert.head} := \gamma_c \cdot A_{culvert} \cdot t_{culvert.head} = 21.75 \cdot kip$$

Weight of culvert on footing:

$$W_{culvert.heel} := \gamma_c \cdot \left(A_{total.culvert} - A_{culvert}\right) \cdot L_{culvert.heel} = 54 \cdot kip$$

Total weight of concrete structures:

$$W_{concrete} := W_{walls} - W_{culvert.head} + W_{culvert.heel} = 1532 \cdot kip$$

Soil Profiles:

Soil area on heel of front weir wall: $A_{soil.front} := 178.6 ft^2$

Soil height on heel of front weir wall: $h_{soil.front} := 0 ft$

Soil area on heel of side weir walls: $A_{soil.weir} := 170.58 ft^2$

Soil height on weir walls heel: $h_{soil.weir} := 1 ft$

Soil area on toe of headwall: $A_{S3} := 177.125 ft^2$

Soil height on toe of headwall: $h_{S3} := 4.25 ft$

Soil area on headwall heel: $A_{soil.head} := 273.875 ft^2$

Soil height on headwall heel: $h_{soil.heel} := 7 ft$

Load Case I :Normal Operating Condition:

Water level behind front weir wall: $h_{water.front.II} := 5 ft$

Water level behind side weir walls: $h_{water.weir.II} := 5 ft$

Water level inside the riser structure : $h_{water.riser.II} := 0 ft$

Groundwater head under front weir wall: $h_{gw.front.II} := 5 ft$

Groundwater head under headwall: $h_{gw.head.II} := 5ft$

Water level on the back of head wall : $h_{water.head.II} := 5ft$

Weight of soil behind front weir wall:

$$W_{soil.front.II} := \gamma_b \cdot A_{soil.front} \cdot h_{soil.front} = 0 \cdot lbf$$

Weight of soil behind side weir walls:

$$W_{soil.weir.II} := \gamma_b \cdot A_{soil.weir} \cdot h_{soil.weir} = 11 \cdot kip$$

Weight of soil on toe of headwall:

$$W_{S3} := \gamma_b \cdot A_{S3} \cdot h_{S3} = 47.12 \cdot kip$$

Weight of soil on heel of headwall:

$$W_{b.soil.heel.II} := \gamma_b \cdot \left(A_{soil.head} \cdot h_{water.head.II} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 29 \cdot kip$$

$$W_{m.soil.heel.II} := \gamma_m \cdot A_{soil.head} \cdot \left(h_{soil.heel} - h_{water.head.II}\right) = 65.7 \cdot kip$$

$$W_{soil.heel.II} := W_{b.soil.heel.II} + W_{m.soil.heel.II} = 95 \cdot kip$$

Total weight of soil:

$$W_{soil.II} := W_{soil.front.II} + W_{soil.weir.II} + W_{S3} + W_{soil.heel.II} = 153 \cdot kip$$

Weight of water behind front weir wall:

$$W_{w.front.II} := \gamma_w \cdot A_{soil.front} \cdot h_{water.front.II} = 55.7 \cdot kip$$

Weight of water on heel of side weir walls:

$$W_{w.weir.II} := \gamma_w \cdot A_{soil.weir} \cdot h_{water.weir.II} = 53.2 \cdot kip$$

Weight of water on toe of headwall:

$W_{W3} := \gamma_w \cdot A_{S3} \cdot h_{water.weir.II} = 55.263 \cdot kip$

Weight of water inside the riser basin:

$W_{w.basin.II} := \gamma_w \cdot A_{basin} \cdot h_{water.riser.II} = 0 \cdot lbf$

Weight of water on heel of headwall:

$W_{w.heel.head.II} := \gamma_w \cdot \left(A_{soil.head} \cdot h_{water.head.II} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 29 \cdot kip$

Total weight of water:

$W_{w.II} := W_{w.front.II} + W_{w.weir.II} + W_{w.basin.II} + W_{W3} + W_{w.heel.head.II} = 194 \cdot kip$

Uplift pressure at front wall:

$U_{front.II} := \left(h_{gw.front.II} + t_{footing}\right) \cdot \gamma_w = 561.6 \cdot psf$

Uplift pressure at headwall:

$U_{head.II} := \left(h_{gw.head.II} + t_{footing}\right) \cdot \gamma_w = 561.6 \cdot psf$

Total Uplift force:

$U_{uplift} := \left(U_{head.II} + U_{front.II}\right) \cdot 0.5 \cdot A_{total.footing} = 1285 \cdot kip$

Factor of safety against flotation:

$$FS_I := \frac{W_{concrete} + W_{soil.II}}{U_{uplift} - W_{w.II}} = 1.54$$

$FlotationCheck_I :=$	"OK" if $FS_I > 1.3$ = "OK" "NG" otherwise

Load Case III :Post Flood Condition:

Water level behind front weir wall: $h_{water.front.V} := 5ft$

Water level behind side weir walls: $h_{water.weir.V} := 5ft$

Water level inside the riser structure : $h_{water.riser.V} := 0ft$

Water level on the back of head wall : $h_{water.head.V} := 6.33ft$

Groundwater head behind front weir wall : $h_{gw.front.V} := 5ft$

Groundwater head behind headwall : $h_{gw.head.V} := 6.33ft$

Weight of soil behind front weir wall:

$$W_{soil.front.V} := \gamma_m \cdot A_{soil.front} \cdot h_{soil.front} = 0 \cdot lbf$$

Weight of soil behind side weir walls:

$$W_{soil.weir.V} := \gamma_b \cdot A_{soil.weir} \cdot h_{soil.weir} = 11 \cdot kip$$

Weight of soil on heel of headwall:

$$W_{soil.heel.V} := \gamma_b \cdot \left(A_{soil.head} \cdot h_{soil.heel} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 64 \cdot kip$$

$$W_{soil.heel.Vm} := \gamma_m \cdot A_{soil.head} \cdot \left(h_{soil.heel} - h_{water.head.V}\right) = 22.02 \cdot kip$$

Weight of soil on toe of headwall:

$$W_{S3} := \gamma_b \cdot A_{S3} \cdot h_{S3} = 47.12 \cdot kip$$

Total weight of soil:

$$W_{soil.V} := W_{soil.front.V} + W_{soil.weir.V} + W_{S3} + W_{soil.heel.V} + W_{soil.heel.Vm} = 144 \cdot kip$$

Weight of water behind front weir wall:

$$W_{w.front.V} := \gamma_w \cdot A_{soil.front} \cdot h_{water.front.V} = 55.7 \cdot kip$$

Weight of water on heel of side weir walls:

$$W_{w.weir.V} := \gamma_w \cdot A_{soil.weir} \cdot h_{water.weir.V} = 53.2 \cdot kip$$

Weight of water inside the riser basin:

$$W_{w.riser.V} := \gamma_w \cdot A_{basin} \cdot h_{water.riser.V} = 0 \cdot lbf$$

Weight of water on heel of headwall:

$$W_{w.heel.head.V} := \gamma_w \cdot \left(A_{soil.head} \cdot h_{water.head.V} - A_{total.culvert} \cdot L_{culvert.heel}\right) = 52 \cdot kip$$

Weight of water on toe of headwall:

$$W_{W3} := \gamma_w \cdot A_{S3} \cdot h_{water.weir.V} = 55.263 \cdot kip$$

Total weight of water:

$$W_{w.V} := W_{w.front.V} + W_{w.weir.V} + W_{w.riser.V} + W_{W3} + W_{w.heel.head.V} = 216 \cdot kip$$

Uplift pressure at front weir wall:

$$U_{front.V} := \left(h_{gw.front.V} + t_{footing}\right) \cdot \gamma_w = 561.6 \cdot psf$$

Uplift pressure at head wall:

$$U_{head.V} := \left(h_{gw.head.V} + t_{footing}\right) \cdot \gamma_w = 644.6 \cdot psf$$

Total Uplift force:

Uplift force under front part of footing:

$$F_{uplift.V} := \left[\left(U_{front.V} + U_{head.V}\right) \div 2\right] \cdot A_{footing} = 1380 \cdot kip$$

Factor of safety against flotation:

$$FS_{III} := \frac{W_{concrete} + W_{soil.V}}{F_{uplift.V} - W_{w.V}} = 1.44$$

$FlotationCheck_{III} :=$	"OK" if $FS_{III} > 1.1$ = "OK" "NG" otherwise

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project Boiling Spring Lakes Dams	**Project Number** 19C21022_00
Title Boiling Spring Lakes Dams Box Culvert Analyses	
Computer Programs Used Eriksson Culvert Design Software	**Version/Release No.** 15.10.0.0

Purpose and Objective

Use the above referenced software to design cast-in-place box culverts for Sanford Dam (SD), Upper Lake Dam (ULD), North Lake Dam (NLD) and Pine Lake Dam (PLD). The software uses AASHTO LRFD specifications (6th Edition) to analyze and design reinforcement for one to four cell box culverts.

Summary of Conclusions

Based on output data for each of the four box culverts, the structural designs are adequate to support the applied design loads in accordance with AASHTO LRFD specifications. Refer to the attached text reports generated by the program which include both input and output data for each culvert analyzed.

Originator			
Robert L. Jarnigan			Jan 11, 2021
	Print	Sign	Date
Checked			
Cristian T. Franklin			Jan 13, 2021
	Print	Sign	Date

Project: Sanford Dam
Task : 3D
Client : Boiling Spring Lake
Job No.: 12C21022.01

CULVERT PROPERTIES
==========
Type of Culvert: Cast-in-Place Specification : LRFD 6th Edition 2012
Operating Mode : Analysis

Physical Dimensions

No. of Boxes: 4 Name: BoxCulvert
Clear Span : 7.5000 ft Fill Depth : 14.67ft
Clear Height: 6.5000 ft Center Skew : 0.00 deg Left Skew: 90.00 deg
Right Skew: 90.00 deg
Length : 68.0000 ft Bottom Slab Support: Full Slab
Haunches: Top, Length: 0.0000 in Height: 0.0000 in
Bottom, Length: 0.0000 in Height: 0.0000 in
Member Thicknesses: Top Slab: 16.0000 in Bot Slab: 16.0000 in
Ext Wall: 12.0000 in Int Wall: 12.0000 in
Wall Joint: None

Material Properties

Concrete: Strength,f'c : 4.500 ksi Density : 0.150 kcf Elasticity,Ec:
4067 ksi
Type : Normal Weight
Fr Factor : 0.24 Gamma1 : 1.60 Gamma3 :
0.75
Steel: Yield,fy : 60.00 ksi fss Limit : 0.60fy Elasticity,Es:
29000 ksi
Yield,fyv : 60.00 ksi Diameter : 1.000 in Type :
Rebar
Soil: Density : 0.130 kcf Slope Factor: 1.150 (B1 Installation)
Poisson's : 0.35
Fe Factor : 1.150 (Maximum for Compacted Fill)
Serviceability, Gamma-e: 1.00

Loads

Live Load: Vehicle: (AA) HL-93 - Design Vehicle

Axle No.	Weight(k)	Dist. From Previous(ft)
1	8.00	0.00
2	32.00	14.00
3	32.00	14.00

Gage Width: 6.00 ft, Tread Width: 20.00 in, Tread Length:
10.00 in

```
                    Include Tandem: yes
                    Tandem: Axle 1: 25.00 k, Axle 2: 25.00 k, Axle Spacing: 4.00
ft
                    Lane Load: 0.64 klf, P-Moment: 18.00 k, P-Shear: 26.00 k
                    Combine: Truck Or Tandem Or Lane
                    Inventory Rating Load Factor: 1.75  Operating Rating Load
Factor: 1.35
                    Design Load Combinations: Strength I
                    Override MPF: no
                    Override DLA: no
            Include Lane Load      : yes         Max. No. of Lanes: Computed by
Program
            Traffic Direction      : Lanes Parallel to Main Reinforcement
            Neglect Live Load for Large Fill Depths: no
            Apply Surcharge at Fill Depths > 2 ft  : yes
            Compute Surcharge Depth: yes
Dead Load:  Future Wearing Surface :  0.15 klf   Add. Dead Load   :  0.00 klf
            Concentrated Loads     : none
Lateral Soil Loads: Max. Equiv. Fluid Press.:100.00 pcf   Min. Equiv. Fluid Press.
: 30.00 pcf
Include Additional Uniform Horiz. Load: no
Include Additional Uniform Vert. Load: no
Buoyancy Check    : yes
Fluid Pressures   : Apply Water Press.  : yes, to the interior
                  : Int. Pressure Head  : 13.00 ft
Foundation Model  : Uniform Loads

Load and Resistance Factors
---------------------------
     Max      Min
DC: 1.250    0.900
DW: 1.500    0.650
EV: 1.300    0.900
EH: 1.350    0.900
WA: 1.000
EQ: 1.000
LL I     : 1.750   LL II     : 1.350   LL Legal     : 1.750
Ductility: 1.000   Importance: 1.000   Redundancy, non-earth: 1.000   Redundancy,
earth: 1.050
Condition: 1.000   System    : 1.000
Phi Shear: 0.900   Phi Moment: 1.000   PM Compression: 0.750   PM Tension    :
0.900
Load Factor Multipliers, Design Mode: 1.00 Analysis Mode: 1.00

Reinforcement
-------------
Reinforcement Covers  :  Exterior      Interior
              Top Slab:  2.5000 in     2.0000 in
              Walls   :  2.5000 in     2.0000 in
              Bot Slab:  3.0000 in     2.0000 in
```

Assigned reinforcement:

Location	Mark	Size	Spacing (in)
Top Slab Inside	A100 (AS2)	6	8.0000
Bottom Slab Inside	A200 (AS3)	6	8.0000
Top Slab Outside	A300 (AS7)	6	8.0000
Bottom Slab Outside	A400 (AS8)	6	8.0000
Top Corner	A1 (AS1)	5	8.0000
Bottom Corner	A2 (AS1)	5	8.0000
Ext. Wall Inside	B1 (AS4)	5	8.0000
Ext. Wall Outside	B2 (AS1)	5	8.0000
Interior Wall	B3	4	8.0000
Longitudinal	C1 (AS6)	4	8.0000
Top Distribution	C100 (AS5)	4	8.0000
Bottom Distribution	C200	4	8.0000

Analysis Options

```
LL Analysis       : Automatically Set Traffic Direction to Account for Skew
Effects: no
                    Limit LL Distribution Width to Culvert Length for: Fills > 2 ft
                    Combine Longitudinal Axle Distribution Overlaps: Yes
                    Combine Transverse Axle Distribution Overlaps: Yes
                    Axle Placement Increment for Moving Load Analysis: 20
                    Include Impact on Bottom Slab: yes
                    Always Distribute Wheel Load: yes
                    Deflection Criteria     : 1/800
Reinforcement     : Always Include Distribution Steel: yes
                    Distribution Slab Provided: no
                    User Defined Longitudinal Steel: yes
                    Max. As used in Vc Calcs: 0.00 in2/ft
                    Distribute Minimum Reinforcement per Face: yes
                    Use individual Member Thicknesses for Min Steel: no
                    Epoxy coat steel: top bars, if fill < 2'
                    Use M-dimension for bar length calcs.: no
Slenderness       : Checked       K Factor: 2.00
Analysis Modeling : Use Haunches in the Structural Analysis Model: no
Critical Sections : Flexure critical section location: 1.5 member depth
                    Shear critical section location: face of support
                    Use Max. Moment with Max. Shear at the Critical Section for
Shear: yes
                    Include depoth of haunch for critical sections: no
Flexure           : Ignore Axial Thrust: yes
                    Use Eq. 12.10.4.2.4a-1: no
Shear             : Always Check Iterative Beta Method
Environmental     : Apply duribility factors: yes
                Exposure    : Normal
```

ANALYSIS RESULTS

==========

Top Slab Thickness = 16.00 in
Bottom Slab Thickness = 16.00 in
Exterior Wall Thickness = 12.00 in
Interior Wall Thickness = 12.00 in

Modular Ratio (N) = 7.13 Max. Steel Ratio = 0.023
Design Span = 8.50 ft Design Height = 7.83 ft
Design Fill Depth = 14.67 ft

Volume of Concrete: 4.660 cy/ft Weight of Steel: 653 lb/ft

M dimension = 1' 4" (method of equivalent capacity)
= 3' 2" (method of contraflexure - ASTM)

Reinforcing Steel Schedule

Location	Bar Mark	Qty	Size	Type	Spacing (in)	As,prv (in2/ft)	Length (ft-in)	Wgt (lbs)	H Leg (ft-in)	V Leg (ft-in)
Top Slab (int)	A100 (AS2)	102	6	STR	8.00	0.660	34- 6	5286		
Bot Slab (int)	A200 (AS3)	102	6	STR	8.00	0.660	34- 6	5286		
Top Slab (ext)	A300 (AS7)	102	6	STR	8.00	0.660	34- 6	5286		
Bot Slab (ext)	A400 (AS8)	102	6	STR	8.00	0.660	34- 6	5286		
Corner (Top)	A1 (AS1)	204	5	L-BAR	8.00	0.465	5-11	1259	3- 2	2- 9
Corner (Bottom)	A2 (AS1)	204	5	L-BAR	8.00	0.465	5- 2	1099	2- 5	2- 9
Ext Wall (int)	B1 (AS4)	204	5	STR	8.00	0.465	7- 0	1489		
Ext Wall (ext)	B2 (AS1)	204	5	STR	8.00	0.465	6- 6	1383		
Int Wall	B3	612	4	STR	8.00	0.300	8- 8	3543		
Top Slab (int- 2)	C100 (AS5)	92	4	STR	8.00	0.300	34- 7	2125		
Bot Slab (int- 2)	C200	92	4	STR	8.00	0.300	34- 7	2125		
Temperature (2)	C1 (AS6)	51	4	STR	8.00	0.300	34- 7	1178		
Temperature (2)	C1 (AS6)	51	4	STR	8.00	0.300	34- 7	1178		
Temperature (2)	C1 (AS6)	24	4	STR	8.00	0.300	34- 7	554		

Temperature	(2) C1	(AS6)	24	4	STR	8.00	0.300	34- 7	554
Temperature	(2) C1	(AS6)	72	4	STR	8.00	0.300	34- 7	6792
								Total	44424

Note: A denotes flexural steel, B denotes vertical steel, C denotes longitudinal steel

AS Bar Marks

Location	As prv in2/ft
Transverse Side Wall - Outside Face (AS1)	0.465
Transverse Top Slab - Inside Face (AS2)	0.660
Transverse Bottom Slab - Inside Face (AS3)	0.660
Transverse Side Wall - Inside Face (AS4)	0.465
Distribution Top Slab - Inside Face (AS5)	0.300
Distribution Top Slab - OutSide Face (AS6)	0.300
Transverse Top Slab - Outside Face (AS7)	0.660
Transverse Bottom Slab - Outside Face (AS8)	0.660

Notes: 1.) Final areas of steel provided must be checked in analysis mode

Splice Lengths Table:

Bar Mark	Size	Splice Length (ft-in)
B1	5	1- 9
B3	4	1- 5
C1	4	1- 5
C100	4	1- 5
C200	4	1- 5

Summary of Ratings Table:

	Flexure					Shear			
Truck	Fill	Member	Location	IR	OR	Fill	Member	Location	IR	OR
(AA) HL-93	14.67	1	TOP	11.07	14.35	14.67	1	BOT		

2.97 3.85

Critical Sections Summary: Flexure

Member 1: (Exterior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings OR	Truck	Fill Depth (ft)
BOT	8.00	-19.32	14.58	20.65	9.19	20.65	1.00	0.47	14.66	13.75	17.83	AA 14.67
MID	47.00	13.34	9.19	21.82	9.69	21.82	1.00	0.47	14.66	11.57	15.00	AA 14.67
MID-	47.00	-10.57	12.86	20.65	9.19	20.65	1.00	0.47	14.66	66.09	85.68	AA 14.67
TOP	8.00	-20.34	14.58	20.65	9.19	20.65	1.00	0.47	14.66	11.07	14.35	AA 14.67

Member 2: (Top Slab), Thickness = 16.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings OR	Truck	Fill Depth (ft)
LT	6.00	-21.26	11.36	29.95	13.19	29.95	1.00	0.47	26.07	13.70	17.75	AA 14.67
MID	40.80	36.04	1.15	43.54	13.63	43.54	1.00	0.66	26.07	21.63	28.04	AA 14.67
RT	6.00	-35.50	1.28	41.89	13.13	41.89	1.00	0.66	26.07	21.12	27.37	AA 14.67

Member 3: (Interior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings OR	Truck	Fill Depth (ft)
BOT	8.00	-1.69	16.94	14.33	9.75	14.33	1.00	0.30	14.66	74.39	96.43	AA 14.67
MID	47.00	3.07	30.72	14.33	9.75	14.33	1.00	0.30	14.66	99.99	99.99	AA 14.67
TOP	8.00	-3.09	30.89	14.33	9.75	14.33	1.00	0.30	14.66	37.64	48.79	AA 14.67

Member 4: (Bottom Slab), Thickness = 16.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR	Truck	Fill Depth (ft)
LT	6.00	-21.26	12.89	28.79	12.69	28.79	1.00	0.47	26.07	13.53	17.53	AA	14.67
MID	40.80	37.83	-0.23	43.54	13.63	43.54	1.00	0.66	26.07	33.25	43.10	AA	14.67
RT	6.00	-39.86	-0.10	40.24	12.63	40.24	1.00	0.66	26.07	25.93	33.61	AA	14.67

Member 5: (Top Slab - Interior Cell), Thickness = 16.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR	Truck	Fill Depth (ft)
LT	6.00	-35.78	1.29	41.89	13.13	41.89	1.00	0.66	26.07	21.25	27.55	AA	14.67
MID	51.00	21.65	11.33	43.54	13.63	43.54	1.00	0.66	26.07	32.57	42.22	AA	14.67
RT	6.00	-29.41	11.39	41.89	13.13	41.89	1.00	0.66	26.07	23.90	30.99	AA	14.67

Member 6: (Interior Wall - Interior Cell), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR	Truck	Fill Depth (ft)
LT	8.00	-2.93	29.30	14.33	9.75	14.33	1.00	0.30	14.66	99.99	99.99	AA	14.67
MID	47.00	2.79	27.91	14.33	9.75	14.33	1.00	0.30	14.66	99.99	99.99	AA	14.67
RT	8.00	-3.02	30.15	14.33	9.75	14.33	1.00	0.30	14.66	49.99	64.81	AA	14.67

Member 7: (Bottom Slab - Interior Cell), Thickness = 16.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR	Truck	Fill Depth (ft)
LT	6.00	-39.59	-0.18	40.24	12.63	40.24	1.00	0.66	26.07	26.38			

```
34.20    AA   14.67
MID   51.00    22.08  12.73   43.54  13.63   43.54   1.00   0.66    26.07    56.70
73.50    AA   14.67
RT     6.00   -29.93  12.79   40.24  12.63   40.24   1.00   0.66    26.07    35.98
46.63    AA   14.67


Critical Sections Summary: Vertical Shear
-----------------------------------------

Member 1: (Exterior Wall), Thickness = 12.00 in
             Design Corr.  Corr.                                          Max.
Load Ratings        Fill
Loc   Dist.  Shear  Moment A. F.  Dv  phi*Vn  Beta     Vc      Vs    Av   Spac   IR
    OR   Truck  Depth
      (in)    (k)   (k-ft)  (k)  (in)                 (k)     (k)  (in2) (in)
                (ft)
BOT    8.00  10.50  -19.3 14.58  8.88  12.86  2.000  14.29b   0.00  0.00  0.00
2.97   3.85   AA   14.67
MID   47.00   0.27   13.3  9.19  9.38  15.91  2.342  17.68a   0.00  0.00  0.00
99.99  99.99   AA   14.67
MID-  47.00   0.27  -10.6 12.86  8.88  18.12  2.817  20.13a   0.00  0.00  0.00
99.99  99.99   AA   14.67
TOP    8.00  -9.64  -20.3 14.58  8.88  12.86  2.000  14.29b   0.00  0.00  0.00
3.59   4.65   AA   14.67

Member 2: (Top Slab), Thickness = 16.00 in
             Design Corr.  Corr.                                          Max.
Load Ratings        Fill
Loc   Dist.  Shear  Moment A. F.  Dv  phi*Vn  Beta     Vc      Vs    Av   Spac   IR
    OR   Truck  Depth
      (in)    (k)   (k-ft)  (k)  (in)                 (k)     (k)  (in2) (in)
                (ft)
LT     6.00  12.81  -21.3 11.36 13.19  21.70   n/a  24.11c   0.00  0.00  0.00
9.78  12.67   AA   14.67
MID   51.00   0.43   36.0  1.15 13.63  21.14   n/a  23.49c   0.00  0.00  0.00
61.73  80.02   AA   14.67
RT     6.00  15.60  -35.5  1.28 13.13  21.64   n/a  24.05c   0.00  0.00  0.00
6.82   8.84   AA   14.67

Member 3: (Interior Wall), Thickness = 12.00 in
             Design Corr.  Corr.                                          Max.
Load Ratings        Fill
Loc   Dist.  Shear  Moment A. F.  Dv  phi*Vn  Beta     Vc      Vs    Av   Spac   IR
    OR   Truck  Depth
      (in)    (k)   (k-ft)  (k)  (in)                 (k)     (k)  (in2) (in)
                (ft)
BOT    8.00   0.02   -1.7 16.94  9.55  34.68  5.014  38.54a   0.00  0.00  0.00
99.99  99.99   AA   14.67
MID   47.00   0.02    3.1 30.72  9.55  35.25  5.097  39.17a   0.00  0.00  0.00
```

99.99 99.99   AA   14.67
TOP   8.00   0.13   -3.1 30.89 9.55 35.25 5.096 39.17a   0.00 0.00 0.00
99.99 99.99   AA   14.67

Member 4: (Bottom Slab), Thickness = 16.00 in
Design Corr. Corr. Max.
Load Ratings Fill
Loc Dist. Shear Moment A. F. Dv phi*Vn Beta Vc Vs Av Spac IR
OR Truck Depth
(in) (k) (k-ft) (k) (in) (k) (k) (in2) (in)
(ft)
LT 6.00 13.06 -21.3 12.89 12.69 20.90 n/a 23.22c 0.00 0.00 0.00
12.21 15.83 AA 14.67
MID 51.00 0.33 37.8 -0.23 13.63 21.13 n/a 23.48c 0.00 0.00 0.00
NC NC AA 14.67
RT 6.00 16.52 -39.9 -0.10 12.63 20.74 n/a 23.05c 0.00 0.00 0.00
6.88 8.92 AA 14.67

Member 5: (Top Slab - Interior Cell), Thickness = 16.00 in
Design Corr. Corr. Max.
Load Ratings Fill
Loc Dist. Shear Moment A. F. Dv phi*Vn Beta Vc Vs Av Spac IR
OR Truck Depth
(in) (k) (k-ft) (k) (in) (k) (k) (in2) (in)
(ft)
LT 6.00 13.89 -35.8 1.29 13.13 21.49 n/a 23.87c 0.00 0.00 0.00
8.76 11.35 AA 14.67
MID 51.00 0.65 21.6 11.33 13.63 23.40 2.372 26.00a 0.00 0.00 0.00
99.99 99.99 AA 14.67
RT 6.00 13.32 -29.4 11.39 13.13 21.68 n/a 24.09c 0.00 0.00 0.00
9.30 12.06 AA 14.67

Member 6: (Interior Wall - Interior Cell), Thickness = 12.00 in
Design Corr. Corr. Max.
Load Ratings Fill
Loc Dist. Shear Moment A. F. Dv phi*Vn Beta Vc Vs Av Spac IR
OR Truck Depth
(in) (k) (k-ft) (k) (in) (k) (k) (in2) (in)
(ft)
LT 8.00 0.06 -2.9 29.30 9.55 35.19 5.088 39.10a 0.00 0.00 0.00
99.99 99.99 AA 14.67
MID 47.00 0.06 2.8 27.91 9.55 35.13 5.080 39.04a 0.00 0.00 0.00
99.99 99.99 AA 14.67
RT 8.00 0.06 -3.0 30.15 9.55 35.23 5.093 39.14a 0.00 0.00 0.00
99.99 99.99 AA 14.67

Member 7: (Bottom Slab - Interior Cell), Thickness = 16.00 in
Design Corr. Corr. Max.
Load Ratings Fill
Loc Dist. Shear Moment A. F. Dv phi*Vn Beta Vc Vs Av Spac IR

```
    OR   Truck  Depth
      (in)    (k)   (k-ft)  (k)  (in)                  (k)     (k)  (in2) (in)
                (ft)
LT     6.00  14.60  -39.6 -0.18 12.63  20.61   n/a  22.90c   0.00  0.00  0.00
10.50  13.62   AA   14.67
MID   51.00   0.77   22.1 12.73 13.63  23.59  2.392  26.21a   0.00  0.00  0.00
99.99  99.99   AA   14.67
RT     6.00  13.63  -29.9 12.79 12.63  20.86   n/a  23.18c   0.00  0.00  0.00
12.51  16.22   AA   14.67

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d -
Standard/Arema


================================================================================
=====================
                                   Analysis Results: Fill Depth = 14.67 ft
================================================================================
=====================

Load Parameters:
---------------
Fe = 1.09     Surcharge Depth :  2.00 ft

Applied Horizontal Loads: (k/ft)
------------------------
Load Description          Bottom of Wall   Top of Wall
 Horizontal Earth Load         2.317          1.534
 Live Load Surcharge           0.200          0.200
 Internal Water Pressure       1.217          0.811


Unfactored Moments due to All Loads: (k-ft)            Unfactored Shears due to All
Loads: (k)
-----------------------------------
-----------------------------------
 M-PT    Mdc    Mev    Mdw    Meh    Mls    Mwa         M-PT    Vdc    Vev    Vdw
 Veh    Vls    Vwa

Member 1: (Exterior Wall)                              Member 1: (Exterior Wall)
 Bottom                                                 Bottom
 1- 0  -0.56  -2.42  -0.17  -8.02  -0.82   2.73         1- 0   0.05  -0.07   0.00
8.11   0.79  -3.24
 1- 1  -0.52  -2.48  -0.18  -2.37  -0.26   0.54         1- 1   0.05  -0.07   0.00
6.33   0.63  -2.34
 1- 2  -0.48  -2.53  -0.18   1.91   0.17  -0.97         1- 2   0.05  -0.07   0.00
4.60   0.47  -1.53
 1- 3  -0.44  -2.59  -0.19   4.87   0.48  -1.89         1- 3   0.05  -0.07   0.00
2.94   0.32  -0.81
 1- 4  -0.40  -2.64  -0.19   6.55   0.66  -2.29         1- 4   0.05  -0.07   0.00
```

1.34 0.16 -0.19

1- 5	-0.37	-2.70	-0.19	6.99	0.72	-2.23	-0.20	0.00	0.33		
1- 6	-0.33	-2.75	-0.20	6.26	0.66	-1.81	-1.68	-0.15	0.76		
1- 7	-0.29	-2.80	-0.20	4.39	0.48	-1.08	-3.09	-0.31	1.09		
1- 8	-0.25	-2.86	-0.21	1.44	0.18	-0.13	-4.45	-0.47	1.33		
1- 9	-0.21	-2.91	-0.21	-2.55	-0.25	0.96	-5.74	-0.62	1.47		
1-10	-0.18	-2.97	-0.21	-7.53	-0.80	2.14	-6.97	-0.78	1.52		

Top

Member 2: (Top Slab)

Left

2- 0	-0.18	-2.97	-0.21	-7.57	-0.80	2.20	1.15	0.12	-0.33		
2- 1	0.35	2.60	0.19	-6.60	-0.70	1.91	1.15	0.12	-0.33		
2- 2	0.73	6.67	0.48	-5.62	-0.60	1.63	1.15	0.12	-0.33		
2- 3	0.96	9.24	0.67	-4.65	-0.49	1.35	1.15	0.12	-0.33		
2- 4	1.05	10.30	0.74	-3.68	-0.39	1.06	1.15	0.12	-0.33		
2- 5	0.99	9.86	0.71	-2.70	-0.29	0.78	1.15	0.12	-0.33		
2- 6	0.79	7.92	0.57	-1.73	-0.18	0.49	1.15	0.12	-0.33		
2- 7	0.45	4.47	0.32	-0.76	-0.08	0.21	1.15	0.12	-0.33		
2- 8	-0.04	-0.47	-0.03	0.22	0.02	-0.08	1.15	0.12	-0.33		
2- 9	-0.67	-6.92	-0.50	1.19	0.13	-0.36	1.15	0.12	-0.33		
2-10	-1.45	-14.87	-1.07	2.16	0.23	-0.64	1.15	0.12	-0.33		

Right

Member 3: (Interior Wall)

Bottom

3- 0	0.13	0.64	0.05	-0.43	-0.05	0.11	-0.01	0.00	0.01		
3- 1	0.12	0.62	0.04	-0.44	-0.05	0.12	-0.01	0.00	0.01		
3- 2	0.11	0.60	0.04	-0.44	-0.05	0.13	-0.01	0.00	0.01		
3- 3	0.10	0.58	0.04	-0.45	-0.05	0.13					

1- 5	0.05	-0.07	0.00								
1- 6	0.05	-0.07	0.00								
1- 7	0.05	-0.07	0.00								
1- 8	0.05	-0.07	0.00								
1- 9	0.05	-0.07	0.00								
1-10	0.05	-0.07	0.00								

Top

Member 2: (Top Slab)

Left

2- 0	0.70	7.44	0.54								
2- 1	0.53	5.67	0.41								
2- 2	0.36	3.90	0.28								
2- 3	0.19	2.13	0.15								
2- 4	0.02	0.37	0.03								
2- 5	-0.15	-1.40	-0.10								
2- 6	-0.32	-3.17	-0.23								
2- 7	-0.49	-4.94	-0.36								
2- 8	-0.66	-6.70	-0.48								
2- 9	-0.83	-8.47	-0.61								
2-10	-1.00	-10.24	-0.74								

Right

Member 3: (Interior Wall)

Bottom

3- 0	-0.01	-0.02	0.00								
3- 1	-0.01	-0.02	0.00								
3- 2	-0.01	-0.02	0.00								
3- 3	-0.01	-0.02	0.00								

-0.01 0.00 0.01
3- 4 0.09 0.56 0.04 -0.45 -0.05 0.14
-0.01 0.00 0.01
3- 5 0.08 0.54 0.04 -0.46 -0.05 0.14
-0.01 0.00 0.01
3- 6 0.07 0.52 0.04 -0.46 -0.05 0.15
-0.01 0.00 0.01
3- 7 0.05 0.50 0.04 -0.47 -0.05 0.16
-0.01 0.00 0.01
3- 8 0.04 0.48 0.03 -0.47 -0.05 0.16
-0.01 0.00 0.01
3- 9 0.03 0.46 0.03 -0.47 -0.05 0.17
-0.01 0.00 0.01
3-10 0.02 0.44 0.03 -0.48 -0.05 0.17
-0.01 0.00 0.01
Top

Member 4: (Bottom Slab)
Left
4- 0 -0.56 -2.42 -0.17 -8.02 -0.82 2.73
1.23 0.13 -0.42
4- 1 0.43 3.01 0.22 -6.97 -0.71 2.37
1.23 0.13 -0.42
4- 2 1.15 6.94 0.50 -5.92 -0.60 2.02
1.23 0.13 -0.42
4- 3 1.60 9.37 0.68 -4.87 -0.50 1.66
1.23 0.13 -0.42
4- 4 1.78 10.30 0.74 -3.82 -0.39 1.31
1.23 0.13 -0.42
4- 5 1.70 9.73 0.70 -2.77 -0.28 0.95
1.23 0.13 -0.42
4- 6 1.34 7.65 0.55 -1.72 -0.17 0.59
1.23 0.13 -0.42
4- 7 0.71 4.07 0.29 -0.67 -0.07 0.24
1.23 0.13 -0.42
4- 8 -0.18 -1.01 -0.07 0.38 0.04 -0.12
1.23 0.13 -0.42
4- 9 -1.35 -7.59 -0.55 1.43 0.15 -0.47
1.23 0.13 -0.42
4-10 -2.78 -15.68 -1.13 2.48 0.25 -0.83
1.23 0.13 -0.42
Right

Member 5: (Top Slab - Interior Cell)
Bottom
5- 0 -1.43 -14.43 -1.04 1.68 0.18 -0.47
-0.28 -0.03 0.08
5- 1 -0.75 -7.39 -0.53 1.45 0.15 -0.40
-0.28 -0.03 0.08

3- 4 -0.01 -0.02 0.00
3- 5 -0.01 -0.02 0.00
3- 6 -0.01 -0.02 0.00
3- 7 -0.01 -0.02 0.00
3- 8 -0.01 -0.02 0.00
3- 9 -0.01 -0.02 0.00
3-10 -0.01 -0.02 0.00
Top

Member 4: (Bottom Slab)
Left
4- 0 1.32 7.28 0.53
4- 1 1.01 5.51 0.40
4- 2 0.69 3.74 0.27
4- 3 0.37 1.98 0.14
4- 4 0.06 0.21 0.02
4- 5 -0.26 -1.56 -0.11
4- 6 -0.58 -3.33 -0.24
4- 7 -0.90 -5.09 -0.37
4- 8 -1.21 -6.86 -0.49
4- 9 -1.53 -8.63 -0.62
4-10 -1.85 -10.40 -0.75
Right

Member 5: (Top Slab - Interior Cell)
Bottom
5- 0 0.89 9.16 0.66
5- 1 0.72 7.39 0.53

5- 2	-0.21	-1.87	-0.13	1.21	0.13	-0.34	-0.28	-0.03	0.08	5- 2	0.55	5.62	0.41
5- 3	0.18	2.16	0.16	0.97	0.10	-0.27	-0.28	-0.03	0.08	5- 3	0.38	3.85	0.28
5- 4	0.43	4.69	0.34	0.73	0.08	-0.20	-0.28	-0.03	0.08	5- 4	0.21	2.09	0.15
5- 5	0.54	5.71	0.41	0.49	0.05	-0.14	-0.28	-0.03	0.08	5- 5	0.04	0.32	0.02
5- 6	0.50	5.23	0.38	0.25	0.03	-0.07	-0.28	-0.03	0.08	5- 6	-0.13	-1.45	-0.10
5- 7	0.31	3.24	0.23	0.01	0.00	0.00	-0.28	-0.03	0.08	5- 7	-0.30	-3.22	-0.23
5- 8	-0.02	-0.24	-0.02	-0.23	-0.03	0.06	-0.28	-0.03	0.08	5- 8	-0.47	-4.98	-0.36
5- 9	-0.49	-5.23	-0.38	-0.47	-0.05	0.13	-0.28	-0.03	0.08	5- 9	-0.64	-6.75	-0.49
5-10	-1.11	-11.72	-0.85	-0.71	-0.08	0.20	-0.28	-0.03	0.08	5-10	-0.81	-8.52	-0.61

Top

Top

Member 6: (Interior Wall - Interior Cell)

Member 6: (Interior Wall - Interior Cell)

Bottom

Bottom

6- 0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6- 0	0.00	0.00	0.00
6- 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6- 1	0.00	0.00	0.00
6- 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6- 2	0.00	0.00	0.00
6- 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6- 3	0.00	0.00	0.00
6- 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6- 4	0.00	0.00	0.00
6- 5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6- 5	0.00	0.00	0.00
6- 6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6- 6	0.00	0.00	0.00
6- 7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6- 7	0.00	0.00	0.00
6- 8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6- 8	0.00	0.00	0.00
6- 9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6- 9	0.00	0.00	0.00
6-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6-10	0.00	0.00	0.00

Top

Top

Member 7: (Bottom Slab - Interior Cell)

Member 7: (Bottom Slab - Interior Cell)

Left

Left

```
 7- 0  -2.65 -15.04  -1.08   2.04   0.21  -0.71         7- 0   1.66   9.28   0.67
-0.36  -0.04   0.13
 7- 1  -1.38  -7.90  -0.57   1.74   0.18  -0.61         7- 1   1.34   7.51   0.54
-0.36  -0.04   0.13
 7- 2  -0.37  -2.26  -0.16   1.43   0.14  -0.50         7- 2   1.02   5.75   0.41
-0.36  -0.04   0.13
 7- 3   0.36   1.87   0.13   1.12   0.11  -0.39         7- 3   0.71   3.98   0.29
-0.36  -0.04   0.13
 7- 4   0.82   4.50   0.32   0.82   0.08  -0.29         7- 4   0.39   2.21   0.16
-0.36  -0.04   0.13
 7- 5   1.02   5.63   0.41   0.51   0.05  -0.18         7- 5   0.07   0.44   0.03
-0.36  -0.04   0.13
 7- 6   0.95   5.26   0.38   0.20   0.02  -0.07         7- 6  -0.25  -1.32  -0.10
-0.36  -0.04   0.13
 7- 7   0.60   3.38   0.24  -0.10  -0.01   0.04         7- 7  -0.56  -3.09  -0.22
-0.36  -0.04   0.13
 7- 8  -0.01   0.00   0.00  -0.41  -0.04   0.14         7- 8  -0.88  -4.86  -0.35
-0.36  -0.04   0.13
 7- 9  -0.89  -4.88  -0.35  -0.72  -0.07   0.25         7- 9  -1.20  -6.62  -0.48
-0.36  -0.04   0.13
 7-10  -2.04 -11.26  -0.81  -1.02  -0.10   0.36         7-10  -1.51  -8.39  -0.61
-0.36  -0.04   0.13
 Right                                                  Right

Unfactored Thrusts due to All Loads: (k)
------------------------------------
 Member    Pdc    Pev    Pdw    Peh    Pls    Pwa
   1      0.70   7.44   0.54   1.15   0.12  -0.33
   2     -0.05   0.07   0.00   6.97   0.78  -1.52
   3      1.89  19.39   1.40  -1.43  -0.15   0.41
   4      0.05  -0.07   0.00   8.11   0.79  -3.24
   5     -0.03   0.09   0.01   6.98   0.78  -1.53
   6      1.62  17.04   1.23   0.56   0.06  -0.16
   7      0.03  -0.09  -0.01   8.10   0.78  -3.24

Buoyancy Check:
---------------
Culvert + Fill Weight, kip   : 5822.40
Buoyant Force, kip           : 1361.36
Sliding Resistance, kip      : 1025.56
Factor of Safety             : 4.28

---------------------------------------- Analysis Truck, HL-93
--------------------------------------

                                 Vehicle  Axle       Weight         Length
Dist. From
                                           No.       (k/ft)          (ft)
Previous (ft)
                                  Truck     1        0.091          45.70
```

```
                                Tandem    1        0.133          21.70


Live Load Parameters:
--------------------
Traffic Direction is Parallel to Main Reinforcement
Distribution Width :  34.54 ft
Impact Factor      :   1.00
Lane Load Distribution Width  :  46.87 ft
Lane Load:  0.035 k/ft


Truck Positions That Cause Maximum Results:
-------------------------------------------

Maximum +Moment in Top Slab                          Maximum -Moment in Top Slab
Vehicle  Axle   Weight    Length    Dist. From      Vehicle  Axle   Weight
Length    Dist. From
          No.     (klf)      (ft)     Left End (ft)            No.     (klf)
(ft)     Left End (ft)
Truck     1      0.091    45.70     -13.93          Truck     1      0.091    45.70
     -5.00
Maximum +Moment             :   0.51 k-ft           Maximum -Moment             :
-0.68 k-ft
Corresponding Moment at End :  -0.19 k-ft           Corresponding Moment at Mid :
0.41 k-ft
Coincident Bottom Slab Load :   0.02 k/ft           Coincident Bottom Slab Load :
0.05 k/ft

Maximum +Shear in Top Slab                           Maximum -Shear in Top Slab
Truck     1      0.091    45.70      -5.43          Truck     1      0.091    45.70
     -4.58
Maximum +Shear              :   0.43 k              Maximum -Shear              :
-0.45 k
Corresponding Shear at Mid  :  -0.06 k              Corresponding Shear at Mid  :
-0.06 k
Coincident Bottom Slab Load :   0.05 k/ft           Coincident Bottom Slab Load :
0.05 k/ft


Maximum +Moment in Top Slab                          Maximum -Moment in Top Slab
Tandem    1      0.133    21.70       7.00          Tandem    1      0.133    21.70
      6.38
Maximum +Moment             :  -1.00 k-ft           Maximum -Moment             :
0.63 k-ft
Corresponding Moment at End :   0.60 k-ft           Corresponding Moment at Mid :
-0.09 k-ft
Coincident Bottom Slab Load :   0.07 k/ft           Coincident Bottom Slab Load :
0.07 k/ft
```

Maximum +Shear in Top Slab
Tandem 1 0.133 21.70 7.65
Maximum +Shear : -0.66 k
Corresponding Shear at Mid : -0.09 k
Coincident Bottom Slab Load : 0.07 k/ft

Maximum -Shear in Top Slab
Maximum -Shear : 0.00 k
Corresponding Shear at Mid : 0.00 k
Coincident Bottom Slab Load : 0.00 k/ft

Unfactored Moments and Shears due to Truck Loads: (k-ft, k)

	Truck				Tandem				Lane			
M-PT	Mll+	Mll-	Vll+	Vll-	Mll+	Mll-	Vll+	Vll-	Mll+	Mll-	Vll+	Vll-
Member 1: (Exterior Wall)												
Bottom												
1- 0	0.02	-0.13	0.02	-0.03	0.03	-0.17	0.03	-0.04	0.01	-0.05	0.01	-0.01
1- 1	0.00	-0.11	0.02	-0.03	0.00	-0.14	0.03	-0.04	0.00	-0.04	0.01	-0.01
1- 2	0.00	-0.11	0.02	-0.03	0.00	-0.12	0.03	-0.04	0.00	-0.04	0.01	-0.01
1- 3	0.00	-0.11	0.02	-0.03	0.00	-0.12	0.03	-0.04	0.00	-0.04	0.01	-0.01
1- 4	0.00	-0.12	0.02	-0.03	0.00	-0.13	0.03	-0.04	0.00	-0.04	0.01	-0.01
1- 5	0.00	-0.12	0.02	-0.03	0.00	-0.14	0.03	-0.04	0.00	-0.05	0.01	-0.01
1- 6	0.00	-0.12	0.02	-0.03	0.00	-0.16	0.03	-0.04	0.00	-0.05	0.01	-0.01
1- 7	0.01	-0.13	0.02	-0.03	0.01	-0.19	0.03	-0.04	0.01	-0.05	0.01	-0.01
1- 8	0.03	-0.15	0.02	-0.03	0.04	-0.22	0.03	-0.04	0.01	-0.06	0.01	-0.01
1- 9	0.04	-0.17	0.02	-0.03	0.07	-0.25	0.03	-0.04	0.02	-0.07	0.01	-0.01
1-10	0.06	-0.19	0.02	-0.03	0.09	-0.28	0.03	-0.04	0.02	-0.07	0.01	-0.01
Top												
Member 2: (Top Slab)												
Left												
2- 0	0.06	-0.19	0.36	-0.03	0.09	-0.28	0.52	-0.05	0.02	-0.07	0.14	-0.01
2- 1	0.11	0.00	0.28	-0.03	0.15	0.00	0.41	-0.05	0.05	-0.01	0.11	-0.02

2- 2	0.29	0.00	0.20	-0.03	0.42	0.00	0.30	-0.05	0.12	-0.01	0.09
-0.02											
2- 3	0.42	-0.02	0.13	-0.04	0.62	-0.03	0.19	-0.06	0.17	-0.02	0.06
-0.03											
2- 4	0.50	-0.05	0.08	-0.07	0.73	-0.07	0.13	-0.10	0.20	-0.03	0.05
-0.04											
2- 5	0.51	-0.07	0.05	-0.11	0.74	-0.11	0.07	-0.16	0.20	-0.04	0.03
-0.05											
2- 6	0.45	-0.10	0.02	-0.15	0.66	-0.15	0.02	-0.23	0.18	-0.05	0.02
-0.07											
2- 7	0.32	-0.13	0.00	-0.22	0.48	-0.19	0.00	-0.32	0.13	-0.06	0.01
-0.09											
2- 8	0.14	-0.16	0.00	-0.30	0.20	-0.23	0.00	-0.43	0.07	-0.08	0.01
-0.12											
2- 9	0.03	-0.33	0.00	-0.37	0.04	-0.49	0.00	-0.55	0.03	-0.14	0.00
-0.14											
2-10	0.03	-0.68	0.00	-0.45	0.04	-1.00	0.00	-0.66	0.01	-0.26	0.00
-0.17											

Right

Member 3: (Interior Wall)

Bottom

3- 0	0.09	-0.06	0.03	-0.03	0.11	-0.09	0.04	-0.04	0.03	-0.02	0.01
-0.01											
3- 1	0.06	-0.04	0.03	-0.03	0.08	-0.05	0.04	-0.04	0.03	-0.02	0.01
-0.01											
3- 2	0.04	-0.02	0.03	-0.03	0.05	-0.02	0.04	-0.04	0.02	-0.01	0.01
-0.01											
3- 3	0.03	0.00	0.03	-0.03	0.03	0.00	0.04	-0.04	0.01	0.00	0.01
-0.01											
3- 4	0.03	-0.01	0.03	-0.03	0.04	-0.01	0.04	-0.04	0.02	-0.01	0.01
-0.01											
3- 5	0.05	-0.03	0.03	-0.03	0.08	-0.04	0.04	-0.04	0.02	-0.02	0.01
-0.01											
3- 6	0.07	-0.05	0.03	-0.03	0.11	-0.07	0.04	-0.04	0.03	-0.02	0.01
-0.01											
3- 7	0.10	-0.07	0.03	-0.03	0.14	-0.10	0.04	-0.04	0.04	-0.03	0.01
-0.01											
3- 8	0.12	-0.10	0.03	-0.03	0.17	-0.13	0.04	-0.04	0.05	-0.04	0.01
-0.01											
3- 9	0.14	-0.12	0.03	-0.03	0.21	-0.16	0.04	-0.04	0.06	-0.05	0.01
-0.01											
3-10	0.16	-0.14	0.03	-0.03	0.24	-0.20	0.04	-0.04	0.07	-0.06	0.01
-0.01											

Top

Member 4: (Bottom Slab)

Left

4- 0	0.02	-0.13	0.32	0.00	0.03	-0.17	0.30	0.00	0.01	-0.05	0.12
0.00											

4- 1	0.13	0.00	0.24	0.00	0.14	0.00	0.23	0.00	0.05	0.00	0.09
0.00											
4- 2	0.30	0.00	0.16	0.00	0.30	0.00	0.16	0.00	0.12	0.00	0.06
0.00											
4- 3	0.41	0.00	0.09	0.00	0.40	0.00	0.09	0.00	0.16	0.00	0.03
0.00											
4- 4	0.45	0.00	0.01	0.00	0.43	0.00	0.01	0.00	0.17	0.00	0.00
0.00											
4- 5	0.43	0.00	0.00	-0.07	0.41	0.00	0.00	-0.07	0.16	0.00	0.00
-0.03											
4- 6	0.34	0.00	0.00	-0.15	0.32	0.00	0.00	-0.14	0.13	0.00	0.00
-0.06											
4- 7	0.18	0.00	0.00	-0.22	0.18	0.00	0.00	-0.21	0.07	0.00	0.00
-0.09											
4- 8	0.01	-0.06	0.00	-0.30	0.02	-0.07	0.00	-0.28	0.01	-0.02	0.00
-0.11											
4- 9	0.00	-0.33	0.00	-0.38	0.00	-0.34	0.00	-0.36	0.00	-0.13	0.00
-0.14											
4-10	0.00	-0.69	0.00	-0.46	0.00	-0.66	0.00	-0.43	0.00	-0.26	0.00
-0.17											

Right

Member 5: (Top Slab - Interior Cell)

Bottom

5- 0	0.03	-0.67	0.43	-0.03	0.05	-0.97	0.63	-0.04	0.02	-0.26	0.17
-0.01											
5- 1	0.01	-0.33	0.35	-0.03	0.02	-0.49	0.51	-0.04	0.02	-0.15	0.14
-0.01											
5- 2	0.13	-0.21	0.27	-0.03	0.19	-0.31	0.40	-0.04	0.06	-0.09	0.11
-0.02											
5- 3	0.27	-0.18	0.20	-0.03	0.40	-0.26	0.29	-0.04	0.12	-0.08	0.09
-0.03											
5- 4	0.35	-0.14	0.12	-0.03	0.50	-0.21	0.17	-0.04	0.16	-0.08	0.07
-0.03											
5- 5	0.36	-0.11	0.06	-0.05	0.52	-0.16	0.09	-0.07	0.17	-0.08	0.05
-0.05											
5- 6	0.33	-0.10	0.04	-0.10	0.49	-0.15	0.06	-0.16	0.16	-0.08	0.04
-0.06											
5- 7	0.27	-0.13	0.04	-0.18	0.39	-0.18	0.06	-0.27	0.13	-0.07	0.03
-0.08											
5- 8	0.14	-0.15	0.04	-0.26	0.20	-0.22	0.06	-0.39	0.07	-0.08	0.02
-0.11											
5- 9	0.04	-0.27	0.04	-0.34	0.07	-0.43	0.06	-0.50	0.04	-0.13	0.02
-0.13											
5-10	0.06	-0.58	0.04	-0.41	0.09	-0.89	0.06	-0.61	0.04	-0.24	0.02
-0.16											

Top

Member 6: (Interior Wall - Interior Cell)

Bottom

6- 0	0.06	-0.06	0.02	-0.02	0.09	-0.09	0.04	-0.04	0.02	-0.02	0.01
-0.01											
6- 1	0.04	-0.04	0.02	-0.02	0.06	-0.06	0.04	-0.04	0.02	-0.02	0.01
-0.01											
6- 2	0.02	-0.02	0.02	-0.02	0.03	-0.03	0.04	-0.04	0.01	-0.01	0.01
-0.01											
6- 3	0.01	-0.01	0.02	-0.02	0.01	-0.01	0.04	-0.04	0.00	0.00	0.01
-0.01											
6- 4	0.02	-0.02	0.02	-0.02	0.02	-0.02	0.04	-0.04	0.01	-0.01	0.01
-0.01											
6- 5	0.03	-0.03	0.02	-0.02	0.05	-0.05	0.04	-0.04	0.02	-0.02	0.01
-0.01											
6- 6	0.05	-0.05	0.02	-0.02	0.08	-0.08	0.04	-0.04	0.03	-0.03	0.01
-0.01											
6- 7	0.07	-0.07	0.02	-0.02	0.10	-0.10	0.04	-0.04	0.03	-0.03	0.01
-0.01											
6- 8	0.09	-0.09	0.02	-0.02	0.13	-0.13	0.04	-0.04	0.04	-0.04	0.01
-0.01											
6- 9	0.11	-0.11	0.02	-0.02	0.16	-0.16	0.04	-0.04	0.05	-0.05	0.01
-0.01											
6-10	0.13	-0.13	0.02	-0.02	0.19	-0.19	0.04	-0.04	0.06	-0.06	0.01
-0.01											
Top											

Member 7: (Bottom Slab - Interior Cell)

Left											
7- 0	0.00	-0.66	0.41	0.00	0.00	-0.63	0.38	0.00	0.00	-0.25	0.16
0.00											
7- 1	0.00	-0.35	0.33	0.00	0.00	-0.34	0.31	0.00	0.00	-0.13	0.13
0.00											
7- 2	0.00	-0.10	0.25	0.00	0.00	-0.11	0.24	0.00	0.00	-0.04	0.10
0.00											
7- 3	0.09	-0.01	0.17	0.00	0.12	-0.02	0.17	0.00	0.04	0.00	0.07
0.00											
7- 4	0.20	0.00	0.10	0.00	0.21	0.00	0.09	0.00	0.08	0.00	0.04
0.00											
7- 5	0.25	0.00	0.02	0.00	0.25	0.00	0.02	0.00	0.09	0.00	0.01
0.00											
7- 6	0.23	0.00	0.00	-0.06	0.23	0.00	0.00	-0.06	0.09	0.00	0.00
-0.02											
7- 7	0.15	0.00	0.00	-0.14	0.14	0.00	0.00	-0.14	0.06	0.00	0.00
-0.05											
7- 8	0.02	-0.02	0.00	-0.21	0.03	-0.03	0.00	-0.21	0.01	-0.01	0.00
-0.08											
7- 9	0.00	-0.21	0.00	-0.29	0.00	-0.22	0.00	-0.28	0.00	-0.08	0.00
-0.11											
7-10	0.00	-0.49	0.00	-0.37	0.00	-0.49	0.00	-0.35	0.00	-0.19	0.00
-0.14											
Right											

Note: Unfactored live load results computed at 14.67 ft and 0 ft fill depths, per LRFD 3.6.1.2.6

Serviceability Check: Crack Control

Bar Mark	Location	Moment (k-ft)	Thrust (k)	Fss (ksi)	Spacing (in)	Allow (in)
A1	Top Corner Bar	-7.2	10.46	9.43	8.00	50.74
A2	Bot Corner Bar	-6.9	10.46	8.44	8.00	57.19
A100	Top Slab (int)	7.7	7.81	5.33	8.00	99.99
A300	Top Slab (ext)	-10.5	7.85	9.43	8.00	54.69
A200	Bot Slab (int)	7.9	8.80	4.91	8.00	99.99
A400	Bot Slab (ext)	-10.7	8.84	9.31	8.00	55.48
B1	Ext Wall (int)	4.5	9.89	2.72	8.00	99.99
B2	Ext Wall (ext)	-3.7	9.21	1.58	8.00	99.99

Serviceability Check: Live Load Deflection

Deflection Ratio of Top Slab = 1/9999 (Limit = 1/800)

Strength Limit State at Critical Sections: Flexure

Member 1: (Exterior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR
BOT	8.00	-19.32	14.58	20.65	9.19	20.65	1.00	0.47	14.66	13.75	17.83
MID	47.00	13.34	9.19	21.82	9.69	21.82	1.00	0.47	14.66	11.57	15.00
MID-	47.00	-10.57	12.86	20.65	9.19	20.65	1.00	0.47	14.66	66.09	85.68
TOP	8.00	-20.34	14.58	20.65	9.19	20.65	1.00	0.47	14.66	11.07	14.35

Member 2: (Top Slab), Thickness = 16.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR
LT	6.00	-21.26	11.36	29.95	13.19	29.95	1.00	0.47	26.07	13.70	17.75
MID	40.80	36.04	1.15	43.54	13.63	43.54	1.00	0.66	26.07		

21.63 28.04
RT 6.00 -35.50 1.28 41.89 13.13 41.89 1.00 0.66 26.07
21.12 27.37

Member 3: (Interior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR
BOT	8.00	-1.69	16.94	14.33	9.75	14.33	1.00	0.30	14.66	74.39	96.43
MID	47.00	3.07	30.72	14.33	9.75	14.33	1.00	0.30	14.66	99.99	99.99
TOP	8.00	-3.09	30.89	14.33	9.75	14.33	1.00	0.30	14.66	37.64	48.79

Member 4: (Bottom Slab), Thickness = 16.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR
LT	6.00	-21.26	12.89	28.79	12.69	28.79	1.00	0.47	26.07	13.53	17.53
MID	40.80	37.83	-0.23	43.54	13.63	43.54	1.00	0.66	26.07	33.25	43.10
RT	6.00	-39.86	-0.10	40.24	12.63	40.24	1.00	0.66	26.07	25.93	33.61

Member 5: (Top Slab - Interior Cell), Thickness = 16.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR
LT	6.00	-35.78	1.29	41.89	13.13	41.89	1.00	0.66	26.07	21.25	27.55
MID	51.00	21.65	11.33	43.54	13.63	43.54	1.00	0.66	26.07	32.57	42.22
RT	6.00	-29.41	11.39	41.89	13.13	41.89	1.00	0.66	26.07	23.90	30.99

Member 6: (Interior Wall - Interior Cell), Thickness = 12.00 in

Loc	Dist.	Design Moment	Corr. A. F.	Mu	ds	Ma	As	Mcr	Load Ratings

```
IR     OR
       (in)    (k-ft)     (k)   (k-ft)   (in)  (k-ft)   phi   (in2)   (k-ft)

LT      8.00    -2.93    29.30   14.33   9.75   14.33   1.00   0.30    14.66
99.99  99.99
MID    47.00     2.79    27.91   14.33   9.75   14.33   1.00   0.30    14.66
99.99  99.99
RT      8.00    -3.02    30.15   14.33   9.75   14.33   1.00   0.30    14.66
49.99  64.81

Member 7: (Bottom Slab - Interior Cell), Thickness = 16.00 in
               Design    Corr.                                                Load
Ratings
Loc    Dist.   Moment    A. F.    Mu      ds     Ma             As      Mcr
IR     OR
       (in)    (k-ft)     (k)   (k-ft)   (in)  (k-ft)   phi   (in2)   (k-ft)

LT      6.00   -39.59    -0.18   40.24  12.63   40.24   1.00   0.66    26.07
26.38  34.20
MID    51.00    22.08    12.73   43.54  13.63   43.54   1.00   0.66    26.07
56.70  73.50
RT      6.00   -29.93    12.79   40.24  12.63   40.24   1.00   0.66    26.07
35.98  46.63


Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under
applied axial load

Strength Limit State at Critical Sections: Vertical Shear
---------------------------------------------------------
Member 1: (Exterior Wall), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
BOT    8.00   10.50   -19.3 14.58  8.88   12.86  2.000 45.00  14.29b   0.00  0.00
0.00    2.97   3.85
MID   47.00    0.27    13.3  9.19  9.38   15.91  2.342 38.89  17.68a   0.00  0.00
0.00   99.99  99.99
MID-  47.00    0.27   -10.6 12.86  8.88   18.12  2.817 35.85  20.13a   0.00  0.00
0.00   99.99  99.99
TOP    8.00   -9.64   -20.3 14.58  8.88   12.86  2.000 45.00  14.29b   0.00  0.00
0.00    3.59   4.65

Member 2: (Top Slab), Thickness = 16.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
```

```
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
LT     6.00   12.81   -21.3 11.36 13.19   21.70   n/a   n/a   24.11c   0.00  0.00
0.00    9.78  12.67
MID   51.00    0.43    36.0  1.15 13.63   21.14   n/a   n/a   23.49c   0.00  0.00
0.00   61.73  80.02
RT     6.00   15.60   -35.5  1.28 13.13   21.64   n/a   n/a   24.05c   0.00  0.00
0.00    6.82   8.84

Member 3: (Interior Wall), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
BOT    8.00    0.02    -1.7 16.94  9.55   34.68  5.014 28.84  38.54a   0.00  0.00
0.00   99.99  99.99
MID   47.00    0.02     3.1 30.72  9.55   35.25  5.097 28.68  39.17a   0.00  0.00
0.00   99.99  99.99
TOP    8.00    0.13    -3.1 30.89  9.55   35.25  5.096 28.68  39.17a   0.00  0.00
0.00   99.99  99.99

Member 4: (Bottom Slab), Thickness = 16.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
LT     6.00   13.06   -21.3 12.89 12.69   20.90   n/a   n/a   23.22c   0.00  0.00
0.00   12.21  15.83
MID   51.00    0.33    37.8 -0.23 13.63   21.13   n/a   n/a   23.48c   0.00  0.00
0.00     NC     NC
RT     6.00   16.52   -39.9 -0.10 12.63   20.74   n/a   n/a   23.05c   0.00  0.00
0.00    6.88   8.92

Member 5: (Top Slab - Interior Cell), Thickness = 16.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
LT     6.00   13.89   -35.8  1.29 13.13   21.49   n/a   n/a   23.87c   0.00  0.00
0.00    8.76  11.35
MID   51.00    0.65    21.6 11.33 13.63   23.40  2.372 41.01  26.00a   0.00  0.00
0.00   99.99  99.99
RT     6.00   13.32   -29.4 11.39 13.13   21.68   n/a   n/a   24.09c   0.00  0.00
```

0.00 9.30 12.06

Member 6: (Interior Wall - Interior Cell), Thickness = 12.00 in

Max. Loc	Load Dist. (in)	Design Shear (k)	Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Spac IR (in)	OR (in)
LT	8.00	0.06	-2.9	29.30	9.55	35.19	5.088	28.70	39.10a	0.00	0.00	0.00	99.99	99.99
MID	47.00	0.06	2.8	27.91	9.55	35.13	5.080	28.71	39.04a	0.00	0.00	0.00	99.99	99.99
RT	8.00	0.06	-3.0	30.15	9.55	35.23	5.093	28.69	39.14a	0.00	0.00	0.00	99.99	99.99

Member 7: (Bottom Slab - Interior Cell), Thickness = 16.00 in

Max. Loc	Load Dist. (in)	Design Shear (k)	Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Spac IR (in)	OR (in)
LT	6.00	14.60	-39.6	-0.18	12.63	20.61	n/a	n/a	22.90c	0.00	0.00	0.00	10.50	13.62
MID	51.00	0.77	22.1	12.73	13.63	23.59	2.392	40.89	26.21a	0.00	0.00	0.00	99.99	99.99
RT	6.00	13.63	-29.9	12.79	12.63	20.86	n/a	n/a	23.18c	0.00	0.00	0.00	12.51	16.22

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arema

Applied Environmental Factors:

M-PT	+Sd	+Beta	+fs(ksi)	-Sd	-Beta	-fs(ksi)
Member 1: (Exterior Wall)						
Bottom						
1- 0	1.00	-0.21	20.00	1.97	1.37	20.00
1- 1	1.99	1.36	20.00	2.00	1.35	20.00
1- 2	1.00	-0.32	20.00	2.19	1.23	20.00
1- 3	1.35	2.00	20.00	2.33	1.16	20.00
1- 4	1.55	1.74	20.00	2.41	1.12	20.00
1- 5	1.59	1.70	20.00	2.41	1.12	20.00

1- 6	1.52	1.77	20.00	2.35	1.15	20.00
1- 7	1.22	2.21	20.00	2.21	1.22	20.00
1- 8	8.72	0.31	20.00	2.05	1.32	20.00
1- 9	1.92	1.40	20.00	1.99	1.36	20.00
1-10	1.78	1.52	20.00	1.97	1.37	20.00

Top

Member 2: (Top Slab)

Left

2- 0	1.77	1.53	20.00	1.97	1.37	20.00
2- 1	2.39	1.13	20.00	1.57	1.72	20.00
2- 2	2.14	1.26	20.00	1.00	-2.20	20.00
2- 3	2.09	1.29	20.00	7.75	0.35	20.00
2- 4	2.07	1.30	20.00	4.55	0.59	20.00
2- 5	2.06	1.31	20.00	3.93	0.69	20.00
2- 6	2.05	1.32	20.00	3.66	0.74	20.00
2- 7	2.03	1.33	20.00	3.47	0.78	20.00
2- 8	6.51	0.41	20.00	1.93	1.40	20.00
2- 9	3.48	0.78	20.00	2.05	1.32	20.00
2-10	3.39	0.80	20.00	2.05	1.32	20.00

Right

Member 3: (Interior Wall)

Bottom

3- 0	2.06	1.31	20.00	1.00	0.00	20.00
3- 1	2.08	1.30	20.00	1.00	-0.14	20.00
3- 2	2.11	1.28	20.00	1.00	-0.33	20.00
3- 3	2.14	1.26	20.00	1.00	-0.59	20.00
3- 4	2.13	1.27	20.00	1.00	-0.98	20.00

3- 5	2.10	1.29	20.00	1.00	-1.64	20.00
3- 6	2.07	1.30	20.00	1.00	-3.00	20.00
3- 7	2.05	1.32	20.00	1.00	-7.32	20.00
3- 8	2.02	1.34	20.00	1.00	90.97	20.00
3- 9	2.00	1.35	20.00	1.33	2.03	20.00
3-10	1.97	1.37	20.00	1.44	1.87	20.00

Top

Member 4: (Bottom Slab)

Left

4- 0	1.66	1.63	20.00	1.97	1.37	20.00
4- 1	2.38	1.13	20.00	1.52	1.78	20.00
4- 2	2.17	1.25	20.00	1.00	-1.47	20.00
4- 3	2.12	1.27	20.00	7.04	0.38	20.00
4- 4	2.10	1.29	20.00	4.44	0.61	20.00
4- 5	2.09	1.29	20.00	3.88	0.70	20.00
4- 6	2.08	1.30	20.00	3.61	0.75	20.00
4- 7	2.07	1.30	20.00	3.41	0.79	20.00
4- 8	4.46	0.60	20.00	2.08	1.30	20.00
4- 9	3.48	0.77	20.00	2.07	1.30	20.00
4-10	3.39	0.80	20.00	2.07	1.31	20.00

Right

Member 5: (Top Slab - Interior Cell)

Bottom

5- 0	3.31	0.82	20.00	2.04	1.32	20.00
5- 1	3.56	0.76	20.00	2.05	1.32	20.00
5- 2	1.00	-0.08	20.00	2.05	1.31	20.00
5- 3	1.97	1.37	20.00	2.08	1.30	20.00

5- 4	2.00	1.35	20.00	2.07	1.30	20.00
5- 5	2.01	1.34	20.00	2.07	1.30	20.00
5- 6	2.01	1.34	20.00	2.98	0.91	20.00
5- 7	2.00	1.35	20.00	3.05	0.88	20.00
5- 8	4.97	0.54	20.00	1.85	1.46	20.00
5- 9	2.06	1.31	20.00	2.02	1.34	20.00
5-10	2.95	0.91	20.00	2.02	1.34	20.00

Top

Member 6: (Interior Wall - Interior Cell)

Bottom

6- 0	1.54	1.75	20.00	1.54	1.75	20.00
6- 1	1.54	1.75	20.00	1.54	1.75	20.00
6- 2	1.54	1.75	20.00	1.54	1.75	20.00
6- 3	1.54	1.75	20.00	1.54	1.75	20.00
6- 4	1.54	1.75	20.00	1.54	1.75	20.00
6- 5	1.54	1.75	20.00	1.54	1.75	20.00
6- 6	1.54	1.75	20.00	1.54	1.75	20.00
6- 7	1.54	1.75	20.00	1.54	1.75	20.00
6- 8	1.54	1.75	20.00	1.54	1.75	20.00
6- 9	1.54	1.75	20.00	1.54	1.75	20.00
6-10	1.54	1.75	20.00	1.54	1.75	20.00

Top

Member 7: (Bottom Slab - Interior Cell)

Left

7- 0	3.33	0.81	20.00	2.07	1.31	20.00
7- 1	3.59	0.75	20.00	2.08	1.30	20.00
7- 2	27.35	0.10	20.00	2.13	1.26	20.00

7- 3	2.01	1.34	20.00	1.99	1.36	20.00
7- 4	2.03	1.33	20.00	2.04	1.32	20.00
7- 5	2.04	1.32	20.00	2.06	1.31	20.00
7- 6	2.04	1.32	20.00	2.99	0.90	20.00
7- 7	2.05	1.32	20.00	3.10	0.87	20.00
7- 8	4.39	0.62	20.00	1.92	1.40	20.00
7- 9	2.05	1.32	20.00	2.04	1.33	20.00
7-10	2.06	1.31	20.00	2.04	1.32	20.00

Right

Vertical Reactions Applied to Structure: (service load values, k/unit width, pos. is up)

Wall #	DL	DW	EV	EH	LS	WA	LL	Tot. w/o LL	Tot. w/ LL
1	0.55	0.01	0.16	-0.09	0.00	1.26	0.36	1.89	2.25
2	-0.44	-0.02	-0.28	0.17	0.01	1.04	0.43	0.48	0.91
3	-0.23	0.02	0.25	-0.16	-0.01	1.27	0.04	1.15	1.19
4	-0.44	-0.02	-0.28	0.17	0.01	1.04	0.43	0.48	0.91
5	0.55	0.01	0.16	-0.09	0.00	1.26	0.36	1.89	2.25

Horizontal Reactions Applied to Structure: (service load values, k/unit width, pos. is right)

Wall #	DL	DW	EV	EH	LS	WA	LL	Tot. w/o LL	Tot. w/ LL
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00								
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00								

Load Combination Results at Tenth Points: (k-ft, k)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior Wall)						
Bottom						
1- 0	-4.572	-34.240	11.855	14.584	12.886	-0.228
1- 1	-9.259	-16.709	11.855	14.584	10.083	-0.010
1- 2	0.285	-10.435	9.189	12.855	7.366	0.135
1- 3	6.737	-10.700	9.189	12.855	4.737	0.209
1- 4	11.945	-10.569	9.189	12.855	2.194	0.211
1- 5	13.336	-10.176	9.189	12.855	0.270	-0.389
1- 6	11.046	-9.697	9.189	12.855	0.129	-2.757
1- 7	5.212	-9.325	9.189	12.855	-0.084	-5.039
1- 8	-4.031	-9.186	9.189	12.855	-0.368	-7.233
1- 9	-8.587	-17.991	11.855	14.584	-0.724	-9.341
1-10	-9.254	-33.738	11.855	14.584	-1.152	-11.362
Top						
Member 2: (Top Slab)						
Left						
2- 0	-9.117	-33.852	1.152	11.362	14.584	9.189
2- 1	9.318	-12.451	1.152	11.270	11.569	7.438
2- 2	23.359	-2.331	1.152	11.270	8.554	5.687
2- 3	32.299	13.626	1.152	11.270	5.558	3.391
2- 4	36.036	19.846	1.152	11.270	2.621	0.498
2- 5	34.572	21.520	1.152	11.270	0.435	-2.417

2- 6	27.906	18.649	1.152	11.270	-1.316	-5.355
2- 7	16.037	11.232	1.152	11.270	-3.067	-8.334
2- 8	-0.322	-2.187	11.234	1.279	-4.818	-11.349
2- 9	-17.240	-24.143	11.270	1.279	-6.568	-14.363
2-10	-38.295	-51.731	11.270	1.279	-8.319	-17.378

Right

Member 3: (Interior Wall)

Bottom

3- 0	2.559	-0.001	30.720	16.942	0.025	-0.131
3- 1	2.402	-0.035	30.720	16.942	0.025	-0.131
3- 2	2.246	-0.069	30.720	16.942	0.025	-0.131
3- 3	2.108	-0.103	30.720	16.942	0.025	-0.131
3- 4	2.075	-0.137	30.720	16.942	0.025	-0.131
3- 5	2.088	-0.172	30.720	16.942	0.025	-0.131
3- 6	2.101	-0.206	30.720	16.942	0.025	-0.131
3- 7	2.113	-0.240	30.720	16.942	0.025	-0.131
3- 8	2.126	-0.274	30.720	16.942	0.025	-0.131
3- 9	2.139	-0.427	30.720	30.890	0.025	-0.131
3-10	2.151	-0.611	30.720	30.890	0.025	-0.131

Top

Member 4: (Bottom Slab)

Left

4- 0	-7.575	-34.240	-0.228	12.886	14.904	9.740
4- 1	11.701	-12.179	-0.228	12.851	11.769	7.857
4- 2	25.853	-2.132	-0.228	12.851	8.633	5.974
4- 3	34.571	15.113	-0.228	12.851	5.498	3.433
4- 4	37.832	21.435	-0.228	12.851	2.372	0.429

4- 5	35.636	22.874	-0.228	12.851	0.326	-2.686
4- 6	27.983	19.431	-0.228	12.851	-1.557	-5.822
4- 7	14.874	11.104	-0.228	12.851	-3.440	-8.957
4- 8	-2.105	-3.764	12.851	-0.100	-5.323	-12.093
4- 9	-20.197	-27.723	12.851	-0.100	-7.206	-15.228
4-10	-43.172	-57.194	12.851	-0.100	-9.089	-18.364

Right

Member 5: (Top Slab - Interior Cell)

Bottom

5- 0	-38.496	-50.159	11.313	1.294	15.663	8.623
5- 1	-17.954	-25.713	11.313	1.294	12.649	6.872
5- 2	0.060	-7.022	11.313	1.294	9.634	5.121
5- 3	11.133	6.369	11.329	1.294	6.619	3.370
5- 4	18.991	14.818	11.329	1.294	3.605	1.620
5- 5	21.649	18.325	11.329	1.294	0.651	-0.131
5- 6	19.260	16.567	11.329	11.313	-1.882	-3.030
5- 7	11.750	9.835	11.329	11.313	-3.633	-6.045
5- 8	-0.234	-2.095	1.233	11.390	-5.383	-9.060
5- 9	-16.998	-19.802	1.233	11.390	-7.134	-12.074
5-10	-37.638	-43.142	11.313	11.390	-8.885	-15.089

Top

Member 6: (Interior Wall - Interior Cell)

Bottom

6- 0	0.235	-0.235	27.911	29.304	0.061	-0.061
6- 1	0.161	-0.161	27.911	29.304	0.061	-0.061
6- 2	0.087	-0.087	27.911	29.304	0.061	-0.061
6- 3	0.030	-0.030	27.911	29.304	0.061	-0.061

6- 4	0.061	-0.061	27.911	29.304	0.061	-0.061
6- 5	0.135	-0.135	27.911	29.304	0.061	-0.061
6- 6	0.209	-0.209	27.065	30.149	0.061	-0.061
6- 7	0.283	-0.283	27.065	30.149	0.061	-0.061
6- 8	0.357	-0.357	27.065	30.149	0.061	-0.061
6- 9	0.431	-0.431	27.065	30.149	0.061	-0.061
6-10	0.505	-0.505	27.065	30.149	0.061	-0.061

Top

Member 7: (Bottom Slab - Interior Cell)

Left

7- 0	-42.408	-54.858	12.807	-0.181	16.444	9.306
7- 1	-20.177	-28.895	12.807	-0.181	13.308	7.423
7- 2	-2.830	-8.404	12.807	-0.181	10.173	5.540
7- 3	10.439	6.397	12.730	-0.181	7.037	3.658
7- 4	18.982	15.721	12.730	-0.181	3.902	1.775
7- 5	22.081	19.723	12.730	-0.181	0.772	-0.108
7- 6	19.740	17.732	12.730	12.807	-1.991	-2.942
7- 7	12.292	10.665	-0.243	12.807	-3.874	-6.069
7- 8	0.138	-1.363	-0.243	12.791	-5.757	-9.203
7- 9	-17.055	-19.994	-0.243	12.791	-7.640	-12.338
7-10	-39.447	-44.133	-0.243	12.791	-9.523	-15.474

Right

```
Project: Pine Lake Dam
Task   : Structural
Client : Boiling Spring Lake
Job No.: 19C21022.03


CULVERT PROPERTIES
==================
Type of Culvert: Cast-in-Place         Specification : LRFD 6th Edition 2012
Operating Mode : Analysis

Physical Dimensions
-------------------
No. of Boxes: 1              Name: BoxCulvert
Clear Span  :  5.0000 ft     Fill Depth  :  14.50ft
Clear Height:  4.0000 ft     Center Skew :  0.00 deg    Left Skew: 90.00 deg
Right Skew: 90.00 deg
Length      :112.0000 ft     Bottom Slab Support: Full Slab
Haunches: Top, Length:  0.0000 in     Height:  0.0000 in
       Bottom, Length:  0.0000 in     Height:  0.0000 in
Member Thicknesses:          Top Slab: 12.0000 in      Bot Slab: 12.0000 in
                             Ext Wall: 12.0000 in
Wall Joint: None

Material Properties
-------------------
Concrete: Strength,f'c :  4.500 ksi   Density     :  0.150 kcf   Elasticity,Ec:
4067 ksi
          Type         : Normal Weight
          Fr Factor    :   0.24       Gamma1      :   1.60       Gamma3       :
0.75
Steel:    Yield,fy     :  60.00 ksi   fss Limit   :  0.60fy      Elasticity,Es:
29000 ksi
          Yield,fyv    :  60.00 ksi   Diameter    :  1.000 in    Type         :
Rebar
Soil:     Density      :  0.130 kcf   Slope Factor:  1.150 (B1 Installation)
          Poisson's    :  0.35
          Fe Factor    :  1.150 (Maximum for Compacted Fill)
Serviceability, Gamma-e:  1.00

Loads
-----
Live Load:  Vehicle: (AA) HL-93 - Design Vehicle
                     Axle No.    Weight(k)   Dist. From Previous(ft)
                        1           8.00             0.00
                        2          32.00            14.00
                        3          32.00            14.00
                     Gage Width: 6.00 ft, Tread Width: 20.00 in, Tread Length:
10.00 in
```

```
                     Include Tandem: yes
                     Tandem: Axle 1: 25.00 k, Axle 2: 25.00 k, Axle Spacing: 4.00
ft
                     Lane Load: 0.64 klf, P-Moment: 18.00 k, P-Shear: 26.00 k
                     Combine: Truck Or Tandem Or Lane
                     Inventory Rating Load Factor: 1.75  Operating Rating Load
Factor: 1.35
                     Design Load Combinations: Strength I
                     Override MPF: no
                     Override DLA: no
            Include Lane Load      : yes         Max. No. of Lanes: Computed by
Program
            Traffic Direction      : Lanes Parallel to Main Reinforcement
            Neglect Live Load for Large Fill Depths: yes
            Apply Surcharge at Fill Depths > 2 ft  : yes
            Compute Surcharge Depth: yes
Dead Load:  Future Wearing Surface :  0.15 klf   Add. Dead Load   :  0.00 klf
            Concentrated Loads     : none
Lateral Soil Loads: Max. Equiv. Fluid Press.:100.00 pcf   Min. Equiv. Fluid Press.
: 30.00 pcf
Include Additional Uniform Horiz. Load: no
Include Additional Uniform Vert. Load: no
Buoyancy Check    : yes
Fluid Pressures   : Apply Water Press.  : yes, to the interior
                  : Int. Pressure Head  : 15.83 ft
Foundation Model  : Uniform Loads

Load and Resistance Factors
---------------------------
     Max      Min
DC: 1.250    0.900
DW: 1.500    0.650
EV: 1.300    0.900
EH: 1.350    0.900
WA: 1.000
EQ: 1.000
LL I     : 1.750   LL II     : 1.350   LL Legal     : 1.750
Ductility: 1.000   Importance: 1.000   Redundancy, non-earth: 1.000   Redundancy,
earth: 1.050
Condition: 1.000   System    : 1.000
Phi Shear: 0.850   Phi Moment: 0.900   PM Compression: 0.750   PM Tension    :
0.900
Load Factor Multipliers, Design Mode: 1.00 Analysis Mode: 1.00

Reinforcement
-------------
Reinforcement Covers  :  Exterior      Interior
              Top Slab:  2.5000 in     2.0000 in
              Walls   :  2.5000 in     2.0000 in
              Bot Slab:  3.0000 in     2.0000 in
```

Assigned reinforcement:

Location	Mark	Size	Spacing (in)
Top Slab Inside	A100 (AS2)	6	8.0000
Bottom Slab Inside	A200 (AS3)	6	8.0000
Top Slab Outside	A300 (AS7)	4	8.0000
Bottom Slab Outside	A400 (AS8)	4	8.0000
Top Corner	A1 (AS1)	4	8.0000
Bottom Corner	A2 (AS1)	4	8.0000
Ext. Wall Inside	B1 (AS4)	4	8.0000
Longitudinal	C1 (AS6)	5	12.0000
Top Distribution	C100 (AS5)	5	12.0000
Bottom Distribution	C200	5	12.0000

Analysis Options

```
LL Analysis       : Automatically Set Traffic Direction to Account for Skew
Effects: no
                    Limit LL Distribution Width to Culvert Length for: None
                    Combine Longitudinal Axle Distribution Overlaps: Yes
                    Combine Transverse Axle Distribution Overlaps: Yes, Max of 2
Axles
                    Axle Placement Increment for Moving Load Analysis: 10
                    Include Impact on Bottom Slab: yes
                    Always Distribute Wheel Load: yes
                    Deflection Criteria     : 1/800
Reinforcement     : Always Include Distribution Steel: yes
                    Distribution Slab Provided: no
                    User Defined Longitudinal Steel: yes
                    Max. As used in Vc Calcs: 0.00 in2/ft
                    Distribute Minimum Reinforcement per Face: yes
                    Use individual Member Thicknesses for Min Steel: yes
                    Epoxy coat steel: top bars, if fill < 2'
                    Use M-dimension for bar length calcs.: no
Slenderness       : Checked       K Factor: 2.00
Analysis Modeling : Use Haunches in the Structural Analysis Model: no
Critical Sections : Flexure critical section location: face of support
                    Shear critical section location: dv beyond support
                    Use Max. Moment with Max. Shear at the Critical Section for
Shear: yes
                    Include depoth of haunch for critical sections: no
Flexure           : Ignore Axial Thrust: no
                    Use Eq. 12.10.4.2.4a-1: yes   Nu Multiplier: 1.00
Shear             : Always Check Iterative Beta Method
Environmental     : Apply duribility factors: yes
                Exposure    : Normal
```

ANALYSIS RESULTS
==========

Top Slab Thickness = 12.00 in
Bottom Slab Thickness = 12.00 in
Exterior Wall Thickness = 12.00 in

Modular Ratio (N) = 7.13 Max. Steel Ratio = 0.023
Design Span = 6.00 ft Design Height = 5.00 ft
Design Fill Depth = 14.50 ft

Volume of Concrete: 0.815 cy/ft Weight of Steel: 103 lb/ft

M dimension = 1' 8" (method of equivalent capacity)
= 2' 4" (method of contraflexure - ASTM)

Reinforcing Steel Schedule

Location	Bar Mark	Qty	Size	Type	Spacing (in)	As,prv (in2/ft)	Length (ft-in)	Wgt (lbs)	H Leg (ft-in)	V Leg (ft-in)
Top Slab (int)	A100 (AS2)	168	6	STR	8.00	0.660	6- 6	1640		
Bot Slab (int)	A200 (AS3)	168	6	STR	8.00	0.660	6- 6	1640		
Top Slab (ext)	A300 (AS7)	168	4	STR	8.00	0.300	6- 6	729		
Bot Slab (ext)	A400 (AS8)	168	4	STR	8.00	0.300	6- 6	729		
Corner (Top)	A1 (AS1)	336	4	L-BAR	8.00	0.300	5- 6	1234	2- 1	3- 5
Corner (Bottom)	A2 (AS1)	336	4	L-BAR	8.00	0.300	5- 6	1234	2- 1	3- 5
Ext Wall (int)	B1 (AS4)	336	4	STR	8.00	0.300	4- 6	1010		
Top Slab (int- 2)	C100 (AS5)	12	5	STR	12.00	0.310	56- 9	710		
Bot Slab (int- 2)	C200	12	5	STR	12.00	0.310	56- 9	710		
Temperature (2)	C1 (AS6)	6	5	STR	12.00	0.310	56- 9	355		
Temperature (2)	C1 (AS6)	6	5	STR	12.00	0.310	56- 9	355		
Temperature (2)	C1 (AS6)	10	5	STR	12.00	0.310	56- 9	592		
Temperature (2)	C1 (AS6)	10	5	STR	12.00	0.310	56- 9	592		
							Total	11530		

Note: A denotes flexural steel, B denotes vertical steel, C denotes longitudinal

steel

AS Bar Marks

Location	As prv in2/ft
Transverse Side Wall - Outside Face (AS1)	0.300
Transverse Top Slab - Inside Face (AS2)	0.660
Transverse Bottom Slab - Inside Face (AS3)	0.660
Transverse Side Wall - Inside Face (AS4)	0.300
Distribution Top Slab - Inside Face (AS5)	0.310
Distribution Top Slab - OutSide Face (AS6)	0.310
Transverse Top Slab - Outside Face (AS7)	0.300
Transverse Bottom Slab - Outside Face (AS8)	0.300

Notes: 1.) Final areas of steel provided must be checked in analysis mode

Splice Lengths Table:

Bar Mark	Size	Splice Length (ft-in)
B1	4	1- 5
C1	5	1- 9
C100	5	1- 9
C200	5	1- 9

Summary of Ratings Table:

	Flexure					Shear			
Truck	Fill	Member	Location	IR	OR	Fill	Member	Location	IR	OR
(AA) HL-93	14.50	1	BOT	NC	NC	14.50	1	BOT	NC	NC

Critical Sections Summary: Flexure

Member 1: (Exterior Wall), Thickness = 12.00 in

Loc	Dist.	Design Moment	Corr. A. F.	Mu	ds	Ma	As	Mcr	Load Ratings IR	Fill

```
 OR    Truck  Depth
      (in)    (k-ft)   (k)   (k-ft)   (in)  (k-ft)    phi   (in2)   (k-ft)
              (ft)
BOT    6.00   -13.29  10.11   12.22   9.25   16.87   0.90   0.30    14.66      NC
  NC     AA   14.50
MID   30.00     2.57   6.27   12.90   9.75   15.80   0.90   0.30    14.66      NC
  NC     AA   14.50
MID-  30.00   -13.05  10.11   12.31   9.31   16.96   0.90   0.30    14.66      NC
  NC     AA   14.50
TOP    6.00   -11.06  10.11   12.22   9.25   16.87   0.90   0.30    14.66      NC
  NC     AA   14.50

Member 2: (Top Slab), Thickness = 12.00 in
              Design   Corr.                                                Load
Ratings         Fill
Loc   Dist.   Moment   A. F.   Mu      ds     Ma             As      Mcr       IR
 OR    Truck  Depth
      (in)    (k-ft)   (k)   (k-ft)   (in)  (k-ft)    phi   (in2)   (k-ft)
              (ft)
LT     6.00    -6.92   6.63   12.22   9.25   15.29   0.90   0.30    14.66      NC
  NC     AA   14.50
MID   36.00    20.35   0.44   27.31   9.63   27.50   0.90   0.66    14.66      NC
  NC     AA   14.50
RT     6.00    -6.92   6.63   12.22   9.25   15.29   0.90   0.30    14.66      NC
  NC     AA   14.50

Member 4: (Bottom Slab), Thickness = 12.00 in
              Design   Corr.                                                Load
Ratings         Fill
Loc   Dist.   Moment   A. F.   Mu      ds     Ma             As      Mcr       IR
 OR    Truck  Depth
      (in)    (k-ft)   (k)   (k-ft)   (in)  (k-ft)    phi   (in2)   (k-ft)
              (ft)
LT     6.00    -7.67   7.53   11.55   8.75   15.03   0.90   0.30    14.66      NC
  NC     AA   14.50
MID   36.00    22.02  -0.16   27.31   9.63   27.23   0.90   0.66    14.66      NC
  NC     AA   14.50
RT     6.00    -7.67   7.53   11.55   8.75   15.03   0.90   0.30    14.66      NC
  NC     AA   14.50


Critical Sections Summary: Vertical Shear
-----------------------------------------

Member 1: (Exterior Wall), Thickness = 12.00 in
             Design Corr.  Corr.                                        Max.
Load Ratings        Fill
Loc   Dist.  Shear  Moment A. F.  Dv  phi*Vn  Beta     Vc      Vs    Av   Spac   IR
    OR   Truck  Depth
      (in)    (k)   (k-ft)  (k)  (in)                 (k)     (k)  (in2) (in)
```

```
                (ft)
BOT   14.64   3.75  -13.3 10.11  9.05  12.38  2.000  14.57b   0.00  0.00  0.00
NC     NC    AA   14.50
MID   30.00   0.35    2.6  6.27  9.55  30.13  4.613  35.45a   0.00  0.00  0.00
NC     NC    AA   14.50
MID-  30.00   0.35  -13.0 10.11  9.12  12.47  2.000  14.67b   0.00  0.00  0.00
NC     NC    AA   14.50
TOP   14.64  -3.54  -11.1 10.11  9.05  12.72  2.055  14.97a   0.00  0.00  0.00
NC     NC    AA   14.50

Member 2: (Top Slab), Thickness = 12.00 in
             Design Corr.  Corr.                                          Max.
Load Ratings        Fill
Loc   Dist.  Shear  Moment A. F.  Dv  phi*Vn  Beta     Vc      Vs    Av   Spac   IR
    OR   Truck  Depth
      (in)    (k)   (k-ft)  (k)  (in)                  (k)     (k)  (in2) (in)
                (ft)
LT    14.64   6.00   -6.9  6.63  9.25  18.97   n/a  22.32c   0.00  0.00  0.00
NC     NC    AA   14.50
MID   36.00   0.00   20.4  0.44  9.63  19.74   n/a  23.23c   0.00  0.00  0.00
NC     NC    AA   14.50
RT    14.64   6.00   -6.9  6.63  9.25  18.97   n/a  22.32c   0.00  0.00  0.00
NC     NC    AA   14.50

Member 4: (Bottom Slab), Thickness = 12.00 in
             Design Corr.  Corr.                                          Max.
Load Ratings        Fill
Loc   Dist.  Shear  Moment A. F.  Dv  phi*Vn  Beta     Vc      Vs    Av   Spac   IR
    OR   Truck  Depth
      (in)    (k)   (k-ft)  (k)  (in)                  (k)     (k)  (in2) (in)
                (ft)
LT    14.64   6.56   -7.7  7.53  8.75  17.95   n/a  21.12c   0.00  0.00  0.00
NC     NC    AA   14.50
MID   36.00   0.00   22.0 -0.16  9.63  19.74   n/a  23.23c   0.00  0.00  0.00
NC     NC    AA   14.50
RT    14.64   6.56   -7.7  7.53  8.75  17.95   n/a  21.12c   0.00  0.00  0.00
NC     NC    AA   14.50

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d -
Standard/Arema


================================================================================
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                                   Analysis Results: Fill Depth = 14.50 ft
================================================================================
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Load Parameters:
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```

Fe = 1.15 Surcharge Depth : 2.00 ft

Applied Horizontal Loads: (k/ft)

Load Description	Bottom of Wall	Top of Wall
Horizontal Earth Load	2.000	1.500
Live Load Surcharge	0.200	0.200
Internal Water Pressure	1.237	0.988

Unfactored Moments due to All Loads: (k-ft)

M-PT	Mdc	Mev	Mdw	Meh	Mls	Mwa	Veh	Vls	Vwa
Member 1: (Exterior Wall)									
Bottom									
1- 0	-0.74	-3.55	-0.25	-1.67	-0.19	0.63	4.59	0.50	-2.08
1- 1	-0.68	-3.55	-0.25	0.37	0.04	-0.26	3.60	0.40	-1.49
1- 2	-0.62	-3.55	-0.25	1.93	0.21	-0.88	2.64	0.30	-0.97
1- 3	-0.57	-3.55	-0.25	3.02	0.34	-1.25	1.70	0.20	-0.50
1- 4	-0.51	-3.55	-0.25	3.64	0.41	-1.40	0.79	0.10	-0.10
1- 5	-0.45	-3.55	-0.25	3.82	0.44	-1.36	-0.10	0.00	0.24
1- 6	-0.39	-3.55	-0.25	3.55	0.41	-1.17	-0.96	-0.10	0.52
1- 7	-0.33	-3.55	-0.25	2.86	0.34	-0.86	-1.80	-0.20	0.74
1- 8	-0.28	-3.55	-0.25	1.76	0.21	-0.45	-2.61	-0.30	0.89
1- 9	-0.22	-3.55	-0.25	0.26	0.04	0.02	-3.40	-0.40	0.98
1-10	-0.16	-3.55	-0.25	-1.63	-0.19	0.52	-4.16	-0.50	1.01
Top									
Member 2: (Top Slab)									
Left									
2- 0	-0.16	-3.55	-0.25	-1.64	-0.19	0.54	0.00	0.00	0.00
2- 1	0.08	-0.04	0.00	-1.64	-0.19	0.54	0.00	0.00	0.00
2- 2	0.27	2.70	0.19	-1.64	-0.19	0.54			

Unfactored Shears due to All Loads: (k)

M-PT	Vdc	Vev	Vdw
Member 1: (Exterior Wall)			
Bottom			
1- 0	0.12	0.00	0.00
1- 1	0.12	0.00	0.00
1- 2	0.12	0.00	0.00
1- 3	0.12	0.00	0.00
1- 4	0.12	0.00	0.00
1- 5	0.12	0.00	0.00
1- 6	0.12	0.00	0.00
1- 7	0.12	0.00	0.00
1- 8	0.12	0.00	0.00
1- 9	0.12	0.00	0.00
1-10	0.12	0.00	0.00
Top			
Member 2: (Top Slab)			
Left			
2- 0	0.45	6.50	0.45
2- 1	0.36	5.20	0.36
2- 2	0.27	3.90	0.27

```
0.00   0.00   0.00
 2- 3   0.41   4.65   0.32  -1.64  -0.19   0.54         2- 3   0.18   2.60   0.18
0.00   0.00   0.00
 2- 4   0.49   5.82   0.40  -1.64  -0.19   0.54         2- 4   0.09   1.30   0.09
0.00   0.00   0.00
 2- 5   0.52   6.21   0.43  -1.64  -0.19   0.54         2- 5   0.00   0.00   0.00
0.00   0.00   0.00
 2- 6   0.49   5.82   0.40  -1.64  -0.19   0.54         2- 6  -0.09  -1.30  -0.09
0.00   0.00   0.00
 2- 7   0.41   4.65   0.32  -1.64  -0.19   0.54         2- 7  -0.18  -2.60  -0.18
0.00   0.00   0.00
 2- 8   0.27   2.70   0.19  -1.64  -0.19   0.54         2- 8  -0.27  -3.90  -0.27
0.00   0.00   0.00
 2- 9   0.08  -0.04   0.00  -1.64  -0.19   0.54         2- 9  -0.36  -5.20  -0.36
0.00   0.00   0.00
 2-10  -0.16  -3.55  -0.25  -1.64  -0.19   0.54         2-10  -0.45  -6.50  -0.45
0.00   0.00   0.00
 Right                                                  Right

Member 4: (Bottom Slab)                                 Member 4: (Bottom Slab)
 Left                                                   Left
 4- 0  -0.74  -3.55  -0.25  -1.67  -0.19   0.63         4- 0   1.20   6.50   0.45
0.00   0.00   0.00
 4- 1  -0.09  -0.04   0.00  -1.67  -0.19   0.63         4- 1   0.96   5.20   0.36
0.00   0.00   0.00
 4- 2   0.41   2.70   0.19  -1.67  -0.19   0.63         4- 2   0.72   3.90   0.27
0.00   0.00   0.00
 4- 3   0.77   4.65   0.32  -1.67  -0.19   0.63         4- 3   0.48   2.60   0.18
0.00   0.00   0.00
 4- 4   0.99   5.82   0.40  -1.67  -0.19   0.63         4- 4   0.24   1.30   0.09
0.00   0.00   0.00
 4- 5   1.06   6.21   0.43  -1.67  -0.19   0.63         4- 5   0.00   0.00   0.00
0.00   0.00   0.00
 4- 6   0.99   5.82   0.40  -1.67  -0.19   0.63         4- 6  -0.24  -1.30  -0.09
0.00   0.00   0.00
 4- 7   0.77   4.65   0.32  -1.67  -0.19   0.63         4- 7  -0.48  -2.60  -0.18
0.00   0.00   0.00
 4- 8   0.41   2.70   0.19  -1.67  -0.19   0.63         4- 8  -0.72  -3.90  -0.27
0.00   0.00   0.00
 4- 9  -0.09  -0.04   0.00  -1.67  -0.19   0.63         4- 9  -0.96  -5.20  -0.36
0.00   0.00   0.00
 4-10  -0.74  -3.55  -0.25  -1.67  -0.19   0.63         4-10  -1.20  -6.50  -0.45
0.00   0.00   0.00
 Right                                                  Right

Unfactored Thrusts due to All Loads: (k)
-----------------------------------
 Member    Pdc    Pev    Pdw    Peh    Pls    Pwa
   1      0.45   6.50   0.45   0.00   0.00   0.00
   2     -0.12   0.00   0.00   4.16   0.50  -1.01
```

```
   4      0.12   0.00   0.00   4.59   0.50  -2.08

Buoyancy Check:
---------------
Culvert + Fill Weight, kip   : 1847.44
Buoyant Force, kip           : 293.53
Sliding Resistance, kip      : 980.00
Factor of Safety             : 6.30

------------------------------- No analysis truck, live load neglected
---------------------------------


Serviceability Check: Crack Control
--------------------
Bar                     Moment  Thrust    Fss   Spacing  Allow
Mark   Location        (k-ft)    (k)    (ksi)    (in)    (in)
A1     Top Corner Bar    -3.9    7.40    4.69     8.00   99.99
A2     Bot Corner Bar    -4.7    7.40    7.93     8.00   61.85
A100   Top Slab (int)     7.2    0.12   14.73     8.00   30.39
A200   Bot Slab (int)     7.8   -0.59   16.59     8.00   26.45

Serviceability Check: Live Load Deflection
--------------------
Deflection Ratio of Top Slab = 1/9999  (Limit = 1/800)


Strength Limit State at Critical Sections: Flexure
--------------------------------------------------
Member 1: (Exterior Wall), Thickness = 12.00 in
               Design    Corr.                                                Load
Ratings
Loc    Dist.   Moment    A. F.    Mu      ds     Ma             As      Mcr
IR     OR
       (in)    (k-ft)     (k)   (k-ft)   (in)  (k-ft)   phi   (in2)   (k-ft)

BOT     6.00   -13.29    10.11   12.22   9.25   16.87   0.90   0.30    14.66
NC     NC
MID    30.00     2.57     6.27   12.90   9.75   15.80   0.90   0.30    14.66
NC     NC
MID-   30.00   -13.05    10.11   12.31   9.31   16.96   0.90   0.30    14.66
NC     NC
TOP     6.00   -11.06    10.11   12.22   9.25   16.87   0.90   0.30    14.66
NC     NC

Member 2: (Top Slab), Thickness = 12.00 in
               Design    Corr.                                                Load
Ratings
Loc    Dist.   Moment    A. F.    Mu      ds     Ma             As      Mcr
IR     OR
```

```
       (in)    (k-ft)     (k)   (k-ft)   (in)  (k-ft)   phi   (in2)   (k-ft)

LT      6.00    -6.92     6.63   12.22   9.25   15.29   0.90   0.30    14.66
NC     NC
MID    36.00    20.35     0.44   27.31   9.63   27.50   0.90   0.66    14.66
NC     NC
RT      6.00    -6.92     6.63   12.22   9.25   15.29   0.90   0.30    14.66
NC     NC

Member 4: (Bottom Slab), Thickness = 12.00 in
               Design    Corr.                                                Load
Ratings
Loc    Dist.   Moment    A. F.    Mu      ds     Ma             As      Mcr
IR     OR
       (in)    (k-ft)     (k)   (k-ft)   (in)  (k-ft)   phi   (in2)   (k-ft)

LT      6.00    -7.67     7.53   11.55   8.75   15.03   0.90   0.30    14.66
NC     NC
MID    36.00    22.02    -0.16   27.31   9.63   27.23   0.90   0.66    14.66
NC     NC
RT      6.00    -7.67     7.53   11.55   8.75   15.03   0.90   0.30    14.66
NC     NC


Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under
applied axial load

Strength Limit State at Critical Sections: Vertical Shear
-------------------------------------------------------
Member 1: (Exterior Wall), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
BOT   14.64    3.75   -13.3 10.11  9.05   12.38  2.000 45.00  14.57b   0.00  0.00
0.00     NC     NC
MID   30.00    0.35     2.6  6.27  9.55   30.13  4.613 29.84  35.45a   0.00  0.00
0.00     NC     NC
MID-  30.00    0.35   -13.0 10.11  9.12   12.47  2.000 45.00  14.67b   0.00  0.00
0.00     NC     NC
TOP   14.64   -3.54   -11.1 10.11  9.05   12.72  2.055 40.57  14.97a   0.00  0.00
0.00     NC     NC

Member 2: (Top Slab), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
```

```
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
LT    14.64    6.00    -6.9  6.63  9.25   18.97   n/a   n/a   22.32c   0.00  0.00
0.00     NC     NC
MID   36.00    0.00    20.4  0.44  9.63   19.74   n/a   n/a   23.23c   0.00  0.00
0.00     NC     NC
RT    14.64    6.00    -6.9  6.63  9.25   18.97   n/a   n/a   22.32c   0.00  0.00
0.00     NC     NC

Member 4: (Bottom Slab), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
LT    14.64    6.56    -7.7  7.53  8.75   17.95   n/a   n/a   21.12c   0.00  0.00
0.00     NC     NC
MID   36.00    0.00    22.0 -0.16  9.63   19.74   n/a   n/a   23.23c   0.00  0.00
0.00     NC     NC
RT    14.64    6.56    -7.7  7.53  8.75   17.95   n/a   n/a   21.12c   0.00  0.00
0.00     NC     NC

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d -
Standard/Arema

Applied Environmental Factors:
----------------------------------
    M-PT    +Sd    +Beta   +fs(ksi)  -Sd    -Beta   -fs(ksi)

  Member 1: (Exterior Wall)
    Bottom
    1- 0    1.00   -4.19    20.00    2.03    1.33    20.00

    1- 1    3.25    0.83    20.00    2.10    1.29    20.00

    1- 2    8.32    0.32    20.00    2.17    1.24    20.00

    1- 3    1.00   -1.70    20.00    2.21    1.22    20.00

    1- 4    1.00   21.30    20.00    2.24    1.21    20.00

    1- 5    1.00    6.95    20.00    2.24    1.21    20.00

    1- 6    1.00   17.61    20.00    2.22    1.22    20.00

    1- 7    1.00   -1.86    20.00    2.18    1.24    20.00

    1- 8    8.52    0.32    20.00    2.13    1.27    20.00
```

1- 9	3.22	0.84	20.00	2.06	1.31	20.00
1-10	1.99	1.35	20.00	2.02	1.34	20.00

Top

Member 2: (Top Slab)

Left

2- 0	1.99	1.36	20.00	2.02	1.34	20.00
2- 1	1.00	-0.31	20.00	1.94	1.39	20.00
2- 2	2.16	1.25	20.00	144.38	0.02	20.00
2- 3	2.12	1.27	20.00	4.60	0.59	20.00
2- 4	2.11	1.28	20.00	4.03	0.67	20.00
2- 5	2.10	1.28	20.00	3.92	0.69	20.00
2- 6	2.11	1.28	20.00	4.03	0.67	20.00
2- 7	2.12	1.27	20.00	4.60	0.59	20.00
2- 8	2.16	1.25	20.00	144.38	0.02	20.00
2- 9	1.00	-0.31	20.00	1.94	1.39	20.00
2-10	1.99	1.36	20.00	2.02	1.34	20.00

Right

Member 4: (Bottom Slab)

Left

4- 0	2.00	1.35	20.00	2.03	1.33	20.00
4- 1	1.00	-10.57	20.00	1.95	1.38	20.00
4- 2	2.17	1.25	20.00	33.65	0.08	20.00
4- 3	2.13	1.27	20.00	4.42	0.61	20.00
4- 4	2.12	1.28	20.00	3.92	0.69	20.00
4- 5	2.11	1.28	20.00	3.83	0.71	20.00
4- 6	2.12	1.28	20.00	3.92	0.69	20.00
4- 7	2.13	1.27	20.00	4.42	0.61	20.00

4- 8	2.17	1.25	20.00	33.65	0.08	20.00
4- 9	1.00	-10.57	20.00	1.95	1.38	20.00
4-10	2.00	1.35	20.00	2.03	1.33	20.00
Right						

Vertical Reactions Applied to Structure: (service load values, k/unit width, pos. is up)

Wall #	DL	DW	EV	EH	LS	WA	LL	Tot. w/o LL	Tot. w/ LL
1	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.75	0.75
2	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.75	0.75

Horizontal Reactions Applied to Structure: (service load values, k/unit width, pos. is right)

Wall #	DL	DW	EV	EH	LS	WA	LL	Tot. w/o LL	Tot. w/ LL
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Load Combination Results at Tenth Points: (k-ft, k)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior Wall)						
Bottom						
1- 0	-6.153	-17.976	10.114	10.114	7.527	-0.163
1- 1	-10.470	-12.987	6.272	10.114	5.952	0.043
1- 2	-5.416	-13.285	6.272	10.114	4.413	0.198
1- 3	1.159	-13.281	6.272	10.114	2.909	0.300
1- 4	2.226	-13.049	6.272	10.114	1.440	0.351
1- 5	2.568	-12.663	6.272	10.114	0.349	-0.033

1- 6	2.201	-12.197	6.272	10.114	0.294	-1.431
1- 7	1.145	-11.724	6.272	10.114	0.188	-2.793
1- 8	-4.967	-11.320	6.272	10.114	0.029	-4.120
1- 9	-9.540	-11.056	6.272	10.114	-0.182	-5.411
1-10	-11.009	-16.282	10.114	10.114	-0.445	-6.667

Top

Member 2: (Top Slab)

Left

2- 0	-10.947	-16.311	0.445	6.626	10.114	6.272
2- 1	-0.037	-5.043	0.445	6.626	8.092	5.017
2- 2	9.085	3.010	0.445	6.667	6.069	3.763
2- 3	15.345	8.756	0.445	6.667	4.046	2.509
2- 4	19.101	12.204	0.445	6.667	2.023	1.254
2- 5	20.353	13.353	0.445	6.667	0.000	0.000
2- 6	19.101	12.204	0.445	6.667	-1.254	-2.023
2- 7	15.345	8.756	0.445	6.667	-2.509	-4.046
2- 8	9.085	3.010	0.445	6.667	-3.763	-6.069
2- 9	-0.037	-5.043	0.445	6.626	-5.017	-8.092
2-10	-10.947	-16.311	0.445	6.626	-6.272	-10.114

Right

Member 4: (Bottom Slab)

Left

4- 0	-12.314	-17.976	-0.163	7.527	11.052	6.947
4- 1	-0.185	-5.615	-0.163	7.527	8.842	5.557
4- 2	9.662	3.289	-0.163	7.486	6.631	4.168
4- 3	16.529	9.643	-0.163	7.486	4.421	2.779
4- 4	20.650	13.455	-0.163	7.486	2.210	1.389

4- 5	22.023	14.725	-0.163	7.486	0.000	0.000
4- 6	20.650	13.455	-0.163	7.486	-1.389	-2.210
4- 7	16.529	9.643	-0.163	7.486	-2.779	-4.421
4- 8	9.662	3.289	-0.163	7.486	-4.168	-6.631
4- 9	-0.185	-5.615	-0.163	7.527	-5.557	-8.842
4-10	-12.314	-17.976	-0.163	7.527	-6.947	-11.052

Right

```
Project: North Lake Dam
Task   : 3D
Client : Boiling Spring Lake
Job No.: 19C21022.02


CULVERT PROPERTIES
==================
Type of Culvert: Cast-in-Place         Specification : LRFD 6th Edition 2012
Operating Mode : Analysis

Physical Dimensions
-------------------
No. of Boxes: 2              Name: BoxCulvert
Clear Span  :  6.0000 ft     Fill Depth  :  9.50 ft
Clear Height:  6.0000 ft     Center Skew :  0.00 deg    Left Skew: 90.00 deg
Right Skew: 90.00 deg
Length      : 75.0000 ft     Bottom Slab Support: Full Slab
Haunches: Top, Length:  0.0000 in     Height:  0.0000 in
       Bottom, Length:  0.0000 in     Height:  0.0000 in
Member Thicknesses:          Top Slab: 12.0000 in      Bot Slab: 12.0000 in
                             Ext Wall: 12.0000 in      Int Wall: 12.0000 in
Wall Joint: None

Material Properties
-------------------
Concrete: Strength,f'c :  4.500 ksi   Density     :  0.150 kcf   Elasticity,Ec:
4067 ksi
          Type         : Normal Weight
          Fr Factor    :   0.24       Gamma1      :   1.60       Gamma3       :
0.75
Steel:    Yield,fy     :  60.00 ksi   fss Limit   :  0.60fy      Elasticity,Es:
29000 ksi
          Yield,fyv    :  60.00 ksi   Diameter    :  1.000 in    Type         :
Rebar
Soil:     Density      :  0.130 kcf   Slope Factor:  1.150 (B1 Installation)
          Poisson's    :  0.35
          Fe Factor    :  1.150 (Maximum for Compacted Fill)
Serviceability, Gamma-e:  1.00

Loads
-----
Live Load:  Vehicle: (AA) HL-93 - Design Vehicle
                     Axle No.    Weight(k)   Dist. From Previous(ft)
                        1           8.00             0.00
                        2          32.00            14.00
                        3          32.00            14.00
                     Gage Width: 6.00 ft, Tread Width: 20.00 in, Tread Length:
10.00 in
```

```
                    Include Tandem: yes
                    Tandem: Axle 1: 25.00 k, Axle 2: 25.00 k, Axle Spacing: 4.00
ft
                    Lane Load: 0.64 klf, P-Moment: 18.00 k, P-Shear: 26.00 k
                    Combine: Truck Or Tandem Or Lane
                    Inventory Rating Load Factor: 1.75  Operating Rating Load
Factor: 1.35
                    Design Load Combinations: Strength I
                    Override MPF: no
                    Override DLA: no
            Include Lane Load      : yes         Max. No. of Lanes: Computed by
Program
            Traffic Direction      : Lanes Parallel to Main Reinforcement
            Neglect Live Load for Large Fill Depths: no
            Apply Surcharge at Fill Depths > 2 ft  : yes
            Compute Surcharge Depth: yes
Dead Load:  Future Wearing Surface :  0.15 klf   Add. Dead Load   :  0.00 klf
            Concentrated Loads     : none
Lateral Soil Loads: Max. Equiv. Fluid Press.:100.00 pcf   Min. Equiv. Fluid Press.
: 30.00 pcf
Include Additional Uniform Horiz. Load: no
Include Additional Uniform Vert. Load: no
Buoyancy Check    : yes
Fluid Pressures   : Apply Water Press.  : yes, to the interior
                  : Int. Pressure Head  : 15.50 ft
Foundation Model  : Uniform Loads

Load and Resistance Factors
---------------------------
     Max      Min
DC: 1.250    0.900
DW: 1.500    0.650
EV: 1.300    0.900
EH: 1.350    0.900
WA: 1.000
EQ: 1.000
LL I     : 1.750   LL II     : 1.350   LL Legal     : 1.750
Ductility: 1.000   Importance: 1.000   Redundancy, non-earth: 1.000   Redundancy,
earth: 1.050
Condition: 1.000   System    : 1.000
Phi Shear: 0.900   Phi Moment: 1.000   PM Compression: 0.750   PM Tension    :
0.900
Load Factor Multipliers, Design Mode: 1.00 Analysis Mode: 1.00

Reinforcement
-------------
Reinforcement Covers  :  Exterior      Interior
              Top Slab:  2.5000 in     2.0000 in
              Walls   :  2.5000 in     2.0000 in
              Bot Slab:  3.0000 in     2.0000 in
```

Assigned reinforcement:

Location	Mark	Size	Spacing (in)
Top Slab Inside	A100 (AS2)	6	8.0000
Bottom Slab Inside	A200 (AS3)	6	8.0000
Top Slab Outside	A300 (AS7)	6	8.0000
Bottom Slab Outside	A400 (AS8)	6	8.0000
Top Corner	A1 (AS1)	5	8.0000
Bottom Corner	A2 (AS1)	5	8.0000
Ext. Wall Inside	B1 (AS4)	5	8.0000
Ext. Wall Outside	B2 (AS1)	5	8.0000
Interior Wall	B3	4	8.0000
Longitudinal	C1 (AS6)	5	8.0000
Top Distribution	C100 (AS5)	5	8.0000
Bottom Distribution	C200	5	8.0000

Analysis Options

```
LL Analysis       : Automatically Set Traffic Direction to Account for Skew
Effects: no
                    Limit LL Distribution Width to Culvert Length for: Fills > 2 ft
                    Combine Longitudinal Axle Distribution Overlaps: Yes, Max of 2
Axles
                    Combine Transverse Axle Distribution Overlaps: Yes, Max of 2
Axles
                    Axle Placement Increment for Moving Load Analysis: 20
                    Include Impact on Bottom Slab: yes
                    Always Distribute Wheel Load: no
                    Deflection Criteria     : 1/800
Reinforcement     : Always Include Distribution Steel: yes
                    Distribution Slab Provided: no
                    User Defined Longitudinal Steel: yes
                    Max. As used in Vc Calcs: 0.00 in2/ft
                    Distribute Minimum Reinforcement per Face: yes
                    Use individual Member Thicknesses for Min Steel: no
                    Epoxy coat steel: top bars, if fill < 2'
                    Use M-dimension for bar length calcs.: no
Slenderness       : Checked       K Factor: 2.00
Analysis Modeling : Use Haunches in the Structural Analysis Model: no
Critical Sections : Flexure critical section location: 1.5 member depth
                    Shear critical section location: dv beyond support
                    Use Max. Moment with Max. Shear at the Critical Section for
Shear: yes
                    Include depoth of haunch for critical sections: no
Flexure           : Ignore Axial Thrust: no
                    Use Eq. 12.10.4.2.4a-1: no
Shear             : Always Check Iterative Beta Method
Environmental     : Apply duribility factors: yes
                Exposure    : Normal
```

ANALYSIS RESULTS
==========

Top Slab Thickness = 12.00 in
Bottom Slab Thickness = 12.00 in
Exterior Wall Thickness = 12.00 in
Interior Wall Thickness = 12.00 in

Modular Ratio (N) = 7.13 Max. Steel Ratio = 0.023
Design Span = 7.00 ft Design Height = 7.00 ft
Design Fill Depth = 9.50 ft

Volume of Concrete: 1.778 cy/ft Weight of Steel: 368 lb/ft

M dimension = 1' 4" (method of equivalent capacity)
= 2' 11" (method of contraflexure - ASTM)

Reinforcing Steel Schedule

Location	Bar Mark	Qty	Size	Type	Spacing (in)	As,prv (in2/ft)	Length (ft-in)	Wgt (lbs)	H Leg (ft-in)	V Leg (ft-in)
Top Slab (int)	A100 (AS2)	113	6	STR	8.00	0.660	14- 6	2461		
Bot Slab (int)	A200 (AS3)	113	6	STR	8.00	0.660	14- 6	2461		
Top Slab (ext)	A300 (AS7)	113	6	STR	8.00	0.660	14- 6	2461		
Bot Slab (ext)	A400 (AS8)	113	6	STR	8.00	0.660	14- 6	2461		
Corner (Top)	A1 (AS1)	226	5	L-BAR	8.00	0.465	4-10	1139	2- 5	2- 5
Corner (Bottom)	A2 (AS1)	226	5	L-BAR	8.00	0.465	4-10	1139	2- 5	2- 5
Ext Wall (int)	B1 (AS4)	226	5	STR	8.00	0.465	6- 6	1532		
Ext Wall (ext)	B2 (AS1)	226	5	STR	8.00	0.465	6- 0	1414		
Int Wall	B3	226	4	STR	8.00	0.300	7- 6	1132		
Top Slab (int- 2)	C100 (AS5)	38	5	STR	8.00	0.465	38- 3	1516		
Bot Slab (int- 2)	C200	38	5	STR	8.00	0.465	38- 3	1516		
Temperature (2)	C1 (AS6)	21	5	STR	8.00	0.465	38- 3	838		
Temperature (2)	C1 (AS6)	21	5	STR	8.00	0.465	38- 3	838		

Temperature	(2) C1	(AS6)	22	5	STR	8.00	0.465	38- 3	878
Temperature	(2) C1	(AS6)	22	5	STR	8.00	0.465	38- 3	878
Temperature	(2) C1	(AS6)	22	5	STR	8.00	0.465	38- 3	4947
								Total	27610

Note: A denotes flexural steel, B denotes vertical steel, C denotes longitudinal steel

AS Bar Marks

Location	As prv in2/ft
Transverse Side Wall - Outside Face (AS1)	0.465
Transverse Top Slab - Inside Face (AS2)	0.660
Transverse Bottom Slab - Inside Face (AS3)	0.660
Transverse Side Wall - Inside Face (AS4)	0.465
Distribution Top Slab - Inside Face (AS5)	0.465
Distribution Top Slab - OutSide Face (AS6)	0.465
Transverse Top Slab - Outside Face (AS7)	0.660
Transverse Bottom Slab - Outside Face (AS8)	0.660

Notes: 1.) Final areas of steel provided must be checked in analysis mode

Splice Lengths Table:

Bar Mark	Size	Splice Length (ft-in)
B1	5	1- 9
B3	4	1- 5
C1	5	1- 9
C100	5	1- 9
C200	5	1- 9

Summary of Ratings Table:

	Flexure					Shear			
Truck	Fill	Member	Location	IR	OR	Fill	Member	Location	IR	OR

```
-------------------------------------------
(AA) HL-93    9.50      4        RT     10.33    13.39      9.50      4        RT
   5.84     7.57


Critical Sections Summary: Flexure
----------------------------------

Member 1: (Exterior Wall), Thickness = 12.00 in
              Design   Corr.                                                Load
Ratings         Fill
Loc   Dist.   Moment   A. F.   Mu      ds     Ma             As      Mcr       IR
 OR    Truck  Depth
      (in)    (k-ft)   (k)   (k-ft)   (in)  (k-ft)    phi   (in2)   (k-ft)
              (ft)
BOT    6.00   -13.15   9.47   20.65   9.19   21.62   0.90   0.47    14.66    16.38
21.23    AA   9.50
MID   42.00     8.50   5.54   21.82   9.69   21.38   0.90   0.47    14.66      NC
  NC     AA   9.50
MID-  42.00   -11.14   8.14   20.65   9.19   21.20   0.90   0.47    14.66    30.78
39.90    AA   9.50
TOP    6.00   -13.17   9.47   20.65   9.19   21.62   0.90   0.47    14.66    13.83
17.92    AA   9.50

Member 2: (Top Slab), Thickness = 12.00 in
              Design   Corr.                                                Load
Ratings         Fill
Loc   Dist.   Moment   A. F.   Mu      ds     Ma             As      Mcr       IR
 OR    Truck  Depth
      (in)    (k-ft)   (k)   (k-ft)   (in)  (k-ft)    phi   (in2)   (k-ft)
              (ft)
LT     6.00   -11.53   7.50   20.65   9.19   20.99   0.90   0.47    14.66    13.43
17.40    AA   9.50
MID   33.60    16.65   0.04   30.34   9.63   27.32   0.90   0.66    14.66    15.98
20.72    AA   9.50
RT     6.00   -18.81   0.20   28.69   9.13   25.88   0.90   0.66    14.66    13.80
17.88    AA   9.50

Member 3: (Interior Wall), Thickness = 12.00 in
              Design   Corr.                                                Load
Ratings         Fill
Loc   Dist.   Moment   A. F.   Mu      ds     Ma             As      Mcr       IR
 OR    Truck  Depth
      (in)    (k-ft)   (k)   (k-ft)   (in)  (k-ft)    phi   (in2)   (k-ft)
              (ft)
BOT    6.00    -1.94  19.43   14.33   9.75   19.16   0.90   0.30    14.66    96.02
99.99    AA   9.50
MID   42.00     1.63  16.30   14.33   9.75   18.15   0.90   0.30    14.66    72.14
93.51    AA   9.50
TOP    6.00    -2.21  22.08   14.33   9.75   20.01   0.90   0.30    14.66    28.48
```

36.92 AA 9.50

Member 4: (Bottom Slab), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings OR	Truck	Fill Depth (ft)
LT	6.00	-11.92	8.81	19.49	8.69	20.42	0.90	0.47	14.66	13.87	17.97	AA 9.50
MID	33.60	18.32	-1.25	30.34	9.63	26.92	0.90	0.66	14.66	16.99	22.03	AA 9.50
RT	6.00	-22.46	-1.09	27.04	8.63	23.99	0.90	0.66	14.66	10.33	13.39	AA 9.50

Critical Sections Summary: Vertical Shear

Member 1: (Exterior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Shear (k)	Design Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings OR	Truck	Fill Depth (ft)
BOT	14.64	5.50	-13.2	9.47	8.88	13.88	2.157	15.42a	0.00	0.00	0.00	9.60	12.44	AA 9.50
MID	42.00	0.37	8.5	5.54	9.38	18.64	2.744	20.72a	0.00	0.00	0.00	99.99	99.99	AA 9.50
MID-	42.00	0.37	-11.1	8.14	8.88	16.02	2.491	17.80a	0.00	0.00	0.00	99.99	99.99	AA 9.50
TOP	14.64	-5.17	-13.2	9.47	8.88	13.93	2.166	15.48a	0.00	0.00	0.00	9.79	12.69	AA 9.50

Member 2: (Top Slab), Thickness = 12.00 in

Loc	Dist. (in)	Design Shear (k)	Design Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings OR	Truck	Fill Depth (ft)
LT	14.64	6.14	-11.5	7.50	9.19	15.01	n/a	16.68c	0.00	0.00	0.00	9.72	12.60	AA 9.50
MID	42.00	0.50	16.7	0.04	9.63	15.24	2.187	16.93a	0.00	0.00	0.00	39.18	50.79	AA 9.50
RT	14.64	7.72	-18.8	0.20	9.13	14.98	n/a	16.65c	0.00	0.00	0.00	7.68	9.95	AA 9.50

Member 3: (Interior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Shear (k)	Design Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn (k)	Beta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	IR OR	Load Ratings Truck	Fill Depth (ft)
BOT	14.64	0.15	-1.9	19.43	9.55	34.77	5.027	38.64a	0.00	0.00	0.00	99.99	99.99	AA 9.50
MID	42.00	0.15	1.6	16.30	9.55	34.64	5.009	38.49a	0.00	0.00	0.00	99.99	99.99	AA 9.50
TOP	14.64	0.15	-2.2	22.08	9.55	34.88	5.043	38.76a	0.00	0.00	0.00	99.99	99.99	AA 9.50

Member 4: (Bottom Slab), Thickness = 12.00 in

Loc	Dist. (in)	Design Shear (k)	Design Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn (k)	Beta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	IR OR	Load Ratings Truck	Fill Depth (ft)
LT	14.64	6.48	-11.9	8.81	8.69	14.21	n/a	15.79c	0.00	0.00	0.00	9.72	12.60	AA 9.50
MID	42.00	0.43	18.3	-1.25	9.63	14.96	n/a	16.62c	0.00	0.00	0.00	NC	NC	AA 9.50
RT	14.64	8.72	-22.5	-1.09	8.63	14.12	n/a	15.69c	0.00	0.00	0.00	5.84	7.57	AA 9.50

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arema

==========

Analysis Results: Fill Depth = 9.50 ft

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Load Parameters:

Fe = 1.14 Surcharge Depth : 2.25 ft

Applied Horizontal Loads: (k/ft)

Load Description	Bottom of Wall	Top of Wall
Horizontal Earth Load	1.700	1.000
Live Load Surcharge	0.225	0.225
Internal Water Pressure	1.342	0.967

Unfactored Moments due to All Loads: (k-ft)

M-PT	Mdc	Mev	Mdw	Meh	Mls	Mwa	Veh	Vls	Vwa
Member 1: (Exterior Wall)									
Bottom									
1- 0	-0.62	-1.85	-0.20	-3.78	-0.62	2.01	5.17	0.79	-3.19
1- 1	-0.57	-1.88	-0.20	-0.57	-0.12	0.09	4.01	0.63	-2.29
1- 2	-0.52	-1.91	-0.20	1.84	0.27	-1.24	2.89	0.47	-1.50
1- 3	-0.47	-1.94	-0.21	3.49	0.55	-2.04	1.82	0.32	-0.79
1- 4	-0.42	-1.97	-0.21	4.41	0.71	-2.38	0.80	0.16	-0.18
1- 5	-0.37	-2.00	-0.21	4.63	0.77	-2.32	-0.17	0.00	0.34
1- 6	-0.32	-2.03	-0.22	4.20	0.72	-1.94	-1.09	-0.16	0.76
1- 7	-0.27	-2.06	-0.22	3.13	0.55	-1.29	-1.96	-0.31	1.09
1- 8	-0.22	-2.09	-0.22	1.47	0.28	-0.45	-2.78	-0.47	1.32
1- 9	-0.16	-2.12	-0.23	-0.74	-0.11	0.53	-3.55	-0.63	1.46
1-10	-0.11	-2.15	-0.23	-3.48	-0.60	1.57	-4.28	-0.79	1.51
Top									
Member 2: (Top Slab)									
Left									
2- 0	-0.11	-2.15	-0.23	-3.51	-0.60	1.62	0.74	0.13	-0.34
2- 1	0.15	0.44	0.05	-2.99	-0.51	1.38	0.74	0.13	-0.34
2- 2	0.33	2.34	0.25	-2.47	-0.42	1.14	0.74	0.13	-0.34
2- 3	0.44	3.55	0.38	-1.96	-0.33	0.90	0.74	0.13	-0.34
2- 4	0.48	4.07	0.43	-1.44	-0.25	0.66	0.74	0.13	-0.34
2- 5	0.45	3.90	0.42	-0.92	-0.16	0.42	0.74	0.13	-0.34
2- 6	0.34	3.04	0.32	-0.40	-0.07	0.18	0.74	0.13	-0.34
2- 7	0.16	1.49	0.16	0.12	0.02	-0.06			

Unfactored Shears due to All Loads: (k)

M-PT	Vdc	Vev	Vdw
Member 1: (Exterior Wall)			
Bottom			
1- 0	0.07	-0.04	0.00
1- 1	0.07	-0.04	0.00
1- 2	0.07	-0.04	0.00
1- 3	0.07	-0.04	0.00
1- 4	0.07	-0.04	0.00
1- 5	0.07	-0.04	0.00
1- 6	0.07	-0.04	0.00
1- 7	0.07	-0.04	0.00
1- 8	0.07	-0.04	0.00
1- 9	0.07	-0.04	0.00
1-10	0.07	-0.04	0.00
Top			
Member 2: (Top Slab)			
Left			
2- 0	0.42	4.20	0.45
2- 1	0.32	3.21	0.34
2- 2	0.21	2.22	0.24
2- 3	0.11	1.24	0.13
2- 4	0.00	0.25	0.03
2- 5	-0.10	-0.73	-0.08
2- 6	-0.21	-1.72	-0.18
2- 7	-0.31	-2.71	-0.29

0.74 0.13 -0.34
2- 8 -0.10 -0.75 -0.08 0.64 0.11 -0.29
0.74 0.13 -0.34
2- 9 -0.43 -3.68 -0.39 1.16 0.20 -0.53
0.74 0.13 -0.34
2-10 -0.83 -7.30 -0.78 1.68 0.29 -0.77
0.74 0.13 -0.34
Right

Member 3: (Interior Wall)
Bottom
3- 0 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
3- 1 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
3- 2 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
3- 3 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
3- 4 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
3- 5 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
3- 6 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
3- 7 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
3- 8 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
3- 9 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
3-10 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00
Top

Member 4: (Bottom Slab)
Left
4- 0 -0.62 -1.85 -0.20 -3.78 -0.62 2.01
0.81 0.13 -0.43
4- 1 0.07 0.67 0.07 -3.22 -0.52 1.71
0.81 0.13 -0.43
4- 2 0.58 2.50 0.27 -2.65 -0.43 1.40
0.81 0.13 -0.43
4- 3 0.90 3.64 0.39 -2.08 -0.34 1.10
0.81 0.13 -0.43
4- 4 1.04 4.09 0.44 -1.51 -0.25 0.80
0.81 0.13 -0.43
4- 5 0.99 3.85 0.41 -0.95 -0.15 0.50
0.81 0.13 -0.43
4- 6 0.76 2.92 0.31 -0.38 -0.06 0.20

2- 8 -0.42 -3.69 -0.39
2- 9 -0.52 -4.68 -0.50
2-10 -0.63 -5.67 -0.60
Right

Member 3: (Interior Wall)
Bottom
3- 0 0.00 0.00 0.00
3- 1 0.00 0.00 0.00
3- 2 0.00 0.00 0.00
3- 3 0.00 0.00 0.00
3- 4 0.00 0.00 0.00
3- 5 0.00 0.00 0.00
3- 6 0.00 0.00 0.00
3- 7 0.00 0.00 0.00
3- 8 0.00 0.00 0.00
3- 9 0.00 0.00 0.00
3-10 0.00 0.00 0.00
Top

Member 4: (Bottom Slab)
Left
4- 0 1.12 4.10 0.44
4- 1 0.85 3.11 0.33
4- 2 0.59 2.12 0.23
4- 3 0.33 1.14 0.12
4- 4 0.07 0.15 0.02
4- 5 -0.20 -0.84 -0.09
4- 6 -0.46 -1.82 -0.19

```
0.81   0.13  -0.43
 4- 7   0.35   1.30   0.14   0.19   0.03  -0.10         4- 7  -0.72  -2.81  -0.30
0.81   0.13  -0.43
 4- 8  -0.24  -1.01  -0.11   0.76   0.12  -0.40         4- 8  -0.98  -3.79  -0.40
0.81   0.13  -0.43
 4- 9  -1.02  -4.01  -0.43   1.32   0.22  -0.70         4- 9  -1.25  -4.78  -0.51
0.81   0.13  -0.43
 4-10  -1.99  -7.70  -0.82   1.89   0.31  -1.00         4-10  -1.51  -5.77  -0.61
0.81   0.13  -0.43
 Right                                                  Right

Unfactored Thrusts due to All Loads: (k)
-----------------------------------
 Member    Pdc    Pev    Pdw    Peh    Pls    Pwa
   1      0.42   4.20   0.45   0.74   0.13  -0.34
   2     -0.07   0.04   0.00   4.28   0.79  -1.51
   3      1.26  11.33   1.21  -1.48  -0.25   0.68
   4      0.07  -0.04   0.00   5.17   0.79  -3.19

Buoyancy Check:
---------------
Culvert + Fill Weight, kip   : 1929.37
Buoyant Force, kip           : 561.60
Sliding Resistance, kip      : 708.75
Factor of Safety             : 3.44

---------------------------------------- Analysis Truck, HL-93
--------------------------------------

                                 Vehicle  Axle       Weight         Length
Dist. From
                                           No.       (k/ft)          (ft)
Previous (ft)
                                  Truck     1        0.048          11.76
                                            2        0.190          11.76
14.00
                                            3        0.190          11.76
14.00

                                  Tandem    1        0.222          15.76


Live Load Parameters:
--------------------
Traffic Direction is Parallel to Main Reinforcement
Distribution Width :  28.59 ft
Impact Factor      :   1.00
Lane Load Distribution Width  :  30.92 ft
Lane Load:  0.041 k/ft
```

Truck Positions That Cause Maximum Results:

Maximum +Moment in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.190	11.76	1.40
	2	0.190	11.76	-12.60
	3	0.048	11.76	-26.60

Maximum +Moment : 0.64 k-ft
Corresponding Moment at End : -0.38 k-ft
Coincident Bottom Slab Load : 0.10 k/ft

Maximum -Moment in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.048	11.76	20.37
	2	0.190	11.76	6.37
	3	0.190	11.76	-7.63

Maximum -Moment : -0.95 k-ft
Corresponding Moment at Mid : 0.53 k-ft
Coincident Bottom Slab Load : 0.16 k/ft

Maximum +Shear in Top Slab

Truck	1	0.190	11.76	1.12
	2	0.190	11.76	-12.88
	3	0.048	11.76	-26.88

Maximum +Shear : 0.62 k
Corresponding Shear at Mid : -0.04 k
Coincident Bottom Slab Load : 0.10 k/ft

Maximum -Shear in Top Slab

Truck	1	0.048	11.76	20.02
	2	0.190	11.76	6.02
	3	0.190	11.76	-7.98

Maximum -Shear : -0.76 k
Corresponding Shear at Mid : -0.09 k
Coincident Bottom Slab Load : 0.16 k/ft

Maximum +Moment in Top Slab

Tandem	1	0.222	15.76	7.88

Maximum +Moment : -1.15 k-ft
Corresponding Moment at End : 0.61 k-ft
Coincident Bottom Slab Load : 0.22 k/ft

Maximum -Moment in Top Slab

Tandem	1	0.222	15.76	-0.88

Maximum -Moment : 0.73 k-ft
Corresponding Moment at Mid : -0.05 k-ft
Coincident Bottom Slab Load : 0.11 k/ft

Maximum +Shear in Top Slab

Tandem	1	0.222	15.76	7.88

Maximum +Shear : -0.89 k

Maximum -Shear in Top Slab

Maximum -Shear :

0.00 k
Corresponding Shear at Mid : -0.12 k Corresponding Shear at Mid :
0.00 k
Coincident Bottom Slab Load : 0.22 k/ft Coincident Bottom Slab Load :
0.00 k/ft

Unfactored Moments and Shears due to Truck Loads: (k-ft, k)

	Truck				Tandem				Lane		
M-PT	Mll+	Mll-	Vll+	Vll-	Mll+	Mll-	Vll+	Vll-	Mll+	Mll-	Vll+
Vll-											
Member 1: (Exterior Wall)											
Bottom											
1- 0	0.00	-0.23	0.04	-0.04	0.00	-0.29	0.04	-0.05	0.00	-0.05	0.01
-0.01											
1- 1	0.00	-0.22	0.04	-0.04	0.00	-0.30	0.04	-0.05	0.00	-0.06	0.01
-0.01											
1- 2	0.00	-0.23	0.04	-0.04	0.00	-0.30	0.04	-0.05	0.00	-0.06	0.01
-0.01											
1- 3	0.00	-0.24	0.04	-0.04	0.00	-0.31	0.04	-0.05	0.00	-0.06	0.01
-0.01											
1- 4	0.00	-0.25	0.04	-0.04	0.00	-0.31	0.04	-0.05	0.00	-0.06	0.01
-0.01											
1- 5	0.00	-0.27	0.04	-0.04	0.00	-0.32	0.04	-0.05	0.00	-0.06	0.01
-0.01											
1- 6	0.00	-0.28	0.04	-0.04	0.00	-0.32	0.04	-0.05	0.00	-0.06	0.01
-0.01											
1- 7	0.02	-0.29	0.04	-0.04	0.02	-0.34	0.04	-0.05	0.00	-0.06	0.01
-0.01											
1- 8	0.04	-0.32	0.04	-0.04	0.04	-0.37	0.04	-0.05	0.01	-0.07	0.01
-0.01											
1- 9	0.06	-0.35	0.04	-0.04	0.07	-0.41	0.04	-0.05	0.01	-0.08	0.01
-0.01											
1-10	0.09	-0.38	0.04	-0.04	0.10	-0.44	0.04	-0.05	0.02	-0.08	0.01
-0.01											
Top											
Member 2: (Top Slab)											
Left											
2- 0	0.09	-0.38	0.62	-0.06	0.10	-0.44	0.73	-0.06	0.02	-0.08	0.14
-0.01											
2- 1	0.11	-0.03	0.49	-0.06	0.11	-0.04	0.57	-0.06	0.03	-0.02	0.11
-0.01											
2- 2	0.32	0.00	0.36	-0.06	0.37	0.00	0.41	-0.06	0.07	0.00	0.08
-0.02											
2- 3	0.51	-0.03	0.23	-0.06	0.60	-0.04	0.27	-0.07	0.11	-0.01	0.06
-0.03											

2- 4	0.62	-0.07	0.15	-0.13	0.72	-0.08	0.17	-0.13	0.13	-0.02	0.04
-0.04											
2- 5	0.64	-0.11	0.08	-0.22	0.74	-0.13	0.09	-0.21	0.14	-0.02	0.03
-0.05											
2- 6	0.56	-0.15	0.03	-0.31	0.65	-0.17	0.03	-0.30	0.12	-0.03	0.02
-0.07											
2- 7	0.39	-0.19	0.00	-0.41	0.45	-0.22	0.00	-0.43	0.08	-0.04	0.01
-0.09											
2- 8	0.12	-0.25	0.00	-0.51	0.14	-0.26	0.00	-0.58	0.04	-0.06	0.00
-0.11											
2- 9	0.00	-0.53	0.00	-0.63	0.00	-0.58	0.00	-0.74	0.01	-0.12	0.00
-0.14											
2-10	0.00	-0.95	0.00	-0.76	0.00	-1.15	0.00	-0.89	0.00	-0.21	0.00
-0.17											

Right

Member 3: (Interior Wall)

Bottom

3- 0	0.13	-0.13	0.07	-0.07	0.16	-0.16	0.09	-0.09	0.03	-0.03	0.02
-0.02											
3- 1	0.08	-0.08	0.07	-0.07	0.10	-0.10	0.09	-0.09	0.02	-0.02	0.02
-0.02											
3- 2	0.03	-0.03	0.07	-0.07	0.04	-0.04	0.09	-0.09	0.01	-0.01	0.02
-0.02											
3- 3	0.02	-0.02	0.07	-0.07	0.02	-0.02	0.09	-0.09	0.01	-0.01	0.02
-0.02											
3- 4	0.07	-0.07	0.07	-0.07	0.08	-0.08	0.09	-0.09	0.02	-0.02	0.02
-0.02											
3- 5	0.12	-0.12	0.07	-0.07	0.14	-0.14	0.09	-0.09	0.03	-0.03	0.02
-0.02											
3- 6	0.17	-0.17	0.07	-0.07	0.20	-0.20	0.09	-0.09	0.04	-0.04	0.02
-0.02											
3- 7	0.23	-0.23	0.07	-0.07	0.26	-0.26	0.09	-0.09	0.05	-0.05	0.02
-0.02											
3- 8	0.28	-0.28	0.07	-0.07	0.32	-0.32	0.09	-0.09	0.06	-0.06	0.02
-0.02											
3- 9	0.33	-0.33	0.07	-0.07	0.38	-0.38	0.09	-0.09	0.07	-0.07	0.02
-0.02											
3-10	0.38	-0.38	0.07	-0.07	0.44	-0.44	0.09	-0.09	0.08	-0.08	0.02
-0.02											

Top

Member 4: (Bottom Slab)

Left

4- 0	0.00	-0.23	0.47	0.00	0.00	-0.29	0.65	0.00	0.00	-0.05	0.12
0.00											
4- 1	0.10	0.00	0.36	0.00	0.11	0.00	0.49	0.00	0.02	0.00	0.09
0.00											
4- 2	0.30	0.00	0.25	0.00	0.39	0.00	0.33	0.00	0.07	0.00	0.06
0.00											

4- 3	0.43	0.00	0.13	0.00	0.57	0.00	0.18	0.00	0.11	0.00	0.03	0.00
4- 4	0.48	0.00	0.02	0.00	0.64	0.00	0.03	0.00	0.12	0.00	0.01	0.00
4- 5	0.46	0.00	0.00	-0.10	0.61	0.00	0.00	-0.13	0.11	0.00	0.00	-0.02
4- 6	0.35	0.00	0.00	-0.21	0.46	0.00	0.00	-0.29	0.09	0.00	0.00	-0.05
4- 7	0.17	0.00	0.00	-0.32	0.20	0.00	0.00	-0.44	0.04	0.00	0.00	-0.08
4- 8	0.00	-0.14	0.00	-0.43	0.00	-0.16	0.00	-0.60	0.00	-0.03	0.00	-0.11
4- 9	0.00	-0.48	0.00	-0.55	0.00	-0.63	0.00	-0.75	0.00	-0.12	0.00	-0.14
4-10	0.00	-0.90	0.00	-0.66	0.00	-1.21	0.00	-0.91	0.00	-0.23	0.00	-0.17
Right												

Note: Unfactored live load results computed at 9.50 ft and 0 ft fill depths, per LRFD 3.6.1.2.6

Serviceability Check: Crack Control

Bar Mark	Location	Moment (k-ft)	Thrust (k)	Fss (ksi)	Spacing (in)	Allow (in)
A1	Top Corner Bar	-4.7	6.66	6.29	8.00	78.41
A2	Bot Corner Bar	-4.7	6.66	6.31	8.00	78.14
A100	Top Slab (int)	5.9	-0.29	12.48	8.00	36.73
A300	Top Slab (ext)	-6.7	-0.20	14.78	8.00	30.26
A200	Bot Slab (int)	6.6	-1.66	14.89	8.00	30.00
A400	Bot Slab (ext)	-8.0	-1.57	20.06	8.00	21.05
B1	Ext Wall (int)	2.8	5.87	1.99	8.00	99.99
B2	Ext Wall (ext)	-4.0	5.67	5.25	8.00	94.72

Serviceability Check: Live Load Deflection

Deflection Ratio of Top Slab = 1/9999 (Limit = 1/800)

Strength Limit State at Critical Sections: Flexure

Member 1: (Exterior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Load Ratings Mcr (k-ft) IR OR
BOT	6.00	-13.15	9.47	20.65	9.19	21.62	0.90	0.47	14.66

16.38 21.23
MID 42.00 8.50 5.54 21.82 9.69 21.38 0.90 0.47 14.66
NC NC
MID- 42.00 -11.14 8.14 20.65 9.19 21.20 0.90 0.47 14.66
30.78 39.90
TOP 6.00 -13.17 9.47 20.65 9.19 21.62 0.90 0.47 14.66
13.83 17.92

Member 2: (Top Slab), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR
LT	6.00	-11.53	7.50	20.65	9.19	20.99	0.90	0.47	14.66	13.43	17.40
MID	33.60	16.65	0.04	30.34	9.63	27.32	0.90	0.66	14.66	15.98	20.72
RT	6.00	-18.81	0.20	28.69	9.13	25.88	0.90	0.66	14.66	13.80	17.88

Member 3: (Interior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR
BOT	6.00	-1.94	19.43	14.33	9.75	19.16	0.90	0.30	14.66	96.02	99.99
MID	42.00	1.63	16.30	14.33	9.75	18.15	0.90	0.30	14.66	72.14	93.51
TOP	6.00	-2.21	22.08	14.33	9.75	20.01	0.90	0.30	14.66	28.48	36.92

Member 4: (Bottom Slab), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load Ratings IR	OR
LT	6.00	-11.92	8.81	19.49	8.69	20.42	0.90	0.47	14.66	13.87	17.97
MID	33.60	18.32	-1.25	30.34	9.63	26.92	0.90	0.66	14.66	16.99	22.03
RT	6.00	-22.46	-1.09	27.04	8.63	23.99	0.90	0.66	14.66	10.33	13.39

Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under applied axial load

Strength Limit State at Critical Sections: Vertical Shear

Member 1: (Exterior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Load Ratings Shear (k)	Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Spac IR (in)	Spac OR (in)
BOT	14.64	5.50	-13.2	9.47	8.88	13.88	2.157	39.71	15.42a	0.00	0.00	0.00	9.60	12.44
MID	42.00	0.37	8.5	5.54	9.38	18.64	2.744	36.60	20.72a	0.00	0.00	0.00	99.99	99.99
MID-	42.00	0.37	-11.1	8.14	8.88	16.02	2.491	37.59	17.80a	0.00	0.00	0.00	99.99	99.99
TOP	14.64	-5.17	-13.2	9.47	8.88	13.93	2.166	39.65	15.48a	0.00	0.00	0.00	9.79	12.69

Member 2: (Top Slab), Thickness = 12.00 in

Loc	Dist. (in)	Design Load Ratings Shear (k)	Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Spac IR (in)	Spac OR (in)
LT	14.64	6.14	-11.5	7.50	9.19	15.01	n/a	n/a	16.68c	0.00	0.00	0.00	9.72	12.60
MID	42.00	0.50	16.7	0.04	9.63	15.24	2.187	40.12	16.93a	0.00	0.00	0.00	39.18	50.79
RT	14.64	7.72	-18.8	0.20	9.13	14.98	n/a	n/a	16.65c	0.00	0.00	0.00	7.68	9.95

Member 3: (Interior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Load Ratings Shear (k)	Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Spac IR (in)	Spac OR (in)
BOT	14.64	0.15	-1.9	19.43	9.55	34.77	5.027	28.82	38.64a	0.00	0.00	0.00	99.99	99.99
MID	42.00	0.15	1.6	16.30	9.55	34.64	5.009	28.85	38.49a	0.00	0.00	0.00	99.99	99.99
TOP	14.64	0.15	-2.2	22.08	9.55	34.88	5.043	28.78	38.76a	0.00	0.00	0.00	99.99	99.99

Member 4: (Bottom Slab), Thickness = 12.00 in

Max. Loc	Load Dist. (in)	Design Ratings Shear (k)	Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Spac (in)	IR	OR
LT	14.64	6.48	-11.9	8.81	8.69	14.21	n/a	n/a	15.79c	0.00	0.00	0.00	9.72	12.60
MID	42.00	0.43	18.3	-1.25	9.63	14.96	n/a	n/a	16.62c	0.00	0.00	0.00	NC	NC
RT	14.64	8.72	-22.5	-1.09	8.63	14.12	n/a	n/a	15.69c	0.00	0.00	0.00	5.84	7.57

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arema

Applied Environmental Factors:

M-PT	+Sd	+Beta	+fs(ksi)	-Sd	-Beta	-fs(ksi)
Member 1: (Exterior Wall)						
Bottom						
1- 0	1.00	-0.19	20.00	1.96	1.38	20.00
1- 1	2.05	1.32	20.00	1.98	1.36	20.00
1- 2	1.00	-2.47	20.00	2.19	1.23	20.00
1- 3	1.24	2.18	20.00	2.30	1.18	20.00
1- 4	1.45	1.87	20.00	2.35	1.15	20.00
1- 5	1.48	1.82	20.00	2.35	1.15	20.00
1- 6	1.42	1.90	20.00	2.30	1.17	20.00
1- 7	1.15	2.34	20.00	2.20	1.23	20.00
1- 8	1.00	-0.74	20.00	2.05	1.32	20.00
1- 9	1.96	1.38	20.00	1.96	1.38	20.00
1-10	1.72	1.57	20.00	1.94	1.39	20.00
Top						
Member 2: (Top Slab)						
Left						
2- 0	1.71	1.58	20.00	1.94	1.39	20.00

2- 1	2.73	0.99	20.00	1.79	1.51	20.00
2- 2	2.15	1.25	20.00	1.00	8.42	20.00
2- 3	2.07	1.30	20.00	14.76	0.18	20.00
2- 4	2.03	1.33	20.00	4.72	0.57	20.00
2- 5	2.01	1.34	20.00	3.82	0.71	20.00
2- 6	1.98	1.36	20.00	3.40	0.79	20.00
2- 7	1.93	1.40	20.00	2.13	1.27	20.00
2- 8	1.00	-2.85	20.00	2.04	1.32	20.00
2- 9	4.35	0.62	20.00	2.04	1.33	20.00
2-10	3.80	0.71	20.00	2.02	1.34	20.00

Right

Member 3: (Interior Wall)

Bottom

3- 0	1.54	1.75	20.00	1.54	1.75	20.00
3- 1	1.54	1.75	20.00	1.54	1.75	20.00
3- 2	1.54	1.75	20.00	1.54	1.75	20.00
3- 3	1.54	1.75	20.00	1.54	1.75	20.00
3- 4	1.54	1.75	20.00	1.54	1.75	20.00
3- 5	1.54	1.75	20.00	1.54	1.75	20.00
3- 6	1.54	1.75	20.00	1.54	1.75	20.00
3- 7	1.54	1.75	20.00	1.54	1.75	20.00
3- 8	1.54	1.75	20.00	1.54	1.75	20.00
3- 9	1.54	1.75	20.00	1.54	1.75	20.00
3-10	1.54	1.75	20.00	1.54	1.75	20.00

Top

Member 4: (Bottom Slab)

Left						
4- 0	1.62	1.66	20.00	1.96	1.38	20.00
4- 1	2.67	1.01	20.00	1.76	1.53	20.00
4- 2	2.17	1.24	20.00	1.00	-161.45	20.00
4- 3	2.10	1.29	20.00	9.43	0.29	20.00
4- 4	2.06	1.31	20.00	4.44	0.61	20.00
4- 5	2.04	1.32	20.00	3.72	0.73	20.00
4- 6	2.02	1.34	20.00	3.34	0.81	20.00
4- 7	1.99	1.36	20.00	2.04	1.32	20.00
4- 8	1.00	-0.34	20.00	2.12	1.27	20.00
4- 9	4.15	0.65	20.00	2.06	1.31	20.00
4-10	3.72	0.73	20.00	2.04	1.32	20.00
Right						

Vertical Reactions Applied to Structure: (service load values, k/unit width, pos. is up)

Wall #	DL	DW	EV	EH	LS	WA	LL	Tot. w/o LL	Tot. w/ LL
1	0.35	0.01	0.10	-0.07	-0.01	1.14	0.62	1.53	2.15
2	-0.71	-0.02	-0.20	0.14	0.01	0.87	0.00	0.09	0.09
3	0.35	0.01	0.10	-0.07	-0.01	1.14	0.62	1.53	2.15

Horizontal Reactions Applied to Structure: (service load values, k/unit width, pos. is right)

Wall #	DL	DW	EV	EH	LS	WA	LL	Tot. w/o LL	Tot. w/ LL
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00								

Load Combination Results at Tenth Points: (k-ft, k)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior Wall)						
Bottom						
1- 0	-3.053	-20.641	6.756	9.468	8.811	-1.249
1- 1	-7.616	-10.158	6.756	9.468	6.883	-0.807
1- 2	0.843	-10.105	5.539	8.139	5.025	-0.439
1- 3	4.555	-10.962	5.539	8.139	3.236	-0.147
1- 4	7.664	-11.141	5.539	8.139	1.517	0.071
1- 5	8.502	-10.791	5.539	8.139	0.369	-0.289
1- 6	7.167	-10.064	5.539	8.139	0.437	-1.869
1- 7	3.757	-9.160	5.539	8.139	0.430	-3.380
1- 8	0.445	-8.203	5.539	8.139	0.347	-4.822
1- 9	-6.033	-10.559	6.756	9.468	0.190	-6.194
1-10	-5.220	-19.709	6.756	9.468	-0.043	-7.497
Top						
Member 2: (Top Slab)						
Left						
2- 0	-5.094	-19.790	0.043	7.497	9.468	5.539
2- 1	3.490	-8.219	0.043	7.412	7.561	4.531
2- 2	10.380	-1.781	0.043	7.412	5.654	3.487
2- 3	14.824	4.904	0.043	7.412	3.762	1.837
2- 4	16.651	8.208	0.043	7.412	1.957	0.100
2- 5	15.831	9.339	0.043	7.412	0.499	-1.688
2- 6	12.363	8.298	0.043	7.412	-0.509	-3.484

2- 7	6.701	4.441	7.341	0.199	-1.517	-5.321
2- 8	0.315	-3.612	7.412	0.199	-2.525	-7.228
2- 9	-7.855	-14.754	7.412	0.199	-3.533	-9.135
2-10	-17.584	-28.933	7.412	0.199	-4.541	-11.041

Right

Member 3: (Interior Wall)

Bottom

3- 0	0.424	-0.424	18.959	19.426	0.150	-0.150
3- 1	0.261	-0.261	18.959	19.426	0.150	-0.150
3- 2	0.102	-0.102	18.959	19.426	0.150	-0.150
3- 3	0.063	-0.063	16.302	22.083	0.150	-0.150
3- 4	0.226	-0.226	16.302	22.083	0.150	-0.150
3- 5	0.388	-0.388	16.302	22.083	0.150	-0.150
3- 6	0.551	-0.551	16.302	22.083	0.150	-0.150
3- 7	0.713	-0.713	16.302	22.083	0.150	-0.150
3- 8	0.875	-0.875	16.302	22.083	0.150	-0.150
3- 9	1.038	-1.038	16.302	22.083	0.150	-0.150
3-10	1.200	-1.200	16.302	22.083	0.150	-0.150

Top

Member 4: (Bottom Slab)

Left

4- 0	-4.960	-20.641	-1.249	8.811	10.150	6.180
4- 1	4.687	-8.433	-1.249	8.739	8.046	5.030
4- 2	12.176	-1.676	-1.249	8.739	5.943	3.860
4- 3	16.719	6.020	-1.249	8.739	3.839	2.028
4- 4	18.318	9.542	-1.249	8.739	1.738	0.194
4- 5	16.971	10.594	-1.249	8.739	0.431	-1.866

4- 6	12.679	9.177	-1.249	8.739	-0.719	-3.970
4- 7	6.186	4.888	8.655	-1.094	-1.869	-6.073
4- 8	0.134	-4.741	8.739	-1.094	-3.019	-8.177
4- 9	-9.893	-17.869	8.739	-1.094	-4.168	-10.281
4-10	-21.189	-33.942	8.739	-1.094	-5.318	-12.384

Right

```
Project: Upper Lake Dam
Task   : 3D
Client : Boiling spring Lake
Job No.: 19C21022.04


CULVERT PROPERTIES
==================
Type of Culvert: Cast-in-Place         Specification : LRFD 6th Edition 2012
Operating Mode : Analysis

Physical Dimensions
-------------------
No. of Boxes: 4              Name: BoxCulvert
Clear Span  :  6.0000 ft     Fill Depth  :  3.25 ft
Clear Height:  5.0000 ft     Center Skew :  0.00 deg    Left Skew: 90.00 deg
Right Skew: 90.00 deg
Length      : 62.5000 ft     Bottom Slab Support: Full Slab
Haunches: Top, Length:  0.0000 in     Height:  0.0000 in
       Bottom, Length:  0.0000 in     Height:  0.0000 in
Member Thicknesses:          Top Slab: 12.0000 in      Bot Slab: 12.0000 in
                             Ext Wall: 12.0000 in      Int Wall: 12.0000 in
Wall Joint: None

Material Properties
-------------------
Concrete: Strength,f'c :  4.500 ksi   Density     :  0.150 kcf   Elasticity,Ec:
4067 ksi
          Type         : Normal Weight
          Fr Factor    :   0.24       Gamma1      :   1.60       Gamma3       :
0.75
Steel:    Yield,fy     :  60.00 ksi   fss Limit   :  0.60fy      Elasticity,Es:
29000 ksi
          Yield,fyv    :  60.00 ksi   Diameter    :  1.000 in    Type         :
Rebar
Soil:     Density      :  0.130 kcf   Slope Factor:  1.150 (B1 Installation)
          Poisson's    :  0.35
          Fe Factor    :  1.150 (Maximum for Compacted Fill)
Serviceability, Gamma-e:  1.00

Loads
-----
Live Load:  Vehicle: (AA) HL-93 - Design Vehicle
                     Axle No.    Weight(k)   Dist. From Previous(ft)
                        1           8.00             0.00
                        2          32.00            14.00
                        3          32.00            14.00
                     Gage Width: 6.00 ft, Tread Width: 20.00 in, Tread Length:
10.00 in
```

```
                    Include Tandem: yes
                    Tandem: Axle 1: 25.00 k, Axle 2: 25.00 k, Axle Spacing: 4.00
ft
                    Lane Load: 0.64 klf, P-Moment: 18.00 k, P-Shear: 26.00 k
                    Combine: Truck Or Tandem Or Lane
                    Inventory Rating Load Factor: 1.75  Operating Rating Load
Factor: 1.35
                    Design Load Combinations: Strength I
                    Override MPF: no
                    Override DLA: no
            Include Lane Load      : yes         Max. No. of Lanes: Computed by
Program
            Traffic Direction      : Lanes Parallel to Main Reinforcement
            Neglect Live Load for Large Fill Depths: no
            Apply Surcharge at Fill Depths > 2 ft  : yes
            Compute Surcharge Depth: yes
Dead Load:  Future Wearing Surface :  0.15 klf   Add. Dead Load   :  0.00 klf
            Concentrated Loads     : none
Lateral Soil Loads: Max. Equiv. Fluid Press.:100.00 pcf   Min. Equiv. Fluid Press.
: 30.00 pcf
Include Additional Uniform Horiz. Load: no
Include Additional Uniform Vert. Load: no
Buoyancy Check    : yes
Fluid Pressures   : Apply Water Press.  : yes, to the interior
                  : Int. Pressure Head  : 7.00 ft
Foundation Model  : Uniform Loads

Load and Resistance Factors
---------------------------
     Max      Min
DC: 1.250    0.900
DW: 1.500    0.650
EV: 1.300    0.900
EH: 1.350    0.900
WA: 1.000
EQ: 1.000
LL I     : 1.750   LL II     : 1.350   LL Legal     : 1.750
Ductility: 1.000   Importance: 1.000   Redundancy, non-earth: 1.000   Redundancy,
earth: 1.050
Condition: 1.000   System    : 1.000
Phi Shear: 0.900   Phi Moment: 1.000   PM Compression: 0.750   PM Tension    :
0.900
Load Factor Multipliers, Design Mode: 1.00 Analysis Mode: 1.00

Reinforcement
-------------
Reinforcement Covers  :  Exterior      Interior
              Top Slab:  2.5000 in     2.0000 in
              Walls   :  2.5000 in     2.0000 in
              Bot Slab:  3.0000 in     2.0000 in
```

Assigned reinforcement:

Location	Mark	Size	Spacing (in)
Top Slab Inside	A100 (AS2)	5	8.0000
Bottom Slab Inside	A200 (AS3)	5	8.0000
Top Slab Outside	A300 (AS7)	5	8.0000
Bottom Slab Outside	A400 (AS8)	5	8.0000
Top Corner	A1 (AS1)	4	8.0000
Bottom Corner	A2 (AS1)	4	8.0000
Ext. Wall Inside	B1 (AS4)	4	8.0000
Interior Wall	B3	4	8.0000
Longitudinal	C1 (AS6)	5	12.0000
Top Distribution	C100 (AS5)	5	12.0000
Bottom Distribution	C200	5	12.0000

Analysis Options

```
LL Analysis       : Automatically Set Traffic Direction to Account for Skew
Effects: no
                    Limit LL Distribution Width to Culvert Length for: Fills > 2 ft
                    Combine Longitudinal Axle Distribution Overlaps: Yes
                    Combine Transverse Axle Distribution Overlaps: Yes
                    Axle Placement Increment for Moving Load Analysis: 10
                    Include Impact on Bottom Slab: yes
                    Always Distribute Wheel Load: no
                    Deflection Criteria     : 1/800
Reinforcement     : Always Include Distribution Steel: yes
                    Distribution Slab Provided: no
                    User Defined Longitudinal Steel: yes
                    Max. As used in Vc Calcs: 0.00 in2/ft
                    Distribute Minimum Reinforcement per Face: no
                    Use individual Member Thicknesses for Min Steel: yes
                    Epoxy coat steel: top bars, if fill < 2'
                    Use M-dimension for bar length calcs.: no
Slenderness       : Checked       K Factor: 2.00
Analysis Modeling : Use Haunches in the Structural Analysis Model: no
Critical Sections : Flexure critical section location: face of support
                    Shear critical section location: dv beyond support
                    Use Max. Moment with Max. Shear at the Critical Section for
Shear: yes
                    Include depoth of haunch for critical sections: no
Flexure           : Ignore Axial Thrust: yes
                    Use Eq. 12.10.4.2.4a-1: no
Shear             : Always Check Iterative Beta Method
Environmental     : Apply duribility factors: yes
                Exposure    : Normal
```

ANALYSIS RESULTS
==========

Top Slab Thickness = 12.00 in
Bottom Slab Thickness = 12.00 in
Exterior Wall Thickness = 12.00 in
Interior Wall Thickness = 12.00 in

Modular Ratio (N) = 7.13 Max. Steel Ratio = 0.023
Design Span = 7.00 ft Design Height = 6.00 ft
Design Fill Depth = 3.25 ft

Volume of Concrete: 3.074 cy/ft Weight of Steel: 430 lb/ft

M dimension = 1' 4" (method of equivalent capacity)
= 3' 5" (method of contraflexure - ASTM)

Reinforcing Steel Schedule

Location	Bar Mark	Qty	Size	Type	Spacing (in)	As,prv (in2/ft)	Length (ft-in)	Wgt (lbs)	H Leg (ft-in)	V Leg (ft-in)
Top Slab (int)	A100 (AS2)	94	5	STR	8.00	0.465	28- 6	2794		
Bot Slab (int)	A200 (AS3)	94	5	STR	8.00	0.465	28- 6	2794		
Top Slab (ext)	A300 (AS7)	94	5	STR	8.00	0.465	28- 6	2794		
Bot Slab (ext)	A400 (AS8)	94	5	STR	8.00	0.465	28- 6	2794		
Corner (Top)	A1 (AS1)	188	4	L-BAR	8.00	0.300	6- 0	754	2- 1	3-11
Corner (Bottom)	A2 (AS1)	188	4	L-BAR	8.00	0.300	6- 0	754	2- 1	3-11
Ext Wall (int)	B1 (AS4)	188	4	STR	8.00	0.300	5- 6	691		
Int Wall	B3	564	4	STR	8.00	0.300	6- 6	2449		
Top Slab (int- 2)	C100 (AS5)	50	5	STR	12.00	0.310	32- 0	1669		
Bot Slab (int- 2)	C200	50	5	STR	12.00	0.310	32- 0	1669		
Temperature (2)	C1 (AS6)	28	5	STR	12.00	0.310	32- 0	935		
Temperature (2)	C1 (AS6)	28	5	STR	12.00	0.310	32- 0	935		
Temperature (2)	C1 (AS6)	12	5	STR	12.00	0.310	32- 0	401		
Temperature (2)	C1 (AS6)	12	5	STR	12.00	0.310	32- 0	401		
Temperature (2)	C1 (AS6)	36	5	STR	12.00	0.310	32- 0	5073		

Total 26905

Note: A denotes flexural steel, B denotes vertical steel, C denotes longitudinal steel

AS Bar Marks

Location	As prv in2/ft
Transverse Side Wall - Outside Face (AS1)	0.300
Transverse Top Slab - Inside Face (AS2)	0.465
Transverse Bottom Slab - Inside Face (AS3)	0.465
Transverse Side Wall - Inside Face (AS4)	0.300
Distribution Top Slab - Inside Face (AS5)	0.310
Distribution Top Slab - OutSide Face (AS6)	0.310
Transverse Top Slab - Outside Face (AS7)	0.465
Transverse Bottom Slab - Outside Face (AS8)	0.465

Notes: 1.) Final areas of steel provided must be checked in analysis mode

Splice Lengths Table:

Bar Mark	Size	Splice Length (ft-in)
B1	4	1- 5
B3	4	1- 5
C1	5	1- 9
C100	5	1- 9
C200	5	1- 9

Summary of Ratings Table:

		Flexure					Shear			
Truck	Fill	Member	Location	IR	OR	Fill	Member	Location	IR	OR
(AA) HL-93	3.25	1	TOP	3.69	4.78	3.25	2	RT	3.27	4.23

Critical Sections Summary: Flexure

Member 1: (Exterior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load IR	Ratings OR	Truck	Fill Depth (ft)
BOT	6.00	-6.54	8.25	13.58	9.25	13.58	1.00	0.30	14.66	9.38	12.16	AA	3.25
MID	36.00	3.81	2.34	14.33	9.75	14.33	1.00	0.30	14.66	9.20	11.92	AA	3.25
MID-	36.00	-7.76	7.71	13.67	9.31	13.67	1.00	0.30	14.66	6.50	8.43	AA	3.25
TOP	6.00	-9.22	8.25	13.58	9.25	13.58	1.00	0.30	14.66	3.69	4.78	AA	3.25

Member 2: (Top Slab), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load IR	Ratings OR	Truck	Fill Depth (ft)
LT	6.00	-7.31	4.46	13.58	9.25	13.58	1.00	0.30	14.66	4.93	6.39	AA	3.25
MID	33.60	13.50	-0.43	21.82	9.69	21.82	1.00	0.47	14.66	3.99	5.18	AA	3.25
RT	6.00	-10.91	0.39	20.65	9.19	20.65	1.00	0.47	14.66	5.91	7.66	AA	3.25

Member 3: (Interior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	Mcr (k-ft)	Load IR	Ratings OR	Truck	Fill Depth (ft)
BOT	6.00	-1.56	15.57	14.33	9.75	14.33	1.00	0.30	14.66	24.99	32.40	AA	3.25
MID	36.00	2.53	7.25	14.33	9.75	14.33	1.00	0.30	14.66	12.30	15.94	AA	3.25
TOP	6.00	-3.66	15.57	14.33	9.75	14.33	1.00	0.30	14.66	6.00	7.78	AA	3.25

Member 4: (Bottom Slab), Thickness = 12.00 in

Load Ratings Fill

Loc	Dist.	Moment	A. F.	Mu	ds	Ma		As	Mcr	IR
OR	Truck	Depth								
	(in)	(k-ft)	(k)	(k-ft)	(in)	(k-ft)	phi	(in2)	(k-ft)	
		(ft)								
LT	6.00	-5.96	5.22	12.83	8.75	12.83	1.00	0.30	14.66	8.51
11.03	AA	3.25								
MID	33.60	10.51	-1.08	21.82	9.69	21.82	1.00	0.47	14.66	9.89
12.81	AA	3.25								
RT	6.00	-11.02	-0.25	19.49	8.69	19.49	1.00	0.47	14.66	7.75
10.05	AA	3.25								

Member 5: (Top Slab - Interior Cell), Thickness = 12.00 in

		Design	Corr.							Load
Ratings		Fill								
Loc	Dist.	Moment	A. F.	Mu	ds	Ma		As	Mcr	IR
OR	Truck	Depth								
	(in)	(k-ft)	(k)	(k-ft)	(in)	(k-ft)	phi	(in2)	(k-ft)	
		(ft)								
LT	6.00	-10.43	0.23	20.65	9.19	20.65	1.00	0.47	14.66	6.27
8.13	AA	3.25								
MID	42.00	10.76	3.76	21.82	9.69	21.82	1.00	0.47	14.66	4.54
5.89	AA	3.25								
RT	6.00	-9.30	4.32	20.65	9.19	20.65	1.00	0.47	14.66	6.52
8.45	AA	3.25								

Member 6: (Interior Wall - Interior Cell), Thickness = 12.00 in

		Design	Corr.							Load
Ratings		Fill								
Loc	Dist.	Moment	A. F.	Mu	ds	Ma		As	Mcr	IR
OR	Truck	Depth								
	(in)	(k-ft)	(k)	(k-ft)	(in)	(k-ft)	phi	(in2)	(k-ft)	
		(ft)								
LT	6.00	-1.55	15.46	14.33	9.75	14.33	1.00	0.30	14.66	33.21
43.05	AA	3.25								
MID	36.00	1.53	6.37	14.33	9.75	14.33	1.00	0.30	14.66	14.46
18.75	AA	3.25								
RT	6.00	-3.51	15.25	14.33	9.75	14.33	1.00	0.30	14.66	6.31
8.18	AA	3.25								

Member 7: (Bottom Slab - Interior Cell), Thickness = 12.00 in

		Design	Corr.							Load
Ratings		Fill								
Loc	Dist.	Moment	A. F.	Mu	ds	Ma		As	Mcr	IR
OR	Truck	Depth								
	(in)	(k-ft)	(k)	(k-ft)	(in)	(k-ft)	phi	(in2)	(k-ft)	
		(ft)								
LT	6.00	-10.51	-0.35	19.49	8.69	19.49	1.00	0.47	14.66	8.18
10.61	AA	3.25								
MID	42.00	7.04	4.54	21.82	9.69	21.82	1.00	0.47	14.66	13.96
18.09	AA	3.25								

RT 6.00 -8.42 5.11 19.49 8.69 19.49 1.00 0.47 14.66 10.69
13.86 AA 3.25

Critical Sections Summary: Vertical Shear

Member 1: (Exterior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Shear (k)	Design Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	IR	Load Ratings OR	Truck	Fill Depth (ft)
BOT	14.64	3.01	-6.5	8.25	9.05	16.84	2.570	18.71a	0.00	0.00	0.00	12.33	15.99	AA	3.25
MID	36.00	0.48	3.8	2.34	9.55	20.98	3.033	23.31a	0.00	0.00	0.00	70.41	91.27	AA	3.25
MID-	36.00	0.48	-7.8	7.71	9.12	16.80	2.545	18.66a	0.00	0.00	0.00	31.25	40.51	AA	3.25
TOP	14.64	-3.07	-9.2	8.25	9.05	14.39	2.195	15.98a	0.00	0.00	0.00	8.67	11.24	AA	3.25

Member 2: (Top Slab), Thickness = 12.00 in

Loc	Dist. (in)	Design Shear (k)	Design Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	IR	Load Ratings OR	Truck	Fill Depth (ft)
LT	14.64	5.69	-7.3	4.46	9.25	15.07	n/a	16.74c	0.00	0.00	0.00	3.66	4.74	AA	3.25
MID	42.00	1.14	13.5	-0.43	9.69	15.13	n/a	16.82c	0.00	0.00	0.00	11.69	15.16	AA	3.25
RT	14.64	6.56	-10.9	0.39	9.19	15.11	n/a	16.79c	0.00	0.00	0.00	3.27	4.23	AA	3.25

Member 3: (Interior Wall), Thickness = 12.00 in

Loc	Dist. (in)	Design Shear (k)	Design Moment (k-ft)	Corr. A. F. (k)	Corr. Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	IR	Load Ratings OR	Truck	Fill Depth (ft)
BOT	14.64	0.58	-1.6	15.57	9.55	34.57	4.998	38.41a	0.00	0.00	0.00	57.69	74.79	AA	3.25
MID	36.00	0.58	2.5	7.25	9.55	33.62	4.861	37.36a	0.00	0.00	0.00	56.11	72.74	AA	3.25
TOP	14.64	0.63	-3.7	15.57	9.55	34.27	4.955	38.08a	0.00	0.00	0.00	58.07	75.27	AA	3.25

Member 4: (Bottom Slab), Thickness = 12.00 in

Loc	Dist. (in)	Shear (k)	Moment (k-ft)	A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Vc (k)	Vs (k)	Av (in2)	Spac (in)	IR OR	Truck	Design Depth (ft)	Corr. Load	Corr. Ratings	Max. Fill
LT	14.64	3.64	-6.0	5.22	8.75	15.31	2.416	17.01a	0.00	0.00	0.00	11.38	14.75	AA	3.25		
MID	42.00	0.17	10.5	-1.08	9.69	15.73	2.243	17.48a	0.00	0.00	0.00	NC	NC	AA	3.25		
RT	14.64	4.81	-11.0	-0.25	8.69	14.06	n/a	15.62c	0.00	0.00	0.00	7.35	9.53	AA	3.25		

Member 5: (Top Slab - Interior Cell), Thickness = 12.00 in

Loc	Dist. (in)	Shear (k)	Moment (k-ft)	A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Vc (k)	Vs (k)	Av (in2)	Spac (in)	IR OR	Truck	Design Depth (ft)	Corr. Load	Corr. Ratings	Max. Fill
LT	14.64	6.03	-10.4	0.23	9.19	15.08	n/a	16.76c	0.00	0.00	0.00	3.49	4.52	AA	3.25		
MID	42.00	1.37	10.8	3.76	9.69	16.47	2.348	18.30a	0.00	0.00	0.00	12.93	16.76	AA	3.25		
RT	14.64	5.84	-9.3	4.32	9.19	15.17	2.281	16.86a	0.00	0.00	0.00	3.60	4.67	AA	3.25		

Member 6: (Interior Wall - Interior Cell), Thickness = 12.00 in

Loc	Dist. (in)	Shear (k)	Moment (k-ft)	A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Vc (k)	Vs (k)	Av (in2)	Spac (in)	IR OR	Truck	Design Depth (ft)	Corr. Load	Corr. Ratings	Max. Fill
LT	14.64	0.52	-1.5	15.46	9.55	34.57	4.998	38.41a	0.00	0.00	0.00	67.06	86.93	AA	3.25		
MID	36.00	0.52	1.5	6.37	9.55	34.07	4.926	37.86a	0.00	0.00	0.00	66.09	85.67	AA	3.25		
RT	14.64	0.52	-3.5	15.25	9.55	34.29	4.957	38.10a	0.00	0.00	0.00	66.51	86.22	AA	3.25		

Member 7: (Bottom Slab - Interior Cell), Thickness = 12.00 in

Loc	Dist. (in)	Shear (k)	Moment (k-ft)	A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Vc (k)	Vs (k)	Av (in2)	Spac (in)	IR OR	Truck	Design Depth (ft)	Corr. Load	Corr. Ratings	Max. Fill

```
LT    14.64   2.94  -10.5 -0.35  8.69  13.84   n/a  15.38c   0.00  0.00  0.00
13.25  17.18   AA   3.25
MID   42.00   0.29    7.0  4.54  9.69  20.50  2.923  22.78a   0.00  0.00  0.00
99.99  99.99   AA   3.25
RT    14.64   3.87   -8.4  5.11  8.69  15.56  2.475  17.29a   0.00  0.00  0.00
11.04  14.32   AA   3.25

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d -
Standard/Arema


================================================================================
=====================
                                   Analysis Results: Fill Depth = 3.25 ft
================================================================================
=====================

Load Parameters:
---------------
Fe = 1.02     Surcharge Depth :  2.97 ft

Applied Horizontal Loads: (k/ft)
------------------------
Load Description          Bottom of Wall   Top of Wall
 Horizontal Earth Load         0.975          0.375
 Live Load Surcharge           0.298          0.298
 Internal Water Pressure       0.749          0.437


Unfactored Moments due to All Loads: (k-ft)            Unfactored Shears due to All
Loads: (k)
-----------------------------------
-----------------------------------
 M-PT    Mdc    Mev    Mdw    Meh    Mls    Mwa         M-PT    Vdc    Vev    Vdw
 Veh    Vls    Vwa

Member 1: (Exterior Wall)                              Member 1: (Exterior Wall)
 Bottom                                                 Bottom
 1- 0  -0.57  -0.68  -0.24  -1.25  -0.54   0.71         1- 0   0.06  -0.01   0.00
2.33   0.89  -1.51
 1- 1  -0.53  -0.69  -0.24  -0.02  -0.06  -0.07         1- 1   0.06  -0.01   0.00
1.77   0.72  -1.08
 1- 2  -0.49  -0.69  -0.24   0.88   0.31  -0.60         1- 2   0.06  -0.01   0.00
1.24   0.54  -0.70
 1- 3  -0.45  -0.70  -0.24   1.47   0.58  -0.92         1- 3   0.06  -0.01   0.00
0.74   0.36  -0.36
 1- 4  -0.41  -0.71  -0.24   1.78   0.74  -1.05         1- 4   0.06  -0.01   0.00
0.28   0.18  -0.07
 1- 5  -0.38  -0.71  -0.25   1.82   0.80  -1.02         1- 5   0.06  -0.01   0.00
-0.14   0.00   0.18
```

1- 6	-0.34	-0.72	-0.25	1.62	0.75	-0.85	-0.53	-0.18	0.38		
1- 7	-0.30	-0.73	-0.25	1.20	0.59	-0.57	-0.88	-0.36	0.54		
1- 8	-0.26	-0.73	-0.25	0.58	0.32	-0.22	-1.19	-0.53	0.65		
1- 9	-0.22	-0.74	-0.26	-0.22	-0.05	0.19	-1.47	-0.71	0.72		
1-10	-0.18	-0.75	-0.26	-1.18	-0.54	0.63	-1.72	-0.89	0.74		
Top											

Member 2: (Top Slab)

Left											
2- 0	-0.18	-0.75	-0.26	-1.20	-0.54	0.65	0.23	0.10	-0.13		
2- 1	0.09	0.08	0.03	-1.04	-0.46	0.57	0.23	0.10	-0.13		
2- 2	0.30	0.69	0.24	-0.88	-0.39	0.48	0.23	0.10	-0.13		
2- 3	0.42	1.09	0.38	-0.72	-0.32	0.39	0.23	0.10	-0.13		
2- 4	0.48	1.27	0.44	-0.56	-0.25	0.30	0.23	0.10	-0.13		
2- 5	0.46	1.25	0.43	-0.40	-0.18	0.21	0.23	0.10	-0.13		
2- 6	0.37	1.01	0.35	-0.24	-0.11	0.13	0.23	0.10	-0.13		
2- 7	0.21	0.56	0.19	-0.08	-0.04	0.04	0.23	0.10	-0.13		
2- 8	-0.03	-0.10	-0.04	0.08	0.03	-0.05	0.23	0.10	-0.13		
2- 9	-0.35	-0.98	-0.34	0.24	0.10	-0.14	0.23	0.10	-0.13		
2-10	-0.73	-2.07	-0.72	0.40	0.17	-0.23	0.23	0.10	-0.13		
Right											

Member 3: (Interior Wall)

Bottom											
3- 0	0.11	0.14	0.05	-0.13	-0.07	0.05	-0.01	0.00	0.01		
3- 1	0.10	0.14	0.05	-0.13	-0.07	0.06	-0.01	0.00	0.01		
3- 2	0.09	0.14	0.05	-0.14	-0.07	0.07	-0.01	0.00	0.01		
3- 3	0.09	0.13	0.05	-0.14	-0.07	0.07	-0.01	0.00	0.01		
3- 4	0.08	0.13	0.05	-0.15	-0.07	0.08	-0.01	0.00	0.01		

1- 6	0.06	-0.01	0.00								
1- 7	0.06	-0.01	0.00								
1- 8	0.06	-0.01	0.00								
1- 9	0.06	-0.01	0.00								
1-10	0.06	-0.01	0.00								
Top											

Member 2: (Top Slab)

Left											
2- 0	0.45	1.33	0.46	0.23	0.10	-0.13					
2- 1	0.34	1.02	0.35	0.23	0.10	-0.13					
2- 2	0.24	0.72	0.25	0.23	0.10	-0.13					
2- 3	0.13	0.42	0.14	0.23	0.10	-0.13					
2- 4	0.03	0.11	0.04	0.23	0.10	-0.13					
2- 5	-0.08	-0.19	-0.07	0.23	0.10	-0.13					
2- 6	-0.18	-0.49	-0.17	0.23	0.10	-0.13					
2- 7	-0.29	-0.79	-0.28	0.23	0.10	-0.13					
2- 8	-0.39	-1.10	-0.38	0.23	0.10	-0.13					
2- 9	-0.50	-1.40	-0.49	0.23	0.10	-0.13					
2-10	-0.60	-1.70	-0.59	0.23	0.10	-0.13					
Right											

Member 3: (Interior Wall)

Bottom											
3- 0	-0.01	-0.01	0.00	-0.01	0.00	0.01					
3- 1	-0.01	-0.01	0.00	-0.01	0.00	0.01					
3- 2	-0.01	-0.01	0.00	-0.01	0.00	0.01					
3- 3	-0.01	-0.01	0.00	-0.01	0.00	0.01					
3- 4	-0.01	-0.01	0.00	-0.01	0.00	0.01					

3- 5	0.07	0.13	0.04	-0.15	-0.07	0.09	-0.01	0.00	-0.01	0.00
3- 6	0.06	0.12	0.04	-0.16	-0.07	0.09	-0.01	0.00	-0.01	0.00
3- 7	0.05	0.12	0.04	-0.16	-0.07	0.10	-0.01	0.00	-0.01	0.00
3- 8	0.04	0.12	0.04	-0.17	-0.07	0.10	-0.01	0.00	-0.01	0.00
3- 9	0.04	0.11	0.04	-0.17	-0.07	0.11	-0.01	0.00	-0.01	0.00
3-10	0.03	0.11	0.04	-0.18	-0.07	0.12	-0.01	0.00	-0.01	0.00

Top

Member 4: (Bottom Slab)

Left

4- 0	-0.57	-0.68	-0.24	-1.25	-0.54	0.71	0.24	0.10	-0.13
4- 1	0.02	0.13	0.04	-1.08	-0.47	0.61	0.24	0.10	-0.13
4- 2	0.46	0.72	0.25	-0.92	-0.40	0.52	0.24	0.10	-0.13
4- 3	0.75	1.11	0.38	-0.75	-0.33	0.43	0.24	0.10	-0.13
4- 4	0.88	1.28	0.44	-0.59	-0.25	0.33	0.24	0.10	-0.13
4- 5	0.86	1.24	0.43	-0.42	-0.18	0.24	0.24	0.10	-0.13
4- 6	0.69	0.99	0.34	-0.25	-0.11	0.15	0.24	0.10	-0.13
4- 7	0.37	0.53	0.18	-0.09	-0.03	0.05	0.24	0.10	-0.13
4- 8	-0.11	-0.15	-0.05	0.08	0.04	-0.04	0.24	0.10	-0.13
4- 9	-0.74	-1.04	-0.36	0.25	0.11	-0.13	0.24	0.10	-0.13
4-10	-1.52	-2.14	-0.74	0.41	0.18	-0.22	0.24	0.10	-0.13

Right

Member 5: (Top Slab - Interior Cell)

Bottom

5- 0	-0.70	-1.95	-0.68	0.22	0.11	-0.11
5- 1	-0.36	-0.97	-0.34	0.19	0.09	-0.09
5- 2	-0.09	-0.20	-0.07	0.16	0.08	-0.08
5- 3	0.11	0.35	0.12	0.13	0.06	-0.06

Top

Member 4: (Bottom Slab)

Left

4- 0	0.95	1.31	0.45	0.24	0.10	-0.13
4- 1	0.73	1.00	0.35	0.24	0.10	-0.13
4- 2	0.52	0.70	0.24	0.24	0.10	-0.13
4- 3	0.30	0.40	0.14	0.24	0.10	-0.13
4- 4	0.08	0.09	0.03	0.24	0.10	-0.13
4- 5	-0.14	-0.21	-0.07	0.24	0.10	-0.13
4- 6	-0.35	-0.51	-0.18	0.24	0.10	-0.13
4- 7	-0.57	-0.81	-0.28	0.24	0.10	-0.13
4- 8	-0.79	-1.12	-0.39	0.24	0.10	-0.13
4- 9	-1.01	-1.42	-0.49	0.24	0.10	-0.13
4-10	-1.22	-1.72	-0.60	0.24	0.10	-0.13

Right

Member 5: (Top Slab - Interior Cell)

Bottom

5- 0	0.54	1.55	0.54	-0.05	-0.02	0.02
5- 1	0.44	1.25	0.43	-0.05	-0.02	0.02
5- 2	0.33	0.95	0.33	-0.05	-0.02	0.02
5- 3	0.23	0.64	0.22			

-0.05 -0.02 0.02
5- 4 0.23 0.70 0.24 0.09 0.04 -0.05 5- 4 0.12 0.34 0.12
-0.05 -0.02 0.02
5- 5 0.28 0.83 0.29 0.06 0.03 -0.03 5- 5 0.02 0.04 0.01
-0.05 -0.02 0.02
5- 6 0.26 0.75 0.26 0.03 0.01 -0.01 5- 6 -0.09 -0.26 -0.09
-0.05 -0.02 0.02
5- 7 0.16 0.46 0.16 0.00 0.00 0.00 5- 7 -0.19 -0.57 -0.20
-0.05 -0.02 0.02
5- 8 -0.01 -0.04 -0.01 -0.04 -0.02 0.02 5- 8 -0.30 -0.87 -0.30
-0.05 -0.02 0.02
5- 9 -0.25 -0.76 -0.26 -0.07 -0.03 0.03 5- 9 -0.40 -1.17 -0.41
-0.05 -0.02 0.02
5-10 -0.57 -1.68 -0.58 -0.10 -0.05 0.05 5-10 -0.51 -1.48 -0.51
-0.05 -0.02 0.02
Top Top

Member 6: (Interior Wall - Interior Cell) Member 6:
(Interior Wall - Interior Cell)
Bottom Bottom
6- 0 0.00 0.00 0.00 0.00 0.00 0.00 6- 0 0.00 0.00 0.00
0.00 0.00 0.00
6- 1 0.00 0.00 0.00 0.00 0.00 0.00 6- 1 0.00 0.00 0.00
0.00 0.00 0.00
6- 2 0.00 0.00 0.00 0.00 0.00 0.00 6- 2 0.00 0.00 0.00
0.00 0.00 0.00
6- 3 0.00 0.00 0.00 0.00 0.00 0.00 6- 3 0.00 0.00 0.00
0.00 0.00 0.00
6- 4 0.00 0.00 0.00 0.00 0.00 0.00 6- 4 0.00 0.00 0.00
0.00 0.00 0.00
6- 5 0.00 0.00 0.00 0.00 0.00 0.00 6- 5 0.00 0.00 0.00
0.00 0.00 0.00
6- 6 0.00 0.00 0.00 0.00 0.00 0.00 6- 6 0.00 0.00 0.00
0.00 0.00 0.00
6- 7 0.00 0.00 0.00 0.00 0.00 0.00 6- 7 0.00 0.00 0.00
0.00 0.00 0.00
6- 8 0.00 0.00 0.00 0.00 0.00 0.00 6- 8 0.00 0.00 0.00
0.00 0.00 0.00
6- 9 0.00 0.00 0.00 0.00 0.00 0.00 6- 9 0.00 0.00 0.00
0.00 0.00 0.00
6-10 0.00 0.00 0.00 0.00 0.00 0.00 6-10 0.00 0.00 0.00
0.00 0.00 0.00
Top Top

Member 7: (Bottom Slab - Interior Cell) Member 7:
(Bottom Slab - Interior Cell)
Left Left
7- 0 -1.41 -2.00 -0.69 0.28 0.12 -0.17 7- 0 1.12 1.56 0.54
-0.06 -0.02 0.04
7- 1 -0.70 -1.01 -0.35 0.24 0.10 -0.14 7- 1 0.90 1.26 0.44

```
-0.06  -0.02   0.04
 7- 2  -0.15  -0.23  -0.08   0.20   0.08  -0.12         7- 2   0.68   0.96   0.33
-0.06  -0.02   0.04
 7- 3   0.25   0.33   0.12   0.16   0.06  -0.09         7- 3   0.46   0.65   0.23
-0.06  -0.02   0.04
 7- 4   0.50   0.69   0.24   0.11   0.05  -0.07         7- 4   0.25   0.35   0.12
-0.06  -0.02   0.04
 7- 5   0.60   0.83   0.29   0.07   0.03  -0.04         7- 5   0.03   0.05   0.02
-0.06  -0.02   0.04
 7- 6   0.54   0.75   0.26   0.03   0.01  -0.02         7- 6  -0.19  -0.25  -0.09
-0.06  -0.02   0.04
 7- 7   0.34   0.47   0.16  -0.01  -0.01   0.01         7- 7  -0.41  -0.56  -0.19
-0.06  -0.02   0.04
 7- 8  -0.02  -0.02  -0.01  -0.06  -0.02   0.03         7- 8  -0.62  -0.86  -0.30
-0.06  -0.02   0.04
 7- 9  -0.54  -0.73  -0.25  -0.10  -0.04   0.06         7- 9  -0.84  -1.16  -0.40
-0.06  -0.02   0.04
 7-10  -1.20  -1.65  -0.57  -0.14  -0.06   0.09         7-10  -1.06  -1.47  -0.51
-0.06  -0.02   0.04
 Right                                                  Right

Unfactored Thrusts due to All Loads: (k)
------------------------------------
 Member    Pdc    Pev    Pdw    Peh    Pls    Pwa
   1      0.45   1.33   0.46   0.23   0.10  -0.13
   2     -0.06   0.01   0.00   1.72   0.89  -0.74
   3      1.15   3.26   1.13  -0.27  -0.12   0.15
   4      0.06  -0.01   0.00   2.33   0.89  -1.51
   5     -0.05   0.02   0.01   1.72   0.89  -0.75
   6      1.01   2.95   1.02   0.09   0.04  -0.05
   7      0.05  -0.02  -0.01   2.33   0.89  -1.50

Buoyancy Check:
---------------
Culvert + Fill Weight, kip   : 1543.91
Buoyant Force, kip           : 791.70
Sliding Resistance, kip      : 253.13
Factor of Safety             : 1.95

---------------------------------------- Analysis Truck, HL-93
--------------------------------------

                                Vehicle  Axle       Weight         Length
Dist. From
                                          No.       (k/ft)          (ft)
Previous (ft)
                                 Truck     1        0.890           4.57
                                           2        0.890           4.57
14.00
                                           3        0.223           4.57
```

14.00

Tandem 1 0.742 8.57

Live Load Parameters:

Traffic Direction is Parallel to Main Reinforcement
Distribution Width : 9.40 ft
Impact Factor : 1.20
Lane Load Distribution Width : 13.74 ft
Lane Load: 0.056 k/ft

Truck Positions That Cause Maximum Results:

Maximum +Moment in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.223	4.57	31.50
	2	0.890	4.57	17.50
	3	0.890	4.57	3.50

Maximum +Moment : 2.69 k-ft
Corresponding Moment at End : -1.69 k-ft
Coincident Bottom Slab Load : 0.29 k/ft

Maximum -Moment in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.890	4.57	4.01
	2	0.890	4.57	-9.99
	3	0.223	4.57	-23.99

Maximum -Moment : -2.68 k-ft
Corresponding Moment at Mid : 2.54 k-ft
Coincident Bottom Slab Load : 0.15 k/ft

Maximum +Shear in Top Slab

Truck	1	0.223	4.57	37.29
	2	0.890	4.57	23.29
	3	0.890	4.57	9.29

Maximum +Shear : 2.84 k
Corresponding Shear at Mid : -0.20 k
Coincident Bottom Slab Load : 0.29 k/ft

Maximum -Shear in Top Slab

Truck	1	0.890	4.57	4.71
	2	0.890	4.57	-9.29
	3	0.223	4.57	-23.29

Maximum -Shear : -2.90 k
Corresponding Shear at Mid : 0.21 k
Coincident Bottom Slab Load : 0.15 k/ft

Maximum +Moment in Top Slab
Tandem 1 0.742 8.57 5.60
Maximum +Moment : -2.93 k-ft
Corresponding Moment at End : 2.09 k-ft
Coincident Bottom Slab Load : 0.23 k/ft

Maximum -Moment in Top Slab
Tandem 1 0.742 8.57 9.10
Maximum -Moment : 2.65 k-ft
Corresponding Moment at Mid : 0.00 k-ft
Coincident Bottom Slab Load : 0.23 k/ft

Maximum +Shear in Top Slab
Tandem 1 0.742 8.57 4.81
Maximum +Shear : -2.77 k
Corresponding Shear at Mid : -0.17 k
Coincident Bottom Slab Load : 0.23 k/ft

Maximum -Shear in Top Slab
Maximum -Shear : 0.00 k
Corresponding Shear at Mid : 0.00 k
Coincident Bottom Slab Load : 0.00 k/ft

Unfactored Moments and Shears due to Truck Loads: (k-ft, k)

	Truck				Tandem				Lane		
M-PT	Mll+	Mll-	Vll+	Vll-	Mll+	Mll-	Vll+	Vll-	Mll+	Mll-	Vll+ Vll-
Member 1: (Exterior Wall)											
Bottom											
1- 0	0.04	-0.63	0.17	-0.30	0.01	-0.50	0.14	-0.28	0.00	-0.09	0.02 -0.02
1- 1	0.00	-0.53	0.17	-0.30	0.00	-0.44	0.14	-0.28	0.00	-0.09	0.02 -0.02
1- 2	0.00	-0.59	0.17	-0.30	0.00	-0.44	0.14	-0.28	0.00	-0.09	0.02 -0.02
1- 3	0.00	-0.72	0.17	-0.30	0.00	-0.59	0.14	-0.28	0.00	-0.09	0.02 -0.02
1- 4	0.00	-0.87	0.17	-0.30	0.00	-0.74	0.14	-0.28	0.00	-0.09	0.02 -0.02
1- 5	0.01	-1.01	0.17	-0.30	0.00	-0.89	0.14	-0.28	0.00	-0.09	0.02 -0.02
1- 6	0.07	-1.15	0.17	-0.30	0.01	-1.05	0.14	-0.28	0.00	-0.10	0.02 -0.02
1- 7	0.13	-1.29	0.17	-0.30	0.10	-1.21	0.14	-0.28	0.01	-0.10	0.02 -0.02
1- 8	0.20	-1.43	0.17	-0.30	0.18	-1.38	0.14	-0.28	0.01	-0.11	0.02 -0.02
1- 9	0.29	-1.60	0.17	-0.30	0.26	-1.54	0.14	-0.28	0.02	-0.12	0.02 -0.02
1-10	0.39	-1.78	0.17	-0.30	0.35	-1.71	0.14	-0.28	0.03	-0.13	0.02

-0.02
 Top

Member 2: (Top Slab)
 Left
 2- 0 0.39 -1.78 2.68 -0.21 0.35 -1.71 2.47 -0.20 0.03 -0.13 0.19
-0.02
 2- 1 0.41 -0.52 2.24 -0.21 0.27 -0.32 1.95 -0.20 0.04 -0.03 0.15
-0.02
 2- 2 1.31 0.00 1.80 -0.21 1.03 0.00 1.43 -0.20 0.09 0.00 0.12
-0.02
 2- 3 2.14 -0.10 1.37 -0.32 1.84 -0.07 1.01 -0.23 0.15 -0.01 0.09
-0.03
 2- 4 2.60 -0.24 0.97 -0.52 2.29 -0.21 0.65 -0.41 0.18 -0.02 0.06
-0.05
 2- 5 2.69 -0.38 0.63 -0.80 2.39 -0.35 0.36 -0.66 0.19 -0.03 0.04
-0.07
 2- 6 2.42 -0.52 0.33 -1.17 2.11 -0.48 0.14 -0.97 0.17 -0.04 0.03
-0.09
 2- 7 1.79 -0.67 0.11 -1.60 1.48 -0.62 0.00 -1.34 0.12 -0.05 0.01
-0.12
 2- 8 0.84 -0.81 0.01 -2.04 0.48 -0.76 0.00 -1.76 0.06 -0.07 0.01
-0.15
 2- 9 0.12 -1.18 0.01 -2.49 0.10 -1.21 0.00 -2.25 0.02 -0.15 0.00
-0.18
 2-10 0.13 -2.68 0.01 -2.90 0.10 -2.93 0.00 -2.77 0.01 -0.28 0.00
-0.22
 Right

Member 3: (Interior Wall)
 Bottom
 3- 0 0.57 -0.41 0.34 -0.34 0.46 -0.39 0.31 -0.30 0.05 -0.03 0.03
-0.03
 3- 1 0.38 -0.22 0.34 -0.34 0.29 -0.21 0.31 -0.30 0.03 -0.02 0.03
-0.03
 3- 2 0.19 -0.04 0.34 -0.34 0.11 -0.03 0.31 -0.30 0.02 0.00 0.03
-0.03
 3- 3 0.26 -0.11 0.34 -0.34 0.17 -0.07 0.31 -0.30 0.02 -0.01 0.03
-0.03
 3- 4 0.45 -0.29 0.34 -0.34 0.36 -0.25 0.31 -0.30 0.04 -0.02 0.03
-0.03
 3- 5 0.65 -0.47 0.34 -0.34 0.55 -0.43 0.31 -0.30 0.05 -0.03 0.03
-0.03
 3- 6 0.85 -0.66 0.34 -0.34 0.73 -0.61 0.31 -0.30 0.06 -0.05 0.03
-0.03
 3- 7 1.06 -0.86 0.34 -0.34 0.92 -0.79 0.31 -0.30 0.08 -0.06 0.03
-0.03
 3- 8 1.26 -1.06 0.34 -0.34 1.11 -0.97 0.31 -0.30 0.09 -0.08 0.03
-0.03
 3- 9 1.47 -1.26 0.34 -0.34 1.30 -1.15 0.31 -0.30 0.11 -0.10 0.03

-0.03
3-10 1.67 -1.46 0.34 -0.34 1.49 -1.33 0.31 -0.30 0.13 -0.11 0.03
-0.03
Top

Member 4: (Bottom Slab)
Left
4- 0 0.04 -0.63 0.89 0.00 0.01 -0.50 0.72 0.00 0.00 -0.09 0.17
0.00
4- 1 0.30 -0.08 0.69 0.00 0.29 -0.07 0.56 0.00 0.03 -0.01 0.13
0.00
4- 2 0.67 0.00 0.49 0.00 0.58 0.00 0.40 0.00 0.09 0.00 0.09
0.00
4- 3 0.94 0.00 0.28 0.00 0.77 0.00 0.25 0.00 0.14 0.00 0.05
0.00
4- 4 1.06 0.00 0.08 0.00 0.85 0.00 0.09 0.00 0.17 0.00 0.01
0.00
4- 5 1.04 0.00 0.00 -0.17 0.82 0.00 0.00 -0.13 0.16 0.00 0.00
-0.03
4- 6 0.88 0.00 0.00 -0.37 0.68 0.00 0.00 -0.29 0.13 0.00 0.00
-0.07
4- 7 0.57 0.00 0.00 -0.58 0.42 0.00 0.00 -0.45 0.07 0.00 0.00
-0.11
4- 8 0.12 -0.32 0.00 -0.78 0.10 -0.26 0.00 -0.60 0.01 -0.03 0.00
-0.14
4- 9 0.00 -0.94 0.00 -0.98 0.00 -0.73 0.00 -0.76 0.00 -0.13 0.00
-0.18
4-10 0.00 -1.70 0.00 -1.19 0.00 -1.32 0.00 -0.92 0.00 -0.28 0.00
-0.22
Right

Member 5: (Top Slab - Interior Cell)
Bottom
5- 0 0.31 -2.56 2.84 -0.20 0.27 -2.77 2.65 -0.18 0.02 -0.27 0.21
-0.01
5- 1 0.17 -1.12 2.41 -0.20 0.14 -1.15 2.13 -0.18 0.02 -0.15 0.18
-0.02
5- 2 0.78 -0.87 1.96 -0.20 0.52 -0.84 1.61 -0.18 0.05 -0.08 0.14
-0.02
5- 3 1.66 -0.82 1.52 -0.20 1.41 -0.69 1.11 -0.18 0.11 -0.06 0.11
-0.03
5- 4 2.23 -0.80 1.09 -0.38 1.94 -0.55 0.73 -0.18 0.15 -0.06 0.08
-0.04
5- 5 2.45 -0.79 0.72 -0.68 2.13 -0.41 0.42 -0.40 0.17 -0.06 0.06
-0.06
5- 6 2.29 -0.78 0.41 -1.05 1.95 -0.50 0.20 -0.71 0.16 -0.06 0.05
-0.08
5- 7 1.78 -0.79 0.22 -1.46 1.43 -0.63 0.20 -1.09 0.12 -0.06 0.03
-0.11
5- 8 0.92 -0.81 0.22 -1.91 0.54 -0.76 0.20 -1.59 0.06 -0.07 0.02

-0.14
5- 9 0.19 -1.02 0.22 -2.36 0.17 -1.10 0.20 -2.11 0.04 -0.14 0.02
-0.17
5-10 0.34 -2.45 0.22 -2.80 0.31 -2.71 0.20 -2.63 0.04 -0.26 0.02
-0.21
Top

Member 6: (Interior Wall - Interior Cell)
Bottom
6- 0 0.39 -0.39 0.29 -0.29 0.38 -0.38 0.28 -0.28 0.04 -0.04 0.02
-0.02
6- 1 0.22 -0.22 0.29 -0.29 0.21 -0.21 0.28 -0.28 0.02 -0.02 0.02
-0.02
6- 2 0.09 -0.09 0.29 -0.29 0.09 -0.09 0.28 -0.28 0.01 -0.01 0.02
-0.02
6- 3 0.22 -0.22 0.29 -0.29 0.13 -0.13 0.28 -0.28 0.02 -0.02 0.02
-0.02
6- 4 0.39 -0.39 0.29 -0.29 0.29 -0.29 0.28 -0.28 0.03 -0.03 0.02
-0.02
6- 5 0.57 -0.57 0.29 -0.29 0.46 -0.46 0.28 -0.28 0.04 -0.04 0.02
-0.02
6- 6 0.74 -0.74 0.29 -0.29 0.63 -0.63 0.28 -0.28 0.05 -0.05 0.02
-0.02
6- 7 0.92 -0.92 0.29 -0.29 0.80 -0.80 0.28 -0.28 0.07 -0.07 0.02
-0.02
6- 8 1.09 -1.09 0.29 -0.29 0.96 -0.96 0.28 -0.28 0.08 -0.08 0.02
-0.02
6- 9 1.27 -1.27 0.29 -0.29 1.13 -1.13 0.28 -0.28 0.10 -0.10 0.02
-0.02
6-10 1.45 -1.45 0.29 -0.29 1.30 -1.30 0.28 -0.28 0.11 -0.11 0.02
-0.02
Top

Member 7: (Bottom Slab - Interior Cell)
Left
7- 0 0.00 -1.59 1.07 0.00 0.00 -1.33 0.88 0.00 0.00 -0.26 0.20
0.00
7- 1 0.00 -0.92 0.86 0.00 0.00 -0.77 0.72 0.00 0.00 -0.13 0.16
0.00
7- 2 0.10 -0.38 0.66 0.00 0.06 -0.33 0.56 0.00 0.01 -0.04 0.12
0.00
7- 3 0.43 -0.08 0.46 0.00 0.34 -0.06 0.40 0.00 0.05 -0.01 0.08
0.00
7- 4 0.66 0.00 0.25 0.00 0.52 0.00 0.24 0.00 0.09 0.00 0.05
0.00
7- 5 0.75 0.00 0.08 -0.03 0.59 0.00 0.08 -0.03 0.11 0.00 0.01
0.00
7- 6 0.70 0.00 0.00 -0.18 0.54 0.00 0.00 -0.18 0.10 0.00 0.00
-0.03
7- 7 0.50 0.00 0.00 -0.38 0.39 0.00 0.00 -0.34 0.06 0.00 0.00

```
-0.07
 7- 8   0.16  -0.20   0.00  -0.59   0.12  -0.20   0.00  -0.50   0.01  -0.02   0.00
-0.11
 7- 9   0.00  -0.66   0.00  -0.79   0.00  -0.61   0.00  -0.66   0.00  -0.09   0.00
-0.15
 7-10   0.00  -1.28   0.00  -1.00   0.00  -1.13   0.00  -0.82   0.00  -0.21   0.00
-0.19
 Right

Note: Unfactored live load results computed at 3.25 ft and 0 ft fill depths, per
LRFD 3.6.1.2.6


Serviceability Check: Crack Control
--------------------
Bar                     Moment  Thrust    Fss   Spacing  Allow
Mark   Location        (k-ft)    (k)    (ksi)    (in)    (in)
A1     Top Corner Bar    -3.4    5.24    5.69     8.00   88.03
A2     Bot Corner Bar    -2.4    5.24    1.90     8.00   99.99
A100   Top Slab (int)     3.9    2.46    8.41     8.00   57.43
A300   Top Slab (ext)    -3.4    2.79    6.82     8.00   71.90
A200   Bot Slab (int)     2.6    3.05    3.89     8.00   99.99
A400   Bot Slab (ext)    -3.1    3.37    5.43     8.00   91.49
B1     Ext Wall (int)     1.3    2.35    1.64     8.00   99.99

Serviceability Check: Live Load Deflection
--------------------
Deflection Ratio of Top Slab = 1/9999  (Limit = 1/800)


Strength Limit State at Critical Sections: Flexure
--------------------------------------------------
Member 1: (Exterior Wall), Thickness = 12.00 in
               Design    Corr.                                                  Load
Ratings
Loc    Dist.   Moment    A. F.    Mu      ds     Ma             As      Mcr
IR     OR
       (in)    (k-ft)     (k)   (k-ft)   (in)  (k-ft)   phi   (in2)   (k-ft)

BOT     6.00    -6.54     8.25   13.58   9.25   13.58   1.00   0.30    14.66
9.38  12.16
MID    36.00     3.81     2.34   14.33   9.75   14.33   1.00   0.30    14.66
9.20  11.92
MID-   36.00    -7.76     7.71   13.67   9.31   13.67   1.00   0.30    14.66
6.50   8.43
TOP     6.00    -9.22     8.25   13.58   9.25   13.58   1.00   0.30    14.66
3.69   4.78

Member 2: (Top Slab), Thickness = 12.00 in
               Design    Corr.                                                  Load
```

Ratings

Loc	Dist.	Moment	A. F.	Mu	ds	Ma		As	Mcr	IR	OR
	(in)	(k-ft)	(k)	(k-ft)	(in)	(k-ft)	phi	(in2)	(k-ft)		
LT	6.00	-7.31	4.46	13.58	9.25	13.58	1.00	0.30	14.66	4.93	6.39
MID	33.60	13.50	-0.43	21.82	9.69	21.82	1.00	0.47	14.66	3.99	5.18
RT	6.00	-10.91	0.39	20.65	9.19	20.65	1.00	0.47	14.66	5.91	7.66

Member 3: (Interior Wall), Thickness = 12.00 in

Load Ratings

Loc	Dist.	Design Moment	Corr. A. F.	Mu	ds	Ma		As	Mcr	IR	OR
	(in)	(k-ft)	(k)	(k-ft)	(in)	(k-ft)	phi	(in2)	(k-ft)		
BOT	6.00	-1.56	15.57	14.33	9.75	14.33	1.00	0.30	14.66	24.99	32.40
MID	36.00	2.53	7.25	14.33	9.75	14.33	1.00	0.30	14.66	12.30	15.94
TOP	6.00	-3.66	15.57	14.33	9.75	14.33	1.00	0.30	14.66	6.00	7.78

Member 4: (Bottom Slab), Thickness = 12.00 in

Load Ratings

Loc	Dist.	Design Moment	Corr. A. F.	Mu	ds	Ma		As	Mcr	IR	OR
	(in)	(k-ft)	(k)	(k-ft)	(in)	(k-ft)	phi	(in2)	(k-ft)		
LT	6.00	-5.96	5.22	12.83	8.75	12.83	1.00	0.30	14.66	8.51	11.03
MID	33.60	10.51	-1.08	21.82	9.69	21.82	1.00	0.47	14.66	9.89	12.81
RT	6.00	-11.02	-0.25	19.49	8.69	19.49	1.00	0.47	14.66	7.75	10.05

Member 5: (Top Slab - Interior Cell), Thickness = 12.00 in

Load Ratings

Loc	Dist.	Design Moment	Corr. A. F.	Mu	ds	Ma		As	Mcr	IR	OR
	(in)	(k-ft)	(k)	(k-ft)	(in)	(k-ft)	phi	(in2)	(k-ft)		
LT	6.00	-10.43	0.23	20.65	9.19	20.65	1.00	0.47	14.66	6.27	8.13
MID	42.00	10.76	3.76	21.82	9.69	21.82	1.00	0.47	14.66		

4.54 5.89
RT 6.00 -9.30 4.32 20.65 9.19 20.65 1.00 0.47 14.66
6.52 8.45

Member 6: (Interior Wall - Interior Cell), Thickness = 12.00 in
Design Corr. Load
Ratings
Loc Dist. Moment A. F. Mu ds Ma As Mcr
IR OR
(in) (k-ft) (k) (k-ft) (in) (k-ft) phi (in2) (k-ft)

LT 6.00 -1.55 15.46 14.33 9.75 14.33 1.00 0.30 14.66
33.21 43.05
MID 36.00 1.53 6.37 14.33 9.75 14.33 1.00 0.30 14.66
14.46 18.75
RT 6.00 -3.51 15.25 14.33 9.75 14.33 1.00 0.30 14.66
6.31 8.18

Member 7: (Bottom Slab - Interior Cell), Thickness = 12.00 in
Design Corr. Load
Ratings
Loc Dist. Moment A. F. Mu ds Ma As Mcr
IR OR
(in) (k-ft) (k) (k-ft) (in) (k-ft) phi (in2) (k-ft)

LT 6.00 -10.51 -0.35 19.49 8.69 19.49 1.00 0.47 14.66
8.18 10.61
MID 42.00 7.04 4.54 21.82 9.69 21.82 1.00 0.47 14.66
13.96 18.09
RT 6.00 -8.42 5.11 19.49 8.69 19.49 1.00 0.47 14.66
10.69 13.86

Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under applied axial load

Strength Limit State at Critical Sections: Vertical Shear

Member 1: (Exterior Wall), Thickness = 12.00 in
Design Corr. Corr.
Max. Load Ratings
Loc Dist. Shear Moment A. F. Dv phi*Vn Beta Theta Vc Vs Av
Spac IR OR
(in) (k) (k-ft) (k) (in) (k) (k) (k) (in2)
(in)
BOT 14.64 3.01 -6.5 8.25 9.05 16.84 2.570 37.26 18.71a 0.00 0.00
0.00 12.33 15.99
MID 36.00 0.48 3.8 2.34 9.55 20.98 3.033 35.31 23.31a 0.00 0.00
0.00 70.41 91.27
MID- 36.00 0.48 -7.8 7.71 9.12 16.80 2.545 37.45 18.66a 0.00 0.00

```
0.00   31.25  40.51
TOP   14.64   -3.07    -9.2  8.25  9.05   14.39  2.195 39.60  15.98a   0.00  0.00
0.00    8.67  11.24

Member 2: (Top Slab), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
LT    14.64    5.69    -7.3  4.46  9.25   15.07   n/a   n/a   16.74c   0.00  0.00
0.00    3.66   4.74
MID   42.00    1.14    13.5 -0.43  9.69   15.13   n/a   n/a   16.82c   0.00  0.00
0.00   11.69  15.16
RT    14.64    6.56   -10.9  0.39  9.19   15.11   n/a   n/a   16.79c   0.00  0.00
0.00    3.27   4.23

Member 3: (Interior Wall), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
BOT   14.64    0.58    -1.6 15.57  9.55   34.57  4.998 28.87  38.41a   0.00  0.00
0.00   57.69  74.79
MID   36.00    0.58     2.5  7.25  9.55   33.62  4.861 29.18  37.36a   0.00  0.00
0.00   56.11  72.74
TOP   14.64    0.63    -3.7 15.57  9.55   34.27  4.955 28.96  38.08a   0.00  0.00
0.00   58.07  75.27

Member 4: (Bottom Slab), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
LT    14.64    3.64    -6.0  5.22  8.75   15.31  2.416 37.92  17.01a   0.00  0.00
0.00   11.38  14.75
MID   42.00    0.17    10.5 -1.08  9.69   15.73  2.243 39.77  17.48a   0.00  0.00
0.00     NC     NC
RT    14.64    4.81   -11.0 -0.25  8.69   14.06   n/a   n/a   15.62c   0.00  0.00
0.00    7.35   9.53

Member 5: (Top Slab - Interior Cell), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
```

```
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
LT    14.64    6.03   -10.4  0.23  9.19   15.08   n/a   n/a   16.76c   0.00  0.00
0.00    3.49   4.52
MID   42.00    1.37    10.8  3.76  9.69   16.47  2.348 39.11  18.30a   0.00  0.00
0.00   12.93  16.76
RT    14.64    5.84    -9.3  4.32  9.19   15.17  2.281 39.10  16.86a   0.00  0.00
0.00    3.60   4.67

Member 6: (Interior Wall - Interior Cell), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
LT    14.64    0.52    -1.5 15.46  9.55   34.57  4.998 28.87  38.41a   0.00  0.00
0.00   67.06  86.93
MID   36.00    0.52     1.5  6.37  9.55   34.07  4.926 29.02  37.86a   0.00  0.00
0.00   66.09  85.67
RT    14.64    0.52    -3.5 15.25  9.55   34.29  4.957 28.95  38.10a   0.00  0.00
0.00   66.51  86.22

Member 7: (Bottom Slab - Interior Cell), Thickness = 12.00 in
             Design   Corr.  Corr.
Max.   Load Ratings
Loc   Dist.  Shear   Moment  A. F.  Dv   phi*Vn   Beta Theta   Vc      Vs     Av
Spac     IR     OR
      (in)     (k)   (k-ft)   (k)  (in)    (k)                 (k)     (k)  (in2)
(in)
LT    14.64    2.94   -10.5 -0.35  8.69   13.84   n/a   n/a   15.38c   0.00  0.00
0.00   13.25  17.18
MID   42.00    0.29     7.0  4.54  9.69   20.50  2.923 35.88  22.78a   0.00  0.00
0.00   99.99  99.99
RT    14.64    3.87    -8.4  5.11  8.69   15.56  2.475 37.53  17.29a   0.00  0.00
0.00   11.04  14.32

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d -
Standard/Arema

Applied Environmental Factors:
-----------------------------------
    M-PT    +Sd    +Beta   +fs(ksi)  -Sd    -Beta   -fs(ksi)

  Member 1: (Exterior Wall)
    Bottom
    1- 0    1.00   -0.32    20.00    1.86    1.45    20.00

    1- 1    3.00    0.90    20.00    1.88    1.44    20.00
```

1- 2	1.00	-3.92	20.00	2.02	1.34	20.00
1- 3	1.07	2.53	20.00	2.04	1.32	20.00
1- 4	1.29	2.10	20.00	2.03	1.33	20.00
1- 5	1.33	2.04	20.00	2.00	1.35	20.00
1- 6	1.63	1.66	20.00	1.94	1.39	20.00
1- 7	1.48	1.83	20.00	1.86	1.45	20.00
1- 8	1.00	-1.22	20.00	1.78	1.52	20.00
1- 9	2.13	1.27	20.00	1.74	1.55	20.00
1-10	1.88	1.44	20.00	1.75	1.54	20.00

Top

Member 2: (Top Slab)

Left

2- 0	1.85	1.46	20.00	1.75	1.54	20.00
2- 1	2.07	1.30	20.00	1.73	1.56	20.00
2- 2	1.84	1.47	20.00	1.00	7.22	20.00
2- 3	1.79	1.51	20.00	1.00	-0.04	20.00
2- 4	1.77	1.53	20.00	2.37	1.14	20.00
2- 5	1.75	1.54	20.00	2.40	1.13	20.00
2- 6	1.73	1.56	20.00	2.64	1.02	20.00
2- 7	1.69	1.59	20.00	1.00	-0.19	20.00
2- 8	1.50	1.80	20.00	1.64	1.65	20.00
2- 9	2.16	1.25	20.00	1.82	1.48	20.00
2-10	3.77	0.72	20.00	1.80	1.50	20.00

Right

Member 3: (Interior Wall)

Bottom

3- 0	1.72	1.57	20.00	1.34	2.02	20.00

3- 1	1.77	1.52	20.00	1.18	2.29	20.00
3- 2	1.88	1.44	20.00	1.00	-1.45	20.00
3- 3	1.83	1.47	20.00	1.00	2.83	20.00
3- 4	1.75	1.54	20.00	1.39	1.94	20.00
3- 5	1.70	1.59	20.00	1.47	1.84	20.00
3- 6	1.67	1.62	20.00	1.50	1.80	20.00
3- 7	1.65	1.64	20.00	1.52	1.78	20.00
3- 8	1.63	1.65	20.00	1.53	1.76	20.00
3- 9	1.62	1.67	20.00	1.54	1.76	20.00
3-10	1.61	1.68	20.00	1.54	1.75	20.00

Top

Member 4: (Bottom Slab)

Left

4- 0	1.80	1.50	20.00	1.86	1.45	20.00
4- 1	2.19	1.23	20.00	1.80	1.50	20.00
4- 2	1.97	1.37	20.00	1.00	-20.98	20.00
4- 3	1.94	1.39	20.00	12.25	0.22	20.00
4- 4	1.92	1.41	20.00	4.99	0.54	20.00
4- 5	1.91	1.42	20.00	4.14	0.65	20.00
4- 6	1.89	1.43	20.00	3.77	0.72	20.00
4- 7	1.86	1.45	20.00	3.48	0.78	20.00
4- 8	8.63	0.31	20.00	1.79	1.51	20.00
4- 9	3.73	0.72	20.00	1.89	1.43	20.00
4-10	3.58	0.75	20.00	1.90	1.42	20.00

Right

Member 5: (Top Slab - Interior Cell)

Bottom

5- 0	2.14	1.26	20.00	1.79	1.51	20.00
5- 1	2.18	1.24	20.00	1.82	1.48	20.00
5- 2	1.43	1.89	20.00	1.69	1.59	20.00
5- 3	1.66	1.63	20.00	1.03	2.63	20.00
5- 4	1.69	1.60	20.00	5.46	0.49	20.00
5- 5	1.70	1.59	20.00	3.26	0.83	20.00
5- 6	1.69	1.60	20.00	3.83	0.71	20.00
5- 7	1.67	1.62	20.00	1.00	-19.17	20.00
5- 8	1.52	1.77	20.00	1.58	1.70	20.00
5- 9	2.13	1.27	20.00	1.78	1.52	20.00
5-10	2.11	1.28	20.00	1.76	1.53	20.00

Top

Member 6: (Interior Wall - Interior Cell)

Bottom

6- 0	1.54	1.75	20.00	1.54	1.75	20.00
6- 1	1.54	1.75	20.00	1.54	1.75	20.00
6- 2	1.54	1.75	20.00	1.54	1.75	20.00
6- 3	1.54	1.75	20.00	1.54	1.75	20.00
6- 4	1.54	1.75	20.00	1.54	1.75	20.00
6- 5	1.54	1.75	20.00	1.54	1.75	20.00
6- 6	1.54	1.75	20.00	1.54	1.75	20.00
6- 7	1.54	1.75	20.00	1.54	1.75	20.00
6- 8	1.54	1.75	20.00	1.54	1.75	20.00
6- 9	1.54	1.75	20.00	1.54	1.75	20.00
6-10	1.54	1.75	20.00	1.54	1.75	20.00

Top

Member 7: (Bottom Slab - Interior Cell)

Left						
7- 0	3.43	0.79	20.00	1.90	1.42	20.00
7- 1	3.71	0.73	20.00	1.89	1.43	20.00
7- 2	1.00	-0.27	20.00	1.85	1.46	20.00
7- 3	1.83	1.47	20.00	2.07	1.31	20.00
7- 4	1.86	1.45	20.00	2.03	1.33	20.00
7- 5	1.87	1.45	20.00	2.04	1.32	20.00
7- 6	1.87	1.45	20.00	3.09	0.87	20.00
7- 7	1.85	1.46	20.00	3.20	0.84	20.00
7- 8	1.50	1.80	20.00	1.68	1.61	20.00
7- 9	2.03	1.33	20.00	1.87	1.45	20.00
7-10	2.04	1.32	20.00	1.88	1.43	20.00
Right						

Vertical Reactions Applied to Structure: (service load values, k/unit width, pos. is up)

Wall #	DL	DW	EV	EH	LS	WA	LL	Tot. w/o LL	Tot. w/ LL
1	0.39	0.01	0.02	-0.01	0.00	0.91	2.68	1.32	4.00
2	-0.29	-0.01	-0.03	0.02	0.01	0.88	2.84	0.58	3.42
3	-0.20	0.01	0.02	-0.03	-0.01	0.93	0.22	0.71	0.93
4	-0.29	-0.01	-0.03	0.02	0.01	0.88	2.84	0.58	3.42
5	0.39	0.01	0.02	-0.01	0.00	0.91	2.68	1.32	4.00

Horizontal Reactions Applied to Structure: (service load values, k/unit width, pos. is right)

Wall #	DL	DW	EV	EH	LS	WA	LL	Tot. w/o LL	Tot. w/ LL
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Load Combination Results at Tenth Points: (k-ft, k)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior Wall)						
Bottom						
1- 0	-1.694	-10.808	2.647	8.254	5.224	-1.077
1- 1	-4.066	-5.681	2.339	8.254	4.108	-0.869
1- 2	0.605	-6.476	2.339	7.715	3.043	-0.692
1- 3	2.071	-7.168	2.339	7.715	2.029	-0.546
1- 4	3.458	-7.581	2.339	7.715	1.066	-0.431
1- 5	3.806	-7.764	2.339	7.715	0.476	-0.669
1- 6	3.178	-7.770	3.186	7.715	0.529	-1.530
1- 7	1.801	-7.657	3.186	7.715	0.550	-2.340
1- 8	0.349	-7.478	2.339	7.715	0.541	-3.099
1- 9	-2.261	-8.478	2.647	8.254	0.501	-3.807
1-10	-1.470	-12.902	2.647	8.254	0.430	-4.464
Top						
Member 2: (Top Slab)						
Left						
2- 0	-1.423	-12.953	-0.430	4.464	8.254	2.339
2- 1	2.379	-5.058	-0.430	4.464	6.784	1.917

2- 2	7.544	-0.925	-0.430	3.946	5.307	1.243
2- 3	11.509	-0.027	-0.430	3.946	3.854	0.354
2- 4	13.496	3.176	-0.430	4.464	2.457	-0.702
2- 5	13.489	3.292	-0.430	4.464	1.143	-1.899
2- 6	11.476	2.410	-0.430	4.464	-0.069	-3.234
2- 7	7.528	-0.038	-0.430	4.464	-0.618	-4.688
2- 8	2.111	-2.755	3.641	0.393	-1.041	-6.176
2- 9	-3.338	-8.084	3.641	0.393	-1.463	-7.652
2-10	-7.611	-17.973	3.946	0.393	-1.886	-9.083

Right

Member 3: (Interior Wall)

Bottom

3- 0	2.440	-0.826	7.251	15.568	0.578	-0.629
3- 1	1.891	-0.363	7.251	15.568	0.578	-0.629
3- 2	1.369	-0.084	7.251	3.953	0.578	-0.629
3- 3	1.513	-0.149	7.251	15.568	0.578	-0.629
3- 4	2.013	-0.678	7.251	15.568	0.578	-0.629
3- 5	2.528	-1.220	7.251	15.568	0.578	-0.629
3- 6	3.057	-1.786	7.251	15.568	0.578	-0.629
3- 7	3.586	-2.374	7.251	15.568	0.578	-0.629
3- 8	4.115	-2.968	7.251	15.568	0.578	-0.629
3- 9	4.644	-3.562	7.251	15.568	0.578	-0.629
3-10	5.173	-4.155	7.251	15.568	0.578	-0.629

Top

Member 4: (Bottom Slab)

Left

4- 0	-3.044	-10.808	-1.077	5.224	5.734	2.790

4- 1	2.171	-4.025	-1.077	5.224	4.535	2.267
4- 2	6.484	-0.801	-1.077	4.919	3.336	1.743
4- 3	9.295	2.891	-1.077	4.919	2.137	1.083
4- 4	10.512	4.525	-1.077	4.919	0.952	0.240
4- 5	10.132	5.003	-1.077	4.919	0.172	-0.900
4- 6	8.159	4.327	-1.077	4.919	-0.352	-2.099
4- 7	4.591	2.495	-1.077	4.919	-0.876	-3.298
4- 8	-0.197	-1.782	4.401	-0.255	-1.400	-4.497
4- 9	-4.632	-8.612	4.919	-0.255	-1.923	-5.696
4-10	-9.928	-17.037	4.919	-0.255	-2.447	-6.896

Right

Member 5: (Top Slab - Interior Cell)

Bottom

5- 0	-7.513	-16.873	3.755	0.235	8.584	2.068
5- 1	-3.396	-7.859	3.755	0.235	7.134	1.645
5- 2	1.742	-3.453	3.755	0.235	5.645	1.223
5- 3	6.616	-0.669	3.755	0.235	4.160	0.800
5- 4	9.661	1.037	3.755	0.235	2.720	0.030
5- 5	10.759	1.729	3.755	0.235	1.368	-1.196
5- 6	9.845	1.402	3.755	0.235	0.124	-2.540
5- 7	6.978	-0.309	-0.334	4.324	-0.889	-3.972
5- 8	2.319	-2.525	-0.334	4.324	-1.312	-5.458
5- 9	-2.997	-6.775	-0.334	4.324	-1.734	-6.955
5-10	-6.924	-15.619	-0.334	4.324	-2.157	-8.420

Top

Member 6: (Interior Wall - Interior Cell)

Bottom

6- 0	1.054	-1.054	6.370	15.464	0.516	-0.516
6- 1	0.588	-0.588	6.370	15.464	0.516	-0.516
6- 2	0.245	-0.245	6.370	15.464	0.516	-0.516
6- 3	0.603	-0.603	6.370	15.464	0.516	-0.516
6- 4	1.062	-1.062	6.370	15.464	0.516	-0.516
6- 5	1.529	-1.529	6.370	15.464	0.516	-0.516
6- 6	1.998	-1.998	6.370	15.246	0.516	-0.516
6- 7	2.474	-2.474	6.587	15.246	0.516	-0.516
6- 8	2.951	-2.951	6.587	15.246	0.516	-0.516
6- 9	3.427	-3.427	6.587	15.246	0.516	-0.516
6-10	3.903	-3.903	6.587	15.246	0.516	-0.516

Top

Member 7: (Bottom Slab - Interior Cell)

Left

7- 0	-9.677	-15.857	4.888	-0.351	6.224	2.568
7- 1	-4.472	-8.365	4.888	-0.351	5.025	2.044
7- 2	0.043	-2.470	4.888	-0.351	3.826	1.521
7- 3	3.711	1.589	4.541	-0.351	2.627	0.997
7- 4	6.172	3.851	4.541	-0.351	1.428	0.473
7- 5	7.036	4.677	4.541	-0.351	0.286	-0.058
7- 6	6.307	4.230	4.541	4.888	-0.574	-1.167
7- 7	4.051	2.505	-0.919	4.888	-1.098	-2.360
7- 8	0.335	-0.925	-0.919	5.109	-1.622	-3.559
7- 9	-4.126	-6.394	-0.919	5.109	-2.145	-4.758
7-10	-9.355	-13.482	-0.919	5.109	-2.669	-5.957

Right

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CALCULATION COVER SHEET

Project	Project Number
Boiling Spring Lakes Dams	19C21022_00

Title

Sanford Dam Retaining Wall Design and Analysis Calculations

Computer Programs Used	Version/Release No.
Microsoft Excel - Retwall	2016

Purpose and Objective

Determine geometry of inlet headwall, headwall above culvert, weir walls and outlet sidewalls for the specified load cases. Design reinforcement to resist flexural moments in the stem and footings where applicable for the above structural elements.

Load Cases
LC - 1 Normal Operating Condition
LC - 2 Maintenance Condition
LC - 3 Post Flood Condition
LC - 4 Seismic Condition

Summary of Conclusions

Tables included in the calculations below summarize the stability of the sections. Reinforcement designed via the calculations below are called out in the structural design drawings.

Originator		
Cristian T. Franklin	CF	Jan 12, 2021
Print	Sign	Date

Checked		
Robert L. Jarnigan	RJarnigan	Jan 13, 2021
Print	Sign	Date

Table S1: Stability Summary for Inlet Headwall at Sanford Dam

Load Case	Loading Description	Sliding FOS actual / Req'd FOS	% Base in Compression / Req'd	Pressure at Toe (psf)	Pressure at Heel (psf)
LC1	Normal Operating Condition, At-Rest (Critical Structure, Usual Load)	2.02 / 2.0	100 / 100	1351	1630
LC2	Maintenance Condition, At-Rest (Critical Structure, Unusual)	1.87 / 1.5	100 / 75	2077	1804
LC3	Post Flood Condition, At-Rest (Critical Structure, Extreme)	1.63 / 1.1	100 / >0	1536	1191
LC4	Seismic Condition, Active (Critical Structure, Extreme)	1.44 / 1.3	100 / >0	2281	322

Project	**BSL**	**STABILITY ANALYSIS**			
Client	**City of Boiling Spring Lake**	By	Date:	Program Ver:	Sheet
Location	**Sanford Lake Dam**	RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet Headwall (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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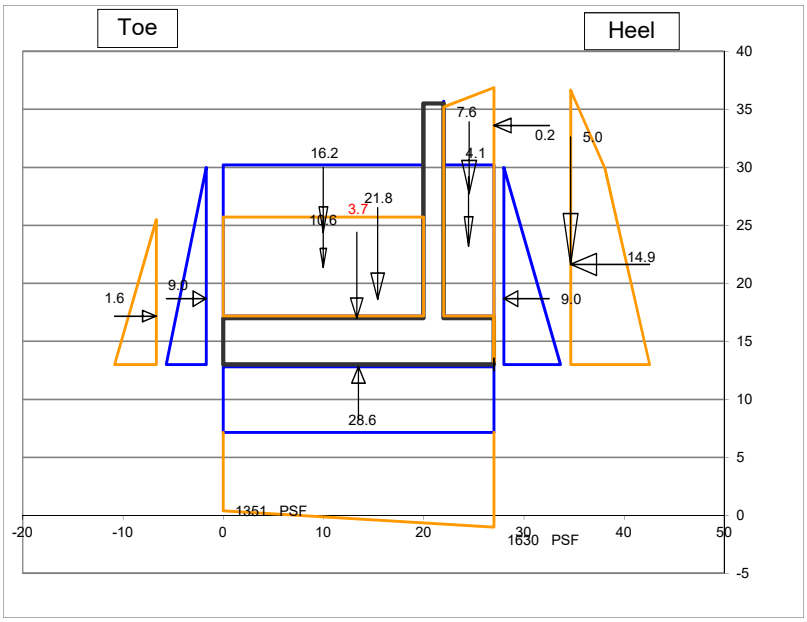
Wall Geometry and Material Properties

Top of Wall Elevation	35.5	ft
Stem Height	18.5	ft
Footing Thickness	4	ft
Top Width of Wall	2	ft
Toe Length (Bt)	20	ft
Heel Length (Bh)	5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	2	ft
Top of Footing EL	17.0	
Base Elevation	13.0	ft
Base Width	27.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	13	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	**2.02**
Reaction within Middle 1/3 ?	**YES**
% Base in Compression	**100%**
Foundation Reaction Pressure	**OK**



Fill over Heel Input

Backfill EL at Wall (FillELw)	35	ft
Water EL at Heel (WaterELh)	30	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	18.43	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.62	
Sloping Backfill EL at Heel (FillELh)	36.7	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	25.50	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	at-rest pressure for negative 3:1 sloped backfill
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	27.0	13.3	
Elevation	33.6	17	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	3.69	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	3.69	0.00
Force Applied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	21.8	15.4	335.3	
Soil Weight on Heel	7.6	24.5	185.7	
Water Weight on Heel	4.1	24.5	99.4	
Vert Force on Heel from Sloping Fill	5.0	27.0	133.7	
Soil Weight on Toe	10.6	10.0	106.4	
Water Weight at Toe	16.2	10.0	162.2	
Uplift	-28.6	13.5		386.7
Compaction	0.0	27.0		0.0
Sloping Soil	3.7	13.3	49.2	
0	0.0	0.0		
Surcharge	0.0	24.5	0.0	
Total Vertical Force	**40.2**			
HORZONTAL FORCES				
Water Pressure, Heel Side	9.0	5.7		51.1
Soil Pressure, Heel Side	14.86	8.6		128.0
Water Pressure, Toe Side	-9.0	5.7	51.1	
Soil Pressure, Toe Side	-1.57	4.2	6.5	
EQ Soil Dynamic Component ΔP_{AE}	0.00	14.7		0.0
EQ Inertia Force (wall + backfill)	0.00	7.9		0.0
Compaction	0.2	20.6		3.5
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	11.8		0.0
Total Horizontal Force	**13.5**			
Total Moments			**1129.5**	**569.3**
Net Moment			**560.2**	

Safety Factor Evaluation

Uplift Pressure at Toe		1.06	KSF
Uplift Pressure at Heel		1.06	KSF
Eccentricity		-0.42	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		1.35	KSF
		9.38	PSI
Reaction Pressure at Heel		1.63	KSF
		11.32	PSI
%Base in Compression	100%	**27.00**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**2.02**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Lake Dam**	RLJ	4/20/2020	BETA 6.3	2
Structure:	**Box Inlet Headwall (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

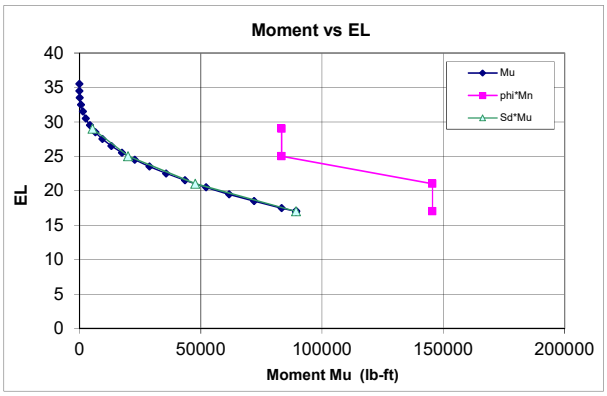
Severe Environmental Exposure? N

Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.6
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.6
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	17	0.00368	0.00335	0.95	8	1.00	6	1.58	21.5	0.00612	145,501	89,245	55,778	1.00	36.0	20.7	89,245	OK	OK
4	21	0.00194	0.00259	0.67	8	1.00	6	1.58	21.5	0.00612	145,501	47,697	29,811	1.00	36.0	11.1	47,697	OK	OK
8	25	0.00080	0.00106	0.29	6	0.75	6	0.88	21.6	0.00339	83,351	20,025	12,516	1.00	36.0	8.1	20,025	OK	OK
12	29	0.00021	0.00100	0.29	6	0.75	6	0.88	21.6	0.00339	83,351	5,314	3,321	1.00	36.0	2.2	5,314	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	17	0.29	6	0.75	6	0.88	OK
4	21	0.29	6	0.75	6	0.88	OK
8	25	0.29	6	0.75	6	0.88	OK
12	29	0.29	6	0.75	6	0.88	OK

Check Shear:

Vu:	12,168	lb	**Optional Diagonal Bars:**		
ϕVc:	25,961	lb	Max of Vu(stem) and Vu(heel):	15,986	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.50	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
4.0	33.54	1.00	33.5	1.3	43.6	8629	17,308	OK
8.0	21.47	0.75	16.1	1.3	20.9	5230	17,409	OK
12.0	21.47	0.75	16.1	1.3	20.9	2277	17,409	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
12.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.25	0.25	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Critical Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Bounding Pressures Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-12,000	10	1.0	-12000	-120,000	-120,000
Soil Weight on Toe			-10642	10	1	-10642	-106,420	-106,420
Water Weight on Toe			-16224	10	1	-16224	-162,240	-162,240
Uplift	1.06	1.06	21,216	10.00	1.4	29702	297,024	212,160
Foundation Reaction	1.35	1.56	29,088	9.76	1.6	46540	454,393	283,996
			0	0.00	1	0	0	0
Sloping Soil			-3,693	6.67	1.0	-3693	-24,623	-24,623
			0	20.00	1.0	0	0	0
Sum						**33,683**	**338,135**	**82,873**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00084	0.00111	0.60	6	0.75	6	0.88	44.6	0.00164	174,431	89,245	55,778	1.00	36.0	17.3	89,245	OK	OK

Check Shear on Toe:

Vu: 33,683 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq in^2/LF	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.39	6	0.75	6	0.88	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Bounding Press. Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,000	2.50	1.2	3600	9,000	7,500
Soil Weight on Heel			7,569	2.54	1.6	12110	30,722	19,201
Water Weight on Heel			4,056	2.50	1.4	5678	14,196	10,140
Vert Force on Heel from Sloping Fill			4,951	5.00	1.6	7921	39,606	24,754
Surcharge			0	5.00	1.2	0	0	0
Uplift	1.06	1.06	-5304	2.50	1	-5304	-13260	-13,260
Foundation Reaction	1.58	1.63	-8,020	2.51	1	-8020	-20158	-20,158
			0	5.00	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**15,986**	**60,106**	28,177

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**60,106**	**ft-lb**	**:<Use this**	Ms(heel)=	**28,177**	**ft-lb**	**<<Use this**
Mu(stem)=	**89,245**	**ft-lb**		Ms(stem)=	**55,778**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**15,986**	**Lb**	<=Use this
Vu(stem)=	**12,168**	**Lb**	

Compute Heel Reinforcement

Cover 3.5 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00057	0.00100	0.53	6	0.75	6	0.88	44.1	0.00166	172,451	60,106	28,177	1.00	36.0	8.8	60,106	OK	OK

Check Shear on Heel:

Vu: 15,986 lb
ϕVc: 53,280 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in^2/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	6	0.88	6	6	0.88	**1.76**	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Sanford Lake Dam		
Structure:	Box Inlet Headwall (Normal Structure)		
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)		

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STABILITY ANALYSIS

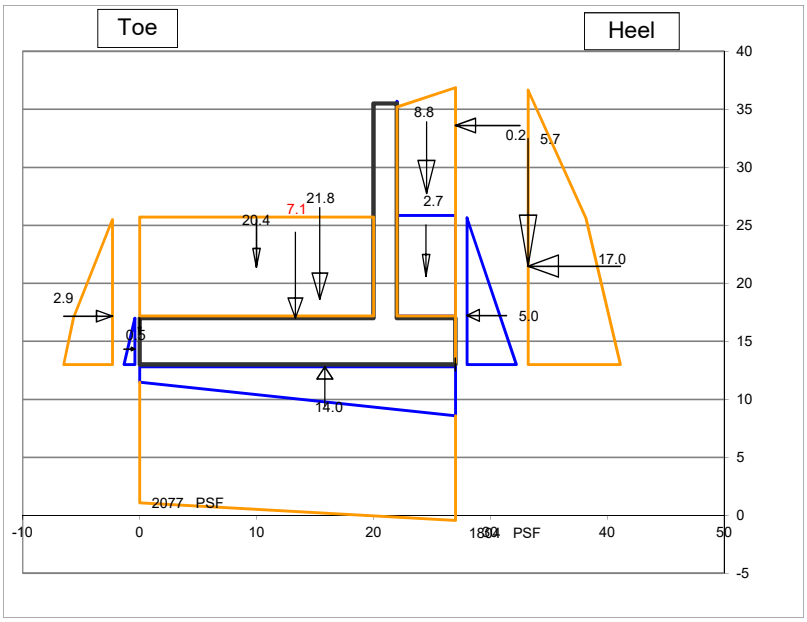
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	12/01/20		19C21022.01

Wall Geometry and Material Properties

Top of Wall Elevation	35.5	ft
Stem Height	18.5	ft
Footing Thickness	4	ft
Top Width of Wall	2	ft
Toe Length (Bt)	20	ft
Heel Length (Bh)	5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	2	ft
Top of Footing EL	17.0	
Base Elevation	13.0	ft
Base Width	27.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	13	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.87
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	35	ft
Water EL at Heel (WaterELh)	25.66	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	18.43	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.62	
Sloping Backfill EL at Heel (FillELh)	36.7	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	25.50	ft	
Water EL at Toe (WaterELt)	17.0	ft	Invert EL drain
γ_{moist}	120	pcf	
γ_{sat}	125	pcf	
Kp at Toe (Kt) (for Global Stability)	0.32		at-rest pressure for negative 3:1 sloped backfill
Include F_P in Forces & Moments Table?	Y		
Ko at Toe (Kts) (for Structural Design)	0.50		

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	27.0	13.3	
Elevation	33.6	17	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	7.08	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	7.08	0.00
Force Applied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	21.8	15.4	335.3	
Soil Weight on Heel	8.8	24.5	216.3	
Water Weight on Heel	2.7	24.5	66.2	
Vert Force on Heel from Sloping Fill	5.7	27.0	153.2	
Soil Weight on Toe	20.4	10.0	204.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-14.0	15.8		222.3
Compaction	0.0	27.0		0.0
Sloping Soil	7.1	13.3	94.4	
0	0.0	0.0		
Surcharge	0.0	24.5	0.0	
Total Vertical Force	**52.4**			
HORZONTAL FORCES				
Water Pressure, Heel Side	5.0	4.2		21.1
Soil Pressure, Heel Side	17.02	8.5		144.2
Water Pressure, Toe Side	-0.5	1.3	0.7	
Soil Pressure, Toe Side	-2.85	4.2	11.9	
EQ Soil Dynamic Component ΔP_{AE}	0.00	14.7		0.0
EQ Inertia Force (wall + backfill)	0.00	7.8		0.0
Compaction	0.2	20.6		3.5
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	11.8		0.0
Total Horizontal Force	**18.8**			
Total Moments			**1081.9**	**391.1**
Net Moment			**690.7**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.25	KSF
Uplift Pressure at Heel		0.79	KSF
Eccentricity		0.32	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		2.08	KSF
		14.42	PSI
Reaction Pressure at Heel		1.80	KSF
		12.53	PSI
%Base in Compression	100%	27.00	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.87	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Lake Dam**	RLJ	4/20/2020	BETA 6.3	2
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC2 - Maintenance Condition (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

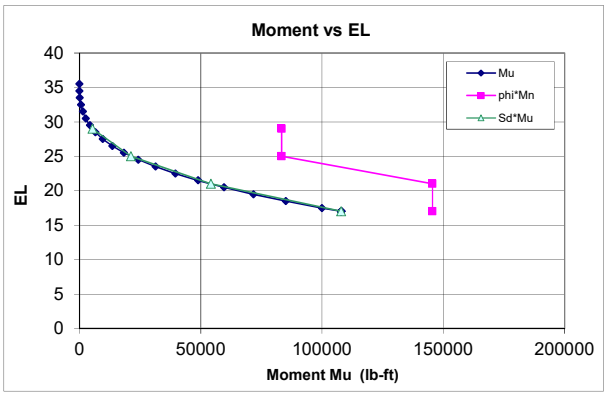
Severe Environmental Exposure? N

Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.6
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	17	0.00448	0.00335	1.16	8	1.00	6	1.58	21.5	0.00612	145,501	107,909	68,288	1.00	36.0	25.3	107,909	OK	OK
4	21	0.00221	0.00294	0.76	8	1.00	6	1.58	21.5	0.00612	145,501	54,115	33,954	1.00	36.0	12.6	54,115	OK	OK
8	25	0.00084	0.00112	0.29	6	0.75	6	0.88	21.6	0.00339	83,351	21,149	13,219	1.00	36.0	8.6	21,149	OK	OK
12	29	0.00021	0.00100	0.29	6	0.75	6	0.88	21.6	0.00339	83,351	5,323	3,327	1.00	36.0	2.2	5,323	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	17	0.29	6	0.75	6	0.88	OK
4	21	0.29	6	0.75	6	0.88	OK
8	25	0.29	6	0.75	6	0.88	OK
12	29	0.29	6	0.75	6	0.88	OK

Check Shear:

Vu:	16,319	lb	**Optional Diagonal Bars:**		
ϕVc:	25,961	lb	Max of Vu(stem) and Vu(heel):	17,715	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.56	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
4.0	33.54	1.00	33.5	1.3	43.6	10711	17,308	OK
8.0	21.47	0.75	16.1	1.3	20.9	5905	17,409	OK
12.0	21.47	0.75	16.1	1.3	20.9	2304	17,409	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
12.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.25	0.25	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL	TOE & HEEL REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Sanford Lake Dam	RLJ	4/20/2020	BETA 6.3	3
Structure:	Box Inlet Headwall (Normal Structure)	Checked	Chk Date		Job No
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-12,000	10	1.0	-12000	-120,000	-120,000
Soil Weight on Toe			-20400	10	1	-20400	-204,000	-204,000
Water Weight on Toe			0	10	1	0	0	0
Uplift	0.25	0.65	8,989	8.51	1.4	12584	107,131	76,522
Foundation Reaction	2.08	1.87	39,515	10.17	1.6	63224	643,006	401,879
			0	0.00	1	0	0	0
Sloping Soil			-7,080	6.67	1.0	-7080	-47,200	-47,200
			0	20.00	1.0	0	0	0
Sum						**36,328**	**378,937**	**107,201**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00101	0.00135	0.72	6	0.75	6	0.88	44.6	0.00164	174,431	107,909	68,288	1.00	36.0	21.1	107,909	OK	OK

Check Shear on Toe:

Vu: 36,328 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.39	6	0.75	6	0.88	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,000	2.50	1.2	3600	9,000	7,500
Soil Weight on Heel			8,813	2.54	1.6	14102	35,774	22,359
Water Weight on Heel			2,703	2.50	1.4	3784	9,460	6,757
Vert Force on Heel from Sloping Fill			5,673	5.00	1.6	9077	45,383	28,365
Surcharge			0	5.00	1.2	0	0	0
Uplift	0.69	0.79	-3700	2.56	1	-3700	-9460	-9,460
Foundation Reaction	1.85	1.80	-9,147	2.49	1	-9147	-22761	-22,761
			0	5.00	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**17,715**	**67,396**	32,759

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe) **0** **ft-lb** Ms(heel,global)= **0** **ft-lb**
Mu (heel,computed)= **67,396** **ft-lb** **:<Use this** Ms(heel)= **32,759** **ft-lb** **<<Use this**
Mu(stem)= **107,909** **ft-lb** Ms(stem)= **68,288** **ft-lb**

Check Vu above with Vu(stem)

Vu (heel)= **17,715** **Lb** <=Use this
Vu(stem)= **16,319** **Lb**

Compute Heel Reinforcement

Cover 3.5 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00064	0.00100	0.53	6	0.75	6	0.88	44.1	0.00166	172,451	67,396	32,759	1.00	36.0	10.3	67,396	OK	OK

Check Shear on Heel:

Vu: 17,715 lb
ϕVc: 53,280 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	6	0.88	6	6	0.88	**1.76**	OK	50%

Project	**BSL**		
Client	**City of Boiling Spring Lake**		
Location	**Sanford Lake Dam**		
Structure:	**Box Inlet Headwall (Critical Structure)**		
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**		

Schnabel ENGINEERING

STABILITY ANALYSIS

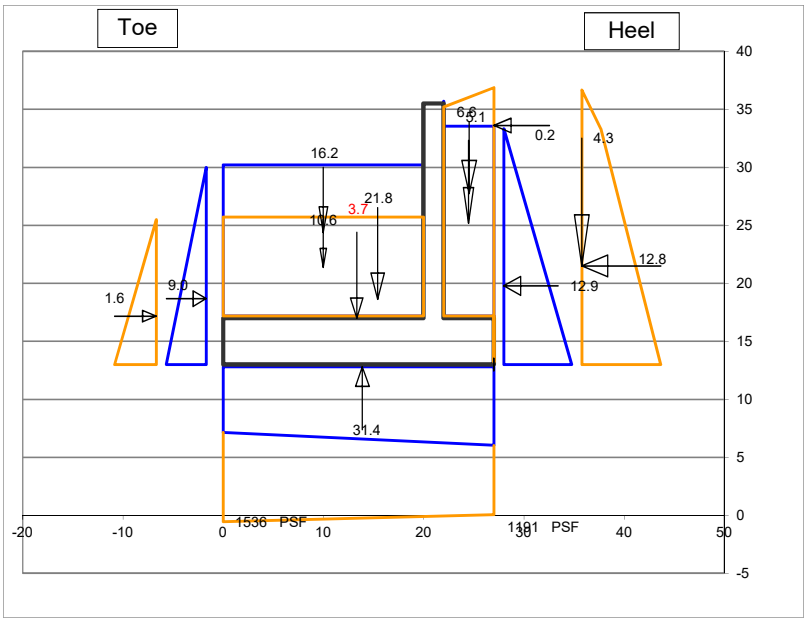
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	12/01/20		19C21022.01

Wall Geometry and Material Properties

Top of Wall Elevation	35.5	ft
Stem Height	18.5	ft
Footing Thickness	4	ft
Top Width of Wall	2	ft
Toe Length (Bt)	20	ft
Heel Length (Bh)	5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	2	ft
Top of Footing EL	17.0	
Base Elevation	13.0	ft
Base Width	27.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	13	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	**1.63**
Reaction within Middle 1/3 ?	**YES**
% Base in Compression	**100%**
Foundation Reaction Pressure	**OK**



Fill over Heel Input

Backfill EL at Wall (FillELw)	35	ft
Water EL at Heel (WaterELh)	33.33	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	18.43	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.62	
Sloping Backfill EL at Heel (FillELh)	36.7	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	25.50	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	at-rest pressure for negative 3:1 sloped backfill
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	27.0	13.3	
Elevation	33.6	17	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	3.69	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	3.69	0.00
Force Applied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	21.8	15.4	335.3	
Soil Weight on Heel	6.6	24.5	162.2	
Water Weight on Heel	5.1	24.5	124.9	
Vert Force on Heel from Sloping Fill	4.3	27.0	114.8	
Soil Weight on Toe	10.6	10.0	106.4	
Water Weight at Toe	16.2	10.0	162.2	
Uplift	-31.4	13.9		437.2
Compaction	0.0	27.0		0.0
Sloping Soil	3.7	13.3	49.2	
0	0.0	0.0		
Surcharge	0.0	24.5	0.0	
Total Vertical Force	**36.8**			
HORZONTAL FORCES				
Water Pressure, Heel Side	12.9	6.8		87.4
Soil Pressure, Heel Side	12.76	8.5		108.4
Water Pressure, Toe Side	-9.0	5.7	51.1	
Soil Pressure, Toe Side	-1.57	4.2	6.5	
EQ Soil Dynamic Component ΔP_{AE}	0.00	14.7		0.0
EQ Inertia Force (wall + backfill)	0.00	7.9		0.0
Compaction	0.2	20.6		3.5
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	11.8		0.0
Total Horizontal Force	**15.2**			
Total Moments			**1112.7**	**636.6**
Net Moment			**476.1**	

Safety Factor Evaluation

Uplift Pressure at Toe		1.06	KSF
Uplift Pressure at Heel		1.27	KSF
Eccentricity		0.57	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		1.54	KSF
		10.67	PSI
Reaction Pressure at Heel		1.19	KSF
		8.27	PSI
%Base in Compression	100%	**27.00**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**1.63**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Sanford Lake Dam		
Structure:	Box Inlet Headwall (Critical Structure)		
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)		

Schnabel ENGINEERING

STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	4/20/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	12/1/2020		19C21022.01

Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

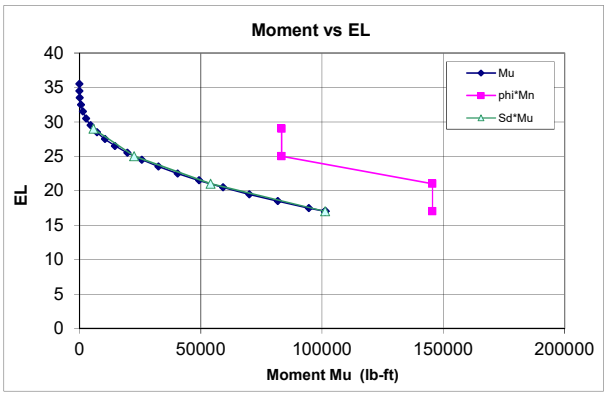
Severe Environmental Exposure? N

Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.6
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρcalc	Required ρmin	Required Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu? / ϕMn>Mu?	As min? / As max?
0	17	0.00420	0.00335	1.08	8	1.00	6	1.58	21.5	0.00612	145,501	101,290	66,115	1.00	36.0	24.5	101,290	OK	OK
4	21	0.00221	0.00294	0.76	8	1.00	6	1.58	21.5	0.00612	145,501	54,093	35,299	1.00	36.0	13.1	54,093	OK	OK
8	25	0.00090	0.00120	0.31	6	0.75	6	0.88	21.6	0.00339	83,351	22,555	14,687	1.00	36.0	9.5	22,555	OK	OK
12	29	0.00023	0.00100	0.29	6	0.75	6	0.88	21.6	0.00339	83,351	5,762	3,706	1.00	36.0	2.4	5,762	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	Asreq (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	17	0.29	6	0.75	6	0.88	OK
4	21	0.29	6	0.75	6	0.88	OK
8	25	0.29	6	0.75	6	0.88	OK
12	29	0.29	6	0.75	6	0.88	OK

Check Shear:

Vu:	13,803	lb	**Optional Diagonal Bars:**		
ϕVc:	25,961	lb	Max of Vu(stem) and Vu(heel):	15,754	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.50	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	ld/db	db (in)	ld (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
4.0	33.54	1.00	33.5	1.3	43.6	9819	17,308	OK
8.0	21.47	0.75	16.1	1.3	20.9	5973	17,409	OK
12.0	21.47	0.75	16.1	1.3	20.9	2574	17,409	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Astreq (in²/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Astprov (in²/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Astprov (in²/LF)	Astprov (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
12.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.25	0.25	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρcalc	Required ρmin	Required Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu?	As min? / As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Critical Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-12,000	10	1.0	-12000	-120,000	-120,000
Soil Weight on Toe			-10642	10	1	-10642	-106,420	-106,420
Water Weight on Toe			-16224	10	1	-16224	-162,240	-162,240
Uplift	1.06	1.21	22,757	9.77	1.4	31859	311,404	222,432
Foundation Reaction	1.54	1.28	28,170	10.30	1.6	45071	464,353	290,221
			0	0.00	1	0	0	0
Sloping Soil			-3,693	6.67	1.0	-3693	-24,623	-24,623
			0	20.00	1.0	0	0	0
Sum						**34,371**	**362,474**	**99,369**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00095	0.00127	0.68	6	0.75	6	0.88	44.6	0.00164	174,431	101,290	66,115	1.00	36.0	20.5	101,290	OK	OK

Check Shear on Toe:

Vu: 34,371 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.39	6	0.75	6	0.88	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,000	2.50	1.2	3600	9,000	7,500
Soil Weight on Heel			6,612	2.54	1.6	10580	26,839	16,774
Water Weight on Heel			5,096	2.50	1.4	7134	17,836	12,740
Vert Force on Heel from Sloping Fill			4,252	5.00	1.6	6804	34,018	21,261
Surcharge			0	5.00	1.2	0	0	0
Uplift	1.23	1.27	-6248	2.51	1	-6248	-15700	-15,700
Foundation Reaction	1.26	1.19	-6,115	2.48	1	-6115	-15155	-15,155
			0	5.00	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**15,754**	**56,838**	27,421

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**56,838**	**ft-lb**	**:<Use this**	Ms(heel)=	**27,421**	**ft-lb**	**<<Use this**
Mu(stem)=	**101,290**	**ft-lb**		Ms(stem)=	**66,115**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**15,754**	**Lb**	<=Use this
Vu(stem)=	**13,803**	**Lb**	

Compute Heel Reinforcement

Cover 3.5 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00054	0.00100	0.53	6	0.75	6	0.88	44.1	0.00166	172,451	56,838	27,421	1.00	36.0	8.6	56,838	OK	OK

Check Shear on Heel:

Vu: 15,754 lb
ϕVc: 53,280 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	6	0.88	6	6	0.88	**1.76**	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Sanford Lake Dam		
Structure:	Box Inlet Headwall (Critical Structure)		
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)		

Schnabel ENGINEERING

STABILITY ANALYSIS

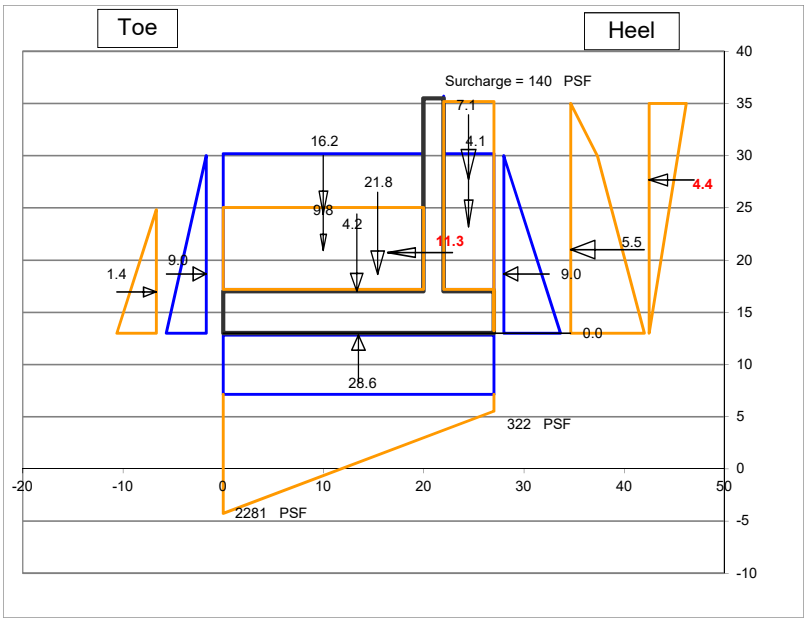
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	12/01/20		19C21022.01

Wall Geometry and Material Properties

Top of Wall Elevation	35.5	ft
Stem Height	18.5	ft
Footing Thickness	4	ft
Top Width of Wall	2	ft
Toe Length (Bt)	20	ft
Heel Length (Bh)	5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	2	ft
Top of Footing EL	17.0	
Base Elevation	13.0	ft
Base Width	27.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	13	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib) (total stress)	24	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.2	

Stability Summary

Half Section (Yes/No)?	No	
Sliding Factor of Safety	1.44	Sliding FS is calculated without uplift pressure.
Reaction within Middle 1/3 ?	YES	
% Base in Compression	100%	Overturning stability is calculated with uplift pressure.
Foundation Reaction Pressure	OK	



Fill over Heel Input

Backfill EL at Wall (FillELw)	35	ft
Water EL at Heel (WaterELh)	30	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	35.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.144	

Fill over Toe Input

Fill EL at Toe (FillELt)	24.8	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	at-rest pressure for negative 3:1 sloped backfill
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force Total stress cohesion = 50 psf	1.350	KLF

Surcharge Load

Qs=	140	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Sloping Soil		
Station	13.3		
Elevation	17		
CCW Angle from Vert	0		
Magnitude (kips)	4.17		
Horiz Force	0.00	0.00	0.00
Vert Force	4.17	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	21.8	15.4	335.3	
Soil Weight on Heel	7.1	24.5	173.2	
Water Weight on Heel	4.1	24.5	99.4	
Vert Force on Heel from Sloping Fill	0.0	27.0	0.0	
Soil Weight on Toe	9.8	10.0	98.1	
Water Weight at Toe	16.2	10.0	162.2	
Uplift	-28.6	13.5		386.7
Sloping Soil	4.2	13.3	55.6	
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.7	24.5	17.2	
Total Vertical Force	**35.1**			
HORZONTAL FORCES				
Water Pressure, Heel Side	9.0	5.7		51.1
Soil Pressure, Heel Side	5.50	8.0		44.0
Water Pressure, Toe Side	-9.0	5.7	51.1	
Soil Pressure, Toe Side	-1.40	3.9	5.5	
EQ Soil Dynamic Component ΔP_{AE}	4.37	14.7		64.1
EQ Inertia Force (wall + backfill)	11.33	7.7		87.4
Sloping Soil	0.0			
0	0.0			
0	0.0			
Surcharge	0.8	11.0		9.0
Total Horizontal Force	**20.6**			
Total Moments			**997.6**	**642.2**
Net Moment			**355.3**	

Safety Factor Evaluation

Uplift Pressure at Toe		1.06	KSF
Uplift Pressure at Heel		1.06	KSF
Eccentricity		3.39	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		2.28	KSF
		15.84	PSI
Reaction Pressure at Heel		0.32	KSF
		2.23	PSI
%Base in Compression	100%	27.00	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		1.35	KLF
Sliding Factor of Safety		1.44	

Cell Modified

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force	*Unmodified*	-28.64	KIPS
Modified Uplift Arm	*Unmodified*	13.50	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment	*Unmodified*	N/A	
Modified Sliding F.S.		N/A	

Cell Modified

Project	BSL	STEM REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Sanford Lake Dam	RLJ	4/20/2020	BETA 6.3	2
Structure:	Box Inlet Headwall (Critical Structure)	Checked	Chk Date		Job No.
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)	CTF	12/1/2020		19C21022.01

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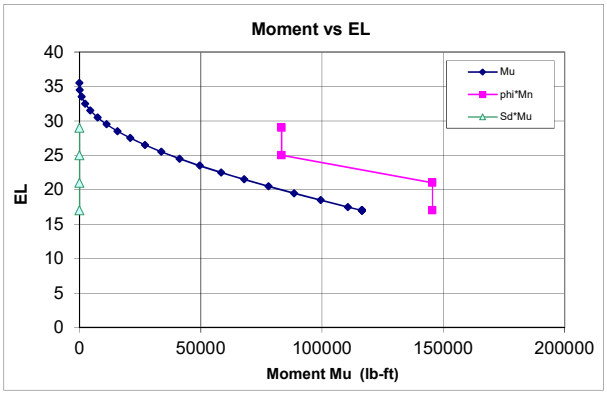
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.6
Load Factor M1 Sloping Soil		1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	17	0.00485	0.00335	1.25	8	1.00	6	1.58	21.5	0.00612	145,501	116,383	99,061	N/A	N/A	36.8	N/A	OK	OK
4	21	0.00299	0.00335	0.87	8	1.00	6	1.58	21.5	0.00612	145,501	72,861	63,230	N/A	N/A	23.5	N/A	OK	OK
8	25	0.00150	0.00200	0.52	6	0.75	6	0.88	21.6	0.00339	83,351	37,429	33,322	N/A	N/A	21.6	N/A	OK	OK
12	29	0.00053	0.00100	0.29	6	0.75	6	0.88	21.6	0.00339	83,351	13,297	12,210	N/A	N/A	7.9	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	17	0.29	6	0.75	6	0.88	OK
4	21	0.29	6	0.75	6	0.88	OK
8	25	0.29	6	0.75	6	0.88	OK
12	29	0.29	6	0.75	6	0.88	OK

Check Shear:

Vu:	11,574	lb	**Optional Diagonal Bars:**		
ϕVc:	25,961	lb	Max of Vu(stem) and Vu(heel):	13,610	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.43	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
4.0	33.54	1.00	33.5	1.3	43.6	10028	17,308	OK
8.0	21.47	0.75	16.1	1.3	20.9	7530	17,409	OK
12.0	21.47	0.75	16.1	1.3	20.9	4511	17,409	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%
12.0	288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bounding Pressures Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.24	0.24	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Critical Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-12,000	10	1.0	-12000	-120,000	-120,000
Soil Weight on Toe			-9807	10	1	-9807	-98,073	-98,073
Water Weight on Toe			-16224	10	1	-16224	-162,240	-162,240
Uplift	1.06	1.06	21,216	10.00	1.4	29702	297,024	212,160
Foundation Reaction	2.28	0.83	31,109	11.56	1.6	49774	575,165	359,478
Sloping Soil			-4,173	6.67	1	-4173	-27,822	-27,822
			0	20.00	1.0	0	0	0
			0	20.00	1.0	0	0	0
Sum						**37,272**	**464,053**	**163,502**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00109	0.00146	0.78	6	0.75	6	0.88	44.6	0.00164	174,431	116,383	99,061	N/A	N/A	30.7	N/A	OK	OK

Check Shear on Toe:

Vu: 37,272 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.39	6	0.75	6	0.88	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,000	2.50	1.2	3600	9,000	7,500
Soil Weight on Heel			7,069	2.50	1.6	11310	28,276	17,673
Water Weight on Heel			4,056	2.50	1.4	5678	14,196	10,140
Vert Force on Heel from Sloping Fill			0	5.00	1.6	0	0	0
Surcharge			700	5.00	1.2	840	4,200	3,500
Uplift	1.06	1.06	-5304	2.50	1	-5304	-13260	-13,260
Foundation Reaction	0.68	0.32	-2,515	2.20	1	-2515	-5532	-5,532
			0	0.00	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**13,610**	**36,880**	20,021

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**36,880**	**ft-lb**	**:<Use this**	Ms(heel)=	**20,021**	**ft-lb**	**<<Use this**
Mu(stem)=	**116,383**	**ft-lb**		Ms(stem)=	**99,061**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**13,610**	**Lb**	<=Use this
Vu(stem)=	**11,574**	**Lb**	

Compute Heel Reinforcement

Cover 3.5 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00035	0.00100	0.53	6	0.75	6	0.88	44.1	0.00166	172,451	36,880	20,021	N/A	N/A	6.3	N/A	OK	OK

Check Shear on Heel:

Vu: 13,610 lb
ϕVc: 53,280 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	6	0.88	6	6	0.88	**1.76**	OK	50%

Table S2: Stability Summary for Outlet Sidewalls (L1&R1) at Sanford Dam

Load Case	Loading Description	Sliding FOS actual / Req'd FOS	% Base in Compression / Req'd	Pressure at Toe (psf)	Pressure at Heel (psf)
LC1	Normal Operating Condition, At-Rest (Critical Structure, Usual Load)	2.72 / 2.0	100 / 100	1188	857
LC2	Maintenance Condition, At-Rest (Critical Structure, Unusual)	2.82 / 1.5	100 / 75	1599	1467
LC3	Post Flood Condition, At-Rest (Critical Structure, Extreme)	2.22 / 1.1	100 / >0	2048	113
LC4	Seismic Condition, Active (Critical Structure, Extreme)	1.40 / 1.3	85 / >0	2397	0

Table S3: Stability Summary for Outlet Sidewalls (L1A&R1A) at Sanford Dam

Load Case	Loading Description	Sliding FOS actual / Req'd FOS	% Base in Compression / Req'd	Pressure at Toe (psf)	Pressure at Heel (psf)
LC1	Normal Operating Condition, At-Rest (Critical Structure, Usual Load)	2.08 / 2.0	100 / 100	970	1123
LC4	Seismic Condition, Active (Critical Structure, Extreme)	1.30 / 1.3	100 / >0	1299	751

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L1, R1) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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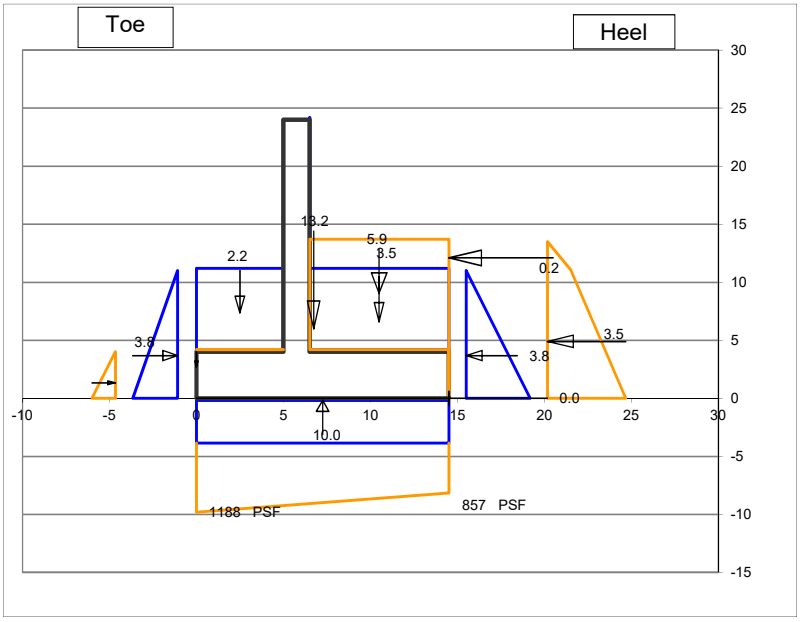
Wall Geometry and Material Properties

Top of Wall Elevation	24	ft
Stem Height	20	ft
Footing Thickness	4	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	4.0	
Base Elevation	0.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	0	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	2.72
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	13.5	ft
Water EL at Heel (WaterELh)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	13.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	4	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction	Slab Resistance	
Station	14.5	0.0	
Elevation	12.1	0	
CCW Angle from Vert	270	90	
Magnitude (kips)	0.17	0.00	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	13.2	6.7	89.0	
Soil Weight on Heel	5.9	10.5	62.0	
Water Weight on Heel	3.5	10.5	36.7	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	2.2	2.5	5.5	
Uplift	-10.0	7.3		72.2
Compaction	0.0	14.5		0.0
Slab Resistance	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**14.8**			
HORZONTAL FORCES				
Water Pressure, Heel Side	3.8	3.7		13.8
Soil Pressure, Heel Side	3.51	4.9		17.1
Water Pressure, Toe Side	-3.8	3.7	13.8	
Soil Pressure, Toe Side	0.00	1.3	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	9.0		0.0
EQ Inertia Force (wall + backfill)	0.00	7.2		0.0
Compaction	0.2	12.1		2.1
Slab Resistance	0.0			
0	0.0			
Surcharge	0.0	6.8		0.0
Total Horizontal Force	**3.7**			
Total Moments			**207.0**	**105.2**
Net Moment			**101.7**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.69	KSF
Uplift Pressure at Heel		0.69	KSF
Eccentricity		0.39	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.19	KSF
		8.25	PSI
Reaction Pressure at Heel		0.86	KSF
		5.95	PSI
%Base in Compression	100%	14.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		2.72	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L1, R1) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

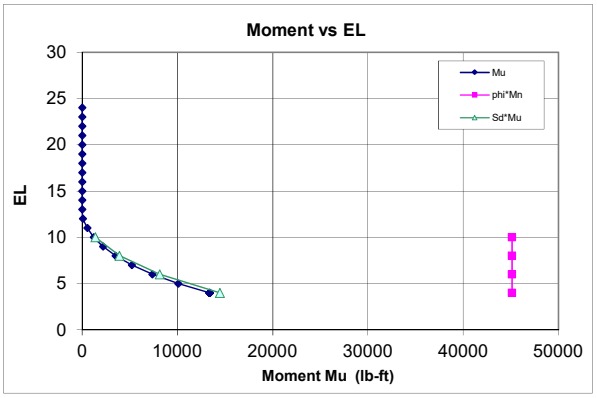
Severe Environmental Exposure? N

Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.2
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Slab Resistanc	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	4	0.00111	0.00147	0.28	6	0.75	8	0.66	15.6	0.00352	45,121	13,372	7,911	1.08	29.6	9.5	14,445	OK	OK
2	6	0.00062	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	7,385	4,453	1.10	29.6	5.3	8,131	OK	OK
4	8	0.00030	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	3,493	2,148	1.12	29.6	2.6	3,922	OK	OK
6	10	0.00011	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	1,218	760	1.14	29.6	0.9	1,387	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	4	0.22	6	0.75	8	0.66	OK
2	6	0.22	6	0.75	8	0.66	OK
4	8	0.22	6	0.75	8	0.66	OK
6	10	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	3,596	lb	**Optional Diagonal Bars:**		
ϕVc:	18,867	lb	Max of Vu(stem) and Vu(heel):	9,988	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.31	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	2430	12,579	OK
4.0	21.47	0.75	16.1	1.3	20.9	1502	12,579	OK
6.0	21.47	0.75	16.1	1.3	20.9	813	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Ast_{req} (in²/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Ast_{prov} (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	3
Structure:	**Outlet Retaining Walls (L1, R1) (Critical Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Bounding Pressures Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-3,000	2.5	1.0	-3000	-7,500	-7,500
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			-2184	2.5	1	-2184	-5,460	-5,460
Uplift	0.69	0.69	3,432	2.50	1.6	5491	13,728	8,580
Foundation Reaction	1.19	1.07	5,657	2.54	1.6	9050	23,007	14,379
			0	0.00	1	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**9,358**	**23,775**	**9,999**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00020	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	21,395	12,658	1.00	31.9	5.2	21,413	OK	OK

Check Shear on Toe:

Vu: 9,358 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.51	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Bounding Press. Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			4,800	4.00	1.4	6720	26,880	19,200
Soil Weight on Heel			5,906	4.00	1.6	9449	37,796	23,622
Water Weight on Heel			3,494	4.00	1.6	5591	22,364	13,978
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	0.69	0.69	-5491	4.00	0.9	-4942	-19768	-21,965
Foundation Reaction	1.04	0.86	-7,589	3.87	0.9	-6830	-26444	-29,382
			0	8.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**9,988**	**40,828**	5,453

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**-8,023**	**ft-lb**		Ms(heel,global)=	**-4,747**	**ft-lb**	
Mu (heel,computed)=	**40,828**	**ft-lb**		Ms(heel)=	**5,453**	**ft-lb**	**<<Use this**
Mu(stem)=	**13,372**	**ft-lb**	**:<Use this**	Ms(stem)=	**7,911**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**9,988**	**Lb**	<=Use this
Vu(stem)=	**3,596**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00012	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	13,372	5,453	1.00	31.9	2.2	13,372	OK	OK

Check Shear on Heel:

Vu: 9,988 lb
ϕVc: 53,884 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in^2/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L1, R1) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC2 - Maintenance (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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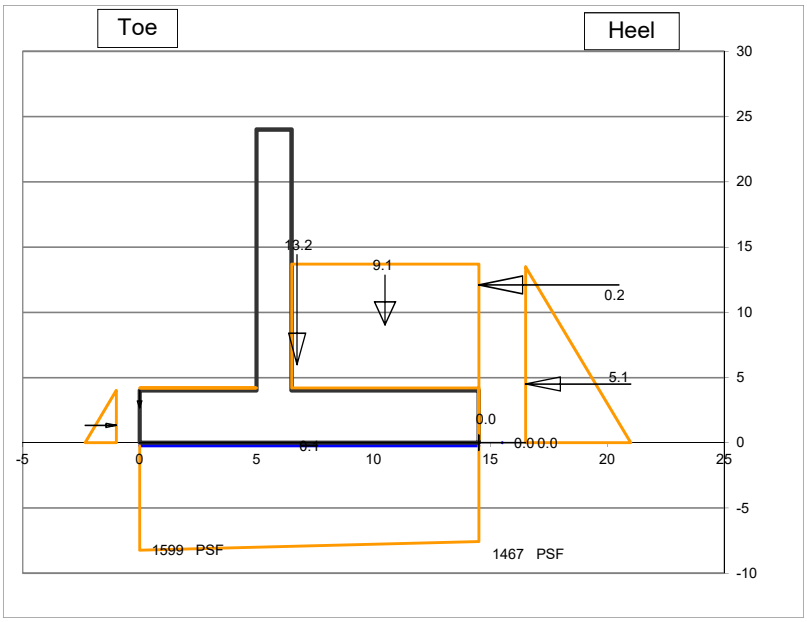
Wall Geometry and Material Properties

Top of Wall Elevation	24	ft
Stem Height	20	ft
Footing Thickness	4	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	4.0	
Base Elevation	0.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	0	
Compute Uplift from Water Levels at Toe/Heel?	N	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	2.82
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	13.5	ft
Water EL at Heel (WaterELh)	0.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	13.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	4	ft
Water EL at Toe (WaterELt)	0.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	0.1
Uplift at Heel (UpliftELh	0.1

Misc. Loads

	1	2	3
Name of Load	Compaction	Slab Resistance	
Station	14.5	0.0	
Elevation	12.1	0	
CCW Angle from Vert	270	90	
Magnitude (kips)	0.17	0.00	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	13.2	6.7	89.0	
Soil Weight on Heel	9.1	10.5	95.8	
Water Weight on Heel	0.0	14.5	0.0	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-0.1	7.3		0.7
Compaction	0.0	14.5		0.0
Slab Resistance	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**22.2**			
HORZONTAL FORCES				
Water Pressure, Heel Side	0.0	0.0		0.0
Soil Pressure, Heel Side	5.14	4.5		23.1
Water Pressure, Toe Side	0.0	0.0	0.0	
Soil Pressure, Toe Side	0.00	1.3	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	9.0		0.0
EQ Inertia Force (wall + backfill)	0.00	6.4		0.0
Compaction	0.2	12.1		2.1
Slab Resistance	0.0			
0	0.0			
Surcharge	0.0	6.8		0.0
Total Horizontal Force	**5.3**			
Total Moments			**184.7**	**25.9**
Net Moment			**158.8**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.01	KSF
Uplift Pressure at Heel		0.01	KSF
Eccentricity		0.10	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.60	KSF
		11.11	PSI
Reaction Pressure at Heel		1.47	KSF
		10.19	PSI
%Base in Compression	100%	14.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		2.82	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	BSL	STEM REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Sanford Dam	RLJ	7/23/2020	BETA 6.3	2
Structure:	Outlet Retaining Walls (L1, R1) (Critical Structure)	Checked	Chk Date		Job No.
Load Condition:	LC2 - Maintenance (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)	CTF	12/1/2020		19C21022.01

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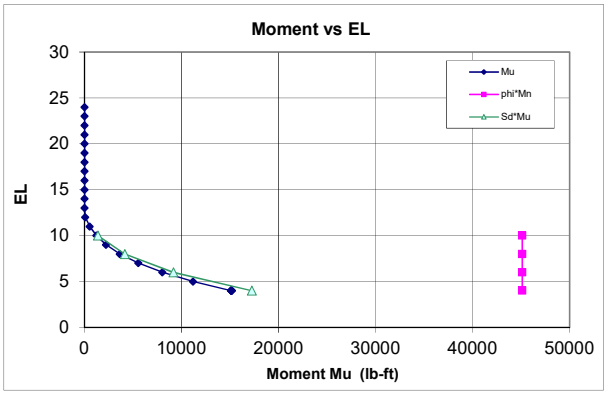
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.2
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Slab Resistanc	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	4	0.00132	0.00176	0.33	6	0.75	8	0.66	15.6	0.00352	45,121	15,126	9,454	1.14	29.6	11.3	17,261	OK	OK
2	6	0.00070	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	8,025	5,016	1.14	29.6	6.0	9,157	OK	OK
4	8	0.00032	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	3,631	2,269	1.14	29.6	2.7	4,143	OK	OK
6	10	0.00011	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	1,223	764	1.14	29.6	0.9	1,395	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	4	0.22	6	0.75	8	0.66	OK
2	6	0.22	6	0.75	8	0.66	OK
4	8	0.22	6	0.75	8	0.66	OK
6	10	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	4,348	lb	**Optional Diagonal Bars:**		
ϕVc:	18,867	lb	Max of Vu(stem) and Vu(heel):	10,443	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.33	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	2814	12,579	OK
4.0	21.47	0.75	16.1	1.3	20.9	1640	12,579	OK
6.0	21.47	0.75	16.1	1.3	20.9	828	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL	TOE & HEEL REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Sanford Dam	RLJ	7/23/2020	BETA 6.3	3
Structure:	Outlet Retaining Walls (L1, R1) (Critical Structure	Checked	Chk Date		Job No
Load Condition:	LC2 - Maintenance (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Bounding Pressures Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-3,000	2.5	1.0	-3000	-7,500	-7,500
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			0	2.5	1	0	0	0
Uplift	0.01	0.01	31	2.50	1.6	50	125	78
Foundation Reaction	1.60	1.55	7,882	2.51	1.6	12612	31,682	19,801
			0	0.00	1	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**9,662**	**24,307**	**12,379**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00024	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	24,202	15,126	1.06	31.9	6.2	25,588	OK	OK

Check Shear on Toe:

Vu: 9,662 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.51	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Bounding Press. Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			4,800	4.00	1.4	6720	26,880	19,200
Soil Weight on Heel			9,120	4.00	1.6	14592	58,368	36,480
Water Weight on Heel			0	4.00	1.6	0	0	0
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	0.01	0.01	-50	4.00	0.9	-45	-180	-200
Foundation Reaction	1.54	1.47	-12,027	3.97	0.9	-10824	-42946	-47,717
			0	8.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**10,443**	**42,123**	7,763

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**-9,076**	**ft-lb**		Ms(heel,global)=	**-5,672**	**ft-lb**	
Mu (heel,computed)=	**42,123**	**ft-lb**		Ms(heel)=	**7,763**	**ft-lb**	**<<Use this**
Mu(stem)=	**15,126**	**ft-lb**	**:<Use this**	Ms(stem)=	**9,454**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**10,443**	**Lb**	<=Use this
Vu(stem)=	**4,348**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00014	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	15,126	7,763	1.00	31.9	3.2	15,126	OK	OK

Check Shear on Heel:

Vu: 10,443 lb
ϕVc: 53,884 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in^2/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L1, R1) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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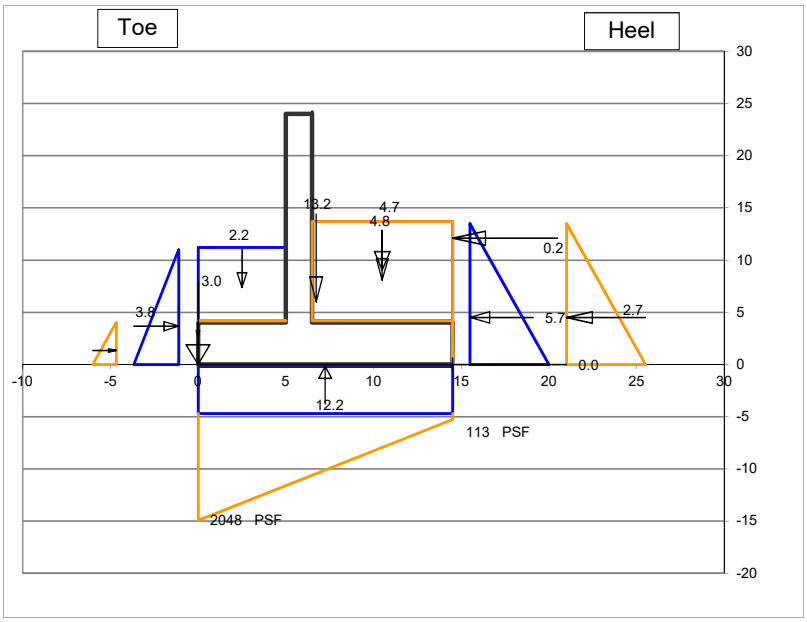
Wall Geometry and Material Properties

Top of Wall Elevation	24	ft
Stem Height	20	ft
Footing Thickness	4	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	4.0	
Base Elevation	0.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	0	
Compute Uplift from Water Levels at Toe/Heel?	N	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	2.22
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	13.5	ft
Water EL at Heel (WaterELh)	13.5	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	13.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	4	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	13.50
Uplift at Heel (UpliftELh	13.50

Misc. Loads

	1	2	3
Name of Load	Compaction	Slab Resistance	
Station	14.5	0.0	
Elevation	12.1	0	
CCW Angle from Vert	270	90	
Magnitude (kips)	0.17	0.00	3
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	3.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	13.2	6.7	89.0	
Soil Weight on Heel	4.8	10.5	50.0	
Water Weight on Heel	4.7	10.5	49.8	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	2.2	2.5	5.5	
Uplift	-12.2	7.3		88.6
Compaction	0.0	14.5		0.0
Slab Resistance	0.0	0.0		
0	3.0	0.0	0.0	
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**15.7**			
HORZONTAL FORCES				
Water Pressure, Heel Side	5.7	4.5		25.6
Soil Pressure, Heel Side	2.68	4.5		12.1
Water Pressure, Toe Side	-3.8	3.7	13.8	
Soil Pressure, Toe Side	0.00	1.3	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	9.0		0.0
EQ Inertia Force (wall + backfill)	0.00	7.2		0.0
Compaction	0.2	12.1		2.1
Slab Resistance	0.0			
0	0.0			
Surcharge	0.0	6.8		0.0
Total Horizontal Force	**4.8**			
Total Moments			**208.0**	**128.3**
Net Moment			**79.7**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.84	KSF
Uplift Pressure at Heel		0.84	KSF
Eccentricity		2.16	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		2.05	KSF
		14.22	PSI
Reaction Pressure at Heel		0.11	KSF
		0.79	PSI
%Base in Compression	100%	14.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		2.22	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L1, R1) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

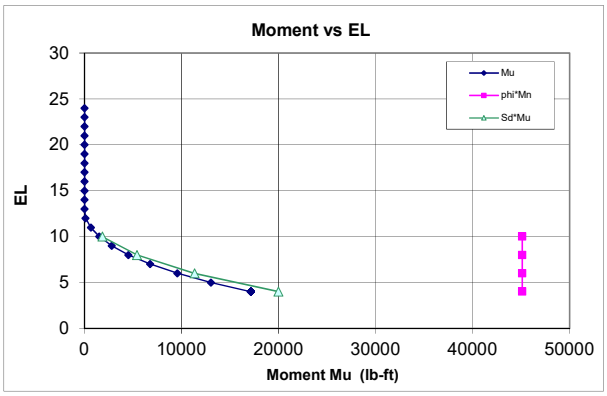
Severe Environmental Exposure? N

Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.2
Load Factor Water, Toe Side	1.2
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Slab Resistanc	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	4	0.00153	0.00205	0.38	6	0.75	8	0.66	15.6	0.00352	45,121	17,160	10,948	1.16	29.6	13.1	19,988	OK	OK
2	6	0.00087	0.00115	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	9,572	6,206	1.18	29.6	7.4	11,331	OK	OK
4	8	0.00041	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	4,519	2,971	1.20	29.6	3.6	5,424	OK	OK
6	10	0.00014	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	1,526	1,007	1.20	29.6	1.2	1,839	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	4	0.22	6	0.75	8	0.66	OK
2	6	0.22	6	0.75	8	0.66	OK
4	8	0.22	6	0.75	8	0.66	OK
6	10	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	4,507	lb	**Optional Diagonal Bars:**		
ϕVc:	18,867	lb	Max of Vu(stem) and Vu(heel):	11,196	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.35	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	3120	12,579	OK
4.0	21.47	0.75	16.1	1.3	20.9	1972	12,579	OK
6.0	21.47	0.75	16.1	1.3	20.9	1061	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Ast_{req} (in²/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Ast_{prov} (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	3
Structure:	**Outlet Retaining Walls (L1, R1) (Critical Structure**	Checked	Chk Date		Job No
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Bounding Pressures Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-3,000	2.5	1.0	-3000	-7,500	-7,500
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			-2184	2.5	1	-2184	-5,460	-5,460
Uplift	0.84	0.84	4,212	2.50	1.6	6739	16,848	10,530
Foundation Reaction	2.05	1.38	8,572	2.66	1.6	13715	36,510	22,819
			0	0.00	1	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**15,270**	**40,398**	**20,389**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00028	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	27,456	17,516	1.08	31.9	7.2	29,631	OK	OK

Check Shear on Toe:

Vu: 15,270 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.51	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Bounding Press. Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			4,800	4.00	1.4	6720	26,880	19,200
Soil Weight on Heel			4,758	4.00	1.6	7612	30,449	19,030
Water Weight on Heel			4,742	4.00	1.6	7588	30,351	18,970
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	0.84	0.84	-6739	4.00	0.9	-6065	-24261	-26,957
Foundation Reaction	1.18	0.11	-5,177	2.90	0.9	-4659	-13513	-15,014
			0	8.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**11,196**	**49,906**	15,229

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**-10,296**	**ft-lb**		Ms(heel,global)=	**-6,569**	**ft-lb**	
Mu (heel,computed)=	**49,906**	**ft-lb**		Ms(heel)=	**15,229**	**ft-lb**	
Mu(stem)=	**17,160**	**ft-lb**	**:<Use this**	Ms(stem)=	**10,948**	**ft-lb**	**<<Use this**

Check Vu above with Vu(stem)

Vu (heel)=	**11,196**	**Lb**	<=Use this
Vu(stem)=	**4,507**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00017	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	17,160	10,948	1.08	31.9	4.5	18,519	OK	OK

Check Shear on Heel:

Vu: 11,196 lb
ϕVc: 53,884 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in^2/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L1, R1) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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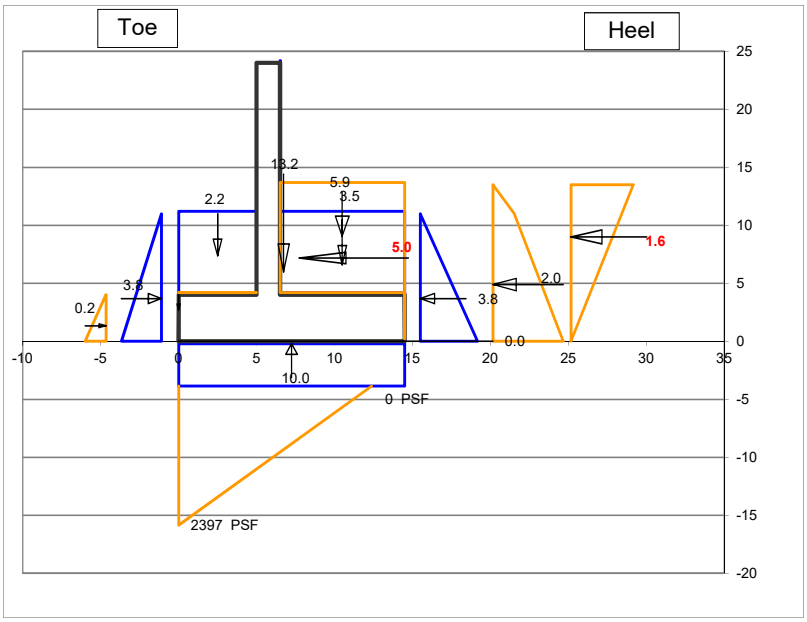
Wall Geometry and Material Properties

Top of Wall Elevation	24	ft
Stem Height	20	ft
Footing Thickness	4	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	4.0	
Base Elevation	0.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	0	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib) (total stress)	24	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.2	Read Me

Stability Summary

Half Section (Yes/No)?	No	
Sliding Factor of Safety	1.40	Sliding FS is calculated without uplift pressure.
Reaction within Middle 1/3 ?	NO	
% Base in Compression	85%	Overturning stability is calculated with uplift pressure.
Foundation Reaction Pressure	OK	



Fill over Heel Input

Backfill EL at Wall (FillELw)	13.5	ft
Water EL at Heel (WaterELh)	11	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	13.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.144	

Fill over Toe Input

Fill EL at Toe (FillELt)	4	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.47	at-rest pressure for level backfill
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force Total stress cohesion = 50 psf	0.62	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Slab Resistance		
Station	0.0		
Elevation	0		
CCW Angle from Vert	90		
Magnitude (kips)	0.00		
Horiz Force	0.00	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	13.2	6.7	89.0	
Soil Weight on Heel	5.9	10.5	62.0	
Water Weight on Heel	3.5	10.5	36.7	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	2.2	2.5	5.5	
Uplift	-9.95	7.3		72.2
Slab Resistance	0.0	0.0		
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**14.8**			
HORZONTAL FORCES				
Water Pressure, Heel Side	3.8	3.7		13.8
Soil Pressure, Heel Side	1.98	4.9		9.7
Water Pressure, Toe Side	-3.8	3.7	13.8	
Soil Pressure, Toe Side	-0.24	1.3	0.3	
EQ Soil Dynamic Component ΔP_{AE}	1.65	9.0		14.8
EQ Inertia Force (wall + backfill)	4.96	7.2		35.6
Slab Resistance	0.0			
0	0.0			
0	0.0			
Surcharge	0.0	6.8		0.0
Total Horizontal Force	**8.3**			
Total Moments			**207.3**	**146.1**
Net Moment			**61.2**	

Safety Factor Evaluation

Uplift Pressure at Toe	0.69	KSF
Uplift Pressure at Heel	0.69	KSF
Eccentricity	3.12	FT
Reaction Within Middle 1/3?	NO	
Reaction Pressure at Toe	2.35	KSF
	16.29	PSI
Reaction Pressure at Heel	-0.30	KSF
	-2.08	PSI
%Base in Compression	See Below	FT
Passive Pressure (Key/Toe)	0.00	KLF
Passive Pressure (Manually Input)	0.62	KLF
Sliding Factor of Safety	See Below	

Modified Cell

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	2.1	2.12	FT
%Base in Compression	85%	12.38	FT
Modified Reaction at the Toe		2.40	KSF
		16.64	PSI
Modified Uplift Force	*Unmodified*	-9.95	KIPS
Modified Uplift Arm	*Unmodified*	7.25	FT
Modified Total Vertical Force		14.83	KIPS
Modified Net Moment	*Unmodified*	61.19	
Modified Sliding F.S.		1.40	

Modified Cell

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L1, R1) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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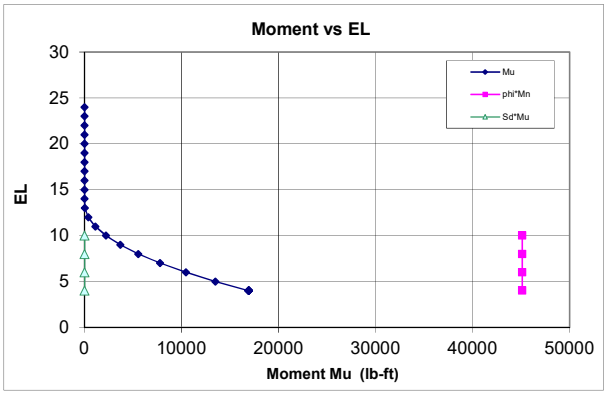
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.2
Load Factor M1 Slab Resistanc		1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	4	0.00130	0.00173	0.32	6	0.75	8	0.66	15.6	0.00352	45,121	16,917	13,997	N/A	N/A	16.7	N/A	OK	OK
2	6	0.00080	0.00106	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	10,442	9,029	N/A	N/A	10.8	N/A	OK	OK
4	8	0.00042	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	5,545	5,001	N/A	N/A	6.0	N/A	OK	OK
6	10	0.00017	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	2,205	2,068	N/A	N/A	2.5	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	4	0.22	6	0.75	8	0.66	OK
2	6	0.22	6	0.75	8	0.66	OK
4	8	0.22	6	0.75	8	0.66	OK
6	10	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	3,636	lb	**Optional Diagonal Bars:**		
ϕVc:	18,867	lb	Max of Vu(stem) and Vu(heel):	13,808	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.43	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	2841	12,579	OK
4.0	21.47	0.75	16.1	1.3	20.9	2057	12,579	OK
6.0	21.47	0.75	16.1	1.3	20.9	1285	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.12	0.12	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	3
Structure:	**Outlet Retaining Walls (L1, R1) (Critical Structure**	Checked	Chk Date		Job No
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Bounding Pressures Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-3,000	2.5	1.0	-3000	-7,500	-7,500
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			-2184	2.5	1	-2184	-5,460	-5,460
Uplift	0.69	0.69	3,432	2.50	1.6	5491	13,728	8,580
Foundation Reaction	2.40	1.43	9,562	2.71	1.6	15300	41,477	25,923
Slab Resistance			0	5.00	1	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**15,607**	**42,245**	**21,543**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 2 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00015	0.00100	0.55	6	0.75	8	0.66	45.6	0.00121	134,221	16,917	13,997	N/A	N/A	5.6	N/A	OK	OK

Check Shear on Toe:

Vu: 15,607 lb
ϕVc: 55,091 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.52	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Bounding Press. Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			4,800	4.00	1.4	6720	26,880	19,200
Soil Weight on Heel			5,906	4.00	1.6	9449	37,796	23,622
Water Weight on Heel			3,494	4.00	1.6	5591	22,364	13,978
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	0.69	0.69	-5491	4.00	0.9	-4942	-19768	-21,965
Foundation Reaction	1.14	0.00	-3,344	1.96	0.9	-3010	-5896	-6,551
			0	0.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**13,808**	**61,376**	28,284

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**61,376**	**ft-lb**		Ms(heel)=	**28,284**	**ft-lb**	
Mu(stem)=	**16,917**	**ft-lb**	**:<Use this**	Ms(stem)=	**13,997**	**ft-lb**	**<<Use this**

Check Vu above with Vu(stem)

Vu (heel)=	**13,808**	**Lb**	<=Use this
Vu(stem)=	**3,636**	**Lb**	

Compute Heel Reinforcement

Cover 2 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00015	0.00100	0.55	6	0.75	8	0.66	45.6	0.00121	134,221	16,917	13,997	N/A	N/A	5.6	N/A	OK	OK

Check Shear on Heel:

Vu: 13,808 lb
ϕVc: 55,091 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in^2/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L1A, R1A) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)	CTF	12/02/20		19C21022.01

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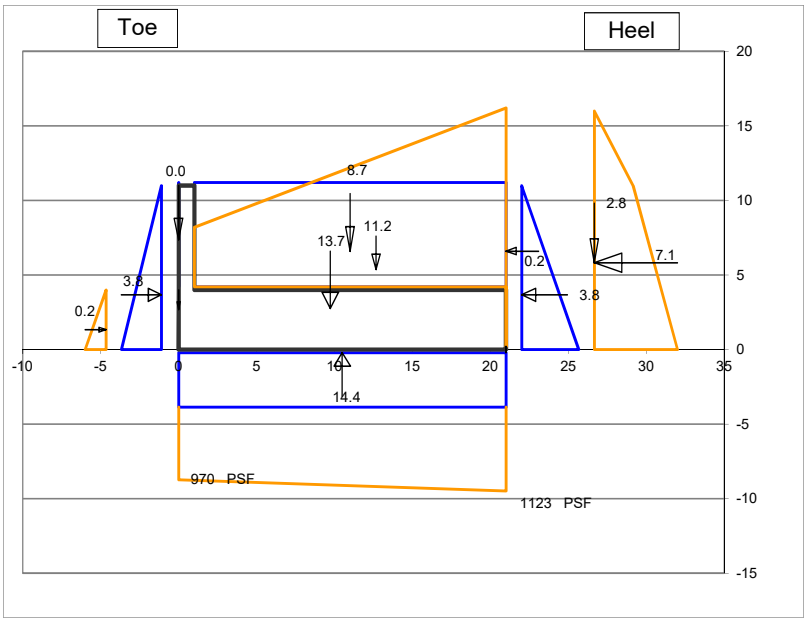
Wall Geometry and Material Properties

Top of Wall Elevation	11	ft
Stem Height	7	ft
Footing Thickness	4	ft
Top Width of Wall	1	ft
Toe Length (Bt)	0	ft
Heel Length (Bh)	20	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1	ft
Top of Footing EL	4.0	
Base Elevation	0.0	ft
Base Width	21.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	0	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	2.08
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	8	ft
Water EL at Heel (WaterELh)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	21.8	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.64	
Sloping Backfill EL at Heel (FillELh)	16.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	4	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.30	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	21.0		
Elevation	6.6		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	13.7	9.7	132.8	
Soil Weight on Heel	11.2	12.7	141.4	
Water Weight on Heel	8.7	11.0	96.1	
Vert Force on Heel from Sloping Fill	2.8	21.0	59.8	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-14.4	10.5		151.4
Compaction	0.0	21.0		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	11.0	0.0	
Total Vertical Force	**22.0**			
HORZONTAL FORCES				
Water Pressure, Heel Side	3.8	3.7		13.8
Soil Pressure, Heel Side	7.11	5.8		41.4
Water Pressure, Toe Side	-3.8	3.7	13.8	
Soil Pressure, Toe Side	-0.15	1.3	0.2	
EQ Soil Dynamic Component ΔP_{AE}	0.00	5.3		0.0
EQ Inertia Force (wall + backfill)	0.00	3.9		0.0
Compaction	0.2	6.6		1.1
0	0.0			
0	0.0			
Surcharge	0.0	8.0		0.0
Total Horizontal Force	**7.1**			
Total Moments			**444.2**	**207.8**
Net Moment			**236.4**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.69	KSF
Uplift Pressure at Heel		0.69	KSF
Eccentricity		-0.25	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		0.97	KSF
		6.74	PSI
Reaction Pressure at Heel		1.12	KSF
		7.80	PSI
%Base in Compression	100%	21.00	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		2.08	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L1A, R1A) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)**	CTF	12/2/2020		19C21022.01

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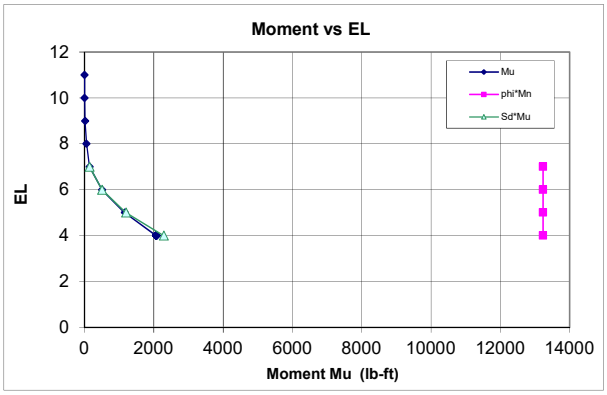
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.2
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	4	0.00045	0.00100	0.14	5	0.63	12	0.31	9.7	0.00267	13,231	2,068	847	1.11	20.0	3.5	2,287	OK	OK
1	5	0.00024	0.00100	0.14	5	0.63	12	0.31	9.7	0.00267	13,231	1,159	444	1.03	20.0	1.8	1,198	OK	OK
2	6	0.00010	0.00100	0.14	5	0.63	12	0.31	9.7	0.00267	13,231	505	153	1.00	20.0	0.6	505	OK	OK
3	7	0.00003	0.00100	0.14	5	0.63	12	0.31	9.7	0.00267	13,231	143	6	1.00	20.0	0.0	143	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	4	0.14	5	0.63	12	0.31	OK
1	5	0.14	5	0.63	12	0.31	OK
2	6	0.14	5	0.63	12	0.31	OK
3	7	0.14	5	0.63	12	0.31	OK

Check Shear:

Vu:	1,061	lb	**Optional Diagonal Bars:**		
ϕVc:	11,697	lb	Max of Vu(stem) and Vu(heel):	21,931	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.69	(in^2/LF)
			As (D bars) for residual shear load:	0.32	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
1.0	21.47	0.63	13.4	1.3	17.4	770	7,799	OK
2.0	21.47	0.63	13.4	1.3	17.4	551	7,799	OK
3.0	21.47	0.63	13.4	1.3	17.4	130	7,799	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	144	0.43	4	8	0.30	4	8	0.30	**0.60**	OK	50%
1.0	144	0.43	4	8	0.30	4	8	0.30	**0.60**	OK	50%
2.0	144	0.43	4	8	0.30	4	8	0.30	**0.60**	OK	50%
3.0	144	0.43	4	8	0.30	4	8	0.30	**0.60**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.08	0.08	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL	TOE & HEEL REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Sanford Dam	RLJ	7/23/2020	BETA 6.3	3
Structure:	Outlet Retaining Walls (L1A, R1A) (Critical Struct	Checked	Chk Date		Job No
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)	CTF	12/2/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			0	0	1.0	0	0	0
Soil Weight on Toe			0	0	0.9	0	0	0
Water Weight on Toe			0	0	0.9	0	0	0
Uplift	0.69	0.69	0	0.00	1.6	0	0	0
Foundation Reaction	0.97	0.97	0	0.00	1.6	0	0	0
			0	0.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**0**	**0**	**0**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
#DIV/0!	#DIV/0!	#DIV/0!	6	0.75	8	0.66	44.6	0.00123	131,251	0	0	#####	31.9	0.0	#DIV/0!	#DIV/0!	#DIV/0!

Check Shear on Toe:

Vu: 0 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.51	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			12,000	10.00	1.4	16800	168,000	120,000
Soil Weight on Heel			11,163	11.67	1.6	17861	208,399	130,249
Water Weight on Heel			8,736	10.00	1.6	13978	139,776	87,360
Vert Force on Heel from Sloping Fill			2,846	20.00	1.6	4553	91,059	56,912
Surcharge			0	20.00	1.2	0	0	0
Uplift	0.69	0.69	-13728	10.00	0.9	-12355	-123552	-137,280
Foundation Reaction	0.98	1.12	-21,006	10.23	0.9	-18905	-193406	-214,895
			0	20.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**21,931**	**290,276**	42,346

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**2,068**	**ft-lb**		Ms(heel,global)=	**847**	**ft-lb**	
Mu (heel,computed)=	**290,276**	**ft-lb**		Ms(heel)=	**42,346**	**ft-lb**	
Mu(stem)=	**2,068**	**ft-lb**	**:<Use this**	Ms(stem)=	**847**	**ft-lb**	**<<Use this**

Check Vu above with Vu(stem)

Vu (heel)=	**21,931**	**Lb**	<=Use this
Vu(stem)=	**1,061**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00002	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	2,068	847	1.00	31.9	0.3	2,068	OK	OK

Check Shear on Heel:

Vu: 21,931 lb
ϕVc: 53,884 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Sanford Dam		
Structure:	Outlet Retaining Walls (L1A, R1A) (Critical Structure)		
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)		

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STABILITY ANALYSIS

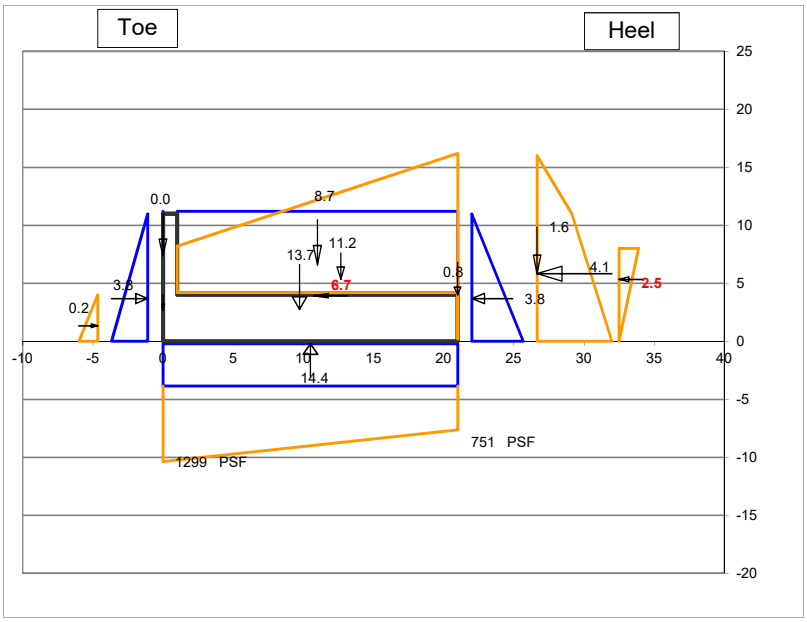
By	Date:	Program Ver:	Sheet
RLJ	07/23/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	12/02/20		19C21022.01

Wall Geometry and Material Properties

Top of Wall Elevation	11	ft
Stem Height	7	ft
Footing Thickness	4	ft
Top Width of Wall	1	ft
Toe Length (Bt)	0	ft
Heel Length (Bh)	20	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1	ft
Top of Footing EL	4.0	
Base Elevation	0.0	ft
Base Width	21.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	0	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	24	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.2	

Stability Summary

Half Section (Yes/No)?	No	
Sliding Factor of Safety	1.30	Sliding FS is calculated without uplift pressure.
Reaction within Middle 1/3 ?	YES	
% Base in Compression	100%	Overturning stability is calculated with uplift pressure.
Foundation Reaction Pressure	OK	



Fill over Heel Input

Backfill EL at Wall (FillELw)	8	ft
Water EL at Heel (WaterELh)	11	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	21.8	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.37	
Sloping Backfill EL at Heel (FillELh)	16.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.623	

Fill over Toe Input

Fill EL at Toe (FillELt)	4	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.47	at-rest pressure for level backfill
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force	Total stress cohesion = 50 psf	1.05	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Slab Bearing		
Station	21.0		
Elevation	4		
CCW Angle from Vert	0		
Magnitude (kips)	0.75		
Horiz Force	0.00	0.00	0.00
Vert Force	0.75	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	13.7	9.7	132.8	
Soil Weight on Heel	11.2	12.7	141.4	
Water Weight on Heel	8.7	11.0	96.1	
Vert Force on Heel from Sloping Fill	1.6	21.0	34.6	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-14.42	10.5		151.4
Slab Bearing	0.8	21.0	15.8	
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	11.0	0.0	
Total Vertical Force	**21.5**			
HORZONTAL FORCES				
Water Pressure, Heel Side	3.8	3.7		13.8
Soil Pressure, Heel Side	4.12	5.8		24.0
Water Pressure, Toe Side	-3.8	3.7	13.8	
Soil Pressure, Toe Side	-0.24	1.3	0.3	
EQ Soil Dynamic Component ΔP_{AE}	2.49	5.3		13.3
EQ Inertia Force (wall + backfill)	6.71	3.9		26.4
Slab Bearing	0.0			
0	0.0			
0	0.0			
Surcharge	0.0	8.0		0.0
Total Horizontal Force	**13.1**			
Total Moments			**434.9**	**228.9**
Net Moment			**206.0**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.69	KSF
Uplift Pressure at Heel		0.69	KSF
Eccentricity		0.93	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.30	KSF
		9.02	PSI
Reaction Pressure at Heel		0.75	KSF
		5.22	PSI
%Base in Compression	100%	21.00	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		1.05	KLF
Sliding Factor of Safety		1.30	

Modified Cell

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force	*Unmodified*	-14.42	KIPS
Modified Uplift Arm	*Unmodified*	10.50	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment	*Unmodified*	N/A	
Modified Sliding F.S.		N/A	

Modified Cell

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L1A, R1A) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/2/2020		19C21022.01

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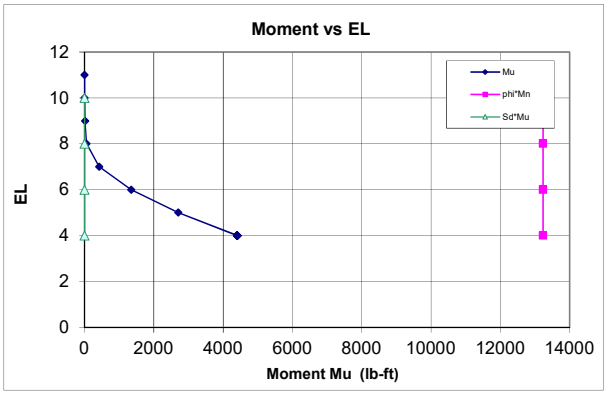
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.2
Load Factor M1 Slab Bearing		1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	4	0.00088	0.00117	0.14	5	0.63	12	0.31	9.7	0.00267	13,231	4,408	3,556	N/A	N/A	14.5	N/A	OK	OK
2	6	0.00027	0.00100	0.14	5	0.63	12	0.31	9.7	0.00267	13,231	1,345	1,068	N/A	N/A	4.4	N/A	OK	OK
4	8	0.00001	0.00100	0.14	5	0.63	12	0.31	9.7	0.00267	13,231	56	0	N/A	N/A	0.0	N/A	OK	OK
6	10	0.00000	0.00100	0.14	5	0.63	12	0.31	9.7	0.00267	13,231	2	0	N/A	N/A	0.0	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	4	0.14	5	0.63	12	0.31	OK
2	6	0.14	5	0.63	12	0.31	OK
4	8	0.14	5	0.63	12	0.31	OK
6	10	0.14	5	0.63	12	0.31	OK

Check Shear:

Vu:	1,830	lb	**Optional Diagonal Bars:**		
ϕVc:	11,697	lb	Max of Vu(stem) and Vu(heel):	18,952	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.60	(in^2/LF)
			As (D bars) for residual shear load:	0.23	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	1160	7,799	OK
4.0	21.47	0.63	13.4	1.3	17.4	56	7,799	OK
6.0	21.47	0.63	13.4	1.3	17.4	6	7,799	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	144	0.43	4	8	0.30	4	8	0.30	**0.60**	OK	50%
2.0	144	0.43	4	8	0.30	4	8	0.30	**0.60**	OK	50%
4.0	144	0.43	4	8	0.30	4	8	0.30	**0.60**	OK	50%
6.0	144	0.43	4	8	0.30	4	8	0.30	**0.60**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.12	0.12	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	BSL	TOE & HEEL REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Sanford Dam	RLJ	7/23/2020	BETA 6.3	3
Structure:	Outlet Retaining Walls (L1A, R1A) (Critical Struct	Checked	Chk Date		Job No
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)	CTF	12/2/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			0	0	1.0	0	0	0
Soil Weight on Toe			0	0	1.6	0	0	0
Water Weight on Toe			0	0	1.2	-1	0	0
Uplift	0.69	0.69	0	0.00	1.4	0	0	0
Foundation Reaction	1.30	1.30	0	0.00	1.1	0	0	0
			0	0.00	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**-1**	**0**	**0**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 2 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00000	0.00100	0.55	6	0.75	8	0.66	45.6	0.00121	134,221	0	0	N/A	N/A	0.0	N/A	OK	OK

Check Shear on Toe:

Vu: -1 lb
ϕVc: 55,091 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.52	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			12,000	10.00	1.4	16800	168,000	120,000
Soil Weight on Heel			11,163	11.67	1.6	17861	208,399	130,249
Water Weight on Heel			8,736	10.00	1.4	12230	122,304	87,360
Vert Force on Heel from Sloping Fill			1,648	20.00	1.6	2637	52,733	32,958
Surcharge			0	20.00	1.2	0	0	0
Uplift	0.69	0.69	-13728	10.00	0.9	-12355	-123552	-137,280
Foundation Reaction	1.27	0.75	-20,246	9.14	0.9	-18221	-166562	-185,069
			0	20.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**18,952**	**261,321**	48,218

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**4,408**	**ft-lb**		Ms(heel,global)=	**3,556**	**ft-lb**	
Mu (heel,computed)=	**261,321**	**ft-lb**		Ms(heel)=	**48,218**	**ft-lb**	
Mu(stem)=	**4,408**	**ft-lb**	**:<Use this**	Ms(stem)=	**3,556**	**ft-lb**	**<<Use this**

Check Vu above with Vu(stem)

Vu (heel)=	**18,952**	**Lb**	<=Use this
Vu(stem)=	**1,830**	**Lb**	

Compute Heel Reinforcement

Cover 2 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00004	0.00100	0.55	6	0.75	8	0.66	45.6	0.00121	134,221	4,408	3,556	N/A	N/A	1.4	N/A	OK	OK

Check Shear on Heel:

Vu: 18,952 lb
ϕVc: 55,091 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Table S4: Stability Summary for Outlet Sidewalls (L2&R2) at Sanford Dam

Load Case	Loading Description	Sliding FOS actual / Req'd FOS	Req'd Slab Resistance (kips)	% Base in Compression / Req'd	Pressure at Toe (psf)	Pressure at Heel (psf)
LC1	Normal Operating Condition, At-Rest (Critical Structure, Usual Load)	2.01 / 2.0	0.50	100 / 100	1422	1027
LC2	Maintenance Condition, At-Rest (Critical Structure, Unusual)	2.15 / 1.5	0	100 / 75	1635	1416
LC3	Post Flood Condition, At-Rest (Critical Structure, Extreme)	1.10 / 1.1	0.65	100 / >0	1296	437
LC4	Seismic Condition, Active (Critical Structure, Extreme)	1.30 / 1.3	1.75	97 / >0	2524	0

Project	**BSL**	**STABILITY ANALYSIS**			
Client	**City of Boiling Spring Lake**	By	Date:	Program Ver:	Sheet
Location	**Sanford Dam**	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L2, R2) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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Wall Geometry and Material Properties

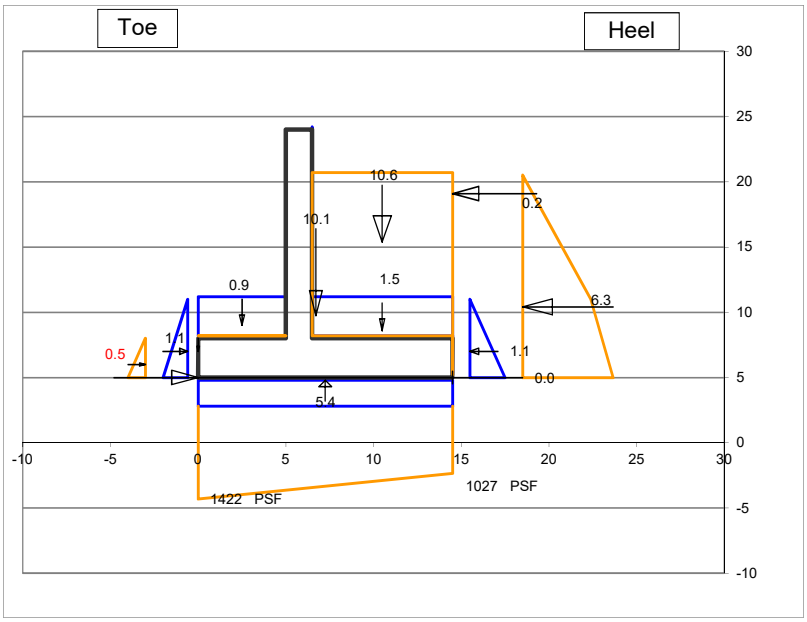
Top of Wall Elevation	24	ft
Stem Height	16	ft
Footing Thickness	3	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	8.0	
Base Elevation	5.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	5	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Fill over Heel Input

Backfill EL at Wall (FillELw)	20.5	ft
Water EL at Heel (WaterELh)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	20.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	**2.01**
Reaction within Middle 1/3 ?	**YES**
% Base in Compression	**100%**
Foundation Reaction Pressure	**OK**



Fill over Toe Input

Fill EL at Toe (FillELt)	8	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction	Slab Resistance	
Station	14.5	0.0	
Elevation	19.1	5	
CCW Angle from Vert	270	90	
Magnitude (kips)	0.17	0.50	
Horiz Force	0.17	-0.50	0.00
Vert Force	0.00	0.00	0.00
Force Appied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.1	6.7	68.0	
Soil Weight on Heel	10.6	10.5	111.5	
Water Weight on Heel	1.5	10.5	15.7	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.9	2.5	2.3	
Uplift	-5.4	7.3		39.4
Compaction	0.0	14.5		0.0
Slab Resistance	0.0	0.0	0.0	
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**17.8**			
HORZONTAL FORCES				
Water Pressure, Heel Side	1.1	2.0		2.2
Soil Pressure, Heel Side	6.29	5.4		34.0
Water Pressure, Toe Side	-1.1	2.0	2.2	
Soil Pressure, Toe Side	0.00	1.0	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	10.3		0.0
EQ Inertia Force (wall + backfill)	0.00	7.2		0.0
Compaction	0.2	14.1		2.4
Slab Resistance	-0.5	0.0	0.0	
0	0.0			
Surcharge	0.0	7.8		0.0
Total Horizontal Force	**6.0**			
Total Moments			**199.9**	**78.1**
Net Moment			**121.8**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.37	KSF
Uplift Pressure at Heel		0.37	KSF
Eccentricity		0.39	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		1.42	KSF
		9.87	PSI
Reaction Pressure at Heel		1.03	KSF
		7.13	PSI
%Base in Compression	100%	**14.50**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**2.01**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L2, R2) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

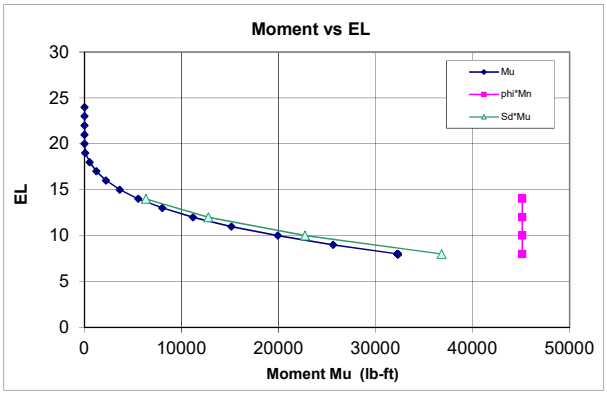
Severe Environmental Exposure? N

Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.2
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Slab Resistanc	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	8	0.00285	0.00335	0.63	6	0.75	8	0.66	15.6	0.00352	45,121	32,297	20,150	1.14	29.6	24.1	36,790	OK	OK
2	10	0.00175	0.00233	0.44	6	0.75	8	0.66	15.6	0.00352	45,121	19,913	12,444	1.14	29.6	14.9	22,721	OK	OK
4	12	0.00098	0.00130	0.24	6	0.75	8	0.66	15.6	0.00352	45,121	11,192	6,995	1.14	29.6	8.4	12,771	OK	OK
6	14	0.00048	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	5,535	3,459	1.14	29.6	4.1	6,316	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	8	0.22	6	0.75	8	0.66	OK
2	10	0.22	6	0.75	8	0.66	OK
4	12	0.22	6	0.75	8	0.66	OK
6	14	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	7,188	lb	**Optional Diagonal Bars:**		
ϕVc:	18,867	lb	Max of Vu(stem) and Vu(heel):	13,559	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.43	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	5235	12,579	OK
4.0	21.47	0.75	16.1	1.3	20.9	3536	12,579	OK
6.0	21.47	0.75	16.1	1.3	20.9	2182	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Ast_{req} (in²/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Ast_{prov} (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL	TOE & HEEL REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Sanford Dam	RLJ	7/23/2020	BETA 6.3	3
Structure:	Outlet Retaining Walls (L2, R2) (Critical Structure	Checked	Chk Date		Job No
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-2,250	2.5	1.0	-2250	-5,625	-5,625
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			-936	2.5	1	-936	-2,340	-2,340
Uplift	0.37	0.37	1,872	2.50	1.6	2995	7,488	4,680
Foundation Reaction	1.42	1.29	6,768	2.54	1.6	10829	27,527	17,205
			0	0.00	1	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**10,639**	**27,050**	**13,920**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00047	0.00100	0.39	6	0.75	8	0.66	32.6	0.00169	95,611	27,050	13,920	1.00	31.1	7.9	27,050	OK	OK

Check Shear on Toe:

Vu: 10,639 lb
ϕVc: 39,394 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq in^2/LF	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.38	5	0.63	8	0.47	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,600	4.00	1.4	5040	20,160	14,400
Soil Weight on Heel			10,622	4.00	1.6	16996	67,983	42,490
Water Weight on Heel			1,498	4.00	1.6	2396	9,585	5,990
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	0.37	0.37	-2995	4.00	0.9	-2696	-10783	-11,981
Foundation Reaction	1.24	1.03	-9,086	3.87	0.9	-8178	-31664	-35,183
			0	8.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**13,559**	**55,281**	15,717

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**5,246**	**ft-lb**		Ms(heel,global)=	**6,231**	**ft-lb**	
Mu (heel,computed)=	**55,281**	**ft-lb**		Ms(heel)=	**15,717**	**ft-lb**	**<<Use this**
Mu(stem)=	**32,297**	**ft-lb**	**:<Use this**	Ms(stem)=	**20,150**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**13,559**	**Lb**	<=Use this
Vu(stem)=	**7,188**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00056	0.00100	0.39	6	0.75	8	0.66	32.6	0.00169	95,611	32,297	15,717	1.00	31.1	8.9	32,297	OK	OK

Check Shear on Heel:

Vu: 13,559 lb
ϕVc: 39,394 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
432	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L2, R2) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC2 - Maintenance (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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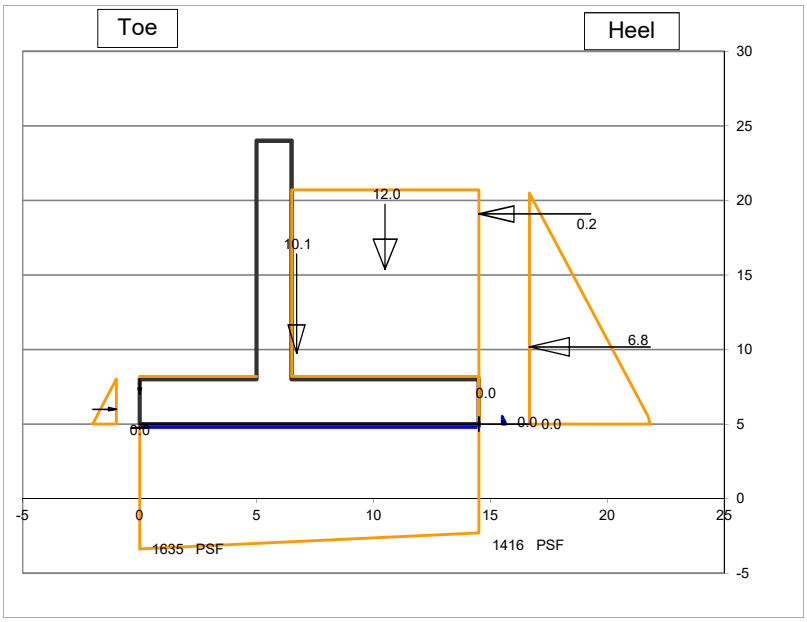
Wall Geometry and Material Properties

Top of Wall Elevation	24	ft
Stem Height	16	ft
Footing Thickness	3	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	8.0	
Base Elevation	5.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	5	
Compute Uplift from Water Levels at Toe/Heel?	N	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	2.15
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	20.5	ft
Water EL at Heel (WaterELh)	5.5	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	20.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	8	ft
Water EL at Toe (WaterELt)	5.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction	Slab Resistance	
Station	14.5	0.0	
Elevation	19.1	5	
CCW Angle from Vert	270	90	
Magnitude (kips)	0.17	0.00	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Appied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.1	6.7	68.0	
Soil Weight on Heel	12.0	10.5	126.0	
Water Weight on Heel	0.0	14.5	0.0	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	0.0	0.0		0.0
Compaction	0.0	14.5		0.0
Slab Resistance	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**22.1**			
HORZONTAL FORCES				
Water Pressure, Heel Side	0.0	0.2		0.0
Soil Pressure, Heel Side	6.77	5.2		35.0
Water Pressure, Toe Side	0.0	0.0	0.0	
Soil Pressure, Toe Side	0.00	1.0	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	10.3		0.0
EQ Inertia Force (wall + backfill)	0.00	6.6		0.0
Compaction	0.2	14.1		2.4
Slab Resistance	0.0			
0	0.0			
Surcharge	0.0	7.8		0.0
Total Horizontal Force	**7.0**			
Total Moments			**194.0**	**37.4**
Net Moment			**156.6**	

Safety Factor Evaluation

Uplift Pressure at Toe		-0.31	KSF
Uplift Pressure at Heel		-0.31	KSF
Eccentricity		0.17	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.64	KSF
		11.36	PSI
Reaction Pressure at Heel		1.42	KSF
		9.84	PSI
%Base in Compression	100%	14.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		2.15	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L2, R2) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC2 - Maintenance (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

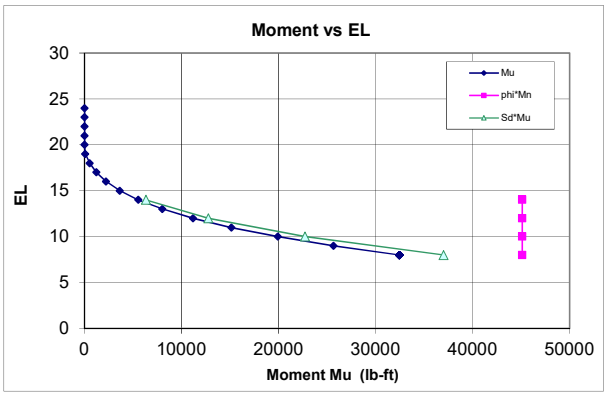
Severe Environmental Exposure? N

Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.2
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Slab Resistanc	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	8	0.00287	0.00335	0.63	6	0.75	8	0.66	15.6	0.00352	45,121	32,435	20,272	1.14	29.6	24.3	37,012	OK	OK
2	10	0.00175	0.00233	0.44	6	0.75	8	0.66	15.6	0.00352	45,121	19,918	12,449	1.14	29.6	14.9	22,729	OK	OK
4	12	0.00098	0.00130	0.24	6	0.75	8	0.66	15.6	0.00352	45,121	11,192	6,995	1.14	29.6	8.4	12,771	OK	OK
6	14	0.00048	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	5,535	3,459	1.14	29.6	4.1	6,316	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	8	0.22	6	0.75	8	0.66	OK
2	10	0.22	6	0.75	8	0.66	OK
4	12	0.22	6	0.75	8	0.66	OK
6	14	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	7,326	lb	**Optional Diagonal Bars:**		
ϕVc:	18,867	lb	Max of Vu(stem) and Vu(heel):	15,854	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.50	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	5251	12,579	OK
4.0	21.47	0.75	16.1	1.3	20.9	3536	12,579	OK
6.0	21.47	0.75	16.1	1.3	20.9	2182	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Ast_{req} (in²/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Ast_{prov} (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL	TOE & HEEL REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Sanford Dam	RLJ	7/23/2020	BETA 6.3	3
Structure:	Outlet Retaining Walls (L2, R2) (Critical Structure	Checked	Chk Date		Job No
Load Condition:	LC2 - Maintenance (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-2,250	2.5	1.0	-2250	-5,625	-5,625
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			0	2.5	1	0	0	0
Uplift	-0.31	-0.31	-1,560	2.50	1.6	-2496	-6,240	-3,900
Foundation Reaction	1.64	1.56	7,988	2.52	1.6	12781	32,203	20,127
			0	0.00	1	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**8,035**	**20,338**	**10,602**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00035	0.00100	0.39	6	0.75	8	0.66	32.6	0.00169	95,611	20,338	10,602	1.00	31.1	6.0	20,338	OK	OK

Check Shear on Toe:

Vu: 8,035 lb
ϕVc: 39,394 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq in^2/LF	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.38	5	0.63	8	0.47	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,600	4.00	1.4	5040	20,160	14,400
Soil Weight on Heel			12,000	4.00	1.6	19200	76,800	48,000
Water Weight on Heel			0	4.00	1.6	0	0	0
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	-0.31	-0.31	2496	4.00	0.9	2246	8986	9,984
Foundation Reaction	1.54	1.42	-11,814	3.95	0.9	-10633	-41952	-46,613
			0	8.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**15,854**	**63,994**	25,771

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**12,096**	**ft-lb**		Ms(heel,global)=	**9,670**	**ft-lb**	
Mu (heel,computed)=	**63,994**	**ft-lb**		Ms(heel)=	**25,771**	**ft-lb**	
Mu(stem)=	**32,435**	**ft-lb**	**:<Use this**	Ms(stem)=	**20,272**	**ft-lb**	**<<Use this**

Check Vu above with Vu(stem)

Vu (heel)=	**15,854**	**Lb**	<=Use this
Vu(stem)=	**7,326**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00062	0.00100	0.39	6	0.75	8	0.66	32.6	0.00169	95,611	32,435	20,272	1.09	31.1	11.4	35,229	OK	OK

Check Shear on Heel:

Vu: 15,854 lb
ϕVc: 39,394 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
432	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L2, R2) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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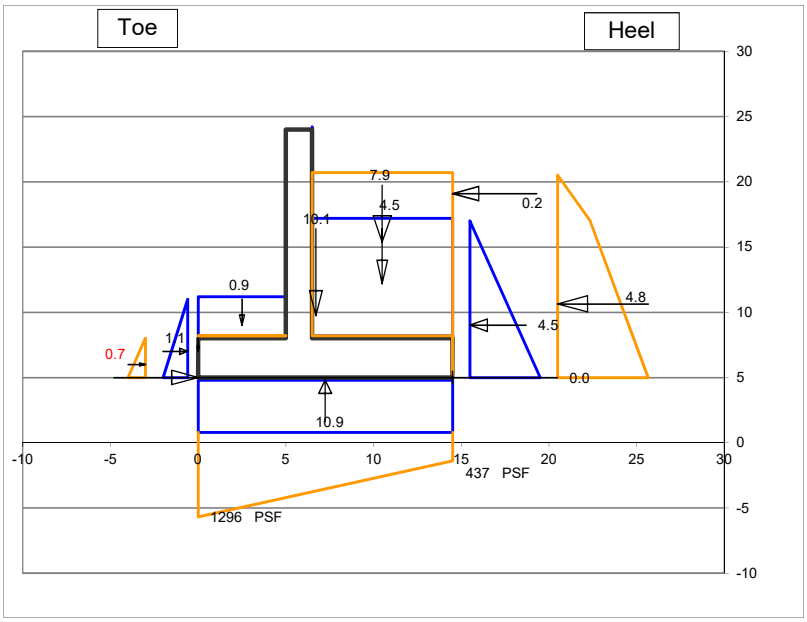
Wall Geometry and Material Properties

Top of Wall Elevation	24	ft
Stem Height	16	ft
Footing Thickness	3	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	8.0	
Base Elevation	5.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	5	
Compute Uplift from Water Levels at Toe/Heel?	N	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.10
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	20.5	ft
Water EL at Heel (WaterELh)	17.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	20.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	8	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	17
Uplift at Heel (UpliftELh	17

Misc. Loads

	1	2	3
Name of Load	Compaction	Slab Resistance	
Station	14.5	0.0	
Elevation	19.1	5	
CCW Angle from Vert	270	90	
Magnitude (kips)	0.17	0.65	
Horiz Force	0.17	-0.65	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.1	6.7	68.0	
Soil Weight on Heel	7.9	10.5	82.6	
Water Weight on Heel	4.5	10.5	47.2	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.9	2.5	2.3	
Uplift	-10.9	7.3		78.7
Compaction	0.0	14.5		0.0
Slab Resistance	0.0	0.0	0.0	
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**12.6**			
HORZONTAL FORCES				
Water Pressure, Heel Side	4.5	4.0		18.0
Soil Pressure, Heel Side	4.83	5.6		27.2
Water Pressure, Toe Side	-1.1	2.0	2.2	
Soil Pressure, Toe Side	0.00	1.0	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	10.3		0.0
EQ Inertia Force (wall + backfill)	0.00	7.3		0.0
Compaction	0.2	14.1		2.4
Slab Resistance	-0.7	0.0	0.0	
0	0.0			
Surcharge	0.0	7.8		0.0
Total Horizontal Force	**7.7**			
Total Moments			**202.4**	**126.4**
Net Moment			**76.0**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.75	KSF
Uplift Pressure at Heel		0.75	KSF
Eccentricity		1.20	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.30	KSF
		9.00	PSI
Reaction Pressure at Heel		0.44	KSF
		3.03	PSI
%Base in Compression	100%	14.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.10	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L2, R2) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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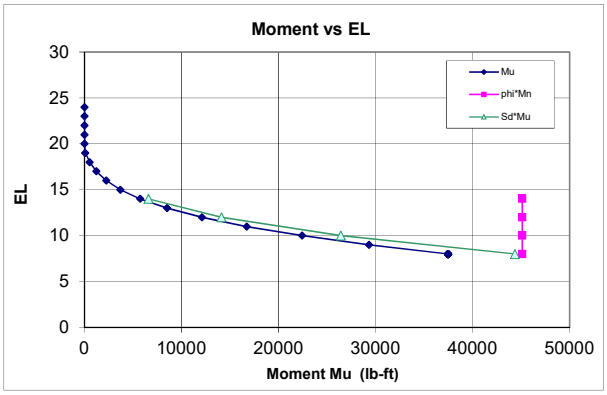
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.2
Load Factor Water, Toe Side	1.2
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Slab Resistanc	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	8	0.00346	0.00335	0.65	6	0.75	8	0.66	15.6	0.00352	45,121	37,467	24,294	1.18	29.6	29.1	44,356	OK	OK
2	10	0.00204	0.00271	0.51	6	0.75	8	0.66	15.6	0.00352	45,121	22,432	14,463	1.18	29.6	17.3	26,407	OK	OK
4	12	0.00108	0.00144	0.27	6	0.75	8	0.66	15.6	0.00352	45,121	12,113	7,733	1.17	29.6	9.3	14,119	OK	OK
6	14	0.00050	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	5,733	3,618	1.15	29.6	4.3	6,607	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	8	0.22	6	0.75	8	0.66	OK
2	10	0.22	6	0.75	8	0.66	OK
4	12	0.22	6	0.75	8	0.66	OK
6	14	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	8,779	lb	**Optional Diagonal Bars:**		
ϕVc:	18,867	lb	Max of Vu(stem) and Vu(heel):	14,574	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.46	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	6296	12,579	OK
4.0	21.47	0.75	16.1	1.3	20.9	4088	12,579	OK
6.0	21.47	0.75	16.1	1.3	20.9	2381	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL	TOE & HEEL REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Sanford Dam	RLJ	7/23/2020	BETA 6.3	3
Structure:	Outlet Retaining Walls (L2, R2) (Critical Structure	Checked	Chk Date		Job No
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-2,250	2.5	1.0	-2250	-5,625	-5,625
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			-936	2.5	1	-936	-2,340	-2,340
Uplift	0.75	0.75	3,744	2.50	1.6	5990	14,976	9,360
Foundation Reaction	1.30	1.00	5,741	2.61	1.6	9185	23,951	14,969
			0	0.00	1	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**11,989**	**30,962**	**16,364**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00054	0.00100	0.39	6	0.75	8	0.66	32.6	0.00169	95,611	30,962	16,364	1.00	31.1	9.2	30,962	OK	OK

Check Shear on Toe:

Vu: 11,989 lb
ϕVc: 39,394 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq in^2/LF	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.38	5	0.63	8	0.47	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,600	4.00	1.4	5040	20,160	14,400
Soil Weight on Heel			7,867	4.00	1.6	12588	50,350	31,469
Water Weight on Heel			4,493	4.00	1.6	7188	28,754	17,971
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	0.75	0.75	-5990	4.00	0.9	-5391	-21565	-23,962
Foundation Reaction	0.91	0.44	-5,390	3.53	0.9	-4851	-17126	-19,029
			0	8.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**14,574**	**60,572**	20,849

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**6,505**	**ft-lb**		Ms(heel,global)=	**7,930**	**ft-lb**	
Mu (heel,computed)=	**60,572**	**ft-lb**		Ms(heel)=	**20,849**	**ft-lb**	**<<Use this**
Mu(stem)=	**37,467**	**ft-lb**	**:<Use this**	Ms(stem)=	**24,294**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**14,574**	**Lb**	<=Use this
Vu(stem)=	**8,779**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00066	0.00100	0.39	6	0.75	8	0.66	32.6	0.00169	95,611	37,467	20,849	1.00	31.1	11.8	37,467	OK	OK

Check Shear on Heel:

Vu: 14,574 lb
ϕVc: 39,394 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
432	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L2, R2) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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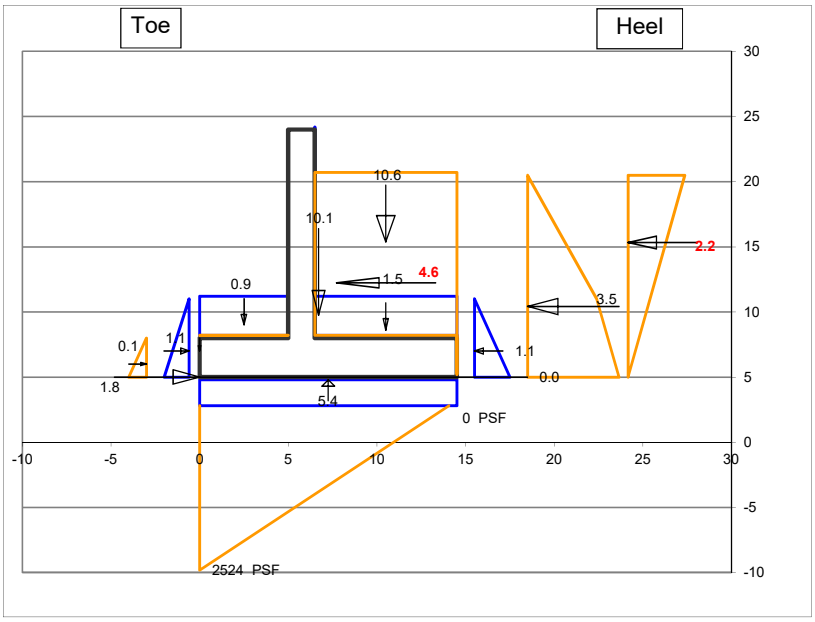
Wall Geometry and Material Properties

Top of Wall Elevation	24	ft
Stem Height	16	ft
Footing Thickness	3	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	8.0	
Base Elevation	5.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	5	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib) (total stress)	24	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.2	Read Me

Stability Summary

Half Section (Yes/No)?	No	
Sliding Factor of Safety	1.30	Sliding FS is calculated without uplift pressure.
Reaction within Middle 1/3 ?	NO	
% Base in Compression	97%	Overturning stability is calculated with uplift pressure.
Foundation Reaction Pressure	OK	



Fill over Heel Input

Backfill EL at Wall (FillELw)	20.5	ft
Water EL at Heel (WaterELh)	11	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	20.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.144	

Fill over Toe Input

Fill EL at Toe (FillELt)	8	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.47	at-rest pressure for level backfill
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force Total stress cohesion = 50 psf	0.70	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Slab Resistance		
Station	0.0		
Elevation	5		
CCW Angle from Vert	90		
Magnitude (kips)	1.75		
Horiz Force	-1.75	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.1	6.7	68.0	
Soil Weight on Heel	10.6	10.5	111.5	
Water Weight on Heel	1.5	10.5	15.7	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.9	2.5	2.3	
Uplift	-5.43	7.3		39.4
Slab Resistance	0.0	0.0	0.0	
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**17.8**			
HORZONTAL FORCES				
Water Pressure, Heel Side	1.1	2.0		2.2
Soil Pressure, Heel Side	3.55	5.4		19.2
Water Pressure, Toe Side	-1.1	2.0	2.2	
Soil Pressure, Toe Side	-0.13	1.0	0.1	
EQ Soil Dynamic Component ΔP_{AE}	2.17	10.3		22.4
EQ Inertia Force (wall + backfill)	4.64	7.2		33.5
Slab Resistance	-1.8	0.0	0.0	
0	0.0			
0	0.0			
Surcharge	0.0	7.8		0.0
Total Horizontal Force	**8.5**			
Total Moments			**200.0**	**116.8**
Net Moment			**83.2**	

Safety Factor Evaluation

Uplift Pressure at Toe	0.37	KSF
Uplift Pressure at Heel	0.37	KSF
Eccentricity	2.56	FT
Reaction Within Middle 1/3?	NO	
Reaction Pressure at Toe	2.52	KSF
	17.51	PSI
Reaction Pressure at Heel	-0.07	KSF
	-0.51	PSI
%Base in Compression	See Below	FT
Passive Pressure (Key/Toe)	0.00	KLF
Passive Pressure (Manually Input)	0.70	KLF
Sliding Factor of Safety	See Below	

Modified Cell

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.4	0.44	FT
%Base in Compression	97%	14.06	FT
Modified Reaction at the Toe		2.52	KSF
		17.53	PSI
Modified Uplift Force	*Unmodified*	-5.43	KIPS
Modified Uplift Arm	*Unmodified*	7.25	FT
Modified Total Vertical Force		17.75	KIPS
Modified Net Moment	*Unmodified*	83.23	
Modified Sliding F.S.		1.30	

Modified Cell

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L2, R2) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

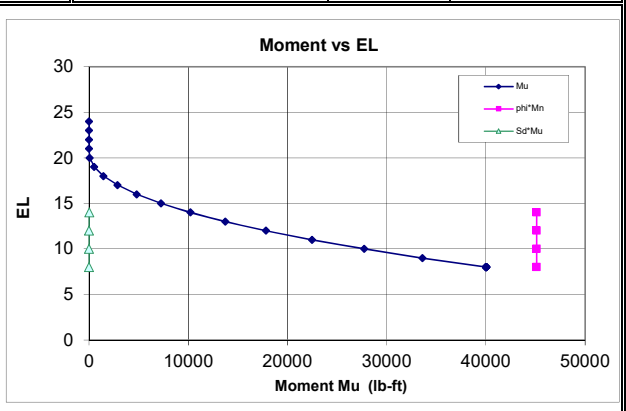
Severe Environmental Exposure? N

Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.2
Load Factor M1 Slab Resistanc		1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	8	0.00311	0.00335	0.63	6	0.75	8	0.66	15.6	0.00352	45,121	40,030	33,799	N/A	N/A	40.4	N/A	OK	OK
2	10	0.00214	0.00285	0.53	6	0.75	8	0.66	15.6	0.00352	45,121	27,737	24,052	N/A	N/A	28.8	N/A	OK	OK
4	12	0.00137	0.00182	0.34	6	0.75	8	0.66	15.6	0.00352	45,121	17,821	15,866	N/A	N/A	19.0	N/A	OK	OK
6	14	0.00078	0.00104	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	10,213	9,339	N/A	N/A	11.2	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	8	0.22	6	0.75	8	0.66	OK
2	10	0.22	6	0.75	8	0.66	OK
4	12	0.22	6	0.75	8	0.66	OK
6	14	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	6,746	lb	**Optional Diagonal Bars:**		
ϕVc:	18,867	lb	Max of Vu(stem) and Vu(heel):	16,815	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.53	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	5550	12,579	OK
4.0	21.47	0.75	16.1	1.3	20.9	4372	12,579	OK
6.0	21.47	0.75	16.1	1.3	20.9	3247	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Ast_{req} (in²/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Ast_{prov} (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.09	0.09	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	BSL	TOE & HEEL REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Sanford Dam	RLJ	7/23/2020	BETA 6.3	3
Structure:	Outlet Retaining Walls (L2, R2) (Critical Structure	Checked	Chk Date		Job No
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-2,250	2.5	1.0	-2250	-5,625	-5,625
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			-936	2.5	1	-936	-2,340	-2,340
Uplift	0.37	0.37	1,872	2.50	1.6	2995	7,488	4,680
Foundation Reaction	2.52	1.63	10,378	2.68	1.6	16606	44,505	27,816
Slab Resistance			0	5.00	1	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**16,415**	**44,028**	**24,531**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00077	0.00103	0.40	6	0.75	8	0.66	32.6	0.00169	95,611	44,028	24,531	N/A	N/A	13.9	N/A	OK	OK

Check Shear on Toe:

Vu: 16,415 lb
ϕVc: 39,394 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.38	5	0.63	8	0.47	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,600	4.00	1.4	5040	20,160	14,400
Soil Weight on Heel			10,622	4.00	1.6	16996	67,983	42,490
Water Weight on Heel			1,498	4.00	1.4	2097	8,387	5,990
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	0.37	0.37	-2995	4.00	0.9	-2696	-10783	-11,981
Foundation Reaction	1.36	0.00	-5,135	2.52	0.9	-4622	-11654	-12,948
			0	0.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**16,815**	**74,094**	37,951

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**-3,998**	**ft-lb**		Ms(heel,global)=	**9,268**	**ft-lb**	
Mu (heel,computed)=	**74,094**	**ft-lb**		Ms(heel)=	**37,951**	**ft-lb**	
Mu(stem)=	**40,030**	**ft-lb**	**:<Use this**	Ms(stem)=	**33,799**	**ft-lb**	**<<Use this**

Check Vu above with Vu(stem)

Vu (heel)=	**16,815**	**Lb**	<=Use this
Vu(stem)=	**6,746**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00070	0.00100	0.39	6	0.75	8	0.66	32.6	0.00169	95,611	40,030	33,799	N/A	N/A	19.1	N/A	OK	OK

Check Shear on Heel:

Vu: 16,815 lb
ϕVc: 39,394 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
432	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Table S5: Stability Summary for Outlet Sidewall (L3&R3) at Sanford Dam

Load Case	Loading Description	Sliding FOS actual / Req'd FOS	Req'd Slab Resistance (kips)	% Base in Compression / Req'd	Pressure at Toe (psf)	Pressure at Heel (psf)
LC1	Normal Operating Condition, At-Rest (Critical Structure, Usual Load)	2.00 / 2.0	1.30	100 / 100	2008	1138
LC2	Maintenance Condition, At-Rest (Critical Structure, Unusual)	1.83 / 1.5	0	100 / 75	2134	1262
LC3	Post Flood Condition, At-Rest (Critical Structure, Extreme)	1.18 / 1.1	0	100 / >0	1714	711
LC4	Seismic Condition, Active (Critical Structure, Extreme)	1.30 / 1.3	3.80	93 / >0	3367	0

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L3, R3) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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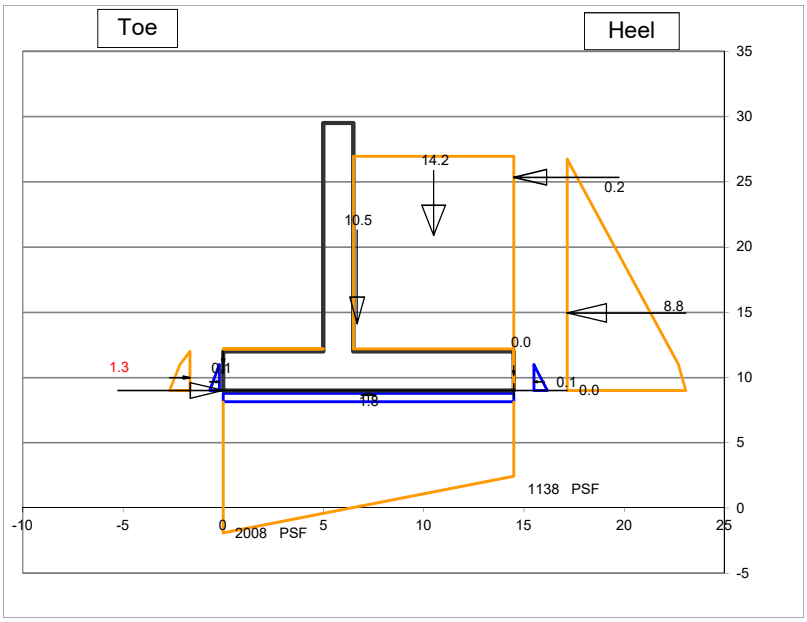
Wall Geometry and Material Properties

Top of Wall Elevation	29.5	ft
Stem Height	17.5	ft
Footing Thickness	3	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	12.0	
Base Elevation	9.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	9	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	2.00
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	26.75	ft
Water EL at Heel (WaterELh)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	26.8	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	12	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction	Slab Resistance	
Station	14.5	0.0	
Elevation	25.35	9	
CCW Angle from Vert	270	90	
Magnitude (kips)	0.17	1.30	
Horiz Force	0.17	-1.30	0.00
Vert Force	0.00	0.00	0.00
Force Appied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.5	6.7	69.9	
Soil Weight on Heel	14.2	10.5	148.7	
Water Weight on Heel	0.0	14.5	0.0	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-1.8	7.3		13.1
Compaction	0.0	14.5		0.0
Slab Resistance	0.0	0.0	0.0	
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**22.8**			
HORZONTAL FORCES				
Water Pressure, Heel Side	0.1	0.7		0.1
Soil Pressure, Heel Side	8.83	5.9		52.5
Water Pressure, Toe Side	-0.1	0.7	0.1	
Soil Pressure, Toe Side	0.00	1.0	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	11.8		0.0
EQ Inertia Force (wall + backfill)	0.00	8.0		0.0
Compaction	0.2	16.4		2.8
Slab Resistance	-1.3	0.0	0.0	
0	0.0			
Surcharge	0.0	8.9		0.0
Total Horizontal Force	**7.7**			
Total Moments			**218.7**	**68.6**
Net Moment			**150.2**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.12	KSF
Uplift Pressure at Heel		0.12	KSF
Eccentricity		0.67	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		2.01	KSF
		13.95	PSI
Reaction Pressure at Heel		1.14	KSF
		7.91	PSI
%Base in Compression	100%	14.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		2.00	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L3, R3) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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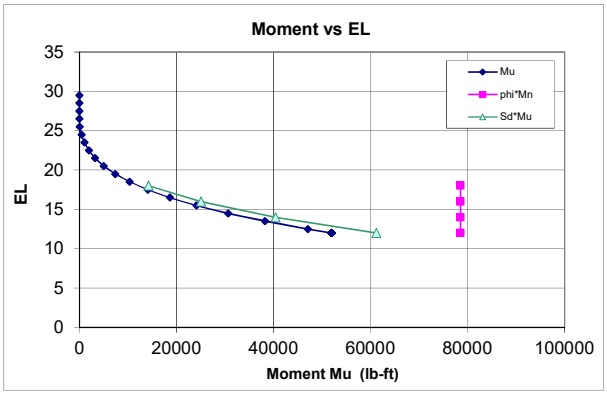
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.2
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Slab Resistanc	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	12	0.00490	0.00335	0.91	8	1.00	8	1.19	15.5	0.00637	78,511	51,946	32,466	1.18	28.7	22.3	61,172	OK	OK
2	14	0.00319	0.00335	0.62	8	1.00	8	1.19	15.5	0.00637	78,511	34,302	21,439	1.18	28.7	14.7	40,394	OK	OK
4	16	0.00196	0.00261	0.49	8	1.00	8	1.19	15.5	0.00637	78,511	21,260	13,288	1.18	28.7	9.1	25,036	OK	OK
6	18	0.00111	0.00148	0.27	8	1.00	8	1.19	15.5	0.00637	78,511	12,100	7,563	1.18	28.7	5.2	14,249	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	12	0.22	6	0.75	8	0.66	OK
2	14	0.22	6	0.75	8	0.66	OK
4	16	0.22	6	0.75	8	0.66	OK
6	18	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	10,093	lb	**Optional Diagonal Bars:**		
ϕVc:	18,716	lb	Max of Vu(stem) and Vu(heel):	16,873	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.53	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
2.0	33.54	1.00	33.5	1.3	43.6	7611	12,478	OK
4.0	33.54	1.00	33.5	1.3	43.6	5490	12,478	OK
6.0	33.54	1.00	33.5	1.3	43.6	3730	12,478	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	3
Structure:	**Outlet Retaining Walls (L3, R3) (Critical Structure**	Checked	Chk Date		Job No
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 2.0) (LCC = Usual) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-2,250	2.5	1.0	-2250	-5,625	-5,625
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			0	2.5	1	0	0	0
Uplift	0.12	0.12	624	2.50	1.6	998	2,496	1,560
Foundation Reaction	2.01	1.71	9,291	2.57	1.6	14866	38,164	23,853
			0	0.00	0.9	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**13,614**	**35,035**	**19,788**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00061	0.00100	0.39	6	0.75	8	0.66	32.6	0.00169	95,611	35,035	19,788	1.00	31.1	11.2	35,035	OK	OK

Check Shear on Toe:

Vu: 13,614 lb
ϕVc: 39,394 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq in^2/LF	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.38	5	0.63	8	0.47	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,600	4.00	1.4	5040	20,160	14,400
Soil Weight on Heel			14,160	4.00	1.6	22656	90,624	56,640
Water Weight on Heel			0	4.00	1.6	0	0	0
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	0.12	0.12	-998	4.00	0.9	-899	-3594	-3,994
Foundation Reaction	1.62	1.14	-11,027	3.77	0.9	-9924	-37393	-41,548
			0	8.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**16,873**	**69,796**	25,498

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**16,911**	**ft-lb**		Ms(heel,global)=	**12,679**	**ft-lb**	
Mu (heel,computed)=	**69,796**	**ft-lb**		Ms(heel)=	**25,498**	**ft-lb**	**<<Use this**
Mu(stem)=	**51,946**	**ft-lb**	**:<Use this**	Ms(stem)=	**32,466**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**16,873**	**Lb**	<=Use this
Vu(stem)=	**10,093**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00091	0.00121	0.48	6	0.75	8	0.66	32.6	0.00169	95,611	51,946	25,498	1.00	31.1	14.4	51,946	OK	OK

Check Shear on Heel:

Vu: 16,873 lb
ϕVc: 39,394 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
432	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L3, R3) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC2 - Maintenace (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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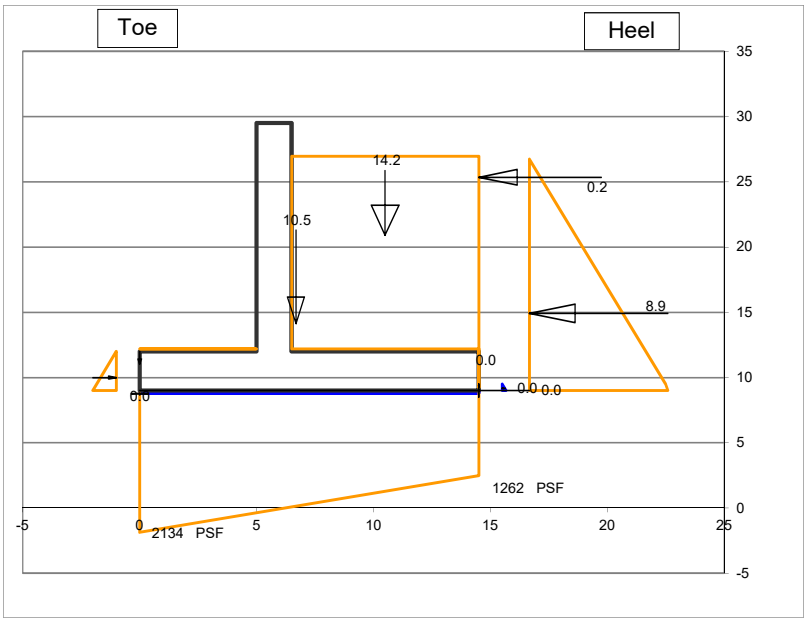
Wall Geometry and Material Properties

Top of Wall Elevation	29.5	ft
Stem Height	17.5	ft
Footing Thickness	3	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	12.0	
Base Elevation	9.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	9	
Compute Uplift from Water Levels at Toe/Heel?	N	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.83
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	26.75	ft
Water EL at Heel (WaterELh)	9.5	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	26.8	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	12	ft
Water EL at Toe (WaterELt)	9.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction	Slab Resistance	
Station	14.5	0.0	
Elevation	25.35	9	
CCW Angle from Vert	270	90	
Magnitude (kips)	0.17	0.00	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.5	6.7	69.9	
Soil Weight on Heel	14.2	10.5	148.7	
Water Weight on Heel	0.0	14.5	0.0	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	0.0	0.0		0.0
Compaction	0.0	14.5		0.0
Slab Resistance	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**24.6**			
HORZONTAL FORCES				
Water Pressure, Heel Side	0.0	0.2		0.0
Soil Pressure, Heel Side	8.88	5.9		52.6
Water Pressure, Toe Side	0.0	0.0	0.0	
Soil Pressure, Toe Side	0.00	1.0	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	11.8		0.0
EQ Inertia Force (wall + backfill)	0.00	7.5		0.0
Compaction	0.2	16.4		2.8
Slab Resistance	0.0			
0	0.0			
Surcharge	0.0	8.9		0.0
Total Horizontal Force	**9.1**			
Total Moments			**218.6**	**55.4**
Net Moment			**163.2**	

Safety Factor Evaluation

Uplift Pressure at Toe		-0.56	KSF
Uplift Pressure at Heel		-0.56	KSF
Eccentricity		0.62	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		2.13	KSF
		14.82	PSI
Reaction Pressure at Heel		1.26	KSF
		8.77	PSI
%Base in Compression	100%	14.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.83	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Sanford Dam		
Structure:	Outlet Retaining Walls (L3, R3) (Critical Structure)		
Load Condition:	LC2 - Maintenace (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	7/23/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	12/1/2020		19C21022.01

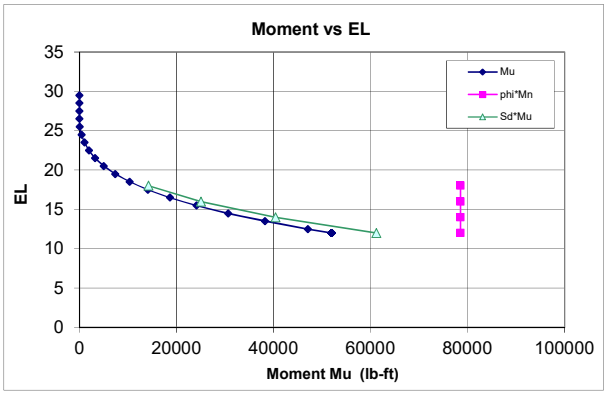
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.2
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Slab Resistanc	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	12	0.00490	0.00335	0.91	8	1.00	8	1.19	15.5	0.00637	78,511	51,946	32,466	1.18	28.7	22.3	61,172	OK	OK
2	14	0.00319	0.00335	0.62	8	1.00	8	1.19	15.5	0.00637	78,511	34,302	21,439	1.18	28.7	14.7	40,394	OK	OK
4	16	0.00196	0.00261	0.49	8	1.00	8	1.19	15.5	0.00637	78,511	21,260	13,288	1.18	28.7	9.1	25,036	OK	OK
6	18	0.00111	0.00148	0.27	8	1.00	8	1.19	15.5	0.00637	78,511	12,100	7,563	1.18	28.7	5.2	14,249	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	12	0.22	6	0.75	8	0.66	OK
2	14	0.22	6	0.75	8	0.66	OK
4	16	0.22	6	0.75	8	0.66	OK
6	18	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	10,093	lb	**Optional Diagonal Bars:**		
ϕVc:	18,716	lb	Max of Vu(stem) and Vu(heel):	20,920	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.66	(in^2/LF)
			As (D bars) for residual shear load:	0.07	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
2.0	33.54	1.00	33.5	1.3	43.6	7611	12,478	OK
4.0	33.54	1.00	33.5	1.3	43.6	5490	12,478	OK
6.0	33.54	1.00	33.5	1.3	43.6	3730	12,478	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bounding Pressures Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	3
Structure:	**Outlet Retaining Walls (L3, R3) (Critical Structure**	Checked	Chk Date		Job No
Load Condition:	**LC2 - Maintenace (Req'd Sliding SF = 1.5) (LCC = Unusual) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-2,250	2.5	1.0	-2250	-5,625	-5,625
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			0	2.5	1	0	0	0
Uplift	-0.56	-0.56	-2,808	2.50	1.6	-4493	-11,232	-7,020
Foundation Reaction	2.13	1.83	9,919	2.56	1.6	15870	40,677	25,423
			0	0.00	1	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**9,127**	**23,820**	**12,778**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00042	0.00100	0.39	6	0.75	8	0.66	32.6	0.00169	95,611	23,820	12,778	1.00	31.1	7.2	23,820	OK	OK

Check Shear on Toe:

Vu: 9,127 lb
ϕVc: 39,394 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.38	5	0.63	8	0.47	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,600	4.00	1.4	5040	20,160	14,400
Soil Weight on Heel			14,160	4.00	1.6	22656	90,624	56,640
Water Weight on Heel			0	4.00	1.6	0	0	0
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	-0.56	-0.56	4493	4.00	0.9	4044	16174	17,971
Foundation Reaction	1.74	1.26	-12,021	3.79	0.9	-10819	-40968	-45,520
			0	8.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**20,920**	**85,990**	43,491

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**28,127**	**ft-lb**		Ms(heel,global)=	**19,689**	**ft-lb**	
Mu (heel,computed)=	**85,990**	**ft-lb**		Ms(heel)=	**43,491**	**ft-lb**	
Mu(stem)=	**51,946**	**ft-lb**	**:<Use this**	Ms(stem)=	**32,466**	**ft-lb**	**<<Use this**

Check Vu above with Vu(stem)

Vu (heel)=	**20,920**	**Lb**	<=Use this
Vu(stem)=	**10,093**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00099	0.00132	0.52	6	0.75	8	0.66	32.6	0.00169	95,611	51,946	32,466	1.09	31.1	18.3	56,421	OK	OK

Check Shear on Heel:

Vu: 20,920 lb
ϕVc: 39,394 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
432	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L3, R3) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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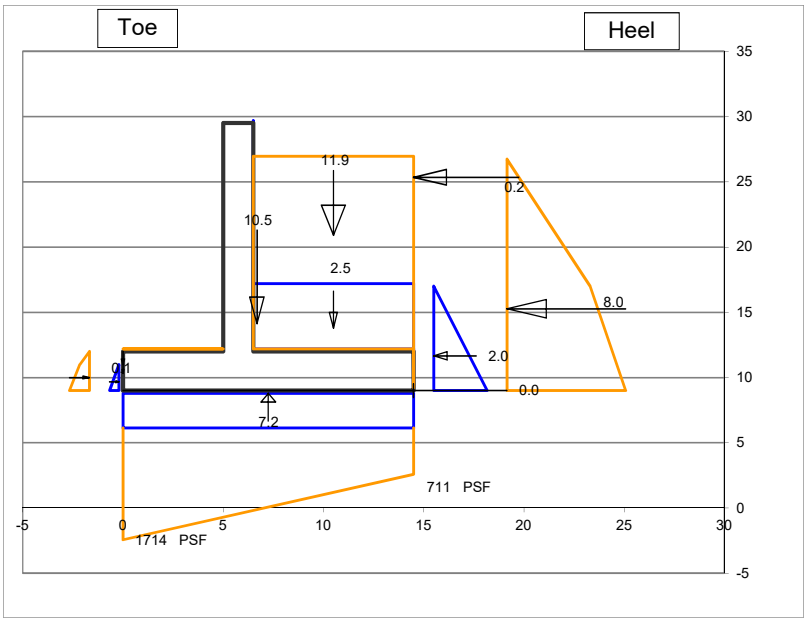
Wall Geometry and Material Properties

Top of Wall Elevation	29.5	ft
Stem Height	17.5	ft
Footing Thickness	3	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	12.0	
Base Elevation	9.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	9	
Compute Uplift from Water Levels at Toe/Heel?	N	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	34	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.18
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	26.75	ft
Water EL at Heel (WaterELh)	17.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	26.8	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	12	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	17
Uplift at Heel (UpliftELh	17

Misc. Loads

	1	2	3
Name of Load	Compaction	Slab Resistance	
Station	14.5	0.0	
Elevation	25.35	9	
CCW Angle from Vert	270	90	
Magnitude (kips)	0.17	0.00	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.5	6.7	69.9	
Soil Weight on Heel	11.9	10.5	124.6	
Water Weight on Heel	2.5	10.5	26.2	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-7.2	7.3		52.5
Compaction	0.0	14.5		0.0
Slab Resistance	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**17.6**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.0	2.7		5.3
Soil Pressure, Heel Side	8.02	6.3		50.3
Water Pressure, Toe Side	-0.1	0.7	0.1	
Soil Pressure, Toe Side	0.00	1.0	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	11.8		0.0
EQ Inertia Force (wall + backfill)	0.00	8.2		0.0
Compaction	0.2	16.4		2.8
Slab Resistance	0.0			
0	0.0			
Surcharge	0.0	8.9		0.0
Total Horizontal Force	**10.1**			
Total Moments			**220.8**	**110.9**
Net Moment			**109.9**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.50	KSF
Uplift Pressure at Heel		0.50	KSF
Eccentricity		1.00	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.71	KSF
		11.90	PSI
Reaction Pressure at Heel		0.71	KSF
		4.94	PSI
%Base in Compression	100%	14.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.18	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L3, R3) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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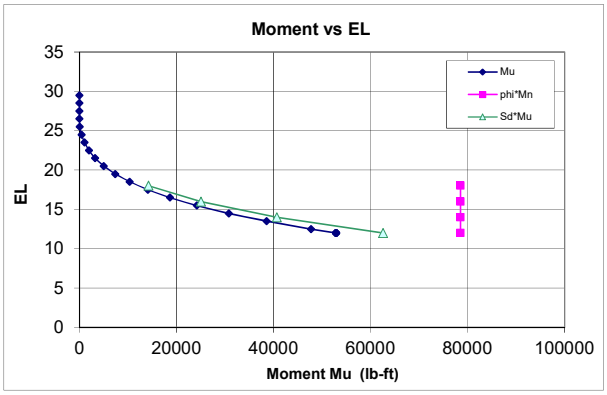
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.2
Load Factor Water, Toe Side	1.2
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Slab Resistanc	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	12	0.00502	0.00335	0.93	8	1.00	8	1.19	15.5	0.00637	78,511	52,867	33,204	1.18	28.7	22.8	62,562	OK	OK
2	14	0.00322	0.00335	0.62	8	1.00	8	1.19	15.5	0.00637	78,511	34,501	21,598	1.18	28.7	14.9	40,694	OK	OK
4	16	0.00196	0.00261	0.49	8	1.00	8	1.19	15.5	0.00637	78,511	21,268	13,294	1.18	28.7	9.1	25,047	OK	OK
6	18	0.00111	0.00148	0.27	8	1.00	8	1.19	15.5	0.00637	78,511	12,100	7,563	1.18	28.7	5.2	14,249	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	12	0.22	6	0.75	8	0.66	OK
2	14	0.22	6	0.75	8	0.66	OK
4	16	0.22	6	0.75	8	0.66	OK
6	18	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	10,646	lb	**Optional Diagonal Bars:**		
ϕVc:	18,716	lb	Max of Vu(stem) and Vu(heel):	17,308	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.54	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
2.0	33.54	1.00	33.5	1.3	43.6	7810	12,478	OK
4.0	33.54	1.00	33.5	1.3	43.6	5512	12,478	OK
6.0	33.54	1.00	33.5	1.3	43.6	3730	12,478	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bounding Pressures Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	3
Structure:	**Outlet Retaining Walls (L3, R3) (Critical Structure**	Checked	Chk Date		Job No
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Bounding Pressures Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-2,250	2.5	1.0	-2250	-5,625	-5,625
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			0	2.5	1	0	0	0
Uplift	0.50	0.50	2,496	2.50	1.6	3994	9,984	6,240
Foundation Reaction	1.71	1.37	7,705	2.59	1.6	12329	31,974	19,984
			0	0.00	1	0	0	0
Slab Resistance			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**14,072**	**36,333**	**20,599**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00064	0.00100	0.39	6	0.75	8	0.66	32.6	0.00169	95,611	36,333	20,599	1.00	31.1	11.6	36,333	OK	OK

Check Shear on Toe:

Vu: 14,072 lb
ϕVc: 39,394 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq in^2/LF	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.38	5	0.63	8	0.47	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Bounding Press. Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,600	4.00	1.4	5040	20,160	14,400
Soil Weight on Heel			11,864	4.00	1.6	18982	75,930	47,456
Water Weight on Heel			2,496	4.00	1.6	3994	15,974	9,984
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	0.50	0.50	-3994	4.00	0.9	-3594	-14377	-15,974
Foundation Reaction	1.26	0.71	-7,904	3.63	0.9	-7114	-25800	-28,667
			0	8.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**17,308**	**71,887**	27,199

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**16,534**	**ft-lb**		Ms(heel,global)=	**12,605**	**ft-lb**	
Mu (heel,computed)=	**71,887**	**ft-lb**		Ms(heel)=	**27,199**	**ft-lb**	**<<Use this**
Mu(stem)=	**52,867**	**ft-lb**	**:<Use this**	Ms(stem)=	**33,204**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**17,308**	**Lb**	<=Use this
Vu(stem)=	**10,646**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00093	0.00124	0.48	6	0.75	8	0.66	32.6	0.00169	95,611	52,867	27,199	1.00	31.1	15.4	52,867	OK	OK

Check Shear on Heel:

Vu: 17,308 lb
ϕVc: 39,394 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in^2/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
432	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Dam	RLJ	07/23/20	BETA 6.3	1
Structure:	Outlet Retaining Walls (L3, R3) (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)	CTF	12/01/20		19C21022.01

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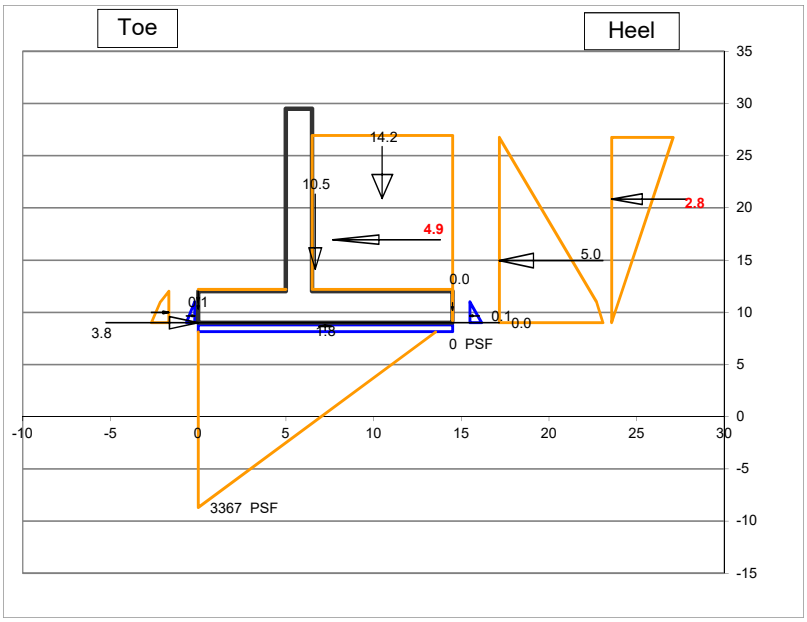
Wall Geometry and Material Properties

Top of Wall Elevation	29.5	ft
Stem Height	17.5	ft
Footing Thickness	3	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	5	ft
Heel Length (Bh)	8	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	12.0	
Base Elevation	9.0	ft
Base Width	14.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	9	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib) (total stress)	24	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.2	Read Me

Stability Summary

Half Section (Yes/No)?	No	
Sliding Factor of Safety	1.30	Sliding FS is calculated without uplift pressure.
Reaction within Middle 1/3 ?	NO	
% Base in Compression	93%	Overturning stability is calculated with uplift pressure.
Foundation Reaction Pressure	OK	



Fill over Heel Input

Backfill EL at Wall (FillELw)	26.75	ft
Water EL at Heel (WaterELh)	11	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	26.8	
ΔKAE (Mononobe-Okabe EQ Coef)	0.144	

Fill over Toe Input

Fill EL at Toe (FillELt)	12	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force (Total stress cohesion = 50 psf)	0.68	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Slab Resistance		
Station	0.0		
Elevation	9		
CCW Angle from Vert	90		
Magnitude (kips)	3.80		
Horiz Force	-3.80	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.5	6.7	69.9	
Soil Weight on Heel	14.2	10.5	148.7	
Water Weight on Heel	0.0	14.5	0.0	
Vert Force on Heel from Sloping Fill	0.0	14.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-1.81	7.3		13.1
Slab Resistance	0.0	0.0	0.0	
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	10.5	0.0	
Total Vertical Force	**22.8**			
HORZONTAL FORCES				
Water Pressure, Heel Side	0.1	0.7		0.1
Soil Pressure, Heel Side	4.98	5.9		29.6
Water Pressure, Toe Side	-0.1	0.7	0.1	
Soil Pressure, Toe Side	0.00	1.0	0.0	
EQ Soil Dynamic Component ΔP_{AE}	2.84	11.8		33.7
EQ Inertia Force (wall + backfill)	4.92	8.0		39.2
Slab Resistance	-3.8	0.0	0.0	
0	0.0			
0	0.0			
Surcharge	0.0	8.9		0.0
Total Horizontal Force	**9.0**			
Total Moments			**218.7**	**115.7**
Net Moment			**103.0**	

Safety Factor Evaluation

Uplift Pressure at Toe	0.12	KSF
Uplift Pressure at Heel	0.12	KSF
Eccentricity	2.73	FT
Reaction Within Middle 1/3?	NO	
Reaction Pressure at Toe	3.35	KSF
	23.28	PSI
Reaction Pressure at Heel	-0.21	KSF
	-1.43	PSI
%Base in Compression	See Below	FT
Passive Pressure (Key/Toe)	0.00	KLF
Passive Pressure (Manually Input)	0.68	KLF
Sliding Factor of Safety	See Below	

Modified Cell

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	1.0	0.95	FT
%Base in Compression	93%	13.55	FT
Modified Reaction at the Toe		3.37	KSF
		23.38	PSI
Modified Uplift Force	*Unmodified*	-1.81	KIPS
Modified Uplift Arm	*Unmodified*	7.25	FT
Modified Total Vertical Force		22.81	KIPS
Modified Net Moment	*Unmodified*	103.03	
Modified Sliding F.S.		1.30	

Modified Cell

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	2
Structure:	**Outlet Retaining Walls (L3, R3) (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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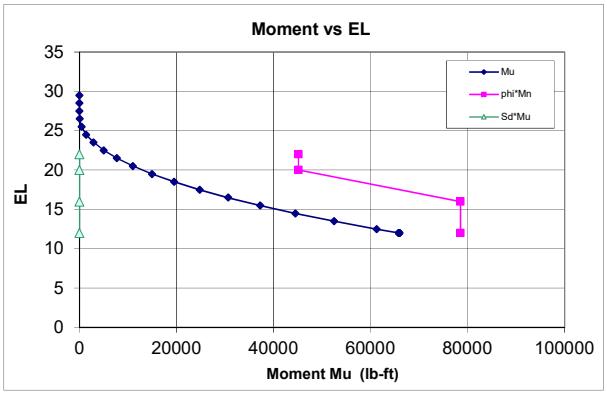
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.2
Load Factor M1 Slab Resistanc		1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	12	0.00530	0.00335	0.99	8	1.00	8	1.19	15.5	0.00637	78,511	65,859	55,645	N/A	N/A	38.3	N/A	OK	OK
4	16	0.00266	0.00335	0.62	8	1.00	8	1.19	15.5	0.00637	78,511	33,841	29,887	N/A	N/A	20.6	N/A	OK	OK
8	20	0.00099	0.00131	0.25	6	0.75	8	0.66	15.6	0.00352	45,121	12,892	11,913	N/A	N/A	14.3	N/A	OK	OK
10	22	0.00048	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	6,273	5,932	N/A	N/A	7.1	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	12	0.22	6	0.75	8	0.66	OK
4	16	0.22	6	0.75	8	0.66	OK
8	20	0.22	6	0.75	8	0.66	OK
10	22	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	9,467	lb	**Optional Diagonal Bars:**		
ϕVc:	18,716	lb	Max of Vu(stem) and Vu(heel):	21,240	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.67	(in²/LF)
			As (D bars) for residual shear load:	0.08	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
4.0	33.54	1.00	33.5	1.3	43.6	6581	12,478	OK
8.0	21.47	0.75	16.1	1.3	20.9	3932	12,579	OK
10.0	21.47	0.75	16.1	1.3	20.9	2697	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Ast_{req} (in²/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in²/LF)	Ast_{prov} (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
10.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Dam**	RLJ	7/23/2020	BETA 6.3	3
Structure:	**Outlet Retaining Walls (L3, R3) (Critical Structure**	Checked	Chk Date		Job No
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)**	CTF	12/1/2020		19C21022.01

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Bounding Pressures Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-2,250	2.5	1.0	-2250	-5,625	-5,625
Soil Weight on Toe			0	2.5	1	0	0	0
Water Weight on Toe			0	2.5	1	0	0	0
Uplift	0.12	0.12	624	2.50	1.6	998	2,496	1,560
Foundation Reaction	3.37	2.12	13,731	2.69	1.6	21969	59,064	36,915
Slab Resistance			0	5.00	1	0	0	0
			0	5.00	1.0	0	0	0
			0	5.00	1.0	0	0	0
Sum						**20,717**	**55,935**	**32,850**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.60 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00098	0.00131	0.51	6	0.75	8	0.66	32.6	0.00169	95,611	55,935	32,850	N/A	N/A	18.6	N/A	OK	OK

Check Shear on Toe:

Vu: 20,717 lb
ϕVc: 39,394 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.38	5	0.63	8	0.47	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Bounding Press. Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			3,600	4.00	1.4	5040	20,160	14,400
Soil Weight on Heel			14,160	4.00	1.6	22656	90,624	56,640
Water Weight on Heel			0	4.00	1.4	0	0	0
Vert Force on Heel from Sloping Fill			0	8.00	1.6	0	0	0
Surcharge			0	8.00	1.2	0	0	0
Uplift	0.12	0.12	-998	4.00	0.9	-899	-3594	-3,994
Foundation Reaction	1.75	0.00	-6,175	2.35	0.9	-5557	-13058	-14,509
			0	0.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**21,240**	**94,131**	52,537

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**9,923**	**ft-lb**		Ms(heel,global)=	**22,795**	**ft-lb**	
Mu (heel,computed)=	**94,131**	**ft-lb**		Ms(heel)=	**52,537**	**ft-lb**	**<<Use this**
Mu(stem)=	**65,859**	**ft-lb**	**:<Use this**	Ms(stem)=	**55,645**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**21,240**	**Lb**	<=Use this
Vu(stem)=	**9,467**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00116	0.00154	0.60	6	0.75	8	0.66	32.6	0.00169	95,611	65,859	52,537	N/A	N/A	29.7	N/A	OK	OK

Check Shear on Heel:

Vu: 21,240 lb
ϕVc: 39,394 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in^2/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
432	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Sanford Lake Dam	RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet U-Frame Weir Sidewalls (Critical Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Operating (Usual load)	CTF	12/01/20		19C21022.01

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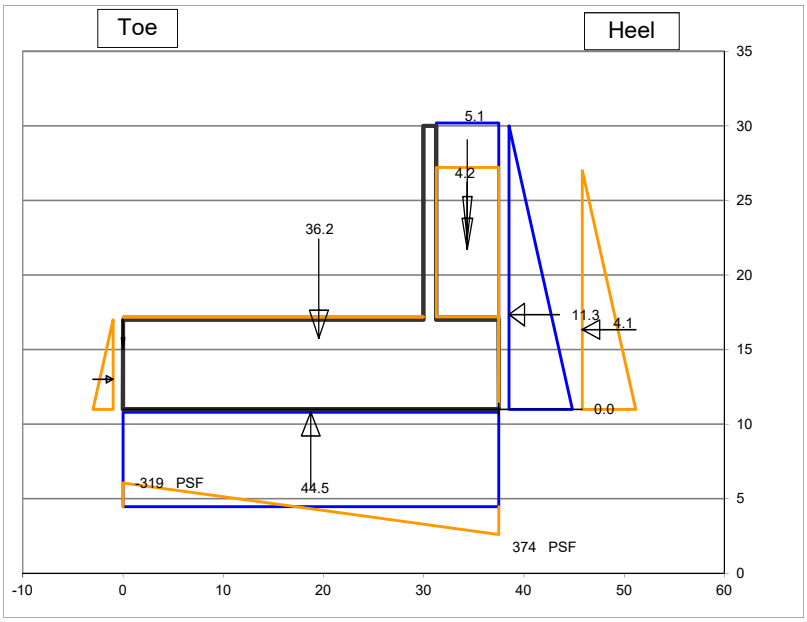
Wall Geometry and Material Properties

Top of Wall Elevation	30	ft
Stem Height	13	ft
Footing Thickness	6	ft
Top Width of Wall	1.25	ft
Toe Length (Bt)	30	ft
Heel Length (Bh)	6.25	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.25	ft
Top of Footing EL	17.0	
Base Elevation	11.0	ft
Base Width	37.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	11	
Compute Uplift from Water Levels at Toe/Heel?	N	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	27	ft
Water EL at Heel (WaterELh)	30	ft
γ_{moist}	120	pcf
γ_{sat}	130	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	27.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	17	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	30
Uplift at Heel (UpliftELh	30

Misc. Loads

	1	2	3
Name of Load			
Station			
Elevation			
CCW Angle from Vert			
Magnitude (kips)			
Horiz Force	0.00	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Appied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	36.2	19.5	707.5	
Soil Weight on Heel	4.2	34.4	145.2	
Water Weight on Heel	5.1	34.4	174.3	
Vert Force on Heel from Sloping Fill	0.0	37.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-44.5	18.8		833.6
0	0.0	0.0		
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	34.4	0.0	
Total Vertical Force	**1.0**			
HORZONTAL FORCES				
Water Pressure, Heel Side	11.3	6.3		71.3
Soil Pressure, Heel Side	4.07	5.3		21.7
Water Pressure, Toe Side	0.0	0.0	0.0	
Soil Pressure, Toe Side	0.00	2.0	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	10.7		0.0
EQ Inertia Force (wall + backfill)	0.00	5.0		0.0
0	0.0			
0	0.0			
0	0.0			
Surcharge	0.0	8.0		0.0
Total Horizontal Force	**15.3**			
Total Moments			**1027.0**	**926.7**
Net Moment			**100.3**	

Safety Factor Evaluation

Uplift Pressure at Toe		1.19	KSF
Uplift Pressure at Heel		1.19	KSF
Eccentricity		-79.36	FT
Reaction Within Middle 1/3?		NO	
Reaction Pressure at Toe		-0.32	KSF
		-2.22	PSI
Reaction Pressure at Heel		0.37	KSF
		2.59	PSI
%Base in Compression	100%	37.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		N/A	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**		
Client	**City of Boiling Spring Lake**		
Location	**Sanford Lake Dam**		
Structure:	**Box Inlet U-Frame Weir Sidewalls (Critical Structure)**		
Load Condition:	**LC1 - Normal Operating (Usual load)**		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	4/20/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	12/1/2020		19C21022.01

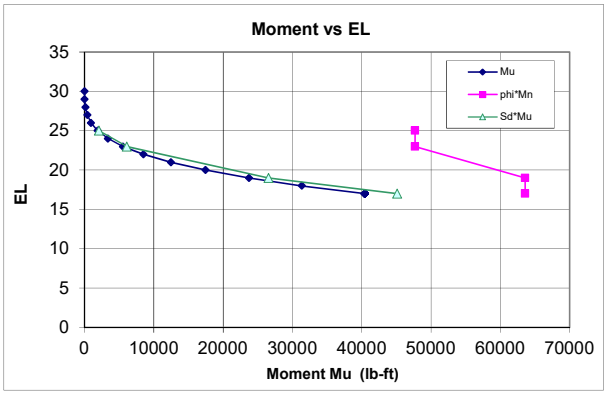
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.2
Load Factor M1	0	1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	17	0.00553	0.00335	0.83	7	0.88	6	1.20	12.6	0.00796	63,590	40,462	28,145	1.11	33.7	23.9	45,112	OK	OK
2	19	0.00319	0.00335	0.51	7	0.88	6	1.20	12.6	0.00796	63,590	23,718	16,554	1.12	33.7	14.1	26,534	OK	OK
6	23	0.00071	0.00100	0.18	6	0.75	6	0.88	12.6	0.00581	47,711	5,536	3,906	1.10	34.5	4.4	6,111	OK	OK
8	25	0.00024	0.00100	0.18	6	0.75	6	0.88	12.6	0.00581	47,711	1,888	1,342	1.11	34.5	1.5	2,100	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	17	0.18	4	0.50	6	0.40	OK
2	19	0.18	4	0.50	6	0.40	OK
6	23	0.18	4	0.50	6	0.40	OK
8	25	0.18	4	0.50	6	0.40	OK

Check Shear:

Vu:	9,924	lb	**Optional Diagonal Bars:**		
ϕVc:	15,169	lb	Max of Vu(stem) and Vu(heel):	13,177	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.41	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	29.35	0.88	25.7	1.3	33.4	N/A	N/A	N/A
2.0	29.35	0.88	25.7	1.3	33.4	6912	10,113	OK
6.0	21.47	0.75	16.1	1.3	20.9	2547	10,163	OK
8.0	21.47	0.75	16.1	1.3	20.9	1194	10,163	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bounding Pressures Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Sanford Lake Dam		
Structure:	Box Inlet U-Frame Weir Sidewalls (Critical Structure)		
Load Condition:	LC4 - Seismic Loading (Extreme Load)		

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STABILITY ANALYSIS

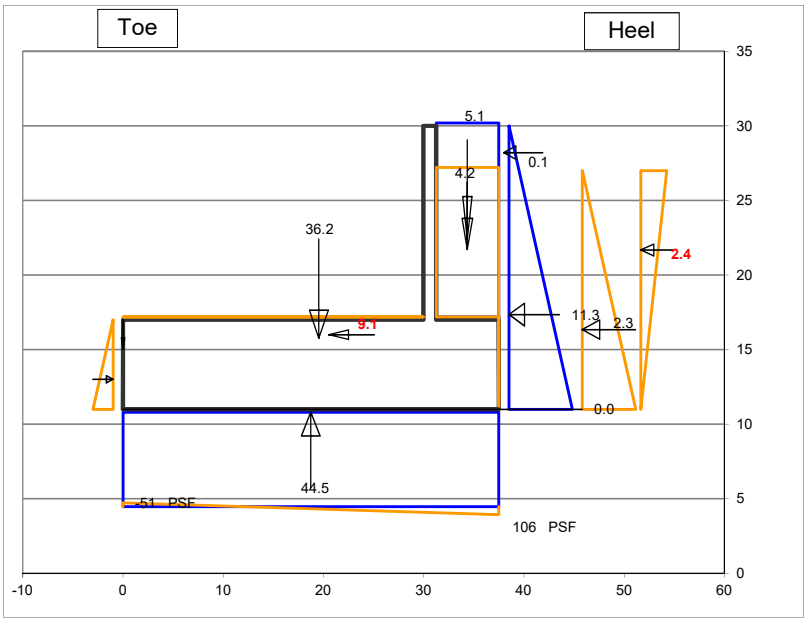
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	12/01/20		19C21022.01

Wall Geometry and Material Properties

Top of Wall Elevation	30	ft
Stem Height	13	ft
Footing Thickness	6	ft
Top Width of Wall	1.25	ft
Toe Length (Bt)	30	ft
Heel Length (Bh)	6.25	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.25	ft
Top of Footing EL	17.0	
Base Elevation	11.0	ft
Base Width	37.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	11	
Compute Uplift from Water Levels at Toe/Heel?	N	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.2	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	27	ft
Water EL at Heel (WaterELh)	30	ft
γ_{moist}	120	pcf
γ_{sat}	130	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	27.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.144	

Fill over Toe Input

Fill EL at Toe (FillELt)	17	ft
Water EL at Toe (WaterELt)	11.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	30
Uplift at Heel (UpliftELh	30

Misc. Loads

	1	2	3
Name of Load	Hydrodynamic		
Station	38.0		
Elevation	28.2		
CCW Angle from Vert	270		
Magnitude (kips)	0.07		
Horiz Force	0.07	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	36.2	19.5	707.5	
Soil Weight on Heel	4.2	34.4	145.2	
Water Weight on Heel	5.1	34.4	174.3	
Vert Force on Heel from Sloping Fill	0.0	37.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-44.5	18.8		833.6
Hydrodynamic	0.0	38.0		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	34.4	0.0	
Total Vertical Force	**1.0**			
HORZONTAL FORCES				
Water Pressure, Heel Side	11.3	6.3		71.3
Soil Pressure, Heel Side	2.29	5.3		12.2
Water Pressure, Toe Side	0.0	0.0	0.0	
Soil Pressure, Toe Side	0.00	2.0	0.0	
EQ Soil Dynamic Component ΔP_{AE}	2.40	10.7		25.6
EQ Inertia Force (wall + backfill)	9.10	5.0		45.4
Hydrodynamic	0.1	17.2		1.1
0	0.0			
0	0.0			
Surcharge	0.0	8.0		0.0
Total Horizontal Force	**25.1**			
Total Moments			**1027.0**	**989.4**
Net Moment			**37.6**	

Safety Factor Evaluation

Uplift Pressure at Toe		1.19	KSF
Uplift Pressure at Heel		1.19	KSF
Eccentricity		-18.05	FT
Reaction Within Middle 1/3?		NO	
Reaction Pressure at Toe		-0.05	KSF
		-0.36	PSI
Reaction Pressure at Heel		0.11	KSF
		0.74	PSI
%Base in Compression	100%	37.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		N/A	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force	*Unmodified*	-44.46	KIPS
Modified Uplift Arm	*Unmodified*	18.75	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment	*Unmodified*	N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Sanford Lake Dam**	RLJ	4/20/2020	BETA 6.3	2
Structure:	**Box Inlet U-Frame Weir Sidewalls (Critical Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC4 - Seismic Loading (Extreme Load)**	CTF	12/1/2020		19C21022.01

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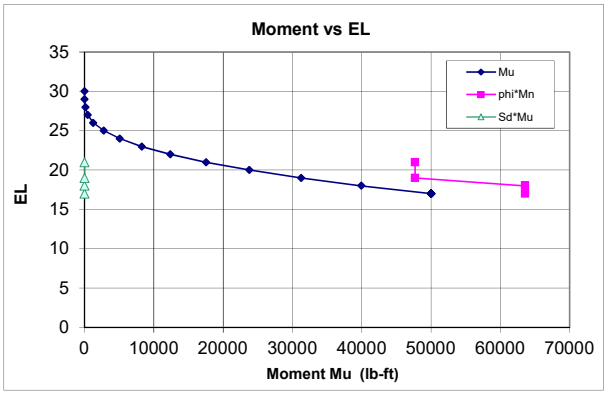
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.2
Load Factor M1 Hydrodynamic		1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	17	0.00617	0.00335	0.93	7	0.88	6	1.20	12.6	0.00796	63,590	50,020	39,088	N/A	N/A	33.2	N/A	OK	OK
1	18	0.00488	0.00335	0.73	7	0.88	6	1.20	12.6	0.00796	63,590	39,959	31,464	N/A	N/A	26.7	N/A	OK	OK
2	19	0.00374	0.00335	0.57	6	0.75	6	0.88	12.6	0.00581	47,711	31,242	24,787	N/A	N/A	28.1	N/A	OK	OK
4	21	0.00207	0.00276	0.42	6	0.75	6	0.88	12.6	0.00581	47,711	17,526	14,106	N/A	N/A	16.0	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	17	0.18	4	0.50	6	0.40	OK
1	18	0.18	4	0.50	6	0.40	OK
2	19	0.18	4	0.50	6	0.40	OK
4	21	0.18	4	0.50	6	0.40	OK

Check Shear:

Vu:	10,759	lb	**Optional Diagonal Bars:**		
ϕVc:	15,169	lb	Max of Vu(stem) and Vu(heel):	14,430	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.45	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	29.35	0.88	25.7	1.3	33.4	N/A	N/A	N/A
1.0	29.35	0.88	25.7	1.3	33.4	9376	10,113	OK
2.0	21.47	0.75	16.1	1.3	20.9	8071	10,163	OK
4.0	21.47	0.75	16.1	1.3	20.9	5697	10,163	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
1.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

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CALCULATION COVER SHEET

Project	Project Number
Boiling Spring Lakes Dams	19C21022_00

Title

Pine Lake Dam Retaining Wall Design and Analysis

Computer Programs Used	Version/Release No.
Microsoft Excel - Retwall	2016

Purpose and Objective

Determine geometry of inlet headwall, outlet sidewalls and weir walls for the specified load cases. Design reinforcement to resist flexural moments in the stem and footings for the above structural elements. Design top & bottom mat reinforcement to resist flexural moments in the slabs based on rigid body U-frame analysis.

Load Cases
LC - 1 Normal Operating Condition
LC - 2 Maintenance Condition
LC - 3 Post Flood Condition
LC - 4 Seismic condition

Summary of Conclusions

Tables included in the calculations below summarize the stability of the "non U-frame" sections. Walls analyzed as a U-Frame are inherently stable. Reinforcement designed via the calculations below are called out in the structural design drawings.

Originator			
Cristian T. Franklin			Jan 12, 2021
	Print	Sign	Date

Checked			
Robert L. Jarnigan			Jan 13, 2021
	Print	Sign	Date

Table P1: Stability Summary for Inlet Headwall at Pine Lake Dam

Load Case	Loading Description	Sliding FOS actual / Req'd FOS	% Base in Compression / Req'd	Pressure at Toe (psf)	Pressure at Heel (psf)
LC1	Normal Operating Condition, At-Rest (Critical Structure, Usual Load)	1.59 / 1.5	100 / 100	1543	958
LC2	Maintenance Condition, At-Rest (Critical Structure, Unusual)	1.42 / 1.3	100 / 75	2312	945
LC3	Post Flood Condition, At-Rest (Critical Structure, Extreme)	1.32 / 1.1	100 / >0	1733	605
LC4	Seismic Condition, Active (Critical Structure, Extreme)	1.23 / 1.1	88 / >0	2678	0

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Pine Lake Dam	RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet Headwall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 1.5) (LCC = Usual) (SIC = Ordinary)	CTF	11/10/20		19C21022.03

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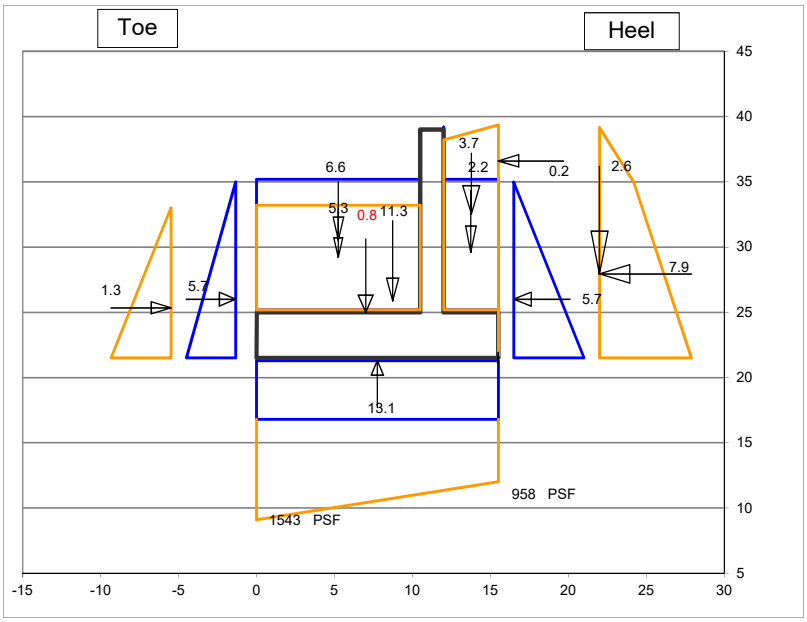
Wall Geometry and Material Properties

Top of Wall Elevation	39	ft
Stem Height	14	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	10.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	25.0	
Base Elevation	21.5	ft
Base Width	15.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.5	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.59
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	38	ft
Water EL at Heel (WaterELh)	35	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	18.43	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.62	
Sloping Backfill EL at Heel (FillELh)	39.2	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	33	ft
Water EL at Toe (WaterELt)	35.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	15.5	7.0	
Elevation	36.6	25	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	0.82	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.82	0.00
Force Appied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	11.3	8.7	98.5	
Soil Weight on Heel	3.7	13.8	50.9	
Water Weight on Heel	2.2	13.8	30.0	
Vert Force on Heel from Sloping Fill	2.6	15.5	40.9	
Soil Weight on Toe	5.3	5.3	27.6	
Water Weight at Toe	6.6	5.3	34.4	
Uplift	-13.1	7.8		101.2
Compaction	0.0	15.5		0.0
Sloping Soil	0.8	7.0	5.8	
0	0.0	0.0		
Surcharge	0.0	13.8	0.0	
Total Vertical Force	**19.4**			
HORZONTAL FORCES				
Water Pressure, Heel Side	5.7	4.5		25.6
Soil Pressure, Heel Side	7.92	6.4		50.9
Water Pressure, Toe Side	-5.7	4.5	25.6	
Soil Pressure, Toe Side	-1.32	3.8	5.1	
EQ Soil Dynamic Component ΔP_{AE}	0.00	11.0		0.0
EQ Inertia Force (wall + backfill)	0.00	6.6		0.0
Compaction	0.2	15.1		2.6
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	8.8		0.0
Total Horizontal Force	**6.8**			
Total Moments			**318.8**	**180.3**
Net Moment			**138.5**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.84	KSF
Uplift Pressure at Heel		0.84	KSF
Eccentricity		0.60	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.54	KSF
		10.72	PSI
Reaction Pressure at Heel		0.96	KSF
		6.65	PSI
%Base in Compression	100%	15.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.59	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	4/20/2020	BETA 6.3	2
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 1.5) (LCC = Usual) (SIC = Ordinary)**	CTF	11/10/2020		19C21022.03

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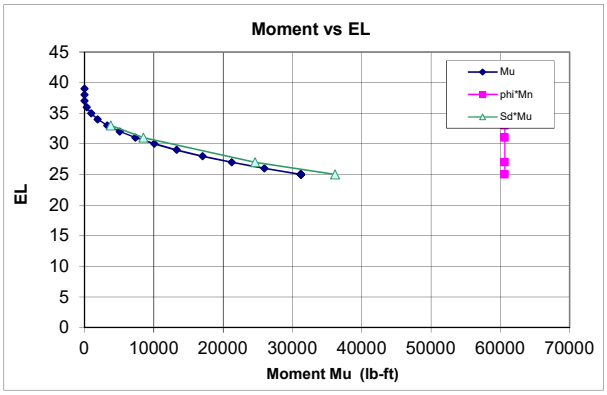
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	25	0.00283	0.00335	0.63	7	0.88	8	0.90	15.6	0.00482	60,639	31,200	19,500	1.16	29.1	17.4	36,143	OK	OK
2	27	0.00191	0.00255	0.48	7	0.88	8	0.90	15.6	0.00482	60,639	21,239	13,274	1.16	29.1	11.8	24,604	OK	OK
6	31	0.00065	0.00100	0.22	7	0.88	8	0.90	15.6	0.00482	60,639	7,342	4,589	1.16	29.1	4.1	8,505	OK	OK
8	33	0.00029	0.00100	0.22	7	0.88	8	0.90	15.6	0.00482	60,639	3,267	2,042	1.16	29.1	1.8	3,784	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	25	0.22	6	0.75	8	0.66	OK
2	27	0.22	6	0.75	8	0.66	OK
6	31	0.22	6	0.75	8	0.66	OK
8	33	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	5,500	lb	**Optional Diagonal Bars:**		
ϕVc:	18,791	lb	Max of Vu(stem) and Vu(heel):	8,867	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.28	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	29.35	0.88	25.7	1.3	33.4	N/A	N/A	N/A
2.0	29.35	0.88	25.7	1.3	33.4	4467	12,528	OK
6.0	29.35	0.88	25.7	1.3	33.4	2505	12,528	OK
8.0	29.35	0.88	25.7	1.3	33.4	1576	12,528	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.23	0.23	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 1.5) (LCC = Usual) (SIC = Ordinary)**	CTF	11/10/2020		19C21022.03

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-5,513	5.25	1.0	-5513	-28,941	-28,941
Soil Weight on Toe			-5258	5.25	1	-5258	-27,607	-27,607
Water Weight on Toe			-6552	5.25	1	-6552	-34,398	-34,398
Uplift	0.84	0.84	8,845	5.25	1.6	14152	74,300	46,437
Foundation Reaction	1.54	1.15	14,121	5.51	1.6	22593	124,443	77,777
			0	0.00	1	0	0	0
Sloping Soil			-822	3.50	1.0	-822	-2,876	-2,876
			0	10.50	1.0	0	0	0
Sum						**18,601**	**104,922**	**30,393**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00042	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	31,200	19,500	1.07	31.6	9.3	33,365	OK	OK

Check Shear on Toe:

Vu: 18,601 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.45	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			1,838	1.75	1.2	2205	3,859	3,216
Soil Weight on Heel			3,696	1.78	1.6	5913	10,497	6,560
Water Weight on Heel			2,184	1.75	1.4	3058	5,351	3,822
Vert Force on Heel from Sloping Fill			2,640	3.50	1.6	4223	14,782	9,239
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.84	0.84	-2948	1.75	1	-2948	-5160	-5,160
Foundation Reaction	1.09	0.96	-3,584	1.71	1	-3584	-6137	-6,137
			0	3.50	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**8,867**	**23,192**	11,541

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**23,192**	**ft-lb**	**:<Use this**	Ms(heel)=	**11,541**	**ft-lb**	**<<Use this**
Mu(stem)=	**31,200**	**ft-lb**		Ms(stem)=	**19,500**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**8,867**	**Lb**	<=Use this
Vu(stem)=	**5,500**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00029	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	23,192	11,541	1.00	31.6	5.5	23,192	OK	OK

Check Shear on Heel:

Vu: 8,867 lb
ϕVc: 46,639 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Pine Lake Dam	RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet Headwall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (LCC = Unusual) (SIC = Ordinary)	CTF	11/10/20		19C21022.03

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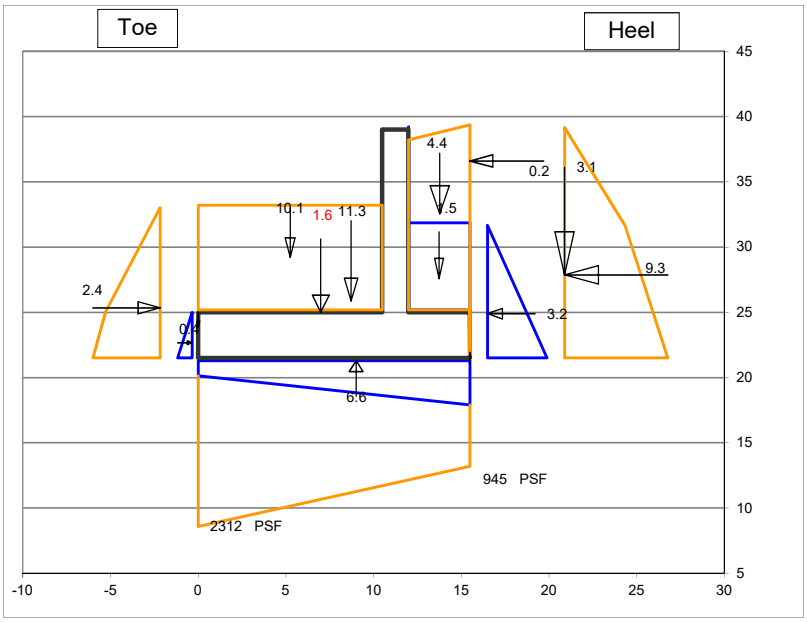
Wall Geometry and Material Properties

Top of Wall Elevation	39	ft
Stem Height	14	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	10.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	25.0	
Base Elevation	21.5	ft
Base Width	15.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.5	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.42
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	38	ft
Water EL at Heel (WaterELh)	31.67	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	18.43	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.62	
Sloping Backfill EL at Heel (FillELh)	39.2	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	33	ft
Water EL at Toe (WaterELt) Invert EL of drain	25.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	15.5	7.0	
Elevation	36.6	25	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	1.58	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	1.58	0.00
Force Appied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	11.3	8.7	98.5	
Soil Weight on Heel	4.4	13.8	60.1	
Water Weight on Heel	1.5	13.8	20.0	
Vert Force on Heel from Sloping Fill	3.1	15.5	47.8	
Soil Weight on Toe	10.1	5.3	52.9	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-6.6	9.0		59.5
Compaction	0.0	15.5		0.0
Sloping Soil	1.6	7.0	11.0	
0	0.0	0.0		
Surcharge	0.0	13.8	0.0	
Total Vertical Force	**25.2**			
HORZONTAL FORCES				
Water Pressure, Heel Side	3.2	3.4		10.9
Soil Pressure, Heel Side	9.25	6.4		58.8
Water Pressure, Toe Side	-0.4	1.2	0.4	
Soil Pressure, Toe Side	-2.43	3.8	9.3	
EQ Soil Dynamic Component ΔP_{AE}	0.00	11.0		0.0
EQ Inertia Force (wall + backfill)	0.00	6.6		0.0
Compaction	0.2	15.1		2.6
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	8.8		0.0
Total Horizontal Force	**9.8**			
Total Moments			**300.1**	**131.9**
Net Moment			**168.2**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.22	KSF
Uplift Pressure at Heel		0.63	KSF
Eccentricity		1.08	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		2.31	KSF
		16.05	PSI
Reaction Pressure at Heel		0.94	KSF
		6.56	PSI
%Base in Compression	100%	15.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.42	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Pine Lake Dam		
Structure:	Box Inlet Headwall (Normal Structure)		
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (LCC = Unusual) (SIC = Ordinary)		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	4/20/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	11/10/2020		19C21022.03

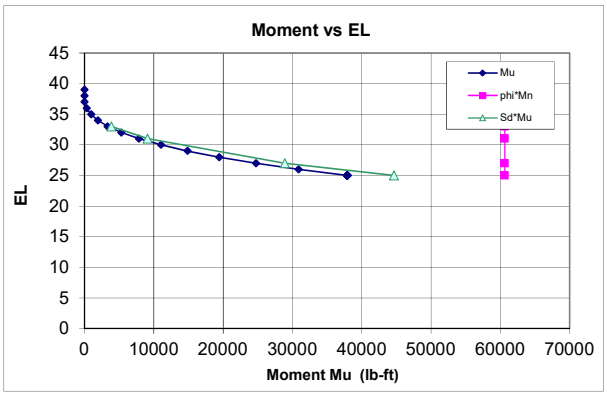
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρcalc	ρmin	Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu? ϕMn>Mu?	As min? As max?
0	25	0.00351	0.00335	0.66	7	0.88	8	0.90	15.6	0.00482	60,639	37,918	24,084	1.18	29.1	21.4	44,639	OK	OK
2	27	0.00225	0.00300	0.56	7	0.88	8	0.90	15.6	0.00482	60,639	24,752	15,602	1.17	29.1	13.9	28,919	OK	OK
6	31	0.00070	0.00100	0.22	7	0.88	8	0.90	15.6	0.00482	60,639	7,857	4,911	1.16	29.1	4.4	9,103	OK	OK
8	33	0.00030	0.00100	0.22	7	0.88	8	0.90	15.6	0.00482	60,639	3,339	2,087	1.16	29.1	1.9	3,868	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	Asreq (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	25	0.22	6	0.75	8	0.66	OK
2	27	0.22	6	0.75	8	0.66	OK
6	31	0.22	6	0.75	8	0.66	OK
8	33	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	7,469	lb	**Optional Diagonal Bars:**		
ϕVc:	18,791	lb	Max of Vu(stem) and Vu(heel):	10,257	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.32	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	ld/db	db (in)	ld (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	29.35	0.88	25.7	1.3	33.4	N/A	N/A	N/A
2.0	29.35	0.88	25.7	1.3	33.4	5730	12,528	OK
6.0	29.35	0.88	25.7	1.3	33.4	2852	12,528	OK
8.0	29.35	0.88	25.7	1.3	33.4	1684	12,528	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Astreq (in²/LF)	Exposed Face Bar #	Spacing (in)	Astprov (in²/LF)	Unexposed Face Bar #	Spacing (in)	Astprov (in²/LF)	Astprov (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.23	0.23	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρcalc	ρmin	Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (LCC = Unusual) (SIC = Ordinary)**	CTF	11/10/2020		19C21022.03

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-5,513	5.25	1.0	-5513	-28,941	-28,941
Soil Weight on Toe			-10080	5.25	1	-10080	-52,920	-52,920
Water Weight on Toe			0	5.25	1	0	0	0
Uplift	0.22	0.50	3,772	4.56	1.4	5281	24,100	17,215
Foundation Reaction	2.31	1.39	19,411	5.69	1.6	31058	176,663	110,414
			0	0.00	1	0	0	0
Sloping Soil			-1,575	3.50	1.0	-1575	-5,513	-5,513
			0	10.50	1.0	0	0	0
Sum						**19,172**	**113,390**	**40,256**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00051	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	37,918	24,084	1.09	31.6	11.5	41,208	OK	OK

Check Shear on Toe:

Vu: 19,172 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq in^2/LF	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.45	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			1,838	1.75	1.2	2205	3,859	3,216
Soil Weight on Heel			4,366	1.78	1.6	6985	12,399	7,749
Water Weight on Heel			1,456	1.75	1.4	2038	3,567	2,548
Vert Force on Heel from Sloping Fill			3,083	3.50	1.6	4932	17,262	10,789
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.54	0.63	-2056	1.80	1	-2056	-3694	-3,694
Foundation Reaction	1.25	0.94	-3,847	1.67	1	-3847	-6418	-6,418
			0	3.50	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**10,257**	**26,975**	14,190

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**26,975**	**ft-lb**	**:<Use this**	Ms(heel)=	**14,190**	**ft-lb**	**<<Use this**
Mu(stem)=	**37,918**	**ft-lb**		Ms(stem)=	**24,084**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**10,257**	**Lb**	<=Use this
Vu(stem)=	**7,469**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00034	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	26,975	14,190	1.00	31.6	6.8	26,975	OK	OK

Check Shear on Heel:

Vu: 10,257 lb
ϕVc: 46,639 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Pine Lake Dam		
Structure:	Box Inlet Headwall (Normal Structure)		
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)		

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STABILITY ANALYSIS

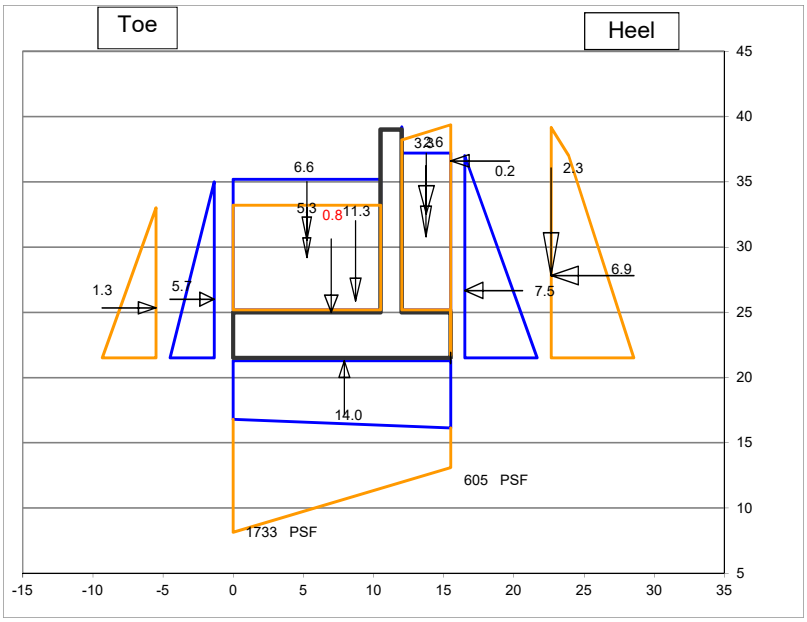
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	11/10/20		19C21022.03

Wall Geometry and Material Properties

Top of Wall Elevation	39	ft
Stem Height	14	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	10.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	25.0	
Base Elevation	21.5	ft
Base Width	15.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.5	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.32
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	38	ft
Water EL at Heel (WaterELh)	37.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	18.43	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.62	
Sloping Backfill EL at Heel (FillELh)	39.2	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	33	ft
Water EL at Toe (WaterELt)	35.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	15.5	7.0	
Elevation	36.6	25	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	0.82	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.82	0.00
Force Appied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	11.3	8.7	98.5	
Soil Weight on Heel	3.3	13.8	45.4	
Water Weight on Heel	2.6	13.8	36.0	
Vert Force on Heel from Sloping Fill	2.3	15.5	35.9	
Soil Weight on Toe	5.3	5.3	27.6	
Water Weight at Toe	6.6	5.3	34.4	
Uplift	-14.0	7.9		111.2
Compaction	0.0	15.5		0.0
Sloping Soil	0.8	7.0	5.8	
0	0.0	0.0		
Surcharge	0.0	13.8	0.0	
Total Vertical Force	**18.1**			
HORZONTAL FORCES				
Water Pressure, Heel Side	7.5	5.2		38.7
Soil Pressure, Heel Side	6.94	6.3		43.8
Water Pressure, Toe Side	-5.7	4.5	25.6	
Soil Pressure, Toe Side	-1.32	3.8	5.1	
EQ Soil Dynamic Component ΔP_{AE}	0.00	11.0		0.0
EQ Inertia Force (wall + backfill)	0.00	6.7		0.0
Compaction	0.2	15.1		2.6
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	8.8		0.0
Total Horizontal Force	**7.6**			
Total Moments			**314.2**	**196.3**
Net Moment			**117.9**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.84	KSF
Uplift Pressure at Heel		0.97	KSF
Eccentricity		1.25	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.73	KSF
		12.04	PSI
Reaction Pressure at Heel		0.61	KSF
		4.20	PSI
%Base in Compression	100%	15.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.32	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	4/20/2020	BETA 6.3	2
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	11/10/2020		19C21022.03

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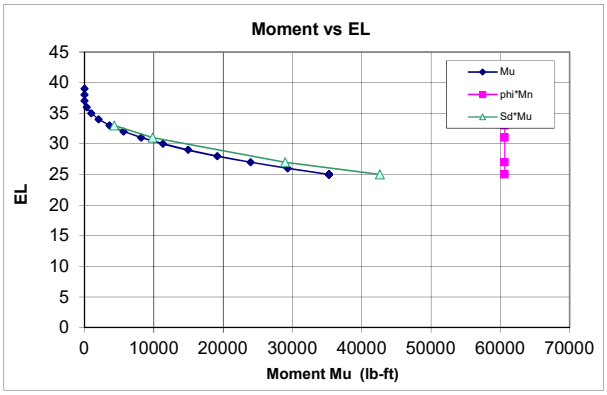
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	25	0.00335	0.00335	0.63	7	0.88	8	0.90	15.6	0.00482	60,639	35,259	22,983	1.21	29.1	20.5	42,600	OK	OK
2	27	0.00225	0.00300	0.56	7	0.88	8	0.90	15.6	0.00482	60,639	23,960	15,609	1.21	29.1	13.9	28,932	OK	OK
6	31	0.00076	0.00101	0.22	7	0.88	8	0.90	15.6	0.00482	60,639	8,189	5,316	1.20	29.1	4.7	9,853	OK	OK
8	33	0.00033	0.00100	0.22	7	0.88	8	0.90	15.6	0.00482	60,639	3,579	2,310	1.20	29.1	2.1	4,281	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	25	0.22	6	0.75	8	0.66	OK
2	27	0.22	6	0.75	8	0.66	OK
6	31	0.22	6	0.75	8	0.66	OK
8	33	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	6,236	lb	**Optional Diagonal Bars:**		
ϕVc:	18,791	lb	Max of Vu(stem) and Vu(heel):	8,947	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.28	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	29.35	0.88	25.7	1.3	33.4	N/A	N/A	N/A
2.0	29.35	0.88	25.7	1.3	33.4	5069	12,528	OK
6.0	29.35	0.88	25.7	1.3	33.4	2839	12,528	OK
8.0	29.35	0.88	25.7	1.3	33.4	1777	12,528	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.23	0.23	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	11/10/2020		19C21022.03

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-5,513	5.25	1.2	-6615	-34,729	-28,941
Soil Weight on Toe			-5258	5.25	1	-5258	-27,607	-27,607
Water Weight on Toe			-6552	5.25	1	-6552	-34,398	-34,398
Uplift	0.84	0.93	9,289	5.17	1.6	14862	76,785	47,991
Foundation Reaction	1.73	0.97	14,188	5.74	1.6	22701	130,413	81,508
			0	0.00	1	0	0	0
Sloping Soil			-822	3.50	1.0	-822	-2,876	-2,876
			0	10.50	1.0	0	0	0
Sum						**18,316**	**107,590**	**35,678**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00049	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	35,259	22,983	1.12	31.6	10.9	39,325	OK	OK

Check Shear on Toe:

Vu: 18,316 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.45	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			1,838	1.75	1.2	2205	3,859	3,216
Soil Weight on Heel			3,294	1.78	1.6	5271	9,356	5,847
Water Weight on Heel			2,621	1.75	1.4	3669	6,421	4,586
Vert Force on Heel from Sloping Fill			2,314	3.50	1.6	3703	12,959	8,099
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.94	0.97	-3336	1.76	1	-3336	-5867	-5,867
Foundation Reaction	0.86	0.61	-2,564	1.65	1	-2564	-4227	-4,227
			0	3.50	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**8,947**	**22,500**	11,655

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**22,500**	**ft-lb**	**:<Use this**	Ms(heel)=	**11,655**	**ft-lb**	**<<Use this**
Mu(stem)=	**35,259**	**ft-lb**		Ms(stem)=	**22,983**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**8,947**	**Lb**	<=Use this
Vu(stem)=	**6,236**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00028	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	22,500	11,655	1.00	31.6	5.5	22,500	OK	OK

Check Shear on Heel:

Vu: 8,947 lb
ϕVc: 46,639 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Pine Lake Dam		
Structure:	Box Inlet Headwall (Normal Structure)		
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)		

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STABILITY ANALYSIS

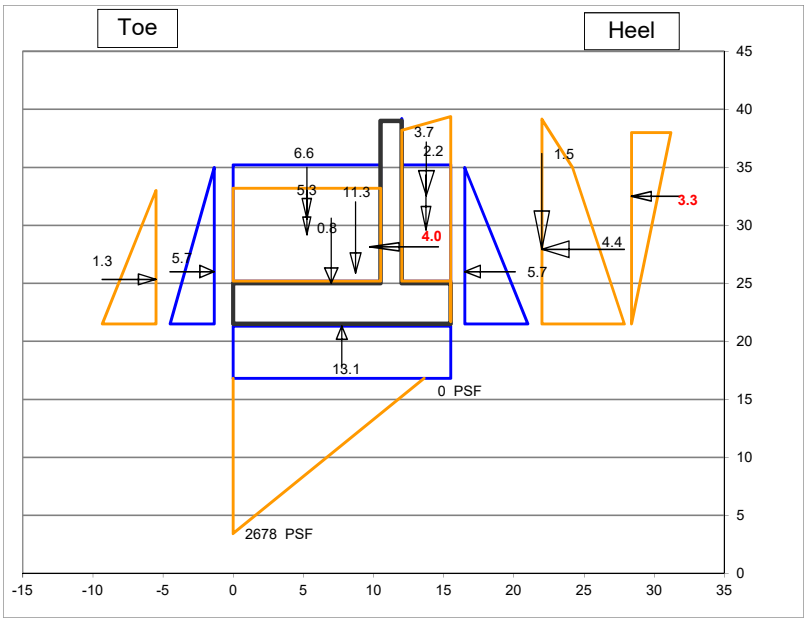
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	11/10/20		19C21022.03

Wall Geometry and Material Properties

Top of Wall Elevation	39	ft
Stem Height	14	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	10.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	25.0	
Base Elevation	21.5	ft
Base Width	15.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.5	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib) (total stress)	20	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.14	Read Me

Stability Summary

Half Section (Yes/No)?	No	
Sliding Factor of Safety	1.23	Sliding FS is calculated without uplift pressure.
Reaction within Middle 1/3 ?	NO	
% Base in Compression	88%	Overturning stability is calculated with uplift pressure.
Foundation Reaction Pressure	OK	



Fill over Heel Input

Backfill EL at Wall (FillELw)	38	ft
Water EL at Heel (WaterELh)	35	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi) (effective stress)	32	degrees
Angle of Sloping Fill from horiz β:	18.43	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.35	
Sloping Backfill EL at Heel (FillELh)	39.2	
ΔKAE (Mononobe-Okabe EQ Coef)	0.194	

Fill over Toe Input

Fill EL at Toe (FillELt)	33	ft
Water EL at Toe (WaterELt)	35.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force Total stress cohesion = 100 psf at base	1.36	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Sloping Soil		
Station	7.0		
Elevation	25		
CCW Angle from Vert	0		
Magnitude (kips)	0.82		
Horiz Force	0.00	0.00	0.00
Vert Force	0.82	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	11.3	8.7	98.5	
Soil Weight on Heel	3.7	13.8	50.9	
Water Weight on Heel	2.2	13.8	30.0	
Vert Force on Heel from Sloping Fill	1.5	15.5	22.9	
Soil Weight on Toe	5.3	5.3	27.6	
Water Weight at Toe	6.6	5.3	34.4	
Uplift	-13.1	7.8		101.2
Sloping Soil	0.8	7.0	5.8	
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	13.8	0.0	
Total Vertical Force	**18.2**			
HORZONTAL FORCES				
Water Pressure, Heel Side	5.7	4.5		25.6
Soil Pressure, Heel Side	4.43	6.4		28.5
Water Pressure, Toe Side	-5.7	4.5	25.6	
Soil Pressure, Toe Side	-1.32	3.8	5.1	
EQ Soil Dynamic Component ΔP_{AE}	3.31	11.0		36.4
EQ Inertia Force (wall + backfill)	3.99	6.6		26.5
Sloping Soil	0.0			
0	0.0			
0	0.0			
Surcharge	0.0	8.8		0.0
Total Horizontal Force	**10.4**			
Total Moments			**300.7**	**218.1**
Net Moment			**82.6**	

Safety Factor Evaluation

Uplift Pressure at Toe	0.84	KSF
Uplift Pressure at Heel	0.84	KSF
Eccentricity	3.21	FT
Reaction Within Middle 1/3?	NO	
Reaction Pressure at Toe	2.64	KSF
	18.32	PSI
Reaction Pressure at Heel	-0.29	KSF
	-1.99	PSI
%Base in Compression	See Below	FT
Passive Pressure (Key/Toe)	0.00	KLF
Passive Pressure (Manually Input)	1.36	KLF
Sliding Factor of Safety	See Below	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	1.9	1.89	FT
%Base in Compression	88%	13.61	FT
Modified Reaction at the Toe		2.68	KSF
		18.60	PSI
Modified Uplift Force	*Unmodified*	-13.06	KIPS
Modified Uplift Arm	*Unmodified*	7.75	FT
Modified Total Vertical Force		18.22	KIPS
Modified Net Moment	*Unmodified*	82.64	
Modified Sliding F.S.		1.23	

Cell Modified

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	4/20/2020	BETA 6.3	2
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	11/10/2020		19C21022.03

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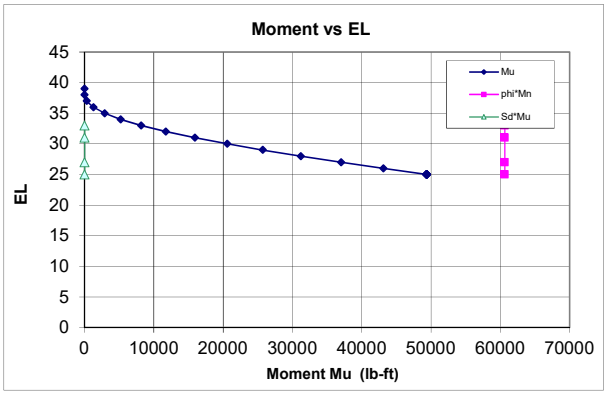
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.2
Load Factor M1 Sloping Soil		1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	25	0.00389	0.00335	0.73	7	0.88	8	0.90	15.6	0.00482	60,639	49,351	44,184	N/A	N/A	39.3	N/A	OK	OK
2	27	0.00290	0.00335	0.63	7	0.88	8	0.90	15.6	0.00482	60,639	37,033	33,431	N/A	N/A	29.8	N/A	OK	OK
6	31	0.00123	0.00164	0.31	7	0.88	8	0.90	15.6	0.00482	60,639	15,908	14,703	N/A	N/A	13.1	N/A	OK	OK
8	33	0.00063	0.00100	0.22	7	0.88	8	0.90	15.6	0.00482	60,639	8,154	7,677	N/A	N/A	6.8	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	25	0.22	6	0.75	8	0.66	OK
2	27	0.22	6	0.75	8	0.66	OK
6	31	0.22	6	0.75	8	0.66	OK
8	33	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	6,320	lb	**Optional Diagonal Bars:**		
ϕVc:	18,791	lb	Max of Vu(stem) and Vu(heel):	10,335	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.32	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	29.35	0.88	25.7	1.3	33.4	N/A	N/A	N/A
2.0	29.35	0.88	25.7	1.3	33.4	5954	12,528	OK
6.0	29.35	0.88	25.7	1.3	33.4	4433	12,528	OK
8.0	29.35	0.88	25.7	1.3	33.4	3278	12,528	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.23	0.23	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	11/10/2020		19C21022.03

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-5,513	5.25	1.0	-5513	-28,941	-28,941
Soil Weight on Toe			-5258	5.25	1	-5258	-27,607	-27,607
Water Weight on Toe			-6552	5.25	1	-6552	-34,398	-34,398
Uplift	0.84	0.84	8,845	5.25	1.6	14152	74,300	46,437
Foundation Reaction	2.68	0.61	17,268	6.35	1.6	27629	175,428	109,642
Sloping Soil			-822	3.50	1	-822	-2,876	-2,876
			0	10.50	1.0	0	0	0
			0	10.50	1.0	0	0	0
Sum						**23,637**	**155,907**	**62,259**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00062	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	49,351	44,184	N/A	N/A	21.0	N/A	OK	OK

Check Shear on Toe:

Vu: 23,637 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.45	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			1,838	1.75	1.2	2205	3,859	3,216
Soil Weight on Heel			3,696	1.78	1.6	5913	10,497	6,560
Water Weight on Heel			2,184	1.75	1.4	3058	5,351	3,822
Vert Force on Heel from Sloping Fill			1,476	3.50	1.6	2362	8,266	5,166
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.84	0.84	-2948	1.75	1	-2948	-5160	-5,160
Foundation Reaction	0.32	0.00	-254	0.54	1	-254	-136	-136
			0	0.00	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**10,335**	**22,676**	13,468

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**22,676**	**ft-lb**	**:<Use this**	Ms(heel)=	**13,468**	**ft-lb**	**<<Use this**
Mu(stem)=	**49,351**	**ft-lb**		Ms(stem)=	**44,184**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**10,335**	**Lb**	<=Use this
Vu(stem)=	**6,320**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00028	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	22,676	13,468	N/A	N/A	6.4	N/A	OK	OK

Check Shear on Heel:

Vu: 10,335 lb
ϕVc: 46,639 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Pine Lake Dam	RLJ	07/24/20	BETA 6.3	1
Structure:	Outlet Retaining Wall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Pool (Req'd Sliding SF = 1.5) (Usual Load)	CTF	11/10/20		19C21022.03

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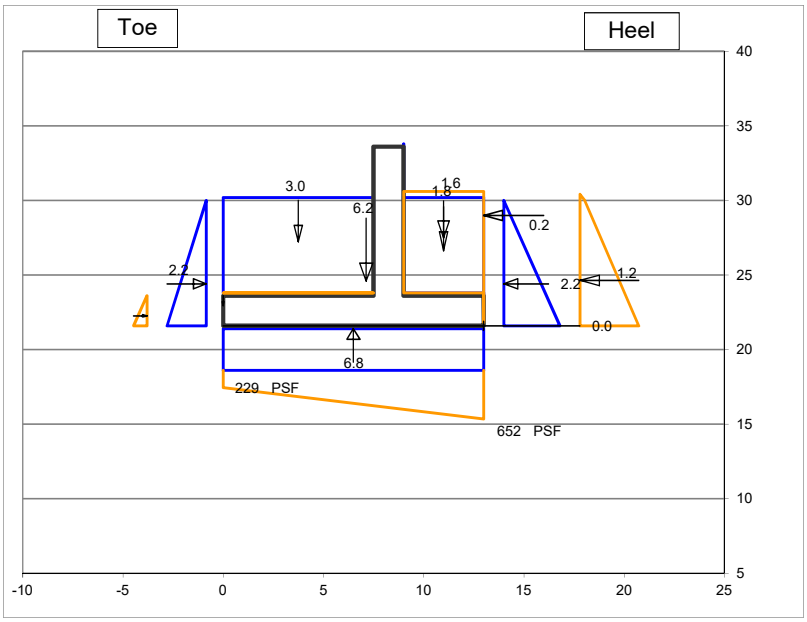
Wall Geometry and Material Properties

Top of Wall Elevation	33.6	ft
Stem Height	10	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	7.5	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	23.6	
Base Elevation	21.6	ft
Base Width	13.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	1.5	ft
Keyway Bot. EL (KeyEL)**	21.6	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	30.4	ft
Water EL at Heel (WaterELh)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	30.4	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	23.6	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	13.0		
Elevation	29		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Appied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	6.2	7.1	43.9	
Soil Weight on Heel	1.8	11.0	19.7	
Water Weight on Heel	1.6	11.0	17.6	
Vert Force on Heel from Sloping Fill	0.0	13.0	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	3.0	3.8	11.2	
Uplift	-6.8	6.5		44.3
Compaction	0.0	13.0		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	11.0	0.0	
Total Vertical Force	**5.7**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.2	2.8		6.2
Soil Pressure, Heel Side	1.23	3.0		3.7
Water Pressure, Toe Side	-2.2	2.8	6.2	
Soil Pressure, Toe Side	0.00	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	5.9		0.0
EQ Inertia Force (wall + backfill)	0.00	4.0		0.0
Compaction	0.2	7.4		1.3
0	0.0			
0	0.0			
Surcharge	0.0	4.4		0.0
Total Horizontal Force	**1.4**			
Total Moments			**98.6**	**55.5**
Net Moment			**43.2**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.52	KSF
Uplift Pressure at Heel		0.52	KSF
Eccentricity		-1.04	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.23	KSF
		1.59	PSI
Reaction Pressure at Heel		0.65	KSF
		4.52	PSI
%Base in Compression	100%	**13.00**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	7/24/2020	BETA 6.3	2
Structure:	**Outlet Retaining Wall (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC1 - Normal Pool (Req'd Sliding SF = 1.5) (Usual Load)**	CTF	11/10/2020		19C21022.03

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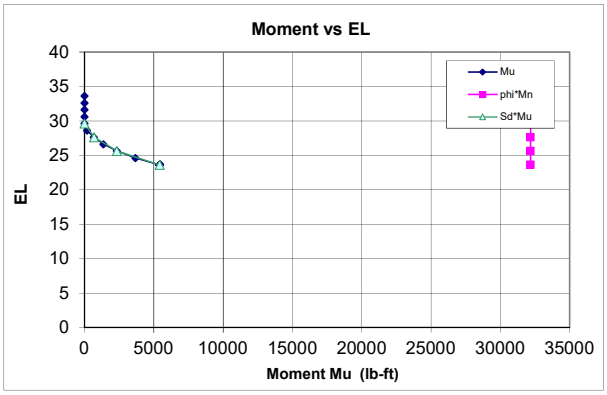
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.6
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	23.6	0.00041	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	5,420	2,706	1.00	30.0	4.5	5,420	OK	OK
2	25.6	0.00018	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	2,341	1,241	1.00	30.0	2.1	2,341	OK	OK
4	27.6	0.00005	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	674	385	1.03	30.0	0.6	693	OK	OK
6	29.6	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	8	5	1.09	30.0	0.0	8	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	23.6	0.22	5	0.63	8	0.47	OK
2	25.6	0.22	5	0.63	8	0.47	OK
4	27.6	0.22	5	0.63	8	0.47	OK
6	29.6	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	1,989	lb	**Optional Diagonal Bars:**		
ϕVc:	18,942	lb	Max of Vu(stem) and Vu(heel):	2,869	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.09	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	1139	12,629	OK
4.0	21.47	0.63	13.4	1.3	17.4	577	12,629	OK
6.0	21.47	0.63	13.4	1.3	17.4	27	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	14.8	0.00113	13,157	0	0	#DIV/0!	20.4	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**BASE SLAB REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date:	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	07/24/20	BETA 6.3	3
Structure:	**Outlet Retaining Wall (Normal Structure)**	Checked	Chk Date:		Job No.
Load Condition:	**LC1 - Normal Pool (Req'd Sliding SF = 1.5** Maximize Positive Moment (CW)	CTF	11/10/20		19C21022.03

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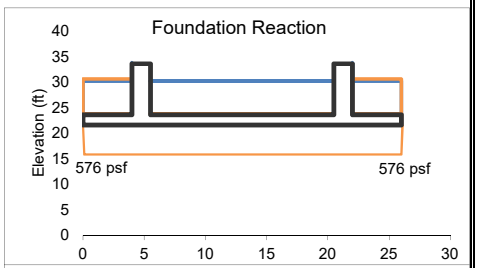
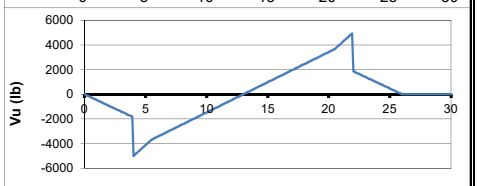
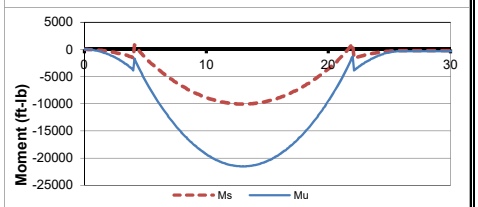
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-2250	2706	1.4	-3150	1.0	2706
point load	0.0	0		1.0	0		0
point load	26.0	0		1.0	0		0
Side Wall	22.0	-2250	-2706	1.4	-3150	1.0	-2706
Footing Length	26.0			1.4	0		0
Total		-4500			-6300		







Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	26	26	-150	2	-300	-7800	1.4	-420	-10920
Soil Wt	0	4	4	-65.976	6.8	-449	-1795	1.6	-718	-2871
Headwater	0	4	4.0	-62.4	6.4	-399	-1597	1.6	-639	-2556
Tailwater/Soil	5.5	20.5	15.0	-62.4	6.4	-399	-5990	1.0	-399	-5990
Headwater	22	26	4	-62.4	6.4	-399	-1597	1.6	-639	-2556
Soil Wt	22	26	4.0	-65.976	6.8	-449	-1795	1.6	-718	-2871
Uplift	0	26	26	62.4	8.4	524	13628	1.4	734	19079
Soil Reaction	0	26	26	288	1	288		1.0	288	
Soil Reaction	0	26	26	288	1	288		1.0	288	
							-6946			-8685

Approx FS floating N/A

Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00000	0.00100	0.24	5	0.63	8	0.47	20.7	0.00187	42,651	0	1,012	N/A	N/A	1.3	N/A	OK	OK

Check Shear:

Vu: 4,927 lb
ϕVc: 24,980 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.63	13.4

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00094	0.00125	0.32	5	0.63	8	0.47	20.7	0.00187	42,651	21,512	10,059	1.00	29.7	12.7	21,512	OK	OK

Check Shear:

Vu: 5,016
ϕVc: 24,980
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.63	17.4

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast Exp/Total
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	(in^2/LF)		
(in^2)	(in^2/LF)									
288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Pine Lake Dam	RLJ	07/24/20	BETA 6.3	1
Structure:	Outlet Retaining Wall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (Unsual Load)	CTF	11/10/20		19C21022.03

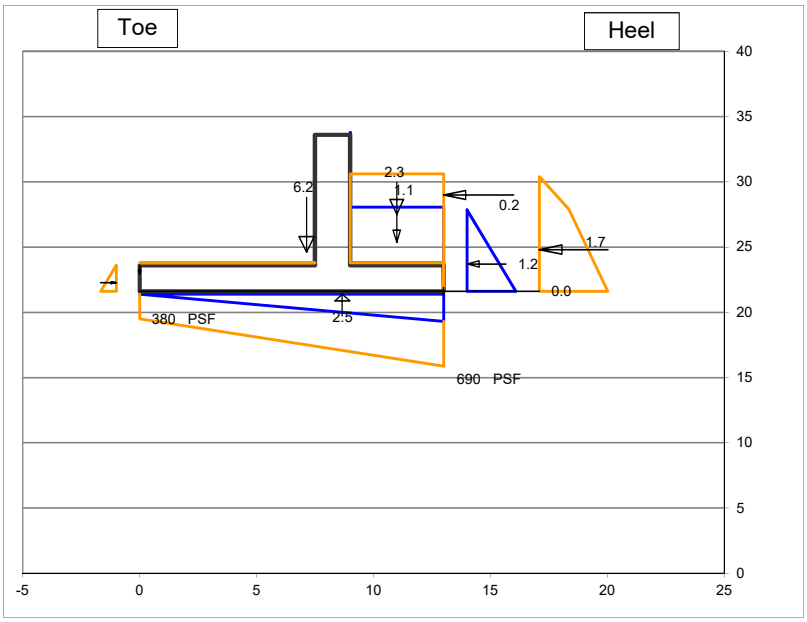
Schnabel ENGINEERING

Wall Geometry and Material Properties

Top of Wall Elevation	33.6	ft
Stem Height	10	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	7.5	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	23.6	
Base Elevation	21.6	ft
Base Width	13.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.6	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	30.4	ft
Water EL at Heel (WaterELh)	27.87	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	30.4	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	23.6	ft
Water EL at Toe (WaterELt)	21.6	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	13.0		
Elevation	29		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	6.2	7.1	43.9	
Soil Weight on Heel	2.3	11.0	25.1	
Water Weight on Heel	1.1	11.0	11.7	
Vert Force on Heel from Sloping Fill	0.0	13.0	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-2.5	8.7		22.0
Compaction	0.0	13.0		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	11.0	0.0	
Total Vertical Force	**7.0**			
HORZONTAL FORCES				
Water Pressure, Heel Side	1.2	2.1		2.6
Soil Pressure, Heel Side	1.65	3.2		5.3
Water Pressure, Toe Side	0.0	0.0	0.0	
Soil Pressure, Toe Side	0.00	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	5.9		0.0
EQ Inertia Force (wall + backfill)	0.00	4.0		0.0
Compaction	0.2	7.4		1.3
0	0.0			
0	0.0			
Surcharge	0.0	4.4		0.0
Total Horizontal Force	**3.1**			
Total Moments			**80.8**	**31.2**
Net Moment			**49.6**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.00	KSF
Uplift Pressure at Heel		0.39	KSF
Eccentricity		-0.63	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.38	KSF
		2.64	PSI
Reaction Pressure at Heel		0.69	KSF
		4.79	PSI
%Base in Compression	100%	**13.00**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Pine Lake Dam		
Structure:	Outlet Retaining Wall (Normal Structure)		
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (Unsual Load)		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	7/24/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	11/10/2020		19C21022.03

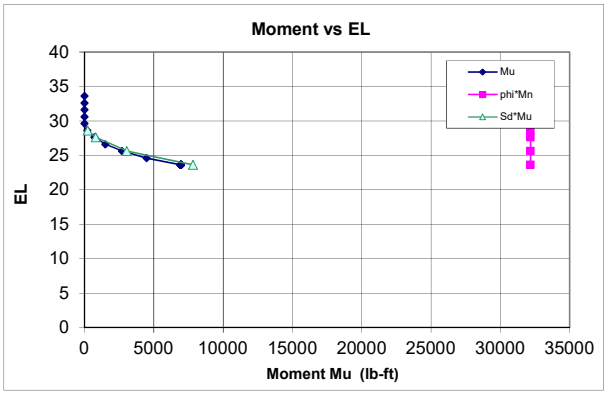
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.6
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	23.6	0.00059	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	6,950	4,343	1.13	30.0	7.3	7,821	OK	OK
2	25.6	0.00023	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	2,709	1,693	1.13	30.0	2.8	3,049	OK	OK
4	27.6	0.00006	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	716	447	1.13	30.0	0.8	805	OK	OK
5	28.6	0.00002	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	198	124	1.13	30.0	0.2	223	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	23.6	0.22	5	0.63	8	0.47	OK
2	25.6	0.22	5	0.63	8	0.47	OK
4	27.6	0.22	5	0.63	8	0.47	OK
5	28.6	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	2,878	lb
ϕVc:	18,942	lb
ϕVc > Vu	OK	

Optional Diagonal Bars:

Max of Vu(stem) and Vu(heel):	3,294	Lb
As (D bars) for entire shear load:	0.10	(in^2/LF)
As (D bars) for residual shear load:	0.00	(in^2/LF)
Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	1461	12,629	OK
4.0	21.47	0.63	13.4	1.3	17.4	631	12,629	OK
5.0	21.47	0.63	13.4	1.3	17.4	421	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
5.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL				
Client	City of Boiling Spring Lake				
Location	Pine Lake Dam				
Structure:	Outlet Retaining Wall (Normal Structure)				
Load Condition:	LC2 - Maintenance Condition (Req'd Slidi	Maximize Positive Moment (CW)			

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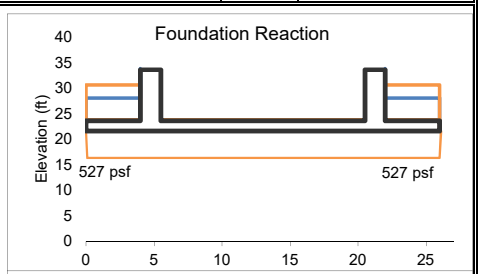
BASE SLAB REINFORCEMENT DESIGN

By	Date:	Program Ver.	Sheet
RLJ	07/24/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/10/20		19C21022.03

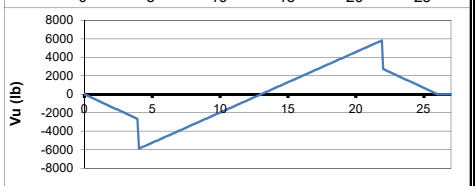
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-2250	4343	1.4	-3150	1.0	4343
point load	0.0	0		1.0	0		0
point load	26.0	0		1.0	0		0
Side Wall	22.0	-2250	-4343	1.4	-3150	1.0	-4343
Footing Length	26.0			1.4	0		0
Total		-4500			-6300		

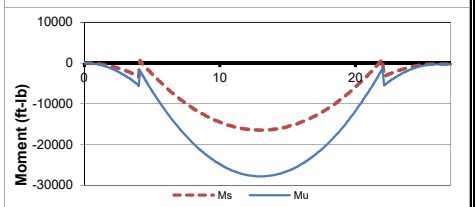


Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	26	26	-150	2	-300	-7800	1.4	-420	-10920
Soil Wt	0	4	4	-83.984	6.8	-571	-2284	1.6	-914	-3655
Headwater	0	4	4.0	-62.4	4.26666667	-266	-1065	1.6	-426	-1704
Tailwater/Soil	5.5	20.5	15.0	0	0	0	0	1.0	0	0
Headwater	22	26	4	-62.4	4.26666667	-266	-1065	1.6	-426	-1704
Soil Wt	22	26	4.0	-83.984	6.8	-571	-2284	1.6	-914	-3655
Uplift	0	26	26	62.4	6.26666667	391	10167	1.4	547	14234
Soil Reaction	0	26	26	264	1	264		1.0	264	
Soil Reaction	0	26	26	264	1	264		1.0	264	
							-4332			-7404

Approx FS floating N/A





Compute Bottom Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
0.00000	0.00100	0.24	5	0.63	8	0.47	20.7	0.00187	42,651	0	866	N/A	N/A	1.1	N/A	OK	OK

Check Shear:

Vu: 5,825 lb
ϕVc: 24,980 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.63	13.4

Compute Top Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi Mn > Mu$?	Meet As min?
0.00131	0.00175	0.44	5	0.63	8	0.47	20.7	0.00187	42,651	27,804	16,466	1.08	29.7	20.8	29,940	OK	OK

Check Shear:

Vu: 5,891
ϕVc: 24,980
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.63	17.4

Compute Longitudinal Steel:

Ag (in²)	Ast_{req} (in²/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in²/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in²/LF)	Ast_{prov} (in²/LF)	Adequacy	Ratio of Ast Exp/Total
288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Pine Lake Dam	RLJ	07/24/20	BETA 6.3	1
Structure:	Outlet Retaining Wall(Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (Extreme Load)	CTF	11/11/20		19C21022.03

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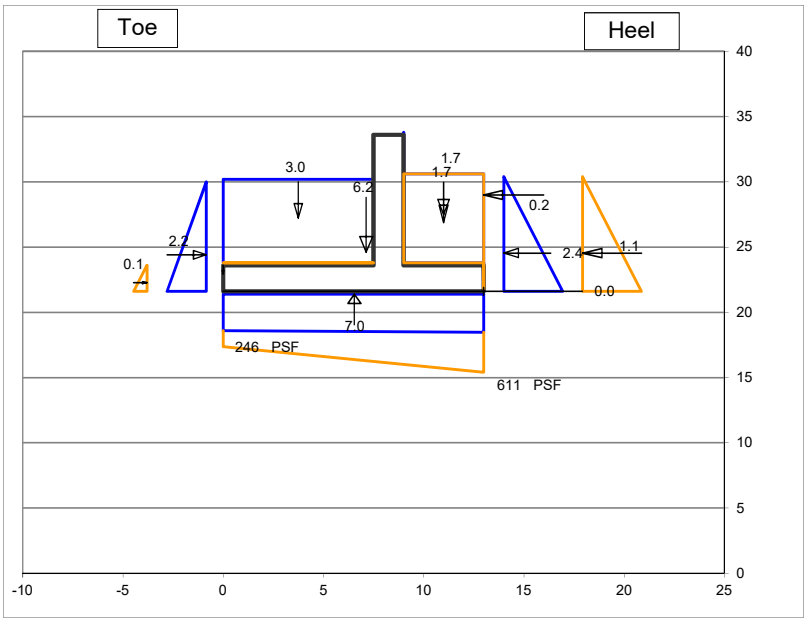
Wall Geometry and Material Properties

Top of Wall Elevation	33.6	ft
Stem Height	10	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	7.5	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	23.6	
Base Elevation	21.6	ft
Base Width	13.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	1.5	ft
Keyway Bot. EL (KeyEL)**	21.6	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	30.4	ft
Water EL at Heel (WaterELh)	30.4	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	30.4	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	23.6	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.47	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	13.0		
Elevation	29		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	6.2	7.1	43.9	
Soil Weight on Heel	1.7	11.0	18.7	
Water Weight on Heel	1.7	11.0	18.7	
Vert Force on Heel from Sloping Fill	0.0	13.0	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	3.0	3.8	11.2	
Uplift	-7.0	6.6		45.7
Compaction	0.0	13.0		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	11.0	0.0	
Total Vertical Force	**5.6**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.4	2.9		7.1
Soil Pressure, Heel Side	1.14	2.9		3.3
Water Pressure, Toe Side	-2.2	2.8	6.2	
Soil Pressure, Toe Side	-0.06	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	5.9		0.0
EQ Inertia Force (wall + backfill)	0.00	4.0		0.0
Compaction	0.2	7.4		1.3
0	0.0			
0	0.0			
Surcharge	0.0	4.4		0.0
Total Horizontal Force	**1.5**			
Total Moments			**98.7**	**57.4**
Net Moment			**41.3**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.52	KSF
Uplift Pressure at Heel		0.55	KSF
Eccentricity		-0.92	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.25	KSF
		1.71	PSI
Reaction Pressure at Heel		0.61	KSF
		4.24	PSI
%Base in Compression	100%	**13.00**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	BSL	STEM REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Pine Lake Dam	RLJ	7/24/2020	BETA 6.3	2
Structure:	Outlet Retaining Wall(Normal Structure)	Checked	Chk Date		Job No.
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (Extreme Load)	CTF	11/11/2020		19C21022.03

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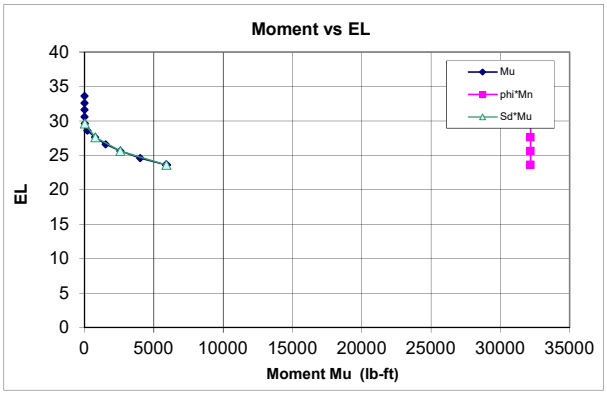
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.6
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	23.6	0.00045	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	5,914	3,015	1.00	30.0	5.1	5,914	OK	OK
2	25.6	0.00019	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	2,581	1,391	1.00	30.0	2.3	2,581	OK	OK
4	27.6	0.00006	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	750	433	1.04	30.0	0.7	780	OK	OK
6	29.6	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	12	7	1.10	30.0	0.0	13	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	23.6	0.22	5	0.63	8	0.47	OK
2	25.6	0.22	5	0.63	8	0.47	OK
4	27.6	0.22	5	0.63	8	0.47	OK
6	29.6	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	2,139	lb	**Optional Diagonal Bars:**		
ϕVc:	18,942	lb	Max of Vu(stem) and Vu(heel):	2,919	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.09	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	1243	12,629	OK
4.0	21.47	0.63	13.4	1.3	17.4	635	12,629	OK
6.0	21.47	0.63	13.4	1.3	17.4	41	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.06	0.06	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	14.8	0.00113	13,157	0	0	#DIV/0!	20.4	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL		BASE SLAB REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake		By	Date:	Program Ver.	Sheet
Location	Pine Lake Dam		RLJ	07/24/20	BETA 6.3	3
Structure:	Outlet Retaining Wall(Normal Structure)		Checked	Chk Date:		Job No.
Load Condition:	LC3 - Post Flood Condition (Req'd Slidin	Maximize Positive Moment (CW)	CTF	11/11/20		19C21022.03

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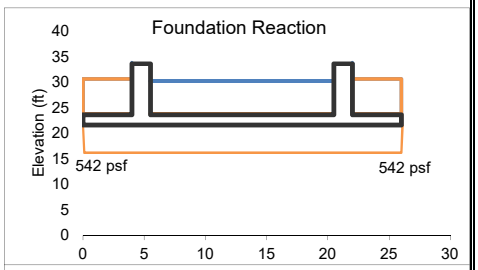
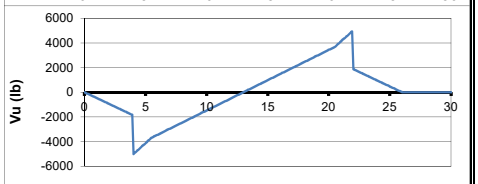
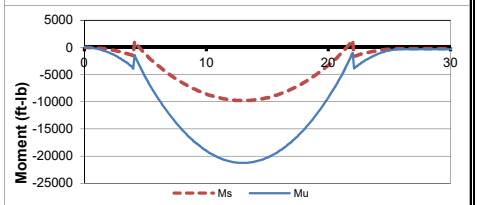
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-2250	3015	1.4	-3150	1.0	3015
point load	0.0	0		1.0	0		0
point load	26.0	0		1.0	0		0
Side Wall	22.0	-2250	-3015	1.4	-3150	1.0	-3015
Footing Length	26.0			1.4	0		0
Total		-4500			-6300		







Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	26	26	-150	2	-300	-7800	1.4	-420	-10920
Soil Wt	0	4	4	-62.6	6.8	-426	-1703	1.6	-681	-2724
Headwater	0	4	4.0	-62.4	6.8	-424	-1697	1.6	-679	-2716
Tailwater/Soil	5.5	20.5	15.0	-62.4	6.4	-399	-5990	1.0	-399	-5990
Headwater	22	26	4	-62.4	6.8	-424	-1697	1.6	-679	-2716
Soil Wt	22	26	4.0	-62.6	6.8	-426	-1703	1.6	-681	-2724
Uplift	0	26	26	62.4	8.8	549	14277	1.4	769	19988
Soil Reaction	0	26	26	271	1	271		1.0	271	
Soil Reaction	0	26	26	271	1	271		1.0	271	
							-6313			-7802

Approx FS floating N/A

Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00000	0.00100	0.24	5	0.63	8	0.47	20.7	0.00187	42,651	0	1,310	N/A	N/A	1.7	N/A	OK	OK

Check Shear:

Vu: 4,936 lb
ϕVc: 24,980 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.63	13.4

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00093	0.00124	0.31	5	0.63	8	0.47	20.7	0.00187	42,651	21,261	9,786	1.00	29.7	12.4	21,261	OK	OK

Check Shear:

Vu: 5,025
ϕVc: 24,980
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.63	17.4

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast Exp/Total
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	(in^2/LF)		
(in^2)	(in^2/LF)									
288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Pine Lake Dam	RLJ	07/24/20	BETA 6.3	1
Structure:	Outlet Retaining Wall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (Extreme Load)	CTF	11/11/20		19C21022.03

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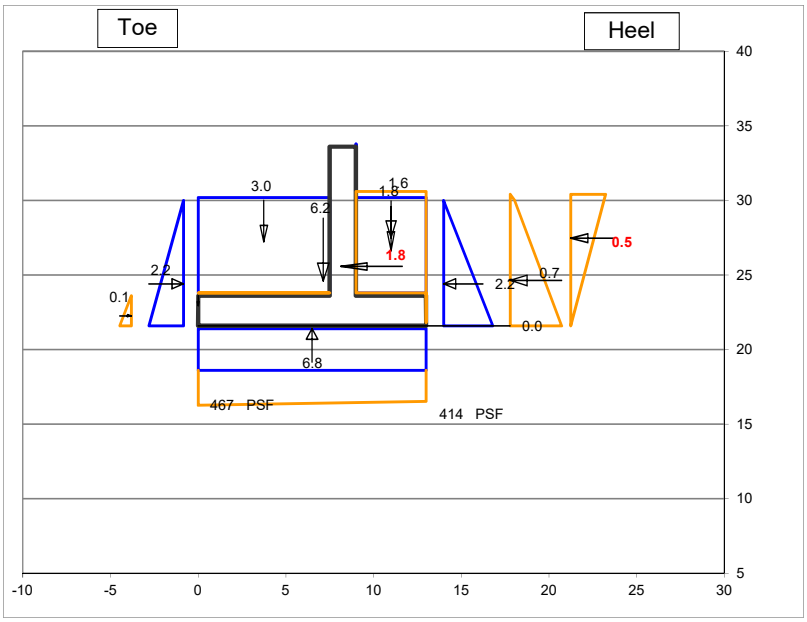
Wall Geometry and Material Properties

	Total Stress Strength Parameters	
Top of Wall Elevation	33.6	ft
Stem Height	10	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	7.5	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	23.6	
Base Elevation	21.6	ft
Base Width	13.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.6	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib) (total stress)	20	degrees
Allowable Bearing Pressure (50% increase for seismic	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.14	

Stability Summary

Half Section (Yes/No)?	Yes	
Sliding Factor of Safety	N/A	FS is calculated based on Total Stress Strength Parameters.
Reaction within Middle 1/3 ?	N/A	Uplift is not included. Added passive force is req'd, see Cell J48.
% Base in Compression	N/A	
Foundation Reaction Pressure	N/A	



Fill over Heel Input

Backfill EL at Wall (FillELw)	30.4	ft
Water EL at Heel (WaterELh)	30	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	30.4	
ΔKAE (Mononobe-Okabe EQ Coef)	0.094	

Fill over Toe Input

Fill EL at Toe (FillELt)	23.6	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.47	(at-rest)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force Cohesion at base =50 psf	0.65	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load			
Station			
Elevation			
CCW Angle from Vert			
Magnitude (kips)			
Horiz Force	0.00	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	6.2	7.1	43.9	
Soil Weight on Heel	1.8	11.0	19.7	
Water Weight on Heel	1.6	11.0	17.6	
Vert Force on Heel from Sloping Fill	0.0	13.0	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	3.0	3.8	11.2	
Uplift	-6.8	6.5		44.3
0	0.0	0.0		
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	11.0	0.0	
Total Vertical Force	**5.7**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.2	2.8		6.2
Soil Pressure, Heel Side	0.70	3.0		2.1
Water Pressure, Toe Side	-2.2	2.8	6.2	
Soil Pressure, Toe Side	-0.06	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.45	5.9		2.7
EQ Inertia Force (wall + backfill)	1.76	4.0		7.0
0	0.0			
0	0.0			
0	0.0			
Surcharge	0.0	4.4		0.0
Total Horizontal Force	**2.8**			
Total Moments			**98.7**	**62.2**
Net Moment			**36.5**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.52	KSF
Uplift Pressure at Heel		0.52	KSF
Eccentricity		0.13	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.47	KSF
		3.24	PSI
Reaction Pressure at Heel		0.41	KSF
		2.87	PSI
%Base in Compression	100%	**13.00**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.65	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force	*Unmodified*	-6.81	KIPS
Modified Uplift Arm	*Unmodified*	6.50	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment	*Unmodified*	N/A	
Modified Sliding F.S.		N/A	

Modified Cell

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	7/24/2020	BETA 6.3	2
Structure:	**Outlet Retaining Wall (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (Extreme Load)**	CTF	11/11/2020		19C21022.03

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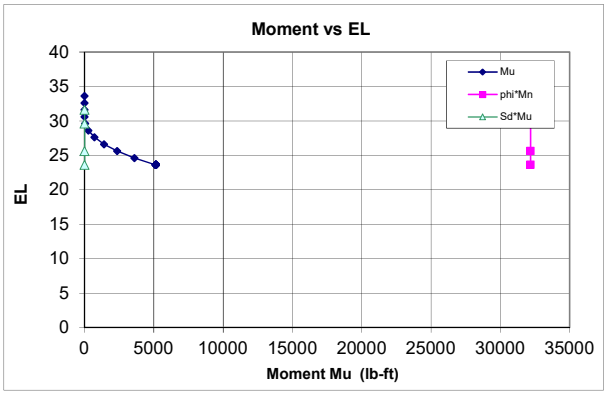
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.6
Load Factor M1	0	1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	23.6	0.00039	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	5,153	3,460	N/A	N/A	5.8	N/A	OK	OK
2	25.6	0.00018	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	2,352	1,775	N/A	N/A	3.0	N/A	OK	OK
6	29.6	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	53	52	N/A	N/A	0.1	N/A	OK	OK
8	31.6	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	0	0	N/A	N/A	0.0	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	23.6	0.22	5	0.63	8	0.47	OK
2	25.6	0.22	5	0.63	8	0.47	OK
6	29.6	0.22	5	0.63	8	0.47	OK
8	31.6	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	1,732	lb	**Optional Diagonal Bars:**		
ϕVc:	18,942	lb	Max of Vu(stem) and Vu(heel):	2,764	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.09	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	1088	12,629	OK
6.0	21.47	0.63	13.4	1.3	17.4	136	12,629	OK
8.0	21.47	0.63	13.4	1.3	17.4	0	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.06	0.06	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	**BSL**	**BASE SLAB REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date:	Program Ver.	Sheet
Location	**Pine Lake Dam**	RLJ	07/24/20	BETA 6.3	3
Structure:	**Outlet Retaining Wall (Normal Structure)**	Checked	Chk Date:		Job No.
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF** Maximize Positive Moment (CW)	CTF	11/11/20		19C21022.03

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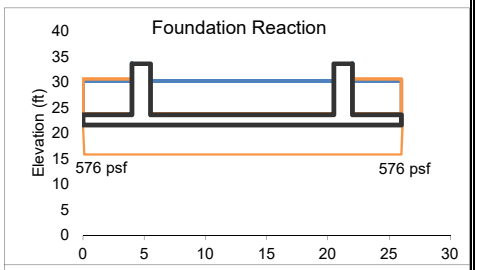
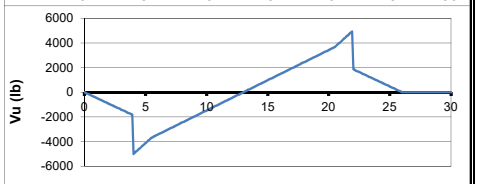
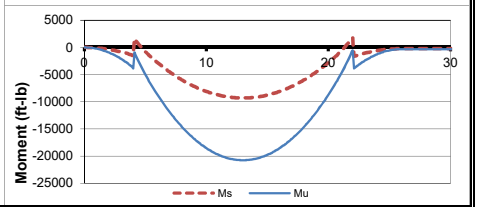
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-2250	3460	1.4	-3150	1.0	3460
point load	0.0	0		1.0	0		0
point load	26.0	0		1.0	0		0
Side Wall	22.0	-2250	-3460	1.4	-3150	1.0	-3460
Footing Length	26.0			1.4	0		0
Total		-4500			-6300		







Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	26	26	-150	2	-300	-7800	1.4	-420	-10920
Soil Wt	0	4	4	-65.976	6.8	-449	-1795	1.6	-718	-2871
Headwater	0	4	4.0	-62.4	6.4	-399	-1597	1.6	-639	-2556
Tailwater/Soil	5.5	20.5	15.0	-62.4	6.4	-399	-5990	1.0	-399	-5990
Headwater	22	26	4	-62.4	6.4	-399	-1597	1.6	-639	-2556
Soil Wt	22	26	4.0	-65.976	6.8	-449	-1795	1.6	-718	-2871
Uplift	0	26	26	62.4	8.4	524	13628	1.4	734	19079
Soil Reaction	0	26	26	288	1	288		1.0	288	
Soil Reaction	0	26	26	288	1	288		1.0	288	
							-6946			-8685

Approx FS floating N/A

Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00000	0.00100	0.25	5	0.63	8	0.47	20.7	0.00187	42,651	0	1,767	N/A	N/A	2.2	N/A	OK	OK

Check Shear:

Vu: 4,927 lb
ϕVc: 24,980 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.63	13.4

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00090	0.00121	0.31	5	0.63	8	0.47	20.7	0.00187	42,651	20,758	9,304	N/A	N/A	11.8	N/A	OK	OK

Check Shear:

Vu: 5,016
ϕVc: 24,980
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.63	17.4

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast Exp/Total
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	(in^2/LF)		
(in^2)	(in^2/LF)									
288	0.86	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Pine Lake Dam		
Structure:	Box Inlet Weir Sidewalls (Normal Structure)		
Load Condition:	LC1 - Normal Operating (Usual Load) (TW = 30' EL)		

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STABILITY ANALYSIS

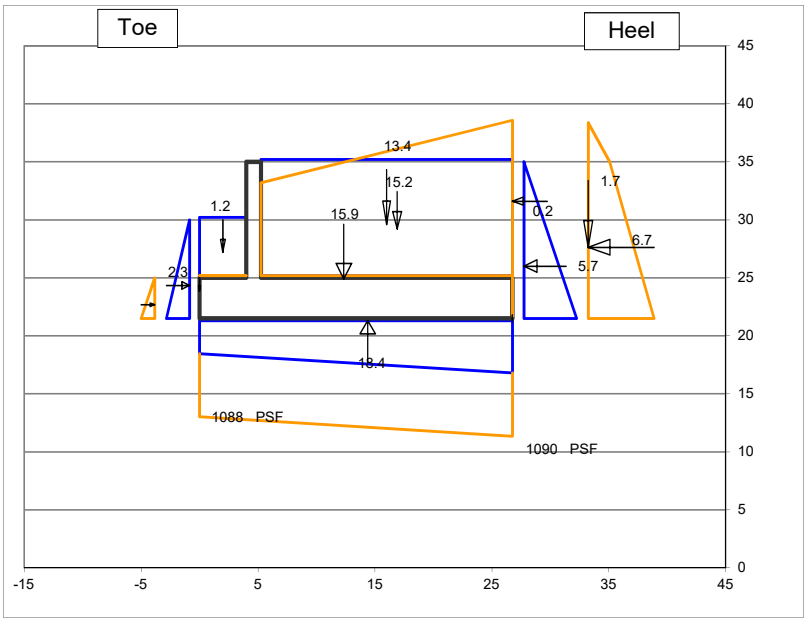
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	11/10/20		19C21022.03

Wall Geometry and Material Properties

Top of Wall Elevation	35	ft
Stem Height	10	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.25	ft
Toe Length (Bt)	4	ft
Heel Length (Bh)	21.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.25	ft
Top of Footing EL	25.0	
Base Elevation	21.5	ft
Base Width	26.8	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.5	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	N/A	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	33	ft
Water EL at Heel (WaterELh)	35	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	14.04	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.58	
Sloping Backfill EL at Heel (FillELh)	38.4	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	25	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	26.8		
Elevation	31.6		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	15.9	12.3	196.5	
Soil Weight on Heel	15.2	16.9	257.5	
Water Weight on Heel	13.4	16.0	214.7	
Vert Force on Heel from Sloping Fill	1.7	26.8	45.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	1.2	2.0	2.5	
Uplift	-18.4	14.4		264.2
Compaction	0.0	26.8		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	16.0	0.0	
Total Vertical Force	**29.1**			
HORZONTAL FORCES				
Water Pressure, Heel Side	5.7	4.5		25.6
Soil Pressure, Heel Side	6.72	6.1		41.1
Water Pressure, Toe Side	-2.3	2.8	6.4	
Soil Pressure, Toe Side	0.00	1.2	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	7.7		0.0
EQ Inertia Force (wall + backfill)	0.00	5.4		0.0
Compaction	0.2	10.1		1.7
0	0.0			
0	0.0			
Surcharge	0.0	8.4		0.0
Total Horizontal Force	**10.3**			
Total Moments			**722.5**	**332.7**
Net Moment			**389.8**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.53	KSF
Uplift Pressure at Heel		0.84	KSF
Eccentricity		0.00	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		1.09	KSF
		7.56	PSI
Reaction Pressure at Heel		1.09	KSF
		7.57	PSI
%Base in Compression	100%	**26.75**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Pine Lake Dam		
Structure:	Box Inlet Weir Sidewalls (Normal Structure)		
Load Condition:	LC1 - Normal Operating (Usual Load) (TW = 30' EL)		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	4/20/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	11/10/2020		19C21022.03

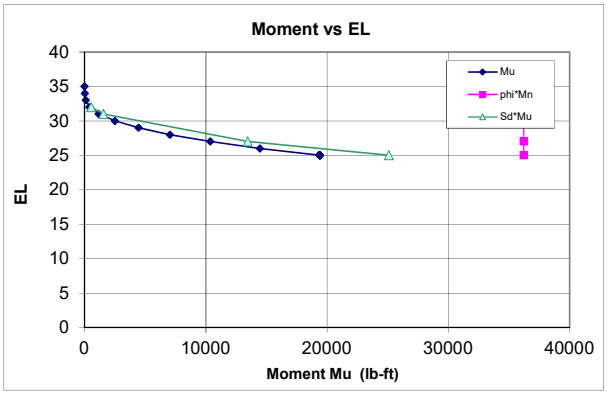
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.2
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	25	0.00299	0.00335	0.51	6	0.75	8	0.66	12.6	0.00436	36,211	19,400	13,262	1.29	28.5	19.8	25,093	OK	OK
2	27	0.00158	0.00211	0.32	6	0.75	8	0.66	12.6	0.00436	36,211	10,371	7,112	1.30	28.5	10.6	13,457	OK	OK
6	31	0.00018	0.00100	0.18	6	0.75	8	0.66	12.6	0.00436	36,211	1,173	816	1.32	28.5	1.2	1,544	OK	OK
7	32	0.00006	0.00100	0.18	6	0.75	8	0.66	12.6	0.00436	36,211	403	287	1.35	28.5	0.4	542	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	25	0.18	6	0.75	8	0.66	OK
2	27	0.18	6	0.75	8	0.66	OK
6	31	0.18	6	0.75	8	0.66	OK
7	32	0.18	6	0.75	8	0.66	OK

Check Shear:

Vu:	5,367	lb	**Optional Diagonal Bars:**		
ϕVc:	15,244	lb	Max of Vu(stem) and Vu(heel):	27,120	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.85	(in^2/LF)
			As (D bars) for residual shear load:	0.37	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	3699	10,163	OK
6.0	21.47	0.75	16.1	1.3	20.9	1088	10,163	OK
7.0	21.47	0.75	16.1	1.3	20.9	421	10,163	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
7.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL		BASE SLAB REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake		By	Date:	Program Ver.	Sheet
Location	Pine Lake Dam		RLJ	04/20/20	BETA 6.3	3
Structure:	Box Inlet Weir Sidewalls (Normal Structure)		Checked	Chk Date:		Job No.
Load Condition:	LC1 - Normal Operating (Usual Load) (TW	Maximize Positive Moment (CW)	CTF	11/10/20		19C21022.03

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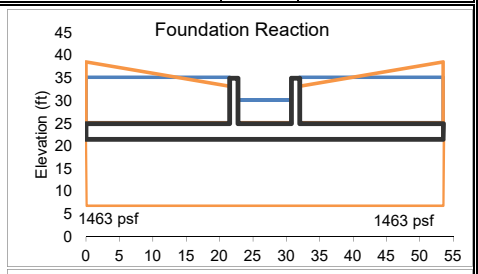
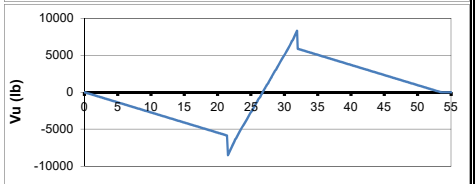
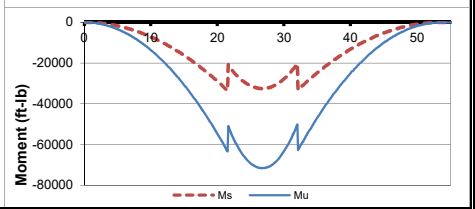
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	21.5	-1875	13262	1.4	-2625	1.0	13262
point load	0.0	0		1.0	0		0
point load	53.5	0		1.0	0		0
Side Wall	32.0	-1875	-13262	1.4	-2625	1.0	-13262
Footing Length	53.5			1.4	0		0
Total		-3750			-5250		



Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	53.5	53.5	-160	3.5	-560	-29960	1.4	-784	-41944
Soil Wt	0	21.5	21.5	-88.574	8	-709	-15235	1.6	-1134	-24375
Headwater	0	21.5	21.5	-62.4	10	-624	-13416	1.6	-998	-21466
Tailwater/Soil	22.8	30.8	8.0	-62.4	5	-312	-2496	1.0	-312	-2496
Headwater	32	53.5	21.5	-62.4	10	-624	-13416	1.6	-998	-21466
Soil Wt	32	53.5	21.5	-88.574	8	-709	-15235	1.6	-1134	-24375
Uplift	0	53.5	53.5	62.4	13.5	842	45068	1.4	1179	63096
Soil Reaction	0	53.5	53.5	732	1	732		1.0	732	
Soil Reaction	0	53.5	53.5	732	1	732		1.0	732	
							-44689			-73026
Approx FS floating		**N/A**								





Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
#DIV/0!	#DIV/0!	#DIV/0!	6	0.75	8	0.66	38.6	0.00142	113,431	0	0	#DIV/0!	31.6	0.0	#DIV/0!	#DIV/0!	#DIV/0!

Check Shear:

Vu: 8,323 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00090	0.00119	0.56	6	0.75	8	0.66	38.6	0.00142	113,431	71,615	33,558	1.00	31.6	16.0	71,615	OK	OK

Check Shear:

Vu: 8,509
ϕVc: 46,639
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	(in^2/LF)		Exp/Total
(in^2)	(in^2/LF)									
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

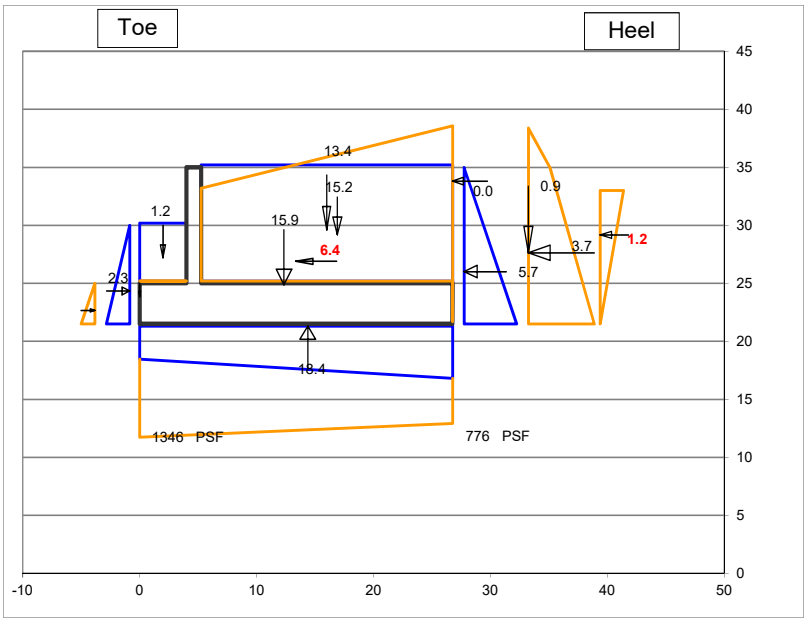
Project	BSL	Schnabel ENGINEERING	STABILITY ANALYSIS		
Client	City of Boiling Spring Lake		By	Date:	Program Ver:	Sheet
Location	Pine Lake Dam		RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet Weir Sidewalls (Normal Structure)		Checked	Chk Date:		Job No
Load Condition:	LC4 - Seismic Loading (Extreme Load) (TW = 30' EL)		CTF	11/10/20		19C21022.02

Wall Geometry and Material Properties

	Total Stress Strength Parameters	
Top of Wall Elevation	35	ft
Stem Height	10	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.25	ft
Toe Length (Bt)	4	ft
Heel Length (Bh)	21.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.25	ft
Top of Footing EL	25.0	
Base Elevation	21.5	ft
Base Width	26.8	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.5	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	N/A	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.14	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	33	ft
Water EL at Heel (WaterELh)	35	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	14.04	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.32	
Sloping Backfill EL at Heel (FillELh)	38.4	
ΔKAE (Mononobe-Okabe EQ Coef)	0.150	

Fill over Toe Input

Fill EL at Toe (FillELt)	25	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	(at-rest)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)		

Manually-Input Passive Resistance at Toe

Passive Force	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Hydrodynamic		
Station	26.8		
Elevation	33.8		
CCW Angle from Vert	270		
Magnitude (kips)	0.02		
Horiz Force	0.02	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Appied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	15.9	12.3	196.5	
Soil Weight on Heel	15.2	16.9	257.5	
Water Weight on Heel	13.4	16.0	214.7	
Vert Force on Heel from Sloping Fill	0.9	26.8	24.6	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	1.2	2.0	2.5	
Uplift	-18.4	14.4		264.2
Hydrodynamic	0.0	26.8		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	16.0	0.0	
Total Vertical Force	**28.4**			
HORZONTAL FORCES				
Water Pressure, Heel Side	5.7	4.5		25.6
Soil Pressure, Heel Side	3.67	6.1		22.5
Water Pressure, Toe Side	-2.3	2.8	6.4	
Soil Pressure, Toe Side	0.00	1.2	0.0	
EQ Soil Dynamic Component ΔP_{AE}	1.24	7.7		9.5
EQ Inertia Force (wall + backfill)	6.41	5.4		34.6
Hydrodynamic	0.0	12.3		0.3
0	0.0			
0	0.0			
Surcharge	0.0	8.4		0.0
Total Horizontal Force	**14.8**			
Total Moments			**702.1**	**356.6**
Net Moment			**345.5**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.53	KSF
Uplift Pressure at Heel		0.84	KSF
Eccentricity		1.20	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.35	KSF
		9.35	PSI
Reaction Pressure at Heel		0.78	KSF
		5.39	PSI
%Base in Compression	100%	26.75	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		N/A	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force	*Unmodified*	-18.36	KIPS
Modified Uplift Arm	*Unmodified*	14.39	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment	*Unmodified*	N/A	
Modified Sliding F.S.		N/A	

Project	BSL	STEM REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Pine Lake Dam	RLJ	4/20/2020	BETA 6.3	2
Structure:	Box Inlet Weir Sidewalls (Normal Structure)	Checked	Chk Date		Job No.
Load Condition:	LC4 - Seismic Loading (Extreme Load) (TW = 30' EL)	CTF	11/10/2020		19C21022.02

Schnabel ENGINEERING

Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

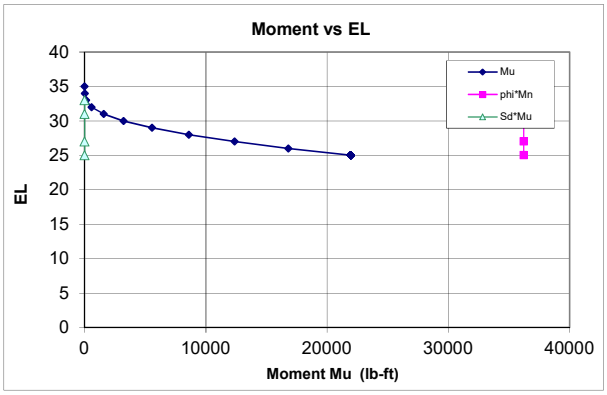
Severe Environmental Exposure? N

Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.2
Load Factor M1 Hydrodynamic		1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρcalc	ρmin	Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu? ϕMn>Mu?	As min? As max?
0	25	0.00261	0.00335	0.51	6	0.75	8	0.66	12.6	0.00436	36,211	21,963	17,331	N/A	N/A	25.8	N/A	OK	OK
2	27	0.00145	0.00194	0.29	6	0.75	8	0.66	12.6	0.00436	36,211	12,365	9,929	N/A	N/A	14.8	N/A	OK	OK
6	31	0.00018	0.00100	0.18	6	0.75	8	0.66	12.6	0.00436	36,211	1,580	1,298	N/A	N/A	1.9	N/A	OK	OK
8	33	0.00002	0.00100	0.18	6	0.75	8	0.66	12.6	0.00436	36,211	133	100	N/A	N/A	0.1	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	Asreq (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	25	0.18	6	0.75	8	0.66	OK
2	27	0.18	6	0.75	8	0.66	OK
6	31	0.18	6	0.75	8	0.66	OK
8	33	0.18	6	0.75	8	0.66	OK

Check Shear:

Vu:	5,489	lb	**Optional Diagonal Bars:**		
ϕVc:	15,244	lb	Max of Vu(stem) and Vu(heel):	21,154	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.66	(in²/LF)
			As (D bars) for residual shear load:	0.19	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	ld/db	db (in)	ld (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	4106	10,163	OK
6.0	21.47	0.75	16.1	1.3	20.9	1306	10,163	OK
8.0	21.47	0.75	16.1	1.3	20.9	195	10,163	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Astreq (in²/LF)	Exposed Face Bar #	Spacing (in)	Astprov (in²/LF)	Unexposed Face Bar #	Spacing (in)	Astprov (in²/LF)	Astprov (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρcalc	ρmin	Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	BSL				
Client	City of Boiling Spring Lake				
Location	Pine Lake Dam				
Structure:	Box Inlet Weir Sidewalls (Normal Structure)				
Load Condition:	LC4 - Seismic Loading (Extreme Load) (T Maximize Negative Moment (CCW)				

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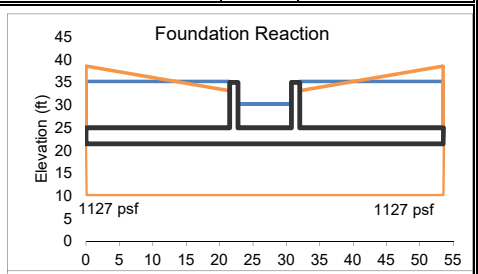
BASE SLAB REINFORCEMENT DESIGN

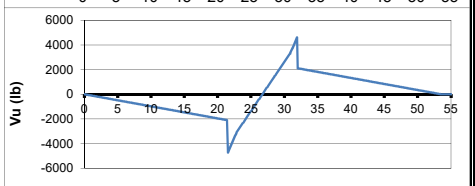
By	Date:	Program Ver.	Sheet
RLJ	04/20/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/10/20		19C21022.02

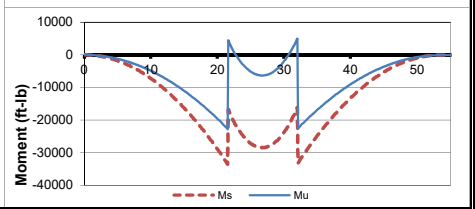
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	21.5	-1875	17331	1.4	-2625	1.6	27729
point load	0.0	0		1.0	0		0
point load	53.5	0		1.0	0		0
Side Wall	32.0	-1875	-17331	1.4	-2625	1.6	-27729
Footing Length	53.5			1.4	0		0
Total		-3750			-5250		



Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	53.5	53.5	-150	3.5	-525	-28088	1.4	-735	-39323
Soil Wt	0	21.5	21.5	-88.574	8	-709	-15235	1.0	-709	-15235
Headwater	0	21.5	21.5	-62.4	10	-624	-13416	1.0	-624	-13416
Tailwater/Soil	22.8	30.8	8.0	-62.4	5	-312	-2496	1.4	-437	-3494
Headwater	32	53.5	21.5	-62.4	10	-624	-13416	1.0	-624	-13416
Soil Wt	32	53.5	21.5	-88.574	8	-709	-15235	1.0	-709	-15235
Uplift	0	53.5	53.5	62.4	13.5	842	45068	1.0	842	45068
Soil Reaction	0	53.5	53.5	564	1	564		1.0	564	
Soil Reaction	0	53.5	53.5	564	1	564		1.0	564	
							-42816			-55050
Approx FS floating		**N/A**								





Compute Bottom Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
0.00006	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	4,970	0	N/A	N/A	0.0	N/A	OK	OK

Check Shear:

Vu: 4,610 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi Mn > Mu$?	Meet As min?
0.00028	0.00100	0.47	6	0.75	8	0.66	38.6	0.00142	113,431	22,802	33,558	N/A	N/A	16.0	N/A	OK	OK

Check Shear:

Vu: 4,734
ϕVc: 46,639
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in^2/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Schnabel ENGINEERING

CALCULATION COVER SHEET

Project	Project Number
Boiling Spring Lakes Dams	19C21022_00

Title

North Lake Dam Retaining Wall Design and Analysis

Computer Programs Used	Version/Release No.
Microsoft Excel - Retwall	2016

Purpose and Objective

Determine geometry of inlet headwall, outlet sidewalls and weir walls for the specified load cases. Design reinforcement to resist flexural moments in the stem and footings for the above structural elements. Design top & bottom mat reinforcement to resist flexural moments in the slabs based on rigid body U-frame analysis.

Load Cases
LC - 1 Normal Operating Condition
LC - 2 Maintenance Condition
LC - 3 Post Flood Condition
LC - 4 Seismic condition

Summary of Conclusions

Tables included in the calculations below summarize the stability of the "non U-frame" sections. Walls analyzed as a U-Frame are inherently stable. Reinforcement designed via the calculations below are called out in the structural design drawings.

Originator			
Cristian T. Franklin		CF	Jan 12, 2021
	Print	Sign	Date
Checked			
Robert L. Jarnigan		RJarnigan	Jan 12, 2021
	Print	Sign	Date

Table N1: Stability Summary for Inlet Headwall at North Lake Dam

Load Case	Loading Description	Sliding FOS actual / Req'd FOS	% Base in Compression / Req'd	Pressure at Toe (psf)	Pressure at Heel (psf)
LC1	Normal Operating Condition, At-Rest (Critical Structure, Usual Load)	1.89 / 1.5	100 / 100	2476	285
LC2	Maintenance Condition, At-Rest (Critical Structure, Unusual)	1.67 / 1.3	100 / 75	3406	154
LC3	Post Flood Condition, At-Rest (Critical Structure, Extreme)	1.52 / 1.1	90 / >0	2810	0
LC4	Seismic Condition, Active (Critical Structure, Extreme)	1.44 / 1.1	67 / >0	4094	0

Project	BSL		
Client	City of Boiling Spring Lake		
Location	North Lake Dam		
Structure:	Box Inlet Headwall (Normal Structure)		
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 1.5) (LCC = Usual) (SIC = Ordinary)		

Schnabel ENGINEERING

STABILITY ANALYSIS

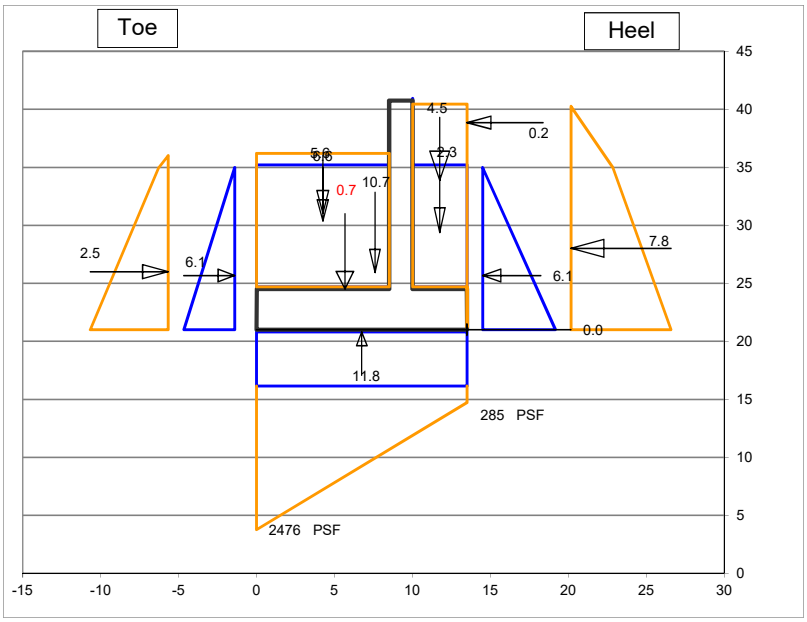
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	11/09/20		19C21022.02

Wall Geometry and Material Properties

Top of Wall Elevation	40.75	ft
Stem Height	16.25	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	8.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	24.5	
Base Elevation	21.0	ft
Base Width	13.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.89
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	40.25	ft
Water EL at Heel (WaterELh)	35	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	40.3	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	36.00	ft
Water EL at Toe (WaterELt)	35.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_P in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	13.5	5.7	
Elevation	38.85	24.5	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	0.71	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.71	0.00
Force Appied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.7	7.6	81.7	
Soil Weight on Heel	4.5	11.8	52.9	
Water Weight on Heel	2.3	11.8	26.9	
Vert Force on Heel from Sloping Fill	0.0	13.5	0.0	
Soil Weight on Toe	6.6	4.3	28.1	
Water Weight at Toe	5.6	4.3	23.7	
Uplift	-11.8	6.8		79.6
Compaction	0.0	13.5		0.0
Sloping Soil	0.7	5.7	4.0	
0	0.0	0.0		
Surcharge	0.0	11.8	0.0	
Total Vertical Force	**18.6**			
HORZONTAL FORCES				
Water Pressure, Heel Side	6.1	4.7		28.5
Soil Pressure, Heel Side	7.81	7.0		54.7
Water Pressure, Toe Side	-6.1	4.7	28.5	
Soil Pressure, Toe Side	-2.52	5.0	12.6	
EQ Soil Dynamic Component ΔP_{AE}	0.00	12.8		0.0
EQ Inertia Force (wall + backfill)	0.00	8.2		0.0
Compaction	0.2	17.9		3.1
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	9.6		0.0
Total Horizontal Force	**5.5**			
Total Moments			**258.5**	**165.9**
Net Moment			**92.5**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.87	KSF
Uplift Pressure at Heel		0.87	KSF
Eccentricity		1.79	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		2.48	KSF
		17.20	PSI
Reaction Pressure at Heel		0.29	KSF
		1.98	PSI
%Base in Compression	100%	13.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.89	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	BSL	Schnabel ENGINEERING	STEM REINFORCEMENT DESIGN		
Client	City of Boiling Spring Lake		By	Date	Program Ver.	Sheet
Location	North Lake Dam		RLJ	4/20/2020	BETA 6.3	2
Structure:	Box Inlet Headwall (Normal Structure)		Checked	Chk Date		Job No.
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 1.5) (LCC = Usual) (SIC = Ordinary)		CTF	11/9/2020		19C21022.02

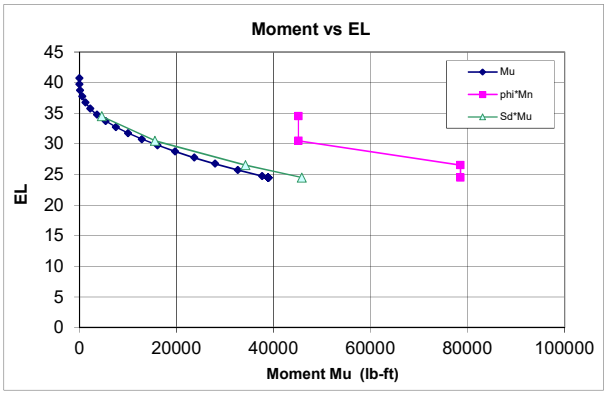
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.6
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.6
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	24.5	0.00364	0.00335	0.68	8	1.00	8	1.19	15.5	0.00637	78,511	38,916	24,323	1.18	28.7	16.7	45,828	OK	OK
2	26.5	0.00270	0.00335	0.62	8	1.00	8	1.19	15.5	0.00637	78,511	29,067	18,167	1.18	28.7	12.5	34,229	OK	OK
6	30.5	0.00119	0.00159	0.30	6	0.75	8	0.66	15.6	0.00352	45,121	13,620	8,513	1.14	29.6	10.2	15,542	OK	OK
10	34.5	0.00035	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	4,003	2,502	1.14	29.6	3.0	4,568	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	24.5	0.22	6	0.75	8	0.66	OK
2	26.5	0.22	6	0.75	8	0.66	OK
6	30.5	0.22	6	0.75	8	0.66	OK
10	34.5	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	5,273	lb
ϕVc:	18,716	lb
ϕVc > Vu	OK	

Optional Diagonal Bars:

Max of Vu(stem) and Vu(heel):	7,574	Lb
As (D bars) for entire shear load:	0.24	(in^2/LF)
As (D bars) for residual shear load:	0.00	(in^2/LF)
Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
2.0	33.54	1.00	33.5	1.3	43.6	4574	12,478	OK
6.0	21.47	0.75	16.1	1.3	20.9	3141	12,579	OK
10.0	21.47	0.75	16.1	1.3	20.9	1660	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
10.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.30	0.30	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**North Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 1.5) (LCC = Usual) (SIC = Ordinary)**	CTF	11/9/2020		19C21022.02

Schnabel ENGINEERING

Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-4,463	4.25	1.0	-4463	-18,966	-18,966
Soil Weight on Toe			-6607	4.25	1	-6607	-28,080	-28,080
Water Weight on Toe			-5569	4.25	1	-5569	-23,669	-23,669
Uplift	0.87	0.87	7,426	4.25	1.6	11881	50,494	31,559
Foundation Reaction	2.48	1.10	15,184	4.80	1.6	24295	116,543	72,839
			0	0.00	1	0	0	0
Sloping Soil			-714	2.83	1.0	-714	-2,023	-2,023
			0	8.50	1.0	0	0	0
Sum						**18,823**	**94,299**	**31,660**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00052	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	38,916	24,323	1.07	31.6	11.6	41,617	OK	OK

Check Shear on Toe:

Vu: 18,823 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.45	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			1,838	1.75	1.2	2205	3,859	3,216
Soil Weight on Heel			4,506	1.75	1.6	7209	12,616	7,885
Water Weight on Heel			2,293	1.75	1.4	3210	5,618	4,013
Vert Force on Heel from Sloping Fill			0	3.50	1.6	0	0	0
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.87	0.87	-3058	1.75	1	-3058	-5351	-5,351
Foundation Reaction	0.85	0.29	-1,992	1.46	1	-1992	-2907	-2,907
			0	3.50	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**7,574**	**13,835**	6,856

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**13,835**	**ft-lb**	**:<Use this**	Ms(heel)=	**6,856**	**ft-lb**	**<<Use this**
Mu(stem)=	**38,916**	**ft-lb**		Ms(stem)=	**24,323**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**7,574**	**Lb**	<=Use this
Vu(stem)=	**5,273**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00017	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	13,835	6,856	1.00	31.6	3.3	13,835	OK	OK

Check Shear on Heel:

Vu: 7,574 lb
ϕVc: 46,639 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	North Lake Dam		
Structure:	Box Inlet Headwall (Normal Structure)		
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (LCC = Unusual) (SIC = Ordinary)		

Schnabel ENGINEERING

STABILITY ANALYSIS

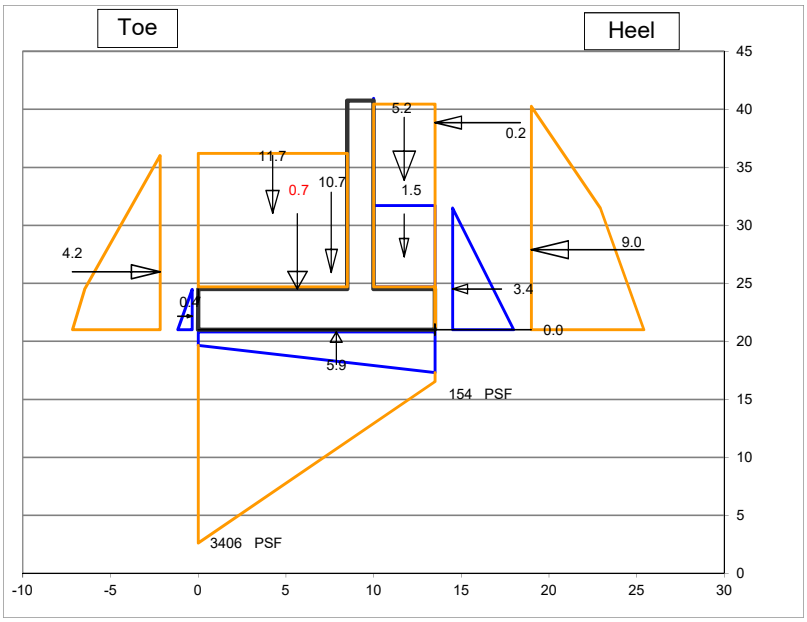
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	11/09/20		19C21022.02

Wall Geometry and Material Properties

Top of Wall Elevation	40.75	ft
Stem Height	16.25	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	8.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	24.5	
Base Elevation	21.0	ft
Base Width	13.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.67
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	40.25	ft
Water EL at Heel (WaterELh)	31.50	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	40.3	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)		36.00	ft
Water EL at Toe (WaterELt)	Invert EL of drain	24.5	ft
γ_{moist}		120	pcf
γ_{sat}		125	pcf
Kp at Toe (Kt)	(for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_p in Forces & Moments Table?		Y	
Ko at Toe (Kts)	(for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	13.5	5.7	
Elevation	38.85	24.5	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	0.71	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.71	0.00
Force Appied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.7	7.6	81.7	
Soil Weight on Heel	5.2	11.8	61.2	
Water Weight on Heel	1.5	11.8	18.0	
Vert Force on Heel from Sloping Fill	0.0	13.5	0.0	
Soil Weight on Toe	11.7	4.3	49.9	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-5.9	7.9		46.4
Compaction	0.0	13.5		0.0
Sloping Soil	0.7	5.7	4.0	
0	0.0	0.0		
Surcharge	0.0	11.8	0.0	
Total Vertical Force	**24.0**			
HORZONTAL FORCES				
Water Pressure, Heel Side	3.4	3.5		12.0
Soil Pressure, Heel Side	8.97	6.9		61.9
Water Pressure, Toe Side	-0.4	1.2	0.4	
Soil Pressure, Toe Side	-4.21	5.0	21.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	12.8		0.0
EQ Inertia Force (wall + backfill)	0.00	8.2		0.0
Compaction	0.2	17.9		3.1
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	9.6		0.0
Total Horizontal Force	**8.0**			
Total Moments			**236.2**	**123.4**
Net Moment			**112.8**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.22	KSF
Uplift Pressure at Heel		0.65	KSF
Eccentricity		2.06	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		3.41	KSF
		23.65	PSI
Reaction Pressure at Heel		0.15	KSF
		1.07	PSI
%Base in Compression	100%	13.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.67	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**North Lake Dam**	RLJ	4/20/2020	BETA 6.3	2
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (LCC = Unusual) (SIC = Ordinary)**	CTF	11/9/2020		19C21022.02

Schnabel ENGINEERING

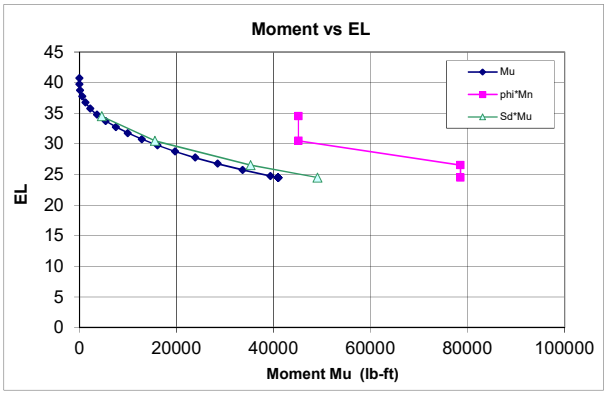
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.6
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.6
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρcalc	Required ρmin	Required Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu? / ϕMn>Mu?	As min? / As max?
0	24.5	0.00390	0.00335	0.72	8	1.00	8	1.19	15.5	0.00637	78,511	40,909	26,013	1.20	28.7	17.9	49,013	OK	OK
2	26.5	0.00278	0.00335	0.62	8	1.00	8	1.19	15.5	0.00637	78,511	29,704	18,727	1.19	28.7	12.9	35,285	OK	OK
6	30.5	0.00119	0.00158	0.30	6	0.75	8	0.66	15.6	0.00352	45,121	13,586	8,492	1.14	29.6	10.2	15,505	OK	OK
10	34.5	0.00035	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	4,003	2,502	1.14	29.6	3.0	4,568	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	Asreq (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	24.5	0.22	6	0.75	8	0.66	OK
2	26.5	0.22	6	0.75	8	0.66	OK
6	30.5	0.22	6	0.75	8	0.66	OK
10	34.5	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	6,203	lb	**Optional Diagonal Bars:**		
ϕVc:	18,716	lb	Max of Vu(stem) and Vu(heel):	8,570	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.27	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	ld/db	db (in)	ld (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
2.0	33.54	1.00	33.5	1.3	43.6	5027	12,478	OK
6.0	21.47	0.75	16.1	1.3	20.9	3135	12,579	OK
10.0	21.47	0.75	16.1	1.3	20.9	1659	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Astreq (in²/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Astprov (in²/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Astprov (in²/LF)	Astprov (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
10.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.30	0.30	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρcalc	Required ρmin	Required Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu?	As min? / As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL	TOE & HEEL REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	North Lake Dam	RLJ	4/20/2020	BETA 6.3	3
Structure:	Box Inlet Headwall (Normal Structure)	Checked	Chk Date		Job No
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (LCC = Unusual) (SIC = Ordinary)	CTF	11/9/2020		19C21022.02

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-4,463	4.25	1.0	-4463	-18,966	-18,966
Soil Weight on Toe			-11730	4.25	1	-11730	-49,853	-49,853
Water Weight on Toe			0	4.25	1	0	0	0
Uplift	0.22	0.49	3,021	3.70	1.4	4229	15,655	11,182
Foundation Reaction	3.41	1.36	20,252	4.86	1.6	32403	157,436	98,397
			0	0.00	1	0	0	0
Sloping Soil			-714	2.83	1.0	-714	-2,023	-2,023
			0	8.50	1.0	0	0	0
Sum						**19,725**	**102,249**	**38,738**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00055	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	40,909	26,013	1.09	31.6	12.4	44,510	OK	OK

Check Shear on Toe:

Vu: 19,725 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.45	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			1,838	1.75	1.2	2205	3,859	3,216
Soil Weight on Heel			5,209	1.75	1.6	8335	14,586	9,116
Water Weight on Heel			1,528	1.75	1.4	2139	3,744	2,674
Vert Force on Heel from Sloping Fill			0	3.50	1.6	0	0	0
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.54	0.65	-2094	1.81	1	-2094	-3780	-3,780
Foundation Reaction	1.00	0.15	-2,015	1.32	1	-2015	-2666	-2,666
			0	3.50	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**8,570**	**15,742**	8,559

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**15,742**	**ft-lb**	**:<Use this**	Ms(heel)=	**8,559**	**ft-lb**	**<<Use this**
Mu(stem)=	**40,909**	**ft-lb**		Ms(stem)=	**26,013**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**8,570**	**Lb**	<=Use this
Vu(stem)=	**6,203**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00020	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	15,742	8,559	1.00	31.6	4.1	15,742	OK	OK

Check Shear on Heel:

Vu: 8,570 lb
ϕVc: 46,639 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	North Lake Dam		
Structure:	Box Inlet Headwall (Normal Structure)		
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)		

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STABILITY ANALYSIS

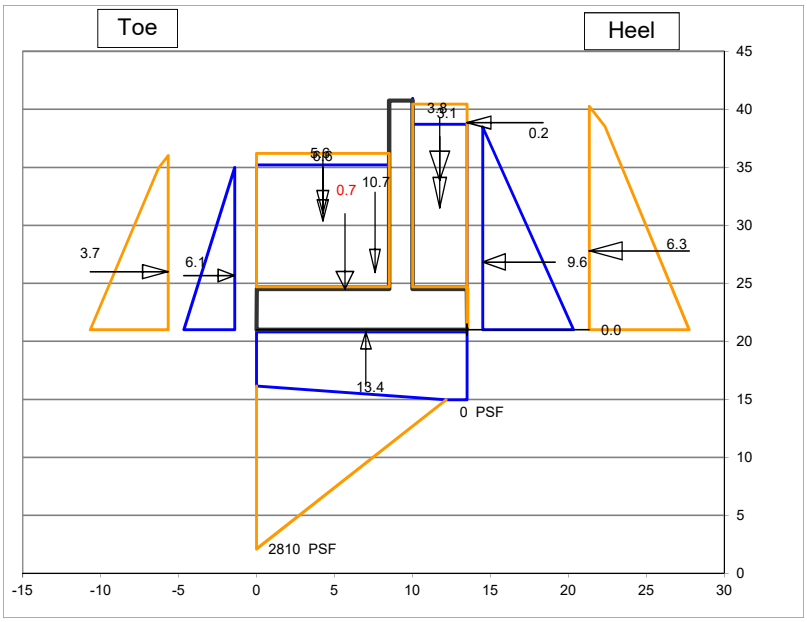
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	11/09/20		19C21022.02

Wall Geometry and Material Properties

Top of Wall Elevation	40.75	ft
Stem Height	16.25	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	8.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	24.5	
Base Elevation	21.0	ft
Base Width	13.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.52
Reaction within Middle 1/3 ?	NO
% Base in Compression	90%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	40.25	ft
Water EL at Heel (WaterELh)	38.5	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	40.3	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	36.00	ft
Water EL at Toe (WaterELt)	35.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.47	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	13.5	5.7	
Elevation	38.85	24.5	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	0.71	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.71	0.00
Force Appied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.7	7.6	81.7	
Soil Weight on Heel	3.8	11.8	44.7	
Water Weight on Heel	3.1	11.8	35.9	
Vert Force on Heel from Sloping Fill	0.0	13.5	0.0	
Soil Weight on Toe	6.6	4.3	28.1	
Water Weight at Toe	5.6	4.3	23.7	
Uplift	-13.3	7.0		92.9
Compaction	0.0	13.5		0.0
Sloping Soil	0.7	5.7	4.0	
0	0.0	0.0		
Surcharge	0.0	11.8	0.0	
Total Vertical Force	**17.2**			
HORZONTAL FORCES				
Water Pressure, Heel Side	9.6	5.8		55.7
Soil Pressure, Heel Side	6.32	6.8		43.0
Water Pressure, Toe Side	-6.1	4.7	28.5	
Soil Pressure, Toe Side	-3.70	5.0	18.5	
EQ Soil Dynamic Component ΔP_{AE}	0.00	12.8		0.0
EQ Inertia Force (wall + backfill)	0.00	8.2		0.0
Compaction	0.2	17.9		3.1
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	9.6		0.0
Total Horizontal Force	**6.2**			
Total Moments			**265.1**	**194.6**
Net Moment			**70.5**	

Safety Factor Evaluation

Uplift Pressure at Toe	0.87	KSF
Uplift Pressure at Heel	1.09	KSF
Eccentricity	2.66	FT
Reaction Within Middle 1/3?	NO	
Reaction Pressure at Toe	2.78	KSF
	19.34	PSI
Reaction Pressure at Heel	-0.23	KSF
	-1.61	PSI
%Base in Compression	See Below	FT
Passive Pressure (Key/Toe)	0.00	KLF
Passive Pressure (Manually Input)	0.00	KLF
Sliding Factor of Safety	See Below	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	1.3	1.34	FT
%Base in Compression	90%	12.16	FT
Modified Reaction at the Toe		2.81	KSF
		19.52	PSI
Modified Uplift Force		-13.41	KIPS
Modified Uplift Arm		7.02	FT
Modified Total Vertical Force		17.08	KIPS
Modified Net Moment		69.21	
Modified Sliding F.S.		1.52	

Project	BSL	STEM REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	North Lake Dam	RLJ	4/20/2020	BETA 6.3	2
Structure:	Box Inlet Headwall (Normal Structure)	Checked	Chk Date		Job No.
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)	CTF	11/9/2020		19C21022.02

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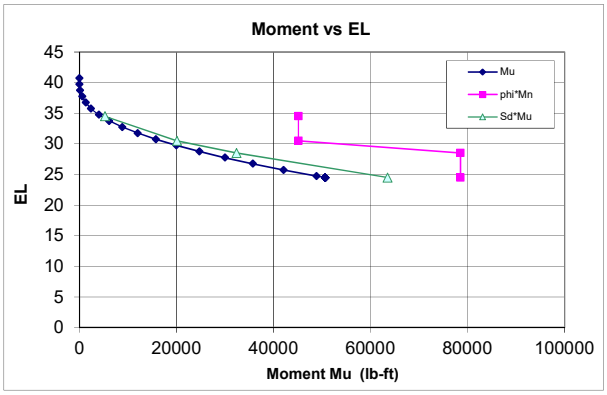
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.6
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.6
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρcalc	Required ρmin	Required Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu? ϕMn>Mu?	As min? As max?
0	24.5	0.00510	0.00335	0.95	8	1.00	8	1.19	15.5	0.00637	78,511	50,599	33,687	1.25	28.7	23.2	63,471	OK	OK
4	28.5	0.00254	0.00335	0.62	8	1.00	8	1.19	15.5	0.00637	78,511	25,969	17,173	1.25	28.7	11.8	32,357	OK	OK
6	30.5	0.00154	0.00206	0.39	6	0.75	8	0.66	15.6	0.00352	45,121	16,720	10,997	1.20	29.6	13.2	20,078	OK	OK
10	34.5	0.00040	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	4,473	2,879	1.18	29.6	3.4	5,256	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	Asreq (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	24.5	0.22	6	0.75	8	0.66	OK
4	28.5	0.22	6	0.75	8	0.66	OK
6	30.5	0.22	6	0.75	8	0.66	OK
10	34.5	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	7,168	lb	**Optional Diagonal Bars:**		
ϕVc:	18,716	lb	Max of Vu(stem) and Vu(heel):	8,252	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.26	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	ld/db	db (in)	ld (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
4.0	33.54	1.00	33.5	1.3	43.6	5140	12,478	OK
6.0	21.47	0.75	16.1	1.3	20.9	4108	12,579	OK
10.0	21.47	0.75	16.1	1.3	20.9	2008	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Astreq (in²/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Astprov (in²/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Astprov (in²/LF)	Astprov (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
10.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.44	0.44	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρcalc	Required ρmin	Required Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**North Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	11/9/2020		19C21022.02

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Bounding Pressures Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-4,463	4.25	1.0	-4463	-18,966	-18,966
Soil Weight on Toe			-6607	4.25	1	-6607	-28,080	-28,080
Water Weight on Toe			-5569	4.25	1	-5569	-23,669	-23,669
Uplift	0.87	1.03	8,075	4.14	1.4	11304	46,757	33,398
Foundation Reaction	2.81	0.85	15,535	5.01	1.6	24857	124,571	77,857
			0	0.00	1	0	0	0
Sloping Soil			-714	2.83	1.0	-714	-2,023	-2,023
			0	8.50	1.0	0	0	0
Sum						**18,808**	**98,590**	**38,517**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00072	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	50,599	33,687	1.14	31.6	16.0	57,640	OK	OK

Check Shear on Toe:

Vu: 18,808 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.45	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Bounding Press. Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			1,838	1.75	1.2	2205	3,859	3,216
Soil Weight on Heel			3,802	1.75	1.6	6084	10,647	6,654
Water Weight on Heel			3,058	1.75	1.4	4281	7,491	5,351
Vert Force on Heel from Sloping Fill			0	3.50	1.6	0	0	0
Surcharge			0	3.50	1.2	0	0	0
Uplift	1.05	1.09	-3780	1.76	1	-3780	-6658	-6,658
Foundation Reaction	0.50	0.00	-537	0.72	1	-537	-386	-386
			0	3.50	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**8,252**	**14,952**	8,176

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**14,952**	**ft-lb**	**:<Use this**	Ms(heel)=	**8,176**	**ft-lb**	**<<Use this**
Mu(stem)=	**50,599**	**ft-lb**		Ms(stem)=	**33,687**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**8,252**	**Lb**	<=Use this
Vu(stem)=	**7,168**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00019	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	14,952	8,176	1.00	31.6	3.9	14,952	OK	OK

Check Shear on Heel:

Vu: 8,252 lb
ϕVc: 46,639 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in^2/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	North Lake Dam		
Structure:	Box Inlet Headwall (Normal Structure)		
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)		

Schnabel ENGINEERING

STABILITY ANALYSIS

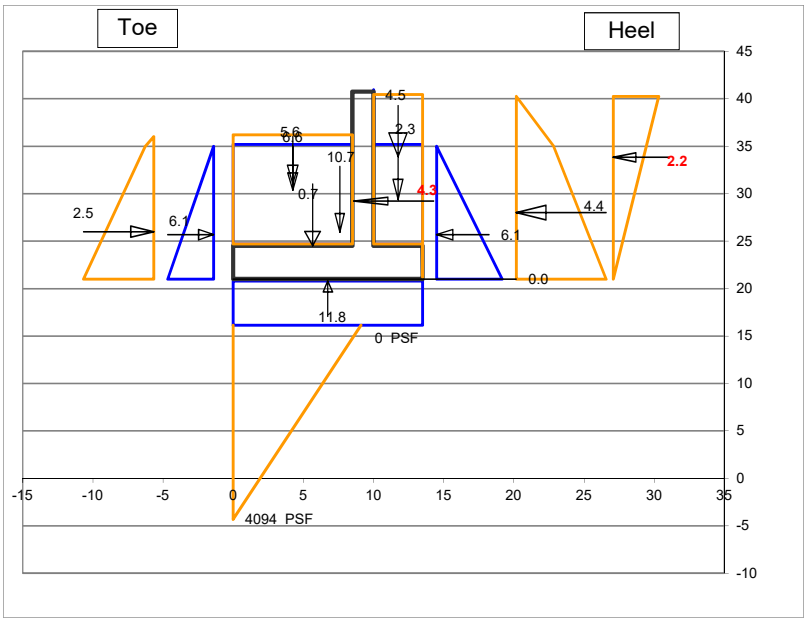
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	11/09/20		19C21022.02

Wall Geometry and Material Properties

Top of Wall Elevation	40.75	ft
Stem Height	16.25	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	8.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	24.5	
Base Elevation	21.0	ft
Base Width	13.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib) (total stress)	20	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.14	Read Me

Stability Summary

Half Section (Yes/No)?	No	
Sliding Factor of Safety	1.44	Sliding FS is calculated without uplift pressure.
Reaction within Middle 1/3 ?	NO	
% Base in Compression	67%	Overturning stability is calculated with uplift pressure.
Foundation Reaction Pressure	OK	



Fill over Heel Input

Backfill EL at Wall (FillELw)	40.25	
Water EL at Heel (WaterELh)	35	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi) (effective stress)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	40.3	
ΔKAE (Mononobe-Okabe EQ Coef)	0.094	

Fill over Toe Input

Fill EL at Toe (FillELt)	36.00	ft
Water EL at Toe (WaterELt)	35.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force Total stress cohesion = 100 psf at base	0.91	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Sloping Soil		
Station	5.7		
Elevation	24.5		
CCW Angle from Vert	0		
Magnitude (kips)	0.71		
Horiz Force	0.00	0.00	0.00
Vert Force	0.71	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.7	7.6	81.7	
Soil Weight on Heel	4.5	11.8	52.9	
Water Weight on Heel	2.3	11.8	26.9	
Vert Force on Heel from Sloping Fill	0.0	13.5	0.0	
Soil Weight on Toe	6.6	4.3	28.1	
Water Weight at Toe	5.6	4.3	23.7	
Uplift	-11.8	6.8		79.6
Sloping Soil	0.7	5.7	4.0	
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	11.8	0.0	
Total Vertical Force	**18.6**			
HORZONTAL FORCES				
Water Pressure, Heel Side	6.1	4.7		28.5
Soil Pressure, Heel Side	4.41	7.0		30.9
Water Pressure, Toe Side	-6.1	4.7	28.5	
Soil Pressure, Toe Side	-2.52	5.0	12.6	
EQ Soil Dynamic Component ΔP_{AE}	2.17	12.8		27.9
EQ Inertia Force (wall + backfill)	4.26	8.2		35.0
Sloping Soil	0.0			
0	0.0			
0	0.0			
Surcharge	0.0	9.6		0.0
Total Horizontal Force	**8.3**			
Total Moments			**258.5**	**201.9**
Net Moment			**56.6**	

Safety Factor Evaluation

Uplift Pressure at Toe	0.87	KSF
Uplift Pressure at Heel	0.87	KSF
Eccentricity	3.71	FT
Reaction Within Middle 1/3?	NO	
Reaction Pressure at Toe	3.66	KSF
	25.42	PSI
Reaction Pressure at Heel	-0.90	KSF
	-6.24	PSI
%Base in Compression	See Below	FT
Passive Pressure (Key/Toe)	0.00	KLF
Passive Pressure (Manually Input)	0.91	KLF
Sliding Factor of Safety	See Below	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	4.4	4.39	FT
%Base in Compression	67%	9.11	FT
Modified Reaction at the Toe		4.09	KSF
		28.43	PSI
Modified Uplift Force	*Unmodified*	-11.79	KIPS
Modified Uplift Arm	*Unmodified*	6.75	FT
Modified Total Vertical Force		18.64	KIPS
Modified Net Moment	*Unmodified*	56.58	
Modified Sliding F.S.		1.44	

Cell Modified

Project	BSL		
Client	City of Boiling Spring Lake		
Location	North Lake Dam		
Structure:	Box Inlet Headwall (Normal Structure)		
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	4/20/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	11/9/2020		19C21022.02

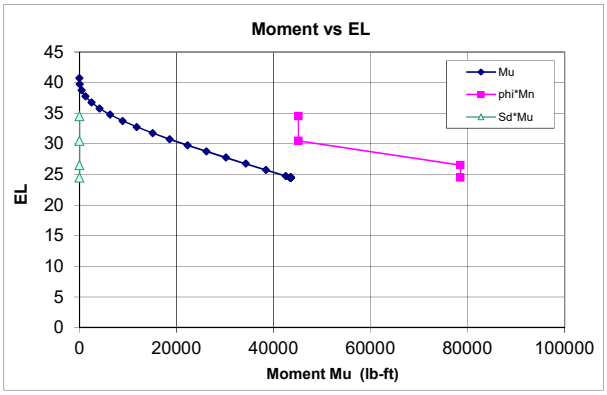
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.6
Load Factor M1 Sloping Soil		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρcalc	Required ρmin	Required Asreq (in²/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu? ϕMn>Mu?	As min? As max?
0	24.5	0.00345	0.00335	0.64	8	1.00	8	1.19	15.5	0.00637	78,511	43,522	38,653	N/A	N/A	26.6	N/A	OK	OK
2	26.5	0.00278	0.00335	0.62	8	1.00	8	1.19	15.5	0.00637	78,511	35,304	31,347	N/A	N/A	21.6	N/A	OK	OK
6	30.5	0.00149	0.00199	0.37	6	0.75	8	0.66	15.6	0.00352	45,121	19,463	17,389	N/A	N/A	20.8	N/A	OK	OK
10	34.5	0.00053	0.00100	0.22	6	0.75	8	0.66	15.6	0.00352	45,121	6,922	6,337	N/A	N/A	7.6	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	Asreq (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	24.5	0.22	6	0.75	8	0.66	OK
2	26.5	0.22	6	0.75	8	0.66	OK
6	30.5	0.22	6	0.75	8	0.66	OK
10	34.5	0.22	6	0.75	8	0.66	OK

Check Shear:

Vu:	4,065	lb	**Optional Diagonal Bars:**		
ϕVc:	18,716	lb	Max of Vu(stem) and Vu(heel):	9,567	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.30	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	ld/db	db (in)	ld (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	33.54	1.00	33.5	1.3	43.6	N/A	N/A	N/A
2.0	33.54	1.00	33.5	1.3	43.6	4122	12,478	OK
6.0	21.47	0.75	16.1	1.3	20.9	3673	12,579	OK
10.0	21.47	0.75	16.1	1.3	20.9	2472	12,579	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Astreq (in²/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Astprov (in²/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Astprov (in²/LF)	Astprov (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
10.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.30	0.30	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρcalc	Required ρmin	Required Asreq (in²/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**North Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	11/9/2020		19C21022.02

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-4,463	4.25	1.0	-4463	-18,966	-18,966
Soil Weight on Toe			-6607	4.25	1	-6607	-28,080	-28,080
Water Weight on Toe			-5569	4.25	1	-5569	-23,669	-23,669
Uplift	0.87	0.87	7,426	4.25	1.4	10396	44,182	31,559
Foundation Reaction	4.09	0.27	18,557	5.49	1.6	29691	162,999	101,874
Sloping Soil			-714	2.83	1	-714	-2,023	-2,023
			0	8.50	1.0	0	0	0
			0	8.50	1.0	0	0	0
Sum						**22,734**	**134,443**	**60,695**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00054	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	43,522	38,653	N/A	N/A	18.4	N/A	OK	OK

Check Shear on Toe:

Vu: 22,734 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.45	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			1,838	1.75	1.2	2205	3,859	3,216
Soil Weight on Heel			4,506	1.75	1.6	7209	12,616	7,885
Water Weight on Heel			2,293	1.75	1.4	3210	5,618	4,013
Vert Force on Heel from Sloping Fill			0	3.50	1.6	0	0	0
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.87	0.87	-3058	1.75	1	-3058	-5351	-5,351
Foundation Reaction	0.00	0.00	0	1.75	1	0	0	0
			0	0.00	1	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**9,567**	**16,742**	9,763

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**
Mu (heel,computed)=	**16,742**	**ft-lb**	**:<Use this**	Ms(heel)=	**9,763**	**ft-lb** **<<Use this**
Mu(stem)=	**43,522**	**ft-lb**		Ms(stem)=	**38,653**	**ft-lb**

Check Vu above with Vu(stem)

Vu (heel)=	**9,567**	**Lb**	<=Use this
Vu(stem)=	**4,065**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00021	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	16,742	9,763	N/A	N/A	4.6	N/A	OK	OK

Check Shear on Heel:

Vu: 9,567 lb
ϕVc: 46,639 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	North Lake Dam	RLJ	07/22/20	BETA 6.3	1
Structure:	Outlet Retaining Wall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 2.0) (Usual Load)	CTF	11/09/20		19C21022.02

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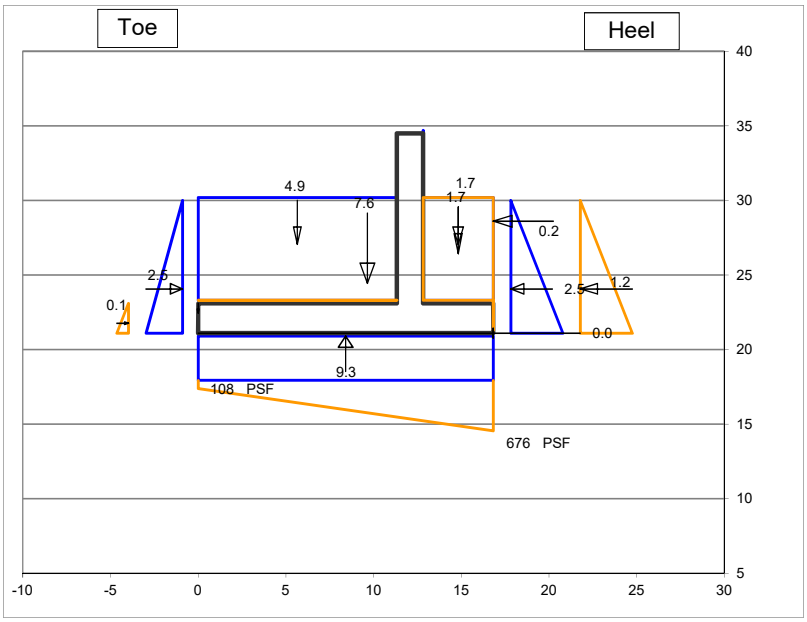
Wall Geometry and Material Properties

Top of Wall Elevation	34.5	ft
Stem Height	11.4	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	11.33	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	23.1	
Base Elevation	21.1	ft
Base Width	16.8	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.1	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	30	ft
Water EL at Heel (WaterELh)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	30.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	23.1	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.47	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	16.8		
Elevation	28.6		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Appied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	7.6	9.6	73.5	
Soil Weight on Heel	1.7	14.8	25.6	
Water Weight on Heel	1.7	14.8	25.5	
Vert Force on Heel from Sloping Fill	0.0	16.8	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	4.9	5.7	27.6	
Uplift	-9.3	8.4		78.7
Compaction	0.0	16.8		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	14.8	0.0	
Total Vertical Force	**6.6**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.5	3.0		7.3
Soil Pressure, Heel Side	1.17	3.0		3.5
Water Pressure, Toe Side	-2.5	3.0	7.3	
Soil Pressure, Toe Side	-0.06	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	5.9		0.0
EQ Inertia Force (wall + backfill)	0.00	3.9		0.0
Compaction	0.2	7.5		1.3
0	0.0			
0	0.0			
Surcharge	0.0	4.5		0.0
Total Horizontal Force	**1.3**			
Total Moments			**159.6**	**90.7**
Net Moment			**68.9**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.56	KSF
Uplift Pressure at Heel		0.56	KSF
Eccentricity		-2.03	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.11	KSF
		0.75	PSI
Reaction Pressure at Heel		0.68	KSF
		4.69	PSI
%Base in Compression	100%	**16.83**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	**BSL**		
Client	**City of Boiling Spring Lake**		
Location	**North Lake Dam**		
Structure:	**Outlet Retaining Wall (Normal Structure)**		
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 2.0) (Usual Load)**		

Schnabel ENGINEERING

STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	7/22/2020	BETA 6.3	2
Checked	**Chk Date**		**Job No.**
CTF	11/9/2020		19C21022.02

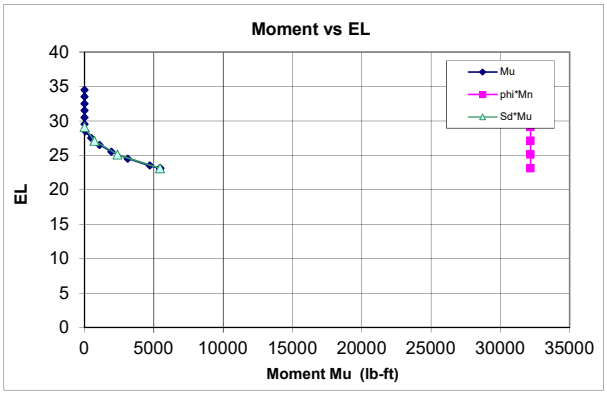
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.2
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	23.1	0.00041	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	5,458	2,557	1.00	30.0	4.3	5,458	OK	OK
2	25.1	0.00018	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	2,376	1,179	1.00	30.0	2.0	2,376	OK	OK
4	27.1	0.00005	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	706	378	1.00	30.0	0.6	706	OK	OK
6	29.1	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	9	4	1.00	30.0	0.0	9	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	23.1	0.22	5	0.63	8	0.47	OK
2	25.1	0.22	5	0.63	8	0.47	OK
4	27.1	0.22	5	0.63	8	0.47	OK
6	29.1	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	1,990	lb	**Optional Diagonal Bars:**		
ϕVc:	18,942	lb	Max of Vu(stem) and Vu(heel):	2,770	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.09	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	1140	12,629	OK
4.0	21.47	0.63	13.4	1.3	17.4	578	12,629	OK
6.0	21.47	0.63	13.4	1.3	17.4	29	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.06	0.06	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL				
Client	City of Boiling Spring Lake				
Location	North Lake Dam				
Structure:	Outlet Retaining Wall (Normal Structure)				
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF	Maximize Positive Moment (CW)			

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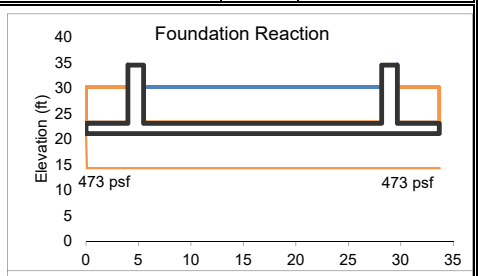
BASE SLAB REINFORCEMENT DESIGN

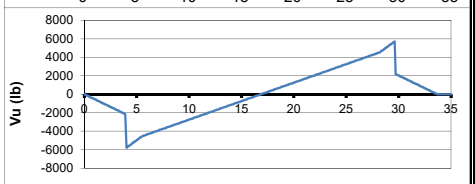
By	Date:	Program Ver.	Sheet
RLJ	07/22/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/09/20		19C21022.02

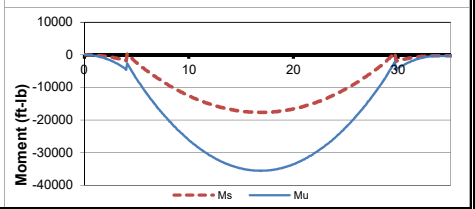
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-2565	2557	1.4	-3591	1.0	2557
point load	0.0	0		1.0	0		0
point load	33.7	0		1.0	0		0
Side Wall	29.7	-2565	-2557	1.4	-3591	1.0	-2557
Footing Length	33.7			1.4	0		0
Total		-5130			-7182		



Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	33.7	33.7	-150	2	-300	-10110	1.4	-420	-14154
Soil Wt	0	4	4	-62.6	6.9	-432	-1728	1.6	-691	-2764
Headwater	0	4	4.0	-62.4	6.9	-431	-1722	1.6	-689	-2756
Tailwater/Soil	5.5	28.2	22.7	-62.4	6.9	-431	-9774	1.0	-431	-9774
Headwater	29.7	33.7	4	-62.4	6.9	-431	-1722	1.6	-689	-2756
Soil Wt	29.7	33.7	4.0	-62.6	6.9	-432	-1728	1.6	-691	-2764
Uplift	0	33.7	33.7	62.4	8.9	555	18716	1.4	778	26202
Soil Reaction	0	33.7	33.7	237	1	237		1.0	237	
Soil Reaction	0	33.7	33.7	237	1	237		1.0	237	
							-8068			-8766
Approx FS floating		**N/A**								





Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00000	0.00100	0.25	6	0.75	12	0.44	20.6	0.00178	40,266	0	577	N/A	N/A	0.8	N/A	OK	OK

Check Shear:

Vu: 5,705 lb
ϕVc: 24,904 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00158	0.00210	0.52	7	0.88	8	0.90	20.6	0.00365	80,889	35,539	17,648	1.00	29.0	11.8	35,539	OK	OK

Check Shear:

Vu: 5,788
ϕVc: 24,829
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
34.88	0.88	30.5

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)			Exp/Total
(in^2)	(in^2/LF)							(in^2/LF)		
288	0.86	6	12	0.44	6	12	0.44	**0.88**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	North Lake Dam	RLJ	07/22/20	BETA 6.3	1
Structure:	Outlet Retaining Wall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (Unsual Load)	CTF	11/09/20		19C21022.02

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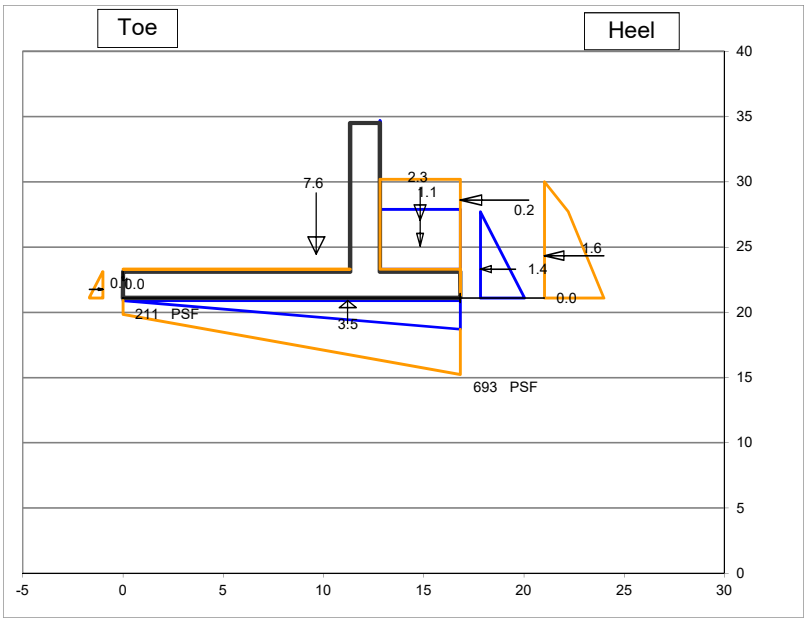
Wall Geometry and Material Properties

Top of Wall Elevation	34.5	ft
Stem Height	11.4	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	11.33	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	23.1	
Base Elevation	21.1	ft
Base Width	16.8	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.1	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	30	ft
Water EL at Heel (WaterELh)	27.7	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	30.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	23.1	ft
Water EL at Toe (WaterELt)	21.1	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	16.8		
Elevation	28.6		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	7.6	9.6	73.5	
Soil Weight on Heel	2.3	14.8	33.5	
Water Weight on Heel	1.1	14.8	17.0	
Vert Force on Heel from Sloping Fill	0.0	16.8	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.1	0.0	0.0	
Uplift	-3.5	11.2		38.9
Compaction	0.0	16.8		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	14.8	0.0	
Total Vertical Force	**7.6**			
HORZONTAL FORCES				
Water Pressure, Heel Side	1.4	2.2		3.0
Soil Pressure, Heel Side	1.65	3.2		5.3
Water Pressure, Toe Side	0.0	0.0	0.0	
Soil Pressure, Toe Side	0.00	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	5.9		0.0
EQ Inertia Force (wall + backfill)	0.00	3.9		0.0
Compaction	0.2	7.5		1.3
0	0.0			
0	0.0			
Surcharge	0.0	4.5		0.0
Total Horizontal Force	**3.2**			
Total Moments			**124.0**	**48.5**
Net Moment			**75.4**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.00	KSF
Uplift Pressure at Heel		0.41	KSF
Eccentricity		-1.50	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.21	KSF
		1.46	PSI
Reaction Pressure at Heel		0.69	KSF
		4.82	PSI
%Base in Compression	100%	**16.83**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	BSL		
Client	City of Boiling Spring Lake		
Location	North Lake Dam		
Structure:	Outlet Retaining Wall (Normal Structure)		
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (Unsual Load)		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	7/22/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	11/9/2020		19C21022.02

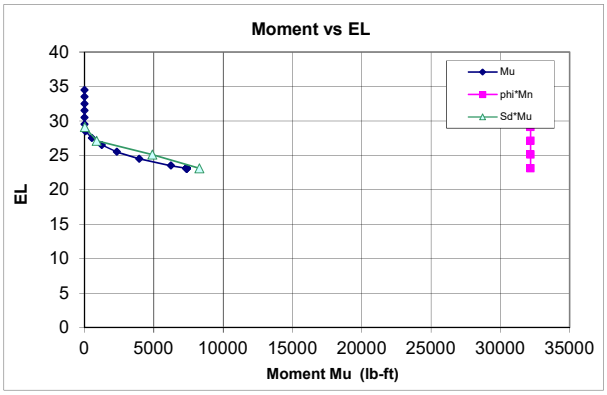
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.2
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	23.1	0.00063	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	7,375	4,609	1.13	30.0	7.7	8,299	OK	OK
2	25.1	0.00037	0.00100	0.29	5	0.63	8	0.47	15.7	0.00247	32,188	2,899	1,812	1.69	20.0	3.0	4,892	OK	OK
4	27.1	0.00007	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	782	489	1.13	30.0	0.8	880	OK	OK
6	29.1	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	11	7	1.13	30.0	0.0	12	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	23.1	0.22	5	0.63	8	0.47	OK
2	25.1	0.29	5	0.63	8	0.47	OK
4	27.1	0.22	5	0.63	8	0.47	OK
6	29.1	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	3,023	lb	**Optional Diagonal Bars:**		
ϕVc:	18,942	lb	Max of Vu(stem) and Vu(heel):	3,290	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.10	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	1550	12,629	OK
4.0	21.47	0.63	13.4	1.3	17.4	665	12,629	OK
6.0	21.47	0.63	13.4	1.3	17.4	37	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

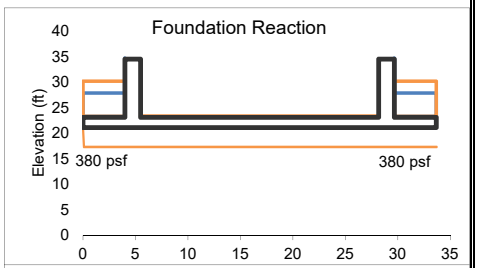
Project	BSL				
Client	City of Boiling Spring Lake				
Location	North Lake Dam				
Structure:	Outlet Retaining Wall (Normal Structure)				
Load Condition:	LC2 - Maintenance Condition (Req'd Slidi	Maximize Positive Moment (CW)			

Schnabel ENGINEERING

BASE SLAB REINFORCEMENT DESIGN

By	Date:	Program Ver.	Sheet
RLJ	07/22/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/09/20		19C21022.02

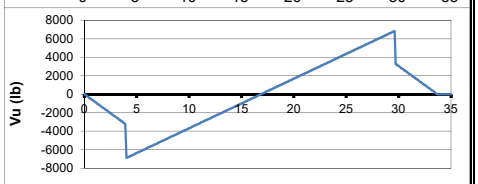
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-2565	4609	1.4	-3591	1.0	4609
point load	0.0	0		1.0	0		0
point load	33.7	0		1.0	0		0
Side Wall	29.7	-2565	-4609	1.4	-3591	1.0	-4609
Footing Length	33.7			1.4	0		0
Total		-5130			-7182		

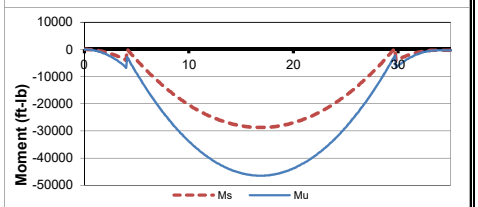


Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	33.7	33.7	-150	2	-300	-10110	1.4	-420	-14154
Soil Wt	0	4	4	-81.733	6.9	-564	-2256	1.6	-902	-3609
Headwater	0	4	4.0	-62.4	4.6	-287	-1148	1.6	-459	-1837
Tailwater/Soil	5.5	28.2	22.7	0	0	0	0	1.0	0	0
Headwater	29.7	33.7	4	-62.4	4.6	-287	-1148	1.6	-459	-1837
Soil Wt	29.7	33.7	4.0	-81.733	6.9	-564	-2256	1.6	-902	-3609
Uplift	0	33.7	33.7	62.4	6.6	412	13879	1.4	577	19431
Soil Reaction	0	33.7	33.7	190	1	190		1.0	190	
Soil Reaction	0	33.7	33.7	190	1	190		1.0	190	
							-3039			-5616

Approx FS floating N/A





Compute Bottom Reinforcement

Cover 3 in

Required			Provided															
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00000	0.00100	0.25	6	0.75	12	0.44	20.6	0.00178	40,266	0	379	N/A	N/A	0.5	N/A	OK	OK

Check Shear:

Vu: 6,838 lb
ϕVc: 24,904 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided															
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00239	0.00319	0.79	7	0.88	8	0.90	20.6	0.00365	80,889	46,453	28,740	1.15	29.0	19.2	53,596	OK	OK

Check Shear:

Vu: 6,892
ϕVc: 24,829
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
34.88	0.88	30.5

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast Exp/Total
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	(in^2/LF)		
(in^2)	(in^2/LF)									
288	0.86	6	12	0.44	6	12	0.44	**0.88**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	North Lake Dam	RLJ	07/22/20	BETA 6.3	1
Structure:	Outlet Retaining Wall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (Extreme Load)	CTF	11/19/20		19C21022.02

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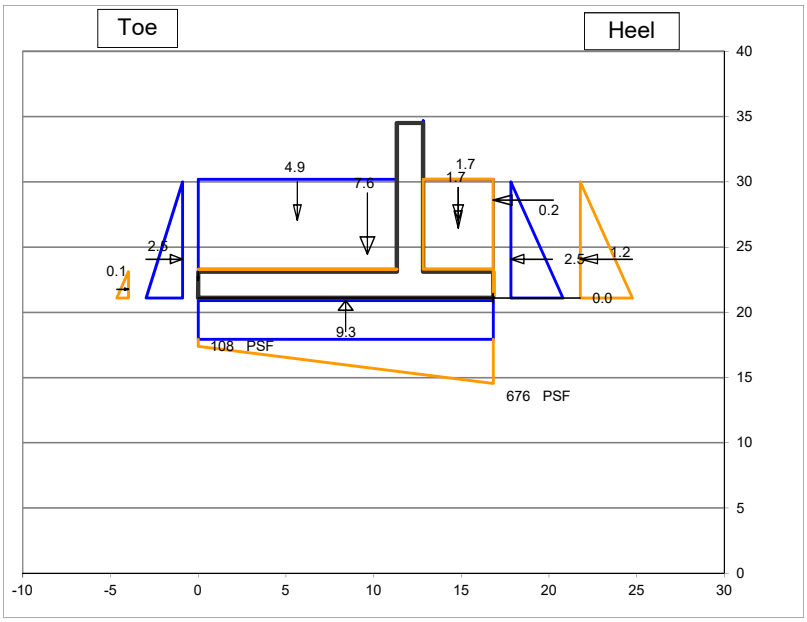
Wall Geometry and Material Properties

Top of Wall Elevation	34.5	ft
Stem Height	11.4	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	11.33	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	23.1	
Base Elevation	21.1	ft
Base Width	16.8	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.1	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	30	ft
Water EL at Heel (WaterELh)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	30.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	23.1	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.47	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	16.8		
Elevation	28.6		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	7.6	9.6	73.5	
Soil Weight on Heel	1.7	14.8	25.6	
Water Weight on Heel	1.7	14.8	25.5	
Vert Force on Heel from Sloping Fill	0.0	16.8	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	4.9	5.7	27.6	
Uplift	-9.3	8.4		78.7
Compaction	0.0	16.8		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	14.8	0.0	
Total Vertical Force	**6.6**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.5	3.0		7.3
Soil Pressure, Heel Side	1.17	3.0		3.5
Water Pressure, Toe Side	-2.5	3.0	7.3	
Soil Pressure, Toe Side	-0.06	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	5.9		0.0
EQ Inertia Force (wall + backfill)	0.00	3.9		0.0
Compaction	0.2	7.5		1.3
0	0.0			
0	0.0			
Surcharge	0.0	4.5		0.0
Total Horizontal Force	**1.3**			
Total Moments			**159.6**	**90.7**
Net Moment			**68.9**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.56	KSF
Uplift Pressure at Heel		0.56	KSF
Eccentricity		-2.03	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.11	KSF
		0.75	PSI
Reaction Pressure at Heel		0.68	KSF
		4.69	PSI
%Base in Compression	100%	**16.83**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	**BSL**		
Client	**City of Boiling Spring Lake**		
Location	**North Lake Dam**		
Structure:	**Outlet Retaining Wall (Normal Structure)**		
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (Extreme Load)**		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	7/22/2020	BETA 6.3	2
Checked	**Chk Date**		**Job No.**
CTF	11/19/2020		19C21022.02

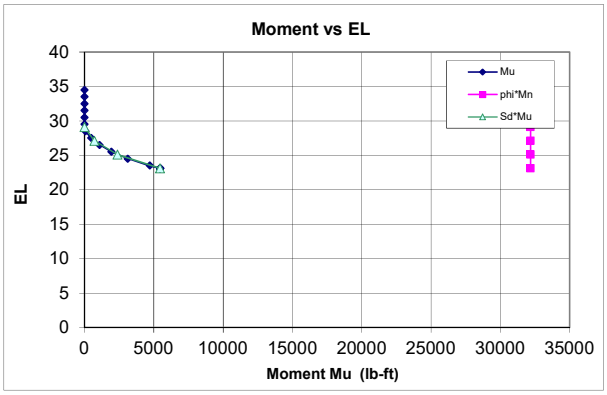
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.2
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	23.1	0.00041	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	5,458	2,557	1.00	30.0	4.3	5,458	OK	OK
2	25.1	0.00018	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	2,376	1,179	1.00	30.0	2.0	2,376	OK	OK
4	27.1	0.00005	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	706	378	1.00	30.0	0.6	706	OK	OK
6	29.1	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	9	4	1.00	30.0	0.0	9	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	23.1	0.22	5	0.63	8	0.47	OK
2	25.1	0.22	5	0.63	8	0.47	OK
4	27.1	0.22	5	0.63	8	0.47	OK
6	29.1	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	1,990	lb	**Optional Diagonal Bars:**		
ϕVc:	18,942	lb	Max of Vu(stem) and Vu(heel):	2,770	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.09	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	1140	12,629	OK
4.0	21.47	0.63	13.4	1.3	17.4	578	12,629	OK
6.0	21.47	0.63	13.4	1.3	17.4	29	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.06	0.06	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

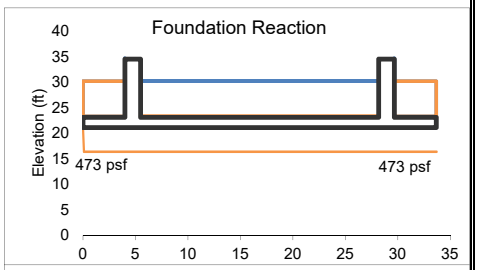
Project	BSL				
Client	City of Boiling Spring Lake				
Location	North Lake Dam				
Structure:	Outlet Retaining Wall (Normal Structure)				
Load Condition:	LC3 - Post Flood Condition (Req'd Slidin	Maximize Positive Moment (CW)			

Schnabel ENGINEERING

BASE SLAB REINFORCEMENT DESIGN

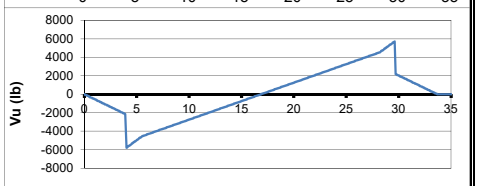
By	Date:	Program Ver.	Sheet
RLJ	07/22/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/19/20		19C21022.02

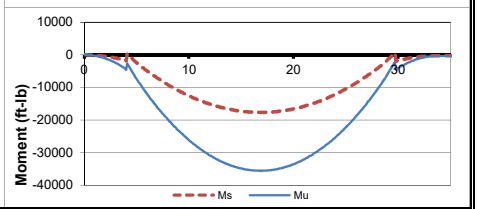
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-2565	2557	1.4	-3591	1.0	2557
point load	0.0	0		1.0	0		0
point load	33.7	0		1.0	0		0
Side Wall	29.7	-2565	-2557	1.4	-3591	1.0	-2557
Footing Length	33.7			1.4	0		0
Total		-5130			-7182		



Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	33.7	33.7	-150	2	-300	-10110	1.4	-420	-14154
Soil Wt	0	4	4	-62.6	6.9	-432	-1728	1.6	-691	-2764
Headwater	0	4	4.0	-62.4	6.9	-431	-1722	1.6	-689	-2756
Tailwater/Soil	5.5	28.2	22.7	-62.4	6.9	-431	-9774	1.0	-431	-9774
Headwater	29.7	33.7	4	-62.4	6.9	-431	-1722	1.6	-689	-2756
Soil Wt	29.7	33.7	4.0	-62.6	6.9	-432	-1728	1.6	-691	-2764
Uplift	0	33.7	33.7	62.4	8.9	555	18716	1.4	778	26202
Soil Reaction	0	33.7	33.7	237	1	237		1.0	237	
Soil Reaction	0	33.7	33.7	237	1	237		1.0	237	
							-8068			-8766
Approx FS floating		**N/A**								





Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00000	0.00100	0.25	6	0.75	12	0.44	20.6	0.00178	40,266	0	577	N/A	N/A	0.8	N/A	OK	OK

Check Shear:

Vu: 5,705 lb
ϕVc: 24,904 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00158	0.00210	0.52	7	0.88	8	0.90	20.6	0.00365	80,889	35,539	17,648	1.00	29.0	11.8	35,539	OK	OK

Check Shear:

Vu: 5,788
ϕVc: 24,829
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
34.88	0.88	30.5

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)			Exp/Total
(in^2)	(in^2/LF)							(in^2/LF)		
288	0.86	6	12	0.44	6	12	0.44	**0.88**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	North Lake Dam	RLJ	07/22/20	BETA 6.3	1
Structure:	Outlet Retaining Wall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (Extreme Load)	CTF	11/09/20		19C21022.02

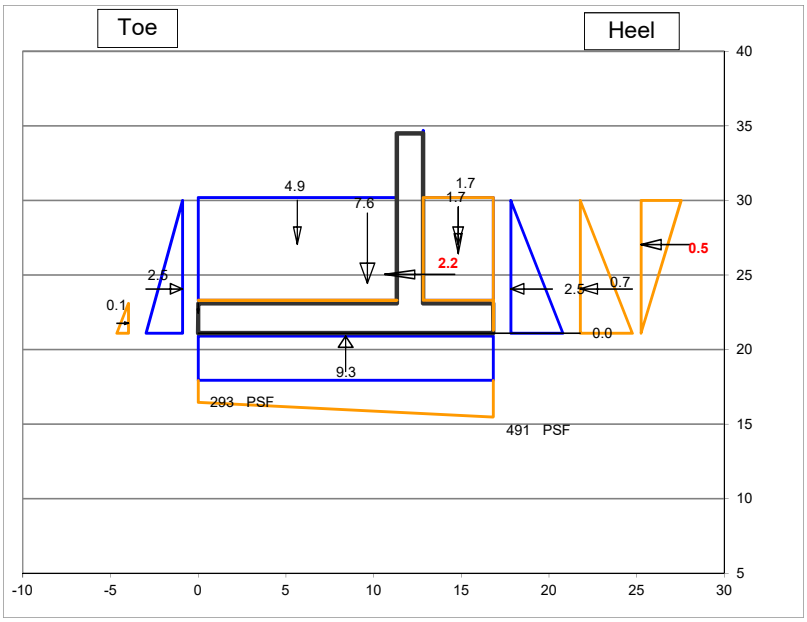
Schnabel ENGINEERING

Wall Geometry and Material Properties

	Total Stress Strength Parameters	
Top of Wall Elevation	34.5	ft
Stem Height	11.4	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	11.33	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	23.1	
Base Elevation	21.1	ft
Base Width	16.8	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21.1	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib) (total stress)	20	degrees
Allowable Bearing Pressure (50% increase for seismic	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.14	

Stability Summary

Half Section (Yes/No)?	Yes	
Sliding Factor of Safety	N/A	FS is calculated based on Total Stress Strength Parameters.
Reaction within Middle 1/3 ?	N/A	Uplift is not included. Added passive force is req'd, see Cell J48.
% Base in Compression	N/A	
Foundation Reaction Pressure	N/A	



Fill over Heel Input

Backfill EL at Wall (FillELw)	30	ft
Water EL at Heel (WaterELh)	30	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	30.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.094	

Fill over Toe Input

Fill EL at Toe (FillELt)	23.1	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.47	(at-rest)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force Cohesion at base	0.84	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load			
Station			
Elevation			
CCW Angle from Vert			
Magnitude (kips)			
Horiz Force	0.00	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	7.6	9.6	73.5	
Soil Weight on Heel	1.7	14.8	25.6	
Water Weight on Heel	1.7	14.8	25.5	
Vert Force on Heel from Sloping Fill	0.0	16.8	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	4.9	5.7	27.6	
Uplift	-9.35	8.4		78.7
0	0.0	0.0		
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	14.8	0.0	
Total Vertical Force	**6.6**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.5	3.0		7.3
Soil Pressure, Heel Side	0.66	3.0		2.0
Water Pressure, Toe Side	-2.5	3.0	7.3	
Soil Pressure, Toe Side	-0.06	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.46	5.9		2.8
EQ Inertia Force (wall + backfill)	2.23	3.9		8.8
0	0.0			
0	0.0			
0	0.0			
Surcharge	0.0	4.5		0.0
Total Horizontal Force	**3.3**			
Total Moments			**159.6**	**99.5**
Net Moment			**60.2**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.56	KSF
Uplift Pressure at Heel		0.56	KSF
Eccentricity		-0.71	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.29	KSF
		2.04	PSI
Reaction Pressure at Heel		0.49	KSF
		3.41	PSI
%Base in Compression	100%	**16.83**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.84	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force	*Unmodified*	-9.35	KIPS
Modified Uplift Arm	*Unmodified*	8.42	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment	*Unmodified*	N/A	
Modified Sliding F.S.		N/A	

Modified Cell

Project	**BSL**		
Client	**City of Boiling Spring Lake**		
Location	**North Lake Dam**		
Structure:	**Outlet Retaining Wall (Normal Structure)**		
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (Extreme Load)**		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	7/22/2020	BETA 6.3	2
Checked	**Chk Date**		**Job No.**
CTF	11/9/2020		19C21022.02

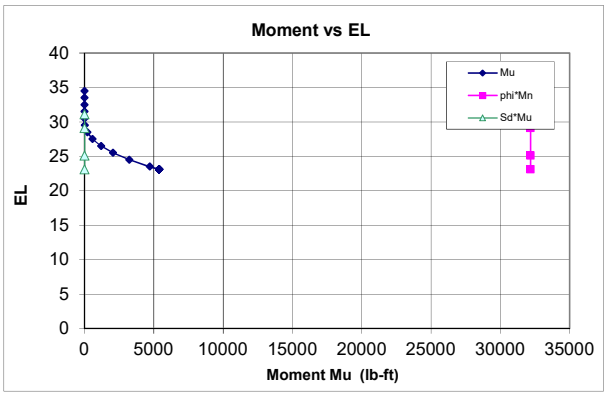
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.2
Load Factor M1	0	1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	23.1	0.00041	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	5,389	3,477	N/A	N/A	5.8	N/A	OK	OK
2	25.1	0.00019	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	2,493	1,808	N/A	N/A	3.0	N/A	OK	OK
6	29.1	0.00001	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	69	65	N/A	N/A	0.1	N/A	OK	OK
8	31.1	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	0	0	N/A	N/A	0.0	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	23.1	0.22	5	0.63	8	0.47	OK
2	25.1	0.22	5	0.63	8	0.47	OK
6	29.1	0.22	5	0.63	8	0.47	OK
8	31.1	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	1,785	lb	**Optional Diagonal Bars:**		
ϕVc:	18,942	lb	Max of Vu(stem) and Vu(heel):	2,935	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.09	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	1130	12,629	OK
6.0	21.47	0.63	13.4	1.3	17.4	157	12,629	OK
8.0	21.47	0.63	13.4	1.3	17.4	0	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.06	0.06	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	BSL				
Client	City of Boiling Spring Lake				
Location	North Lake Dam				
Structure:	Outlet Retaining Wall (Normal Structure)				
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF	Maximize Positive Moment (CW)			

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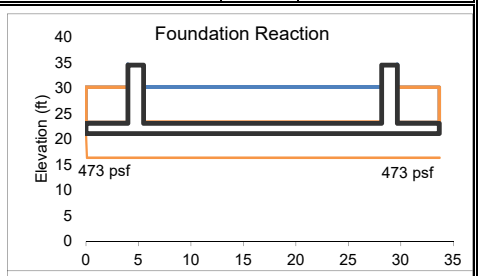
BASE SLAB REINFORCEMENT DESIGN

By	Date:	Program Ver.	Sheet
RLJ	07/22/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/09/20		19C21022.02

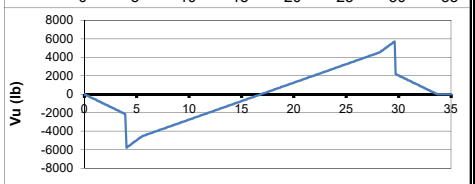
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-2565	3477	1.4	-3591	1.0	3477
point load	0.0	0		1.0	0		0
point load	33.7	0		1.0	0		0
Side Wall	29.7	-2565	-3477	1.4	-3591	1.0	-3477
Footing Length	33.7			1.4	0		0
Total		-5130			-7182		

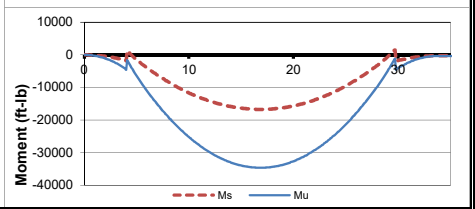


Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	33.7	33.7	-150	2	-300	-10110	1.4	-420	-14154
Soil Wt	0	4	4	-62.6	6.9	-432	-1728	1.6	-691	-2764
Headwater	0	4	4.0	-62.4	6.9	-431	-1722	1.6	-689	-2756
Tailwater/Soil	5.5	28.2	22.7	-62.4	6.9	-431	-9774	1.0	-431	-9774
Headwater	29.7	33.7	4	-62.4	6.9	-431	-1722	1.6	-689	-2756
Soil Wt	29.7	33.7	4.0	-62.6	6.9	-432	-1728	1.6	-691	-2764
Uplift	0	33.7	33.7	62.4	8.9	555	18716	1.4	778	26202
Soil Reaction	0	33.7	33.7	237	1	237		1.0	237	
Soil Reaction	0	33.7	33.7	237	1	237		1.0	237	
							-8068			-8766

Approx FS floating N/A





Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00000	0.00100	0.25	6	0.75	12	0.44	20.6	0.00178	40,266	0	1,496	N/A	N/A	2.0	N/A	OK	OK

Check Shear:

Vu: 5,705 lb
ϕVc: 24,904 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00153	0.00205	0.51	7	0.88	8	0.90	20.6	0.00365	80,889	34,620	16,729	N/A	N/A	11.2	N/A	OK	OK

Check Shear:

Vu: 5,788
ϕVc: 24,829
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
34.88	0.88	30.5

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)			Exp/Total
(in^2)	(in^2/LF)							(in^2/LF)		
288	0.86	6	12	0.44	6	12	0.44	**0.88**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	North Lake Dam	RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet Weir Sidewalls (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Operating (Usual Load) (TW = 30' EL)	CTF	11/09/20		19C21022.02

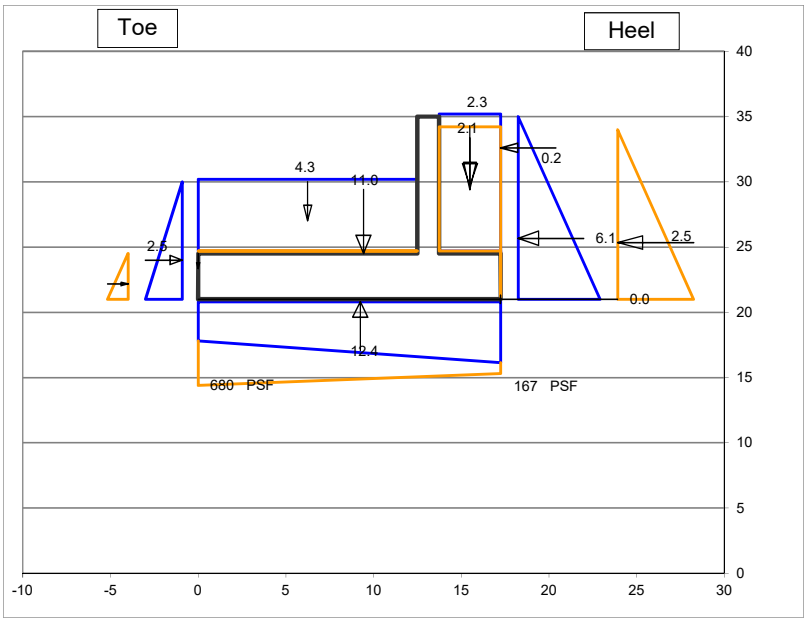
Schnabel ENGINEERING

Wall Geometry and Material Properties

Top of Wall Elevation	35	ft
Stem Height	10.5	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.25	ft
Toe Length (Bt)	12.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.25	ft
Top of Footing EL	24.5	
Base Elevation	21.0	ft
Base Width	17.3	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	N/A	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	34	ft
Water EL at Heel (WaterELh)	35	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	34.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	24.5	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	17.3		
Elevation	32.6		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Appied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	11.0	9.4	104.0	
Soil Weight on Heel	2.1	15.5	32.3	
Water Weight on Heel	2.3	15.5	35.5	
Vert Force on Heel from Sloping Fill	0.0	17.3	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	4.3	6.3	26.8	
Uplift	-12.4	9.3		114.5
Compaction	0.0	17.3		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	15.5	0.0	
Total Vertical Force	**7.3**			
HORZONTAL FORCES				
Water Pressure, Heel Side	6.1	4.7		28.5
Soil Pressure, Heel Side	2.49	4.3		10.8
Water Pressure, Toe Side	-2.5	3.0	7.6	
Soil Pressure, Toe Side	0.00	1.2	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	8.7		0.0
EQ Inertia Force (wall + backfill)	0.00	4.4		0.0
Compaction	0.2	11.6		2.0
0	0.0			
0	0.0			
Surcharge	0.0	6.5		0.0
Total Horizontal Force	**6.2**			
Total Moments			**206.2**	**155.8**
Net Moment			**50.3**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.56	KSF
Uplift Pressure at Heel		0.87	KSF
Eccentricity		1.74	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.68	KSF
		4.72	PSI
Reaction Pressure at Heel		0.17	KSF
		1.16	PSI
%Base in Compression	100%	**17.25**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	**BSL**		
Client	**City of Boiling Spring Lake**		
Location	**North Lake Dam**		
Structure:	**Box Inlet Weir Sidewalls (Normal Structure)**		
Load Condition:	**LC1 - Normal Operating (Usual Load) (TW = 30' EL)**		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	4/20/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	11/9/2020		19C21022.02

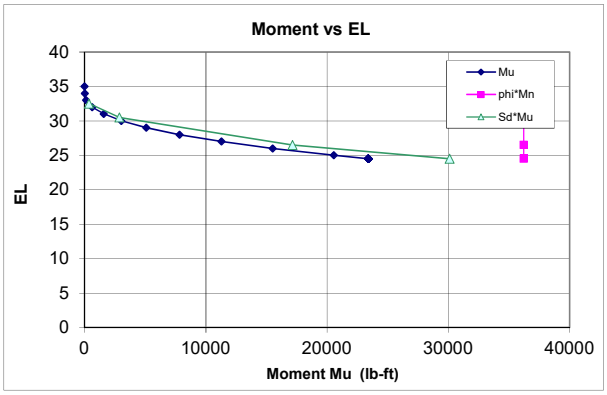
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.6
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	24.5	0.00360	0.00335	0.55	6	0.75	8	0.66	12.6	0.00436	36,211	23,390	15,907	1.29	28.5	23.7	30,097	OK	OK
2	26.5	0.00202	0.00270	0.41	6	0.75	8	0.66	12.6	0.00436	36,211	13,307	9,059	1.29	28.5	13.5	17,141	OK	OK
6	30.5	0.00033	0.00100	0.18	6	0.75	8	0.66	12.6	0.00436	36,211	2,241	1,519	1.28	28.5	2.3	2,874	OK	OK
8	32.5	0.00004	0.00100	0.18	6	0.75	8	0.66	12.6	0.00436	36,211	282	196	1.32	28.5	0.3	371	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	24.5	0.18	6	0.75	8	0.66	OK
2	26.5	0.18	6	0.75	8	0.66	OK
6	30.5	0.18	6	0.75	8	0.66	OK
8	32.5	0.18	6	0.75	8	0.66	OK

Check Shear:

Vu:	5,894	lb	**Optional Diagonal Bars:**		
ϕVc:	15,244	lb	Max of Vu(stem) and Vu(heel):	5,894	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.19	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	4220	10,163	OK
6.0	21.47	0.75	16.1	1.3	20.9	1448	10,163	OK
8.0	21.47	0.75	16.1	1.3	20.9	601	10,163	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

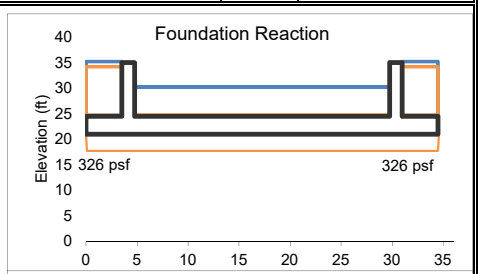
Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL			BASE SLAB REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake			By	Date:	Program Ver.	Sheet
Location	North Lake Dam			RLJ	04/20/20	BETA 6.3	3
Structure:	Box Inlet Weir Sidewalls (Normal Structure)			Checked	Chk Date:		Job No.
Load Condition:	LC1 - Normal Operating (Usual Load) (TW	Maximize Positive Moment (CW)		CTF	11/09/20		19C21022.02

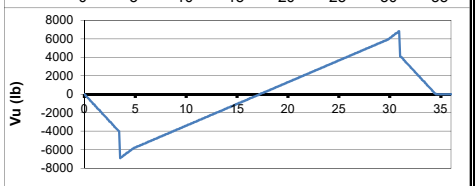
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	3.5	-1969	15907	1.4	-2756	1.0	15907
point load	0.0	0		1.0	0		0
point load	34.5	0		1.0	0		0
Side Wall	31.0	-1969	-15907	1.4	-2756	1.0	-15907
Footing Length	34.5			1.4	0		0
Total		-3938			-5513		

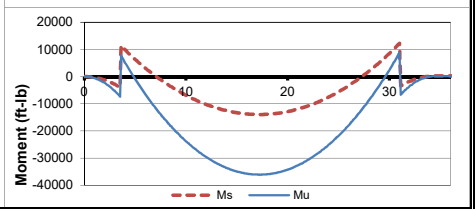


Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	34.5	34.5	-150	3.5	-525	-18113	1.4	-735	-25358
Soil Wt	0	3.5	3.5	-62.6	9.5	-595	-2081	1.6	-952	-3330
Headwater	0	3.5	3.5	-62.4	10.5	-655	-2293	1.6	-1048	-3669
Tailwater/Soil	4.8	29.8	25.0	-62.4	5.5	-343	-8580	1.0	-343	-8580
Headwater	31	34.5	3.5	-62.4	10.5	-655	-2293	1.6	-1048	-3669
Soil Wt	31	34.5	3.5	-62.6	9.5	-595	-2081	1.6	-952	-3330
Uplift	0	34.5	34.5	62.4	14	874	30139	1.4	1223	42195
Soil Reaction	0	34.5	34.5	163	1	163		1.0	163	
Soil Reaction	0	34.5	34.5	163	1	163		1.0	163	
							-5303			-5742

Approx FS floating N/A





Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00011	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	8,799	12,259	N/A	N/A	5.8	N/A	OK	OK

Check Shear:

Vu: 6,824 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00045	0.00100	0.47	6	0.75	8	0.66	38.6	0.00142	113,431	36,075	13,954	1.00	31.6	6.6	36,075	OK	OK

Check Shear:

Vu: 6,906
ϕVc: 46,639
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast Exp/Total
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	(in^2/LF)		
(in^2)	(in^2/LF)									
504	0.86	6	8	0.66	6	8	0.66	1.32	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	North Lake Dam	RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet Weir Sidewalls (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC4- Seismic Loading (Extreme Load) (TW = 30' EL)	CTF	11/09/20		19C21022.02

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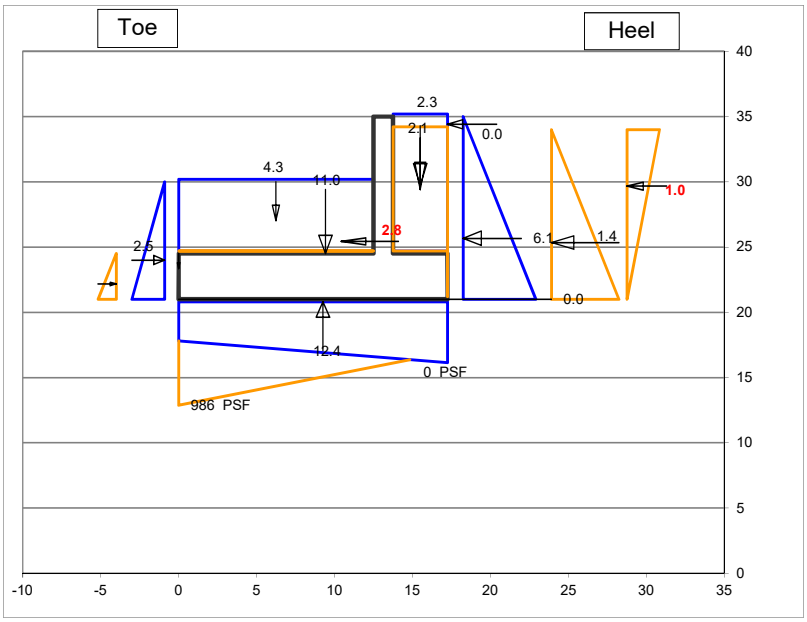
Wall Geometry and Material Properties

	Total Stress Strength Parameters	
Top of Wall Elevation	35	ft
Stem Height	10.5	ft
Footing Thickness	3.5	ft
Top Width of Wall	1.25	ft
Toe Length (Bt)	12.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.25	ft
Top of Footing EL	24.5	
Base Elevation	21.0	ft
Base Width	17.3	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	21	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	N/A	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.14	Read Me

Stability Summary

Half Section (Yes/No)?	Yes	Cracked Section Analysis Not Applicable
Sliding Factor of Safety	N/A	
Reaction within Middle 1/3 ?	N/A	
% Base in Compression	N/A	
Foundation Reaction Pressure	N/A	



Fill over Heel Input

Backfill EL at Wall (FillELw)	34	ft
Water EL at Heel (WaterELh)	35	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	34.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.094	

Fill over Toe Input

Fill EL at Toe (FillELt)	24.5	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	(at-rest)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Hydrodynamic		
Station	17.3		
Elevation	34.4		
CCW Angle from Vert	270		
Magnitude (kips)	0.01		
Horiz Force	0.01	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	11.0	9.4	104.0	
Soil Weight on Heel	2.1	15.5	32.3	
Water Weight on Heel	2.3	15.5	35.5	
Vert Force on Heel from Sloping Fill	0.0	17.3	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	4.3	6.3	26.8	
Uplift	-12.4	9.3		114.5
Hydrodynamic	0.0	17.3		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	15.5	0.0	
Total Vertical Force	**7.3**			
HORZONTAL FORCES				
Water Pressure, Heel Side	6.1	4.7		28.5
Soil Pressure, Heel Side	1.40	4.3		6.1
Water Pressure, Toe Side	-2.5	3.0	7.6	
Soil Pressure, Toe Side	0.00	1.2	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.99	8.7		8.6
EQ Inertia Force (wall + backfill)	2.76	4.4		12.2
Hydrodynamic	0.0	13.4		0.1
0	0.0			
0	0.0			
Surcharge	0.0	6.5		0.0
Total Horizontal Force	**8.7**			
Total Moments			**206.2**	**170.0**
Net Moment			**36.1**	

Safety Factor Evaluation

Uplift Pressure at Toe	0.56	KSF
Uplift Pressure at Heel	0.87	KSF
Eccentricity	3.68	FT
Reaction Within Middle 1/3?	NO	
Reaction Pressure at Toe	0.97	KSF
	6.71	PSI
Reaction Pressure at Heel	-0.12	KSF
	-0.83	PSI
%Base in Compression	See Below	FT
Passive Pressure (Key/Toe)	0.00	KLF
Passive Pressure (Manually Input)	0.00	KLF
Sliding Factor of Safety	N/A	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	2.4	2.42	FT
%Base in Compression	86%	14.83	FT
Modified Reaction at the Toe		0.99	KSF
		6.85	PSI
Modified Uplift Force	*Unmodified*	-12.38	KIPS
Modified Uplift Arm	*Unmodified*	9.25	FT
Modified Total Vertical Force		7.31	KIPS
Modified Net Moment	*Unmodified*	36.15	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**North Lake Dam**	RLJ	4/20/2020	BETA 6.3	2
Structure:	**Box Inlet Weir Sidewalls (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC4- Seismic Loading (Extreme Load) (TW = 30' EL)**	CTF	11/9/2020		19C21022.02

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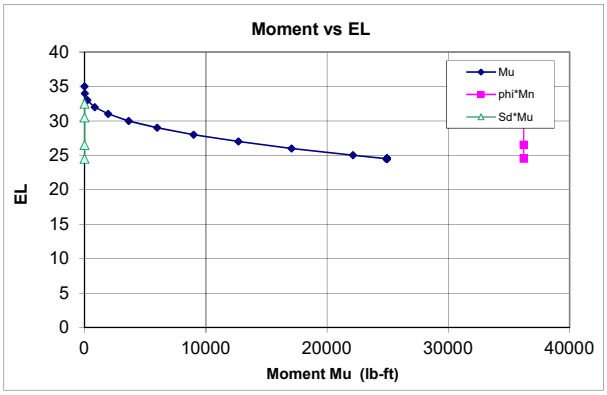
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.6
Load Factor M1 Hydrodynamic		1.4
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	24.5	0.00297	0.00335	0.51	6	0.75	8	0.66	12.6	0.00436	36,211	24,930	19,383	N/A	N/A	28.9	N/A	OK	OK
2	26.5	0.00174	0.00232	0.35	6	0.75	8	0.66	12.6	0.00436	36,211	14,802	11,725	N/A	N/A	17.5	N/A	OK	OK
6	30.5	0.00032	0.00100	0.18	6	0.75	8	0.66	12.6	0.00436	36,211	2,713	2,263	N/A	N/A	3.4	N/A	OK	OK
8	32.5	0.00006	0.00100	0.18	6	0.75	8	0.66	12.6	0.00436	36,211	480	409	N/A	N/A	0.6	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	24.5	0.18	6	0.75	8	0.66	OK
2	26.5	0.18	6	0.75	8	0.66	OK
6	30.5	0.18	6	0.75	8	0.66	OK
8	32.5	0.18	6	0.75	8	0.66	OK

Check Shear:

Vu:	5,751	lb	**Optional Diagonal Bars:**		
ϕVc:	15,244	lb	Max of Vu(stem) and Vu(heel):	5,760	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.18	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	4379	10,163	OK
6.0	21.47	0.75	16.1	1.3	20.9	1683	10,163	OK
8.0	21.47	0.75	16.1	1.3	20.9	611	10,163	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	180	0.54	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	BSL				
Client	City of Boiling Spring Lake				
Location	North Lake Dam				
Structure:	Box Inlet Weir Sidewalls (Normal Structure)				
Load Condition:	LC4- Seismic Loading (Extreme Load) (T\	Maximize Positive Moment (CW)			

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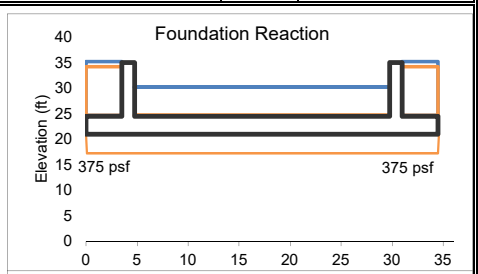
BASE SLAB REINFORCEMENT DESIGN

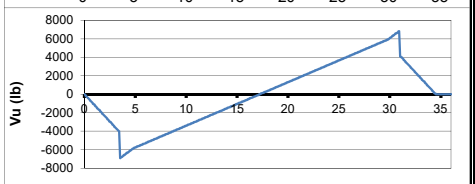
By	Date:	Program Ver.	Sheet
RLJ	04/20/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/09/20		19C21022.02

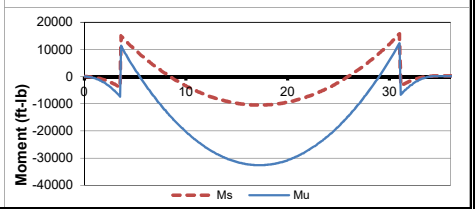
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	3.5	-1969	19383	1.4	-2756	1.0	19383
point load	0.0	0		1.0	0		0
point load	34.5	0		1.0	0		0
Side Wall	31.0	-1969	-19383	1.4	-2756	1.0	-19383
Footing Length	34.5			1.4	0		0
Total		-3938			-5513		



Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	34.5	34.5	-160	3.5	-560	-19320	1.4	-784	-27048
Soil Wt	0	3.5	3.5	-62.6	9.5	-595	-2081	1.6	-952	-3330
Headwater	0	3.5	3.5	-62.4	10.5	-655	-2293	1.6	-1048	-3669
Tailwater/Soil	4.8	29.8	25.0	-62.4	5.5	-343	-8580	1.0	-343	-8580
Headwater	31	34.5	3.5	-62.4	10.5	-655	-2293	1.6	-1048	-3669
Soil Wt	31	34.5	3.5	-62.6	9.5	-595	-2081	1.6	-952	-3330
Uplift	0	34.5	34.5	62.4	14	874	30139	1.4	1223	42195
Soil Reaction	0	34.5	34.5	188	1	188		1.0	188	
Soil Reaction	0	34.5	34.5	188	1	188		1.0	188	
							-6510			-7432
Approx FS floating		**N/A**								





Compute Bottom Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
0.00015	0.00100	0.46	6	0.75	8	0.66	38.6	0.00142	113,431	12,274	15,735	N/A	N/A	7.5	N/A	OK	OK

Check Shear:

Vu: 6,824 lb
ϕVc: 46,639 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi Mn > Mu$?	Meet As min?
0.00041	0.00100	0.47	6	0.75	8	0.66	38.6	0.00142	113,431	32,599	10,479	N/A	N/A	5.0	N/A	OK	OK

Check Shear:

Vu: 6,906
ϕVc: 46,639
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in²)	Ast_{req} (in²/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in²/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in²/LF)	Ast_{prov} (in²/LF)	Adequacy	Ratio of Ast Exp/Total
504	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

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CALCULATION COVER SHEET

Project	Project Number
Boiling Spring Lakes Dams	19C21022_00

Title

Upper Lake Dam Retaining Wall Design and Analysis

Computer Programs Used	Version/Release No.
Microsoft Excel - Retwall	2016

Purpose and Objective

Determine geometry of inlet headwall, outlet sidewalls and weir walls for the specified load cases. Design reinforcement to resist flexural moments in the stem and footings for the above structural elements. Design top & bottom mat reinforcement to resist flexural moments in the slabs based on rigid body U-frame analysis.

Load Cases
LC - 1 Normal Operating Condition
LC - 2 Maintenance Condition
LC - 3 Post Flood Condition
LC - 4 Seismic condition

Summary of Conclusions

Tables included in the calculations below summarize the stability of the "non U-frame" sections. Walls analyzed as a U-Frame are inherently stable. Reinforcement designed via the calculations below are called out in the structural design drawings.

Originator		
Cristian T. Franklin		Jan 13, 2021
Print	Sign	Date

Checked		
Robert L. Jarnigan		Jan 13, 2021
Print	Sign	Date

Table U1: Stability Summary for Inlet Headwall at Upper Lake Dam

Load Case	Loading Description	Sliding FOS actual / Req'd FOS	% Base in Compression / Req'd	Pressure at Toe (psf)	Pressure at Heel (psf)
LC1	Normal Operating Condition, At-Rest (Critical Structure, Usual Load)	1.76 / 1.5	100 / 100	1250	444
LC2	Maintenance Condition, At-Rest (Critical Structure, Unusual)	1.51 / 1.3	100 / 75	1670	368
LC3	Post Flood Condition, At-Rest (Critical Structure, Extreme)	1.26 / 1.1	100 / >0	1454	96
LC4	Seismic Condition, Active (Critical Structure, Extreme)	1.56 / 1.3	99 / >0	1711	0

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Upper Lake Dam		
Structure:	Box Inlet Headwall (Normal Structure)		
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 1.5) (LCC = Usual) (SIC = Ordinary)		

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STABILITY ANALYSIS

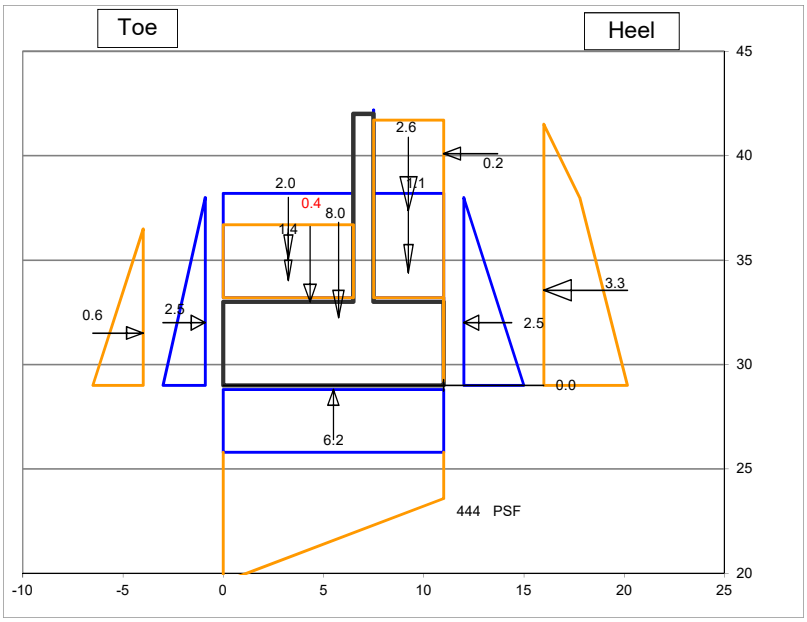
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	11/30/20		19C21022.04

Wall Geometry and Material Properties

Top of Wall Elevation	42	ft
Stem Height	9	ft
Footing Thickness	4	ft
Top Width of Wall	1	ft
Toe Length (Bt)	6.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1	ft
Top of Footing EL	33.0	
Base Elevation	29.0	ft
Base Width	11.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	29	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.76
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	41.5	ft
Water EL at Heel (WaterELh)	38	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	41.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	36.5	ft
Water EL at Toe (WaterELt)	38.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	11.0	4.3	
Elevation	40.1	33	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	0.41	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.41	0.00
Force Appied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	8.0	5.8	45.8	
Soil Weight on Heel	2.6	9.3	23.7	
Water Weight on Heel	1.1	9.3	10.1	
Vert Force on Heel from Sloping Fill	0.0	11.0	0.0	
Soil Weight on Toe	1.4	3.3	4.6	
Water Weight at Toe	2.0	3.3	6.6	
Uplift	-6.2	5.5		34.0
Compaction	0.0	11.0		0.0
Sloping Soil	0.4	4.3	1.8	
0	0.0	0.0		
Surcharge	0.0	9.3	0.0	
Total Vertical Force	**9.3**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.5	3.0		7.6
Soil Pressure, Heel Side	3.31	4.6		15.1
Water Pressure, Toe Side	-2.5	3.0	7.6	
Soil Pressure, Toe Side	-0.56	2.5	1.4	
EQ Soil Dynamic Component ΔP_{AE}	0.00	8.3		0.0
EQ Inertia Force (wall + backfill)	0.00	4.9		0.0
Compaction	0.2	11.1		1.9
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	6.3		0.0
Total Horizontal Force	**2.9**			
Total Moments			**101.6**	**58.6**
Net Moment			**43.0**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.56	KSF
Uplift Pressure at Heel		0.56	KSF
Eccentricity		0.87	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.25	KSF
		8.65	PSI
Reaction Pressure at Heel		0.44	KSF
		3.08	PSI
%Base in Compression	100%	11.00	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.76	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Upper Lake Dam**	RLJ	4/20/2020	BETA 6.3	2
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 1.5) (LCC = Usual) (SIC = Ordinary)**	CTF	11/30/2020		19C21022.04

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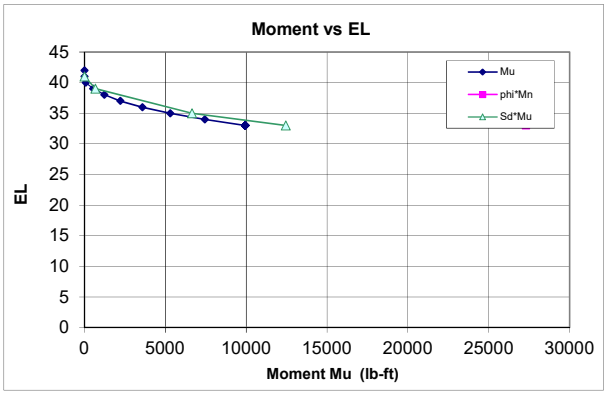
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.0
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	33	0.00254	0.00335	0.39	6	0.75	8	0.66	9.6	0.00571	27,301	9,935	6,209	1.25	26.9	12.3	12,447	OK	OK
2	35	0.00134	0.00179	0.21	6	0.75	8	0.66	9.6	0.00571	27,301	5,312	3,320	1.25	26.9	6.6	6,656	OK	OK
6	39	0.00013	0.00100	0.14	6	0.75	8	0.66	9.6	0.00571	27,301	538	336	1.25	26.9	0.7	674	OK	OK
8	41	0.00000	0.00100	0.14	6	0.75	8	0.66	9.6	0.00571	27,301	2	1	1.25	26.9	0.0	2	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	33	0.14	6	0.75	8	0.66	OK
2	35	0.14	6	0.75	8	0.66	OK
6	39	0.14	6	0.75	8	0.66	OK
8	41	0.14	6	0.75	8	0.66	OK

Check Shear:

Vu:	2,689	lb	**Optional Diagonal Bars:**		
ϕVc:	11,622	lb	Max of Vu(stem) and Vu(heel):	4,804	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.15	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	1931	7,748	OK
6.0	21.47	0.75	16.1	1.3	20.9	557	7,748	OK
8.0	21.47	0.75	16.1	1.3	20.9	11	7,748	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.15	0.15	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Upper Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 1.5) (LCC = Usual) (SIC = Ordinary)**	CTF	11/30/2020		19C21022.04

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-3,900	3.25	1.0	-3900	-12,675	-12,675
Soil Weight on Toe			-1424	3.25	1	-1424	-4,628	-4,628
Water Weight on Toe			-2028	3.25	1	-2028	-6,591	-6,591
Uplift	0.56	0.56	3,650	3.25	1.6	5841	18,982	11,864
Foundation Reaction	1.25	0.77	6,555	3.50	1.6	10488	36,756	22,973
			0	0.00	1	0	0	0
			0	2.17	1.0	0	0	0
			0	6.50	1.0	0	0	0
Sum						**8,977**	**31,844**	**10,942**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00010	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	9,935	6,209	1.06	31.9	2.6	10,504	OK	OK

Check Shear on Toe:

Vu: 8,977 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.51	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			2,100	1.75	1.2	2520	4,410	3,675
Soil Weight on Heel			2,566	1.75	1.6	4105	7,183	4,490
Water Weight on Heel			1,092	1.75	1.6	1747	3,058	1,911
Vert Force on Heel from Sloping Fill			0	3.50	1.6	0	0	0
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.56	0.56	-1966	1.75	0.9	-1769	-3096	-3,440
Foundation Reaction	0.70	0.44	-1,999	1.62	0.9	-1799	-2914	-3,237
			0	3.50	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**4,804**	**8,642**	3,398

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**8,642**	**ft-lb**	**:<Use this**	Ms(heel)=	**3,398**	**ft-lb**	**<<Use this**
Mu(stem)=	**9,935**	**ft-lb**		Ms(stem)=	**6,209**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**4,804**	**Lb**	<=Use this
Vu(stem)=	**2,689**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00008	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	8,642	3,398	1.00	31.9	1.4	8,642	OK	OK

Check Shear on Heel:

Vu: 4,804 lb
ϕVc: 53,884 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Upper Lake Dam	RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet Headwall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (LCC = Unusual) (SIC = Ordinary)	CTF	11/30/20		19C21022.04

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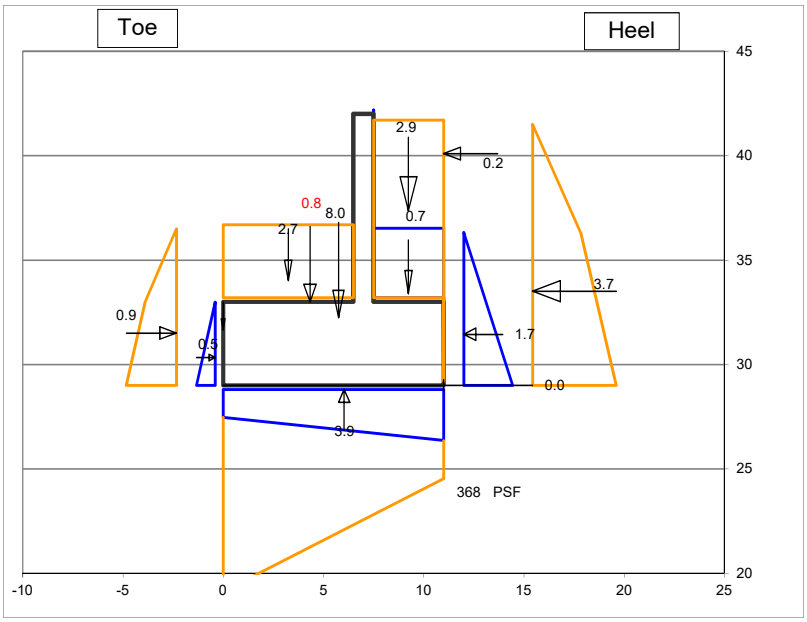
Wall Geometry and Material Properties

Top of Wall Elevation	42	ft
Stem Height	9	ft
Footing Thickness	4	ft
Top Width of Wall	1	ft
Toe Length (Bt)	6.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1	ft
Top of Footing EL	33.0	
Base Elevation	29.0	ft
Base Width	11.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	29	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.51
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	41.5	ft
Water EL at Heel (WaterELh)	36.33	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	41.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	36.5	ft
Water EL at Toe (WaterELt) Invert EL of drain	33.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	11.0	4.3	
Elevation	40.1	33	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	0.78	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.78	0.00
Force Appied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	8.0	5.8	45.8	
Soil Weight on Heel	2.9	9.3	26.8	
Water Weight on Heel	0.7	9.3	6.7	
Vert Force on Heel from Sloping Fill	0.0	11.0	0.0	
Soil Weight on Toe	2.7	3.3	8.9	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-3.9	6.0		23.5
Compaction	0.0	11.0		0.0
Sloping Soil	0.8	4.3	3.4	
0	0.0	0.0		
Surcharge	0.0	9.3	0.0	
Total Vertical Force	**11.2**			
HORZONTAL FORCES				
Water Pressure, Heel Side	1.7	2.4		4.1
Soil Pressure, Heel Side	3.68	4.5		16.6
Water Pressure, Toe Side	-0.5	1.3	0.7	
Soil Pressure, Toe Side	-0.93	2.5	2.3	
EQ Soil Dynamic Component ΔP_{AE}	0.00	8.3		0.0
EQ Inertia Force (wall + backfill)	0.00	4.9		0.0
Compaction	0.2	11.1		1.9
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	6.3		0.0
Total Horizontal Force	**4.1**			
Total Moments			**94.6**	**46.1**
Net Moment			**48.5**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.25	KSF
Uplift Pressure at Heel		0.46	KSF
Eccentricity		1.17	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.67	KSF
		11.59	PSI
Reaction Pressure at Heel		0.37	KSF
		2.55	PSI
%Base in Compression	100%	11.00	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.51	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	BSL	STEM REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Upper Lake Dam	RLJ	4/20/2020	BETA 6.3	2
Structure:	Box Inlet Headwall (Normal Structure)	Checked	Chk Date		Job No.
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (LCC = Unusual) (SIC = Ordinary)	CTF	11/30/2020		19C21022.04

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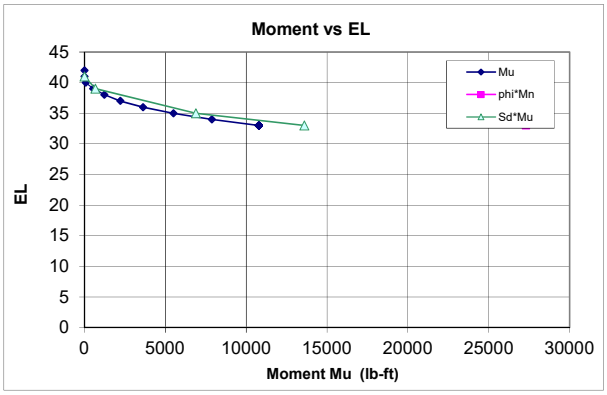
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.6
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρcalc	Required ρmin	Required Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu? ϕMn>Mu?	As min? As max?
0	33	0.00278	0.00335	0.39	6	0.75	8	0.66	9.6	0.00571	27,301	10,778	6,784	1.26	26.9	13.4	13,600	OK	OK
2	35	0.00139	0.00186	0.21	6	0.75	8	0.66	9.6	0.00571	27,301	5,498	3,439	1.25	26.9	6.8	6,895	OK	OK
6	39	0.00013	0.00100	0.14	6	0.75	8	0.66	9.6	0.00571	27,301	538	336	1.25	26.9	0.7	674	OK	OK
8	41	0.00000	0.00100	0.14	6	0.75	8	0.66	9.6	0.00571	27,301	2	1	1.25	26.9	0.0	2	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	Asreq (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	33	0.14	6	0.75	8	0.66	OK
2	35	0.14	6	0.75	8	0.66	OK
6	39	0.14	6	0.75	8	0.66	OK
8	41	0.14	6	0.75	8	0.66	OK

Check Shear:

Vu:	3,193	lb	**Optional Diagonal Bars:**		
ϕVc:	11,622	lb	Max of Vu(stem) and Vu(heel):	5,178	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.16	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	ld/db	db (in)	ld (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	2113	7,748	OK
6.0	21.47	0.75	16.1	1.3	20.9	557	7,748	OK
8.0	21.47	0.75	16.1	1.3	20.9	11	7,748	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Astreq (in²/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Astprov (in²/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Astprov (in²/LF)	Astprov (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.15	0.15	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρcalc	Required ρmin	Required Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL	TOE & HEEL REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake	By	Date	Program Ver.	Sheet
Location	Upper Lake Dam	RLJ	4/20/2020	BETA 6.3	3
Structure:	Box Inlet Headwall (Normal Structure)	Checked	Chk Date		Job No
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (LCC = Unusual) (SIC = Ordinary)	CTF	11/30/2020		19C21022.04

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-3,900	3.25	1.0	-3900	-12,675	-12,675
Soil Weight on Toe			-2730	3.25	1	-2730	-8,873	-8,873
Water Weight on Toe			0	3.25	1	0	0	0
Uplift	0.25	0.37	2,019	3.04	1.6	3230	9,803	6,127
Foundation Reaction	1.67	0.90	8,351	3.57	1.6	13361	47,756	29,848
			0	0.00	1	0	0	0
Sloping Soil			-780	2.17	1.0	-780	-1,690	-1,690
			0	6.50	1.0	0	0	0
Sum						**9,181**	**34,322**	**12,737**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00011	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	10,778	6,784	1.06	31.9	2.8	11,476	OK	OK

Check Shear on Toe:

Vu: 9,181 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.51	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			2,100	1.75	1.2	2520	4,410	3,675
Soil Weight on Heel			2,901	1.75	1.6	4642	8,123	5,077
Water Weight on Heel			727	1.75	1.6	1164	2,036	1,273
Vert Force on Heel from Sloping Fill			0	3.50	1.6	0	0	0
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.39	0.46	-1485	1.80	0.9	-1336	-2400	-2,666
Foundation Reaction	0.78	0.37	-2,012	1.54	0.9	-1810	-2788	-3,098
			0	3.50	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**5,178**	**9,382**	4,261

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**9,382**	**ft-lb**	**:<Use this**	Ms(heel)=	**4,261**	**ft-lb**	**<<Use this**
Mu(stem)=	**10,778**	**ft-lb**		Ms(stem)=	**6,784**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**5,178**	**Lb**	<=Use this
Vu(stem)=	**3,193**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00009	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	9,382	4,261	1.00	31.9	1.8	9,382	OK	OK

Check Shear on Heel:

Vu: 5,178 lb
ϕVc: 53,884 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Upper Lake Dam	RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet Headwall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)	CTF	11/30/20		19C21022.04

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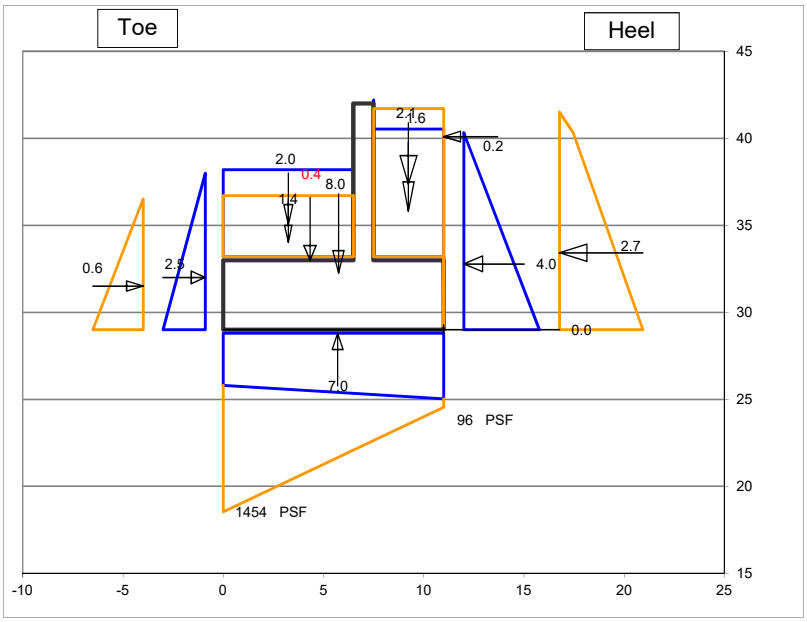
Wall Geometry and Material Properties

Top of Wall Elevation	42	ft
Stem Height	9	ft
Footing Thickness	4	ft
Top Width of Wall	1	ft
Toe Length (Bt)	6.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1	ft
Top of Footing EL	33.0	
Base Elevation	29.0	ft
Base Width	11.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	29	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	No
Sliding Factor of Safety	1.26
Reaction within Middle 1/3 ?	YES
% Base in Compression	100%
Foundation Reaction Pressure	OK



Fill over Heel Input

Backfill EL at Wall (FillELw)	41.5	ft
Water EL at Heel (WaterELh)	40.3	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	41.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	36.5	ft
Water EL at Toe (WaterELt)	38.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Compaction	Sloping Soil	
Station	11.0	4.3	
Elevation	40.1	33	
CCW Angle from Vert	270	0	
Magnitude (kips)	0.17	0.41	
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.41	0.00
Force Appied to	Stem	Toe	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	8.0	5.8	45.8	
Soil Weight on Heel	2.1	9.3	19.4	
Water Weight on Heel	1.6	9.3	14.8	
Vert Force on Heel from Sloping Fill	0.0	11.0	0.0	
Soil Weight on Toe	1.4	3.3	4.6	
Water Weight at Toe	2.0	3.3	6.6	
Uplift	-7.0	5.7		39.9
Compaction	0.0	11.0		0.0
Sloping Soil	0.4	4.3	1.8	
0	0.0	0.0		
Surcharge	0.0	9.3	0.0	
Total Vertical Force	**8.5**			
HORZONTAL FORCES				
Water Pressure, Heel Side	4.0	3.8		15.1
Soil Pressure, Heel Side	2.67	4.4		11.8
Water Pressure, Toe Side	-2.5	3.0	7.6	
Soil Pressure, Toe Side	-0.56	2.5	1.4	
EQ Soil Dynamic Component ΔP_{AE}	0.00	8.3		0.0
EQ Inertia Force (wall + backfill)	0.00	4.9		0.0
Compaction	0.2	11.1		1.9
Sloping Soil	0.0			
0	0.0			
Surcharge	0.0	6.3		0.0
Total Horizontal Force	**3.8**			
Total Moments			**101.9**	**68.7**
Net Moment			**33.2**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.56	KSF
Uplift Pressure at Heel		0.71	KSF
Eccentricity		1.61	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		1.45	KSF
		10.10	PSI
Reaction Pressure at Heel		0.10	KSF
		0.67	PSI
%Base in Compression	100%	11.00	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		1.26	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**		
Client	**City of Boiling Spring Lake**		
Location	**Upper Lake Dam**		
Structure:	**Box Inlet Headwall (Normal Structure)**		
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	4/20/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	11/30/2020		19C21022.04

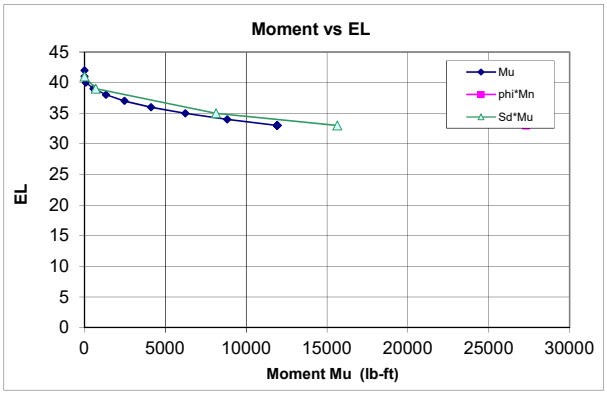
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

	Load Factor
Load Factor Soil, Heel Side	1.6
Load Factor Water, Heel Side	1.4
Load Factor Soil, Toe Side	1.6
Load Factor Water, Toe Side	1.4
Load Factor, Surcharge	1.2
Load Factor M1 Compaction	1.6
Load Factor M2 Sloping Soil	1.6
Load Factor M3 0	1.0
Load Factor, Earthquake	1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	33	0.00321	0.00335	0.39	6	0.75	8	0.66	9.6	0.00571	27,301	11,918	7,799	1.31	26.9	15.4	15,635	OK	OK
2	35	0.00165	0.00220	0.25	6	0.75	8	0.66	9.6	0.00571	27,301	6,231	4,056	1.31	26.9	8.0	8,131	OK	OK
6	39	0.00014	0.00100	0.14	6	0.75	8	0.66	9.6	0.00571	27,301	555	350	1.26	26.9	0.7	702	OK	OK
8	41	0.00000	0.00100	0.14	6	0.75	8	0.66	9.6	0.00571	27,301	2	1	1.25	26.9	0.0	2	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	33	0.14	6	0.75	8	0.66	OK
2	35	0.14	6	0.75	8	0.66	OK
6	39	0.14	6	0.75	8	0.66	OK
8	41	0.14	6	0.75	8	0.66	OK

Check Shear:

Vu:	3,325	lb	**Optional Diagonal Bars:**		
ϕVc:	11,622	lb	Max of Vu(stem) and Vu(heel):	5,298	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.17	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	2361	7,748	OK
6.0	21.47	0.75	16.1	1.3	20.9	597	7,748	OK
8.0	21.47	0.75	16.1	1.3	20.9	11	7,748	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.15	0.15	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Upper Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Headwall (Normal Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.1) (LCC = Extreme) (SIC = Ordinary)**	CTF	11/30/2020		19C21022.04

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Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-3,900	3.25	1.0	-3900	-12,675	-12,675
Soil Weight on Toe			-1424	3.25	1	-1424	-4,628	-4,628
Water Weight on Toe			-2028	3.25	1	-2028	-6,591	-6,591
Uplift	0.56	0.65	3,930	3.17	1.6	6288	19,951	12,470
Foundation Reaction	1.45	0.65	6,845	3.66	1.6	10952	40,114	25,071
			0	0.00	1	0	0	0
Sloping Soil			-407	2.17	1.0	-407	-882	-882
			0	6.50	1.0	0	0	0
Sum						**9,481**	**35,290**	**12,765**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00012	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	11,918	7,799	1.11	31.9	3.2	13,193	OK	OK

Check Shear on Toe:

Vu: 9,481 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.51	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			2,100	1.75	1.2	2520	4,410	3,675
Soil Weight on Heel			2,097	1.75	1.6	3355	5,871	3,669
Water Weight on Heel			1,602	1.75	1.6	2563	4,484	2,803
Vert Force on Heel from Sloping Fill			0	3.50	1.6	0	0	0
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.66	0.71	-2394	1.77	0.9	-2155	-3813	-4,237
Foundation Reaction	0.53	0.10	-1,094	1.35	0.9	-984	-1326	-1,473
			0	3.50	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**5,298**	**9,626**	4,437

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**9,626**	**ft-lb**	**:<Use this**	Ms(heel)=	**4,437**	**ft-lb**	**<<Use this**
Mu(stem)=	**11,918**	**ft-lb**		Ms(stem)=	**7,799**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**5,298**	**Lb**	<=Use this
Vu(stem)=	**3,325**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00009	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	9,626	4,437	1.00	31.9	1.8	9,626	OK	OK

Check Shear on Heel:

Vu: 5,298 lb
ϕVc: 53,884 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Upper Lake Dam	RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet Extended (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)	CTF	11/30/20		19C21022.04

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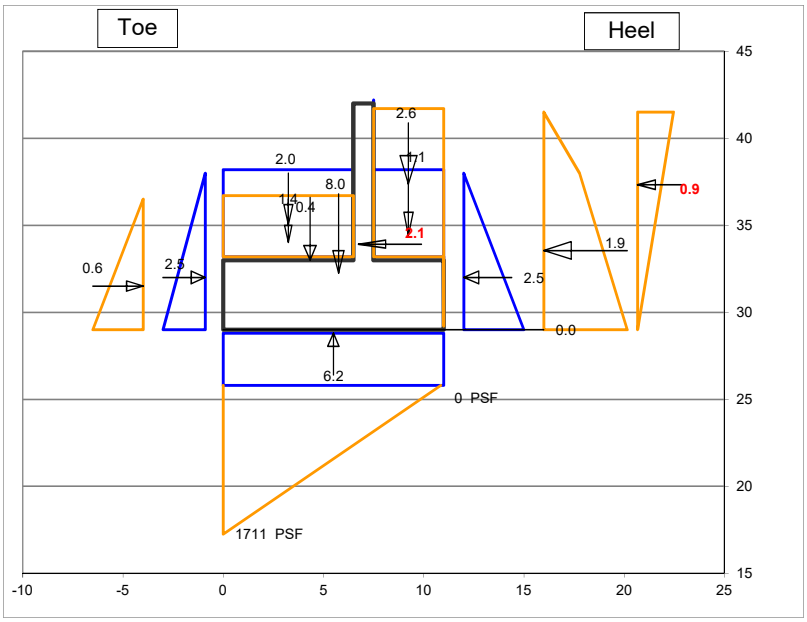
Wall Geometry and Material Properties

Top of Wall Elevation	42	ft
Stem Height	9	ft
Footing Thickness	4	ft
Top Width of Wall	1	ft
Toe Length (Bt)	6.5	ft
Heel Length (Bh)	3.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1	ft
Top of Footing EL	33.0	
Base Elevation	29.0	ft
Base Width	11.0	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	29	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib) (total stress)	20	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.14	Read Me

Stability Summary

Half Section (Yes/No)?	No	
Sliding Factor of Safety	1.56	Sliding FS is calculated with uplift pressure.
Reaction within Middle 1/3 ?	NO	
% Base in Compression	99%	Overturning stability is calculated with uplift pressure.
Foundation Reaction Pressure	OK	



Fill over Heel Input

Backfill EL at Wall (FillELw)	41.5	ft
Water EL at Heel (WaterELh)	38	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi) (effective stress)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	41.5	
ΔKAE (Mononobe-Okabe EQ Coef)	0.094	

Fill over Toe Input

Fill EL at Toe (FillELt)	36.5	ft
Water EL at Toe (WaterELt)	38.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	(at-rest for -3:1 sloped backfill)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.50	

Manually-Input Passive Resistance at Toe

Passive Force Total stress cohesion = 100 psf at base	1.10	KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load	Sloping Soil		
Station	4.3		
Elevation	33		
CCW Angle from Vert	0		
Magnitude (kips)	0.41		
Horiz Force	0.00	0.00	0.00
Vert Force	0.41	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	8.0	5.8	45.8	
Soil Weight on Heel	2.6	9.3	23.7	
Water Weight on Heel	1.1	9.3	10.1	
Vert Force on Heel from Sloping Fill	0.0	11.0	0.0	
Soil Weight on Toe	1.4	3.3	4.6	
Water Weight at Toe	2.0	3.3	6.6	
Uplift	-6.2	5.5		34.0
Sloping Soil	0.4	4.3	1.8	
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	9.3	0.0	
Total Vertical Force	**9.3**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.5	3.0		7.6
Soil Pressure, Heel Side	1.87	4.6		8.5
Water Pressure, Toe Side	-2.5	3.0	7.6	
Soil Pressure, Toe Side	-0.56	2.5	1.4	
EQ Soil Dynamic Component ΔP_{AE}	0.92	8.3		7.6
EQ Inertia Force (wall + backfill)	2.08	4.9		10.2
Sloping Soil	0.0			
0	0.0			
0	0.0			
Surcharge	0.0	6.3		0.0
Total Horizontal Force	**4.3**			
Total Moments			**101.6**	**67.9**
Net Moment			**33.6**	

Safety Factor Evaluation

Uplift Pressure at Toe	0.56	KSF
Uplift Pressure at Heel	0.56	KSF
Eccentricity	1.88	FT
Reaction Within Middle 1/3?	NO	
Reaction Pressure at Toe	1.71	KSF
	11.88	PSI
Reaction Pressure at Heel	-0.02	KSF
	-0.15	PSI
%Base in Compression	See Below	FT
Passive Pressure (Key/Toe)	0.00	KLF
Passive Pressure (Manually Input)	1.10	KLF
Sliding Factor of Safety	See Below	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.1	0.14	FT
%Base in Compression	99%	10.86	FT
Modified Reaction at the Toe		1.71	KSF
		11.88	PSI
Modified Uplift Force	*Unmodified*	-6.18	KIPS
Modified Uplift Arm	*Unmodified*	5.50	FT
Modified Total Vertical Force		9.29	KIPS
Modified Net Moment	*Unmodified*	33.63	
Modified Sliding F.S.		1.56	

Cell Modified

Project	**BSL**		
Client	**City of Boiling Spring Lake**		
Location	**Upper Lake Dam**		
Structure:	**Box Inlet Extended (Normal Structure)**		
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)**		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	4/20/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	11/30/2020		19C21022.04

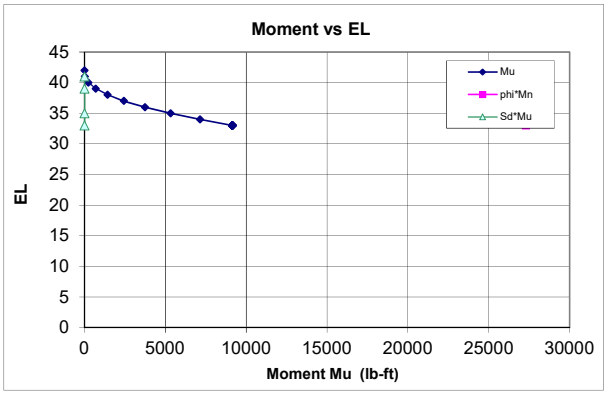
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.2
Load Factor M1 Sloping Soil		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	33	0.00186	0.00247	0.29	6	0.75	8	0.66	9.6	0.00571	27,301	9,147	7,517	N/A	N/A	14.9	N/A	OK	OK
2	35	0.00107	0.00143	0.17	6	0.75	8	0.66	9.6	0.00571	27,301	5,330	4,508	N/A	N/A	8.9	N/A	OK	OK
6	39	0.00014	0.00100	0.14	6	0.75	8	0.66	9.6	0.00571	27,301	694	645	N/A	N/A	1.3	N/A	OK	OK
8	41	0.00001	0.00100	0.14	6	0.75	8	0.66	9.6	0.00571	27,301	25	25	N/A	N/A	0.0	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	33	0.14	6	0.75	8	0.66	OK
2	35	0.14	6	0.75	8	0.66	OK
6	39	0.14	6	0.75	8	0.66	OK
8	41	0.14	6	0.75	8	0.66	OK

Check Shear:

Vu:	2,075	lb	**Optional Diagonal Bars:**		
ϕVc:	11,622	lb	Max of Vu(stem) and Vu(heel):	5,803	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.18	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.75	16.1	1.3	20.9	N/A	N/A	N/A
2.0	21.47	0.75	16.1	1.3	20.9	1710	7,748	OK
6.0	21.47	0.75	16.1	1.3	20.9	584	7,748	OK
8.0	21.47	0.75	16.1	1.3	20.9	103	7,748	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
8.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.15	0.15	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	**BSL**	**TOE & HEEL REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Upper Lake Dam**	RLJ	4/20/2020	BETA 6.3	3
Structure:	**Box Inlet Extended (Normal Structure)**	Checked	Chk Date		Job No
Load Condition:	**LC4 - Seismic Loading (Req'd Sliding SF = 1.3) (LCC = Extreme) (SIC = Ordinary)**	CTF	11/30/2020		19C21022.04

Schnabel ENGINEERING

Toe Design

Toe: Compute Vu and Mu

Force	Bounding Pressures Toe KSF	Wall KSF	Force Lbs	Arm Ft	Load Fctr	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Toe			-3,900	3.25	1.0	-3900	-12,675	-12,675
Soil Weight on Toe			-1424	3.25	1	-1424	-4,628	-4,628
Water Weight on Toe			-2028	3.25	1	-2028	-6,591	-6,591
Uplift	0.56	0.56	3,650	3.25	1.6	5841	18,982	11,864
Foundation Reaction	1.71	0.69	7,792	3.71	1.6	12467	46,285	28,928
Sloping Soil			-407	2.17	1	-407	-882	-882
			0	6.50	1.0	0	0	0
			0	6.50	1.0	0	0	0
Sum						**10,548**	**40,491**	**16,016**

Upper Limit on $M_u$toe as multiple of $M_u$stem

1.00 x Mu stem

Compute Toe Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00009	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	9,147	7,517	N/A	N/A	3.1	N/A	OK	OK

Check Shear on Toe:

Vu: 10,548 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute S&T steel in top face of Toe

Insert Min S&T ratio: 0.001 Ag

Asreq (in^2/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	Meet As min?
0.51	6	0.75	8	0.66	OK

Heel Design

Heel: Compute Vu and Mu

Force	Bounding Press. Wall KSF	Heel KSF	Force Lbs	Arm Ft	Load Factor	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Weight of Heel			2,100	1.75	1.2	2520	4,410	3,675
Soil Weight on Heel			2,566	1.75	1.6	4105	7,183	4,490
Water Weight on Heel			1,092	1.75	1.6	1747	3,058	1,911
Vert Force on Heel from Sloping Fill			0	3.50	1.6	0	0	0
Surcharge			0	3.50	1.2	0	0	0
Uplift	0.56	0.56	-1966	1.75	0.9	-1769	-3096	-3,440
Foundation Reaction	0.53	0.00	-889	1.12	0.9	-800	-896	-996
			0	0.00	0.9	0	0	0
			0	0.00	1.0	0	0	0
			0	0.00	1.0	0	0	0
Sum						**5,803**	**10,659**	5,640

Check Sum of Moments for Mu

Use greater of Mu(heel,global) and Mu(heel,computed), but not more than Mu(stem):

Mu(heel,global)= Mu(stem)+Mu(key)-Mu(toe)	**0**	**ft-lb**		Ms(heel,global)=	**0**	**ft-lb**	
Mu (heel,computed)=	**10,659**	**ft-lb**		Ms(heel)=	**5,640**	**ft-lb**	**<<Use this**
Mu(stem)=	**9,147**	**ft-lb**	**:<Use this**	Ms(stem)=	**7,517**	**ft-lb**	

Check Vu above with Vu(stem)

Vu (heel)=	**5,803**	**Lb**	<=Use this
Vu(stem)=	**2,075**	**Lb**	

Compute Heel Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	Meet As min?
0.00009	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	9,147	5,640	N/A	N/A	2.3	N/A	OK	OK

Check Shear on Heel:

Vu: 5,803 lb
ϕVc: 53,884 lb
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bottom Face Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
576	0.86	6	8	0.66	6	8	0.66	**1.32**	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Upper Lake Dam		
Structure:	Outlet Retaining Wall (Normal Structure)		
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF = 1.5) (Usual Load)		

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STABILITY ANALYSIS

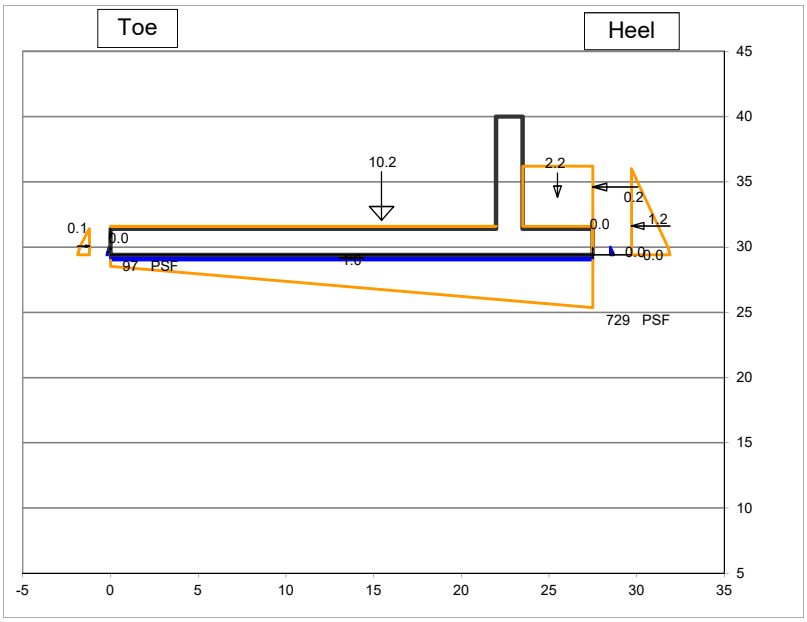
By	Date:	Program Ver:	Sheet
RLJ	07/24/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	11/30/20		19C21022.04

Wall Geometry and Material Properties

Top of Wall Elevation	40	ft
Stem Height	8.6	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	22	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	31.4	
Base Elevation	29.4	ft
Base Width	27.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	29.4	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	36	ft
Water EL at Heel (WaterELh)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	36.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	31.4	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.47	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	27.5		
Elevation	34.6		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.2	15.5	157.5	
Soil Weight on Heel	2.2	25.5	56.3	
Water Weight on Heel	0.0	27.5	0.0	
Vert Force on Heel from Sloping Fill	0.0	27.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-1.0	13.8		14.2
Compaction	0.0	27.5		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	25.5	0.0	
Total Vertical Force	**11.4**			
HORZONTAL FORCES				
Water Pressure, Heel Side	0.0	0.2		0.0
Soil Pressure, Heel Side	1.22	2.2		2.7
Water Pressure, Toe Side	0.0	0.2	0.0	
Soil Pressure, Toe Side	-0.11	0.7	0.1	
EQ Soil Dynamic Component ΔP_{AE}	0.00	4.4		0.0
EQ Inertia Force (wall + backfill)	0.00	2.3		0.0
Compaction	0.2	5.2		0.9
0	0.0			
0	0.0			
Surcharge	0.0	3.3		0.0
Total Horizontal Force	**1.3**			
Total Moments			**213.8**	**17.8**
Net Moment			**196.1**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.04	KSF
Uplift Pressure at Heel		0.04	KSF
Eccentricity		-3.51	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.10	KSF
		0.67	PSI
Reaction Pressure at Heel		0.73	KSF
		5.06	PSI
%Base in Compression	100%	**27.50**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	**BSL**		
Client	**City of Boiling Spring Lake**		
Location	**Upper Lake Dam**		
Structure:	**Outlet Retaining Wall (Normal Structure)**		
Load Condition:	**LC1 - Normal Operating (Req'd Sliding SF = 1.5) (Usual Load)**		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	7/24/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	11/30/2020		19C21022.04

Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

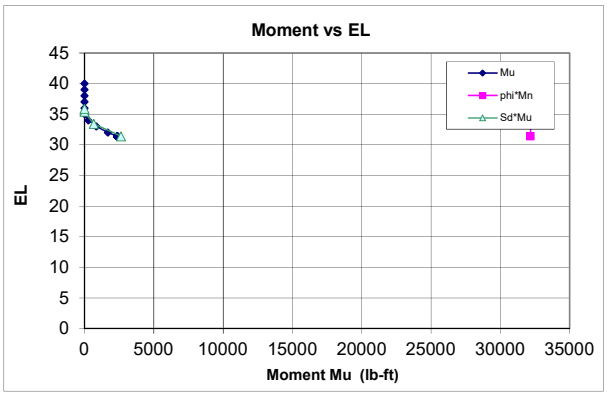
Severe Environmental Exposure? N

Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.6
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	31.4	0.00020	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	2,345	1,466	1.13	30.0	2.5	2,639	OK	OK
2	33.4	0.00005	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	595	372	1.13	30.0	0.6	669	OK	OK
4	35.4	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	3	2	1.13	30.0	0.0	4	OK	OK
4.5	35.9	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	0	0	1.13	30.0	0.0	0	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	31.4	0.22	5	0.63	8	0.47	OK
2	33.4	0.22	5	0.63	8	0.47	OK
4	35.4	0.22	5	0.63	8	0.47	OK
4.5	35.9	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	1,230	lb
ϕVc:	18,942	lb
ϕVc > Vu	OK	

Optional Diagonal Bars:

Max of Vu(stem) and Vu(heel):	2,618	Lb
As (D bars) for entire shear load:	0.08	(in^2/LF)
As (D bars) for residual shear load:	0.00	(in^2/LF)
Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	580	12,629	OK
4.0	21.47	0.63	13.4	1.3	17.4	16	12,629	OK
4.5	21.47	0.63	13.4	1.3	17.4	0	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.5	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.06	0.06	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL				
Client	City of Boiling Spring Lake				
Location	Upper Lake Dam				
Structure:	Outlet Retaining Wall (Normal Structure)				
Load Condition:	LC1 - Normal Operating (Req'd Sliding SF	Maximize Positive Moment (CW)			

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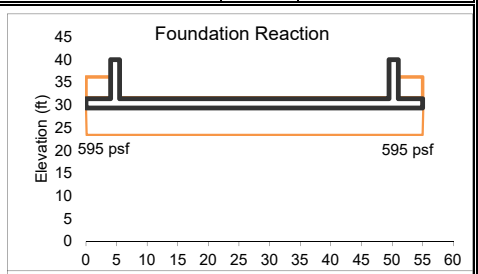
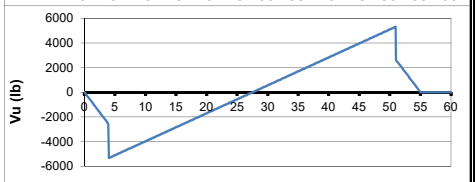
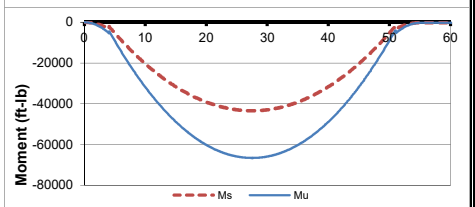
BASE SLAB REINFORCEMENT DESIGN

By	Date:	Program Ver.	Sheet
RLJ	07/24/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/30/20		19C21022.04

Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-1935	1466	1.4	-2709	1.0	1466
point load	0.0	0		1.4	0		0
point load	55.0	0		1.4	0		0
Side Wall	51.0	-1935	-1466	1.4	-2709	1.0	-1466
Footing Length	55.0			1.4	0		0
Total		-3870			-5418		







Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	55	55	-150	2	-300	-16500	1.4	-420	-23100
Soil Wt	0	4	4	-120	4.6	-552	-2208	1.6	-883	-3533
Headwater	0	4	4.0	-62.4	0	0	0	1.6	0	0
Tailwater/Soil	5.5	49.5	44.0	0	0	0	0	1.0	0	0
Headwater	51	55	4	-62.4	0	0	0	1.6	0	0
Soil Wt	51	55	4.0	-120	4.6	-552	-2208	1.6	-883	-3533
Uplift	0	55	55	62.4	0.6	37	2059	1.4	52	2883
Soil Reaction	0	55	55	297	1	297		1.0	297	
Soil Reaction	0	55	55	297	1	297		1.0	297	
							-18857			-27283

Approx FS floating N/A

Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
#DIV/0!	#DIV/0!	#DIV/0!	6	0.75	12	0.44	20.6	0.00178	40,266	0	0	#DIV/0!	21.2	0.0	#DIV/0!	#DIV/0!	#DIV/0!

Check Shear:

Vu: 3,064 lb
ϕVc: 24,904 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00373	0.00335	0.92	8	1.00	8	1.19	20.5	0.00482	105,174	66,593	43,441	1.23	28.6	22.3	82,156	OK	OK

Check Shear:

Vu: 5,334
ϕVc: 24,753
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
34.88	1.00	34.9

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast Exp/Total
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	(in^2/LF)		
(in^2)	(in^2/LF)									
288	0.86	6	12	0.44	6	12	0.44	**0.88**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Upper Lake Dam	RLJ	07/24/20	BETA 6.3	1
Structure:	Outlet Retaining Wall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (Unsual Load)	CTF	11/30/20		19C21022.04

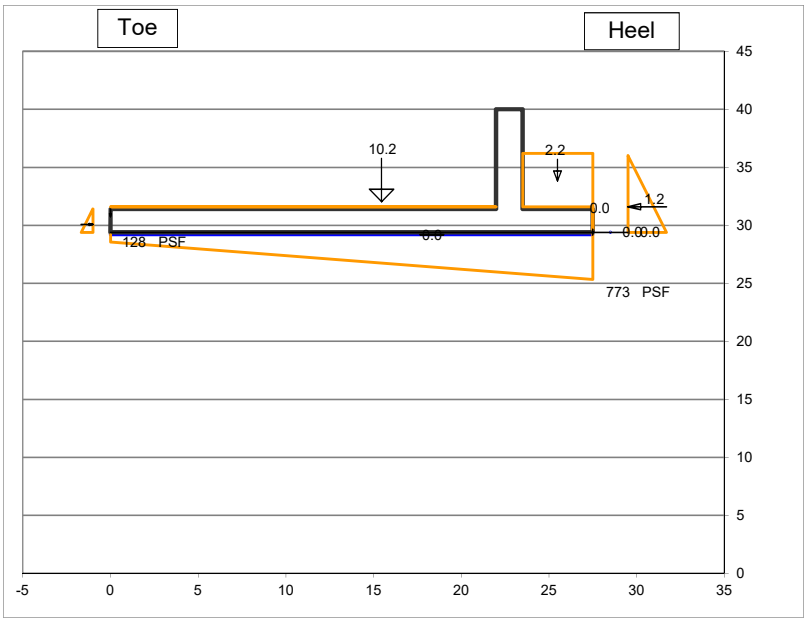
Schnabel ENGINEERING

Wall Geometry and Material Properties

Top of Wall Elevation	40	ft
Stem Height	8.6	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	22	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	31.4	
Base Elevation	29.4	ft
Base Width	27.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	29.4	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	36	ft
Water EL at Heel (WaterELh)	29.41	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	36.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	31.4	ft
Water EL at Toe (WaterELt)	29.4	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load			
Station			
Elevation			
CCW Angle from Vert			
Magnitude (kips)			
Horiz Force	0.00	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Appied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.2	15.5	157.5	
Soil Weight on Heel	2.2	25.5	56.3	
Water Weight on Heel	0.0	27.5	0.0	
Vert Force on Heel from Sloping Fill	0.0	27.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	0.0	18.3		0.2
0	0.0	0.0		
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	25.5	0.0	
Total Vertical Force	**12.4**			
HORZONTAL FORCES				
Water Pressure, Heel Side	0.0	0.0		0.0
Soil Pressure, Heel Side	1.23	2.2		2.7
Water Pressure, Toe Side	0.0	0.0	0.0	
Soil Pressure, Toe Side	0.00	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	4.4		0.0
EQ Inertia Force (wall + backfill)	0.00	2.2		0.0
0	0.0			
0	0.0			
0	0.0			
Surcharge	0.0	3.3		0.0
Total Horizontal Force	**1.2**			
Total Moments			**213.8**	**2.9**
Net Moment			**210.9**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.00	KSF
Uplift Pressure at Heel		0.00	KSF
Eccentricity		-3.28	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.13	KSF
		0.89	PSI
Reaction Pressure at Heel		0.77	KSF
		5.37	PSI
%Base in Compression	100%	**27.50**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		**N/A**	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Upper Lake Dam**	RLJ	7/24/2020	BETA 6.3	2
Structure:	**Outlet Retaining Wall (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC2 - Maintenance Condition (Req'd Sliding SF = 1.3) (Unsual Load)**	CTF	11/30/2020		19C21022.04

Schnabel ENGINEERING

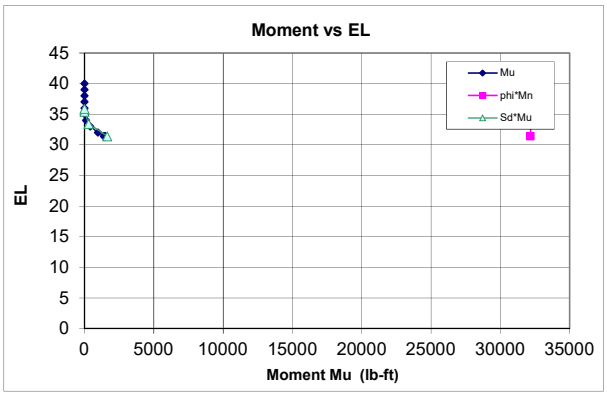
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.6
Load Factor M1	0	1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	31.4	0.00012	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	1,464	915	1.13	30.0	1.5	1,648	OK	OK
2	33.4	0.00002	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	264	165	1.13	30.0	0.3	298	OK	OK
4	35.4	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	3	2	1.13	30.0	0.0	4	OK	OK
4.5	35.9	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	0	0	1.13	30.0	0.0	0	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	31.4	0.22	5	0.63	8	0.47	OK
2	33.4	0.22	5	0.63	8	0.47	OK
4	35.4	0.22	5	0.63	8	0.47	OK
4.5	35.9	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	955	lb	**Optional Diagonal Bars:**		
ϕVc:	18,942	lb	Max of Vu(stem) and Vu(heel):	2,598	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.08	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	305	12,629	OK
4.0	21.47	0.63	13.4	1.3	17.4	16	12,629	OK
4.5	21.47	0.63	13.4	1.3	17.4	0	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.5	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL				
Client	City of Boiling Spring Lake				
Location	Upper Lake Dam				
Structure:	Outlet Retaining Wall (Normal Structure)				
Load Condition:	LC2 - Maintenance Condition (Req'd Slidi	Maximize Positive Moment (CW)			

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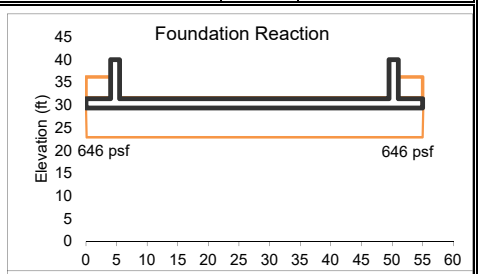
BASE SLAB REINFORCEMENT DESIGN

By	Date:	Program Ver.	Sheet
RLJ	07/24/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/30/20		19C21022.04

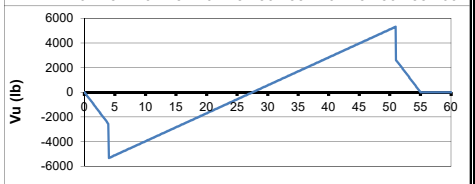
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-1935	915	1.4	-2709	1.0	915
point load	0.0	0		1.4	0		0
point load	55.0	0		1.4	0		0
Side Wall	51.0	-1935	-915	1.4	-2709	1.0	-915
Footing Length	55.0			1.4	0		0
Total		-3870			-5418		

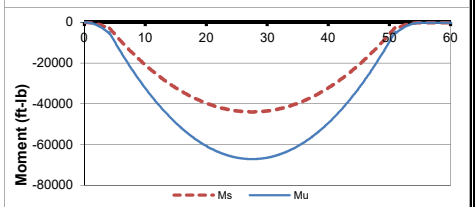


Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	55	55	-150	2	-300	-16500	1.4	-420	-23100
Soil Wt	0	4	4	-120	4.6	-552	-2208	1.6	-883	-3533
Headwater	0	4	4.0	-62.4	0	0	0	1.6	0	0
Tailwater/Soil	5.5	49.5	44.0	0	0	0	0	1.0	0	0
Headwater	51	55	4	-62.4	0	0	0	1.6	0	0
Soil Wt	51	55	4.0	-120	4.6	-552	-2208	1.6	-883	-3533
Uplift	0	55	55	62.4	0.01	1	34	1.4	1	48
Soil Reaction	0	55	55	323	1	323		1.0	323	
Soil Reaction	0	55	55	323	1	323		1.0	323	
							-20882			-30118

Approx FS floating N/A





Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
#DIV/0!	#DIV/0!	#DIV/0!	6	0.75	12	0.44	20.6	0.00178	40,266	0	0	#DIV/0!	21.2	0.0	#DIV/0!	#DIV/0!	#DIV/0!

Check Shear:

Vu: 3,064 lb
ϕVc: 24,904 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00378	0.00335	0.94	8	1.00	8	1.19	20.5	0.00482	105,174	67,143	43,992	1.24	28.6	22.6	83,197	OK	OK

Check Shear:

Vu: 5,334
ϕVc: 24,753
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
34.88	1.00	34.9

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast Exp/Total
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	(in^2/LF)		
(in^2)	(in^2/LF)									
288	0.86	6	12	0.44	6	12	0.44	**0.88**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Upper Lake Dam	RLJ	07/24/20	BETA 6.3	1
Structure:	Outlet Retaining Wall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC3 - Post Flood Condition (Req'd Sliding SF = 1.3) (Unsual Load)	CTF	11/30/20		19C21022.04

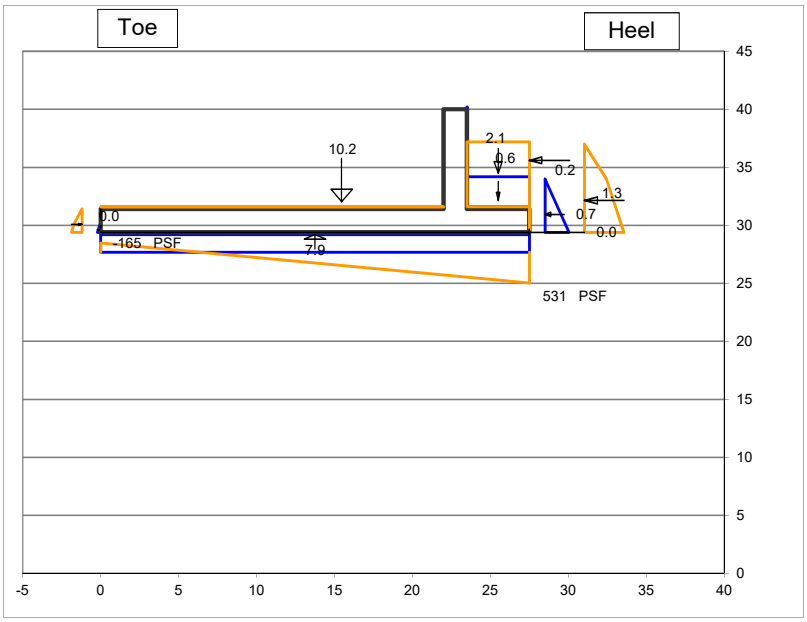
Schnabel ENGINEERING

Wall Geometry and Material Properties

Top of Wall Elevation	40	ft
Stem Height	8.6	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	22	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	31.4	
Base Elevation	29.4	ft
Base Width	27.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	29.4	
Compute Uplift from Water Levels at Toe/Heel?	N	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	37	ft
Water EL at Heel (WaterELh)	34.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	37.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	31.4	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	34
Uplift at Heel (UpliftELh	34

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	27.5		
Elevation	35.6		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.2	15.5	157.5	
Soil Weight on Heel	2.1	25.5	53.3	
Water Weight on Heel	0.6	25.5	16.5	
Vert Force on Heel from Sloping Fill	0.0	27.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-7.9	13.8		108.5
Compaction	0.0	27.5		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	25.5	0.0	
Total Vertical Force	**5.0**			
HORZONTAL FORCES				
Water Pressure, Heel Side	0.7	1.5		1.0
Soil Pressure, Heel Side	1.34	2.7		3.7
Water Pressure, Toe Side	0.0	0.2	0.0	
Soil Pressure, Toe Side	0.00	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.00	5.1		0.0
EQ Inertia Force (wall + backfill)	0.00	2.6		0.0
Compaction	0.2	6.2		1.1
0	0.0			
0	0.0			
Surcharge	0.0	3.8		0.0
Total Horizontal Force	**2.2**			
Total Moments			**227.3**	**114.3**
Net Moment			**113.0**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.29	KSF
Uplift Pressure at Heel		0.29	KSF
Eccentricity		-8.71	FT
Reaction Within Middle 1/3?		NO	
Reaction Pressure at Toe		-0.16	KSF
		-1.15	PSI
Reaction Pressure at Heel		0.53	KSF
		3.69	PSI
%Base in Compression	100%	27.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		N/A	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Upper Lake Dam**	RLJ	7/24/2020	BETA 6.3	2
Structure:	**Outlet Retaining Wall (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC3 - Post Flood Condition (Req'd Sliding SF = 1.3) (Unsual Load)**	CTF	11/30/2020		19C21022.04

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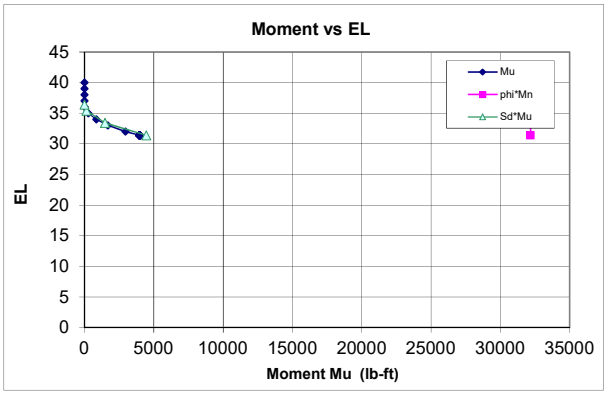
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.6
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	31.4	0.00034	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	3,964	2,477	1.13	30.0	4.2	4,460	OK	OK
2	33.4	0.00011	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	1,309	818	1.13	30.0	1.4	1,473	OK	OK
4	35.4	0.00001	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	117	73	1.13	30.0	0.1	131	OK	OK
5	36.4	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	3	2	1.13	30.0	0.0	4	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	31.4	0.22	5	0.63	8	0.47	OK
2	33.4	0.22	5	0.63	8	0.47	OK
4	35.4	0.22	5	0.63	8	0.47	OK
5	36.4	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	1,882	lb	**Optional Diagonal Bars:**		
ϕVc:	18,942	lb	Max of Vu(stem) and Vu(heel):	3,302	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.10	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	870	12,629	OK
4.0	21.47	0.63	13.4	1.3	17.4	391	12,629	OK
5.0	21.47	0.63	13.4	1.3	17.4	16	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
5.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	#DIV/0!	34.9	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL				
Client	City of Boiling Spring Lake				
Location	Upper Lake Dam				
Structure:	Outlet Retaining Wall (Normal Structure)				
Load Condition:	LC3 - Post Flood Condition (Req'd Slidin	Maximize Negative Moment (CCW)			

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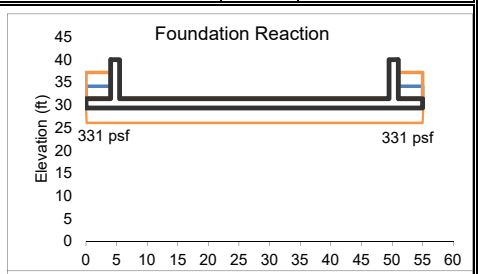
BASE SLAB REINFORCEMENT DESIGN

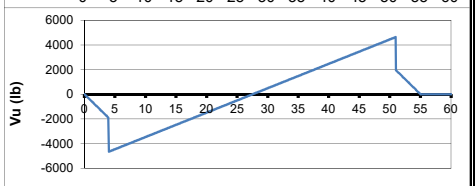
By	Date:	Program Ver.	Sheet
RLJ	07/24/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/30/20		19C21022.04

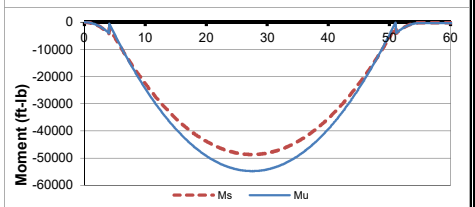
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-1935	2477	1.4	-2709	1.6	3964
point load	0.0	0		1.0	0		0
point load	55.0	0		1.0	0		0
Side Wall	51.0	-1935	-2477	1.4	-2709	1.6	-3964
Footing Length	55.0			1.4	0		0
Total		-3870			-5418		



Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	55	55	-150	2	-300	-16500	1.4	-420	-23100
Soil Wt	0	4	4	-93.35	5.6	-523	-2091	1.0	-523	-2091
Headwater	0	4	4.0	-62.4	2.6	-162	-649	1.0	-162	-649
Tailwater/Soil	5.5	49.5	44.0	0	0	0	0	1.4	0	0
Headwater	51	55	4	-62.4	2.6	-162	-649	1.0	-162	-649
Soil Wt	51	55	4.0	-93.35	5.6	-523	-2091	1.0	-523	-2091
Uplift	0	55	55	62.4	4.6	287	15787	1.0	287	15787
Soil Reaction	0	55	55	166	1	166		1.0	166	
Soil Reaction	0	55	55	166	1	166		1.0	166	
							-6193			-12793
Approx FS floating		**N/A**								





Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
#DIV/0!	#DIV/0!	#DIV/0!	6	0.75	12	0.44	20.6	0.00178	40,266	0	0	#DIV/0!	21.2	0.0	#DIV/0!	#DIV/0!	#DIV/0!

Check Shear:

Vu: 2,675 lb
ϕVc: 24,904 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00419	0.00335	1.04	8	1.00	8	1.19	20.5	0.00482	105,174	54,780	48,681	1.68	28.6	25.0	92,065	OK	OK

Check Shear:

Vu: 4,656
ϕVc: 24,753
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
34.88	1.00	34.9

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast Exp/Total
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)			
(in^2)	(in^2/LF)							(in^2/LF)		
288	0.86	6	12	0.44	6	12	0.44	**0.88**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Upper Lake Dam	RLJ	07/24/20	BETA 6.3	1
Structure:	Outlet Retaining Wall (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (Extreme Load)	CTF	11/30/20		19C21022.04

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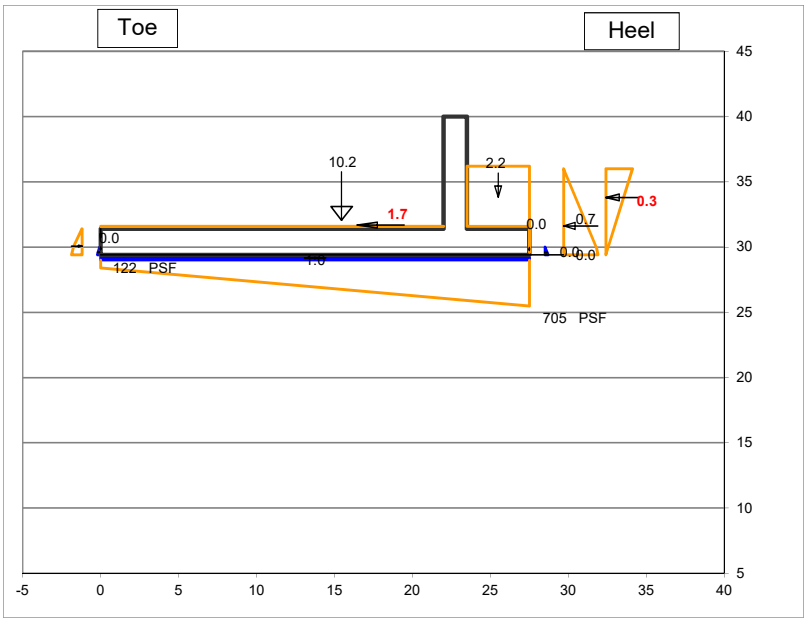
Wall Geometry and Material Properties

Top of Wall Elevation	40	ft
Stem Height	8.6	ft
Footing Thickness	2	ft
Top Width of Wall	1.5	ft
Toe Length (Bt)	22	ft
Heel Length (Bh)	4	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1.5	ft
Top of Footing EL	31.4	
Base Elevation	29.4	ft
Base Width	27.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	29.4	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	29	degrees
Allowable Bearing Pressure (50% increase for seismic	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.14	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	36	ft
Water EL at Heel (WaterELh)	30	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	36.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.094	

Fill over Toe Input

Fill EL at Toe (FillELt)	31.4	ft
Water EL at Toe (WaterELt)	30.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.00	(at-rest)
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force	Cohesion at base	0.00	KLF
		1.38	

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)

Uplift at Heel (UpliftELh)

Misc. Loads

	1	2	3
Name of Load			
Station			
Elevation			
CCW Angle from Vert			
Magnitude (kips)			
Horiz Force	0.00	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Toe	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	10.2	15.5	157.5	
Soil Weight on Heel	2.2	25.5	56.3	
Water Weight on Heel	0.0	27.5	0.0	
Vert Force on Heel from Sloping Fill	0.0	27.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-1.03	13.8		14.2
0	0.0	0.0		
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	25.5	0.0	
Total Vertical Force	**11.4**			
HORZONTAL FORCES				
Water Pressure, Heel Side	0.0	0.2		0.0
Soil Pressure, Heel Side	0.69	2.2		1.5
Water Pressure, Toe Side	0.0	0.2	0.0	
Soil Pressure, Toe Side	0.00	0.7	0.0	
EQ Soil Dynamic Component ΔP_{AE}	0.26	4.4		1.1
EQ Inertia Force (wall + backfill)	1.74	2.3		4.0
0	0.0			
0	0.0			
0	0.0			
Surcharge	0.0	3.3		0.0
Total Horizontal Force	**2.7**			
Total Moments			**213.8**	**20.8**
Net Moment			**193.0**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.04	KSF
Uplift Pressure at Heel		0.04	KSF
Eccentricity		-3.23	FT
Reaction Within Middle 1/3?		**YES**	
Reaction Pressure at Toe		0.12	KSF
		0.85	PSI
Reaction Pressure at Heel		0.70	KSF
		4.89	PSI
%Base in Compression	100%	**27.50**	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		**N/A**	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force	*Unmodified*	-1.03	KIPS
Modified Uplift Arm	*Unmodified*	13.75	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment	*Unmodified*	N/A	
Modified Sliding F.S.		N/A	

Modified Cell

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Upper Lake Dam		
Structure:	Outlet Retaining Wall (Normal Structure)		
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF = 1.1) (Extreme Load)		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	7/24/2020	BETA 6.3	2
Checked	Chk Date		Job No.
CTF	11/30/2020		19C21022.04

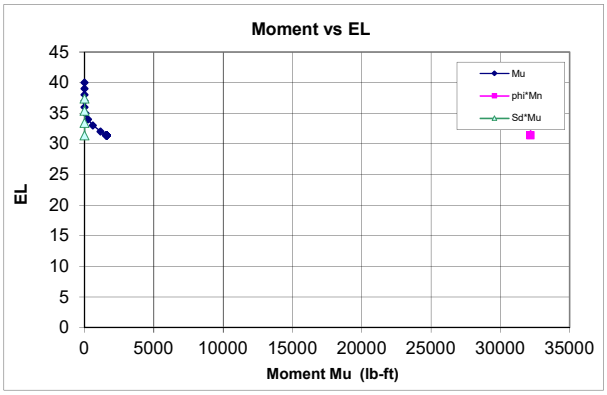
Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

Severe Environmental Exposure? N



Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.6
Load Factor Soil, Toe Side		1.2
Load Factor Water, Toe Side		1.2
Load Factor, Surcharge		1.6
Load Factor M1	0	1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010

Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	31.4	0.00012	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	1,587	1,277	N/A	N/A	2.1	N/A	OK	OK
2	33.4	0.00003	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	445	389	N/A	N/A	0.7	N/A	OK	OK
4	35.4	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	20	20	N/A	N/A	0.0	N/A	OK	OK
6	37.4	0.00000	0.00100	0.22	5	0.63	8	0.47	15.7	0.00247	32,188	0	0	N/A	N/A	0.0	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in^2/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	31.4	0.22	5	0.63	8	0.47	OK
2	33.4	0.22	5	0.63	8	0.47	OK
4	35.4	0.22	5	0.63	8	0.47	OK
6	37.4	0.22	5	0.63	8	0.47	OK

Check Shear:

Vu:	787	lb	**Optional Diagonal Bars:**		
ϕVc:	18,942	lb	Max of Vu(stem) and Vu(heel):	2,694	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.08	(in^2/LF)
			As (D bars) for residual shear load:	0.00	(in^2/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	373	12,629	OK
4.0	21.47	0.63	13.4	1.3	17.4	70	12,629	OK
6.0	21.47	0.63	13.4	1.3	17.4	0	12,629	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in^2)	Ast_{req} (in^2/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in^2/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%
6.0	216	0.65	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.00	0.00	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	8	0.30	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

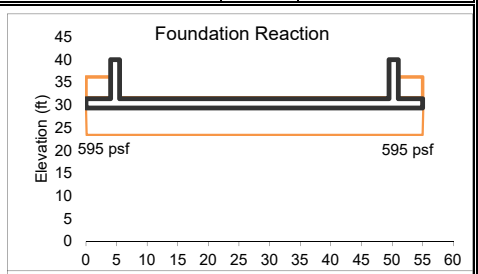
Project	BSL				
Client	City of Boiling Spring Lake				
Location	Upper Lake Dam				
Structure:	Outlet Retaining Wall (Normal Structure)				
Load Condition:	LC4 - Seismic Loading (Req'd Sliding SF	Maximize Positive Moment (CW)			

Schnabel ENGINEERING

BASE SLAB REINFORCEMENT DESIGN

By	Date:	Program Ver.	Sheet
RLJ	07/24/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/30/20		19C21022.04

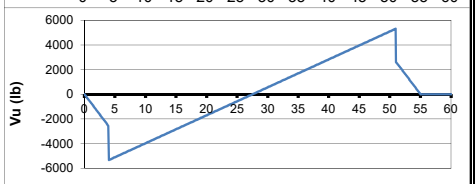
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.0	-1935	1277	1.4	-2709	1.0	1277
point load	0.0	0		1.4	0		0
point load	55.0	0		1.4	0		0
Side Wall	51.0	-1935	-1277	1.4	-2709	1.0	-1277
Footing Length	55.0			1.4	0		0
Total		-3870			-5418		

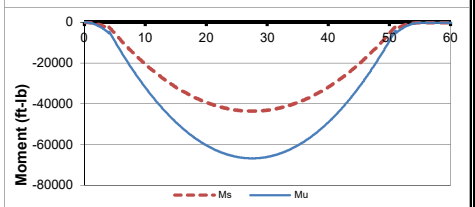


Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	55	55	-150	2	-300	-16500	1.4	-420	-23100
Soil Wt	0	4	4	-120	4.6	-552	-2208	1.6	-883	-3533
Headwater	0	4	4.0	-62.4	0	0	0	1.6	0	0
Tailwater/Soil	5.5	49.5	44.0	0	0	0	0	1.0	0	0
Headwater	51	55	4	-62.4	0	0	0	1.6	0	0
Soil Wt	51	55	4.0	-120	4.6	-552	-2208	1.6	-883	-3533
Uplift	0	55	55	62.4	0.6	37	2059	1.4	52	2883
Soil Reaction	0	55	55	297	1	297		1.0	297	
Soil Reaction	0	55	55	297	1	297		1.0	297	
							-18857			-27283

Approx FS floating N/A





Compute Bottom Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
0.00000	0.00100	0.25	6	0.75	12	0.44	20.6	0.00178	40,266	0	0	N/A	N/A	0.0	N/A	OK	OK

Check Shear:

Vu: 3,064 lb
ϕVc: 24,904 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required ρ_{calc}	ρ_{min}	As_{req} (in^2/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in^2/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi Mn > Mu$?	Meet As min?
0.00301	0.00335	0.83	8	1.00	8	1.19	20.5	0.00482	105,174	66,782	43,630	N/A	N/A	22.4	N/A	OK	OK

Check Shear:

Vu: 5,334
ϕVc: 24,753
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
34.88	1.00	34.9

Compute Longitudinal Steel:

Ag (in^2)	Ast_{req} (in^2/LF)	Top Face Bar #	Top Face Spacing (in)	Top Face Ast_{prov} (in^2/LF)	Bottom Face Bar #	Bottom Face Spacing (in)	Bottom Face Ast_{prov} (in^2/LF)	Ast_{prov} (in^2/LF)	Adequacy	Ratio of Ast Exp/Total
288	0.86	6	12	0.44	6	12	0.44	**0.88**	OK	50%

Project	BSL	STABILITY ANALYSIS			
Client	City of Boiling Spring Lake	By	Date:	Program Ver:	Sheet
Location	Upper Lake Dam	RLJ	04/20/20	BETA 6.3	1
Structure:	Box Inlet Weir Sidewalls (Normal Structure)	Checked	Chk Date:		Job No
Load Condition:	LC1 - Normal Operating (Usual Load)	CTF	11/30/20		19C21022.04

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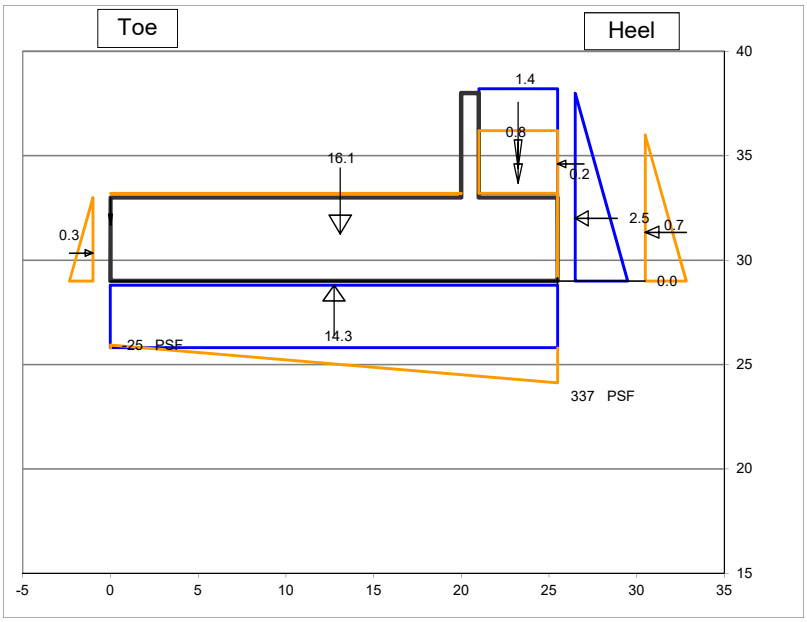
Wall Geometry and Material Properties

Top of Wall Elevation	38	ft
Stem Height	5	ft
Footing Thickness	4	ft
Top Width of Wall	1	ft
Toe Length (Bt)	20	ft
Heel Length (Bh)	4.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1	ft
Top of Footing EL	33.00	
Base Elevation	29.0	ft
Base Width	25.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	29	
Compute Uplift from Water Levels at Toe/Heel?	N	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	N/A	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	36	ft
Water EL at Heel (WaterELh)	38	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Ko At Rest	
Horiz. Pressure Coef K (Kh)=>	0.47	
Sloping Backfill EL at Heel (FillELh)	36.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.000	

Fill over Toe Input

Fill EL at Toe (FillELt)	33	ft
Water EL at Toe (WaterELt)	29.0	ft
γ_{moist}	120	pcf
γ_{sat}	125	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	38
Uplift at Heel (UpliftELh	38

Misc. Loads

	1	2	3
Name of Load	Compaction		
Station	25.5		
Elevation	34.6		
CCW Angle from Vert	270		
Magnitude (kips)	0.17		
Horiz Force	0.17	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	16.1	13.1	210.5	
Soil Weight on Heel	0.8	23.3	19.6	
Water Weight on Heel	1.4	23.3	32.6	
Vert Force on Heel from Sloping Fill	0.0	25.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-14.3	12.8		182.6
Compaction	0.0	25.5		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	23.3	0.0	
Total Vertical Force	**4.0**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.5	3.0		7.6
Soil Pressure, Heel Side	0.72	2.3		1.7
Water Pressure, Toe Side	0.0	0.0	0.0	
Soil Pressure, Toe Side	-0.31	1.3	0.4	
EQ Soil Dynamic Component ΔP_{AE}	0.00	4.7		0.0
EQ Inertia Force (wall + backfill)	0.00	2.5		0.0
Compaction	0.2	5.6		1.0
0	0.0			
0	0.0			
Surcharge	0.0	3.5		0.0
Total Horizontal Force	**3.1**			
Total Moments			**263.2**	**192.8**
Net Moment			**70.3**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.56	KSF
Uplift Pressure at Heel		0.56	KSF
Eccentricity		-4.93	FT
Reaction Within Middle 1/3?		NO	
Reaction Pressure at Toe		-0.02	KSF
		-0.17	PSI
Reaction Pressure at Heel		0.34	KSF
		2.34	PSI
%Base in Compression	100%	25.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		N/A	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force		N/A	KIPS
Modified Uplift Arm		N/A	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment		N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**	**STEM REINFORCEMENT DESIGN**			
Client	**City of Boiling Spring Lake**	By	Date	Program Ver.	Sheet
Location	**Upper Lake Dam**	RLJ	4/20/2020	BETA 6.3	2
Structure:	**Box Inlet Weir Sidewalls (Normal Structure)**	Checked	Chk Date		Job No.
Load Condition:	**LC1 - Normal Operating (Usual Load)**	CTF	11/30/2020		19C21022.04

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Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ max	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? Y

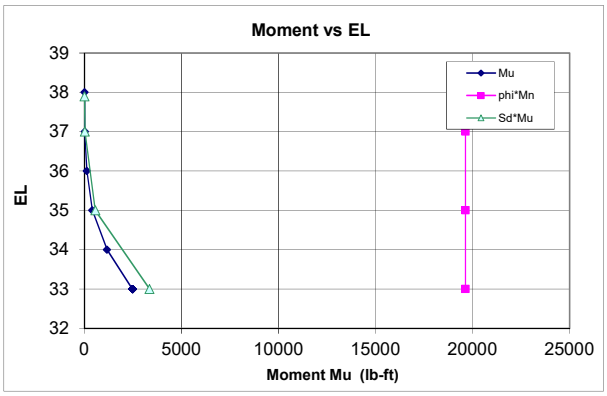
Severe Environmental Exposure? N

Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.2
Load Factor M1 Compaction		1.6
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρcalc	ρmin	Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu? ϕMn>Mu?	As min? As max?
0	33	0.00066	0.00100	0.14	5	0.63	8	0.47	9.7	0.00400	19,633	2,472	1,708	1.36	27.5	4.7	3,351	OK	OK
2	35	0.00011	0.00100	0.14	5	0.63	8	0.47	9.7	0.00400	19,633	401	286	1.40	27.5	0.8	561	OK	OK
4	37	0.00000	0.00100	0.14	5	0.63	8	0.47	9.7	0.00400	19,633	15	10	1.40	27.5	0.0	20	OK	OK
4.9	37.9	0.00000	0.00100	0.14	5	0.63	8	0.47	9.7	0.00400	19,633	0	0	1.40	27.5	0.0	0	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	Asreq (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	33	0.14	5	0.63	8	0.47	OK
2	35	0.14	5	0.63	8	0.47	OK
4	37	0.14	5	0.63	8	0.47	OK
4.9	37.9	0.14	5	0.63	8	0.47	OK

Check Shear:

Vu:	1,579	lb	**Optional Diagonal Bars:**		
ϕVc:	11,697	lb	Max of Vu(stem) and Vu(heel):	3,329	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.10	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	ld/db	db (in)	ld (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	417	7,799	OK
4.0	21.47	0.63	13.4	1.3	17.4	44	7,799	OK
4.9	21.47	0.63	13.4	1.3	17.4	0	7,799	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Astreq (in²/LF)	Exposed Face Bar #	Spacing (in)	Astprov (in²/LF)	Unexposed Face Bar #	Spacing (in)	Astprov (in²/LF)	Astprov (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.9	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.08	0.08	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρcalc	ρmin	Asreq (in²/LF)	Provided Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	ρ prov.	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs max (ksi)	fs (ksi)	SdMu	ϕMn>SdMu?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	#DIV/0!	25.0	0.0	#####	#DIV/0!	#DIV/0!

Project	BSL				
Client	City of Boiling Spring Lake				
Location	Upper Lake Dam				
Structure:	Box Inlet Weir Sidewalls (Normal Structure)				
Load Condition:	LC1 - Normal Operating (Usual Load)	Maximize Positive Moment (CW)			

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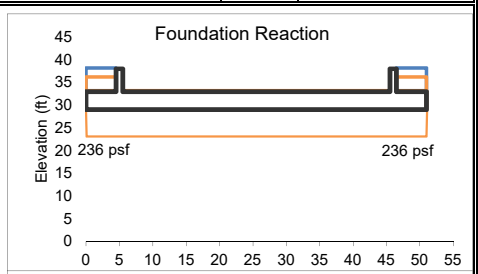
BASE SLAB REINFORCEMENT DESIGN

By	Date:	Program Ver.	Sheet
RLJ	04/20/20	BETA 6.3	3
Checked	Chk Date:		Job No.
CTF	11/30/20		19C21022.04

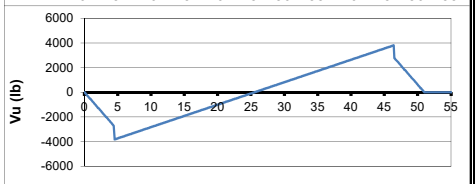
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.5	-750	1708	1.4	-1050	1.0	1708
point load	0.0	0		1.0	0		0
point load	51.0	0		1.0	0		0
Side Wall	46.5	-750	-1708	1.4	-1050	1.0	-1708
Footing Length	51.0			1.4	0		0
Total		-1500			-2100		

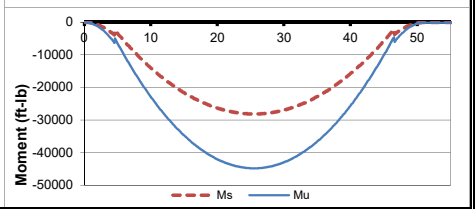


Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	51	51	-150	4	-600	-30600	1.4	-840	-42840
Soil Wt	0	4.5	4.5	-62.6	3	-188	-845	1.6	-300	-1352
Headwater	0	4.5	4.5	-62.4	5	-312	-1404	1.6	-499	-2246
Tailwater/Soil	5.5	45.5	40.0	0	0	0	0	1.0	0	0
Headwater	46.5	51	4.5	-62.4	5	-312	-1404	1.6	-499	-2246
Soil Wt	46.5	51	4.5	-62.6	3	-188	-845	1.6	-300	-1352
Uplift	0	51	51	62.4	9	562	28642	1.4	786	40098
Soil Reaction	0	51	51	118	1	118		1.0	118	
Soil Reaction	0	51	51	118	1	118		1.0	118	
							-6457			-9939

Approx FS floating N/A





Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
#DIV/0!	#DIV/0!	#DIV/0!	6	0.75	8	0.66	44.6	0.00123	131,251	0	0	#DIV/0!	31.9	0.0	#DIV/0!	#DIV/0!	#DIV/0!

Check Shear:

Vu: 2,826 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00044	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	44,792	28,133	1.06	31.9	11.6	47,590	OK	OK

Check Shear:

Vu: 3,828
ϕVc: 53,884
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast Exp/Total
		Bar #	Spacing (in)	Ast_{prov} (in^2/LF)	Bar #	Spacing (in)	Ast_{prov} (in^2/LF)			
(in^2)	(in^2/LF)							(in^2/LF)		
576	0.86	6	8	0.66	6	8	0.66	1.32	OK	50%

Project	BSL		
Client	City of Boiling Spring Lake		
Location	Upper Lake Dam		
Structure:	Box Inlet Weir Sidewalls (Normal Structure)		
Load Condition:	LC4 - Seismic Loading (Extreme Load)		

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STABILITY ANALYSIS

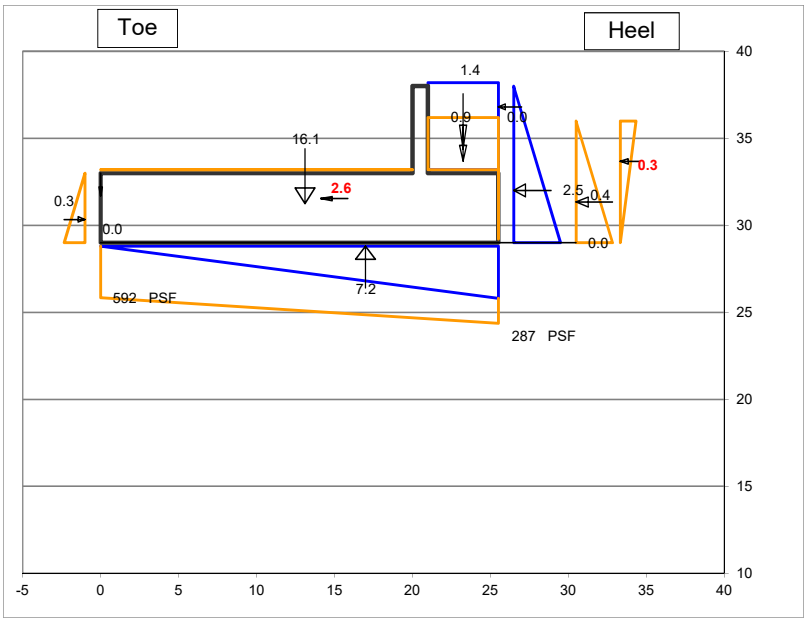
By	Date:	Program Ver:	Sheet
RLJ	04/20/20	BETA 6.3	1
Checked	Chk Date:		Job No
CTF	11/30/20		19C21022.04

Wall Geometry and Material Properties

Top of Wall Elevation	38	ft
Stem Height	5	ft
Footing Thickness	4	ft
Top Width of Wall	1	ft
Toe Length (Bt)	20	ft
Heel Length (Bh)	4.5	ft
Toe Side Batter 'zt' (zH:1V)	0	
Heel Side Batter 'zh' (zH:1V)	0	
Bottom Width of Wall Stem	1	ft
Top of Footing EL	33.0	
Base Elevation	29.0	ft
Base Width	25.5	ft
Key Dist from Toe (Xk)	0	ft
Key Width (Bk)	0	ft
Keyway Bot. EL (KeyEL)**	29	
Compute Uplift from Water Levels at Toe/Heel?	Y	(Y/N)
Concrete Unit Weight (Gc)	150	pcf
Friction Angle at Base (phib)	N/A	degrees
Allowable Bearing Pressure	4500	PSF
Horiz. EQ Acceleration k_{hEQ}	0.14	

Stability Summary

Half Section (Yes/No)?	Yes
Sliding Factor of Safety	N/A
Reaction within Middle 1/3 ?	N/A
% Base in Compression	N/A
Foundation Reaction Pressure	N/A



Fill over Heel Input

Backfill EL at Wall (FillELw)	36	ft
Water EL at Heel (WaterELh)	38	ft
γ_{moist}	120	pcf
γ_{sat}	130	pcf
Soil Friction Angle (phi)	32	degrees
Angle of Sloping Fill from horiz β:	0	degrees
Use vertical comp. of sloping fill for stability?	Y	
Soil Pressure Method	Kah_Coulomb	
Horiz. Pressure Coef K (Kh)=>	0.27	
Sloping Backfill EL at Heel (FillELh)	36.0	
ΔKAE (Mononobe-Okabe EQ Coef)	0.094	

Fill over Toe Input

Fill EL at Toe (FillELt)	33	ft
Water EL at Toe (WaterELt)	29.0	ft
γ_{moist}	120	pcf
γ_{sat}	130	pcf
Kp at Toe (Kt) (for Global Stability)	0.32	
Include F_p in Forces & Moments Table?	Y	
Ko at Toe (Kts) (for Structural Design)	0.00	

Manually-Input Passive Resistance at Toe

Passive Force		KLF

Surcharge Load

Qs=	0	PSF
Include Qs to resist sliding & OT? (Y/N)	Y	

Manually-Input Uplift (EL)

Uplift at Toe (UpliftELt)	
Uplift at Heel (UpliftELh)	

Misc. Loads

	1	2	3
Name of Load	Hydrodynamic		
Station	25.5		
Elevation	36.8		
CCW Angle from Vert	270		
Magnitude (kips)	0.02		
Horiz Force	0.02	0.00	0.00
Vert Force	0.00	0.00	0.00
Force Applied to	Stem	Stem	Stem

Summation of Forces and Moments

	Forces		Moments	
	Force (Kips)	Arm (ft)	Stabilizing (K-ft)	Overturning (K-ft)
VERTICAL FORCES				
Weight of Wall	16.1	13.1	210.5	
Soil Weight on Heel	0.9	23.3	21.2	
Water Weight on Heel	1.4	23.3	32.6	
Vert Force on Heel from Sloping Fill	0.0	25.5	0.0	
Soil Weight on Toe	0.0	0.0	0.0	
Water Weight at Toe	0.0	0.0	0.0	
Uplift	-7.2	17.0		121.8
Hydrodynamic	0.0	25.5		0.0
0	0.0	0.0		
0	0.0	0.0		
Surcharge	0.0	23.3	0.0	
Total Vertical Force	**11.2**			
HORZONTAL FORCES				
Water Pressure, Heel Side	2.5	3.0		7.6
Soil Pressure, Heel Side	0.44	2.3		1.0
Water Pressure, Toe Side	0.0	0.0	0.0	
Soil Pressure, Toe Side	-0.31	1.3	0.4	
EQ Soil Dynamic Component ΔP_{AE}	0.30	4.7		1.4
EQ Inertia Force (wall + backfill)	2.57	2.5		6.5
Hydrodynamic	0.0	7.8		0.2
0	0.0			
0	0.0			
Surcharge	0.0	3.5		0.0
Total Horizontal Force	**5.5**			
Total Moments			**264.7**	**138.5**
Net Moment			**126.2**	

Safety Factor Evaluation

Uplift Pressure at Toe		0.00	KSF
Uplift Pressure at Heel		0.56	KSF
Eccentricity		1.48	FT
Reaction Within Middle 1/3?		YES	
Reaction Pressure at Toe		0.59	KSF
		4.11	PSI
Reaction Pressure at Heel		0.29	KSF
		1.99	PSI
%Base in Compression	100%	25.50	FT
Passive Pressure (Key/Toe)		0.00	KLF
Passive Pressure (Manually Input)		0.00	KLF
Sliding Factor of Safety		N/A	

Sliding Factor of Safety - Cracked Section

-Performed if resultant is outside of middle 1/3 of base

Crack Length	0.0	N/A	FT
%Base in Compression	N/A	N/A	FT
Modified Reaction at the Toe		N/A	KSF
		N/A	PSI
Modified Uplift Force	*Unmodified*	-7.17	KIPS
Modified Uplift Arm	*Unmodified*	16.99	FT
Modified Total Vertical Force		N/A	KIPS
Modified Net Moment	*Unmodified*	N/A	
Modified Sliding F.S.		N/A	

Project	**BSL**		
Client	**City of Boiling Spring Lake**		
Location	**Upper Lake Dam**		
Structure:	**Box Inlet Weir Sidewalls (Normal Structure)**		
Load Condition:	**LC4 - Seismic Loading (Extreme Load)**		

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STEM REINFORCEMENT DESIGN

By	Date	Program Ver.	Sheet
RLJ	4/20/2020	BETA 6.3	2
Checked	**Chk Date**		**Job No.**
CTF	11/30/2020		19C21022.04

Material Properties

f'c	4,500	psi
fy	60,000	psi
ϕ	0.9	
ρ_{max}	0.0160	
E steel	29,000,000	
E concrete	3,823,676	
n	7.58	

Durability Options

Use Environmental Durability Factor? N

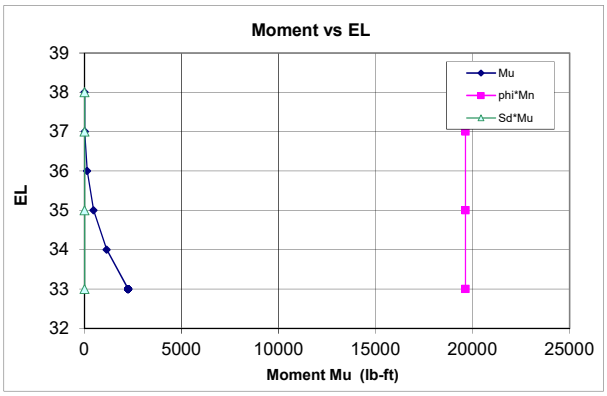
Severe Environmental Exposure? N

Horizontal Force

		Load Factor
Load Factor Soil, Heel Side		1.6
Load Factor Water, Heel Side		1.4
Load Factor Soil, Toe Side		1.6
Load Factor Water, Toe Side		1.4
Load Factor, Surcharge		1.2
Load Factor M1 Hydrodynamic		1.0
Load Factor M2	0	1.0
Load Factor M3	0	1.0
Load Factor, Earthquake		1.0

Min Vert S&T Ratio to Gross Area

Total	0.0030
Back Face	0.0010
Exposed Face	0.0010



Stem Design

Cover 2 in.

Primary Tension Steel

H above Ftg	EL	Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in²/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (sq in)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$? $\phi M_n > M_u$?	As min? As max?
0	33	0.00044	0.00100	0.14	5	0.63	8	0.47	9.7	0.00400	19,633	2,246	1,678	N/A	N/A	4.6	N/A	OK	OK
2	35	0.00009	0.00100	0.14	5	0.63	8	0.47	9.7	0.00400	19,633	467	353	N/A	N/A	1.0	N/A	OK	OK
4	37	0.00000	0.00100	0.14	5	0.63	8	0.47	9.7	0.00400	19,633	15	10	N/A	N/A	0.0	N/A	OK	OK
5	38	0.00000	0.00100	0.14	5	0.63	8	0.47	9.7	0.00400	19,633	0	0	N/A	N/A	0.0	N/A	OK	OK

Vertical Temperature and Shrinkage (compression face)

H above Ftg	EL	As_{req} (in²/LF)	Bar #	Bar Dia. (in)	Sp. (in)	As/LF (sq in)	As>Asreq
0	33	0.14	5	0.63	8	0.47	OK
2	35	0.14	5	0.63	8	0.47	OK
4	37	0.14	5	0.63	8	0.47	OK
5	38	0.14	5	0.63	8	0.47	OK

Check Shear:

Vu:	1,351	lb	**Optional Diagonal Bars:**		
ϕVc:	11,697	lb	Max of Vu(stem) and Vu(heel):	2,951	Lb
ϕVc > Vu	OK		As (D bars) for entire shear load:	0.09	(in²/LF)
			As (D bars) for residual shear load:	0.00	(in²/LF)
			Use:		

Compute Lap Splice Length

Bars at H above Ftg (ft)	l_d/d_b	d_b (in)	l_d (in)	Splice Factor	Splice Length (in)	Vu (lb)	2/3Vc (lb)	Bar Cutoff OK?
0.0	21.47	0.63	13.4	1.3	17.4	N/A	N/A	N/A
2.0	21.47	0.63	13.4	1.3	17.4	489	7,799	OK
4.0	21.47	0.63	13.4	1.3	17.4	44	7,799	OK
5.0	21.47	0.63	13.4	1.3	17.4	0	7,799	OK

Compute Longitudinal Steel using: ACI 350 0.003

H above Ftg	Ag (in²)	Ast_{req} (in²/LF)	Exposed Face Bar #	Exposed Face Spacing (in)	Exposed Face Ast_{prov} (in²/LF)	Unexposed Face Bar #	Unexposed Face Spacing (in)	Unexposed Face Ast_{prov} (in²/LF)	Ast_{prov} (in²/LF)	Adequacy	Ratio of Ast Exp/Total
0.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
2.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
4.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%
5.0	144	0.43	5	8	0.47	5	8	0.47	**0.93**	OK	50%

Key Design: Compute Vu and Mu

Force	Bounding Pressures Bot. Ftg KSF	Bot. Key KSF	Force Lbs	Arm Ft	Load Fct	Vu Lb	Mu Ft-Lb	Ms Ft-Lb
Passive Pressure on Key	0.09	0.09	0	0.00	1.6	0	0	0

Check Shear on Key:

Vu:	0	Lb
ϕVc:	N/A	Lb
	OK	

Compute Key Reinforcement

Cover: 3 in

Required ρ_{calc}	Required ρ_{min}	Required As_{req} (in²/LF)	Bar #	Bar Dia. (in)	Spacing (in)	As/LF (in²/LF)	d (in)	$\rho_{prov.}$	ϕMn (ft-lb)	Mu (ft-lb)	Ms (ft-lb)	Sd (ft-lb)	fs_{max} (ksi)	fs (ksi)	SdMu	$\phi M_n > S_d M_u$?	As min? As max?
#DIV/0!	#DIV/0!	#DIV/0!	4	0.50	12	0.20	0.0	0.00000	0	0	0	N/A	N/A	0.0	N/A	NO	#DIV/0!

Project	BSL			BASE SLAB REINFORCEMENT DESIGN			
Client	City of Boiling Spring Lake			By	Date:	Program Ver.	Sheet
Location	Upper Lake Dam			RLJ	04/20/20	BETA 6.3	3
Structure:	Box Inlet Weir Sidewalls (Normal Structure)			Checked	Chk Date:		Job No.
Load Condition:	LC4 - Seismic Loading (Extreme Load)	Maximize Positive Moment (CW)		CTF	11/30/20		19C21022.04

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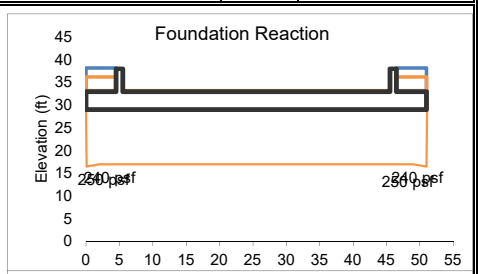
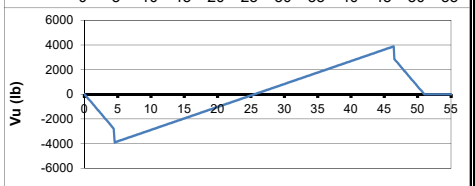
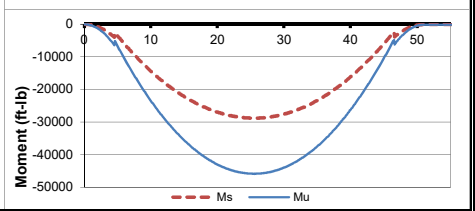
Item	x (ft)	Point Load (lb)	Moment (ft-lb)	Point Load Factor	Factored Point Load (lb)	Moment Load Factor	Factored Moment (ft-lb)
	0				0		0
Side Wall	4.5	-750	1678	1.4	-1050	1.0	1678
point load	0.0	0		1.0	0		0
point load	51.0	0		1.0	0		0
Side Wall	46.5	-750	-1678	1.4	-1050	1.0	-1678
Footing Length	51.0			1.4	0		0
Total		-1500			-2100		







Distributed Loads

Item	From x=	to x=	Width	Unit Wt	Height	Unfactored Load/LF	Unfactored Subtotal	Load Factor	Factored Load/LF	Factored Subtotal
Dead Wt	0	51	51	-150	4	-600	-30600	1.4	-840	-42840
Soil Wt	0	4.5	4.5	-67.6	3	-203	-913	1.6	-324	-1460
Headwater	0	4.5	4.5	-62.4	5	-312	-1404	1.6	-499	-2246
Tailwater/Soil	5.5	45.5	40.0	0	0	0	0	1.0	0	0
Headwater	46.5	51	4.5	-62.4	5	-312	-1404	1.6	-499	-2246
Soil Wt	46.5	51	4.5	-67.6	3	-203	-913	1.6	-324	-1460
Uplift	0	51	51	62.4	9	562	28642	1.4	786	40098
Soil Reaction	0	49	49	125	1	125		1.0	125	
Soil Reaction	2	51	49	125	1	125		1.0	125	
							-6592			-10155

Approx FS floating N/A

Compute Bottom Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi M_n > S_d M_u$? $\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00000	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	0	0	N/A	N/A	0.0	N/A	OK	OK

Check Shear:

Vu: 2,885 lb
ϕVc: 53,884 lb
OK

Compute Development Length (Inches):

l_d/d_b	d_b	l_d
21.47	0.75	16.1

Compute Top Reinforcement

Cover 3 in

Required			Provided														
ρ_{calc}	ρ_{min}	As_{req}	Bar #	Bar Dia.	Spacing	As/LF	d	$\rho_{prov.}$	ϕMn	Mu	Ms	Sd	fs_{max}	fs	SdMu	$\phi Mn > Mu$?	Meet As min?
		(in^2/LF)		(in)	(in)	(in^2/LF)	(in)		(ft-lb)	(ft-lb)	(ft-lb)		(ksi)	(ksi)			
0.00043	0.00100	0.54	6	0.75	8	0.66	44.6	0.00123	131,251	45,845	28,799	N/A	N/A	11.8	N/A	OK	OK

Check Shear:

Vu: 3,909
ϕVc: 53,884
OK

Compute Development Length (inches):

l_d/d_b	d_b	l_d
27.91	0.75	20.9

Compute Longitudinal Steel:

Ag	Ast_{req}	Top Face			Bottom Face			Ast_{prov}	Adequacy	Ratio of Ast
		Bar #	Spacing	Ast_{prov}	Bar #	Spacing	Ast_{prov}			Exp/Total
(in^2)	(in^2/LF)		(in)	(in^2/LF)		(in)	(in^2/LF)	(in^2/LF)		
576	0.86	6	8	0.66	6	8	0.66	1.32	OK	50%

Appendix 5 – Environmental Permitting

DAMS CONSTRUCTION/RECONSTRUCTION PROJECT

CITY OF BOILING SPRING LAKES

North Lake Dam (BRUNS-001), Pine Lake Dam (BRUNS-002), Sanford Dam (BRUNS-003), Upper Lake Dam (BRUNS-012)

5400 Trinity Road, Suite 107

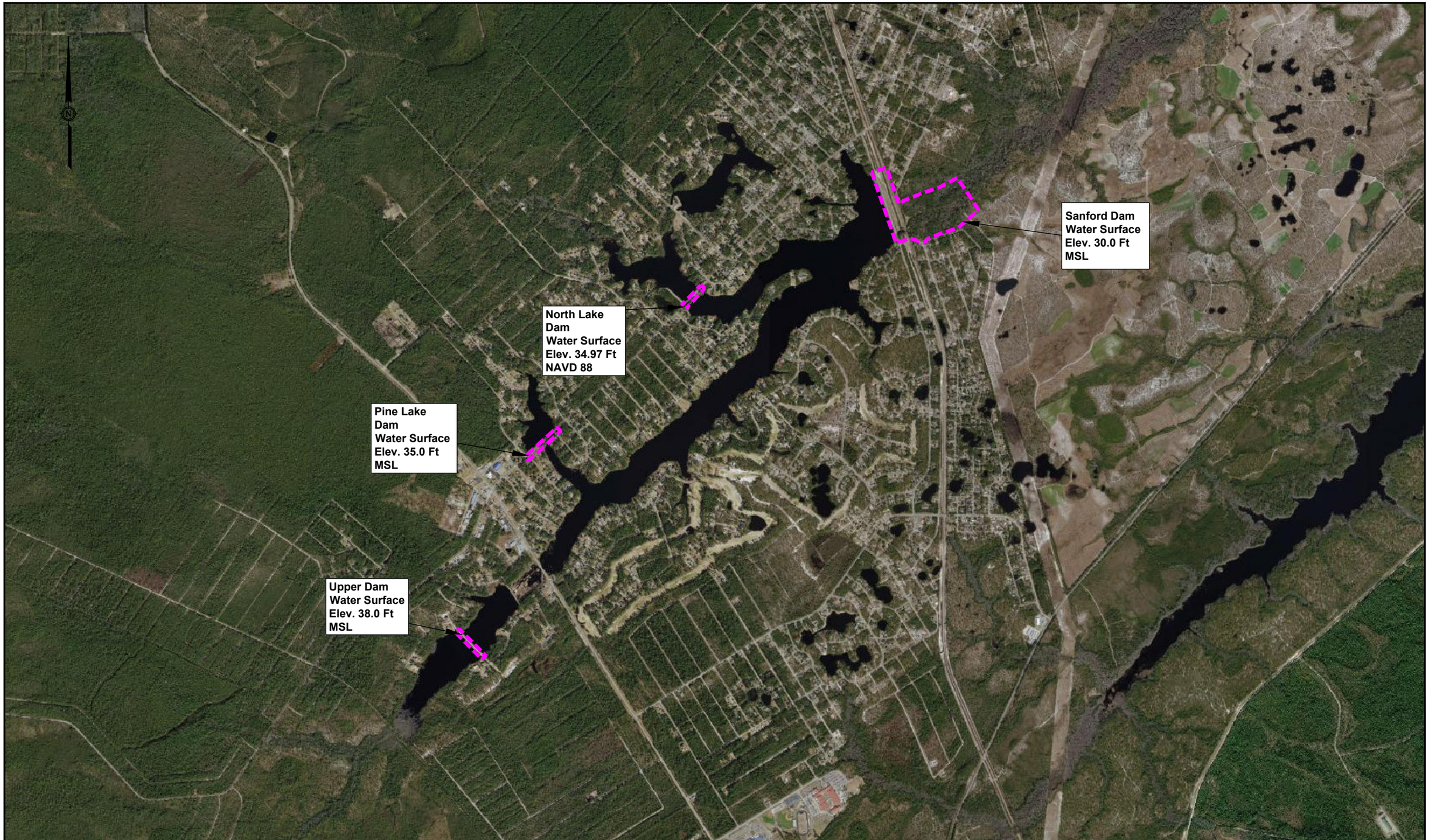
Raleigh, North Carolina 27607

Firm License No.: C-0459

JULY 2020

20.07036

APPENDIX 5.1



P:\2019\19.07042 - BOILINGSPRLNC - DAM DESIGN\DESIGN\REPORTS & PLANNING\DRAWINGS\FIGURES.DWG PLOT DATE 8/23/2019 11:56 AM ALEX LOWDERMILK

mcgill
1013 State Farm Road
Boone, NC 28607
828.386.1920
NC Firm License # C-0459
mcgillassociates.com

DATE 8/23/2019	PROJECT # 19.07042
OFFICE MANAGER MC	DESIGNER AL
PROJECT MANAGER MH	REVIEWER JS

DAM REPAIRS

CITY OF BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

2000 0 1000 2000 4000

GRAPHIC SCALE DIVISION VALUE = 2000 FEET

STUDY LIMITS MAP

FIGURES

A-1

APPENDIX 5.2

NATIONWIDE PERMIT 3
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
FINAL NOTICE OF ISSUANCE AND MODIFICATION OF NATIONWIDE PERMITS
FEDERAL REGISTER
AUTHORIZED MARCH 19, 2017

Maintenance. (a) The repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. This NWP also authorizes the removal of previously authorized structures or fills. Any stream channel modification is limited to the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill; such modifications, including the removal of material from the stream channel, must be immediately adjacent to the project. This NWP also authorizes the removal of accumulated sediment and debris within, and in the immediate vicinity of, the structure or fill. This NWP also authorizes the repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced, or is under contract to commence, within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this two-year limit may be waived by the district engineer, provided the permittee can demonstrate funding, contract, or other similar delays.

(b) This NWP also authorizes the removal of accumulated sediments and debris outside the immediate vicinity of existing structures (e.g., bridges, culverted road crossings, water intake structures, etc.). The removal of sediment is limited to the minimum necessary to restore the waterway in the vicinity of the structure to the approximate dimensions that existed when the structure was built, but cannot extend farther than 200 feet in any direction from the structure. This 200 foot limit does not apply to maintenance dredging to remove accumulated sediments blocking or restricting outfall and intake structures or to maintenance dredging to remove accumulated sediments from canals associated with outfall and intake structures. All dredged or excavated materials must be deposited and retained in an area that has no waters of the United States unless otherwise specifically approved by the district engineer under separate authorization.

(c) This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the maintenance activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After conducting the maintenance activity, temporary fills must be

removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

(d) This NWP does not authorize maintenance dredging for the primary purpose of navigation. This NWP does not authorize beach restoration. This NWP does not authorize new stream channelization or stream relocation projects.

Notification: For activities authorized by paragraph (b) of this NWP, the permittee must submit a pre-construction notification to the district engineer prior to commencing the activity (see general condition 32). The pre-construction notification must include information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals. (Authorities: Section 10 of the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act (Sections 10 and 404))

Note: This NWP authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the Clean Water Act section 404(f) exemption for maintenance.

NATIONWIDE PERMIT GENERAL CONDITIONS

The following General Conditions must be followed in order for any authorization by a NWP to be valid:

1. Navigation. (a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. Aquatic Life Movements. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

3. Spawning Areas. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. Migratory Bird Breeding Areas. Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. Shellfish Beds. No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. Suitable Material. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

7. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. Adverse Effects From Impoundments. If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. Management of Water Flows. To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. Fills Within 100-Year Floodplains. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. Equipment. Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. Removal of Temporary Fills. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. Single and Complete Project. The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. Wild and Scenic Rivers. (a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status,

unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

(b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. The permittee shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.

(c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

17. Tribal Rights. No NWP activity may cause more than minimal adverse effects on tribal rights (including treaty rights), protected tribal resources, or tribal lands.

18. Endangered Species. (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the effects of the proposed activity has been completed. Direct effects are the immediate effects on listed species and critical habitat caused by the NWP activity. Indirect effects are those effects on listed species and critical habitat that are caused by the NWP activity and are later in time, but still are reasonably certain to occur.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. If pre-construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that

might be affected by the proposed activity or that utilize the designated critical habitat that might be affected by the proposed activity. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non- Federal applicant of the Corps' determination within 45 days of receipt of a complete pre- construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have "no effect" on listed species or critical habitat, or until ESA section 7 consultation has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWPs.

(e) Authorization of an activity by an NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.

(g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://www.nmfs.noaa.gov/pr/species/esa/ respectively.

19. Migratory Birds and Bald and Golden Eagles. The permittee is responsible for ensuring their action complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting appropriate local office of the U.S. Fish and Wildlife Service to determine applicable measures to reduce impacts to migratory

birds or eagles, including whether "incidental take" permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

20. Historic Properties. (a) In cases where the district engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act. If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: no historic properties affected, no adverse effect, or adverse effect. Where the non-Federal applicant has identified historic properties on which the activity might have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed.

(d) For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. Discovery of Previously Unknown Remains and Artifacts. If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. Designated Critical Resource Waters. Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, and 52 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation. The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation to ensure that the activity results in no more than minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult-to-replace resources (see 33 CFR 332.3(e)(3)).

(e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. Restored riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-

lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation.

(2) The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f)).

(3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation.

(4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)).

(5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan only needs to address the baseline conditions at the impact site and the number of credits to be provided.

(6) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).

(g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs.

(h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill

material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

24. Safety of Impoundment Structures. To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. Water Quality. Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. Coastal Zone Management. In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. Use of Multiple Nationwide Permits. The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

29. Transfer of Nationwide Permit Verifications. If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:
"When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To

validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

_____
(Transferee)

_____
(Date)

30. Compliance Certification. Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

(a) A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

(c) The signature of the permittee certifying the completion of the activity and mitigation.

The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

31. Activities Affecting Structures or Works Built by the United States. If an NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a "USACE project"), the prospective permittee must submit a pre-construction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission is not authorized by NWP until the appropriate Corps office issues the section 408 permission to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

32. Pre-Construction Notification. (a) Timing. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the

prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed activity;

(3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;

(4) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures. For single and complete linear projects, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters.

Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(7) For non-Federal permittees, if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed activity or utilize the designated critical habitat that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act;

(8) For non-Federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act;

(9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the "study river" (see general condition 16); and

(10) For an activity that requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from the Corps office having jurisdiction over that USACE project.

(c) Form of Pre-Construction Notification: The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is an NWP PCN and must include all of the applicable information required in paragraphs (b)(1) through (10) of this general condition. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and

supporting materials if the district engineer has established tools and procedures for electronic submittals.

(d) Agency Coordination: (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity's adverse environmental effects so that they are no more than minimal.

(2) Agency coordination is required for: (i) all NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require pre-construction notification and will result in the loss of greater than 300 linear feet of stream bed; (iii) NWP 13 activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iv) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes.

(3) When agency coordination is required, the district engineer will immediately provide (e.g., via e-mail, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or e-mail that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of pre-construction notifications to expedite agency coordination.

DISTRICT ENGINEER'S DECISION

1. In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal

individual or cumulative adverse environmental effects or may be contrary to the public interest. If a project proponent requests authorization by a specific NWP, the district engineer should issue the NWP verification for that activity if it meets the terms and conditions of that NWP, unless he or she determines, after considering mitigation, that the proposed activity will result in more than minimal individual and cumulative adverse effects on the aquatic environment and other aspects of the public interest and exercises discretionary authority to require an individual permit for the proposed activity. For a linear project, this determination will include an evaluation of the individual crossings of waters of the United States to determine whether they individually satisfy the terms and conditions of the NWP(s), as well as the cumulative effects caused by all of the crossings authorized by NWP. If an applicant requests a waiver of the 300 linear foot limit on impacts to streams or of an otherwise applicable limit, as provided for in NWPs 13, 21, 29, 36, 39, 40, 42, 43, 44, 50, 51, 52, or 54, the district engineer will only grant the waiver upon a written determination that the NWP activity will result in only minimal individual and cumulative adverse environmental effects. For those NWPs that have a waivable 300 linear foot limit for losses of intermittent and ephemeral stream bed and a 1/2-acre limit (i.e., NWPs 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52), the loss of intermittent and ephemeral stream bed, plus any other losses of jurisdictional waters and wetlands, cannot exceed 1/2-acre.

2. When making minimal adverse environmental effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. He or she will also consider the cumulative adverse environmental effects caused by activities authorized by NWP and whether those cumulative adverse environmental effects are no more than minimal. The district engineer will also consider site specific factors, such as the environmental setting in the vicinity of the NWP activity, the type of resource that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. If an appropriate functional or condition assessment method is available and practicable to use, that assessment method may be used by the district engineer to assist in the minimal adverse environmental effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site- specific environmental concerns.

3. If the proposed activity requires a PCN and will result in a loss of greater than 1/10-acre of wetlands, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for NWP activities with smaller impacts, or for impacts to other types of waters (e.g., streams). The district engineer will consider any proposed compensatory mitigation or other mitigation measures the applicant has included in the proposal in determining whether the net adverse environmental effects of the proposed activity are no more than minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse environmental effects are no more than minimal, after considering mitigation, the district engineer will notify the permittee and

include any activity-specific conditions in the NWP verification the district engineer deems necessary. Conditions for compensatory mitigation requirements must comply with the appropriate provisions at 33 CFR 332.3(k). The district engineer must approve the final mitigation plan before the permittee commences work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the proposed compensatory mitigation plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure the NWP activity results in no more than minimal adverse environmental effects. If the net adverse environmental effects of the NWP activity (after consideration of the mitigation proposal) are determined by the district engineer to be no more than minimal, the district engineer will provide a timely written response to the applicant. The response will state that the NWP activity can proceed under the terms and conditions of the NWP, including any activity-specific conditions added to the NWP authorization by the district engineer.

4. If the district engineer determines that the adverse environmental effects of the proposed activity are more than minimal, then the district engineer will notify the applicant either: (a) that the activity does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (b) that the activity is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal; or (c) that the activity is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse environmental effects, the activity will be authorized within the 45-day PCN period (unless additional time is required to comply with general conditions 18, 20, and/or 31, or to evaluate PCNs for activities authorized by NWPs 21, 49, and 50), with activity-specific conditions that state the mitigation requirements. The authorization will include the necessary conceptual or detailed mitigation plan or a requirement that the applicant submit a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal. When compensatory mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan or has determined that prior approval of a final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation.

FURTHER INFORMATION

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).

DEFINITIONS

Best management practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural.

Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Direct effects: Effects that are caused by the activity and occur at the same time and place.

Discharge: The term "discharge" means any discharge of dredged or fill material into waters of the United States.

Ecological reference: A model used to plan and design an aquatic habitat and riparian area restoration, enhancement, or establishment activity under NWP 27. An ecological reference may be based on the structure, functions, and dynamics of an aquatic habitat type or a riparian area type that currently exists in the region where the proposed NWP 27 activity is located. Alternatively, an ecological reference may be based on a conceptual model for the aquatic habitat type or riparian area type to be restored, enhanced, or established as a result of the proposed NWP 27 activity. An ecological reference takes into account the range of variation of the aquatic habitat type or riparian area type in the region.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Ephemeral stream: An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

High Tide Line: The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National

Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete non-linear project in the Corps Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Indirect effects: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. The loss of stream bed includes the acres or linear feet of stream bed that are filled or excavated as a result of the regulated activity. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the United States.

Navigable waters: Waters subject to section 10 of the Rivers and Harbors Act of 1899. These waters are defined at 33 CFR part 329.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Non-tidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of flowing or standing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of “open waters” include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: An ordinary high water mark is a line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas.

Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the

primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Protected tribal resources: Those natural resources and properties of traditional or customary religious or cultural importance, either on or off Indian lands, retained by, or reserved by or for, Indian tribes through treaties, statutes, judicial decisions, or executive orders, including tribal trust resources.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands next to streams, lakes, and estuarine- marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects riverine, lacustrine, estuarine, and marine waters with their adjacent wetlands, non-wetland waters, or uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 23.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term "single and complete project" is defined as that portion of the total linear project proposed or accomplished by one owner/developer or partnership or other association of owners/developers that includes all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete non-linear project must have independent utility (see definition of "independent utility"). Single and complete non-linear projects may not be "piecemealed" to avoid the limits in an NWP authorization.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a jurisdictional wetland that is inundated by tidal waters. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water

surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line.

Tribal lands: Any lands title to which is either: 1) held in trust by the United States for the benefit of any Indian tribe or individual; or 2) held by any Indian tribe or individual subject to restrictions by the United States against alienation.

Tribal rights: Those rights legally accruing to a tribe or tribes by virtue of inherent sovereign authority, unextinguished aboriginal title, treaty, statute, judicial decisions, executive order or agreement, and that give rise to legally enforceable remedies.

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: For purposes of the NWPs, a waterbody is a jurisdictional water of the United States. If a wetland is adjacent to a waterbody determined to be a water of the United States, that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)). Examples of "waterbodies" include streams, rivers, lakes, ponds, and wetlands.

FINAL 2017 REGIONAL CONDITIONS

NOTICE ABOUT WEB LINKS IN THIS DOCUMENT:
The web links (both internal to our Wilmington District and any external links to collaborating agencies) in this document are valid at the time of publication. However, the Wilmington District Regulatory Program web page addresses, as with other agency web sites, may change over the timeframe of the five-year Nationwide Permit renewal cycle, in response to policy mandates or technology advances. While we will make every effort to check on the integrity of our web links and provide re-direct pages whenever possible, we ask that you report any broken links to us so we can keep the page information current and usable. We apologize in advanced for any broken links that you may encounter, and we ask that you navigate from the Regulatory home page (Regulatory Permit Program Wetlands and Streams) of the Wilmington District Corps of Engineers, to the "Permits" section of our web site to find links for pages that cannot be found by clicking directly on the listed web link in this document.

Final 2017 Regional Conditions for Nationwide Permits (NWP) in the Wilmington District

1.0 Excluded Waters

The Corps has identified waters that will be excluded from the use of all NWP's during certain timeframes. These waters are:

1.1 Anadromous Fish Spawning Areas

Waters of the United States identified by either the North Carolina Division of Marine Fisheries (NCDMF) or the North Carolina Wildlife Resources Commission (NCWRC) as anadromous fish spawning areas are excluded during the period between February 15 and June 30, without prior written approval from the Corps and either NCDMF or NCWRC.

1.2 Trout Waters Moratorium

Waters of the United States in the designated trout watersheds of North Carolina are excluded during the period between October 15 and April 15 without prior written approval from the NCWRC, or from the Eastern Band of Cherokee Indians (EBCI) Fisheries and Wildlife Management (FWM) office if the project is located on EBCI trust land. (See Section 2.7 for information on the designated trout watersheds).

1.3 Sturgeon Spawning Areas as Designated by the National Marine Fisheries Service (NMFS)

Waters of the United States designated as sturgeon spawning areas are excluded during the period between February 1 and June 30, without prior written approval from the NMFS.

2.0 Waters Requiring Additional Notification

The Corps has identified waters that will be subject to additional notification requirements for activities authorized by all NWPs. These waters are:

2.1 Western NC Counties that Drain to Designated Critical Habitat

For proposed activities within waters of the United States that require a Pre-Construction Notification (PCN) and are located in the sixteen counties listed below, permittees must provide a copy of the PCN to the U.S. Fish and Wildlife Service (USFWS), 160 Zillicoa Street, Asheville, North Carolina 28801. This PCN must be sent concurrently to the U.S. Fish and Wildlife Service and the Corps Asheville Regulatory Field Office. Please see General Condition 18 for specific notification requirements related to the Endangered Species Act and the below website for information on the location of designated critical habitat.

Counties with tributaries that drain to designated critical habitat that require notification to the Asheville U.S. Fish and Wildlife Service: Avery, Cherokee, Forsyth, Graham, Haywood, Henderson, Jackson, Macon, Mecklenburg, Mitchell, Stokes, Surry, Swain, Transylvania, Union and Yancey.

Website and office addresses for Endangered Species Act Information:

The Wilmington District has developed the following website for permittees which provides guidelines on how to review linked websites and maps in order to fulfill NWP General Condition 18 requirements:
http://www.saw.usace.army.mil/Missions/RegulatoryPermitProgram/AgencyCoordination/ESA.aspx

Permittees who do not have internet access may contact the appropriate U.S. Fish and Wildlife Service offices listed below or Corps at (910) 251-4633:

Asheville U.S. Fish and Wildlife Service Office counties: All counties west of and including Anson, Stanly, Davidson, Forsythe and Stokes Counties.

U.S. Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801
Telephone: (828) 258-3939

Raleigh U.S. Fish and Wildlife Service Office counties: all counties east of and including Richmond, Montgomery, Randolph, Guilford, and Rockingham Counties.

U.S. Fish and Wildlife Service
Raleigh Field Office
Post Office Box 33726

Raleigh, NC 27636-3726
Telephone: (919) 856-4520

2.2 Special Designation Waters

Prior to the use of any NWP, except NWP 3, that involves a discharge of dredged or fill material in any of the following identified waters and/or adjacent wetlands in North Carolina, permittees shall submit a PCN to the District Engineer prior to commencing the activity (see General Condition 32). The North Carolina waters and wetlands that require additional notification requirements are:

"Outstanding Resource Waters" (ORW) or "High Quality Waters" (HQW) as designated by the North Carolina Environmental Management Commission; "Primary Nursery Areas" (PNA), including inland PNA, as designated by the North Carolina Marine Fisheries Commission and the NCWRC; or wetlands adjacent to these waters. Definitions of ORW, HQW and PNA waters can be found in the North Carolina State Administrative Code, Title 15A, Subchapters 2B and 10C (15A NCAC 02B, 15A NCAC 10C) and at the following World Wide Web page: http://reports.oah.state.nc.us/ncac.asp?folderName=\Title%2015A%20-%20Environmental%20Quality&lookUpError=15A%20NCAC%20000%20. Surface water classifications for waters in North Carolina can be viewed at the North Carolina Division of Water Resources website or at the following World Wide Web Page: https://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/classifications

Permittees who do not have internet access may contact the Corps at (910) 251- 4633.

2.3 Coastal Area Management Act (CAMA) Areas of Environmental Concern

Non-federal permittees for any NWP in a designated "Area of Environmental Concern" (AEC) in the twenty (20) counties of Eastern North Carolina covered by the North Carolina Coastal Area Management Act (CAMA) must also obtain the required CAMA permit. Development activities for non-federal projects may not commence until a copy of the approved CAMA permit is furnished to the appropriate Wilmington District Regulatory Field Office (Wilmington Field Office – 69 Darlington Avenue, Wilmington, NC 28403, (910) 251-4802 or Washington Field Office – 2407 West 5th Street, Washington, NC 27889, (910) 251-4610).

2.4 Barrier Islands

Prior to the use of any NWP on a barrier island of North Carolina, permittees must submit a PCN to the District Engineer prior to commencing the activity (see General Condition 32).

2.5 Mountain or Piedmont Bogs

Prior to the use of any NWP in a Bog, as classified by the North Carolina Wetland Assessment Methodology (NCWAM), permittees shall submit a PCN to the District Engineer prior to commencing the activity (see General Condition 32). The latest version of NCWAM can be

viewed on the Corps RIBITS (Regulatory In-lieu Fee and Bank Information Tracking System) website or at the following World Wide Web Page:
https://ribits.usace.army.mil/ribits_apex/f?p=107:27:0::NO:::

2.6 Animal Waste Facilities

Prior to use of any NWP for construction of animal waste facilities in waters of the United States, including wetlands, permittees shall submit a PCN to the District Engineer prior to commencing the activity (see General Condition 32).

2.7 Trout Waters

Prior to any discharge of dredge or fill material into streams, waterbodies or wetlands within the 294 designated trout watersheds of North Carolina, the permittee shall submit a PCN (see General Condition 32) to the District Engineer prior to commencing the activity, unless other thresholds are established in the Regional Conditions in Section 4 (Additional Regional Conditions for Specific Nationwide Permits). The permittee shall also provide a copy of the notification to the appropriate NCWRC office, or to the EBCI FWM Office (if the project is located on EBCI trust land), to facilitate the determination of any potential impacts to designated Trout Waters.

Notification to the Corps will include a statement with the name of the NCWRC or EBCI FWM biologist contacted, the date of the notification, the location of work, a delineation of wetlands and waters, a discussion of alternatives to working in the mountain trout waters, why alternatives were not selected, and, if applicable, a plan to provide compensatory mitigation for all unavoidable adverse impacts to mountain trout waters.

NCWRC and NC Trout Watersheds:

NCWRC Contact**	**Counties that are entirely within Trout Watersheds***		**Counties that are partially within Trout Watersheds***	
Mountain Coordinator Balsam Depot 20830 Great Smoky Mountain Expressway Waynesville, NC 28786 Telephone: (828) 558-6011 For NCDOT Projects: NCDOT Coordinator 206 Charter. Street Albemarle, NC 28001 Telephone: (704) 982-9181	Alleghany Ashe Avery Graham Haywood	Jackson Macon Swain Transylvania Watauga	Burke Buncombe Caldwell Cherokee Clay Henderson Madison	McDowell Mitchell Polk Rutherford Surry Wilkes Yancey

*NOTE: To determine notification requirements, contact the Corps Asheville Regulatory Field Office at (828) 271-7980 or view maps for each County at the following World Wide Web page: http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Agency-Coordination/Trout/.

**If a project is located on EBCI trust land, submit the PCN in accordance with Section 3.14. Contact the Corps Asheville Regulatory Field Office at (828) 271-7980 with questions.

2.8 Western NC Waters and Corridors

The permittee shall submit a PCN (see General Condition 32) to the District Engineer prior to commencing the activity in waters of the United States if the activity will occur within any of the following identified waters in western North Carolina, within 0.5 mile on either side of these waters, or within 0.75 mile of the Little Tennessee River, as measured from the top of the bank of the respective water (i.e., river, stream, or creek):

Brasstown Creek
Burningtown Creek
Cane River
Caney Fork
Cartoogechaye Creek
Chattooga River
Cheoah River
Cowee Creek
Cullasaja River
Deep Creek
Ellijay Creek
French Broad River
Garden Creek
Hiwassee River
Hominy Creek
Iotla Creek
Little Tennessee River (within the river or within 0.75 mile on either side of this river)
Nantahala River
Nolichucky River
North Fork French Broad River
North Toe River
Nottley River
Oconaluftee River (portion not located on trust/EBCI land)
Peachtree Creek
Shooting Creek
Snowbird Creek
South Toe River
Stecoah Creek
Swannanoa River
Sweetwater Creek

Tuckasegee River (also spelled Tuckaseegee or Tuckaseigee)
Valley River
Watauga Creek
Watauga River
Wayah Creek
West Fork French Broad River

To determine notification requirements, contact the Corps Asheville Regulatory Field Office at (828) 271-7980 or view maps for all corridors at the following World Wide Web page: http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Agency-Coordination/Designated-Special-Waters.aspx

3.0 List of Corps Regional Conditions for All Nationwide Permits

The following conditions apply to all Nationwide Permits in the Wilmington District:

3.1 Limitation of Loss of Stream Bed

NWPs may not be used for activities that may result in the loss or degradation of more than 300 total linear feet of stream bed, unless the District Engineer has waived the 300 linear foot limit for ephemeral and intermittent streams on a case-by-case basis and has determined that the proposed activity will result in minimal individual and cumulative adverse impacts to the aquatic environment. Waivers for the loss of ephemeral and intermittent streams must be in writing and documented by appropriate/accepted stream quality assessments*. This waiver only applies to the 300 linear feet threshold for NWPs.

This Regional Condition does not apply to NWP 23 (Approved Categorical Exclusions).

*NOTE: Permittees should utilize the most current methodology prescribed by Wilmington District to assess stream function and quality. Information can be found at: https://ribits.usace.army.mil/ribits_apex/f?p=107:27:0::NO:::

3.2 Mitigation for Loss of Stream Bed

For any NWP that results in a loss of more than 150 linear feet of stream, the permittee shall provide a mitigation proposal to compensate for more than minimal individual and cumulative adverse impacts to the aquatic environment. For stream losses of 150 linear feet or less that require a PCN, the District Engineer may determine, on a case-by-case basis, that compensatory mitigation is required to ensure that the activity results in minimal adverse effect on the aquatic environment.

3.3 Pre-construction Notification for Loss of Streambed Exceeding 150 Feet

Prior to use of any NWP for any activity which impacts more than 150 total linear feet of perennial stream, intermittent or ephemeral stream, the permittee shall submit a PCN to the District Engineer prior to commencing the activity (see General Condition 32). This applies to

NWPs that do not have specific notification requirements. If a NWP has specific notification requirements, the requirements of the NWP should be followed.

3.4 Restriction on Use of Live Concrete

For all NWPs which allow the use of concrete as a building material, live or fresh concrete, including bags of uncured concrete, may not come into contact with the water in or entering into waters of the United States. Water inside coffer dams or casings that has been in contact with wet concrete shall only be returned to waters of the United States after the concrete is set and cured and when it no longer poses a threat to aquatic organisms.

3.5 Requirements for Using Riprap for Bank Stabilization

For all NWPs that allow for the use of riprap material for bank stabilization, the following measures shall be applied:

3.5.1. Where bank stabilization is conducted as part of an activity, natural design, bioengineering and/or geoengineering methods that incorporate natural durable materials, native seed mixes, and native plants and shrubs are to be utilized to the maximum extent practicable.

3.5.2. Filter cloth must be placed underneath the riprap as an additional requirement of its use in North Carolina waters. The placement of filter fabric is not required if the riprap will be pushed or "keyed" into the bank of the waterbody. A waiver from the specifications in this Regional Condition may be requested in writing. The waiver will only be issued if it can be demonstrated that the impacts of complying with this Regional Condition would result in greater adverse impacts to the aquatic environment.

3.5.3. The placement of riprap shall be limited to the areas depicted on submitted work plan drawings.

3.5.4. The riprap material shall be clean and free from loose dirt or any pollutant except in trace quantities that would not have an adverse environmental effect.

3.5.5. It shall be of a size sufficient to prevent its movement from the authorized alignment by natural forces under normal conditions.

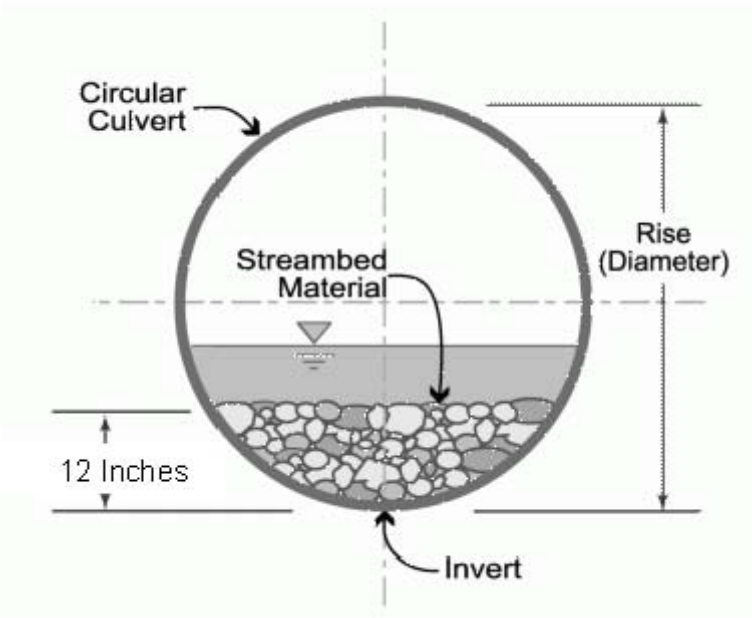
3.5.6. The riprap material shall consist of clean rock or masonry material such as, but not limited to, granite, marl, or broken concrete.

3.6 Requirements for Culvert Placement

3.6.1 For all NWPs that involve the construction/installation of culverts, measures will be included in the construction/installation that will promote the safe passage of fish and other aquatic organisms. The dimension, pattern, and profile of the stream above and below a pipe or culvert should not be modified by altering the width or depth of the stream profile in connection with the construction activity. The width, height, and gradient of a proposed culvert should be

sufficient to pass the average historical low flow and spring flow without adversely altering flow velocity. Spring flow is the seasonal sustained high flow that typically occurs in the spring. Spring flows should be determined from gage data, if available. In the absence of such data, bank-full flow can be used as a comparable indicator.

In Public Trust Areas of Environmental Concern (AEC) and/or the Estuarine Waters AEC as designated by the Coastal Area Management Act (CAMA): All pipes/culverts must be sufficiently sized to allow for the burial of the bottom of the culvert at least one foot below normal bed elevation.



In all other areas: Culverts greater than 48 inches in diameter will be buried at least one foot below the bed of the stream. Culverts 48 inches in diameter or less shall be buried to maintain aquatic passage and to maintain passage during drought or low flow conditions, and every effort shall be made to maintain the existing channel slope.

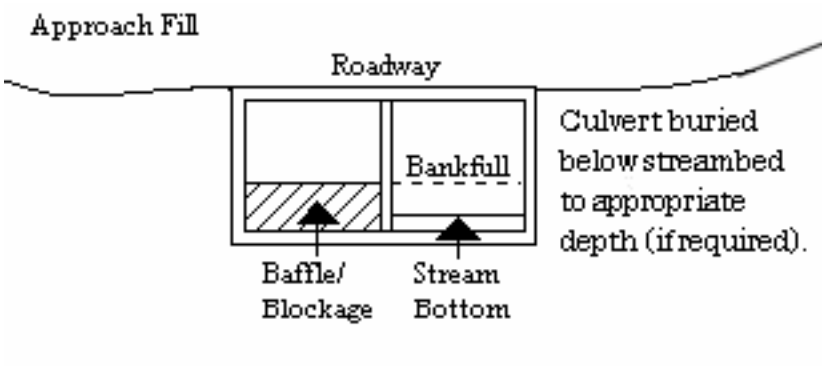
Culverts must be designed and constructed in a manner that minimizes destabilization and head cutting. Destabilizing the channel and head cutting upstream should be considered and appropriate actions incorporated in the design and placement of the culvert.

A waiver from the depth specifications in this condition may be requested, in writing, by the permittee and issued by the Corp; this request must be specific as to the reasons(s) for the request. The waiver will be issued if it can be demonstrated that the proposed design would result in less impacts to the aquatic environment.

All counties: Culverts placed within riparian and/or riverine wetlands must be installed in a manner that does not restrict the flow and circulation patterns of waters of the United States.

Culverts placed across wetland fills purely for the purposes of equalizing surface water do not have to be buried, but the culverts must be of adequate size and/or number to ensure unrestricted transmission of water.

3.6.2 Bank-full flows (or less) shall be accommodated through maintenance of the existing bank-full channel cross sectional area. Additional culverts or culvert barrels at such crossings shall be allowed only to receive bank-full flows.



3.6.3 Where adjacent floodplain is available, flows exceeding bank-full should be accommodated by installing culverts at the floodplain elevation. Additional culverts or culvert barrels at such crossings should not be buried, or if buried, must have sills at the inlets to ensure that they only receive flows exceeding bank-full.

3.6.4 Excavation of existing stream channels shall be limited to the minimum necessary to construct or install the proposed culvert. The final width of the impacted stream at the culvert inlet and outlet should be no greater than the original stream width. A waiver from this condition may be requested in writing; this request must be specific as to the reason(s) for the request. The waiver will be issued if the proposed design would result in less impacts to the aquatic environment and/or if it can be demonstrated that it is not practicable to restore the final width of the impacted stream at the culvert inlet and outlet to the width of the original stream channel.

3.6.5 The width of the culvert shall be comparable to the width of the stream channel. If the width of the culvert is wider than the stream channel, the culvert shall include baffles, benches and/or sills to maintain the width of the stream channel. A waiver from this condition may be requested in writing; this request must be specific as to the reason(s) for the request. The waiver will be issued if it can be demonstrated that it is not practicable or necessary to include baffles, benches or sills and the design would result in less impacts to the aquatic environment.

3.7 Notification to NCDEQ Shellfish Sanitation Section

Permittees shall notify the NCDEQ Shellfish Sanitation Section prior to dredging in or removing sediment from an area closed to shell fishing where the effluent may be released to an area open for shell fishing or swimming in order to avoid contamination from the disposal area and cause a temporary shellfish closure to be made. Such notification shall also be provided to the appropriate Corps Regulatory Field Office. Any disposal of sand to the ocean beach should occur between November 1 and April 30 when recreational usage is low. Only clean sand

should be used and no dredged sand from closed shell fishing areas may be used. If beach disposal were to occur at times other than stated above or if sand from a closed shell fishing area is to be used, a swimming advisory shall be posted, and a press release shall be issued by the permittee.

3.8 Submerged Aquatic Vegetation

Impacts to Submerged Aquatic Vegetation (SAV) are not authorized by any NWP, except NWP 48, unless EFH Consultation has been completed pursuant to the Magnuson-Stevens Fisheries Conservation and Management Act (Magnuson-Stevens Act). Permittees shall submit a PCN (See NWP General Condition 32) to the District Engineer prior to commencing the activity if the project would affect SAV. The permittee may not begin work until notified by the Corps that the requirements of the Magnuson-Stevens Act have been satisfied and that the activity is authorized.

3.9 Sedimentation and Erosion Control Structures and Measures

All PCNs will identify and describe sedimentation and erosion control structures and measures proposed for placement in waters of the United States. The structures and measures should be depicted on maps, surveys or drawings showing location and impacts to jurisdictional wetlands and streams.

3.10 Restoration of Temporary Impacts to Stream Beds

Upon completion of work that involves temporary stream impacts, streambeds are to be restored to pre-project elevations and widths using natural streambed material such that the impacted stream reach mimics the adjacent upstream and downstream reach. The impacted area shall be backfilled with natural streambed material to a depth of at least 12 inches or to the bottom depth of the impacted area if shallower than 12 inches. An engineered in-stream structure or material can be used to provide protection of a buried structure if it provides benefits to the aquatic environment and can be accomplished by a natural streambed design. A permittee may request a waiver of this condition if it is determined a buried structure needs significant physical protection beyond those provided in this condition. This condition does not apply to NWP 27 – Aquatic Habitat Restoration, Enhancement, and Establishment Activities.

3.11 Restoration of Temporary Impacts to Stream Banks

Upon completion of work involving temporary stream bank impacts, stream banks are to be restored to pre-project grade and contours or beneficial grade and contours if the original bank slope is steep and unstable. Natural durable materials, native seed mixes, and native plants and shrubs are to be utilized in the restoration. Natural designs which use bioengineered and/or geo-engineered methods are to be applied. An engineered structure or material can be used to provide protection of a buried structure if it provides benefits to the stream bank environment, provided it is not in excess of the minimum amount needed for protection and does not exceed an average of one cubic yard per running foot placed along the bank below the plane of the ordinary high water mark. A permittee may request a waiver of this condition if it is determined a buried structure

needs significant physical protection beyond those provided in this condition. This condition does not apply to NWP 27 – Aquatic Habitat Restoration, Enhancement, and Establishment Activities.

3.12 Federal Navigation Channel Setbacks and Corps Easements

3.12.1 Authorized structures and fills located in or adjacent to Federally authorized waterways will be constructed in accordance with the latest setback criteria established by the Wilmington District Engineer. You may review the setback policy at http://www.saw.usace.army.mil/Missions/Navigation/Setbacks.aspx. This general permit does not authorize the construction of hardened or permanently fixed structures within the Federally Authorized Channel Setback, unless the activity is approved by the Corps. The permittee shall submit a PCN (see General Condition 32) to the District Engineer prior to the construction of any structures or fills within the Federally Authorized Channel Setback.

3.12.2 The permittee shall obtain a Consent to Cross Government Easement from the Wilmington District's Land Use Coordinator prior to any crossing of the Corps easement and/or prior to commencing construction of any structures, authorized dredging or other work within the right-of-way of, or in proximity to, a federally designated disposal area. The Land Use Coordinator may be contacted at: CESAW-OP-N, 69 Darlington Avenue, Wilmington, North Carolina 28403-1343, email: SAWWeb-NAV@usace.army.mil

3.13 Northern Long-eared Bat – Endangered Species Act Compliance

The Wilmington District, U.S. Army Corps of Engineers has consulted with the United States Fish and Wildlife Service (USFWS) in regards to the threatened Northern long-eared bat (NLEB) (*Myotis septentrionalis*) and Standard Local Operating Procedures for Endangered Species (SLOPES) have been approved by the Corps and the USFWS. This condition concerns effects to the NLEB only and does not address effects to other federally listed species and/or federally designated critical habitat.

A. Procedures when the Corps is the lead federal* agency for a project:

The permittee must comply with (1) and (2) below when:

- the project is located in the western 41 counties of North Carolina, to include non-federal aid North Carolina Department of Transportation (NCDOT) projects, OR;

- the project is located in the 59 eastern counties of North Carolina, and is a non-NCDOT project.

*Generally, if a project is located on private property or on non-federal land, and the project is not being funded by a federal entity, the Corps will be the lead federal agency due to the requirement to obtain Department of the Army authorization to impact waters of the United States. If the project is located on federal land, contact the Corps to determine the lead federal agency.

(1) A permittee using a NWP must check to see if their project is located in the range of the NLEB by using the following website: http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf. If the project is within the range of the NLEB, or if the project includes percussive activities (e.g., blasting, pile driving, etc.), the permittee is then required to check the appropriate website in the paragraph below to discover if their project:

- is located in a 12-digit Hydrologic Unit Code area ("red HUC" - shown as red areas on the map), AND/OR;

- involves percussive activities within 0.25 mile of a red HUC.

Red HUC maps - for the western 41 counties in NC (covered by the Asheville Ecological Services Field Office), check the project location against the electronic maps found at: http://www.fws.gov/asheville/htmls/project_review/NLEB_in_WNC.html. For the eastern 59 counties in NC (covered by the Raleigh Ecological Services Field Office), check the project location against the electronic maps found at: https://www.fws.gov/raleigh/NLEB_RFO.html.

(2) A permittee must submit a PCN to the District Engineer, and receive written authorization from the District Engineer, prior to commencing the activity, if the activity will involve any of the following:

- tree clearing/removal, construction/installation of wind turbines in a red HUC, AND/OR;

- bridge removal or maintenance, unless the bridge has been inspected and there is no evidence of bat use, (applies anywhere in the range of the NLEB), AND/OR:

- percussive activities in a red HUC, or within 0.25 mile of a red HUC.

The permittee may proceed with the activity without submitting a PCN to either the Corps or the USFWS, provided the activity complies with all applicable NWP terms and general and regional conditions, if the permittee's review under A.(1) and A.(2) above shows that the project is:

- located outside of a red HUC (and there are no percussive activities), and the activity will NOT include bridge removal or maintenance, unless the bridge has been inspected and there is no evidence of bat use, OR;

- located outside of a red HUC and there are percussive activities, but the percussive activities will not occur within 0.25-mile of a red HUC boundary, and the activity will NOT include bridge removal or maintenance, unless the bridge has been inspected and there is no evidence of bat use, OR;

- located in a red HUC, but the activity will NOT include: tree clearing/removal; construction/installation of wind turbines; bridge removal or maintenance, unless the bridge has been inspected and there is no evidence of bat use, and/or; any percussive activities.

B. Procedures when the USACE is not the lead federal agency:

For projects where another federal agency is the lead federal agency - if that other federal agency has completed project-specific ESA Section 7(a)(2) consultation for the NLEB, and has (1) determined that the project would not cause prohibited incidental take of the NLEB, and (2) completed coordination/consultation that is required by the USFWS (per the directions on the respective USFWS office's website), that project may proceed without notification to either the USACE or the USFWS, provided all General and Regional Permit Conditions are met.

The NLEB SLOPES can be viewed on the USACE website at the following World Wide Web Page: http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Agency-Coordination/ESA/. Permittees who do not have internet access may contact the USACE at (910) 251- 4633.

3.14 Work on Eastern Band of Cherokee Indians Land

All PCNs submitted for activities in waters of the United States on Eastern Band of Cherokee Indians (EBCI) trust land (i.e., Qualla Boundary and non-contiguous tracts of trust land), must comply with the requirements of the latest MOU between the Wilmington District and the Eastern Band of Cherokee Indians.

4.0 Additional Regional Conditions for Specific Nationwide Permits

4.1 NWP #3 – Maintenance

4.1.1 In designated trout watersheds, a PCN is not required for impacts to a maximum of 75 linear feet (150 linear feet for temporary dewatering) of streams and waterbodies when conducting maintenance activities. Minor deviations in an existing structure's configuration, temporary structures and temporary fills are authorized as part of the maintenance activity. In designated trout watersheds, the permittee shall submit a PCN (see Regional Condition 2.7 and General Condition 32) to the District Engineer prior to commencing the activity if; 1) impacts (other than temporary dewatering to work in dry conditions) to streams or waterbodies exceed 75 linear feet; 2) temporary impacts to streams or waterbodies associated with dewatering to work in dry conditions exceeds 150 linear feet; 3) the project will involve impacts to wetlands; 4) the project involves the replacement of a bridge or spanning structure with a culvert or non-spanning structure in waters of the United States; or 5) the activity will be constructed during the trout waters moratorium (October 15 through April 15).

4.1.2 The permittee shall submit a PCN (see NWP General Condition 32) to the District Engineer prior to commencing the activity if the activity involves repair, rehabilitation or replacement of impounding structures or parts of impounding structures or fills.

4.1.3 The permittee shall submit a PCN to the District Engineer prior to commencing the activity if the activity will involve the discharge of dredged or fill material into more than 1/10-acre of wetlands or 150 linear feet of stream channel for the construction of temporary access fills and/or temporary road crossings. The PCN must include a restoration plan that thoroughly describes how all temporary fills will be removed, how pre-project conditions will be restored, and include a timetable for all restoration activities.

APPENDIX 5.3

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER RESOURCES

WATER QUALITY GENERAL CERTIFICATION NO. 4132

GENERAL CERTIFICATION FOR PROJECTS ELIGIBLE FOR US ARMY CORPS OF ENGINEERS

- **NATIONWIDE PERMIT 3 (MAINTENANCE),**
- **NATIONWIDE PERMIT 4 (FISH AND WILDLIFE HARVESTING, ENHANCEMENT, AND ATTRACTION DEVICES AND ACTIVITIES),**
- **NATIONWIDE PERMIT 5 (SCIENTIFIC MEASUREMENT DEVICES),**
- **NATIONWIDE PERMIT 6 (SURVEY ACTIVITIES),**
- **NATIONWIDE PERMIT 7 (OUTFALL STRUCTURES AND ASSOCIATED INTAKE STRUCTURES),**
- **NATIONWIDE PERMIT 19 (MINOR DREDGING),**
- **NATIONWIDE PERMIT 20 (RESPONSE OPERATIONS FOR OIL OR HAZARDOUS SUBSTANCES),**
- **NATIONWIDE PERMIT 22 (REMOVAL OF VESSELS),**
- **NATIONWIDE PERMIT 25 (STRUCTURAL DISCHARGES),**
- **NATIONWIDE PERMIT 30 (MOIST SOIL MANAGEMENT FOR WILDLIFE),**
- **NATIONWIDE PERMIT 32 (COMPLETED ENFORCEMENT ACTIONS),**
- **NATIONWIDE PERMIT 36 (BOAT RAMPS),**
- **REGIONAL GENERAL PERMIT 197800056 (PIERS, DOCKS AND BOATHOUSES), AND**
- **REGIONAL GENERAL PERMIT 197800125 (BOAT RAMPS)**

Water Quality Certification Number 4132 is issued in conformity with the requirements of Section 401, Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Regulations in 15A NCAC 02H .0500 and 15A NCAC 02B .0200 for the discharge of fill material to surface waters and wetland areas as described in 33 CFR 330 Appendix A (B) (3, 4, 5, 6, 7, 19, 20, 22, 25, 30, 32, and 36) of the US Army Corps of Engineers regulations and Regional General Permits 197800056 and 197800125.

The State of North Carolina certifies that the specified category of activity will not violate applicable portions of Sections 301, 302, 303, 306 and 307 of the Public Laws 92-500 and 95-217 if conducted in accordance with the conditions hereinafter set forth.

Effective date: December 1, 2017
Signed this day: December 1, 2017

By

for Linda Culpepper
Interim Director

Activities meeting any one (1) of the following thresholds or circumstances require *written approval* for a 401 Water Quality Certification from the Division of Water Resources (DWR):

a) If any of the conditions of this Certification (listed below) cannot be met; or
b) Total additional permanent impacts to streams (including stream relocations or restorations) greater than 40 linear feet at an existing stream impact location; or
c) Total temporary and permanent impacts to wetlands or open waters equal to or greater than one-tenth (1/10) of an acre; or
d) Complete dewatering and drawdowns to a sediment layer related to pond/dam maintenance or removal; or
e) Any impacts to streams from excavation or dredging other than excavation that is conducted as preparation for installing permanent fill or structures or projects qualifying for a Nationwide Permit 19; or
f) Except for projects qualifying for a Nationwide permit 3, any permanent impacts to waters, or to wetlands adjacent to waters, designated as: ORW (including SAV), HQW (including PNA), SA, WS-I, WS-II, Trout, or North Carolina or National Wild and Scenic River; or
g) Any high-density project, as defined in 15A NCAC 02H .1003(2)(a) and by the density thresholds specified in 15A NCAC 02H .1017, which:
    i. Disturbs one acre or more of land (including a project that disturbs less than one acre of land that is part of a larger common plan of development or sale); and
    ii. Has permanent wetland, stream or open water impacts; and
    iii. Is proposing new built-upon area; and
    iv. Does not have a stormwater management plan reviewed and approved under a state stormwater program[1] or a state-approved local government stormwater program[2].

    Projects that have vested rights, exemptions, or grandfathering from state or locally-implemented stormwater programs and projects that satisfy state or locally-implemented stormwater programs through use of community in-lieu programs **require written approval**; or
h) Any permanent impacts to coastal wetlands [15A NCAC 07H .0205], or Unique Wetlands (UWL); or
i) Any impact associated with a Notice of Violation or an enforcement action for violation(s) of NC Wetland Rules (15A NCAC 02H .0500), NC Isolated Wetland Rules (15A NCAC 02H .1300), NC Surface Water or Wetland Standards (15A NCAC 02B .0200), or State Regulated Riparian Buffer Rules (15A NCAC 02B .0200); or
j) Any impacts to subject water bodies and/or state regulated riparian buffers along subject water bodies in the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman Lake, Jordan Lake or Goose Creek Watersheds (or any other basin or watershed with State Regulated Riparian Area Protection Rules [Buffer Rules] in effect at the time of application) *unless*:

[1] e.g. Coastal Counties, HQW, ORW, or state-implemented Phase II NPDES
[2] e.g. Delegated Phase II NPDES, Water Supply Watershed, Nutrient-Sensitive Waters, or Universal Stormwater Management Program

i. The activities are listed as "EXEMPT" from these rules; or
ii. A Buffer Authorization Certificate is issued by the NC Division of Coastal Management (DCM); or
iii. A Buffer Authorization Certificate or a Minor Variance is issued by a delegated or designated local government implementing a state riparian buffer program pursuant to 143-215.23.

Activities included in this General Certification that do not meet one of the thresholds listed above do not require written approval.

I. ACTIVITY SPECIFIC CONDITIONS:

1. For all dam removal projects meeting the definition under G.S. 143-215.25 and requirements under G.S. 143-215.27 of a professionally supervised dam removal, the applicant shall provide documentation that any sediment that may be released has similar or lower level of contamination than sediment sampled from downstream of the dam in accordance with Session Law 2017-145.

2. For the North Carolina Department of Transportation, compliance with the NCDOT's individual NPDES permit NCS000250 shall serve to satisfy this condition. All other high-density projects that trigger threshold item (g) above shall comply with one of the following requirements: [15A NCAC 02H .0506(b)(5) and (c)(5)]

   a. Provide a completed Stormwater Management Plan (SMP) for review and approval, including all appropriate stormwater control measure (SCM) supplemental forms and associated items, that complies with the high-density development requirements of 15A NCAC 02H .1003. Stormwater management shall be provided throughout the entire project area in accordance with 15A NCAC 02H .1003. For the purposes of 15A NCAC 02H .1003(2)(a), density thresholds shall be determined in accordance with 15A NCAC 02H .1017.

   b. Provide documentation (including calculations, photos, etc.) that the project will not cause degradation of downstream surface waters. Documentation shall include a detailed analysis of the hydrological impacts from stormwater runoff when considering the volume and velocity of stormwater runoff from the project built upon area and the size and existing condition of the receiving stream(s).

   Exceptions to this condition require application to and written approval from DWR.

II. GENERAL CONDITIONS:

1. When written authorization is required, the plans and specifications for the project are incorporated into the authorization by reference and are an enforceable part of the Certification. Any modifications to the project require notification to DWR and may require an application submittal to DWR with the appropriate fee. [15A NCAC 02H .0501 and .0502]

2. No waste, spoil, solids, or fill of any kind shall occur in wetlands or waters beyond the footprint of the impacts (including temporary impacts) as authorized in the written approval from DWR; or beyond the thresholds established for use of this Certification without written authorization. [15A NCAC 02H .0501 and .0502]

   No removal of vegetation or other impacts of any kind shall occur to state regulated riparian buffers beyond the footprint of impacts approved in a Buffer Authorization or Variance or as listed as an exempt activity in the applicable riparian buffer rules. [15A NCAC 02B .0200]

3. In accordance with 15A NCAC 02H .0506(h) and Session Law 2017-10, compensatory mitigation may be required for losses of greater than 300 linear feet of perennial streams and/or greater than one (1) acre of wetlands. Impacts associated with the removal of a dam shall not require mitigation when the removal complies with the requirements of Part 3 of Article 21 in Chapter 143 of the North Carolina General Statutes. Impacts to isolated and other non-404 jurisdictional wetlands shall not be combined with 404 jurisdictional wetlands for the purpose of determining when impact thresholds trigger a mitigation requirement. For linear publicly owned and maintained transportation projects that are not determined to be part of a larger common plan of development by the US Army Corps of Engineers, compensatory mitigation may be required for losses of greater than 300 linear feet per perennial stream.

   Compensatory stream and/or wetland mitigation shall be proposed and completed in compliance with G.S. 143-214.11. For applicants proposing to conduct mitigation within a project site, a complete mitigation proposal developed in accordance with the most recent guidance issued by the US Army Corps of Engineers Wilmington District shall be submitted for review and approval with the application for impacts.

4. All activities shall be in compliance with any applicable State Regulated Riparian Buffer Rules in Chapter 2 of Title 15A.

5. When applicable, all construction activities shall be performed and maintained in full compliance with G.S. Chapter 113A Article 4 (Sediment and Pollution Control Act of 1973). Regardless of applicability of the Sediment and Pollution Control Act, all projects shall incorporate appropriate Best Management Practices for the control of sediment and erosion so that no violations of state water quality standards, statutes, or rules occur. [15A NCAC 02H .0506 (b)(3) and (c)(3) and 15A NCAC 02B .0200]

   Design, installation, operation, and maintenance of all sediment and erosion control measures shall be equal to or exceed the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*, or for linear transportation projects, the *NCDOT Sediment and Erosion Control Manual*.

   All devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) sites, including contractor-owned or leased borrow pits associated with the project. Sufficient materials required for stabilization and/or repair of erosion control measures and stormwater routing and treatment shall be on site at all times.

For borrow pit sites, the erosion and sediment control measures shall be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*. Reclamation measures and implementation shall comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act and the Mining Act of 1971.

If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), SA, WS-I, WS-II, High Quality Waters (HQW), or Outstanding Resource Waters (ORW), then the sedimentation and erosion control designs shall comply with the requirements set forth in 15A NCAC 04B .0124, *Design Standards in Sensitive Watersheds*.

6. Sediment and erosion control measures shall not be placed in wetlands or waters except within the footprint of temporary or permanent impacts authorized under this Certification. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0501 and .0502]

7. Erosion control matting that incorporates plastic mesh and/or plastic twine shall not be used along streambanks or within wetlands. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02B .0201]

8. An NPDES Construction Stormwater Permit (NCG010000) is required for construction projects that disturb one (1) or more acres of land. The NCG010000 Permit allows stormwater to be discharged during land disturbing construction activities as stipulated in the conditions of the permit. If the project is covered by this permit, full compliance with permit conditions including the erosion & sedimentation control plan, inspections and maintenance, self-monitoring, record keeping and reporting requirements is required. [15A NCAC 02H .0506(b)(5) and (c)(5)]

   The North Carolina Department of Transportation (NCDOT) shall be required to be in full compliance with the conditions related to construction activities within the most recent version of their individual NPDES (NCS000250) stormwater permit. [15A NCAC 02H .0506(b)(5) and (c)(5)]

9. All work in or adjacent to streams shall be conducted so that the flowing stream does not come in contact with the disturbed area. Approved best management practices from the most current version of the *NC Sediment and Erosion Control Manual*, or the *NC DOT Construction and Maintenance Activities Manual*, such as sandbags, rock berms, cofferdams, and other diversion structures shall be used to minimize excavation in flowing water. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506(b)(3) and (c)(3)]

10. If activities must occur during periods of high biological activity (e.g. sea turtle nesting, fish spawning, or bird nesting), then biological monitoring may be required at the request of other state or federal agencies and coordinated with these activities. [15A NCAC 02H .0506 (b)(2) and 15A NCAC 04B .0125]

All moratoriums on construction activities established by the NC Wildlife Resources Commission (WRC), US Fish and Wildlife Service (USFWS), NC Division of Marine Fisheries (DMF), or National Marine Fisheries Service (NMFS) shall be implemented. Exceptions to this condition require written approval by the resource agency responsible for the given moratorium. A copy of the approval from the resource agency shall be forwarded to DWR.

Work within a designated trout watershed of North Carolina (as identified by the Wilmington District of the US Army Corps of Engineers), or identified state or federal endangered or threatened species habitat, shall be coordinated with the appropriate WRC, USFWS, NMFS, and/or DMF personnel.

11. Culverts shall be designed and installed in such a manner that the original stream profiles are not altered and allow for aquatic life movement during low flows. The dimension, pattern, and profile of the stream above and below a pipe or culvert shall not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed culvert shall be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. [15A NCAC 02H .0506(b)(2) and (c)(2)]

    Placement of culverts and other structures in streams shall be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20% of the culvert diameter for culverts having a diameter less than or equal to 48 inches, to allow low flow passage of water and aquatic life.

    If multiple pipes or barrels are required, they shall be designed to mimic the existing stream cross section as closely as possible, including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel shall be avoided.

    When topographic constraints indicate culvert slopes of greater than 5%, culvert burial is not required, provided that all alternative options for flattening the slope have been investigated and aquatic life movement/connectivity has been provided when possible (e.g. rock ladders, cross vanes, etc.). Notification, including supporting documentation to include a location map of the culvert, culvert profile drawings, and slope calculations, shall be provided to DWR 60 calendar days prior to the installation of the culvert.

    When bedrock is present in culvert locations, culvert burial is not required provided that there is sufficient documentation of the presence of bedrock. Notification, including supporting documentation such as a location map of the culvert, geotechnical reports, photographs, etc. shall be provided to DWR a minimum of 60 calendar days prior to the installation of the culvert. If bedrock is discovered during construction, then DWR shall be notified by phone or email within 24 hours of discovery.

    If other site-specific topographic constraints preclude the ability to bury the culverts as described above and/or it can be demonstrated that burying the culvert would result in destabilization of the channel, then exceptions to this condition require application to and written approval from DWR.

Installation of culverts in wetlands shall ensure continuity of water movement and be designed to adequately accommodate high water or flood conditions. When roadways, causeways, or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges shall be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in destabilization of streams or wetlands.

The establishment of native woody vegetation and other soft stream bank stabilization techniques shall be used where practicable instead of rip-rap or other bank hardening methods.

12. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means to the maximum extent practicable (e.g. grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506(b)(5)]

13. Application of fertilizer to establish planted/seeded vegetation within disturbed riparian areas and/or wetlands shall be conducted at agronomic rates and shall comply with all other Federal, State and Local regulations. Fertilizer application shall be accomplished in a manner that minimizes the risk of contact between the fertilizer and surface waters. [15A NCAC 02B .0200 and 15A NCAC 02B .0231]

14. If concrete is used during construction, then all necessary measures shall be taken to prevent direct contact between uncured or curing concrete and waters of the state. Water that inadvertently contacts uncured concrete shall not be discharged to waters of the state. [15A NCAC 02B .0200]

15. All proposed and approved temporary fill and culverts shall be removed and the impacted area shall be returned to natural conditions within 60 calendar days after the temporary impact is no longer necessary. The impacted areas shall be restored to original grade, including each stream's original cross sectional dimensions, planform pattern, and longitudinal bed profile. For projects that receive written approval, no temporary impacts are allowed beyond those included in the application and authorization. All temporarily impacted sites shall be restored and stabilized with native vegetation. [15A NCAC 02H .0506(b)(2) and (c)(2)]

16. All proposed and approved temporary pipes/culverts/rip-rap pads etc. in streams shall be installed as outlined in the most recent edition of the *North Carolina Sediment and Erosion Control Planning and Design Manual* or the *North Carolina Surface Mining Manual* or the *North Carolina Department of Transportation Best Management Practices for Construction and Maintenance Activities* so as not to restrict stream flow or cause dis-equilibrium during use of this Certification. [15A NCAC 02H .0506(b)(2) and (c)(2)]

17. Any rip-rap required for proper culvert placement, stream stabilization, or restoration of temporarily disturbed areas shall be restricted to the area directly impacted by the approved construction activity. All rip-rap shall be placed such that the original stream elevation and streambank contours are restored and maintained. Placement of rip-rap or other approved materials shall not result in de-stabilization of the stream bed or banks upstream or downstream of the area or in a manner that precludes aquatic life passage. [15A NCAC 02H .0506(b)(2)]

18. Any rip-rap used for stream or shoreline stabilization shall be of a size and density to prevent movement by wave, current action, or stream flows and shall consist of clean rock or masonry material free of debris or toxic pollutants. Rip-rap shall not be installed in the streambed except in specific areas required for velocity control and to ensure structural integrity of bank stabilization measures. [15A NCAC 02H .0506(b)(2)]

19. Applications for rip-rap groins proposed in accordance with 15A NCAC 07H .1401 (NC Division of Coastal Management General Permit for construction of Wooden and Rip-rap Groins in Estuarine and Public Trust Waters) shall meet all the specific conditions for design and construction specified in 15A NCAC 07H .1405.

20. All mechanized equipment operated near surface waters should be inspected and maintained regularly to prevent contamination of surface waters from fuels, lubricants, hydraulic fluids, or other toxic materials. Construction shall be staged in order to minimize the exposure of equipment to surface waters to the maximum extent practicable. Fueling, lubrication and general equipment maintenance shall be performed in a manner to prevent, to the maximum extent practicable, contamination of surface waters by fuels and oils. [15A NCAC 02H .0506 (b)(3) and (c)(3) and 15A NCAC 02B .0211 (12)]

21. Heavy equipment working in wetlands shall be placed on mats or other measures shall be taken to minimize soil disturbance. [15A NCAC 02H .0506 (b)(3) and (c)(3)]

22. In accordance with 143-215.85(b), the applicant shall report any petroleum spill of 25 gallons or more; any spill regardless of amount that causes a sheen on surface waters; any petroleum spill regardless of amount occurring within 100 feet of surface waters; and any petroleum spill less than 25 gallons that cannot be cleaned up within 24 hours.

23. If an environmental document is required under the State Environmental Policy Act (SEPA), then this General Certification is not valid until a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) is issued by the State Clearinghouse. If an environmental document is required under the National Environmental Policy Act (NEPA), then this General Certification is not valid until a Categorical Exclusion, the Final Environmental Assessment, or Final Environmental Impact Statement is published by the lead agency. [15A NCAC 01C .0107(a)]

24. This General Certification does not relieve the applicant of the responsibility to obtain all other required Federal, State, or Local approvals before proceeding with the project, including those required by, but not limited to, Sediment and Erosion Control, Non-Discharge, Water Supply Watershed, and Trout Buffer regulations.

25. The applicant and their authorized agents shall conduct all activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act), and any other appropriate requirements of State and Federal Law. If DWR determines that such standards or laws are not being met, including failure to sustain a designated or achieved use, or that State or Federal law is being violated, or that further conditions are necessary to assure compliance, then DWR may revoke or modify a written authorization associated with this General Water Quality Certification. [15A NCAC 02H .0507(d)]

26. The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this Certification. A copy of this Certification, including all conditions shall be available at the project site during the construction and maintenance of this project. [15A NCAC 02H .0507 (c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]

27. When written authorization is required for use of this Certification, upon completion of all permitted impacts included within the approval and any subsequent modifications, the applicant shall be required to return a certificate of completion (available on the DWR website https://edocs.deq.nc.gov/Forms/Certificate-of-Completion). [15A NCAC 02H .0502(f)]

28. Additional site-specific conditions, including monitoring and/or modeling requirements, may be added to the written approval letter for projects proposed under this Water Quality Certification in order to ensure compliance with all applicable water quality and effluent standards. [15A NCAC 02H .0507(c)]

29. If the property or project is sold or transferred, the new permittee shall be given a copy of this Certification (and written authorization if applicable) and is responsible for complying with all conditions. [15A NCAC 02H .0501 and .0502]

III. GENERAL CERTIFICATION ADMINISTRATION:

1. In accordance with North Carolina General Statute 143-215.3D(e), written approval for a 401 Water Quality General Certification must include the appropriate fee. An applicant for a CAMA permit under Article 7 of Chapter 113A of the General Statutes for which a Water Quality Certification is required shall only make one payment to satisfy both agencies; the fee shall be as established by the Secretary in accordance with 143-215.3D(e)(7).

2. This Certification neither grants nor affirms any property right, license, or privilege in any waters, or any right of use in any waters. This Certification does not authorize any person to interfere with the riparian rights, littoral rights, or water use rights of any other person and this Certification does not create any prescriptive right or any right of priority regarding any usage of water. This Certification shall not be interposed as a defense in any action respecting the determination of riparian or littoral rights or other rights to water use. No consumptive user is deemed by virtue of this Certification to possess any prescriptive or

other right of priority with respect to any other consumptive user regardless of the quantity of the withdrawal or the date on which the withdrawal was initiated or expanded.

3. This Certification grants permission to the Director, an authorized representative of the Director, or DWR staff, upon the presentation of proper credentials, to enter the property during normal business hours. [15A NCAC 02H .0502(e)]

4. This General Certification shall expire on the same day as the expiration date of the corresponding Nationwide Permit and/or Regional General Permit. The conditions in effect on the date of issuance of Certification for a specific project shall remain in effect for the life of the project, regardless of the expiration date of this Certification. This General Certification is rescinded when the US Army Corps of Engineers reauthorizes any of the corresponding Nationwide Permits and/or Regional General Permits or when deemed appropriate by the Director of the Division of Water Resources.

5. Non-compliance with or violation of the conditions herein set forth by a specific project may result in revocation of this General Certification for the project and may also result in criminal and/or civil penalties.

6. The Director of the North Carolina Division of Water Resources may require submission of a formal application for Individual Certification for any project in this category of activity if it is deemed in the public's best interest or determined that the project is likely to have a significant adverse effect upon water quality, including state or federally listed endangered or threatened aquatic species, or degrade the waters so that existing uses of the waters or downstream waters are precluded.

History Note: Water Quality Certification (WQC) Number 4132 issued December 1, 2017 replaces WCQ 4085 issued March 3, 2017; WQC 3883 issued March 19, 2012; WQC Number 3687 issued November 1, 2007; WQC Number 3624 issued March 19, 2007; WQC Number 3494 issued December 31, 2004; and WQC Number 3376 issued March 18, 2002.

APPENDIX 5.4

NC DEPARTMENT OF
NATURAL AND CULTURAL RESOURCES

Roy Cooper, **Governor**
Susi Hamilton, **Secretary**
Walter Clark, **Director, Land and Water Stewardship**

NCNHDE-10048

August 16, 2019

Jon Swaim
McGill Associates, PA
1013 State Farm Road
Boone, NC 28607
RE: Boiling Springs Lakes Dam Repairs; 1907042.000

Dear Jon Swaim:

The North Carolina Natural Heritage Program (NCNHP) appreciates the opportunity to provide information about natural heritage resources for the project referenced above.

A query of the NCNHP database indicates that there are records for rare species, important natural communities, natural areas, and/or conservation/managed areas within the proposed project boundary. These results are presented in the attached 'Documented Occurrences' tables and map.

The attached 'Potential Occurrences' table summarizes rare species and natural communities that have been documented within a one-mile radius of the property boundary. The proximity of these records suggests that these natural heritage elements may potentially be present in the project area if suitable habitat exists. Tables of natural areas and conservation/managed areas within a one-mile radius of the project area, if any, are also included in this report.

If a Federally-listed species is documented within the project area or indicated within a one-mile radius of the project area, the NCNHP recommends contacting the US Fish and Wildlife Service (USFWS) for guidance. Contact information for USFWS offices in North Carolina is found here: https://www.fws.gov/offices/Directory/ListOffices.cfm?statecode=37.

Please note that natural heritage element data are maintained for the purposes of conservation planning, project review, and scientific research, and are not intended for use as the primary criteria for regulatory decisions. Information provided by the NCNHP database may not be published without prior written notification to the NCNHP, and the NCNHP must be credited as an information source in these publications. Maps of NCNHP data may not be redistributed without permission.

Also please note that the NC Natural Heritage Program may follow this letter with additional correspondence if a Dedicated Nature Preserve, Registered Heritage Area, Clean Water Management Trust Fund easement, or an occurrence of a Federally-listed species is documented near the project area.

If you have questions regarding the information provided in this letter or need additional assistance, please contact Rodney A. Butler at rodney.butler@ncdcr.gov or 919-707-8603.

Sincerely,
NC Natural Heritage Program

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Intersecting the Project Area
Boiling Springs Lakes Dam Repairs
Project No. 1907042.000
August 16, 2019
NCNHDE-10048

Element Occurrences Documented Within Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Natural Community	27168	Cypress--Gum Swamp (Blackwater Subtype)	---	2009-02-16	A	2-High	---	---	G4?	S4
Natural Community	12390	Pond Pine Woodland (Typic Subtype)	---	2017-03-24	B	3-Medium	---	---	G3	S3
Natural Community	2428	Sandy Pine Savanna (Rush Featherling Subtype)	---	2017-03-24	B	3-Medium	---	---	G1	S1
Reptile	10454	Deirochelys reticularia reticularia	Eastern Chicken Turtle	1977-07	H?	3-Medium	---	Special Concern	G5T5	S2S3
Vascular Plant	14083	Dionaea muscipula	Venus Flytrap	23 June 2018	A	3-Medium	---	Special Concern Vulnerable	G2	S2

Natural Areas Documented Within Project Area

Site Name	Representational Rating	Collective Rating
Boiling Spring Lakes Limesink Complex	R2 (Very High)	C1 (Exceptional)
Blue Pond/Allen Creek	R1 (Exceptional)	C2 (Very High)

Managed Areas Documented Within Project Area*

Managed Area Name	Owner	Owner Type
North Carolina Coastal Land Trust Easement	North Carolina Coastal Land Trust	Private
Brunswick County Open Space	Brunswick County: multiple local government	Local Government

*NOTE: If the proposed project intersects with a conservation/managed area, please contact the landowner directly for additional information. If the project intersects with a Dedicated Nature Preserve (DNP), Registered Natural Heritage Area (RHA), or Federally-listed species, NCNHP staff may provide additional correspondence regarding the project.

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/content/help. Data query generated on August 16, 2019; source: NCNHP, Q3 Jul 2019. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

Element Occurrences Documented Within a One-mile Radius of the Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Bird	36564	Peucaea aestivalis	Bachman's Sparrow	2014-05-23	E	3-Medium	---	Special Concern	G3	S3B,S2N
Bird	21524	Peucaea aestivalis	Bachman's Sparrow	2017-05-17	E	3-Medium	---	Special Concern	G3	S3B,S2N
Bird	11348	Picoides borealis	Red-cockaded Woodpecker	2018-06-08	E	3-Medium	Endangered	Endangered	G3	S2
Bird	37799	Setophaga virens waynei	Wayne's Black-throated Green Warbler	1939-05-19	H	5-Very Low	---	Endangered	G5T1	S2B
Dragonfly or Damselfly	33738	Somatochlora georgiana	Coppery Emerald	2004-Pre	H?	5-Very Low	---	Significantly Rare	G3G4	S2?
Freshwater Fish	38088	Enneacanthus chaetodon	Blackbanded Sunfish	2017-10-05	E	3-Medium	---	Significantly Rare	G3G4	S3
Moss	23040	Sphagnum fallax	Pretty Peatmoss	1975-06-12	H	4-Low	---	Significantly Rare Peripheral	G5	S2
Natural Community	27168	Cypress--Gum Swamp (Blackwater Subtype)	---	2009-02-16	A	2-High	---	---	G4?	S4
Natural Community	10208	High Pocosin (Evergreen Subtype)	---	2008-05-30	A	2-High	---	---	G3	S3S4
Natural Community	5709	Pine/Scrub Oak Sandhill (Coastal Fringe Subtype)	---	2017-03-24	AB	4-Low	---	---	G2	S2
Natural Community	12390	Pond Pine Woodland (Typic Subtype)	---	2017-03-24	B	3-Medium	---	---	G3	S3
Natural Community	13072	Pond Pine Woodland (Typic Subtype)	---	1998	C	3-Medium	---	---	G3	S3
Natural Community	2428	Sandy Pine Savanna (Rush Featherling Subtype)	---	2017-03-24	B	3-Medium	---	---	G1	S1

Element Occurrences Documented Within a One-mile Radius of the Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Natural Community	6846	Small Depression Drawdown Meadow (Typic Subtype)	---	1991-07-18	C?	4-Low	---	---	G2?	S2S3
Natural Community	24622	Small Depression Drawdown Meadow (Typic Subtype)	---	2006	C	3-Medium	---	---	G2?	S2S3
Natural Community	30811	Small Depression Pond (Open Lily Pond Subtype)	---	1991-07-18	C?	4-Low	---	---	G3?	S3
Natural Community	30860	Small Depression Pond (Open Lily Pond Subtype)	---	2006	C	3-Medium	---	---	G3?	S3
Natural Community	30812	Small Depression Pond (Typic Marsh Subtype)	---	1991-07-18	C?	4-Low	---	---	G3?	S3
Natural Community	30813	Small Depression Shrub Border	---	1991-07-18	C?	4-Low	---	---	G3?	S3
Natural Community	30411	Wet Pine Flatwoods (Sand Myrtle Subtype)	---	2017-03-24	B	3-Medium	---	---	G2?	S1
Natural Community	19436	Wet Pine Flatwoods (Sand Myrtle Subtype)	---	2010	BC	3-Medium	---	---	G2?	S1
Natural Community	13502	Wet Pine Flatwoods (Typic Subtype)	---	2010-05-06	B	3-Medium	---	---	G3	S3
Natural Community	13353	Wet Pine Flatwoods (Typic Subtype)	---	2010-05-06	C	3-Medium	---	---	G3	S3
Natural Community	29139	Xeric Sandhill Scrub (Typic Subtype)	---	2010-05-06	D	3-Medium	---	---	G3?	S3S4
Reptile	3970	Alligator mississippiensis	American Alligator	2018-02-26	E	4-Low	Threatened Similar Appearance	Threatened	G5	S3
Reptile	10252	Crotalus adamanteus	Eastern Diamondback Rattlesnake	2009-09	E	4-Low	---	Endangered	G4	S1
Reptile	10454	Deirochelys reticularia reticularia	Eastern Chicken Turtle	1977-07	H?	3-Medium	---	Special Concern	G5T5	S2S3
Reptile	27325	Heterodon simus	Southern Hognose Snake	2009-03-29	E	2-High	---	Threatened	G2	S2

Element Occurrences Documented Within a One-mile Radius of the Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Reptile	3920	Masticophis flagellum	Coachwhip	1946-Pre	H	4-Low	---	Significantly Rare	G5	S3
Reptile	37552	Sistrurus miliarius miliarius	Carolina Pigmy Rattlesnake	1965-06	H	4-Low	---	Special Concern	G5T4T5	S3
Vascular Plant	31525	Amorpha confusa	Savanna Indigo-bush	2012-09-20	D	2-High	---	Threatened	G3T3	S3
Vascular Plant	29742	Amorpha confusa	Savanna Indigo-bush	2019-06-10	E	2-High	---	Threatened	G3T3	S3
Vascular Plant	722	Asclepias pedicellata	Savanna Milkweed	2013-06-06	B	3-Medium	---	Special Concern Vulnerable	G4	S3
Vascular Plant	11592	Dionaea muscipula	Venus Flytrap	2017-06-08	A	3-Medium	---	Special Concern Vulnerable	G2	S2
Vascular Plant	7662	Dionaea muscipula	Venus Flytrap	2017-06	A	3-Medium	---	Special Concern Vulnerable	G2	S2
Vascular Plant	14083	Dionaea muscipula	Venus Flytrap	23 June 2018	A	3-Medium	---	Special Concern Vulnerable	G2	S2
Vascular Plant	28240	Dionaea muscipula	Venus Flytrap	2018-06-06	C	2-High	---	Special Concern Vulnerable	G2	S2
Vascular Plant	4460	Dionaea muscipula	Venus Flytrap	1971-05	X	3-Medium	---	Special Concern Vulnerable	G2	S2
Vascular Plant	6758	Dionaea muscipula	Venus Flytrap	2015-06-03	BC	3-Medium	---	Special Concern Vulnerable	G2	S2
Vascular Plant	29747	Dionaea muscipula	Venus Flytrap	2011-06-15	D	2-High	---	Special Concern Vulnerable	G2	S2
Vascular Plant	23617	Dionaea muscipula	Venus Flytrap	2015-06-03	CD	2-High	---	Special Concern Vulnerable	G2	S2
Vascular Plant	31511	Dionaea muscipula	Venus Flytrap	2017-06-08	Br	2-High	---	Special Concern Vulnerable	G2	S2

Element Occurrences Documented Within a One-mile Radius of the Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Vascular Plant	31526	Dionaea muscipula	Venus Flytrap	2012-09-20	C	2-High	---	Special Concern Vulnerable	G2	S2
Vascular Plant	27343	Dionaea muscipula	Venus Flytrap	2009-02-09	Di	2-High	---	Special Concern Vulnerable	G2	S2
Vascular Plant	35928	Dionaea muscipula	Venus Flytrap	2015-06-03	D	2-High	---	Special Concern Vulnerable	G2	S2
Vascular Plant	2422	Drosera filiformis	Threadleaf Sundew	1975-06	F	5-Very Low	---	Special Concern Vulnerable	G4	S2
Vascular Plant	9117	Eleocharis elongata	Florida Spikerush	1993-09-05	A	3-Medium	---	Endangered	G5?	S1
Vascular Plant	16093	Eupatorium leptophyllum	Limesink Dog-fennel	1990-10-19	A	3-Medium	---	Endangered	G4G5	S2
Vascular Plant	9590	Eupatorium leptophyllum	Limesink Dog-fennel	2006-09-05	A	3-Medium	---	Endangered	G4G5	S2
Vascular Plant	24543	Eupatorium leptophyllum	Limesink Dog-fennel	2006-09-05	E	2-High	---	Endangered	G4G5	S2
Vascular Plant	18781	Lachnocaulon minus	Brown Bogbutton	1999-02-28	A	3-Medium	---	Threatened	G3G4	S2
Vascular Plant	24782	Lachnocaulon minus	Brown Bogbutton	1994-07-14	E	2-High	---	Threatened	G3G4	S2
Vascular Plant	24811	Lachnocaulon minus	Brown Bogbutton	1994-10-12	E	2-High	---	Threatened	G3G4	S2
Vascular Plant	19442	Ludwigia suffruticosa	Shrubby Seedbox	1993-09-05	A	3-Medium	---	Threatened	G5	S2
Vascular Plant	15805	Ludwigia suffruticosa	Shrubby Seedbox	1994-05-23	A	3-Medium	---	Threatened	G5	S2
Vascular Plant	24551	Ludwigia suffruticosa	Shrubby Seedbox	2006-09-05	E	2-High	---	Threatened	G5	S2
Vascular Plant	24552	Ludwigia suffruticosa	Shrubby Seedbox	2006-09-05	E	2-High	---	Threatened	G5	S2
Vascular Plant	7313	Lysimachia asperulifolia	Rough-leaf Loosestrife	2017-06-07	A	3-Medium	Endangered	Endangered	G3	S3
Vascular Plant	29749	Lysimachia asperulifolia	Rough-leaf Loosestrife	2011-06-13	BC	3-Medium	Endangered	Endangered	G3	S3
Vascular Plant	30366	Lysimachia asperulifolia	Rough-leaf Loosestrife	2012-02-04	D	2-High	Endangered	Endangered	G3	S3
Vascular Plant	15298	Myriophyllum laxum	Loose Water-milfoil	1968-08 09	H	3-Medium	---	Endangered	G3	S2
Vascular Plant	15827	Myriophyllum laxum	Loose Water-milfoil	1950-06	H	3-Medium	---	Endangered	G3	S2
Vascular Plant	11587	Myriophyllum laxum	Loose Water-milfoil	1994-07-14	C	3-Medium	---	Endangered	G3	S2

Element Occurrences Documented Within a One-mile Radius of the Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Vascular Plant	9065	Platanthera integra	Yellow Fringeless Orchid	1948-08	H	4-Low	---	Special Concern Vulnerable	G3G4	S2
Vascular Plant	6719	Rhynchospora pleiantha	Coastal Beaksedge	1994-05-23	A	3-Medium	---	Threatened	G2G3	S2
Vascular Plant	13257	Rhynchospora pleiantha	Coastal Beaksedge	1993-09-05	A	3-Medium	---	Threatened	G2G3	S2
Vascular Plant	15636	Scleria verticillata	Savanna Nutrush	1933-10-08	H	5-Very Low	---	Significantly Rare Peripheral	G5	S2
Vascular Plant	23487	Utricularia cornuta	Horned Bladderwort	1992-09-05	B	2-High	---	Threatened	G5	S1S2
Vascular Plant	23492	Utricularia cornuta	Horned Bladderwort	1990-10-19	B	3-Medium	---	Threatened	G5	S1S2

Natural Areas Documented Within a One-mile Radius of the Project Area

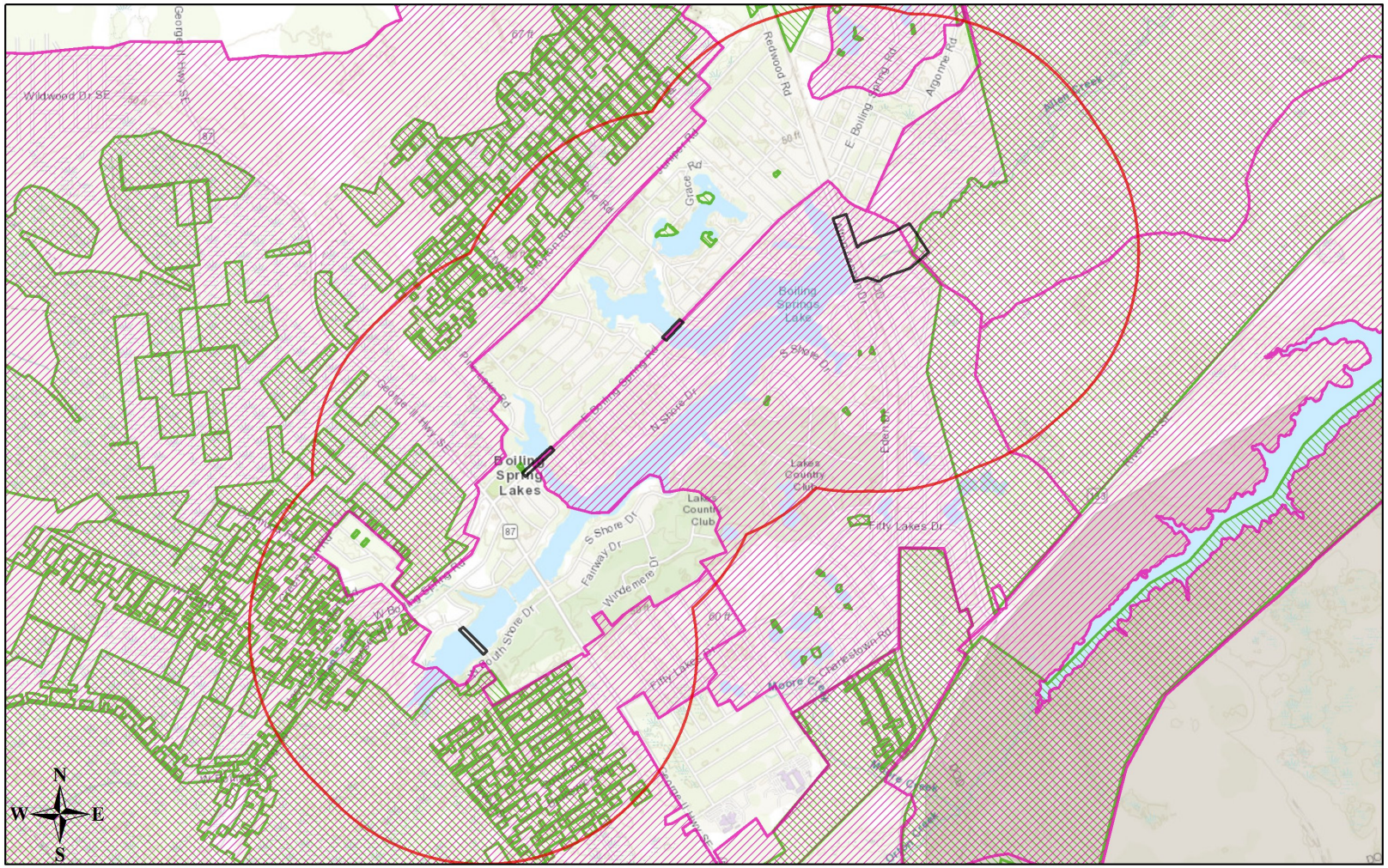
Site Name	Representational Rating	Collective Rating
Boiling Spring Lakes Limesink Complex	R2 (Very High)	C1 (Exceptional)
Orton Sandhills and Limesinks	R2 (Very High)	C2 (Very High)
Boiling Spring Lakes Wetland Complex	R1 (Exceptional)	C1 (Exceptional)
Blue Pond/Allen Creek	R1 (Exceptional)	C2 (Very High)
Pretty Pond Limesink Complex	R1 (Exceptional)	C2 (Very High)

Managed Areas Documented Within a One-mile Radius of the Project Area

Managed Area Name	Owner	Owner Type
North Carolina Coastal Land Trust Easement	North Carolina Coastal Land Trust	Private
Boiling Spring Lakes Plant Conservation Preserve	NC Department of Agriculture, Plant Conservation Program	State
Boiling Spring Lakes Plant Conservation Preserve Dedicated Nature Preserve	NC Department of Agriculture, Plant Conservation Program	State
Brunswick County Open Space	Brunswick County: multiple local government	Local Government
Pretty Pond Limesink Complex Natural Heritage Preserve	NC DNCR, Natural Heritage Program	State
Pretty Pond Limesink Complex Preserve Dedicated Nature Preserve	NC DNCR, Natural Heritage Program	State
Boiling Spring Lakes Preserve	The Nature Conservancy	Private

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/content/help. Data query generated on August 16, 2019; source: NCNHP, Q3 Jul 2019. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

NCNHDE-10048: Boiling Springs Lakes Dam Repairs



August 16, 2019

- Project Boundary
- Buffered Project Boundary
- NHP Natural Area (NHNA)
- Managed Area (MAREA)

1:41,548

0 0.35 0.7 1.4 mi

0 0.5 1 2 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
Phone: (919) 856-4520 Fax: (919) 856-4556

In Reply Refer To: October 07, 2019
Consultation Code: 04EN2000-2020-SLI-0020
Event Code: 04EN2000-2020-E-00062
Project Name: Boiling Springs Lake Dams project

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The species list generated pursuant to the information you provided identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Section 7 of the Act requires that all federal agencies (or their designated non-federal representative), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species. A biological assessment or evaluation may be prepared to fulfill that requirement and in determining whether additional consultation with the Service is necessary. In addition to the federally-protected species list, information on the species' life histories and habitats and information on completing a biological assessment or

evaluation and can be found on our web page at http://www.fws.gov/raleigh. Please check the web site often for updated information or changes

If your project contains suitable habitat for any of the federally-listed species known to be present within the county where your project occurs, the proposed action has the potential to adversely affect those species. As such, we recommend that surveys be conducted to determine the species' presence or absence within the project area. The use of North Carolina Natural Heritage program data should not be substituted for actual field surveys.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a federally-protected species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared). However, you should maintain a complete record of the assessment, including steps leading to your determination of effect, the qualified personnel conducting the assessment, habitat conditions, site photographs, and any other related articles.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

Not all Threatened and Endangered Species that occur in North Carolina are subject to section 7 consultation with the U.S Fish and Wildlife Service. Atlantic and shortnose sturgeon, sea turtles,when in the water, and certain marine mammals are under purview of the National Marine Fisheries Service. If your project occurs in marine, estuarine, or coastal river systems you should also contact the National Marine Fisheries Service, http://www.nmfs.noaa.gov/

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office. If you have any questions or comments, please contact John Ellis of this office at john_ellis@fws.gov.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
(919) 856-4520

Project Summary

Consultation Code: 04EN2000-2020-SLI-0020

Event Code: 04EN2000-2020-E-00062

Project Name: Boiling Springs Lake Dams project

Project Type: DAM

Project Description: Repair of four dams within the Boiling Springs Lake system.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/34.04804959625184N78.03479865862069W

Counties: Brunswick, NC

Endangered Species Act Species

There is a total of 15 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location is outside the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Red-cockaded Woodpecker *Picoides borealis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7614	Endangered
Wood Stork *Mycteria americana* Population: AL, FL, GA, MS, NC, SC No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8477	Threatened

Reptiles

NAME	STATUS
American Alligator *Alligator mississippiensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/776	Similarity of Appearance (Threatened)
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Snails

NAME	STATUS
Magnificent Ramshorn *Planorbella magnifica* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6216	Candidate

Flowering Plants

NAME	STATUS
Cooley's Meadowrue *Thalictrum cooleyi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3281	Endangered
Rough-leaved Loosestrife *Lysimachia asperulaefolia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2747	Endangered
Seabeach Amaranth *Amaranthus pumilus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8549	Threatened

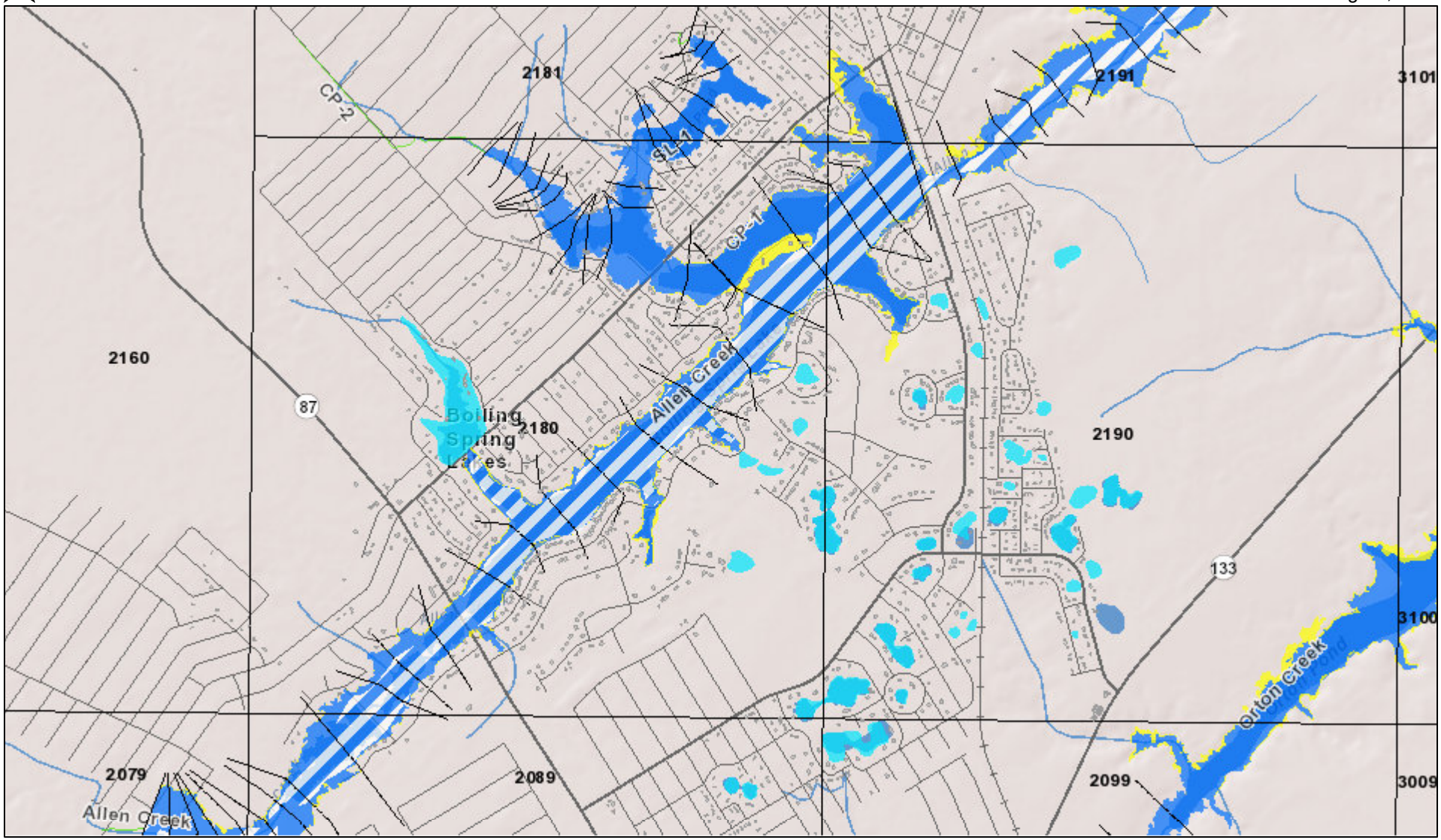
Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

APPENDIX 5.5

N

Aug 16, 2019



Legend

- Panels
- Political Areas
- Stream Centerline
- Cross Sections
- Levee

Flood Hazard Areas

- AE
- Floodway (AE)
- 0.2 % Chance Annual Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard

North Carolina Floodplain Mapping Program

APPENDIX 5.6

October 28, 2019

Ms. Renee Gledhill-Earley
NC State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617

RE: Scoping Request
Boiling Springs Lake
City of Boiling Spring Lakes, North Carolina

Dear Ms. Gledhill-Earley:

The City of Boiling Spring Lakes is in the early stages of repairing four dams within the Boiling Springs Lake system. The lake system consists of four existing dam sites – Sanford Dam, Pine Lake Dam, Upper Dam, and North Lake Dam. The four dams were breached and/or outlet structures were damaged during Hurricane Florence in September of 2018. Proposed plans call for the repair and/or replacement of the earthen dams, concrete risers, and other infrastructure.

Sanford Dam along Alton Lennon Road (see attached maps) is listed on the HPOWEB GIS Service mapper as:

Boiling Spring Lake Dam
HPO Site ID: BW0545
Status: SO
NRHD status: None
Description: 1961

The original earthen dam of Sanford Dam (Boiling Spring Lake Dam) was breached during Hurricane Florence. Additionally, there was a loss of earthen embankment soils and the partial collapse of the mechanically-stabilized earth walls above the spillway outlets. However, at this time, we do not possess specific knowledge of any damage to the Sanford Dam Spillway that is directly attributable to Hurricane Florence. The original concrete riser has lost structural integrity due to surface deterioration and age, the original discharge capacity was reduced during prior joint repairs and grouting and slope reconstruction behind the spillway structure raise concerns for long-term stability (see attached Photo Sheet). The proposed plans call for the removal of the original concrete riser and design of a new riser/intake structure and spillway.

Please provide any comments regarding concerns or other issues of significance that may affect this project. We look forward to your comments on this matter. If you have any questions, feel free to contact me at our office phone number of (828) 386-1920 or my email address jon.swaim@mcgillassociates.com.

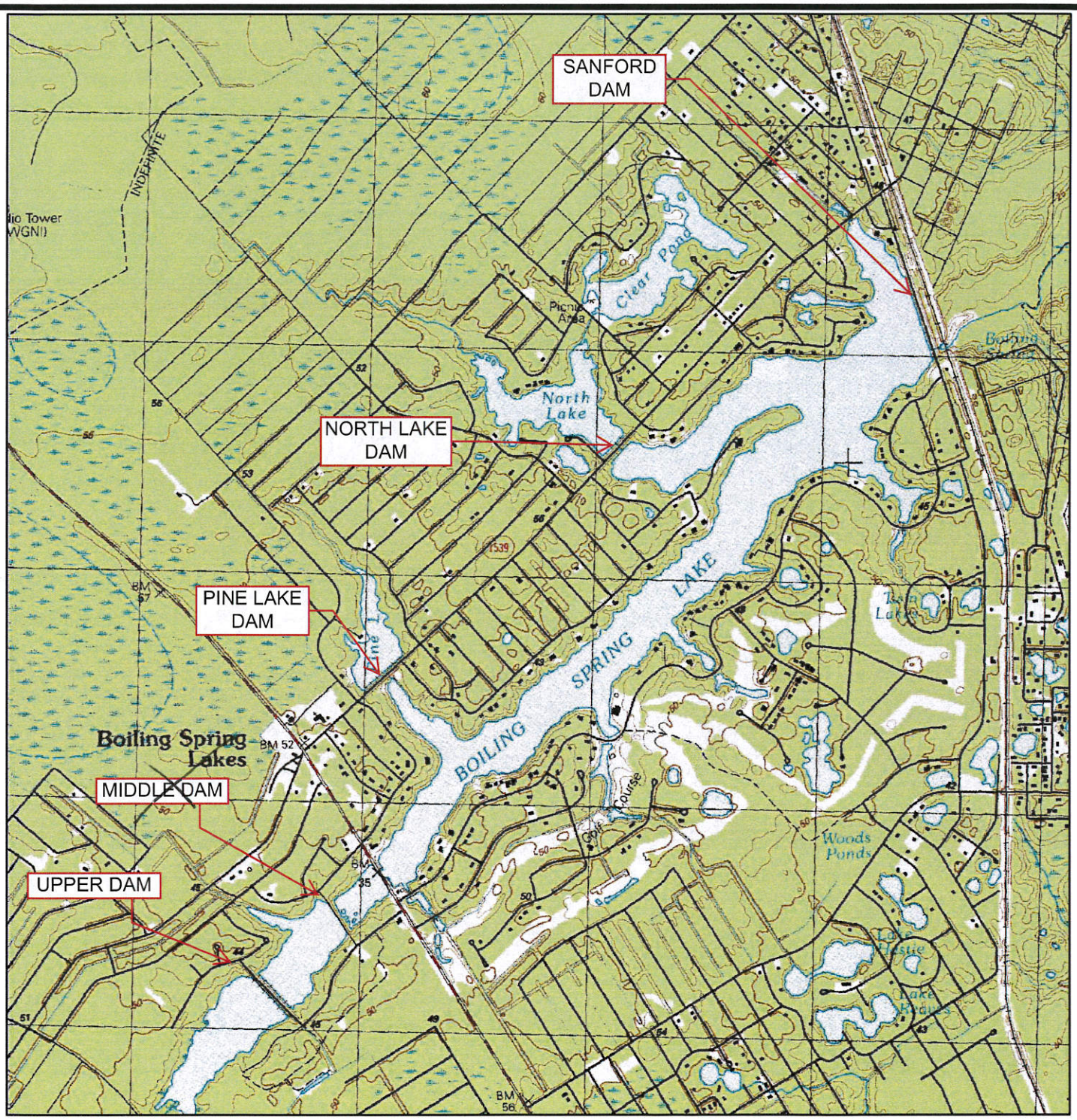
Sincerely,
MCGILL ASSOCIATES, PA

JON SWAIM
Project Manager / Environmental Services

P:\2019\19.07042 -BoilingSprLNC-Dam Design\Design\Reports & Planning

List of attachments:

1. LOCATION/USGS MAP
2. NCHPO MAP
3. PHOTO SHEET



N

0 1,000 2,000 4,000 Feet

L:\Wetlands\LMG18.458\Maps\Mapset

Boundaries are approximate and not meant to be absolute.

Map Source: Brunswick County Topographic Mosaic

Boiling Spring Lakes Dam
Brunswick County, NC

Map Date: 12-18-18
LMG18.458

LMG
LAND MANAGEMENT GROUP
a DAVEY company
3805 Wrightsville Avenue
Wilmington, NC 28403
(910) 452-0001

Figure 2. Topographic Map Composite

August 16, 2019

1:25,000

0 0.17 0.35 0.7 mi

0 0.28 0.55 1.1 km

NR Points

NR Individual Listing

NR Listing, Gone

NRHD Center Point

NR Boundaries

National Register Boundary

Boundary of Destroyed/Removed NR Listing

SL Points

SL Individual Entry

SL and DOE entry

State of North Carolina DOT, Esri, HERE, Garmin, INCREMENT P, NGA,

Photo One: View of existing concrete riser structure located on southern end of Sanford (Boiling Springs Lake) Dam. Structure to be removed and replaced.

Photo Two: View looking at downstream side of Sanford Sanford (Boiling Springs Lake) Dam where earthen dam was breached and destroyed. Concrete riser to the left in this photo.

Photo Three: View of existing concrete riser structure located on southern end of Sanford (Boiling Springs Lake) Dam. Structure to be removed and replaced.

Photo Four: View looking north along Alton Lennon Road at dam breach. Concrete riser to the bottom left of this photo.

mcgill
1013 State Farm Road
Boone, NC 28607
828.386.1920
NC Firm License # C-0459
mcgillassociates.com

DATE	9/26/19
PROJECT #	19.07042
PROJECT MANAGER	MH

Boiling Springs Lake
Dam Repairs

City of Boiling Spring Lakes

BRUNSWICK COUNTY, NORTH CAROLINA

PHOTOSHEET

FIGURE

A

North Carolina Department of Natural and Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary Susi H. Hamilton

Office of Archives and History
Deputy Secretary Kevin Cherry

December 3, 2019

Jon Swaim
McGill Associates
1013 State Farm Road
Boone, NC 28607

Re: Repair Sanford Dam, Pine Lake Dam, Upper Dam, & North Lake Dam, Boiling Springs Lake, Brunswick County, ER 19-2947

Dear Mr. Swaim:

Thank you for your email of October 28, 2019, transmitting the revised scoping letter. We have reviewed the submittal and offer the following comments.

The Boiling Springs Lake Dam (BW0545), or Sanford Dam, was constructed in 1961 with the purpose of creating a centerpiece for development of the Boiling Spring Lakes community. The importance of this resource is related to its engineering and use in community planning. The proposed repair/replacement of key elements will return the resource to its historic form and function. We strongly recommend that the earthen dam be replaced in-kind and have no objection to the project as proposed.

During the Brunswick County survey update of 2010, the dam had not yet reached 50 years of age and could not be considered eligible for listing on the National Register of Historic Places. Today, the dam meets the minimum age requirement. If the Town of Boiling Spring Lakes is interested in finding out more about the survey and listing process, please instruct them to contact the NCHPO Survey Specialist assigned to Brunswick County, Hannah Beckman-Black, at 919-814-6577, or Hannah.beckman@ncdcr.gov

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos
Deputy State Historic Preservation Officer

APPENDIX 5.7

October 8, 2019

Emily Wells
U.S. Fish & Wildlife Service
Raleigh Ecological Services Field Office
P.O. Box 33726
Raleigh, NC 27636-3726

RE: Scoping Request
Boiling Springs Lake
City of Boiling Spring Lakes, Brunswick County, North Carolina

Dear Emily:

The City of Boiling Spring Lakes is in the early stages of repairing four dams within the Boiling Springs Lake system. The lake system consists of four existing dam sites – Sanford Dam, Pine Lake Dam, Upper Dam, and North Lake Dam (see attached Study Limits Map). The four dams were breached and/or outlet structures were damaged during Hurricane Florence in September of 2018. Proposed plans will involve repair and/or replacement of earthen dams, concrete risers, and other infrastructure.

A desktop review was performed to determine what Federally listed threatened and endangered species may occur in the proposed project area or may be affected by the proposed project. The review included database searches conducted through the North Carolina Natural Heritage Program and the USFWS ECOS-IPaC website (see attached consultation letters). A total of fourteen Federally listed threatened and endangered species were identified as being potentially affected by the project. After further review it was determined that only five of those species could potentially occur within the project site based on habitat characteristics.

A survey of potential impacts to five Federally listed threatened and endangered species that may occur within the proposed project limits was conducted by McGill Associates, P.A. on July 30-31, 2019. Biological conclusions for each species are as follows:

Bald Eagle (*Haliaeetus leucocephalus)* – Habitat exists in the project study area in the form of small open water features and nearby canopy trees. A review of NCNHP records on August 16, 2019 indicates no known Bald Eagle occurrences within 1.0 mile of the study area. A site visit on July 30-31, 2019 found no individuals within the study area. Therefore, a biological conclusion of MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT was rendered.

Red-cockaded woodpecker (*Picoides borealis*) – Habitat exists in the project study area in the form of scattered mature pine trees greater than 19 inches in diameter at breast

height. A review of NCNHP records on August 16, 2019 indicates there are known Red-cockaded woodpecker occurrences within 1.0 mile of the study area. A site visit on July 30-31, 2019 found no individuals or nesting cavities within the study area. Therefore, a biological conclusion of MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT was rendered.

Wood stork (*Mycteria americana*) – Habitat exists in the project study area in the form of freshwater marshes and ponds. A review of NCNHP records on August 16, 2019 indicates no known Wood stork occurrences within 1.0 mile of the study area. A site visit on July 30-31, 2019 found no individuals within the study area. Therefore, a biological conclusion of MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT was rendered.

Cooley's meadowrue (*Thalictrum cooleyi*) – Habitat exists in the project study area in the form of open right-of-way clearings on the dams. A review of NCNHP records on August 16, 2019 indicates no known Cooley's meadowrue occurrences within 1.0 mile of the study area. A site visit during the survey window recommended by the USFWS on July 30-31, 2019 found no individuals within the study area. Therefore, a biological conclusion of MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT was rendered.

Rough-leaved loosestrife (*Lysimachia asperulifolia*) – Habitat exists in the project study area in the form of open right-of-way clearings on the dams. A review of NCNHP records on August 16, 2019 indicates there are known Rough-leaved loosestrife occurrences within 1.0 mile of the study area. A site visit during the survey window recommended by the USFWS on July 30-31, 2019 found no individuals within the study area. Therefore, a biological conclusion of MAY AFFECT NOT LIKELY TO ADVERSELY AFFECT was rendered.

Please let us know if you concur with these biological conclusions and if there are any other issues or concerns that may affect this project. We look forward to your comments on this matter. If you have any questions, feel free to contact me at our office phone number of (828) 386-1920 or my email address jon.swaim@mcgillassociates.com.

Sincerely,
MCGILL ASSOCIATES, PA

JON SWAIM
Project Manager / Environmental Services

P:\2019\19.07042 -BoilingSprLNC-Dam Design\Design\Reports & Planning

List of attachments:

1. STUDY LIMITS MAP
2. USFWS CONSULTATION LETTER
3. NCNHP CONSULTATION LETTER

<u>Pine Lake Dam</u> – Work will take place in lake bed just upstream and downstream of the new culverts installed by NCDOT. Upstream a small (approx. 18’ x 5’) concrete drop inlet will be constructed. Downstream a small (approx. 15’ x 20’) rip rap apron will be installed. Lake bed and fringe vegetation areas were surveyed 7/30/2019.

Upstream Project Area.

Upstream Project Area.

Downstream Project Area.

<u>North Lake Dam</u> – Work will take place in lake bed just upstream from the new culverts installed by NCDOT. Upstream an approx. 50’ x 10’ concrete drop inlet will be constructed. Downstream an approx. 15’ x 40’ rip rap apron will be installed. Lake bed and fringe vegetation areas were surveyed 7/30/2019.

Upstream Project Area.

Upstream Project Area.

Downstream Project Area.

<u>Upper Dam</u> – The dam breach will be restored to its original ‘pre hurricane’ footprint and grades, also a new upstream concrete inlet (approx. 120' x 80') and downstream rip rap apron (approx. 60' x 30') will be installed on the eastern end of the dam.

Breach area.

Concrete inlet area.

Rip rap apron outlet area.

<u>Sanford Dam (Boiling Spring Lake Dam)</u> – Proposed work includes the demolition of the existing concrete inlet and the construction of a new upstream concrete inlet (approx. 30' x 100') and downstream rip rap dissipater (30' x 85') within the breached area. Dam will be rebuilt to original 'pre hurricane' footprint and elevations.

Breach Area, looking upstream.

Existing concrete inlet.

Breach area, upstream side.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh ES Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

November 18, 2019

Jon Swaim
McGill Associates, PA
103 State Farm Road
Boone, North Carolina 28607

Re: Boiling Spring Lakes- Multiple Dam Repairs- Brunswick County

Dear Mr. Swaim:

This letter is to inform you that the Service has established an on-line project planning and consultation process which assists developers and consultants in determining whether a federally-listed species or designated critical habitat may be affected by a proposed project. For future projects, please visit the Raleigh Field Office's project planning website at https://www.fws.gov/raleigh/pp.html. If you are only searching for a list of species that may be present in the project's Action Area, then you may use the Service's Information, Planning, and Consultation System (IPaC) website to determine if any listed, proposed, or candidate species may be present in the Action Area and generate a species list. The IPaC website may be viewed at https://ecos.fws.gov/ipac/. The IPaC web site contains a complete and frequently updated list of all endangered and threatened species protected by the provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)(Act), a list of federal species of concern[1] that are known to occur in each county in North Carolina, and other resources.

Section 7 of the Act requires that all federal agencies (or their designated non-federal representative), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species. A biological assessment or evaluation may be prepared to fulfill that requirement and in determining whether additional consultation with the Service is necessary. In addition to the federally-protected species list, information on the

[1] The term "federal species of concern" refers to those species which the Service believes might be in need of concentrated conservation actions. Federal species of concern receive no legal protection and their designation does not necessarily imply that the species will eventually be proposed for listing as a federally endangered or threatened species. However, we recommend that all practicable measures be taken to avoid or minimize adverse impacts to federal species of concern.

species' life histories and habitats and information on completing a biological assessment or evaluation and can be found on our web page at http://www.fws.gov/raleigh. Please check the web site often for updated information or changes.

If your project contains suitable habitat for any of the federally-listed species known to be present within the county where your project occurs, the proposed action has the potential to adversely affect those species. As such, we recommend that surveys be conducted to determine the species' presence or absence within the project area. The use of North Carolina Natural Heritage program data should not be substituted for actual field surveys.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a federally-protected species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared). However, you should maintain a complete record of the assessment, including steps leading to your determination of effect, the qualified personnel conducting the assessment, habitat conditions, site photographs, and any other related articles.

With regard to the above-referenced project, we offer the following remarks. Our comments are submitted pursuant to, and in accordance with, provisions of the Endangered Species Act.

Based on the information provided (including photographs and site specific species surveys) and other information available, it appears that the proposed action is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act at these sites. We believe that the requirements of section 7(a)(2) of the Act have been satisfied for your project. Please remember that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or, (3) a new species is listed or critical habitat determined that may be affected by the identified action.

However, the Service is concerned about the potential impacts the proposed action might have on aquatic species. Aquatic resources are highly susceptible to sedimentation. Therefore, we recommend that all practicable measures be taken to avoid adverse impacts to aquatic species, including implementing directional boring methods and stringent sediment and erosion control measures when replacing the failed dams. An erosion and sedimentation control plan should be submitted to and approved by the North Carolina Division of Land Resources, Land Quality Section prior to construction. Erosion and sedimentation controls should be installed and maintained between the construction site and any nearby down-gradient surface waters. In addition, we recommend maintaining natural, vegetated buffers on all streams and creeks adjacent to the project site.

The North Carolina Wildlife Resources Commission has developed a Guidance Memorandum (a copy can be found on our website at (http://www.fws.gov/raleigh) to address and mitigate secondary and cumulative impacts to aquatic and terrestrial wildlife resources and water quality. We recommend that you consider this document in the development of your projects and in completing an initiation package for consultation (if necessary).

We hope you find our web page useful and informative and that following the process described above will reduce the time required, and eliminate the need, for general correspondence for species' lists. If you have any questions or comments, please contact Emily Wells of this office at (919) 856-4520 ext. 25.

Sincerely,

For Pete Benjamin
Field Supervisor

APPENDIX 5.8

Meeting Minutes

City of Boiling Spring Lakes

Dams Construction/Reconstruction Project Environmental Permitting

Phase 1 – Pre-Permitting Meeting

4393DR-NC: Project #68141

Date: 10.17.19 Time: 10:00 AM

Location: Boiling Spring Lakes – Sanford Dam, Pine Lake Dam, North Lake Dam, Upper Dam

Attendees:

Jeff Repp – City of Boiling Spring Lakes
Maria T. Dunn – NC Wildlife Resources Commission
Chad Coburn – NC Department of Environmental Quality
Gary H. Beecher – US Army Corps of Engineers
Michael Hanson – McGill Associates
Lamyaa Negm - McGill Associates
Jon Swaim - McGill Associates

Discussion Items:

1. Low flow discussion with NC Wildlife Resources Commission
    a. Establishing the correct low flow conditions will be critical for downstream habitat, especially anadromous fish species.
    b. We proposed to match the historic low flow. We will model the O&M conditions to establish the prior flow.
    c. She noted that once they have a prior low flow value, they may want to augment that but, that could only be decided later.
2. It was noted that the restoration of the historic water elevations in the lakes would allow for re-establishing the hydroperiod of the "linear wetlands" and associated habitat around the perimeter of the lakes. Restoration of open water and shoreline habitat would also be restored.
3. WRC wants to focus on establishing the need to restore the lakes versus leaving the lake beds to return to a stream condition. She requested the following to be included in the PCN application:
    a. What water elevation would persist in the lakes if only Sanford Dam was restored?
    b. Stress purpose and need on Upper, Pine, and North Lake Dam reconstruction.
    a. Calculate watershed acreage, effect of open water loss on entire system.

   b. Discuss alternatives, no action, no control on upper dams, intended project.
   c. What is the length of the historic stream bed now exposed?
   d. # of residential/commercial lots affected, boat docks.
   e. presence of public services properties i.e. piers, marinas, kayak launches, parks, etc. that may be affected (8 City parks).
   f. Importance of the existence of Dam Road for the local community.
   g. Comment on Federal and State listed plant and animal species that would benefit from restoring lake elevations.
4. Certain protected species or species of concern are known to be in the area. These may limit timing of construction and/or releases. These will be addressed during permitting.
5. Resolve Sanford Dam historical status with NCHPO.
6. US Army Corps agreed to permit open water impacts for the lake bed. Possibly can be a non-notification, most likely Nationwide 3. Will be determined once permanent impacts calculated.
7. Army Corps would like project timeline incorporated into PCN application.
8. Agency discussion, potential conference call once impact totals calculated to discuss prior to permit application submittal.
9. Other Items - None

Boiling Spring Lakes Dams Construction/Reconstruction
Final Design
Boiling Spring Lakes, North Carolina
Date: **Jan-2021**
Project No.: **19C21022**

Prepared by:
SWM / CDS
Checked by:
DNS / ACP

Engineer's Opinion of Construction Cost
Sanford Dam

Item	Bid Item Description	Estimated Quantity	Unit	Unit Price	Contingency	Total
1	Clearing and Grubbing	11.2	AC	$ 10,516	10%	$ 129,554
2	Erosion and Sediment Control	1	LS	$ 193,370	10%	$ 212,707
3	Permanent Topsoiling and Seeding/Sodding	10.3	AC	$ 1,973	10%	$ 22,330
4	Construction Surveys	14	MO	$ 1,500	10%	$ 23,100
5	Traffic Control	18	MO	$ 300	10%	$ 5,940
6	Demolition and Disposal of Pavement	3,817	SY	$ 6	10%	$ 23,639
7	Demolition and Disposal of Existing Structures	1	LS	$ 20,000	15%	$ 23,000
8	Control of Water	1	LS	$ 1,490,000	10%	$ 1,639,000
9	Dewatering	1	LS	$ 1,600,000	10%	$ 1,760,000
10	Common Excavation	62,900	CY	$ 10	10%	$ 691,900
11	Rock Excavation	30	CY	$ 100	10%	$ 3,300
12	Common Fill	39,800	CY	$ 15	10%	$ 656,700
13	Select Common Fill	50,800	CY	$ 25	10%	$ 1,397,000
14	Core Fill	6,690	CY	$ 30	10%	$ 220,770
15	Select Core Fill	8,390	CY	$ 40	10%	$ 369,160
16	Rock Foundation Preparation	6,300	SY	$ 20	10%	$ 138,600
17	Cast-In-Place Reinforced Concrete, Walls	390	CY	$ 1,000	5%	$ 409,500
18	Cast-In-Place Reinforced Concrete, Slabs	840	CY	$ 800	5%	$ 705,600
19	Cast-In-Place Reinforced Mass Concrete, Slabs	970	CY	$ 800	5%	$ 814,800
20	Cast-In-Place Reinforced Concrete, Culverts	545	CY	$ 1,200	5%	$ 686,700
21	Mudmat	0	CY	$ 300	10%	$ -
22	Leveling Concrete	1,000	CY	$ 300	10%	$ 330,000
23	Sluice Gate	1	LS	$ 50,000	15%	$ 57,500
24	Grating	44	SF	$ 50	10%	$ 2,426
25	Trash Rack	1	LS	$ 7,000	10%	$ 7,700
26	Railing	27	LF	$ 200	10%	$ 5,940
27	Fine Drainfill	4,290	CY	$ 75	10%	$ 353,925
28	Coarse Drainfill	1,060	CY	$ 75	10%	$ 87,450
29	Backfill Stone	50	CY	$ 75	15%	$ 4,313
30	Drain Piping	350	LF	$ 70	10%	$ 26,950
31	Mixed-In-Place Panels	3,900	CY	$ 205	10%	$ 879,450
32	Cutoff Wall	69,540	SF	$ 150	10%	$ 11,474,100
33	Instrumentation	1	LS	$ 117,500	10%	$ 129,250
34	Floating Barrier System	350	LF	$ 85	10%	$ 32,725
35	Riprap Wave Protection, Class B	1,644	TN	$ 52	10%	$ 94,778
36	Riprap Wave Protection, Class 2	5,805	TN	$ 53	10%	$ 335,686
37	Riprap Outlet Protection, Class A	2	TN	$ 53	10%	$ 87
38	Riprap Outlet Protection, Class 2	1,358	TN	$ 53	10%	$ 78,500
39	Geotextile (Riprap)	6,220	SY	$ 3	10%	$ 17,584
40	Riprap Bedding, #57 Washed Stone	1,294	TN	$ 37	10%	$ 52,080
41	Utilities	1	LS	$ 80,000	15%	$ 92,000
42	Guardrail	2,675	LF	$ 17	10%	$ 50,523
43	Compacted Aggregate Base Course (CABC)	1,838	TN	$ 36	10%	$ 72,776
44	S9.5B Asphalt Base Course	647	TN	$ 51	10%	$ 36,395
45	I19.0C Asphalt Intermediate Course	877	TN	$ 57	10%	$ 54,638
46	Thermoplastic Pavement Marking Line (4", 120 mils)	7,042	LF	$ 1	10%	$ 5,112
47	Concrete Curb and Gutter	250	LF	$ 39	10%	$ 10,725
48	Concrete Flume	1	LS	$ 5,000	15%	$ 5,750
49	Geotextile (Gravel Road Stabilization)	0	SY	$ 3	10%	$ -
50	Lake Vegetation Management	272	AC	$ 2,000	15%	$ 625,600
51	Chain Link Fence	235	LF	$ 75	10%	$ 19,388
52	Construction Camera	1	LS	$ 100,000	20%	$ 120,000
					Subtotal:	$ 24,996,648
53	Temporary Construction Facilities	1	LS	$ -	2% Subtotal	$ 500,000
					New Subtotal:	$ 25,496,648
54	Mobliization/Demobilization	1	LS	$ -	10% New Subtotal	$ 2,550,000
						$ 28,046,648

UNIT DEFINITIONS: LS=Lump Sum, LF=Linear Feet, CF = Cubic Feet, SF=Square Feet, CY=Cubic Yards, SY = Square Yards, EA = Each, MO = Month, TN = Ton, AC = Acre

Boiling Spring Lakes Dams Construction/Reconstruction
Final Design
Boiling Spring Lakes, North Carolina
Date: **Jan-2021**
Project No.: **19C21022**

Prepared by:
SWM / CDS
Checked by:
DNS / ACP

Engineer's Opinion of Construction Cost
Upper Lake Dam

Item	Bid Item Description	Estimated Quantity	Unit	Unit Price	Contingency	Total
1	Clearing and Grubbing	1.3	AC	$ 10,516	10%	$ 15,037
2	Erosion and Sediment Control	1	LS	$ 13,871	10%	$ 15,258
3	Permanent Topsoiling and Seeding/Sodding	1.0	AC	$ 1,973	10%	$ 2,170
4	Construction Surveys	6	MO	$ 1,500	10%	$ 9,900
5	Traffic Control	8	MO	$ 200	10%	$ 1,760
6	Demolition and Disposal of Pavement	0	SY	$ 6	10%	$ -
7	Demolition and Disposal of Existing Structures	1	LS	$ 20,000	15%	$ 23,000
8	Control of Water	1	LS	$ 247,000	10%	$ 271,700
9	Dewatering	1	LS	$ 20,000	10%	$ 22,000
10	Common Excavation	4,550	CY	$ 10	10%	$ 50,050
11	Rock Excavation	0	CY	$ -	10%	$ -
12	Common Fill	5,860	CY	$ 15	10%	$ 96,690
13	Select Common Fill	0	CY	$ -	10%	$ -
14	Core Fill	0	CY	$ -	10%	$ -
15	Select Core Fill	0	CY	$ -	10%	$ -
16	Rock Foundation Preparation	0	SY	$ -	10%	$ -
17	Cast-In-Place Reinforced Concrete, Walls	75	CY	$ 1,000	5%	$ 78,750
18	Cast-In-Place Reinforced Concrete, Slabs	485	CY	$ 800	5%	$ 407,400
19	Cast-In-Place Reinforced Mass Concrete, Slabs	0	CY	$ -	5%	$ -
20	Cast-In-Place Reinforced Concrete, Culverts	260	CY	$ 1,200	5%	$ 327,600
21	Mudmat	170	CY	$ 300	10%	$ 56,100
22	Leveling Concrete	0	CY	$ -	10%	$ -
23	Sluice Gate	1	LS	$ 10,000	15%	$ 11,500
24	Grating	23	SF	$ 50	10%	$ 1,265
25	Trash Rack	1	LS	$ 7,000	10%	$ 7,700
26	Railing	20	LF	$ 200	10%	$ 4,400
27	Fine Drainfill	50	CY	$ 75	10%	$ 4,125
28	Coarse Drainfill	5	CY	$ 75	10%	$ 413
29	Backfill Stone	0	CY	$ -	15%	$ -
30	Drain Piping	70	LF	$ 70	10%	$ 5,390
31	Mixed-In-Place Panels	0	CY	$ -	10%	$ -
32	Cutoff Wall	0	SF	$ -	10%	$ -
33	Instrumentation	1	LS	$ 4,000	10%	$ 4,400
34	Floating Barrier System	210	LF	$ 85	10%	$ 19,635
35	Riprap Slope Protection, Class B	2,862	TN	$ 52	10%	$ 164,997
36	Riprap Slope Protection, Class 2	0	TN	$ 53	10%	$ -
37	Riprap Outlet Protection, Class A	0	TN	$ 53	10%	$ -
38	Riprap Outlet Protection, Class 2	324	TN	$ 53	10%	$ 18,736
39	Geotextile (Riprap)	3,078	SY	$ 3	10%	$ 8,702
40	Riprap Bedding, #57 Washed Stone	718	TN	$ 37	10%	$ 28,915
41	Utilities	0	LS	$ -	15%	$ -
42	Guardrail	0	LF	$ 17	10%	$ -
43	Compacted Aggregate Base Course (CABC)	703	TN	$ 36	10%	$ 27,822
44	S9.5B Asphalt Base Course	0	TN	$ 51	10%	$ -
45	I19.0C Asphalt Intermediate Course	0	TN	$ 57	10%	$ -
46	Thermoplastic Pavement Marking Line (4", 120 mils)	0	LF	$ 1	10%	$ -
47	Concrete Curb and Gutter	0	LF	$ 39	10%	$ -
48	Concrete Flume	0	LS	$ 5,000	15%	$ -
49	Geotextile (Gravel Road Stabilization)	1,885	SY	$ 3	10%	$ 6,449
50	Lake Vegetation Management	32	AC	$ 2,000	15%	$ 73,600
51	Chain Link Fence	151	LF	$ 75	10%	$ 12,458
52	Construction Camera	0	LS	$ -	20%	$ -
					Subtotal:	$ 1,777,921
54	Temporary Construction Facilities	1	LS	$ -	2% Subtotal	$ 36,000
					New Subtotal:	$ 1,813,921
55	Mobliization/Demobilization	1	LS	$ -	10% New Subtotal	$ 181,000
						$ 1,994,921

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Boiling Spring Lakes Dams Construction/Reconstruction
Final Design
Boiling Spring Lakes, North Carolina
Date: **Jan-2021**
Project No.: **19C21022**

Prepared by:
SWM / CDS
Checked by:
DNS / ACP

Engineer's Opinion of Construction Cost
North Lake Dam

Item	Bid Item Description	Estimated Quantity	Unit	Unit Price	Contingency	Total
1	Clearing and Grubbing	1.8	AC	$ 10,516	10%	$ 20,821
2	Erosion and Sediment Control	1	LS	$ 48,088	10%	$ 52,897
3	Permanent Topsoiling and Seeding/Sodding	2.0	AC	$ 1,973	10%	$ 4,340
4	Construction Surveys	10	MO	$ 1,500	10%	$ 16,500
5	Traffic Control	12	MO	$ 500	10%	$ 6,600
6	Demolition and Disposal of Pavement	595	SY	$ 6	10%	$ 3,685
7	Demolition and Disposal of Existing Structures	1	LS	$ 20,000	15%	$ 23,000
8	Control of Water	1	LS	$ 88,000	10%	$ 96,800
9	Dewatering	1	LS	$ 10,000	10%	$ 11,000
10	Common Excavation	8,150	CY	$ 10	10%	$ 89,650
11	Rock Excavation	0	CY	$ -	10%	$ -
12	Common Fill	7,350	CY	$ 15	10%	$ 121,275
13	Select Common Fill	0	CY	$ -	10%	$ -
14	Core Fill	0	CY	$ -	10%	$ -
15	Select Core Fill	0	CY	$ -	10%	$ -
16	Rock Foundation Preparation	0	SY	$ -	10%	$ -
17	Cast-In-Place Reinforced Concrete, Walls	145	CY	$ 1,000	5%	$ 152,250
18	Cast-In-Place Reinforced Concrete, Slabs	305	CY	$ 800	5%	$ 256,200
19	Cast-In-Place Reinforced Mass Concrete, Slabs	0	CY	$ -	5%	$ -
20	Cast-In-Place Reinforced Concrete, Culverts	160	CY	$ 1,200	5%	$ 201,600
21	Mudmat	130	CY	$ 300	10%	$ 42,900
22	Leveling Concrete	0	CY	$ -	10%	$ -
23	Sluice Gate	1	LS	$ 10,000	15%	$ 11,500
24	Grating	16	SF	$ 50	10%	$ 880
25	Trash Rack	1	LS	$ 7,000	10%	$ 7,700
26	Railing	18	LF	$ 200	10%	$ 3,960
27	Fine Drainfill	130	CY	$ 75	10%	$ 10,725
28	Coarse Drainfill	10	CY	$ 75	10%	$ 825
29	Backfill Stone	0	CY	$ -	15%	$ -
30	Drain Piping	180	LF	$ 70	10%	$ 13,860
31	Mixed-In-Place Panels	0	CY	$ -	10%	$ -
32	Cutoff Wall	0	SF	$ -	10%	$ -
33	Instrumentation	1	LS	$ 4,000	10%	$ 4,400
34	Floating Barrier System	200	LF	$ 85	10%	$ 18,700
35	Riprap Slope Protection, Class B	695	TN	$ 52	10%	$ 40,039
36	Riprap Slope Protection, Class 2	0	TN	$ 53	10%	$ -
37	Riprap Outlet Protection, Class A	0	TN	$ 53	10%	$ -
38	Riprap Outlet Protection, Class 2	216	TN	$ 53	10%	$ 12,491
39	Geotextile (Riprap)	838	SY	$ 3	10%	$ 2,369
40	Riprap Bedding, #57 Washed Stone	196	TN	$ 37	10%	$ 7,891
41	Utilities	0	LS	$ -	15%	$ -
42	Guardrail	1,175	LF	$ 17	10%	$ 22,192
43	Compacted Aggregate Base Course (CABC)	264	TN	$ 36	10%	$ 10,453
44	S9.5B Asphalt Base Course	93	TN	$ 51	10%	$ 5,249
45	I19.0C Asphalt Intermediate Course	126	TN	$ 57	10%	$ 7,870
46	Thermoplastic Pavement Marking Line (4", 120 mils)	970	LF	$ 1	10%	$ 704
47	Concrete Curb and Gutter	0	LF	$ 39	10%	$ -
48	Concrete Flume	0	LS	$ 5,000	15%	$ -
49	Geotextile (Gravel Road Stabilization)	0	SY	$ 3	10%	$ -
50	Lake Vegetation Management	29	AC	$ 2,000	15%	$ 66,700
51	Chain Link Fence	129	LF	$ 75	10%	$ 10,643
52	Construction Camera	0	LS	$ -	20%	$ -
					Subtotal:	$ 1,358,667
54	Temporary Construction Facilities	1	LS	$ -	2% Subtotal	$ 27,000
					New Subtotal:	$ 1,385,667
55	Mobliization/Demobilization	1	LS	$ -	10% New Subtotal	$ 139,000
						$ 1,524,667

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Boiling Spring Lakes Dams Construction/Reconstruction
Final Design
Boiling Spring Lakes, North Carolina
Date: **Jan-2021**
Project No.: **19C21022**

Prepared by:
SWM / CDS
Checked by:
DNS / ACP

Engineer's Opinion of Construction Cost
Pine Lake Dam

Item	Bid Item Description	Estimated Quantity	Unit	Unit Price	Contingency	Total
1	Clearing and Grubbing	2.5	AC	$ 10,516	10%	$ 28,918
2	Erosion and Sediment Control	1	LS	$ 35,334	10%	$ 38,867
3	Permanent Topsoiling and Seeding/Sodding	2.0	AC	$ 1,973	10%	$ 4,340
4	Construction Surveys	10	MO	$ 1,500	10%	$ 16,500
5	Traffic Control	12	MO	$ 500	10%	$ 6,600
6	Demolition and Disposal of Pavement	476	SY	$ 6	10%	$ 2,948
7	Demolition and Disposal of Existing Structures	1	LS	$ 20,000	15%	$ 23,000
8	Control of Water	1	LS	$ 83,000	10%	$ 91,300
9	Dewatering	1	LS	$ 10,000	10%	$ 11,000
10	Common Excavation	9,220	CY	$ 10	10%	$ 101,420
11	Rock Excavation	0	CY	$ -	10%	$ -
12	Common Fill	8,820	CY	$ 15	10%	$ 145,530
13	Select Common Fill	0	CY	$ -	10%	$ -
14	Core Fill	0	CY	$ -	10%	$ -
15	Select Core Fill	0	CY	$ -	10%	$ -
16	Rock Foundation Preparation	0	SY	$ -	10%	$ -
17	Cast-In-Place Reinforced Concrete, Walls	85	CY	$ 1,000	5%	$ 89,250
18	Cast-In-Place Reinforced Concrete, Slabs	180	CY	$ 800	5%	$ 151,200
19	Cast-In-Place Reinforced Mass Concrete, Slabs	0	CY	$ -	5%	$ -
20	Cast-In-Place Reinforced Concrete, Culverts	120	CY	$ 1,200	5%	$ 151,200
21	Mudmat	100	CY	$ 300	10%	$ 33,000
22	Leveling Concrete	0	CY	$ -	10%	$ -
23	Sluice Gate	1	LS	$ 10,000	15%	$ 11,500
24	Grating	13	SF	$ 50	10%	$ 715
25	Trash Rack	1	LS	$ 7,000	10%	$ 7,700
26	Railing	17	LF	$ 200	10%	$ 3,740
27	Fine Drainfill	100	CY	$ 75	10%	$ 8,250
28	Coarse Drainfill	10	CY	$ 75	10%	$ 825
29	Backfill Stone	0	CY	$ -	15%	$ -
30	Drain Piping	170	LF	$ 70	10%	$ 13,090
31	Mixed-In-Place Panels	0	CY	$ -	10%	$ -
32	Cutoff Wall	0	SF	$ -	10%	$ -
33	Instrumentation	1	LS	$ 4,000	10%	$ 4,400
34	Floating Barrier System	160	LF	$ 85	10%	$ 14,960
35	Riprap Slope Protection, Class B	920	TN	$ 52	10%	$ 53,010
36	Riprap Slope Protection, Class 2	0	TN	$ 53	10%	$ -
37	Riprap Outlet Protection, Class A	0	TN	$ 53	10%	$ -
38	Riprap Outlet Protection, Class 2	126	TN	$ 53	10%	$ 7,286
39	Geotextile (Riprap)	1,003	SY	$ 3	10%	$ 2,835
40	Riprap Bedding, #57 Washed Stone	234	TN	$ 37	10%	$ 9,413
41	Utilities	0	LS	$ -	15%	$ -
42	Guardrail	805	LF	$ 17	10%	$ 15,204
43	Compacted Aggregate Base Course (CABC)	259	TN	$ 36	10%	$ 10,237
44	S9.5B Asphalt Base Course	91	TN	$ 51	10%	$ 5,140
45	I19.0C Asphalt Intermediate Course	124	TN	$ 57	10%	$ 7,707
46	Thermoplastic Pavement Marking Line (4", 120 mils)	950	LF	$ 1	10%	$ 690
47	Concrete Curb and Gutter	0	LF	$ 39	10%	$ -
48	Concrete Flume	0	LS	$ 5,000	15%	$ -
49	Geotextile (Gravel Road Stabilization)	0	SY	$ 3	10%	$ -
50	Lake Vegetation Management	14	AC	$ 2,000	15%	$ 32,200
51	Chain Link Fence	93	LF	$ 75	10%	$ 7,673
52	Construction Camera	0	LS	$ -	20%	$ -
					Subtotal:	$ 1,111,648
54	Temporary Construction Facilities	1	LS	$ -	2% Subtotal	$ 22,000
					New Subtotal:	$ 1,133,648
55	Mobliization/Demobilization	1	LS	$ -	10% New Subtotal	$ 113,000
						$ 1,246,648

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