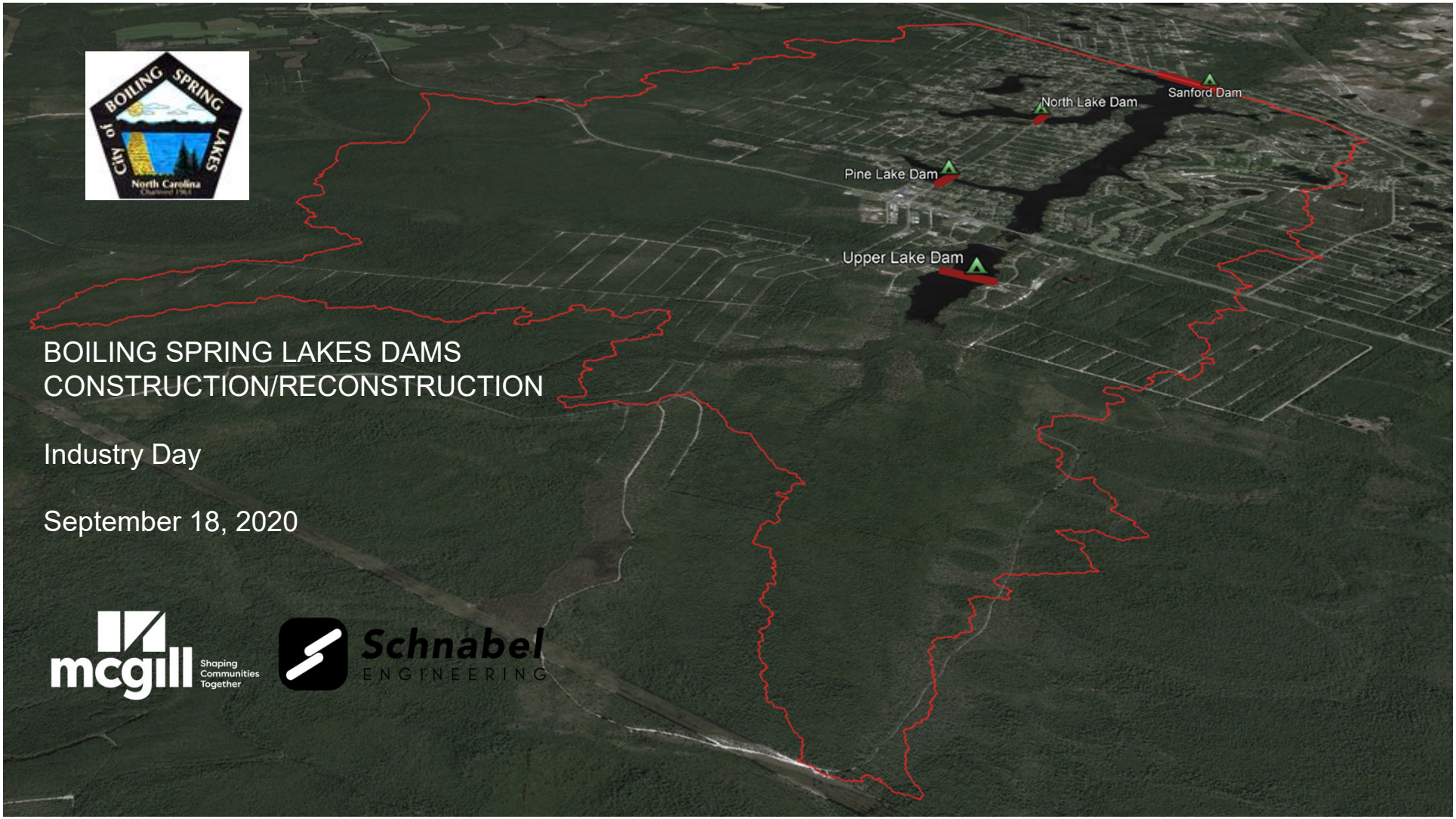


BOILING SPRING LAKES DAMS CONSTRUCTION/RECONSTRUCTION

Industry Day

September 18, 2020

mcgill Shaping Communities Together

Schnabel ENGINEERING

Introductory Remarks

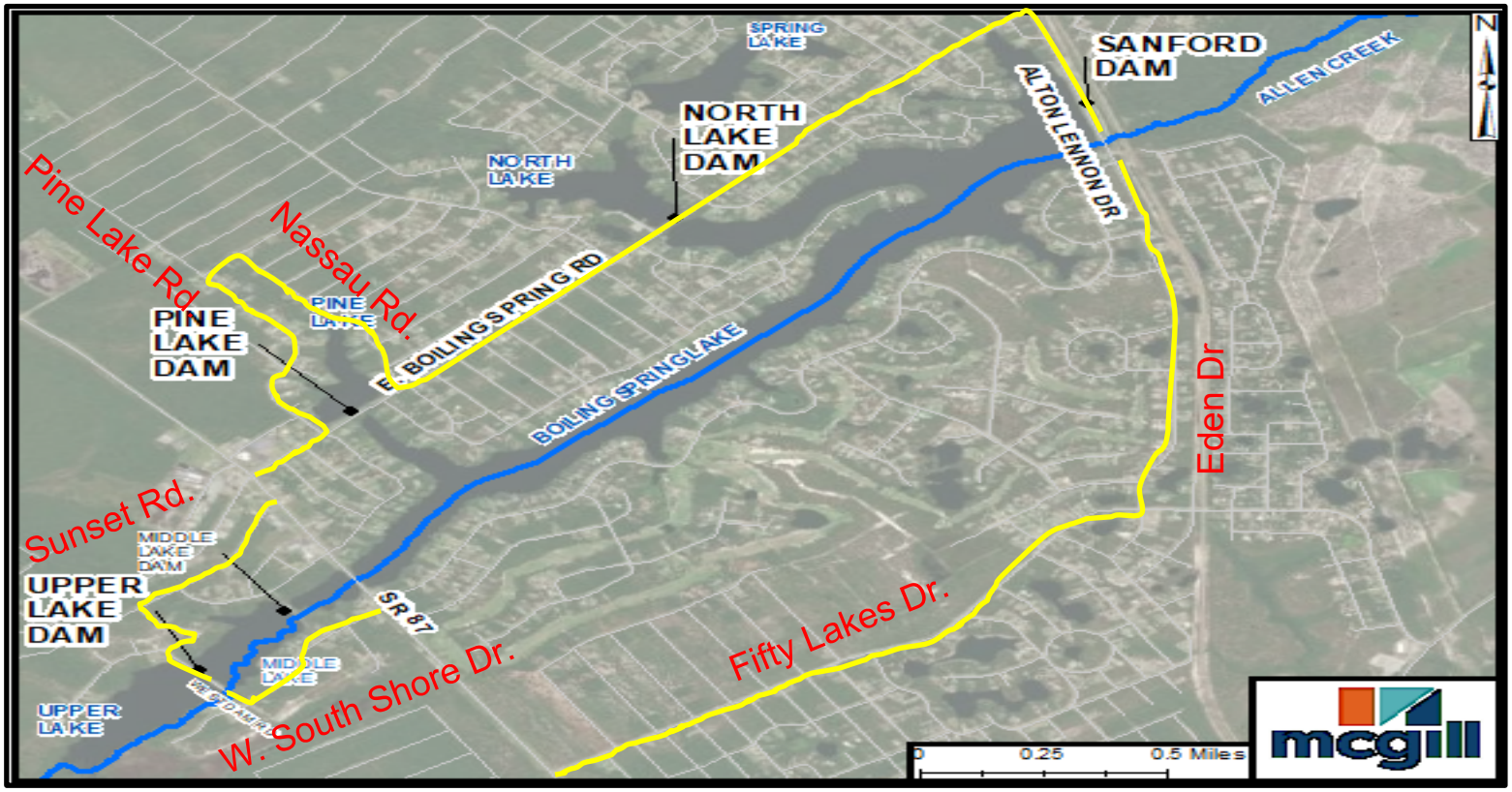
- Reconstruction of four dams that breached during Hurricane Florence
- All information, questions and discussions from today's event are public information
- All design schematics shown in the presentation are based on the 60% design and are subject to change.
- A Geotechnical Data Report is available for download on the City website

Today's Schedule
Presentation: 7:45 - 9 AM.
ULD test pit/site visit 9:15 - 9:45 AM.
PLD site visit 10 - 10:30 AM
NLD site visit 10:45 - 11:15 AM.
SD test pit/site visit 11:30 AM - 12:30 PM

Owner and Design Team

- **Owner:** City of Boiling Spring Lakes
  Representative: Jeffery Repp, City Manager
- **Design Team**:
  - McGill Associates, PA
    Representatives: Michael Hanson, PE, LEED AP, Project Manager
    Michael Norton, PE, Client Manager
  - Schnabel Engineering South, PC
    Representative: Adam Paisley, PE, Project Manager
    Tom Fitzgerald, PE, Project Director

Potential Maintenance of Traffic Routes



Major Elements

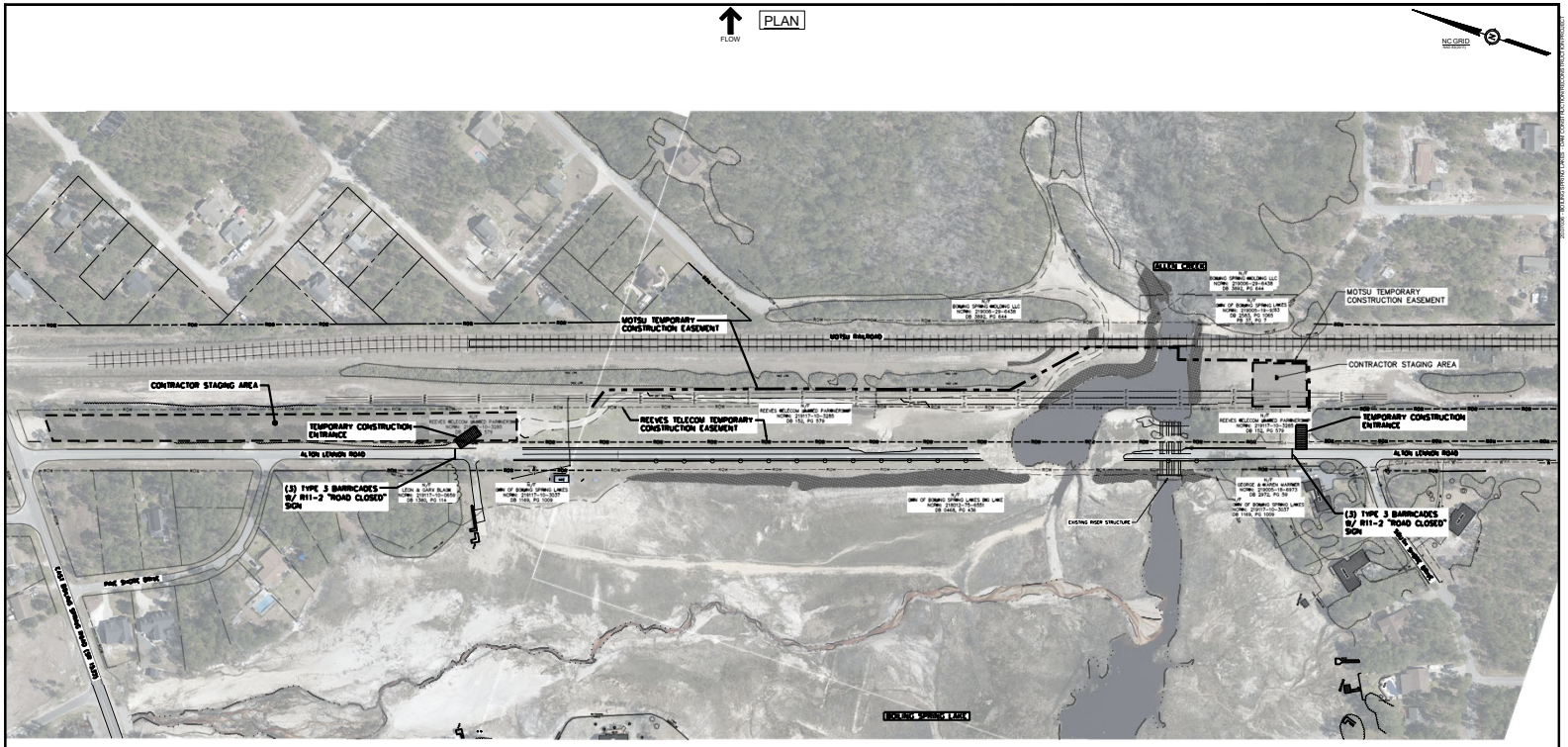
- Mobilization and temporary construction facilities
- Road closures and traffic controls, including acquisition of related permits
- Power and telecom utility relocation/coordination
- Erosion and sediment control
- Control of water (stream diversion using cofferdams over 10 feet high)
- Demolition
- Cast-in-place concrete riser and box culvert spillways (4,000 cubic yards (CY) of structural concrete)
- Approximately 98,000 CY of bulk excavation

Major Elements

- Embankment Construction including core materials, drains and filters (~110,000 CY of earthfill placement and ~7,400 CY of drainfill)
- Construction of deep mixing panels, including soilcrete mix design, design and installation of temporary work platforms, demonstration panels, sampling and laboratory testing (~26,000 CY of soilcrete)
- Roadway reconstruction
- Sanford Dam only:
    - cutoff wall through the entire length 20 feet into the limestone rock (~80,000 square feet of wall profile area)
    - Installation of new instrumentation (structure monitoring points, vibrating wire piezometers, automated data collection and transmission equipment)

Sanford Dam

Sanford Dam Staging



60% DESIGN SET
- FOR REVIEW PURPOSES ONLY -
DO NOT USE FOR CONSTRUCTION

mcgill
712 Village Road SW
Suite 103
Shallotte, NC 28470
910.755.5872
NC Firm License # C-0459
mcgillassociates.com

PRELIMINARY

Schnabel ENGINEERING
LICENCE NUMBER C-2599
11A Oak Branch Drive / Greensboro, NC 27407
T/ 336-274-9456 F/ 336-274-9468 / schnabel-eng.com

NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHICSCALE 100 0 50 100 200 — DIVISION VALUE = 100 FEET

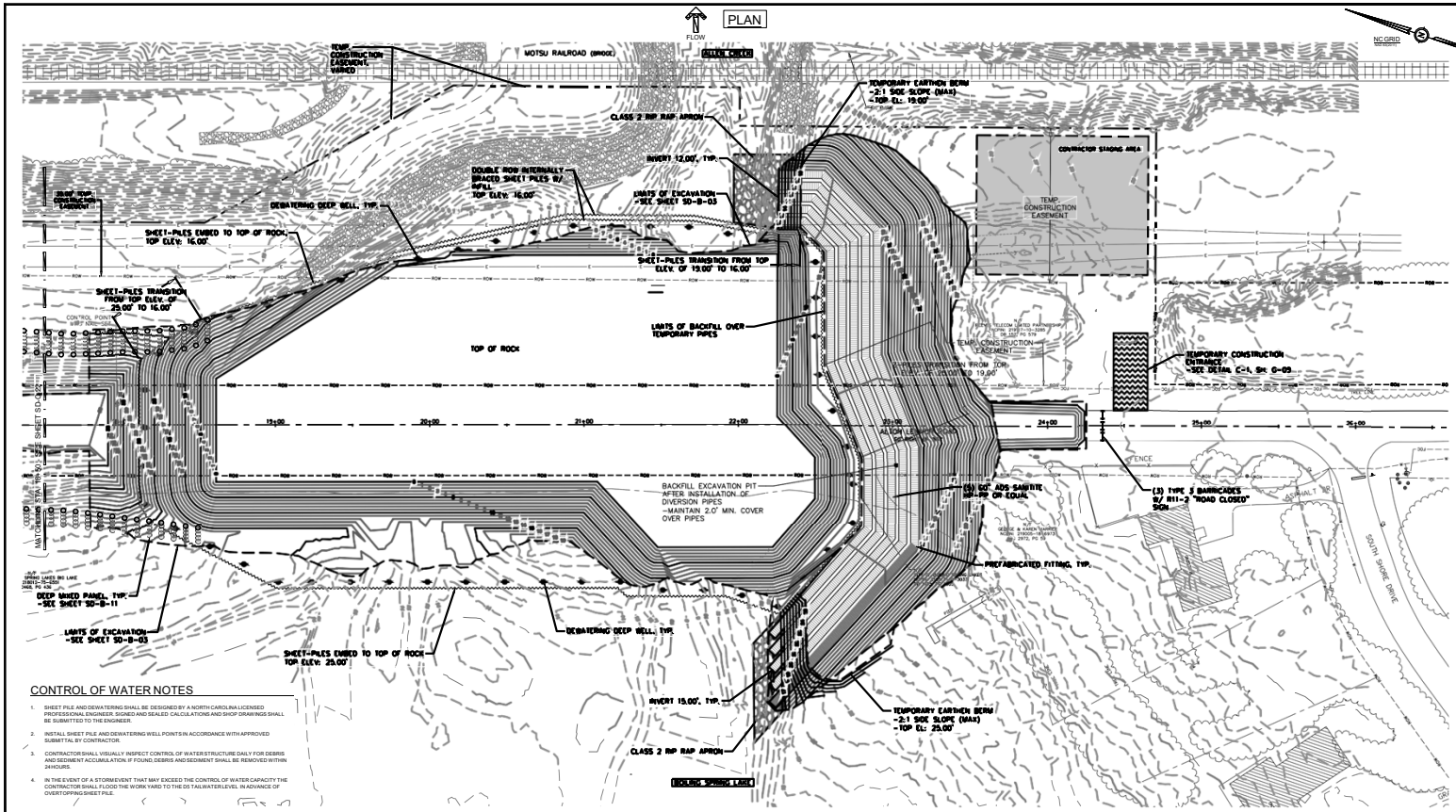
OFFICE MANAGER	DESIGNER
M. NORTON	S. MEEKINS
PROJECT MANAGER	REVIEWER
M. HANSON	M. HANSON

SITE ACCESS AND
TEMPORARY FACILITIES

DATE	PROJECT#	FUNDING#
JULY 17, 2020	20.07036	N/A

SHEET
SD-C-20

Sanford Dam Stage 1 Plan



CONTROL OF WATER NOTES

1. SHEET PILE AND DEWATERING SHALL BE DESIGNED BY A NORTH CAROLINA LICENSED PROFESSIONAL ENGINEER. SIGNED AND SEALED CALCULATIONS AND SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER.
2. INSTALL SHEET PILE AND DEWATERING WELL POINTS IN ACCORDANCE WITH APPROVED SUBMITTAL BY CONTRACTOR.
3. CONTRACTOR SHALL VISUALLY INSPECT CONTROL OF WATER STRUCTURE DAILY FOR DEBRIS AND SEDIMENT ACCUMULATION. IF FOUND, DEBRIS AND SEDIMENT SHALL BE REMOVED WITHIN 24 HOURS.
4. IN THE EVENT OF A STORM EVENT THAT MAY EXCEED THE CONTROL OF WATER CAPACITY THE CONTRACTOR SHALL FLOOD THE WORK YARD TO THE DS TAILWATER LEVEL IN ADVANCE OF OVERTOPPING SHEET PILE.

CONTROL OF WATER AND EROSION CONTROL PLAN LEGEND

COFFERDAM (SHEET PILES)

DEWATERING DEEP WELL

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NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

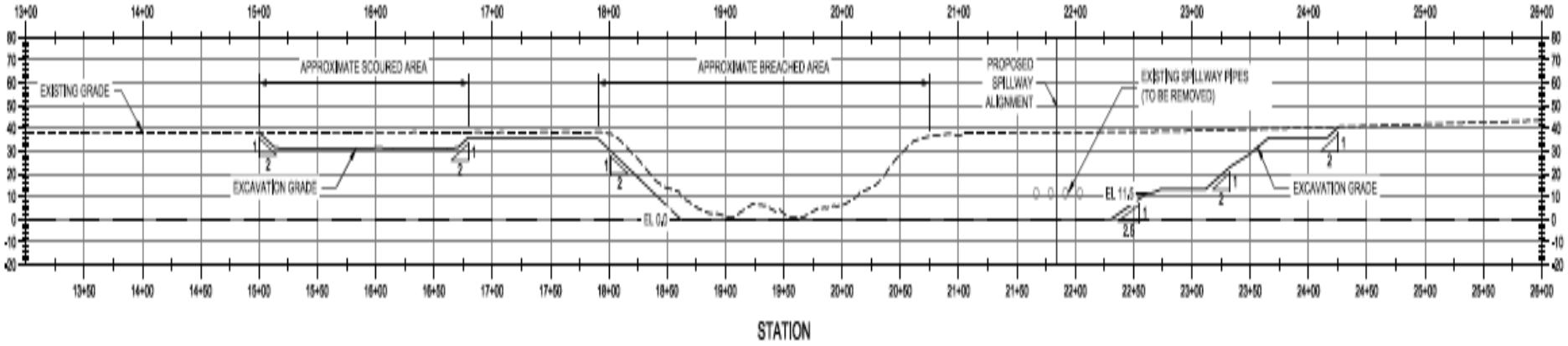
GRAPHICSCALE — DIVISION VALUE = 30 FEET

STAGE 1 EROSION AND SEDIMENTATION CONTROL PLAN
3 OF 3

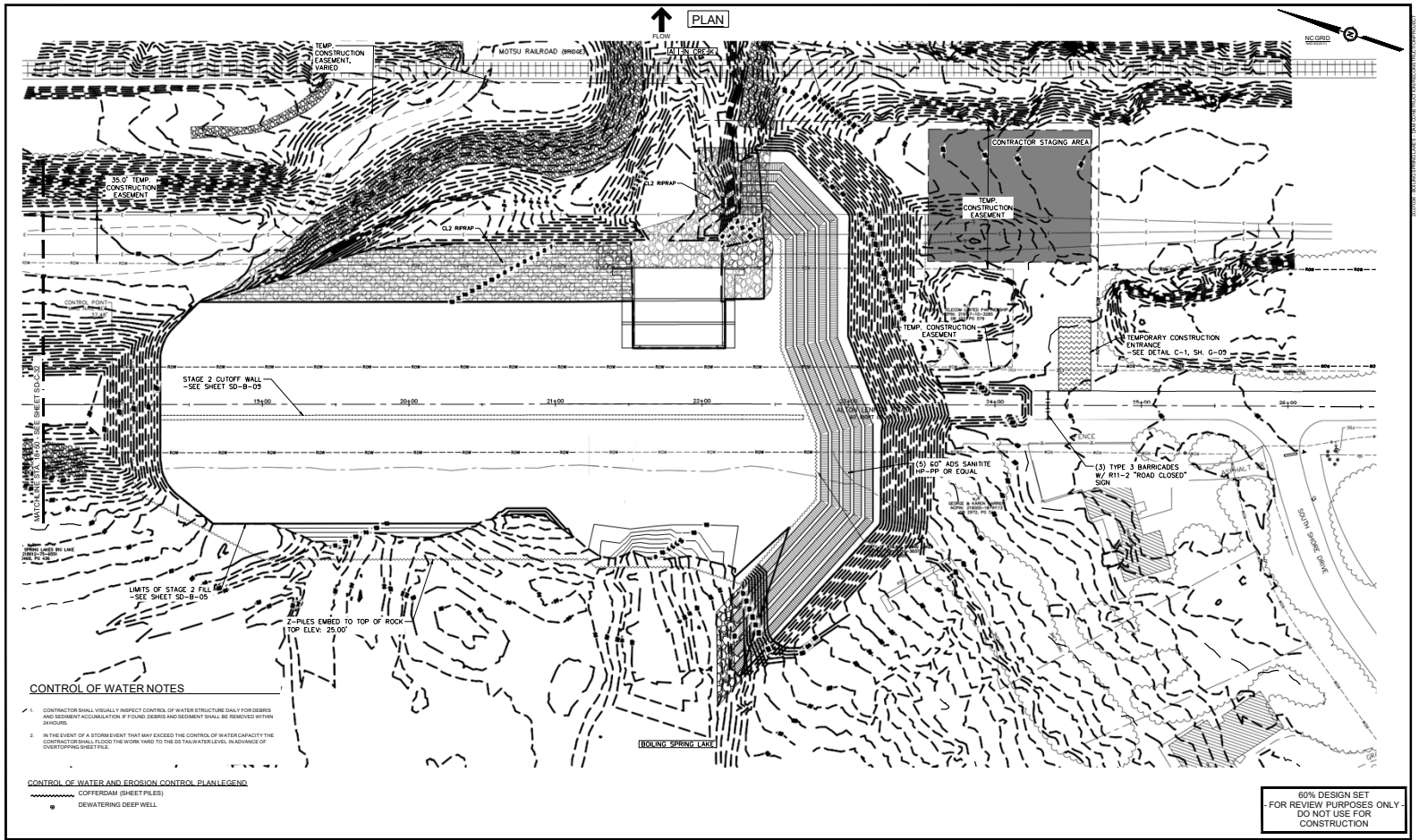
OFFICE MANAGER	DESIGNER			
M. NORTON	S. MEEKINS			
PROJECT MANAGER	REVIEWER	DATE	PROJECT#	FUNDING#
M. HANSON	M. HANSON	JULY 17, 2020	20.07036	N/A

SHEET
SD-C-23

Sanford Dam
Stage 1 Profile



Sanford Dam Stage 2 Plan



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CONTROL OF WATER AND EROSION CONTROL PLAN LEGEND

COFFERDAM (SHEET PILES)

DEWATERING DEEP WELL

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NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

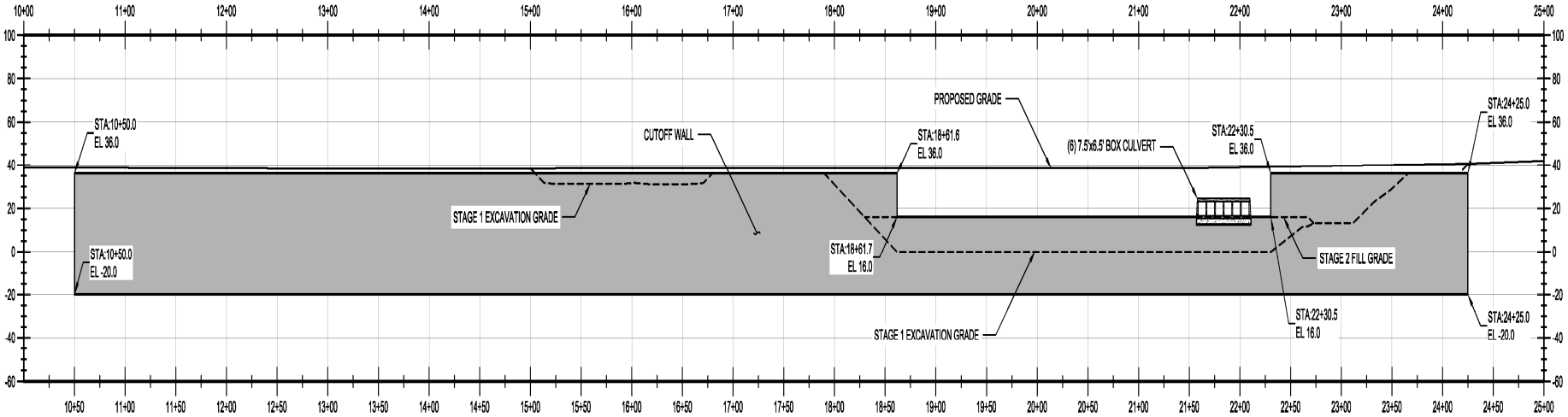
GRAPHIC SCALE: 30 0 15 30 60 — DIVISION VALUE = 30 FEET

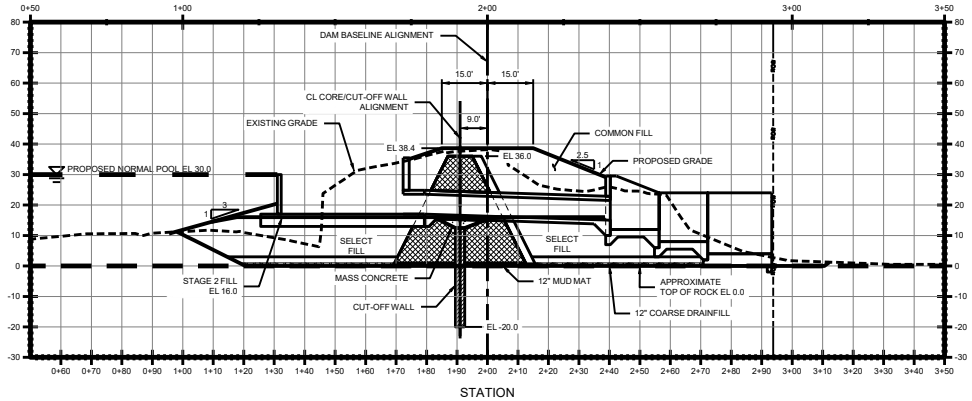
OFFICE MANAGER	DESIGNER
M. NORTON	S. MEEKINS
PROJECT MANAGER	REVIEWER
M. HANSON	M. HANSON

STAGE 2 EROSION AND SEDIMENTATION CONTROL PLAN
3 OF 3

DATE	PROJECT#	FUNDING#
JULY 17, 2020	20.07036	N/A

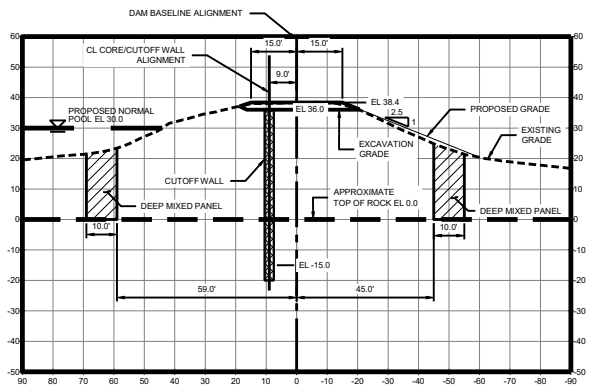
SHEET
SD-C-33


STA:10+50.0
EL 36.0
STA:10+50.0
EL -20.0
CUTOFF WALL
STAGE 1 EXCAVATION GRADE
STA:18+61.6
EL 36.0
STA:18+61.7
EL 16.0
PROPOSED GRADE
(6) 7.5'x6.5' BOX CULVERT
STAGE 1 EXCAVATION GRADE
STA:22+30.5
EL 36.0
STAGE 2 FILL GRADE
STA:22+30.5
EL 16.0
STA:24+25.0
EL 36.0
STA:24+25.0
EL -20.0



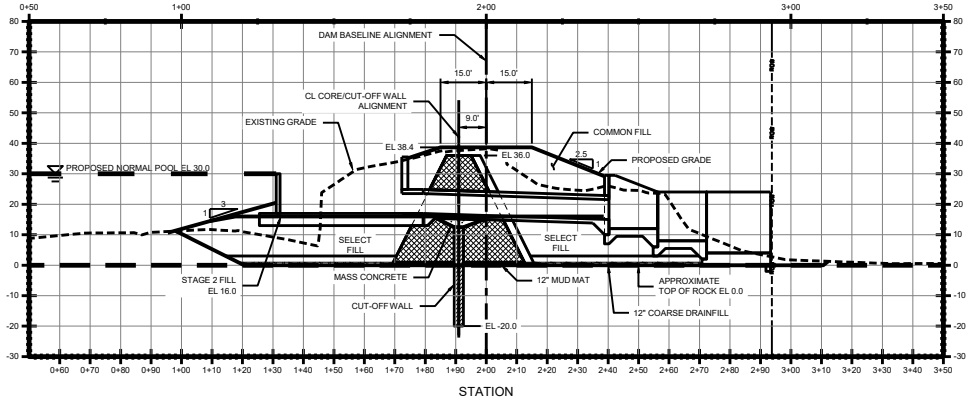
FLOW

1 TYPICAL SECTION THROUGH PROPOSED SPILLWAY ALINGMENT



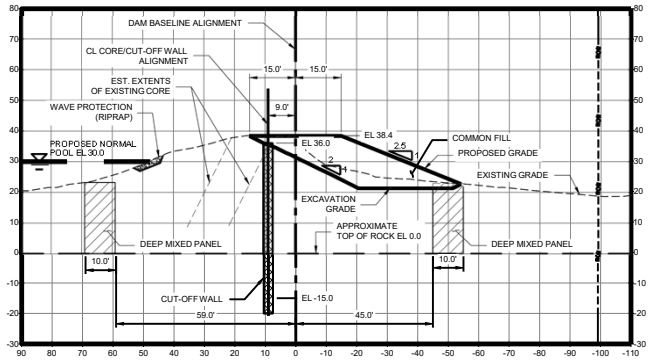
FLOW

3 TYPICAL EMBANKMENT SECTION



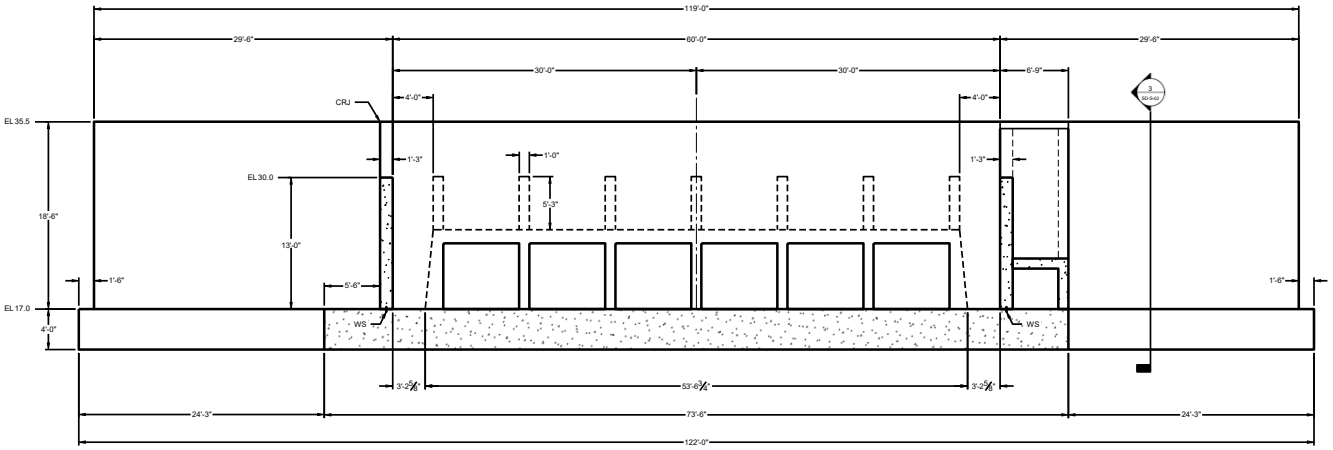
FLOW

1 TYPICAL SECTION THROUGH PROPOSED SPILLWAY ALINGMENT



FLOW

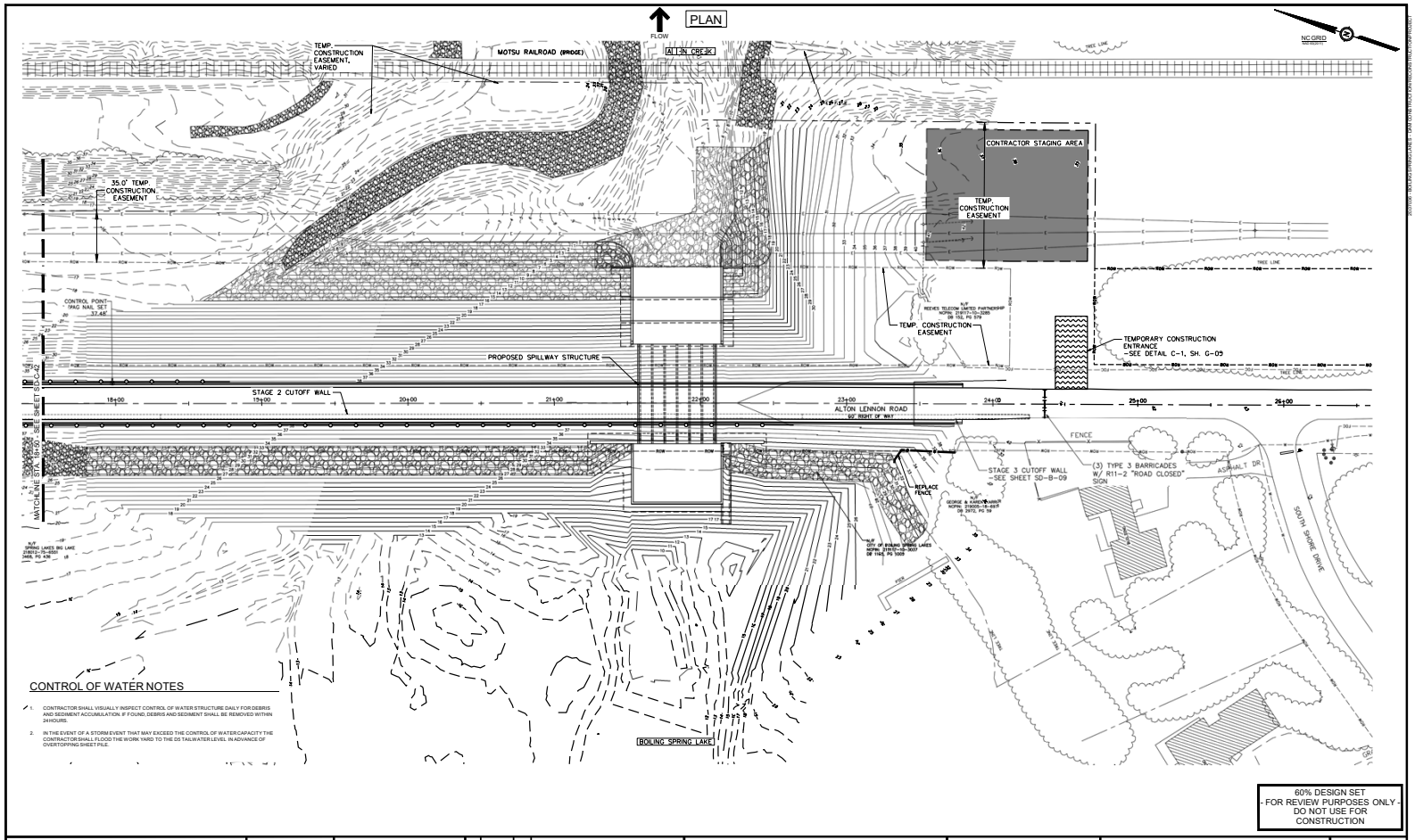
2 TYPICAL SECTION THROUGH SCOURED AREA



1 INLET HEADWALL ELEVATION

SCALE: 3/16"=1'0"

Sanford Dam Stage 3 Plan



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mcgillassociates.com

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T: 336-274-9456 F: 336-274-9468 / schnabel-eng.com

NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT
BOILING SPRING LAKES
BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHICSCALE 30 0 15 30 60 — DIVISION VALUE = 30 FEET

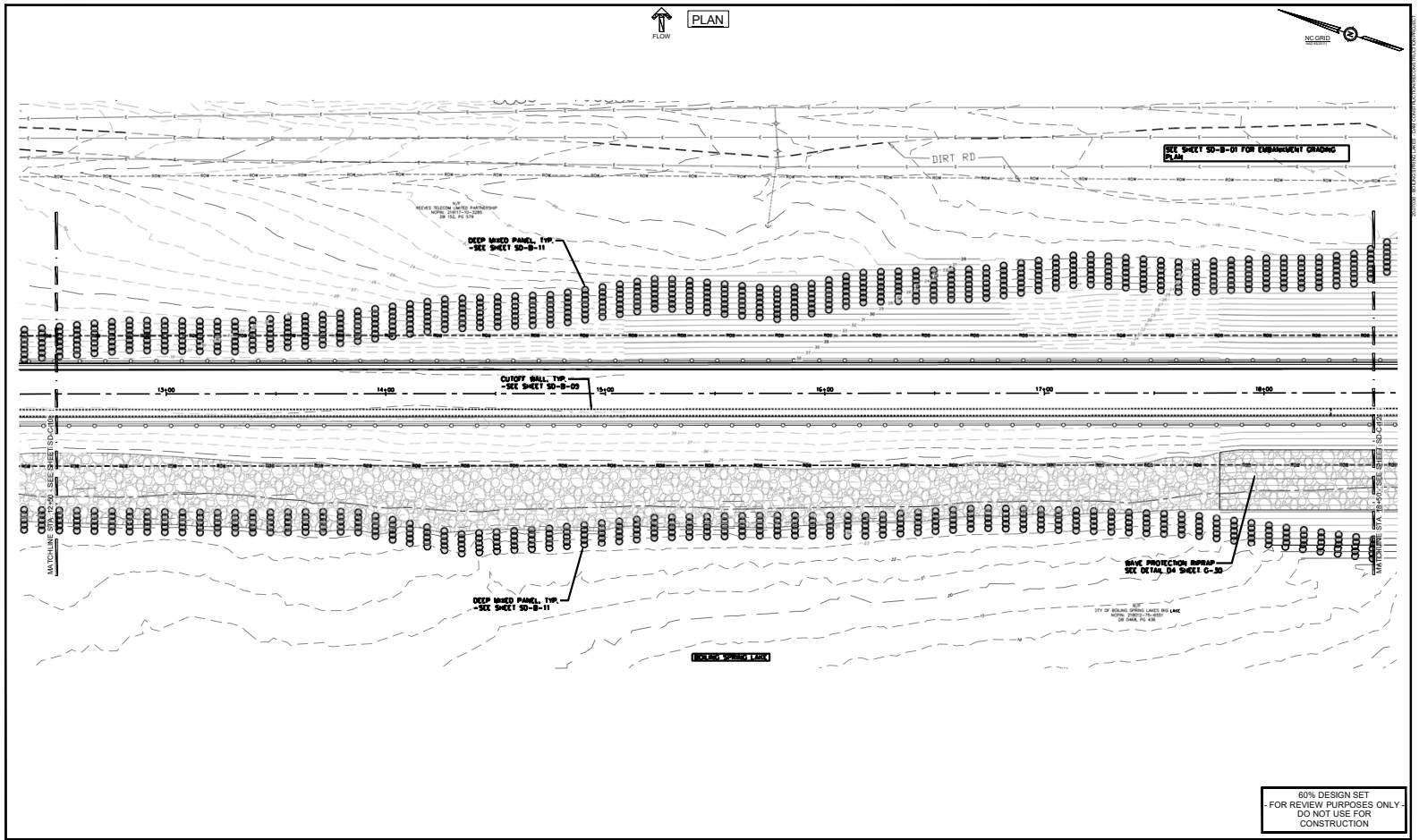
STAGE 3 EROSION AND SEDIMENTATION CONTROL PLAN
3 OF 3

OFFICE MANAGER	DESIGNER			
M. NORTON	S. MEEKINS			
PROJECT MANAGER	REVIEWER	DATE	PROJECT#	FUNDING#
M. HANSON	M. HANSON	JULY 17, 2020	20.07036	N/A

SHEET
SD-C-43

Sanford Dam

Stage 3 Plan



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NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHICSCALE 20 0 10 20 40 — DIVISION VALUE = 20 FEET

OFFICE MANAGER	DESIGNER
M. NORTON	S. MEEKINS
PROJECT MANAGER	REVIEWER
M. HANSON	M. HANSON

FINAL SITE PLAN STA. 12+50 - STA. 18+50

DATE	PROJECT#	FUNDING#
JULY 17, 2020	20.07036	N/A

SHEET

SD-C-11

Upper Lake Dam

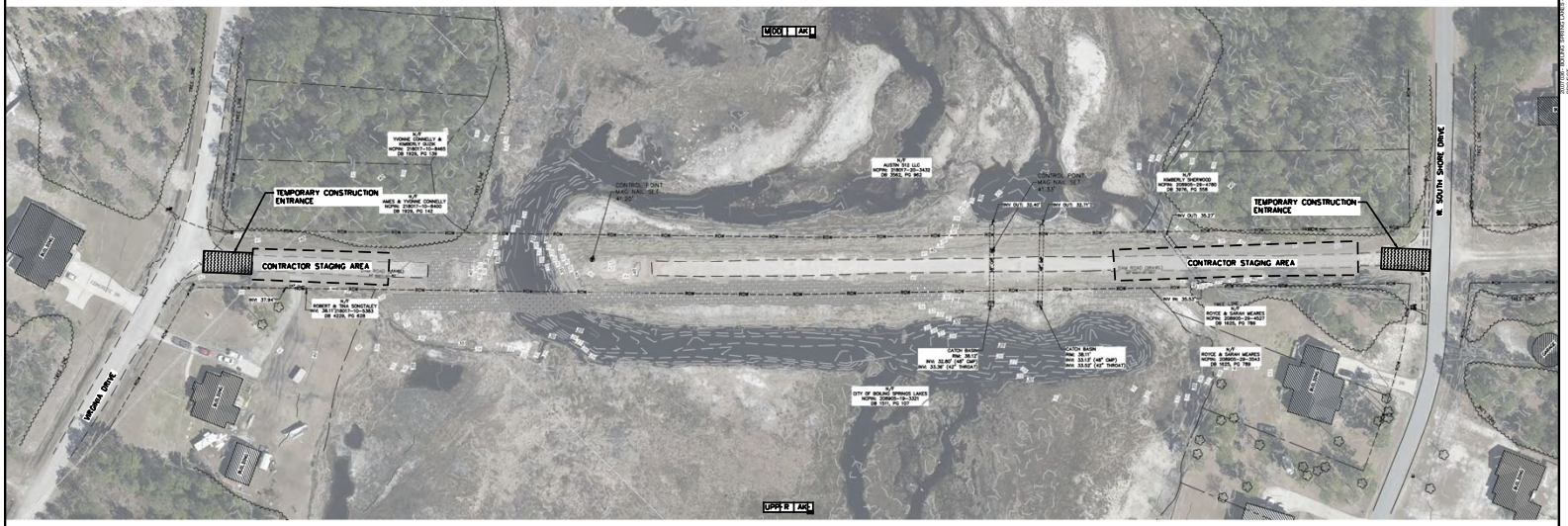
Upper Lake Dam

Staging

PLAN

FLOW

NC GRID



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NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHIC SCALE: 50 0 25 50 100 — DIVISION VALUE = 50 FEET

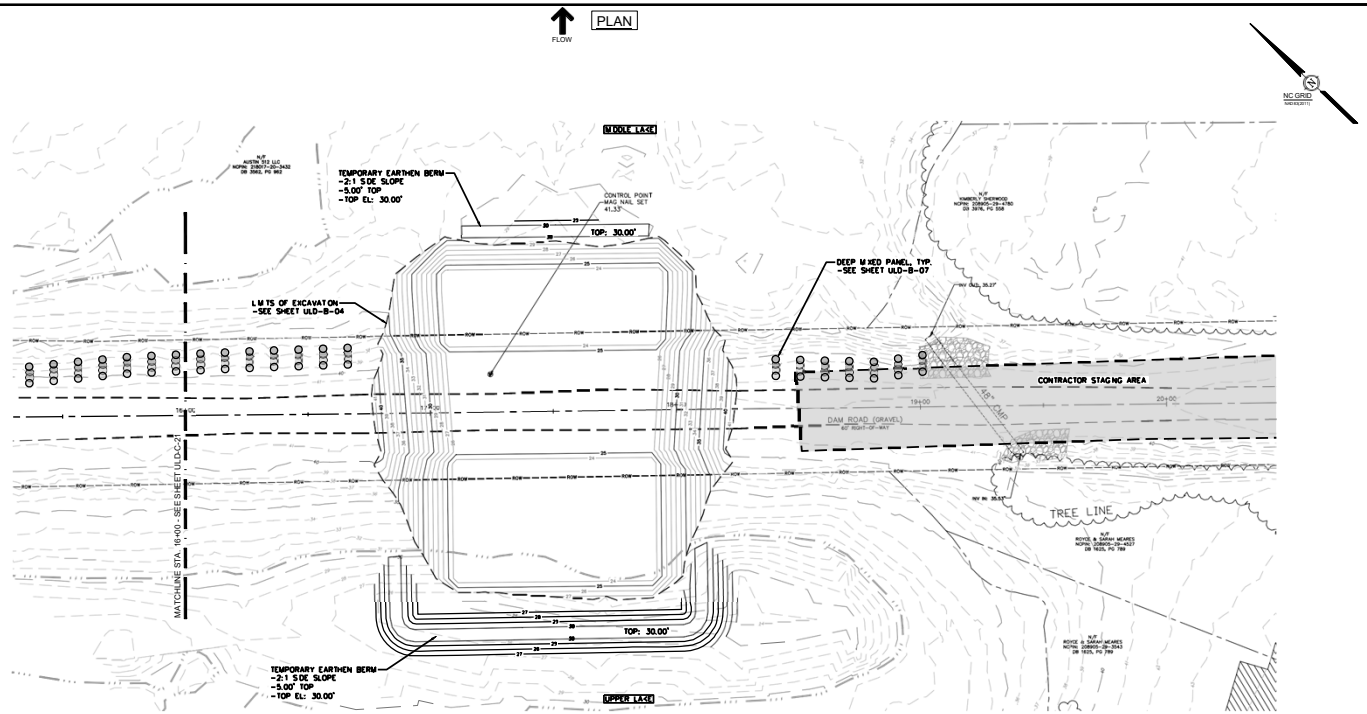
SITE ACCESS AND
TEMPORARY FACILITIES

OFFICE MANAGER	DESIGNER			
M. NORTON	S. MEEKINS			
PROJECT MANAGER	REVIEWER	DATE	PROJECT #	FUNDING #
M. HANSON	M. HANSON	JULY 17, 2020	20.07036	N/A

SHEET
ULD-C-20

Upper Lake Dam

Stage 1 Plan



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NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

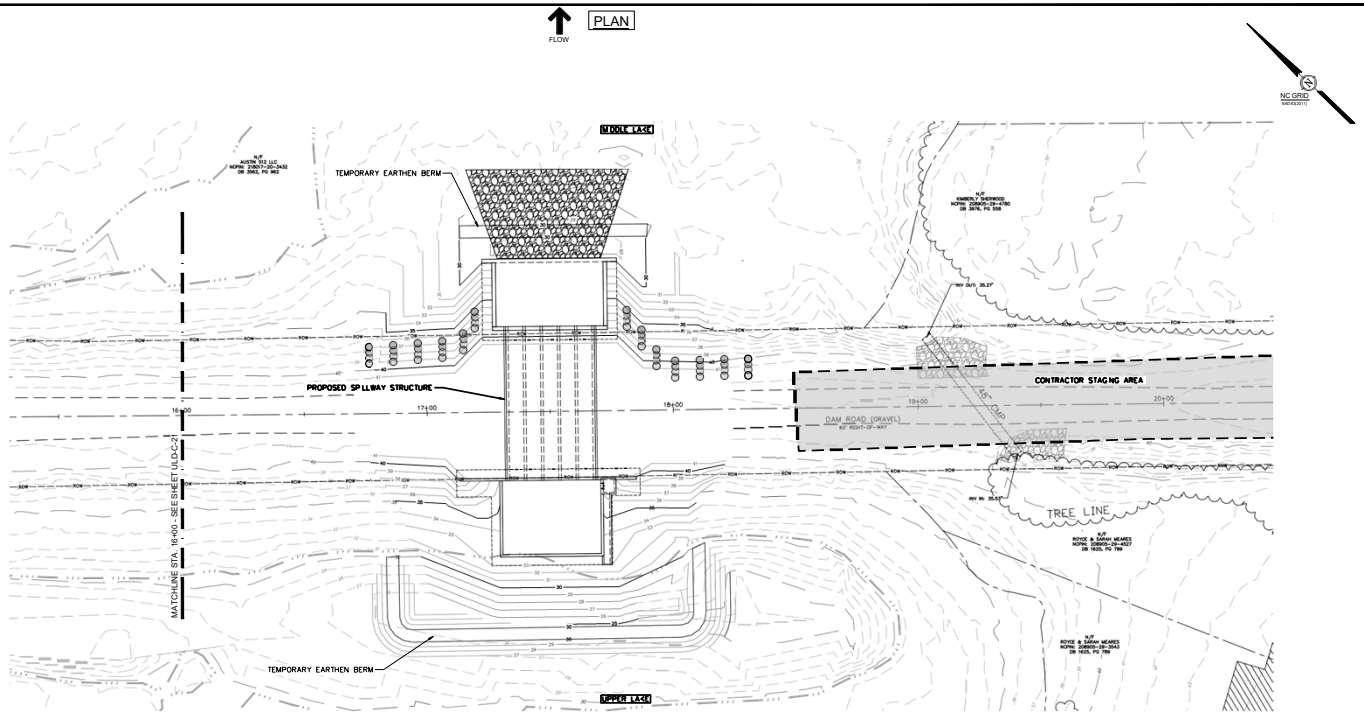
GRAPHIC SCALE: 20 0 10 20 40 — DIVISION VALUE = 20 FEET

OFFICE MANAGER	DESIGNER			
M. NORTON	S. MEEKINS			
PROJECT MANAGER	REVIEWER	DATE	PROJECT #	FUNDING #
M. HANSON	M. HANSON	JULY 17, 2020	20.07036	N/A

STAGE 1 EROSION AND SEDIMENTATION CONTROL PLAN
2 OF 2

SHEET
ULD-C-22

Upper Lake Dam Stage 2 Plan



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NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

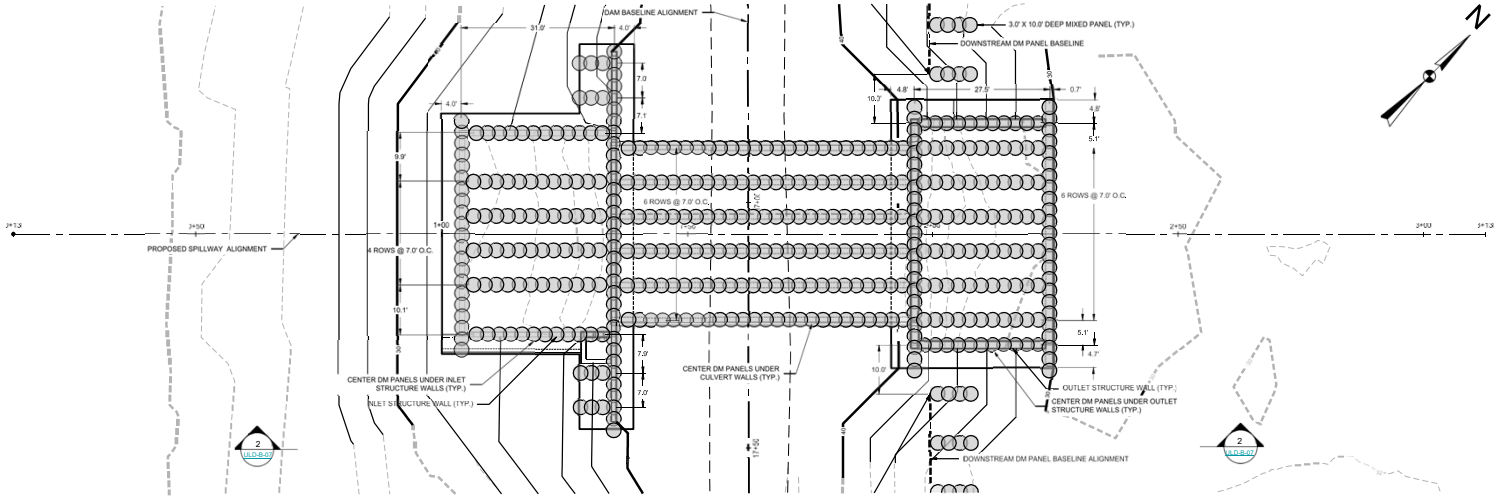
BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHIC SCALE: 20 0 10 20 40 — DIVISION VALUE = 20 FEET

OFFICE MANAGER	DESIGNER			
M. NORTON	S. MEEKINS			
PROJECT MANAGER	REVIEWER	DATE	PROJECT #	FUNDING #
M. HANSON	M. HANSON	JULY 17, 2020	20.07036	N/A

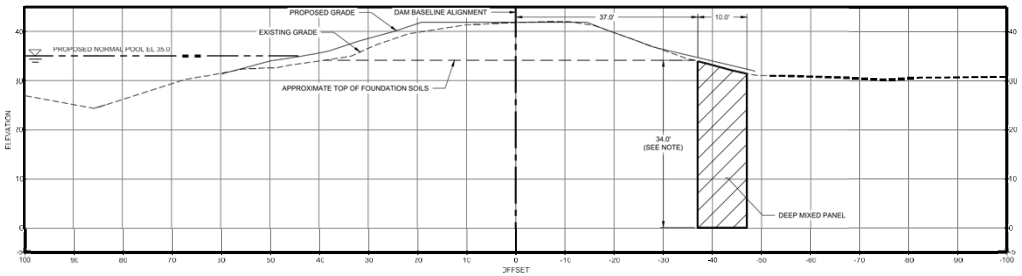
STAGE 2 EROSION AND SEDIMENTATION CONTROL PLAN
2 OF 2

SHEET
ULD-C-32



FLOW

1 UPPER LAKE DAM PROPOSED SPILLWAY DEEP MIXED PANELS PLAN VIEW



FLOW

2 UPPER LAKE DAM PROPOSED EMBANKMENT DEEP MIXED PANELS SECTION STATION 17+50

NOTE: DEEP MIXED PANEL SHALL EXTEND TO A DEPTH OF 34 FEET. BELOW TOP OF FOUNDATION SOILS OR TO TOP OF ROCK.

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N	DA	R	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

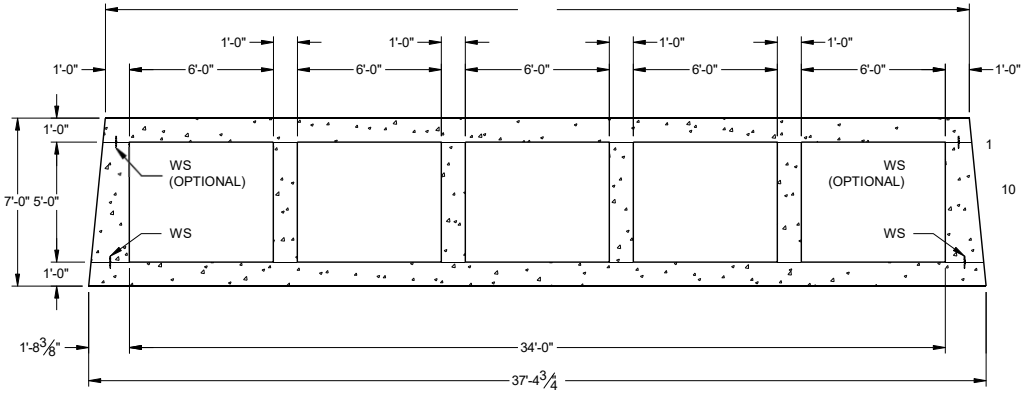
BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHIC SCALE — DIVISION VALUE = 10 FEET

OFFICE MANAGER	DESIGNER		
T. FITZGERALD	R. CALDERON		
PROJECT MANAGER	REVIEWER	DATE	PROJECT#	FUNDING#
A. PAISLEY	A. PAISLEY	JULY 2020	19C21022	N/A

DEEP MIXED PANELS DETAILS

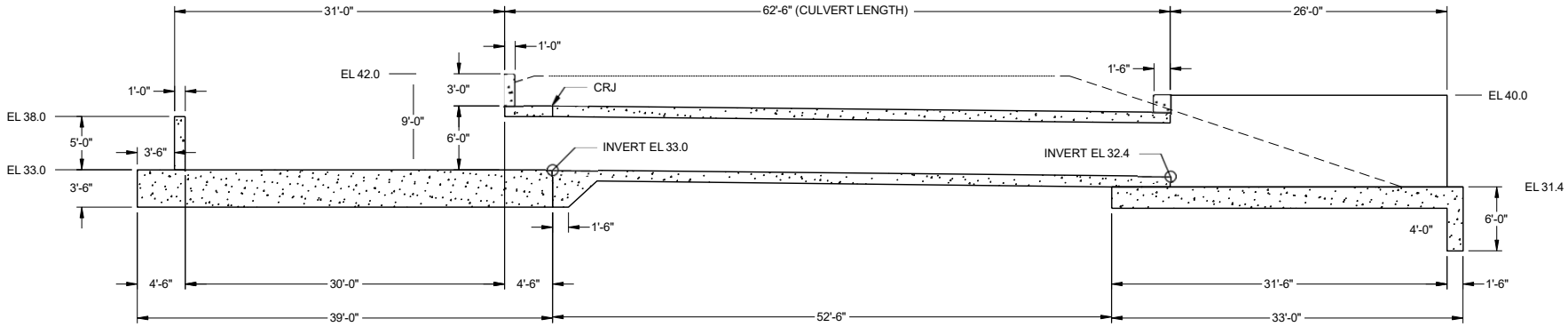
SHEET
ULD-B-07



NOTE: WATERSTOP (WS) SPECIFIED AS OPTIONAL MAY BE DELETED IF EXTERIOR WALLS AND TOP SLAB ARE CAST MONOLITHIC.

3 BOX CULVERT SECTION

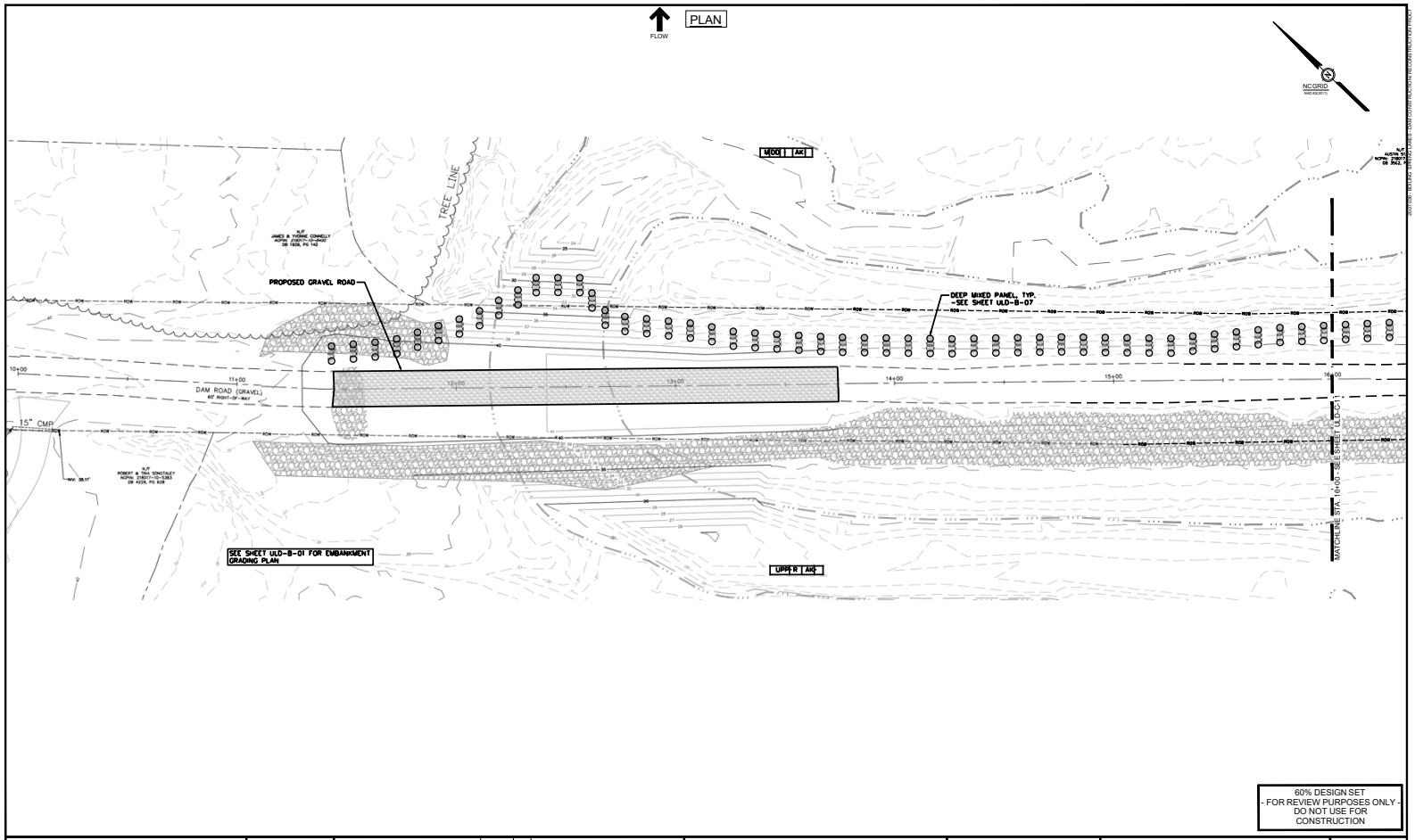
SCALE: 1/4"=1'0"



2 UPPER LAKE DAM ELEVATION

SCALE: 1/8"=1'0"

Upper Lake Dam Stage 3/4 Plan



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NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHIC SCALE: 20 0 10 20 40 — DIVISION VALUE = 20 FEET

OFFICE MANAGER	DESIGNER
M. NORTON	S. MEEKINS
PROJECT MANAGER	REVIEWER
M. HANSON	M. HANSON

FINAL SITE PLAN STA. 10+00 - STA. 16+00

DATE	PROJECT #	FUNDING #
JULY 17, 2020	20.07036	N/A

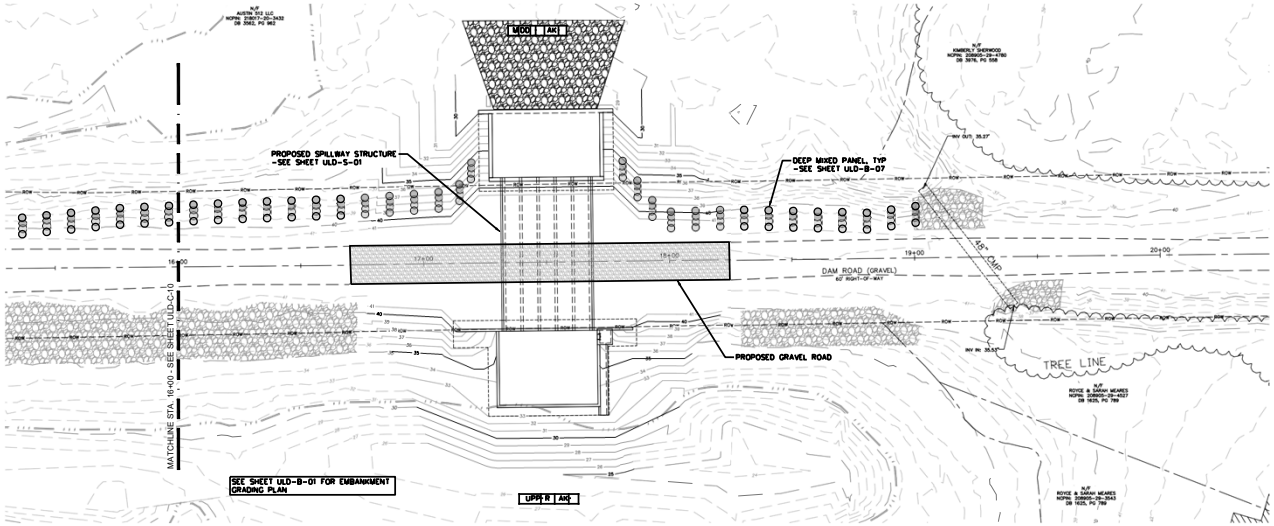
SHEET
ULD-C-10

Upper Lake Dam

Stage 3/4 Plan

PLAN

FLOW



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NC Firm License # C-0459
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LICENCE NUMBER C-2599
11A Oak Branch Drive / Greensboro, NC 27407
T: 336-274-9458 F: 336-274-9466 / schnabel-eng.com

NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHIC SCALE: 20 0 10 20 40 — DIVISION VALUE = 20 FEET

FINAL SITE PLAN STA. 16+00 - STA. 20+00

OFFICE MANAGER	DESIGNER			
M. NORTON	S. MEEKINS			
PROJECT MANAGER	REVIEWER	DATE	PROJECT #	FUNDING #
M. HANSON	M. HANSON	JULY 17, 2020	20.07036	N/A

SHEET

ULD-C-11

North Lake Dam

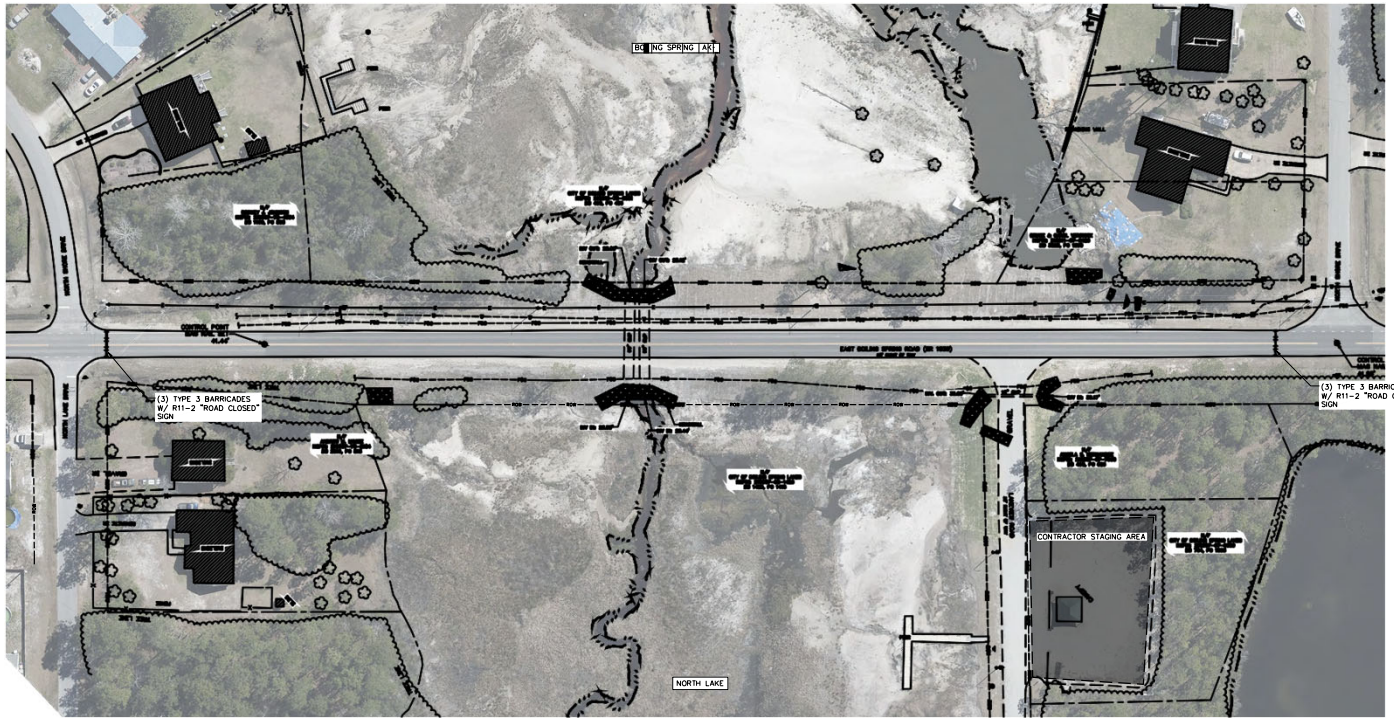
North Lake Dam

Staging

PLAN

FLOW

NC GRID



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N	DA	B	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHICSCALE 40 0 20 40 80
DIVISION VALUE = 40 FEET

OFFICE MANAGER	DESIGNER
M. NORTON	S. MEEKINS
PROJECT MANAGER	REVIEWER
M. HANSON	M. HANSON

SITE ACCESS AND
TEMPORARY FACILITIES

DATE	PROJECT#	FUNDING#
JULY 17, 2020	20.07036	N/A

SHEET

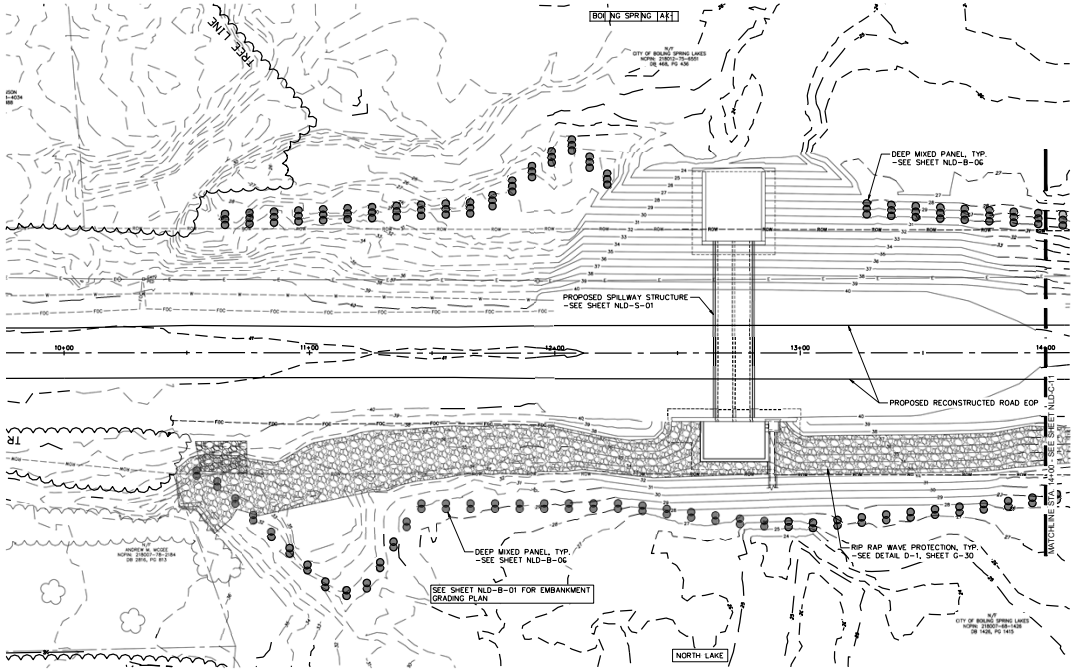
NLD-C-20

North Lake Dam

Left Abutment

PLAN

FLOW



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NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHICSCALE 20 0 10 20 40 — DIVISION VALUE = 20 FEET

OFFICE MANAGER	DESIGNER
M. NORTON	S. MEEKINS
PROJECT MANAGER	REVIEWER
M. HANSON	M. HANSON

FINAL SITE PLAN STA. 10+00 - STA. 14+00

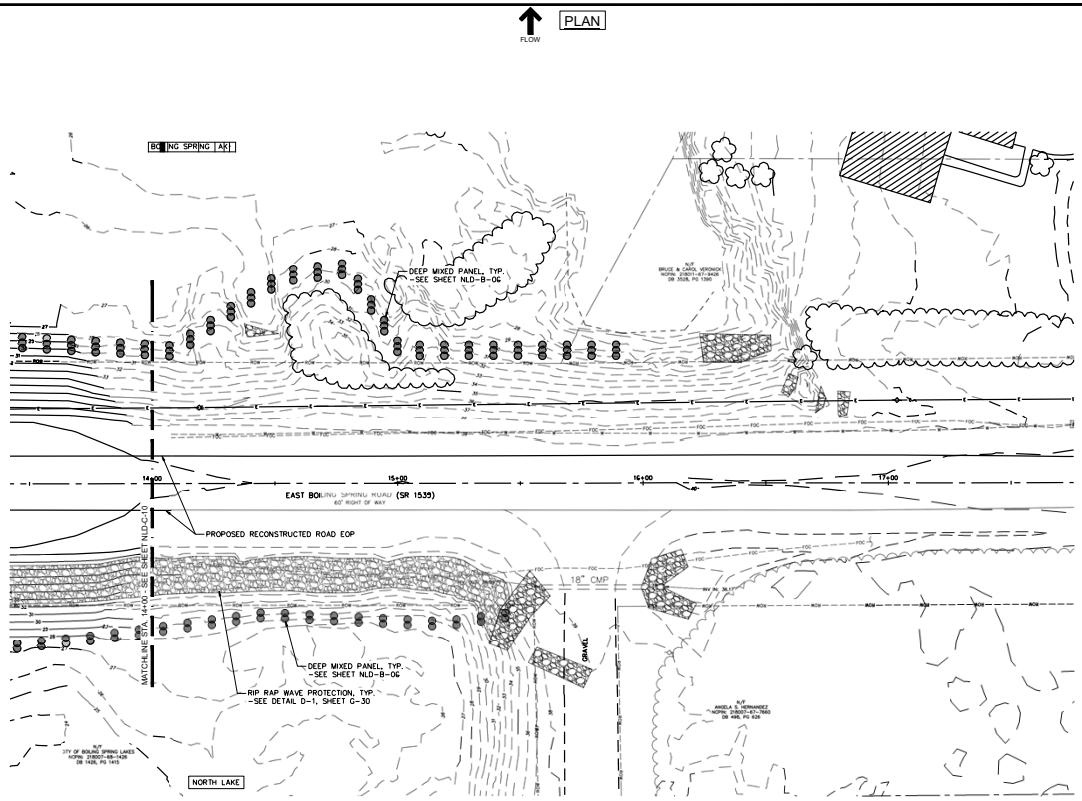
DATE	PROJECT#	FUNDING#
JULY 17, 2020	20.07036	N/A

SHEET

NLD-C-10

North Lake Dam

Right Abutment



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NO.	DATE	BY	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHICSCALE 20 0 10 20 40 — DIVISION VALUE = 20 FEET

OFFICE MANAGER	DESIGNER
M. NORTON	S. MEEKINS
PROJECT MANAGER	REVIEWER
M. HANSON	M. HANSON

FINAL SITE PLAN STA. 14+00 - STA. 17+50

DATE	PROJECT#	FUNDING#
JULY 17, 2020	20.07036	N/A

SHEET
NLD-C-11

Pine Lake Dam

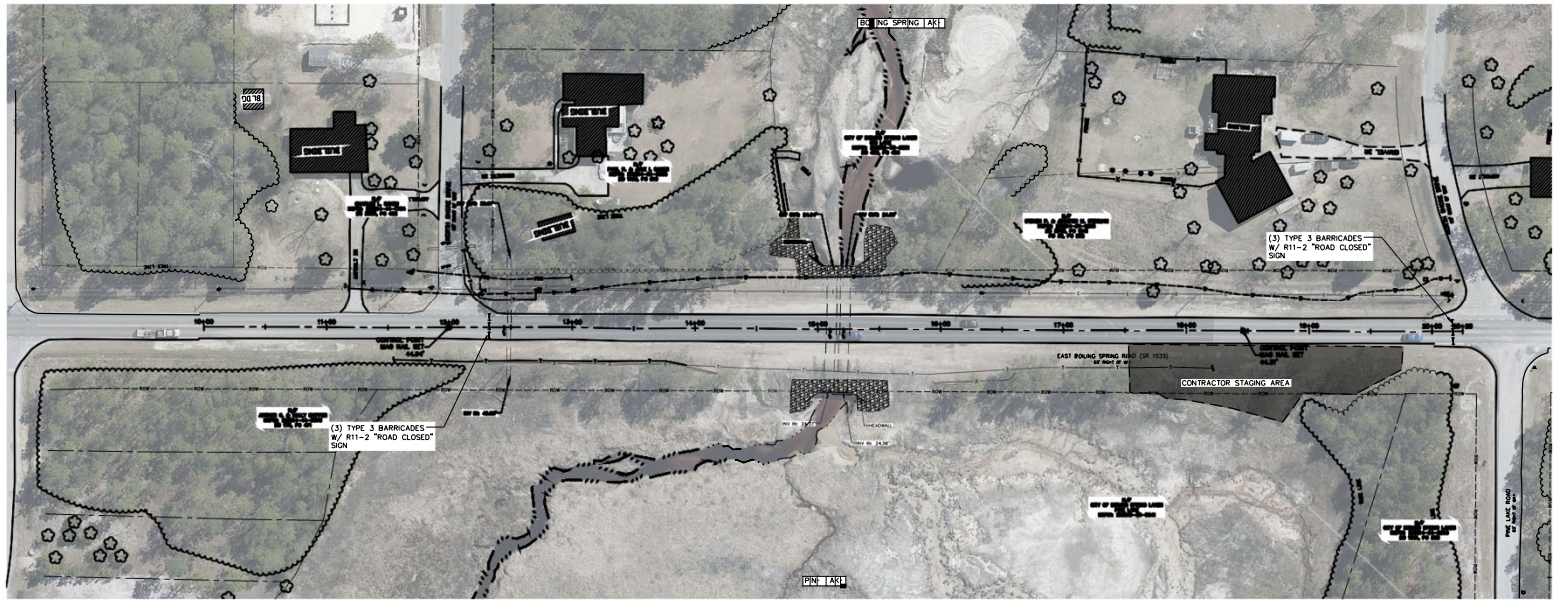
Pine Lake Dam

Staging

PLAN

FLOW

NC GRID



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N	DA	B	DESCRIPTION

DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHIC SCALE: 40 0 20 40 80 — DIVISION VALUE = 40 FEET

OFFICE MANAGER	M. NORTON
DESIGNER	S. MEEKINS
PROJECT MANAGER	M. HANSON
REVIEWER	M. HANSON

SITE ACCESS AND
TEMPORARY FACILITIES

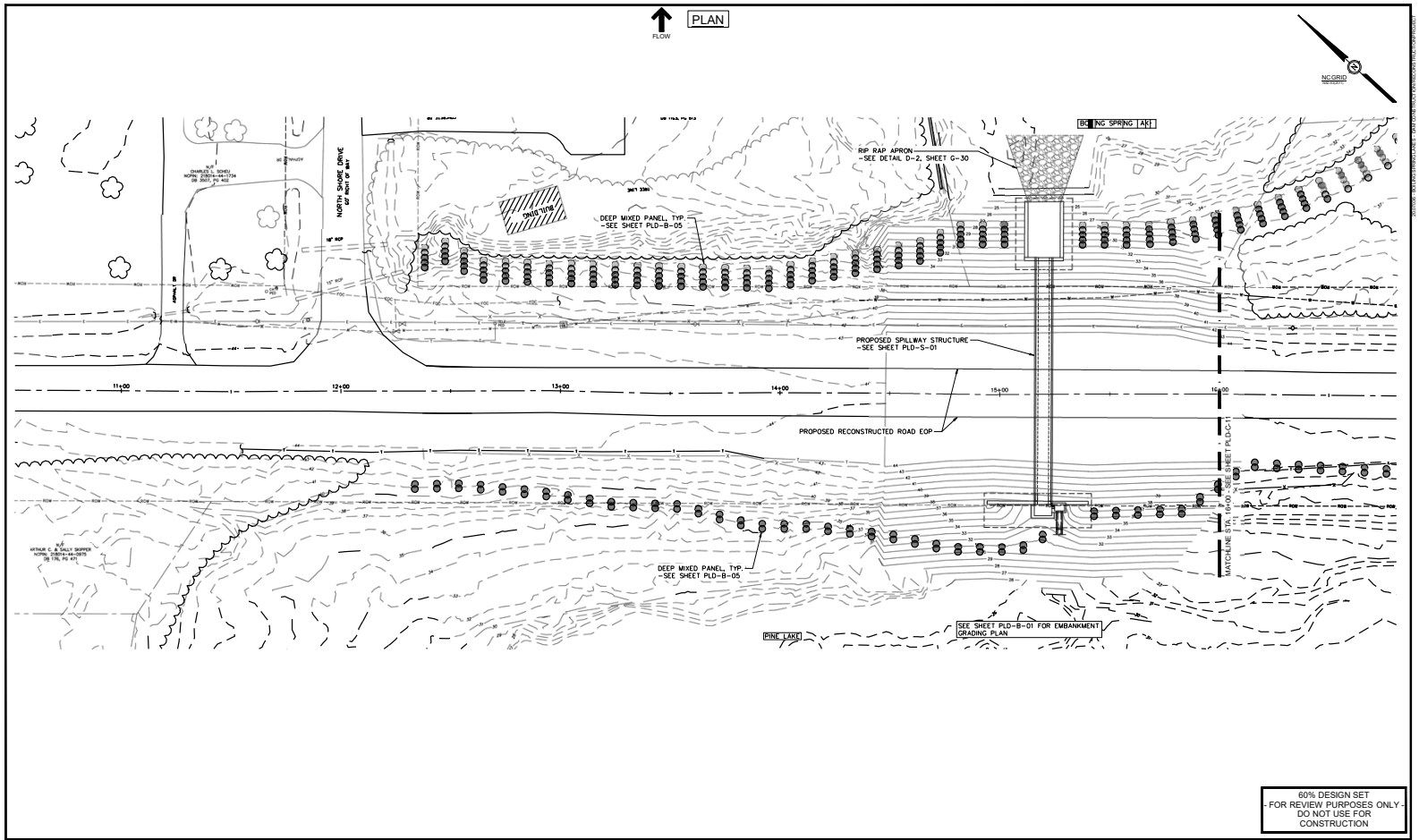
DATE	PROJECT#	FUNDING#
JULY 17, 2020	20.07036	N/A

SHEET

PLD-C-20

Pine Lake Dam

Left Abutment



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DAM CONSTRUCTION/
RECONSTRUCTION PROJECT

BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHICSCALE 20 0 10 20 40 — DIVISION VALUE = 20 FEET

OFFICE MANAGER	DESIGNER			
M. NORTON	S. MEEKINS			
PROJECT MANAGER	REVIEWER	DATE	PROJECT#	FUNDING#
M. HANSON	M. HANSON	JULY 17, 2020	20.07036	N/A

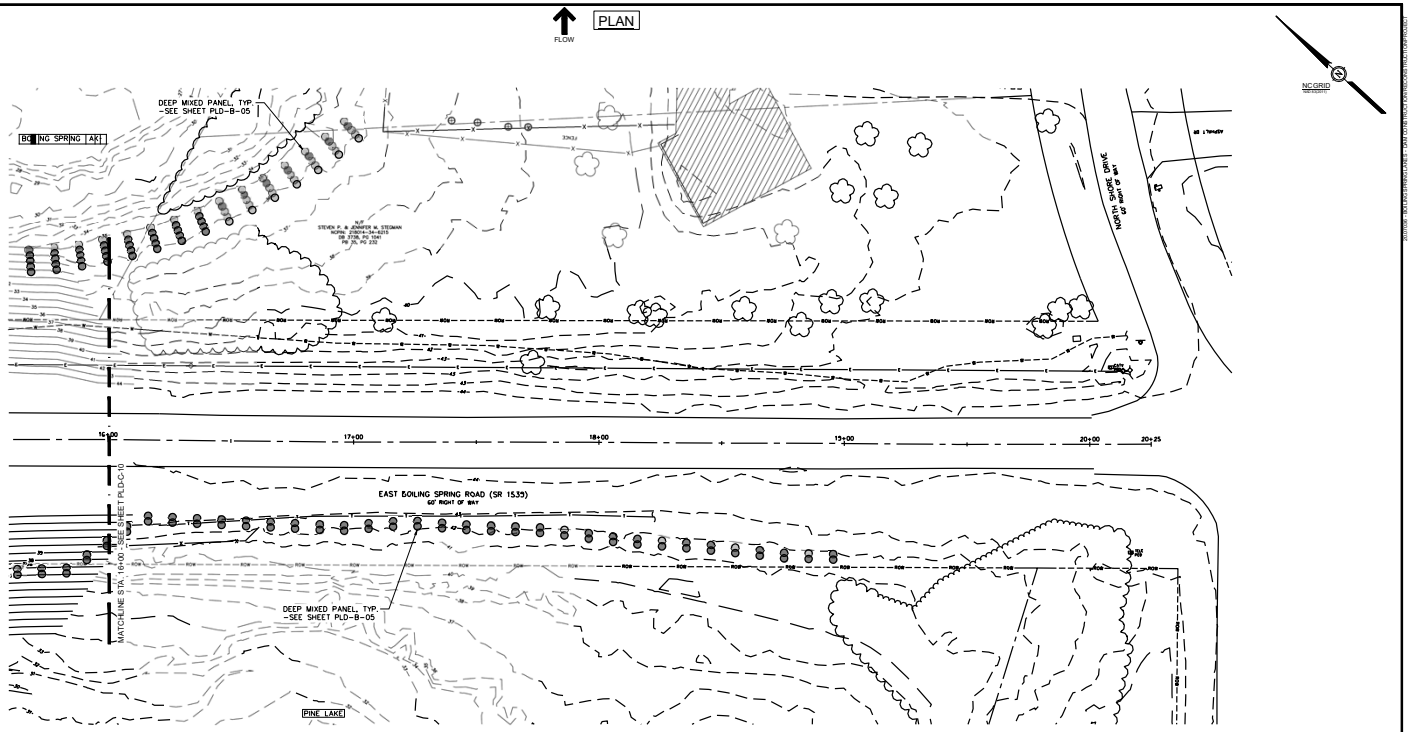
FINAL SITE PLAN STA. 11+00 - STA. 16+50

SHEET

PLD-C-10

Pine Lake Dam

Right Abutment



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BOILING SPRING LAKES

BRUNSWICK COUNTY, NORTH CAROLINA

GRAPHICSCALE 20 0 10 20 40 — DIVISION VALUE = 20 FEET

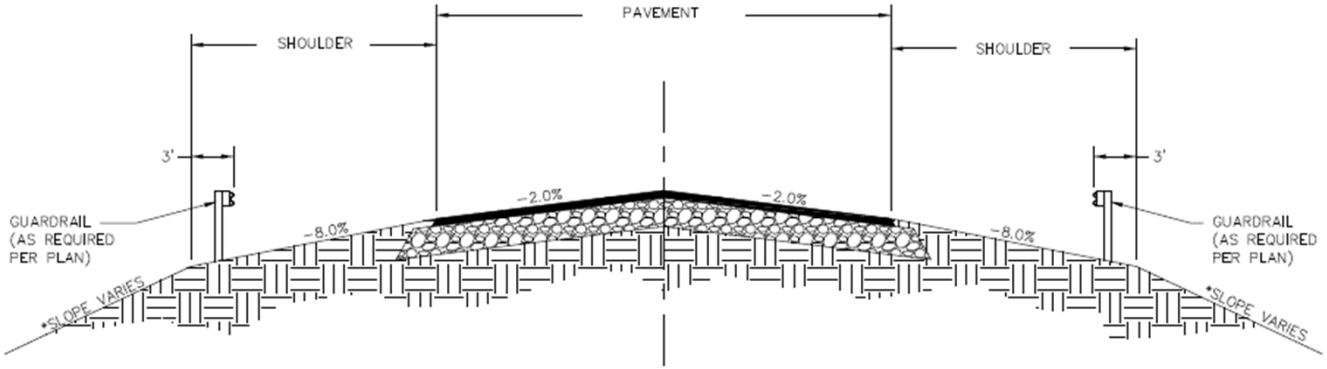
OFFICE MANAGER	DESIGNER		
M. NORTON	S. MEEKINS		
PROJECT MANAGER	REVIEWER	DATE	PROJECT#	FUNDING#
M. HANSON	M. HANSON	JULY 17, 2020	20.07036	N/A

FINAL SITE PLAN STA. 16+50 - STA. 20+25

SHEET

PLD-C-11

Roadway



Not to Scale

Utilities

Questions