STEWARDSHIP
THROUGH
TEAMWORK

CITY OF BOILING SPRING LAKES

EWP—HURRICANE FLORENCE RECOVERY
ISSUE FOR REVIEW & PERMITTING

October 2020

PREPARED BY:
LDSI, Inc.

PREPARED FOR:
The City of Boiling Spring Lakes

BACKGROUND

LDSI was contracted by the City of Boiling Spring Lakes to assist with 9 sites that were affected by Hurricane Florence. LDSI has previously assisted the City with the initial Damage Survey Reports (DSRs) which portions of this submittal utilizes information gleaned during that project. LDSI has conducted topographic surveys and field reconnaissance work to collect data that will be necessary to complete these projects. The sites are located throughout Boiling Spring Lakes, NC. There are four Channel Bank Stabilization sites, three Shoreline Stabilization sites, one Dam Rehabilitation site, and one Clearing & Snagging site. The purpose of this project is to restore the drainage infrastructure to a condition which existed prior to the hurricane.

EXISTING CONDITIONS

Figure 1: National Wetlands Inventory Wetlands map of Boiling Spring Lakes

The City of Boiling Spring Lakes lies within the coastal plain of North Carolina and is surrounded by predominantly Pineland, Drained Wetlands, and residential areas. The soils present within the project sites are primarily sandy, well-drained soils that are typical of North Carolina's Coastal Region. The damage done to the nine sites within the project was caused by approximately 29.5 inches of rainfall that occurred during Hurricane Florence. This resulted in severe debris build up, stream bank erosion, scour, shoreline erosion, and damage to dams. The existing conditions of the nine specific project sites is listed below.

080 – Dam Road

The dam present within project 080 has experienced erosion and related damages as a result of Hurricane Florence. Bank failures and collapse of the auxiliary spillway have de-stabilized the dam and consequently the dam is in need of rehabilitation.

081 – Cherry Road

The channel at Cherry Road has experienced severe erosion and scour as a result of Hurricane Florence. The slope of the stream bed varies significantly throughout the reach and has become unstable. There is a large hole at the downstream end of the reach by East Boiling Spring Road. A Drainage Area and Soils Map of the watershed leading to the Cherry Road Stream can be seen in Appendix A.

082 – East Boiling Spring Road at Patricia Lake

The bank located within project 082 has experienced severe erosion from Hurricane Florence. Failures can be seen along the bank North West of the retaining wall.

083 – Hunters Road

The existing stream at Hunters Road has very little sinuosity and passes through two 48” CMP culverts. High levels of sediment transport have caused the streambed to build up on the upstream side of the upstream culvert. Additionally, there are very few pool sections within this stream reach meaning that it offers little wildlife habitat compared to a healthy stream. At the downstream end of the reach there is sediment build up followed by scour resulting in an irregular streambed profile. A Drainage Area and Soils Map for the watershed leading to the channel at Hunters Road can be seen in Appendix A.

084 – N Shore Drive

The berm located at North Shore drive was damaged during Hurricane Florence and has experienced significant erosion. The damage to the berm has caused the water level in the smaller pond to be lowered significantly. The berm separating the small pond from Patricia lake is currently not functioning as intended.

085 – Pine Lake Road

The channel at Pine Lake Road has very little sinuosity and contains multiple sharp turns that increase erosion. There are two existing 48” CMP culverts within the project reach. The stream bed between the two culverts has eroded significantly and there is a large scour pool at the outlet of the downstream culvert. A Drainage Area and Soils Map of the watershed leading to the Pine Lake Road channel can be seen in Appendix A.

190 – River Road

The stream present within project 190 is filled with debris as a result of Hurricane Florence. The debris within the stream reach significantly lowers the hydraulic capacity of the stream and can induce higher tailwater in upstream areas as a result.

191 – N Shore Drive at Patricia Lake

The shoreline at North Shore drive has eroded severely as a result of Hurricane Florence. Multiple shallow ditches have formed and allowed for channelized surface runoff during storm events which has contributed to the severe erosion of the bank.

192 – Allen Creek

Allen Creek within project 192 has little sinuosity and contains multiple sharp turns that increase erosion. The upstream reach passes through an existing 36” CMP culvert and intersects with perpendicularly with the downstream reach. The downstream reach is fed by a 12” CMP prior to its intersection with the upstream reach. The sections immediately downstream of both the 12” CMP and the 36” CMP have large scour pools. The section of the reach downstream of the scour pool caused by the 36” CMP intersection has experienced channel bank build up due to sedimentation. A Drainage Area and Soils Map of the watershed leading to Allen Creek can be seen in Appendix A.

Descriptions of the soils found within the project areas are as follows:

Lo—Leon fine sand

Typical profile
- *A - 0 to 5 inches:* fine sand
- *E - 5 to 17 inches:* fine sand
- *Bh - 17 to 51 inches:* fine sand
- *E' - 51 to 59 inches:* fine sand
- *B'h - 59 to 95 inches:* fine sand

Setting
- *Landform:* Flats on marine terraces
- *Down-slope shape:* Linear
- *Across-slope shape:* Concave
- *Parent material:* Sandy fluviomarine deposits and/or eolian sands

CT—Croatan muck, ponded, 0 to 2 percent slopes

Typical profile
- *Oa - 0 to 28 inches:* muck
- *Ag - 28 to 33 inches:* mucky sandy loam
- *Cg1 - 33 to 60 inches:* sandy clay loam

- *Cg2 - 60 to 80 inches:* loamy sand

Setting
- *Landform:* Pocosins, flats, carolina bays, bays (geom.)
- *Landform position (three-dimensional):* Talf
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Parent material:* Herbaceous organic material over loamy fluviomarine deposits

Ma—Mandarin fine sand

Typical profile
- *A - 0 to 3 inches:* sand
- *E - 3 to 27 inches:* sand
- *Bh - 27 to 49 inches:* sand
- *E' - 49 to 60 inches:* sand
- *B'h - 60 to 80 inches:* sand

Setting
- *Landform:* Flats on marine terraces
- *Down-slope shape:* Linear
- *Across-slope shape:* Concave
- *Parent material:* Sandy fluviomarine deposits and/or eolian sands

Mu—Murville mucky fine sand

Typical profile
- *A - 0 to 10 inches:* mucky fine sand
- *Bh - 10 to 36 inches:* sand
- *C - 36 to 80 inches:* sand

Setting
- *Landform:* Depressions on marine terraces, flats on marine terraces
- *Down-slope shape:* Concave
- *Across-slope shape:* Concave
- *Parent material:* Sandy fluviomarine deposits and/or eolian sands

KrB—Kureb fine sand, 1 to 8 percent slopes

Typical profile
- *A - 0 to 3 inches:* fine sand
- *E - 3 to 26 inches:* sand
- *C/Bh - 26 to 89 inches:* sand

Setting

- *Landform:* Rims on carolina bays, ridges on marine terraces
- *Landform position (two-dimensional):* Summit, shoulder
- *Landform position (three-dimensional):* Crest
- *Down-slope shape:* Convex
- *Across-slope shape:* Convex
- *Parent material:* Eolian sands and/or sandy fluviomarine deposits

BaB—Baymeade fine sand, 1 to 6 percent slopes

Typical profile
- *A - 0 to 2 inches:* fine sand
- *E/Bh - 2 to 30 inches:* fine sand
- *Bt - 30 to 40 inches:* fine sandy loam
- *C - 40 to 80 inches:* loamy fine sand

Setting
- *Landform:* Ridges on marine terraces
- *Landform position (two-dimensional):* Shoulder, summit
- *Landform position (three-dimensional):* Crest
- *Down-slope shape:* Convex
- *Across-slope shape:* Convex
- *Parent material:* Loamy and sandy marine deposits

PROJECT GOALS

The purpose of this project is to provide technical and administrative services to restore the nine project sites to pre-hurricane conditions while complying with the requirements of the USDA-NRCS Emergency Watershed Protection program. This will be achieved by the following project objectives:

- Removal of sediment deposits within stream reaches
- Channel bank stabilization via grading and planting
- Installation of in-stream structures to maintain grade over time
- Backfilling large scour holes throughout the project sites
- Shoreline stabilization via grading and planting
- Dam rehabilitation via grading and planting
- Removal and clearing of debris from Hurricane Florence

080 – Dam Road

McAdams has provided a preliminary spillway configuration which includes an Articulated Concrete Block (ACB) revetment design for the primary spillway, which will activate in all storm events and will provide approximately 2-feet of freeboard from the top of the dam during the 1/3 Probable Maximum Precipitation (PMP) storm event per NC Dam Safety requirements. The proposed ACB (Armorflex or approved equivalent) spillway is a 250-foot wide overflow weir spillway, sloped 2:1 on the upstream end and 3:1 on the downstream end. Baseflow and normal pool elevation (EL 35) will be maintained by a riser-barrel configuration which will consist of a 4x4 Reinforced Concrete Riser structure and a 24-inch RCP barrel. A low-level drain will also be housed within this structure for lake level drawdown if and as needed. Outfall protection and energy dissipation is provided on the downstream end of the primary spillway with the inclusion of concrete armoring units (A-Jacks or approved equivalent). Shoreline and wave protection has been included in the design as well with an allowance for the upstream and downstream dam embankment to be lined with Class I riprap per NC Dam Safety requirements.

A conference call was held with NCDEMLR Dam Safety on Wednesday September 30, 2020 to review the preliminary spillway configuration, based on the dam's current state as well as the overall context of the other dam repairs throughout the City. Dam Safety provided initial guidance that the proposed spillway configuration will be acceptable provided certain design criteria are met, including design for the 1/3 PMP storm, adequate erosion protection on the downstream end, wave protection, slope stability analysis, and a final EAP and O&M plan at the conclusion of construction.

Following concurrence with the proposed spillway configuration and design, McAdams will finalize the dam and spillway configuration, grading plan, and final internal drainage systems with its geotechnical subconsultant and prepare 90% Construction Drawings for the dam repairs for submission and review with NC Dam Safety and NRCS. It is currently assumed, based on geotechnical information received to date, that the entirety of the dam shell and core be replaced per the preliminary/initial boring logs as obtained by S&ME in May 2020. Much of the interior of the dam includes poorly graded sands, silty sands, and clayey sands which are not ideal for long-term dam stability. S&ME will also be preparing slope stability analysis,

seepage analysis, and sliding analysis in the coming weeks. This will also include final recommendations on fill and compaction for the repaired dam.

McAdams has provided this preliminary information to McGill and Associates for inclusion with the FEMA Conditional Letter of Map Revision (CLOMR) submittal to the North Carolina Emergency Management Floodplain Mapping Program, which is included in the overall Letter of Map Change for Upper Dam and Sanford Dam.

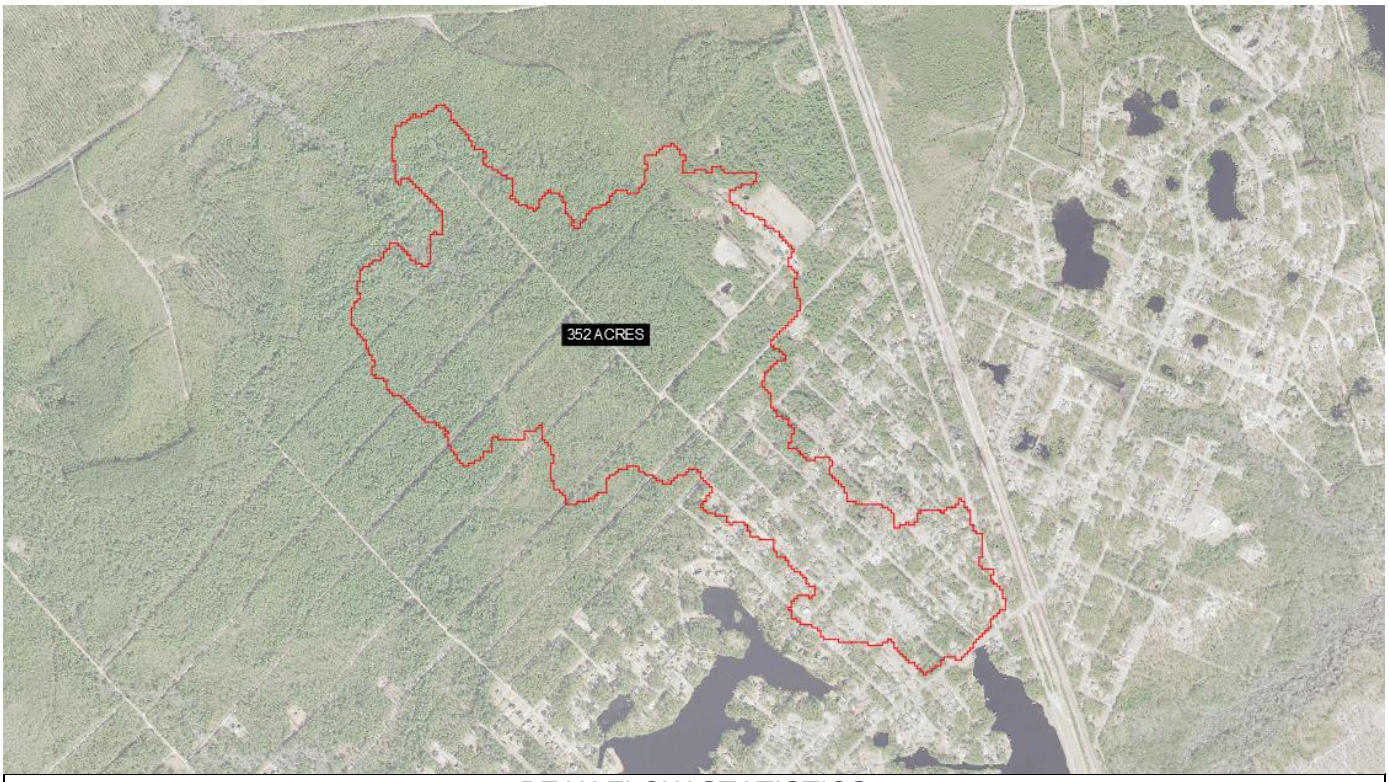
Included with this memorandum report are estimated costs (approximate 65% Construction Drawing level) and the most recent geotechnical boring logs and analysis.

Current estimates for this work are approximately $1,618,000, including General Conditions, Drainage, Structures, and Geotechnical work, as detailed in the attached cost estimate summary.

081 – Cherry Road

081.A Hydrology

Watershed characteristics for the Cherry Road stream were determined primarily through the USGS StreamStats tool along with field reconnaissance. It was found that the watershed draining into the Cherry Road stream is approximately 350 Acres in size and has a 50-year peak flow of approximately 390 CFS (Figure 2). A detailed Drainage Area and Soils Map for the watershed leading to the stream at Cherry Road can be seen in Appendix A.



PEAK FLOW STATISTICS		
STATISTIC	VALUE	UNIT
2-YEAR PEAK FLOOD	82	CFS
5-YEAR PEAK FLOOD	160	CFS
10-YEAR PEAK FLOOD	223	CFS
25-YEAR PEAK FLOOD	314	CFS
50-YEAR PEAK FLOOD	390	CFS

Figure 2: StreamStats Watershed and Peak Flow Statistics for the Cherry Road Stream

081.B Hydraulics

The dimensional parameters for the proposed stream at Cherry Road were calculated by referencing the work of Barbara Doll. Her work statistically analyzed the dimensional characteristics of pristine streams

within the coastal regions of North Carolina to determine the parameters of stable, healthy stream.

PARAMETER	VALUE	UNIT
AREA OF BANKFULL (A_{bkf})	9.8	SQFT
FLOW AT BANKFULL (Q_{bkf})	10.8	CFS
WIDTH OF BANKFULL (W_{bkf})	8.8	FT
DEPTH AT BANKFULL (D_{bkf})	1.1	FT

Figure 3: Dimensional Parameters of the Proposed Stream at Cherry Road

081.C Proposed Design

The proposed stream at Cherry Road will utilize a variety of control structures to maintain grade, prevent unwanted erosion, and promote pool scour to increase biodiversity within the stream. These structures will include 27 Log V-Drops that will be installed at the start of each pool section. They will serve to maintain the elevation at the start of the pool while promoting desirable scour within the pool. In addition to these, there are a total of 7 Log Sill structures that will be used within a section of the stream that is much steeper than the rest. They will allow the stream to hold grade during high-flow storm events. Utilizing the Log Sill structures will allow for the proposed stream to match the streambed elevation of the existing stream more closely. This will limit the amount of earthwork required for construction while still accounting for the stability and health of the proposed stream. The side slopes will be matted with fiber matting and staked with live stakes to restore bank integrity. Debris will be used throughout the channel as log structures.

082 – East Boiling Spring Road at Patricia Lake

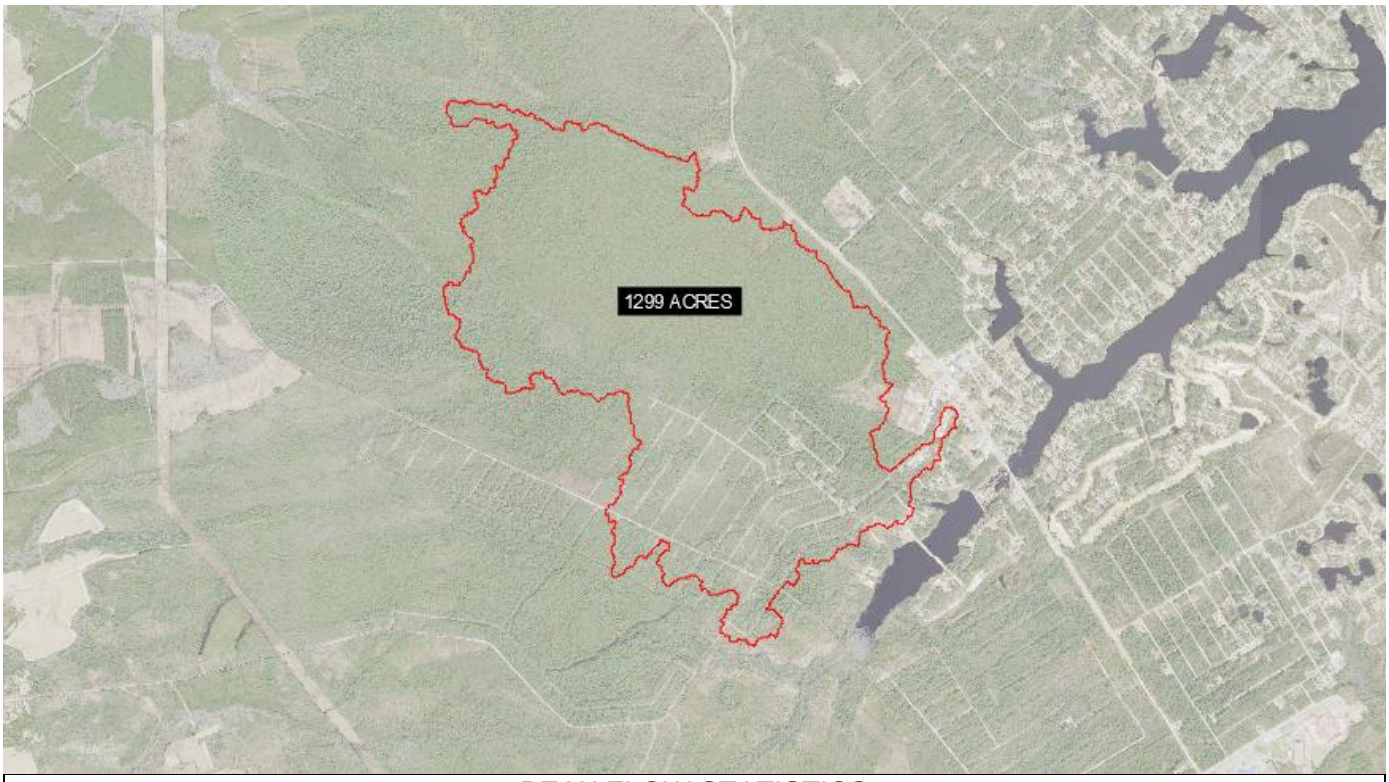
To repair the location of the previous bulkhead failure, stabilization of the slope is necessary. Stabilization of the area will reduce sloughing and erosion of the lake bank which can result in turbidity and sediment load to the lake as well as future undermining of the adjacent roadway. A vegetated natural shoreline approach was taken, using minimal structural elements while leveraging the use of aquatic adjacent tree and shrub species. The vegetated species use will allow the shoreline to repair itself and adapt over time as conditions fluctuate to provide the longest term and self-adapting solution. No replacement of the bulkhead sheetpile wall has been proposed as part of this project.

Current estimates for this work are approximately $135,000 as detailed in the attached cost estimate summary.

083 – Hunters Road

083.A Hydrology

Watershed characteristics for the Hunters Road stream were determined primarily through the USGS StreamStats tool along with field reconnaissance. It was found that the watershed draining into the Hunters Road stream is approximately 1300 Acres in size and has a 50-year peak flow of approximately 473 CFS (Figure 4). A detailed Drainage Area and Soils Map for the watershed leading to the stream at Hunters Road can be seen in Appendix A.



PEAK FLOW STATISTICS		
STATISTIC	VALUE	UNIT
2-YEAR PEAK FLOOD	95	CFS
5-YEAR PEAK FLOOD	192	CFS
10-YEAR PEAK FLOOD	269	CFS
25-YEAR PEAK FLOOD	377	CFS
50-YEAR PEAK FLOOD	473	CFS

Figure 4: StreamStats Watershed and Peak Flow Statistics for the Hunters Road Stream

083.B Hydraulics

The dimensional parameters for the proposed stream at Hunters Road were calculated by referencing the work of Barbara Doll. Her work statistically analyzed the dimensional characteristics of pristine streams

within the coastal regions of North Carolina to determine the parameters of stable, healthy stream

PARAMETER	VALUE	UNIT
AREA OF BANKFULL (A_{bkf})	23.2	SQFT
FLOW AT BANKFULL (Q_{bkf})	27.6	CFS
WIDTH OF BANKFULL (W_{bkf})	14.2	FT
DEPTH AT BANKFULL (D_{bkf})	1.6	FT

Figure 5: Dimensional Parameters of the Proposed Stream at Hunters Road

083.C Proposed Design

The proposed stream at Hunters Road will implement multiple Log V-Drop structures as a means for maintaining the designed grade while promoting pool scour. There are 26 proposed Log V-Drops throughout the Hunters Road stream reach that will be installed at the start of each pool section. They will be especially useful in maintaining grade at both the upstream and downstream ends of the existing culverts. Culverts traditionally cause scour pools to form at both the upstream and downstream ends, and while they have desirable characteristics, they also tend to increase in size over time. The Log V-Drop structures will prevent the culvert scour pools from moving upstream and interfering with a riffle section as well as moving downstream and causing an excessively large pool area. The side slopes will be matted with fiber matting and staked with live stakes to restore bank integrity. Debris will be used throughout the channel as log structures.

084 – N Shore Drive

084.A Hydrology

The small pond located at North Shore drive is separated from lake Patricia by a berm that was damaged during Hurricane Florence. The watershed draining into the small pond is approximately 7.6 Acres and comprised primarily of residential lots. The SCS Curve Number Method for surface runoff shows a volume of 468 CUYD for a 2-Year 24-Hour storm event.

084.B Hydraulics

Due to the small watershed leading into the pond, the time of concentration for the watershed is only 4.7 minutes. That means that within five minutes of a rain event beginning, water from the most hydraulically distant portion of the watershed will have already reached the small pond.

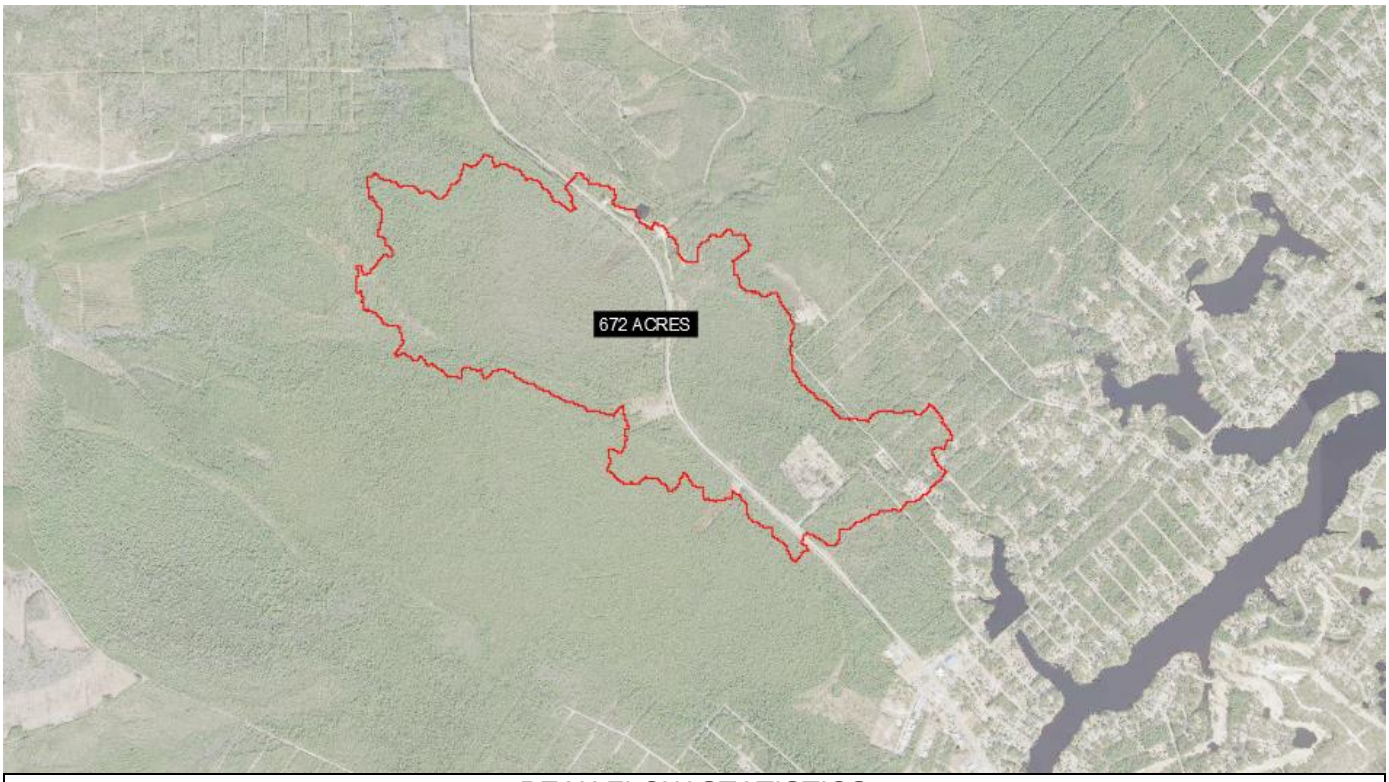
084.C Proposed Design

The water level in the small pond will be managed by a flashboard riser with an outlet pipe running through the berm and draining into Patricia Lake. The flashboard riser will allow for the water level of the smaller pond to be adjusted in anticipation of large storm events that could potentially overwhelm the berm. The berm will be repaired by backfilling and compacting the eroded areas to ensure stability.

085 – Pine Lake Road

085.A Hydrology

Watershed characteristics for the Pine Lake Road stream were determined primarily through the USGS StreamStats tool along with field reconnaissance. It was found that the watershed draining into the Pine Lake Road stream is approximately 670 Acres in size and has a 50-year peak flow of approximately 318 CFS (Figure 6). A detailed Drainage Area and Soils Map for the watershed leading to the stream at Pine Lake Road can be seen in Appendix A.



PEAK FLOW STATISTICS		
STATISTIC	VALUE	UNIT
2-YEAR PEAK FLOOD	62	CFS
5-YEAR PEAK FLOOD	127	CFS
10-YEAR PEAK FLOOD	179	CFS
25-YEAR PEAK FLOOD	253	CFS
50-YEAR PEAK FLOOD	318	CFS

Figure 6: StreamStats Watershed and Peak Flow Statistics for the Pine Lake Road Stream

085.B Hydraulics

The dimensional parameters for the proposed stream at Pine Lake Road were calculated by referencing the work of Barbara Doll. Her work statistically analyzed the dimensional characteristics of pristine streams

within the coastal regions of North Carolina to determine the parameters of stable, healthy stream.

PARAMETER	VALUE	UNIT
AREA OF BANKFULL (A_{bkf})	15.0	SQFT
FLOW AT BANKFULL (Q_{bkf})	17.2	CFS
WIDTH OF BANKFULL (W_{bkf})	11.2	FT
DEPTH AT BANKFULL (D_{bkf})	1.3	FT

Figure 7: Dimensional Parameters of the Proposed Stream at Pine Lake Road

085.C Proposed Design

The proposed stream at Pine Lake Road is unique in that the existing channel features multiple sharp turns as well as multiple culverts. Sharp turns within the stream reach increase shear stress along the banks which can increase bank erosion during high-flow storm events. Culverts tend to form pool sections at their inlets and outlets which are beneficial for energy dissipation but tend to increase in size over time. Because of these existing characteristics, it is critical that the proposed stream include structures to maintain grade, dissipate energy, and limit streambank erosion. The short stream reach will include 6 Log V-Drops placed strategically to promote pooling within the sharp turns to dissipate energy and minimize streambank erosion. The side slopes will be matted with fiber matting and staked with live stakes to restore bank integrity. Debris will be used throughout the channel as log structures.

190 – River Road

190.A Proposed Design

The contractor shall perform clearing and snagging throughout the marked section of the stream reach to remove the debris and restore the hydraulic capacity of the channel.

191 – N Shore Drive at Patricia Lake

191.A Proposed Design

The eroded rill sections leading into Patricia lake will be backfilled and compacted to prevent channelized flow from causing erosion during future storm events. Additionally, the damaged shoreline will be repaired by grading at a 7.5:1 H:V slope to restore stability to the shoreline and then matted with coir fiber matting. Vegetative plugs will be utilized to hold the soil in-place until such time as Patricia Lake is back to normal pool.

The Purpose of this plan is purely for bank stabilization and erosion repair. LDSI, Inc. and its team members have not performed any structural or geotechnical analysis on site 191 and are not liable for any existing or future damages to the property.

192 – Allen Creek

192.A Hydrology

Watershed characteristics for Allen Creek were determined primarily through the USGS StreamStats tool along with field reconnaissance. It was found that the watershed draining into Allen Creek is approximately 130 Acres in size and has a 50-year peak flow of approximately 209 CFS (Figure 8). A detailed Drainage Area and Soils Map for the watershed leading to Allen Creek can be seen in Appendix A.

PEAK FLOW STATISTICS		
STATISTIC	VALUE	UNIT
2-YEAR PEAK FLOOD	44.2	CFS
5-YEAR PEAK FLOOD	86.5	CFS
10-YEAR PEAK FLOOD	120	CFS
25-YEAR PEAK FLOOD	169	CFS
50-YEAR PEAK FLOOD	209	CFS

Figure 8: StreamStats Watershed and Peak Flow Statistics for Allen Creek

192.B Hydraulics

The dimensional parameters for the proposed stream at Allen Creek were calculated by referencing the work of Barbara Doll. Her work statistically analyzed the dimensional characteristics of pristine streams within the coastal regions of North Carolina to determine the parameters of stable, healthy stream.

PARAMETER	VALUE	UNIT
AREA OF BANKFULL (A_{bkf})	5.0	SQFT
FLOW AT BANKFULL (Q_{bkf})	5.2	CFS
WIDTH OF BANKFULL (W_{bkf})	6.1	FT
DEPTH AT BANKFULL (D_{bkf})	0.8	FT

Figure 9: Dimensional Parameters of the Proposed Stream at Allen Creek

192.C Proposed Design

The stream reach at Allen Creek is unique in that it consists of two intersecting stream reaches. The upstream reach passes through a 36” CMP culvert and discharges into the downstream reach perpendicular to the direction of flow. Due to the low sinuosity of the upstream reach, 11 Log V-Drops will be used to hold grade and dissipate energy through pool sections. The use of these structures will help to prevent erosion during high-flow storm events while minimizing deviation from the current stream path. The downstream reach of Allen Creek is fed by a 12” CMP at an elevation that is over 6 feet higher than the rest of the reach. To account for this, a series of 7 Log-Sill structured will be installed to hold grade, minimize erosion, and create pool sections to dissipate the energy of the incoming water. After the point where the upstream reach discharges perpendicularly into the downstream reach, a series of 10 Log V-Drops will be installed to maintain grade, dissipate energy, and prevent erosion. The side slopes will be matted with fiber matting and staked with live stakes to restore bank integrity. Debris will be used throughout the channel as log structures.

Opinions of Probable Cost

080 - Opinion of Probable Cost					
Item	**Description**	**Qty**	**Unit**	**Unit Price**	**Total Price**
1	Bonds, Insurance, Mobilization, and Demobilization	1	LS	$ 64,000.00	$ 64,000
2	Temporary Facilities and Controls	1	LS	$ 35,000.00	$ 35,000
3	Construction Survey	1	LS	$ 20,000.00	$ 20,000
4	Control of Water	1	LS	$165,000.00	$ 165,000
5	Clearing and Grubbing	1	SY	$ 15,000.00	$ 15,000
6	Topsoil, Seeding, and Mulching	3100	SY	$ 5.00	$ 15,500
7	Earthfill	8160	CY	$ 25.00	$ 204,000
8	Imported Drainfill	100	SY	$ 125.00	$ 12,500
9	Riprap (Class I)	950	CY	$ 100.00	$ 95,000
10	Common Excavation	8500	CY	$ 15.00	$ 127,500
11	Silt Fence	1000	LF	$ 3.00	$ 3,000
12	Construction Entrance	90	SY	$ 35.00	$ 3,150
13	Temporary Diversion Berms	400	LF	$ 18.00	$ 7,200
14	PVC Drain Pipes	1	LS	$ 15,000.00	$ 15,000
15	Miscellaneous Washed Stone (No. 57)	629	TN	$ 55.00	$ 34,606
16	Articulated Concrete Block	12000	SF	$ 24.00	$ 288,000
17	Concrete Armor Units	7900	SF	$ 25.00	$ 197,500
18	Orange Safety Fence	1000	LF	$ 3.00	$ 3,000
19	Pipe Cradle	40	CY	$ 415.00	$ 16,600
20	Concrete Spillway Riser (with Trash Rack)	10	CY	$ 500.00	$ 5,000
21	Low-Level Drain	1	LS	$ 12,000.00	$ 12,000
22	Outlet Wingwall and Endwall	9	CY	$ 425.00	$ 3,825
23	Chain Link Fencing, 6'	200	LF	$ 25.00	$ 5,000
24	Chain Link Gate, 6'	2	EA	$ 500	$ 1,000
				Total	**$ 1,348,381**
				20% Contingency	**$ 1,618,057**

081 - Opinion of Probable Cost

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization and Demobilization	1	LS	$ 4,000.00	$ 4,000
2	Construction Surveys	1	LS	$ 2,000.00	$ 2,000
3	Furnish, Install, and Remove Temporary Silt Fence	250	LF	$ 2.31	$ 578
4	Replace Chain Link Fence	80	LF	$ 10.00	$ 800
5	Replace Wood Fence	360	LF	$ 30.00	$ 10,800
6	Furnish, Install, and Remove Temporary Construction Entrance	1	EA	$ 1,000.00	$ 1,000
7	Stream Grading	1276	LF	$ 115.00	$ 146,740
8	Furnish and Install Log V-Drop Structures	27	EA	$ 1,900.00	$ 51,300
10	Furnish and Install Log Sill Structures	7	EA	$ 1,500.00	$ 10,500
11	Furnish and Install Temporary Seeding	0.5	AC	$ 500.00	$ 250
12	Furnish and Install Permanent Seeding	0.5	AC	$ 1,745.88	$ 873
13	Furnish and Install Erosion Control Matting	1860	SY	$ 4.75	$ 8,835
14	Berm and Bank Backfill	1	LS	$18,000.00	$ 18,000
15	Furnish and Install Live Stakes	2500	SY	$ 3.00	$ 7,500
16	Furnish and Install Seedlings	0.5	AC	$ 375.00	$ 188
				Total	**$ 263,363**
				30% Contingency	**$ 342,372**

082 - Opinion of Probable Cost

Item	Description	Qty	Unit	Unit Price	Total Price
1	Bonds, Insurance, Mobilization, & Demobilization	1	LS	$10,000.00	$ 10,000
2	Temporary Facilities and Controls	1	LS	$10,000.00	$ 10,000
3	Construction Survey	1	LS	$ 8,000.00	$ 8,000
4	Control of Water	1	LS	$25,000.00	$ 25,000
5	Clearing and grubbing	1	LS	$ 7,500.00	$ 7,500
6	Topsoil, Seeding, and Mulching	1342	SY	$ 5.00	$ 6,710
7	Earthfill	322	CY	$ 25.00	$ 8,050
8	Geotextile	41	SY	$ 27.00	$ 1,107
9	Riprap (Class I)	41	SY	$ 100.00	$ 4,100
10	Common Excavation	163	CY	$ 15.00	$ 2,445
11	Silt Fence	420	LF	$ 3.00	$ 1,260
12	Construction Entrance	111	SY	$ 35.00	$ 3,885

13	Concrete Armor Jax	1	LS	$ 7,320.00	$ 7,320
14	Erosion Matting	3649	SF	$ 2.99	$ 10,911
15	Orange Safety Fence	210	LF	$ 3.00	$ 630
16	Live Stakes	25	EA	$ 6.30	$ 158
17	Bare Roots	25	EA	$ 5.60	$ 140
18	1-Gallon Plants	50	EA	$ 45.00	$ 2,250
19	Riparian Seeding	0.09	AC	$ 5,500.00	$ 505
20	Seed Mix	1	AC	$ 2,400.00	$ 2,400
				Total	**$ 112,370**
				20% Contingency	**$ 134,844**

083 - Opinion of Probable Cost

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization and Demobilization	1	LS	$ 4,000.00	$ 4,000
2	Construction Surveys	1	LS	$ 2,000.00	$ 2,000
3	Furnish, Install, and Remove Temporary Silt Fence	250	LF	$ 2.31	$ 578
4	Furnish, Install, and Remove Temporary Construction Entrance	1	EA	$ 1,000.00	$ 1,000
5	Stream Grading	1	LS	$123,000.00	$ 123,000
6	Furnish and Install Log V-Drop Structures	26	EA	$ 1,900.00	$ 49,400
7	Furnish and Install Temporary Seeding	2	AC	$ 500.00	$ 1,000
8	Furnish and Install Permanent Seeding	2	AC	$ 1,745.88	$ 3,492
10	Furnish and Install Erosion Control Matting	2340	SY	$ 4.75	$ 11,115
11	Furnish and Install Live Stakes	2340	SY	$ 3.00	$ 7,020
12	Furnish and Install Seedlings	2	AC	$ 375.00	$ 750
				Total	**$ 203,354**
				30% Contingency	**$ 264,361**

084 - Opinion of Probable Cost

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization and Demobilization	1	LS	$ 4,000.00	$ 4,000
2	Construction Surveys	1	LS	$ 2,000.00	$ 2,000
3	Furnish, Install, and Remove Temporary Silt Fence	250	LF	$ 2.31	$ 578
4	Furnish, Install, and Remove Temporary Construction Entrance	1	EA	$ 1,000.00	$ 1,000
5	Furnish and Install Temporary Seeding	0.6	AC	$ 500.00	$ 300
6	Furnish and Install Permanent Seeding	0.6	AC	$ 1,745.88	$ 1,048

7	Furnish and Install Erosion Control Matting	220	SY	$ 4.75	$ 1,045
8	Berm and Bank Backfill	300	CUYD	$ 30.00	$ 9,000
9	Furnish and Install Live Stakes	2900	SY	$ 3.00	$ 8,700
10	Furnish and Install Seedlings	0.6	AC	$ 375.00	$ 225
11	Furnish and Install 30" CMP	40	LF	$ 100.00	$ 4,000
12	Furnish and Install Flashboard Riser	1	EA	$ 15,000.00	$ 15,000
				Total	**$ 46,895**
				30% Contingency	**$ 60,964**

085 - Opinion of Probable Cost

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization and Demobilization	1	LS	$ 4,000.00	$ 4,000
2	Construction Surveys	1	LS	$ 2,000.00	$ 2,000
3	Furnish, Install, and Remove Temporary Silt Fence	250	LF	$ 2.31	$ 578
4	Furnish, Install, and Remove Temporary Construction Entrance	1	EA	$ 1,000.00	$ 1,000
5	Stream Grading	1	LS	$40,000.00	$ 40,000
6	Furnish and Install Log V-Drop Structures	6	EA	$ 1,900.00	$ 11,400
7	Furnish and Install Temporary Seeding	0.5	AC	$ 500.00	$ 250
8	Furnish and Install Permanent Seeding	0.5	AC	$ 1,745.88	$ 873
10	Furnish and Install Erosion Control Matting	820	SY	$ 4.75	$ 3,895
11	Furnish and Install Live Stakes	2400	SY	$ 3.00	$ 7,200
12	Furnish and Install Seedlings	0.5	AC	$ 375.00	$ 188
				Total	**$ 71,383**
				30% Contingency	**$ 92,798**

190 - Opinion of Probable Cost

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization and Demobilization	1	LS	$ 4,000.00	$ 4,000
2	Construction Surveys	1	LS	$ 2,000.00	$ 2,000
3	Clearing and Snagging	1	LS	$14,000.00	$ 14,000
				Total	**$ 20,000**
				30% Contingency	**$ 26,000**

191 - Opinion of Probable Cost

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization and Demobilization	1	LS	$ 4,000.00	$ 4,000
2	Construction Surveys	1	LS	$ 2,000.00	$ 2,000
3	Furnish, Install, and Remove Temporary Silt Fence	250	LF	$ 2.31	$ 578
4	Furnish, Install, and Remove Temporary Construction Entrance	1	EA	$ 1,000.00	$ 1,000
5	Furnish and Install Temporary Seeding	1	AC	$ 500.00	$ 500
6	Furnish and Install Permanent Seeding	1	AC	$ 1,745.88	$ 1,746
7	Furnish and Install Erosion Control Matting	2050	SY	$ 4.75	$ 9,738
8	Berm and Bank Backfill	2000	CUYD	$ 30.00	$ 60,000
9	Furnish and Install Live Stakes	530	SY	$ 3.00	$ 1,590
10	Furnish and Install Seedlings	1	AC	$ 375.00	$ 375
11	Furnish and Install Juncus Plugs	4600	EA	$ 1.50	$ 6,900
				Total	**$ 88,426**
				30% Contingency	**$ 114,954**

192 - Opinion of Probable Cost

Item	Description	Qty	Unit	Unit Price	Total Price
1	Mobilization and Demobilization	1	LS	$ 4,000.00	$ 4,000
2	Construction Surveys	1	LS	$ 2,000.00	$ 2,000
3	Furnish, Install, and Remove Temporary Silt Fence	250	LF	$ 2.31	$ 578
4	Furnish, Install, and Remove Temporary Construction Entrance	2	EA	$ 1,000.00	$ 2,000
5	Stream Grading	1	LS	$30,000.00	$ 30,000
6	Furnish and Install Log V-Drop Structures	21	EA	$ 1,900.00	$ 39,900
7	Furnish and Install Log Sill Structures	7	EA	$ 1,500.00	$ 10,500
8	Furnish and Install Temporary Seeding	0.5	AC	$ 500.00	$ 250
10	Furnish and Install Permanent Seeding	0.5	AC	$ 1,745.88	$ 873
11	Furnish and Install Erosion Control Matting	1340	SY	$ 4.75	$ 6,365
12	Furnish and Install Live Stakes	2420	SY	$ 3.00	$ 7,260
13	Furnish and Install Seedlings	0.5	AC	$ 375.00	$ 188
				Total	**$ 103,913**
				30% Contingency	**$ 135,087**

Total Opinion of Probable Cost		
Project	**Total Cost**	**Total Cost with Contingency**
080 - Dam Road	$ 1,348,381	$ 1,618,057
081 - Cherry Road	$ 263,362	$ 342,371
082 - East boiling Spring Road	$ 112,370	$ 134,844
083 - Hunters Road	$ 203,354	$ 264,360
084 - N Shore Drive	$ 46,895	$ 60,963
085 - Pine Lake Road	$ 71,382	$ 92,797
190 - River Road	$ 20,000	$ 26,000
191 - N Shore Drive at Patricia Lake	$ 88,425	$ 114,953
192 - Allen Creek	$ 103,912	$ 135,086
Total	**$ 2,258,085**	**$ 2,789,435**

Based on the contract from Sept 2019, the allocated funding was $879,987.18 from NRCS and $293,329 from the sponsor for a total of $1,173,316.24. Based on the continued design and permitting the opinion of probable cost for the projects have changed. This is due in part to NC Dam safety determining the dam to be high hazard. Also, additional survey and design has adjusted some quantities of services proposed. The current opinions of probable cost are summarized above and reflect an issue for permitting completion status.

PERMITTING AND NEXT STEPS

Based on a preliminary meeting with the Corps, Gary Beecher, which we discussed Nationwide Permit (NWP) 37, it is our intent to permit all nine sites under one large NWP 37. This is only possible after review and concurrence of this package from NRCS as well as an increase in the associated funding levels, per the opinions of probable cost above.

"**Nationwide Permit 37 - Emergency Watershed Protection and Rehabilitation.** Work done by or funded by:

(a) The Natural Resources Conservation Service for a situation requiring immediate action under its emergency Watershed Protection Program (7 CFR part 624);

(b) The U.S. Forest Service under its Burned-Area Emergency Rehabilitation Handbook (FSH 2509.13);

(c) The Department of the Interior for wildland fire management burned area emergency stabilization and rehabilitation (DOI Manual part 620, Ch. 3);

(d) The Office of Surface Mining, or states with approved programs, for abandoned mine land reclamation activities under Title IV of the Surface Mining Control and Reclamation Act (30 CFR subchapter R), where the activity does not involve coal extraction; or

(e) The Farm Service Agency under its Emergency Conservation Program (7 CFR part 701).

In general, the prospective permittee should wait until the district engineer issues an NWP verification or 45 calendar days have passed before proceeding with the watershed protection and rehabilitation activity. However, in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur, the emergency watershed protection and rehabilitation activity may proceed immediately and the district engineer will consider the information in the pre-construction notification and any comments received as a result of agency coordination to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

Notification: Except in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur, the permittee must submit a pre-construction notification to the district engineer prior to commencing the activity (see general condition 32). (Authorities: Sections 10 and 404)"[1]

[1] https://www.swt.usace.army.mil/Portals/41/docs/missions/regulatory/NationwidePermits/Nationwide%20Permit%2037%20-%20Emergency%20Watershed%20Protection%20and%20Rehabilitation.pdf?ver=2017-03-31-150709-317