MONITORING YEAR 0 ANNUAL REPORT

FINAL

July 2021

SASSARIXA SWAMP MITIGATION SITE

Johnston County, NC
Neuse River Basin
HUC 03020201

DMS Project No. 100040
DMS Contract No. 7425
DMS RFP No. 16-007279
USACE Action ID No. 2018-00432
DWR Project No. 2018-0198
Data Collection Dates: October-March 2021

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

July 22, 2021

Mr. Jeremiah Dow
Project Manager
NCDEQ- Division of Mitigation Services
217 West Jones Street, Suite 3000A
Raleigh, NC 27603

Subject: Comment-Response Letter
Task 6 As-Built Baseline Report
Sassarixa Swamp Mitigation Site, DMS ID# 100040
Neuse River Basin – CU# 03020201, Johnston County, North Carolina
Contract No. 7425

Dear Mr. Dow:

On July 19, 2021, Wildlands Engineering received comments from the North Carolina Division of Mitigation Services (DMS) regarding the Draft As-Built Baseline Report dated June 29, 2021. The following letter documents DMS feedback and Wildlands' corresponding responses and revisions to the As-Built Report.

1. Table 2 – Recommend addition of years that monitoring will be conducted (1, 2, 3, 5, & 7) in the Measurement column for veg plots and cross-sections.
   Response: Monitoring years are added to the Measurement column for veg plots and cross-sections.
2. Appendix C – Recommend including the geomorphology metrics generate with the cross-section tool with each cross-section.

   Response: Geomorphology metrics are now included with each cross-section.

3. The following spatial data issues were identified, please review and revise:
   a. Sassarixa R1 (EII) and T5B (EII) in the as_built_alignments shapefile have portions of their reach outside of the easement. Please remove these external segments and adjust the lengths in the asset table.
   b. If available, please include features that characterize the existing stream.

   Response: Segments outside of the easement on Sassarixa R1 and T5B have been removed.

4. Please note that the project was contracted for 1,228,537.20 BMUs but is currently on track to deliver 1,080,282.590 BMUs which is 148,254.610 BMUs below contact. This will be reconciled with Task 6 payment. Subsequent payments will be unchanged. Please see the included table on the next page for details.

   Response: This has been noted.

Thank you for your review and providing comments on this submittal. If you have any further questions, please contact me at (919) 851-9986, or by email (jlorch@wildlandseng.com).

Sincerely,

Jason Lorch, *Monitoring Coordinator*

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) implemented a full delivery project at the Sassarixa Swamp Mitigation Site (Site) for the North Carolina Department of Environmental Quality Division of Mitigation Services (DMS) to restore a total of 16,141 linear feet of perennial and intermittent streams in Johnston County, NC. The Site will generate 8,618.650 stream credits. The Site is located approximately six miles southwest of Smithfield and five miles north of Four Oaks in the Neuse River Basin 8-Digit Hydrologic Unit Code (HUC) 03020201. Before construction, the Site was a mix of active pastures, fields, and woodlands along Sassarixa Creek and thirteen unnamed tributaries that drain into the Holts Lake watershed, which is part of the Neuse River Basin. The project includes several adjacent properties that have been owned and operated as a livestock farm by a single family since 1850, where livestock were continually rotated through all fields (with access to their associated streams). The western portion of the project includes Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek (T1, T1A, T1B, T1C, T1D, T2, and T3). The eastern portion of the site contains six unnamed tributaries to Black Creek (T4, T5, T5A, T5B, T5C, and T6). The Site is located within a new Neuse River Targeted Local Watershed (TLW) not presented in the 2010 Neuse River Basin Restoration Priorities (RBRP) (Breeding, 2010). The TLW was added in the 2015 Neuse 01 CU Update (DWR, 2015). The Site is located in the Neuse River Basin HUC 03020201130030 and NC Division of Water Resources (DWR) Subbasin 03-04-04. The project involves the restoration, enhancement, and preservation of Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek. The downstream drainage area of the Site is 5,024 acres. The 65.06 acre Site is protected with a permanent conservation easement.

The project goals established in the Mitigation Plan (Wildlands, 2019) were completed with careful consideration of goals and objectives described in the Neuse River RBRP. The project goals include:

- Improve the stability of stream channels;
- Improve instream habitat;
- Reconnect channels with floodplains and to allow a natural flooding regime;
- Restore and enhance native floodplain and streambank vegetation; and
- Permanently protect the Site from harmful land uses.

Site construction was completed in January 2021, and as-built surveys were completed in February 2021, while planting was completed in March 2021. Monitoring Year 0 (MY0) assessments and site visits were completed between October and March 2021. Overall, the Site has met the required vegetation and stream success criteria for MY0. All eleven vegetation monitoring plots met the interim success criteria with an average stem density of 574 planted stems per acre. Prior to construction, intensive vegetation management was completed along Sassarixa Creek, T4, and T5 to control invasive species. Those areas will continued to be assessed throughout the monitoring years to determine if more action is needed. All restored streams are stable and functioning as designed. Several large rain events washed out Old Olive Road creating sediment plumes to move through the newly constructed streams. Due to timing of as-built survey, the longitudinal profile on some sections of the channels indicates channel aggradation. However, the sediment has moved through the system and no action is deemed necessary. Hydrologic data will be collected and reported during MY1.

SASSARIXA SWAMP MITIGATION SITE
Monitoring Year 0 Annual Report

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Section 1: PROJECT OVERVIEW

The Sassarixa Swamp Mitigation Site (Site) is located in Johnston County, approximately six miles southwest of Smithfield and five miles north of Four Oaks. The Site drains to Holts Lake, which drains to the Neuse River. Holts Lake is a recreational lake classified as a Nutrient Sensitive Water (NSW) and the Neuse River is a water supply for the City of Goldsboro. The Site is within Hydrologic Unit Code (HUC) 03020201130030, Subbasin 03-04-04, and is located within the Neuse River Targeted Local Watershed identified in the 2015 Neuse 01 CU Update (DWR, 2015). The project watershed consists primarily of agricultural and wooded land. The drainage area for the Site is 5,024 acres (7.85 square miles).

1.1 Project Quantities and Credits

The Site is located on 10 parcels under 7 different landowners and a conservation easement was recorded on 65.06 acres. Mitigation work within the Site included restoration, enhancement II, and preservation of 16,141 linear feet of perennial and intermittent stream channels. The project is expected to provide 8,618.650 stream credits at closeout.

Table 1: Project Quantities and Credits

PROJECT MITIGATION QUANTITIES							
Project Segment	**Mitigation Plan Footage**	**As-Built Footage**	**Mitigation Category**	**Restoration Level**	**Mitigation Ratio (X:1)**	**Credits**	**Comments**
Stream							
Sassarixa Creek R1-R3	2,631	2,630	Warm	EII	2.5	1,052.400	Ford Crossing, Fencing Out Livestock
T1 R1	570	570	Warm	EII	2.5	228.000	Bank Stabilization, Fencing Out Livestock
T1 R2	824	810	Warm	R	1.0	824.000	Full Channel Restoration, Fencing Out Livestock
T1 R3	509	507	Warm	R	1.0	509.000	Full Channel Restoration, Fencing Out Livestock
T1 R4	252	252	Warm	EII	2.5	100.800	Fencing Out Livestock
T1A	358	356	Warm	EII	2.5	143.200	Fencing Out Livestock
T1B	275	276	Warm	EII	2.5	110.000	Fencing Out Livestock
T1C	307	307	Warm	EII	2.5	122.800	Fencing Out Livestock
T2	1,010	1,006	Warm	R	1.0	1,010.000	Pond Removal, Fencing Out Livestock
T3 R1	1,053	1,041	Warm	R	1.0	1,053.000	Full Channel Restoration, Fencing Out Livestock
T3 R2	61	61	Warm	P	10.0	6.100	Conservation Easement
T4 R1	206	206	Warm	EII	2.5	82.400	Ford Crossing, Fencing Out Livestock
T4 R2	398	399	Warm	EII	2.5	159.200	Bank Stabilization, Fencing Out Livestock

T4 R3	1,509	1,510	Warm	P	10.0	150.900	Culvert Crossing, Conservation Easement
T5 R1	670	642	Warm	EII	2.5	268.000	Bank Stabilization
T5 R2	885	874	Warm	R	1.0	885.000	Full Channel Restoration, Fencing Out Livestock
T5 R3	965	961	Warm	EII	4.0	241.250	Culvert Crossing, Bank Stabilization
T5A	1,026	1,018	Warm	EII	2.5	410.400	Bank Stabilization, Fencing Out Livestock
T5B	580	580	Warm	EII	2.5	232.000	Fencing Out Livestock
T5C[1]	588	588	Warm	EII	2.5	235.200	Fencing Out Livestock
T6 R1	381	383	Warm	R	1.0	381.000	Full Channel Restoration, Fencing Out Livestock
T6 R2	1,035	1,037	Warm	EII	2.5	414.000	Culvert Crossing, Bank Stabilization. Fencing Out Livestock
					Total:	**8,618.650**	

1. T5C Credited using the Headwater Stream guidance method of the valley length.

Restoration Level	**Stream**		
	Warm	**Cool**	**Cold**
Restoration	4,662.000		
Enhancement I	--		
Enhancement II	3,799.650		
Preservation	157.000		
Totals	**8,618.650**		
Total Stream Credit	**8,618.650**		

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. Table 3 below describes expected outcomes to water quality and ecological processes and provides project goals and objectives.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve the stability of stream channels.	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary.	ER stays over 2.2 and BHR below 1.2 with visual assessments showing progression towards stability.	Cross-section monitoring will be assessed during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be assessed annually.	No deviations from design.

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve instream habitat.	Install habitat features such as constructed riffles, lunker logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians leading to colonization and increase in biodiversity over time.	There is no required performance standard for this metric.	N/A	N/A
Reconnect channels with floodplains and to allow a natural flooding regime.	Reconstruct stream channels with designed bankfull dimensions and depth based on reference reach data. Remove pond above T2.	Allow more frequent flood flows to disperse on the floodplain.	Four bankfull events in separate years within monitoring period. 30 consecutive days of flow for intermittent channel.	Crest gauges and/or pressure transducers recording flow elevations.	Reported in MY1.
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zones and plant native shrub and herbaceous species on streambanks.	Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian habitat. Add a source of LWD and organic material to stream.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7.	One hundred square meter vegetation plots are placed on 2% of the planted area of the Site and monitored during MY1, MY2, MY3, MY5, and MY7.	All 11 vegetation plots have a planted stem density greater than 320 stems per acre.
Permanently protect the project Site from harmful uses.	Establish conservation easements on the Site.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments.

1.3 Project Attributes

The project includes several adjacent properties that have been owned and operated as a livestock farm by a single family since 1850, where livestock were continually rotated through all fields with access to the project streams. Based on aerial photos from 1950 to 2012 onsite streams have existed in their approximate locations with very little change to riparian buffer extents since 1950. Two alterations to the Site visible from historical aerial photography were the addition of the pond on T2 between 1964 and 1973, and the addition of the large pond below T5A, T5B, and T5C between 1950 and 1961. According to the landowners, in the 1960's and early 1970's a hog yard was located at the upstream end of T4 and T5, where the streams were diverted to make a hog wallow area. The hogs were moved to a hog house in the early 1970's, however goats, horses, and cattle had continuous access to this portion of the site until Hurricane Matthew struck in September 2016. The floods from the storm destroyed much

of the fencing around T4 and T5 and livestock have been rotated in other fields since that time while fencing was being repaired. Other portions of the site had not seen significant changes in land use with livestock or crop rotations from existing activities. Table 4 below and Table 9a-c in Appendix C present additional information on pre-restoration conditions.

Table 3: Project Attributes

PROJECT INFORMATION			
Project Name	Sassarixa Swamp Mitigation Site	County	Johnston County
Project Area (acres)	65.06	Project Coordinates	35.472153, -78.436000
PROJECT WATERSHED SUMMARY INFORMATION			
Physiographic Province	Rolling Coastal Plain	River Basin	Neuse River
USGS HUC 8-digit	03020201	USGS HUC 14-digit	03020201130030
DWR Sub-basin	03-04-04	Land Use Classification	66% agriculture, 27% forested, 7% developed
Project Drainage Area (acres)	5,024	Percentage of Impervious Area	0.9%

RESTORATION TRIBUTARY SUMMARY INFORMATION					
Parameters	**T1**	**T2**	**T3**	**T5**	**T6**
Pre-project length (feet)	2,202	348	1,098	2,544	1,342
Post-project (feet)	2,155	1,010	1,114	2,553	1,451
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Moderately Confined to Unconfined			
Drainage area (acres)	45	25	26	41.25	38.25
Perennial, Intermittent, Ephemeral	Intermittent		Perennial		
DWR Water Quality Classification	C, NSW			B, NSW	
Dominant Stream Classification (existing)	G5	G5	B5/G5	E5	G5/E5
Dominant Stream Classification (proposed)	C5b	C5b	C5b	E5	C5b
Dominant Evolutionary class (Simon) if applicable	Stage III	Stage IV		Stage III	Stage IV

REGULATORY CONSIDERATIONS			
Parameters	**Applicable?**	**Resolved?**	**Supporting Documentation**
Water of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134.
Water of the United States - Section 401	Yes	Yes	
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2019)
Historic Preservation Act	Yes	Yes	
Coastal Zone Management Act (CZMA or CAMA)	N/A	N/A	N/A
Essential Fisheries Habitat	N/A	N/A	N/A

Section 2: As-Built Condition (Baseline)

The Site construction and as-built surveys were completed in February 2021. The survey included developing an as-built topographic surface; as well as, surveying the as-built channel centerlines, top of banks, structures, and cross-sections.

2.1 As-Built/Record Drawings

A sealed half-size set of record drawings are in Appendix E which includes the post-construction survey, alignments, structures, and monitoring features. No significant field adjustments were made during construction that differ from the design plans. Minimal adjustments were made during construction, where needed, based on field evaluations and are listed below.

2.1.1 Sassarixa Creek Reach 1

- No deviations from design.

2.1.2 Sassarixa Creek Reach 2

- STA 119+34 - 119+66 – Sassarixa Creek was in backwaters during winter baseflow. T2 and Sassarixa Creek were stable and did not require construction of structures.

2.1.3 Sassarixa Creek Reach 3

- No deviations from design.

2.1.4 T1 Reach 1

- STA 203+64 - 203+72 – constructed riffle not installed because existing riffle material adequate and stable.

2.1.5 T1 Reach 2

- STA 205+96 – angled log sill not installed due to decrease tail-of-riffle thalweg elevation.

2.1.6 T1 Reach 3

- No deviations from design.

2.1.7 T1 Reach 4

- STA 220+48 – channel is stable, log sill not needed.

2.1.8 T1A

- No deviations from design.

2.1.9 T1B

- No deviations from design.

2.1.10 T1C

- No deviations from design.

2.1.11 T1D

- STA 280+15 – log sill added for grade control.

2.1.12 T2

- BMP created to capture runoff from surrounding fields and slow water before entering stream;

- STA 306+26 - 306+31, STA 306+61 - 306+66, STA 306+72 - 306+75, STA 306+88 - 306+94, STA 307+00 -307+04, STA 307+64 - 307+68, STA 307+89 - 307+95, and STA 307+99 - 308+05 – rock material was added behind log drops to provide additional roughness to channel during high flow events and stabilize log drops;
- STA 308+08 - 308+11, STA 308+22 - 308+26, STA 308+32 - 308+36, STA 308+46 - 308+48, STA 308+53 - 308+56, STA 308+68 - 308+74 and STA 308+78 - 308+84 – rock material was added behind log drops to provide additional roughness to channel during high flow events and stabilize log drops;
- STA 309+39 - 309+88 – Sassarixa Creek was in backwaters during winter baseflow. T2 and Sassarixa Creek were stable and did not require construction of structures; and
- STA 309+39 - 309+77 – brushtoe was extended to maintain stability.

2.1.13 T3 Reach 1

- Log sills added to ditch above T3 stream;
- Floodplain outlet added for overland flow;
- STA 400+20, STA 400+44, and STA 400+67 – log sills were installed to prevent further erosion and headcuts after pre-construction storms caused erosion;
- STA 402+15 - 402+22, STA 402+59 - 402+73 and STA 403+05 - 403+15 – brushtoe was not needed in these areas because the roots of trees we saved served to stabilize the banks; and
- Log sill was installed on wetland outlet to prevent further erosion caused by pre-construction storms.

2.1.14 T3 Reach 2

- No deviations from design.

2.1.15 T4 Reach 1

- Channel is stable and armoring was not required along culvert outlet.

2.1.16 T4 Reach 2

- No deviations from design.

2.1.17 T4 Reach 3

- No deviations from design.

2.1.18 T5 Reach 1

- NDCOT replaced culvert, regraded road, and stabilized outlet during construction period. This armoring was no longer needed;
- STA 602+35 - 602+56 – brushtoe added to stabilize creek after major storm event;
- STA 603+00 - 603+13 – streambank graded to stabilize creek after major storm event;
- STA 603+27 - 605+81 – due to storm damage, oxbow has been cut through, a native material riffle has been added, streambanks have been graded as needed and oxbow filled in; and
- STA 604+02 - STA 604+30 and STA 604+50 - STA 604+54 – brushtoe added for stabilization.

2.1.19 T5 Reach 2

- STA 607+25 - 607+42 – brushtoe not needed due to additional upstream stabilization work;
- STA 611+25 - outlet added for concentrated flow; and
- STA 611+41 - 611+52 – brushtoe added to stabilize creek after major storm event.

2.1.20 T5 Reach 3

- STA 620+18 - 620+64 – due to storm damage brushtoe added for stability.

2.1.21 T5A

- STA 626+29 – log sills added to stabilize newly formed headcut;
- STA 626+51 – logs added to stabilize newly formed headcut; and
- STA 629+86 - STA 630+03 – riffle was not needed to stabilize existing channel.

2.1.22 T5B

- Culvert protection has been installed.

2.1.23 T5C

- No deviations from design.

2.1.24 T6 Reach 1

- No deviations from design.

2.1.25 T6 Reach 2

- No deviations from design.

Section 3: Monitoring Year 0 Data Assessment

Annual monitoring and site visits were conducted during MY0 to assess the condition of the project. The vegetation and stream success criteria for the Site follow the approved success criteria presented in the Mitigation Plan (Wildlands, 2019). Performance criteria for vegetation, stream, and hydrologic assessment are located in Section 1.2 Table 3: Goals, Performance Criteria, and Functional Improvements.

3.1 Vegetative Assessment

The MY1 vegetative survey was completed in March 2021. Vegetation monitoring resulted in a stem density range of 445 to 648 planted stems per acre which is well above the interim requirement of 320 stems per acre required at MY3. Average stem density was 574 planted stems per acre. All 11 vegetation plots met the interim success criteria and are on track to meet the final success criteria required for MY7. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

3.2 Vegetation Areas of Concern

Vegetation management and herbicide applications were implemented prior to construction along existing forested areas to prevent the spread of invasive species that could compete with planted native species. Dense Chinese privet (*Ligustrum sinense*) and trifoliate orange (*Citrus trifoliata*) was removed along Sassarixa Creek. Sporadic trees of Bradford pear (*Pyrus calleryana*), tree-of-heaven (*Ailanthus altissima*), and princess tree (*Paulownia tomentosa*) were removed along T4 and T5. Invasive species will continue to be monitored and controlled as necessary.

3.3 Stream Assessment

Morphological surveys for MY0 were conducted from October 2020 to March 2021. All streams within the Site are stable and functioning as designed. All 10 cross-sections at the Site show little to no change in the bankfull area and width-to-depth ratio, and bank height ratios are less than 1.2. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and Stream Photographs. Refer to Appendix C for Stream Geomorphology Data.

3.4 Stream Areas of Concern

During the beginning of construction, in September 2020, a nine-inch rain event washed out major portions of Old Olive Road, an NC Department of Transportation (NCDOT) road. Quickly after the road washed out, NCDOT repaired Old Olive Road with gravel. As construction progressed, another major rain event washed out lose sediment from the road, causing sediment plumes to fill in sections of T1, T3, and T5. After the second storm event, NCDOT did additional stabilization along the roadside ditches to prevent further road damage. With each rain event after the road repair, sediment plumes began pushing through the channels, eventually working its way out of the system. With the timing of as-built survey and the sediment making its way through the system, some of the longitudinal profile indicates channel aggradation. After multiple site walks, Wildlands assessed exposed riffled beds indicating that the sediment has made its way through the Site. No action is needed at this time.

3.5 Hydrology Assessment

Hydrologic data will be collected and reported during MY1.

3.6 Wetland Assessment

One groundwater gauge was installed and monitored within an existing wetland zone along T3 at a location requested by North Carolina Division of Water Resources. The purpose of the gauge is to assess

potential effects to wetland hydrology from the construction of the restored stream channel through this area. The results of this monitoring are not tied to a success criterion. Groundwater gauge data will be collected and reported during MY1.

3.7 Adaptive Management Plan

No adaptive management plans are needed at this time.

3.8 Monitoring Year 1 Summary

Overall, the Site looks good, is performing as intended, and is on track to meet success criteria. All vegetation plots are on track to exceed the MY3 interim requirement of 320 planted stems per acre, and all streams within the Site are stable and meeting project goals. Invasive species were control along Sassarixa Creek, T4, and T5 prior to construction and will continued to be assessed throughout the monitoring years. The sediment plumes from Old Olive Road have made their way through the Site and no action is required.

Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

Section 4: METHODOLOGY

Geomorphic data was collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Crest gauges and pressure transducers were installed in riffle cross-sections and monitored throughout the year. Hydrologic monitoring instrument installation and monitoring methods are in accordance with the United States Army Corps of Engineers standards (USACE, 2003). Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

Section 5: REFERENCES

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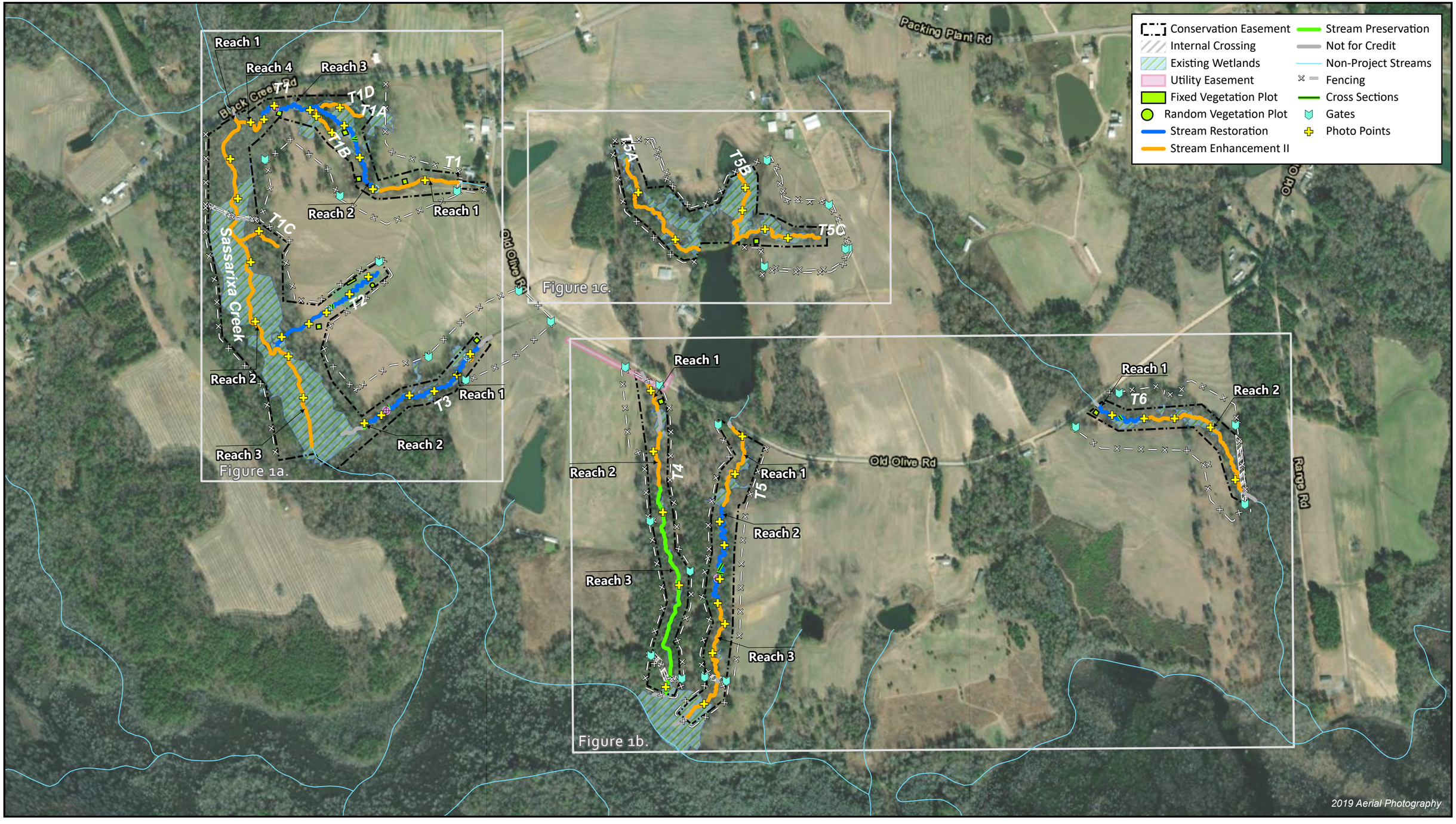
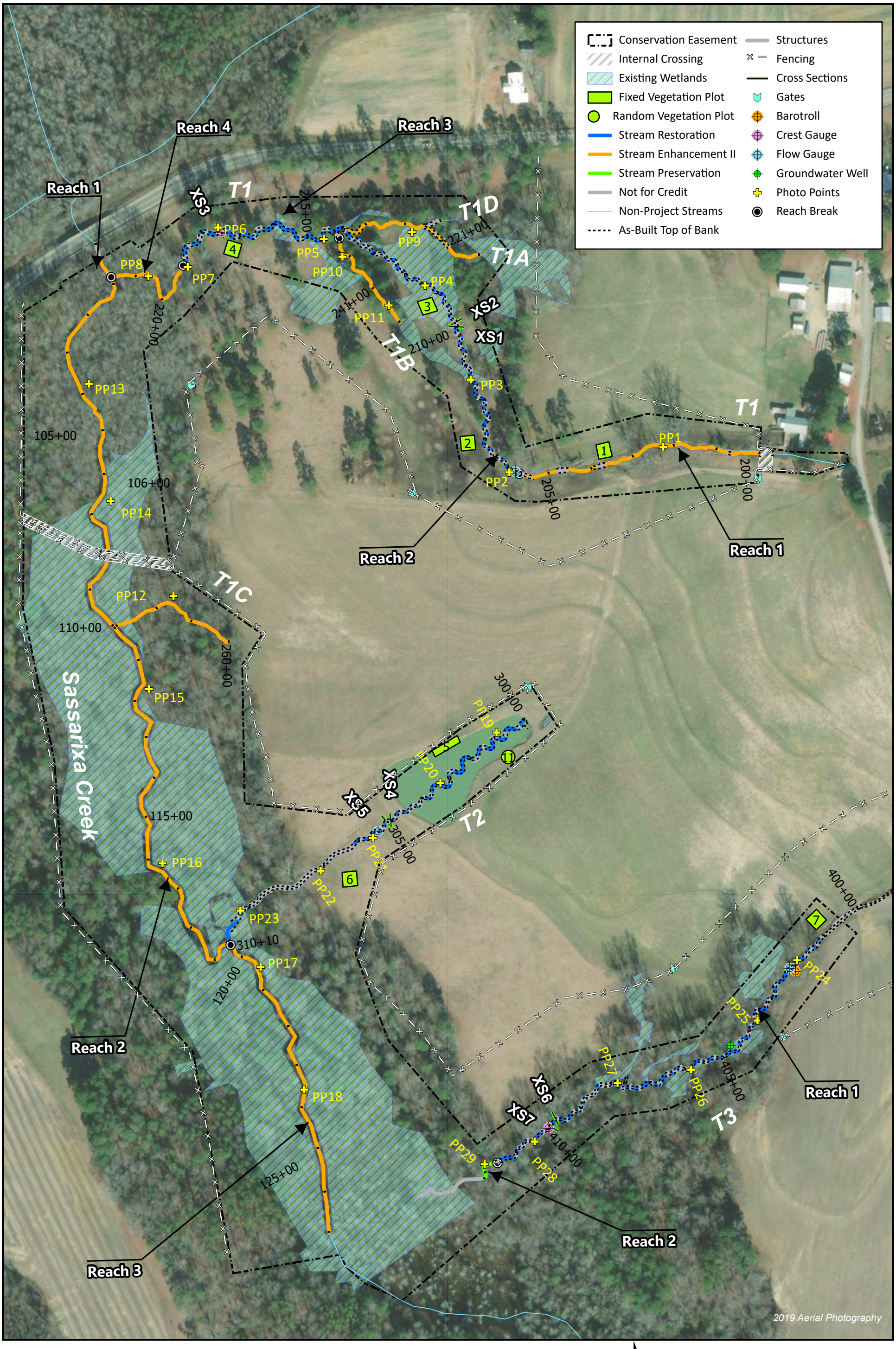


WILDLANDS ENGINEERING

Figure 1. Current Condition Plan View Key
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

Johnston County, NC



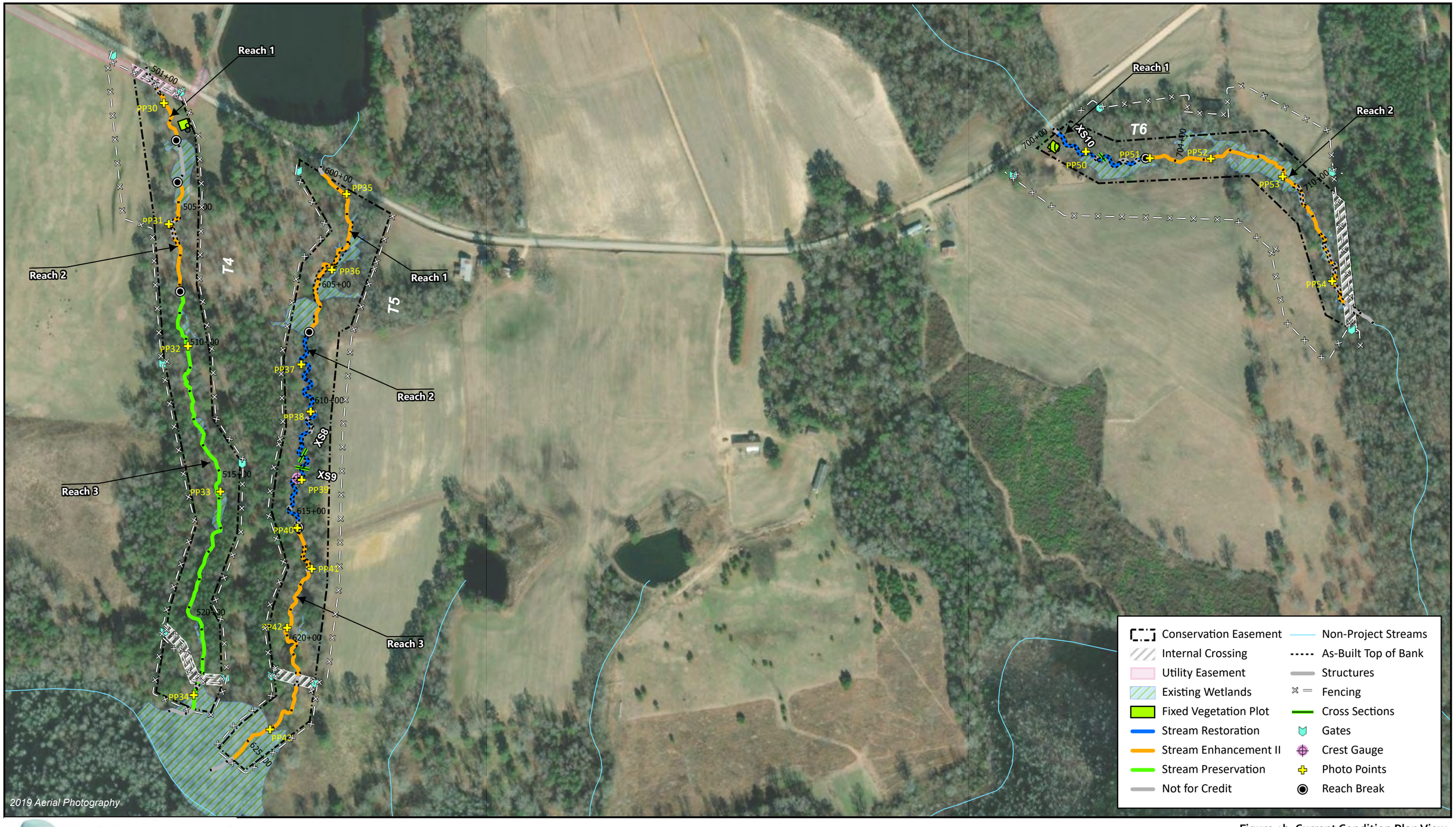
WILDLANDS ENGINEERING

0 200 400 Feet

N

Figure 1a. Current Condition Plan View
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

Johnston County, NC



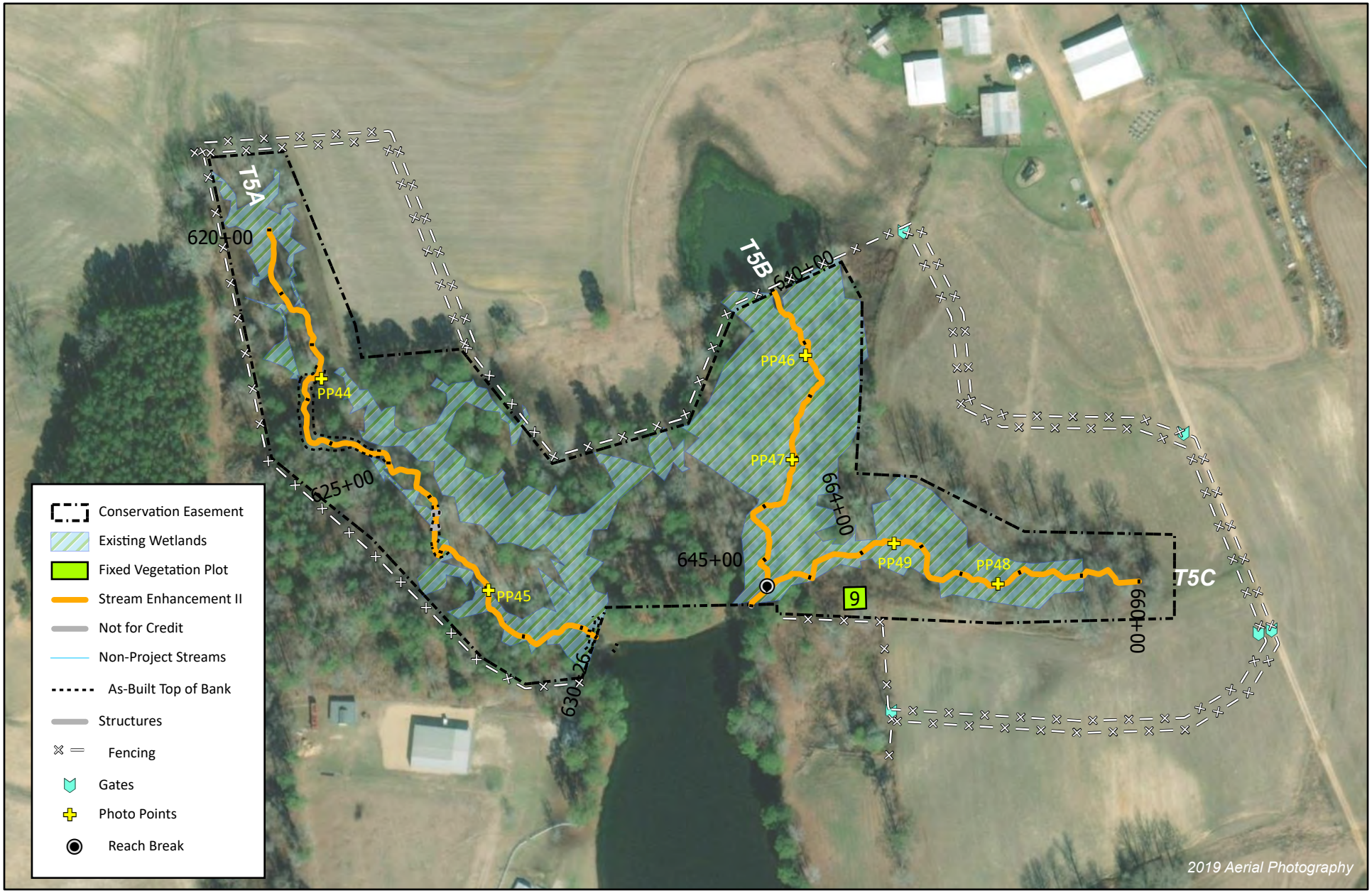
WILDLANDS ENGINEERING

0 300 600 Feet

N

Figure 1b. Current Condition Plan View
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

Johnston County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 1c. Current Condition Plan View
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

Johnston County, NC

APPENDIX A. Visual Assessment Data

Table 4a. Visual Stream Morphology Stability Assessment Table

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

Monitoring Year 0 - 2021

T1 R2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	810
					Assessed Bank Length	1,620
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	27	27		100%

T1 R3

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	507
					Assessed Bank Length	1,014
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	14	14		100%

Table 4a. Visual Stream Morphology Stability Assessment Table

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

Monitoring Year 0 - 2021

T2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	1,006
					Assessed Bank Length	2,012
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	34	34		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	18	18		100%

T3 R1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	1,041
					Assessed Bank Length	2,082
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	30	30		100%

Table 4a. Visual Stream Morphology Stability Assessment Table

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

T5 R2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	874
					Assessed Bank Length	1,748
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	20	20		100%

T6 R1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	383
					Assessed Bank Length	766
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	0	0		N/A
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5		100%

Table 5. Vegetation Condition Assessment Table
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

Planted Acreage **13.03**

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10	0	0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10	0	0%
		Total	**0**	**0%**
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10	0	0%
		Cumulative Total	**0.0**	**0%**

Easement Acreage **65.06**

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Invasive species included in summation above should be identified in report summary.	0.10	0	0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	0 Encroachments Noted / 0 ac	

STREAM PHOTOGRAPHS

PHOTO POINT 1 T1 R1 – upstream *(01/07/2021)*

PHOTO POINT 1 T1 R1 – downstream *(01/07/2021)*

PHOTO POINT 2 T1 R2 – upstream *(01/07/2021)*

PHOTO POINT 2 T1 R2 – downstream *(01/07/2021)*

PHOTO POINT 3 T1 R2 – upstream *(01/07/2021)*

PHOTO POINT 3 T1 R2 – downstream *(01/07/2021)*

	
PHOTO POINT 4 T1 R2 – upstream *(01/07/2021)*	**PHOTO POINT 4 T1 R2 – downstream *(01/07/2021)***
	
PHOTO POINT 5 T1 R3 – upstream *(01/07/2021)*	**PHOTO POINT 5 T1 R3 – downstream *(01/07/2021)***
	
PHOTO POINT 6 T1 R3 – upstream *(01/07/2021)*	**PHOTO POINT 6 T1 R3 – downstream *(01/07/2021)***

	
PHOTO POINT 7 T1 R3 – upstream *(01/07/2021)*	**PHOTO POINT 7 T1 R3 – downstream *(01/07/2021)***
	
PHOTO POINT 8 T1 R4 – upstream *(01/07/2021)*	**PHOTO POINT 8 T1 R4 – downstream *(01/07/2021)***
	
PHOTO POINT 9 T1B – upstream *(01/07/2021)*	**PHOTO POINT 9 T1B – downstream *(01/07/2021)***

	
PHOTO POINT 10 T1B – upstream *(01/07/2021)*	**PHOTO POINT 10 T1B – downstream *(01/07/2021)***
	
PHOTO POINT 11 T1A – upstream *(01/07/2021)*	**PHOTO POINT 11 T1A – downstream *(01/07/2021)***
	
PHOTO POINT 12 T1C – upstream *(12/11/2020)*	**PHOTO POINT 12 T1C – downstream *(12/11/2020)***

	
PHOTO POINT 13 Sassarixa Creek – upstream *(12/11/2020)*	**PHOTO POINT 13 Sassarixa Creek – downstream *(12/11/2020)***
	
PHOTO POINT 14 Sassarixa Creek – upstream *(12/11/2020)*	**PHOTO POINT 14 Sassarixa Creek – downstream *(12/11/2020)***
	
PHOTO POINT 15 Sassarixa Creek – upstream *(12/11/2020)*	**PHOTO POINT 15 Sassarixa Creek – downstream *(12/11/2020)***

	
PHOTO POINT 16 Sassarixa Creek – upstream *(12/11/2020)*	**PHOTO POINT 16 Sassarixa Creek – downstream *(12/11/2020)***
	
PHOTO POINT 17 Sassarixa Creek – upstream *(12/11/2020)*	**PHOTO POINT 17 Sassarixa Creek – downstream *(12/11/2020)***
	
PHOTO POINT 18 Sassarixa Creek – upstream *(12/11/2020)*	**PHOTO POINT 18 Sassarixa Creek – downstream *(12/11/2020)***

PHOTO POINT 19 T2 – upstream *(01/07/2021)*

PHOTO POINT 19 T2 – downstream *(01/07/2021)*

PHOTO POINT 20 T2 – upstream *(01/07/2021)*

PHOTO POINT 20 T2 – downstream *(01/07/2021)*

PHOTO POINT 21 T2 – upstream *(01/07/2021)*

PHOTO POINT 21 T2 – downstream *(01/07/2021)*

	
PHOTO POINT 22 T2 – upstream *(01/07/2021)*	**PHOTO POINT 22 T2 – downstream *(01/07/2021)***
	
PHOTO POINT 23 T2 – upstream *(01/07/2021)*	**PHOTO POINT 23 T2 – downstream *(01/07/2021)***
	
PHOTO POINT 24 T3 R1 – upstream *(12/11/2020)*	**PHOTO POINT 24 T3 R1 – downstream *(12/11/2020)***

	
PHOTO POINT 25 T3 R1 – upstream *(12/11/2020)*	**PHOTO POINT 25 T3 R1 – downstream *(12/11/2020)***
	
PHOTO POINT 26 T3 R1 – upstream *(12/11/2020)*	**PHOTO POINT 26 T3 R1 – downstream *(12/11/2020)***
	
PHOTO POINT 27 T3 R1 – upstream *(12/11/2020)*	**PHOTO POINT 27 T3 R1 – downstream *(12/11/2020)***

	
PHOTO POINT 28 T3 R1 – upstream *(12/11/2020)*	**PHOTO POINT 28 T3 R1 – downstream *(12/11/2020)***
	
PHOTO POINT 29 T3 R2 – upstream *(12/11/2020)*	**PHOTO POINT 29 T3 R2 – downstream *(12/11/2020)***
	
PHOTO POINT 30 T4 R1 – upstream *(11/10/2020)*	**PHOTO POINT 30 T4 R1 – downstream *(11/10/2020)***

	
PHOTO POINT 31 T4 R2 – upstream *(11/10/2020)*	**PHOTO POINT 31 T4 R2 – downstream *(11/10/2020)***
	
PHOTO POINT 32 T4 R3 – upstream *(11/10/2020)*	**PHOTO POINT 32 T4 R3 – downstream *(11/10/2020)***
	
PHOTO POINT 33 T4 R3 – upstream *(11/10/2020)*	**PHOTO POINT 33 T4 R3 – downstream *(11/10/2020)***

	
PHOTO POINT 34 T4 R3 – upstream *(11/10/2020)*	**PHOTO POINT 34 T4 R3 – downstream *(11/10/2020)***
	
PHOTO POINT 35 T5 R1 – upstream *(11/10/2020)*	**PHOTO POINT 35 T5 R1 – downstream *(11/10/2020)***
	
PHOTO POINT 36 T5 R1 – upstream *(11/10/2020)*	**PHOTO POINT 36 T5 R1 – downstream *(11/10/2020)***

PHOTO POINT 37 T5 R2 – upstream *(11/10/2020)*

PHOTO POINT 37 T5 R2 – downstream *(11/10/2020)*

PHOTO POINT 38 T5 R2 – upstream *(11/10/2020)*

PHOTO POINT 38 T5 R2 – downstream *(11/10/2020)*

PHOTO POINT 39 T5 R2 – upstream *(11/10/2020)*

PHOTO POINT 39 T5 R2 – downstream *(11/10/2020)*

	
PHOTO POINT 40 T5 R2 – upstream *(11/10/2020)*	**PHOTO POINT 40 T5 R2 – downstream *(11/10/2020)***
	
PHOTO POINT 41 T5 R2 – upstream *(11/10/2020)*	**PHOTO POINT 41 T5 R3 – downstream *(11/10/2020)***
	
PHOTO POINT 42 T5 R3 – upstream *(11/10/2020)*	**PHOTO POINT 42 T5 R3 – downstream *(11/10/2020)***

	
PHOTO POINT 43 T5 R3 – upstream *(11/10/2020)*	**PHOTO POINT 43 T5 R3 – downstream *(11/10/2020)***
	
PHOTO POINT 44 T5A – upstream *(11/10/2020)*	**PHOTO POINT 44 T5A – downstream *(11/10/2020)***
	
PHOTO POINT 45 T5A – upstream *(11/10/2020)*	**PHOTO POINT 45 T5A – downstream *(11/10/2020)***

	
PHOTO POINT 46 T5B – upstream *(11/10/2020)*	**PHOTO POINT 46 T5B – downstream *(11/10/2020)***
	
PHOTO POINT 47 T5C – upstream *(11/10/2020)*	**PHOTO POINT 47 T5C – downstream *(11/10/2020)***
	
PHOTO POINT 48 T5C – upstream *(11/10/2020)*	**PHOTO POINT 48 T5C – downstream *(11/10/2020)***

PHOTO POINT 49 T5C – upstream *(11/10/2020)*

PHOTO POINT 49 T5C – downstream *(11/10/2020)*

PHOTO POINT 50 T6 R1 – upstream *(10/22/2020)*

PHOTO POINT 50 T6 R1 – downstream *(10/22/2020)*

PHOTO POINT 51 T6 R2 – upstream *(10/22/2020)*

PHOTO POINT 51 T6 R2 – downstream *(10/22/2020)*

	
PHOTO POINT 52 T6 R2 – upstream *(10/22/2020)*	**PHOTO POINT 52 T6 R2 – downstream *(10/22/2020)***
	
PHOTO POINT 53 T6 R2 – upstream *(10/22/2020)*	**PHOTO POINT 53 T6 R2 – downstream *(10/22/2020)***
	
PHOTO POINT 54 T6 R2 – upstream *(10/22/2020)*	**PHOTO POINT 54 T6 R2 – downstream *(10/22/2020)***

VEGETATION PLOT PHOTOGRAPHS

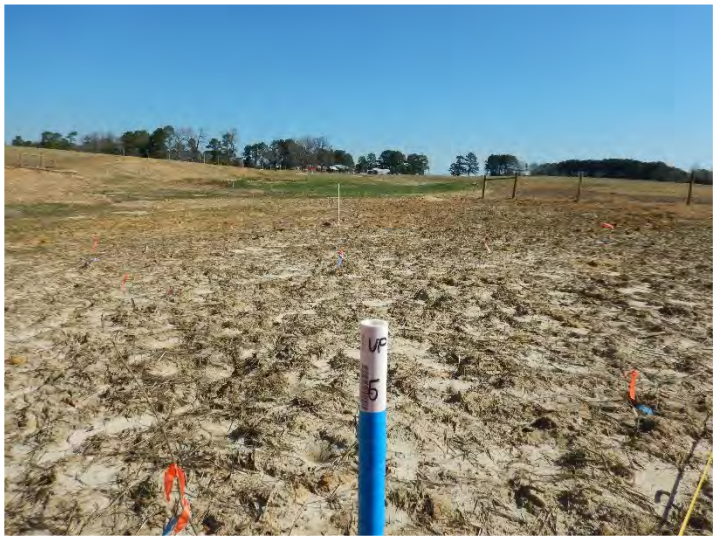
FIXED VEG PLOT 1 *(3/11/2021)*

FIXED VEG PLOT 2 *(3/11/2021)*

FIXED VEG PLOT 3 *(3/11/2021)*

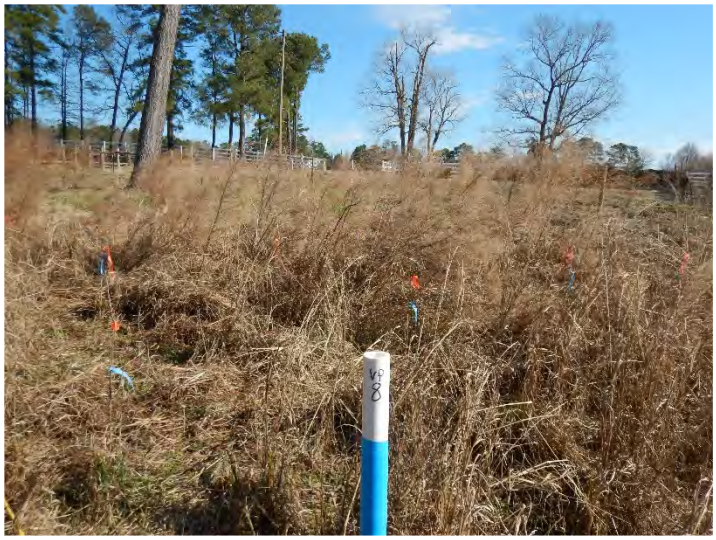
FIXED VEG PLOT 4 *(3/11/2021)*

FIXED VEG PLOT 5 *(3/11/2021)*



FIXED VEG PLOT 6 *(3/11/2021)*

FIXED VEG PLOT 7 *(3/11/2021)*



FIXED VEG PLOT 8 *(3/11/2021)*

FIXED VEG PLOT 9 *(3/11/2021)*

FIXED VEG PLOT 10 *(3/11/2021)*

RANDOM VEG PLOT 11 *(3/16/2021)*

APPENDIX B. Vegetation Plot Data

Table 6. Vegetation Plot Data

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

Planted Acreage	13.03
Date of Initial Plant	2021-03-05
Date of Current Survey	2021-03-11
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	1	1			1	1	1	1
	Betula nigra	river birch	Tree	FACW	3	3			4	4	1	1
	Magnolia virginiana	sweetbay	Tree	FACW	1	1	2	2	1	1	1	1
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	3	3	4	4	2	2
	Populus deltoides	eastern cottonwood	Tree	FAC	1	1	3	3			2	2
	Quercus michauxii	swamp chestnut oak	Tree	FACW	2	2			2	2	4	4
	Quercus nigra	water oak	Tree	FAC	2	2	1	1			1	1
	Quercus phellos	willow oak	Tree	FACW	1	1	2	2	3	3	3	3
Sum				Performance Standard	14	14	11	11	15	15	15	15
Mitigation Plan Performance Standard				Current Year Stem Count		14		11		15		15
				Stems/Acre		567		445		607		607
				Species Count		8		5		6		8
				Dominant Species Composition (%)		21		27		27		27
				Average Plot Height		3		2		2		2
				% Invasives		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		14		11		15		15
				Stems/Acre		567		445		607		607
				Species Count		8		5		6		8
				Dominant Species Composition (%)		21		27		27		27
				Average Plot Height		3		2		2		2
				% Invasives		0		0		0		0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 6. Vegetation Plot Data

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

Planted Acreage	13.03
Date of Initial Plant	2021-03-05
Date of Current Survey	2021-03-11
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	1	1	2	2	1	1	2	2
	Betula nigra	river birch	Tree	FACW	2	2	2	2	2	2	1	1
	Magnolia virginiana	sweetbay	Tree	FACW	1	1	1	1	1	1	1	1
	Platanus occidentalis	American sycamore	Tree	FACW	4	4	2	2	4	4	3	3
	Populus deltoides	eastern cottonwood	Tree	FAC	1	1					1	1
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1	1	4	4	3	3	5	5
	Quercus nigra	water oak	Tree	FAC					1	1		
	Quercus phellos	willow oak	Tree	FACW	2	2	3	3	2	2	1	1
Sum				Performance Standard	12	12	14	14	14	14	14	14
Mitigation Plan Performance Standard				Current Year Stem Count		12		14		14		14
				Stems/Acre		486		567		567		567
				Species Count		7		6		7		7
				Dominant Species Composition (%)		33		29		29		36
				Average Plot Height		3		3		2		3
				% Invasives		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		12		14		14		14
				Stems/Acre		486		567		567		567
				Species Count		7		6		7		7
				Dominant Species Composition (%)		33		29		29		36
				Average Plot Height		3		3		2		3
				% Invasives		0		0		0		0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 6. Vegetation Plot Data

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

Planted Acreage	13.03
Date of Initial Plant	2021-03-05
Date of Current Survey	2021-03-11
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 9 F		Veg Plot 10 F		Veg Plot 11 R
					Planted	Total	Planted	Total	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	3	3	1	1	1
	Betula nigra	river birch	Tree	FACW	3	3	2	2	4
	Magnolia virginiana	sweetbay	Tree	FACW	1	1	2	2	1
	Platanus occidentalis	American sycamore	Tree	FACW	5	5	3	3	3
	Populus deltoides	eastern cottonwood	Tree	FAC	2	2	2	2	1
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1	1	2	2	2
	Quercus nigra	water oak	Tree	FAC			1	1	2
	Quercus phellos	willow oak	Tree	FACW	1	1	2	2	2
Sum				Performance Standard	16	16	15	15	16
Mitigation Plan Performance Standard				Current Year Stem Count		16		15	16
				Stems/Acre		648		607	648
				Species Count		7		8	8
				Dominant Species Composition (%)		31		20	25
				Average Plot Height		2		2	2
				% Invasives		0		0	0
Post Mitigation Plan Performance Standard				Current Year Stem Count		16		15	16
				Stems/Acre		648		607	648
				Species Count		7		8	8
				Dominant Species Composition (%)		31		20	25
				Average Plot Height		2		2	2
				% Invasives		0		0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 7. Vegetation Performance Standards Summary Table

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

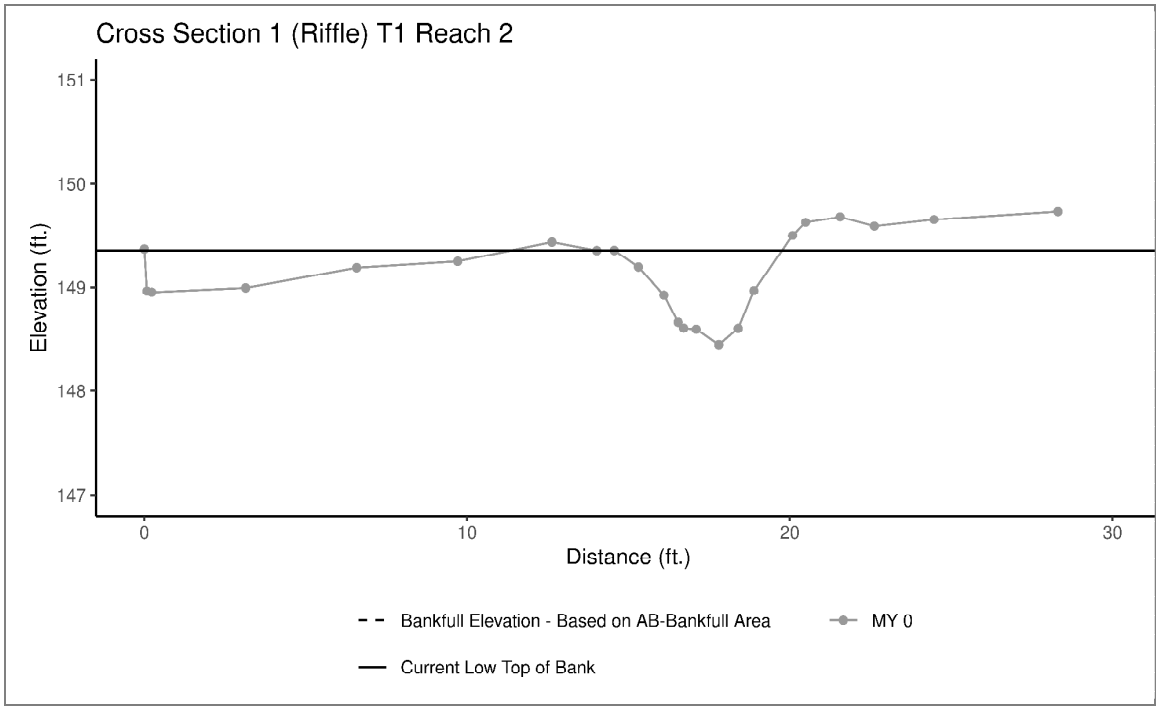
Monitoring Year 0 - 2021

	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1												
Monitoring Year 0	567	3	8	0	445	2	5	0	607	2	6	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1												
Monitoring Year 0	607	2	8	0	486	3	7	0	567	3	6	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1												
Monitoring Year 0	567	2	7	0	567	3	7	0	648	2	7	0
	Veg Plot 10 F				Veg Plot Group 1 R							
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives				
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1												
Monitoring Year 0	607	2	8	0	648	2	8	0				

*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

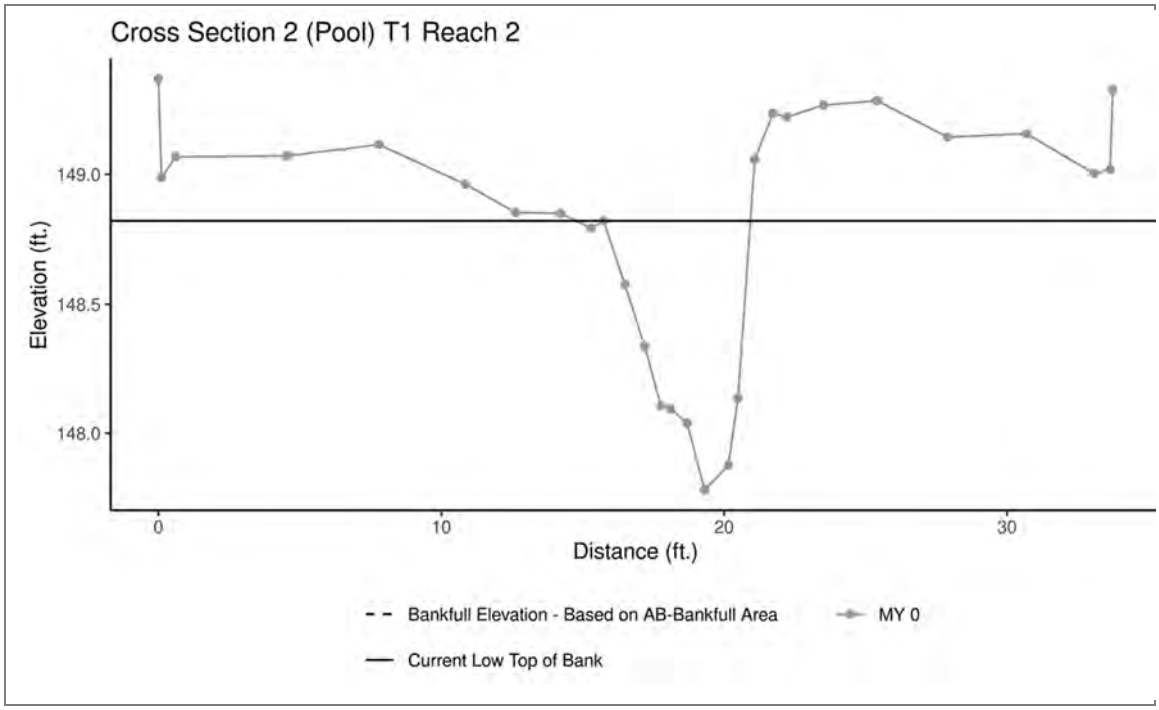
APPENDIX C. Stream Geomorphology Data

Cross-Section Plots



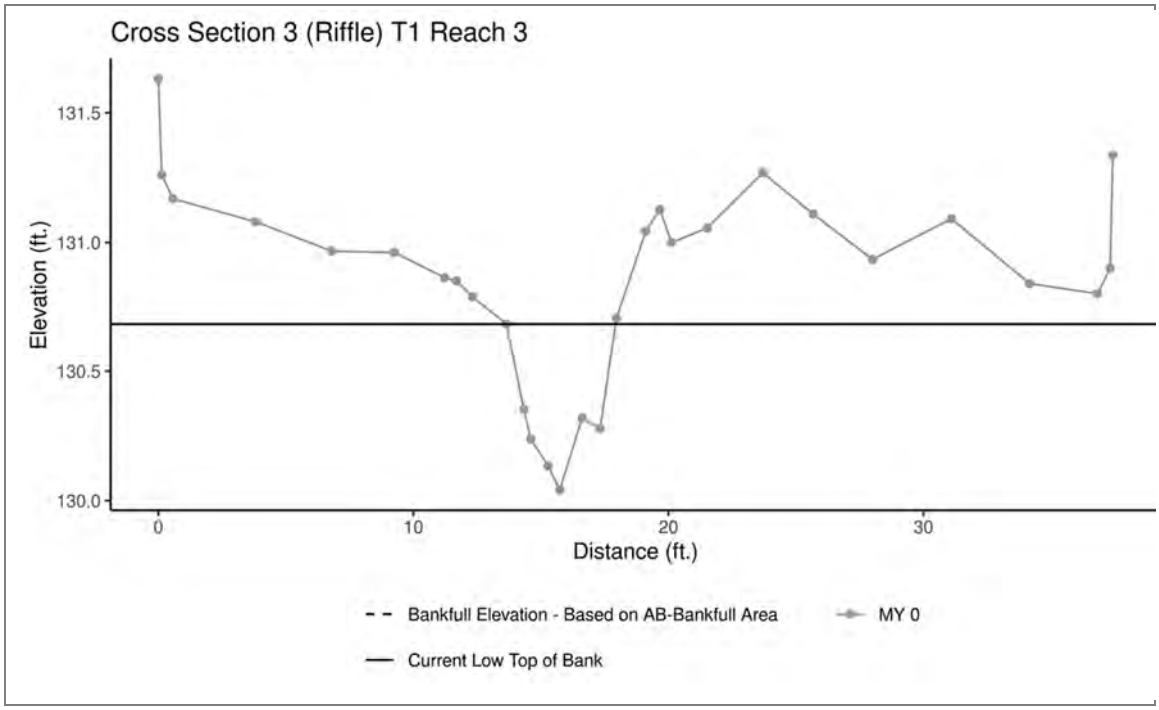
	MY0	MY1	MY2	MY3	MY6	MY7
Bankfull Elevation - Based on AB-Bankfull Area	149.35					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	148.45					
LTOB Elevation	149.35					
LTOB Max Depth	0.902					
LTOB Cross Sectional Area	2.47					

Downstream *(01/19/2021)*



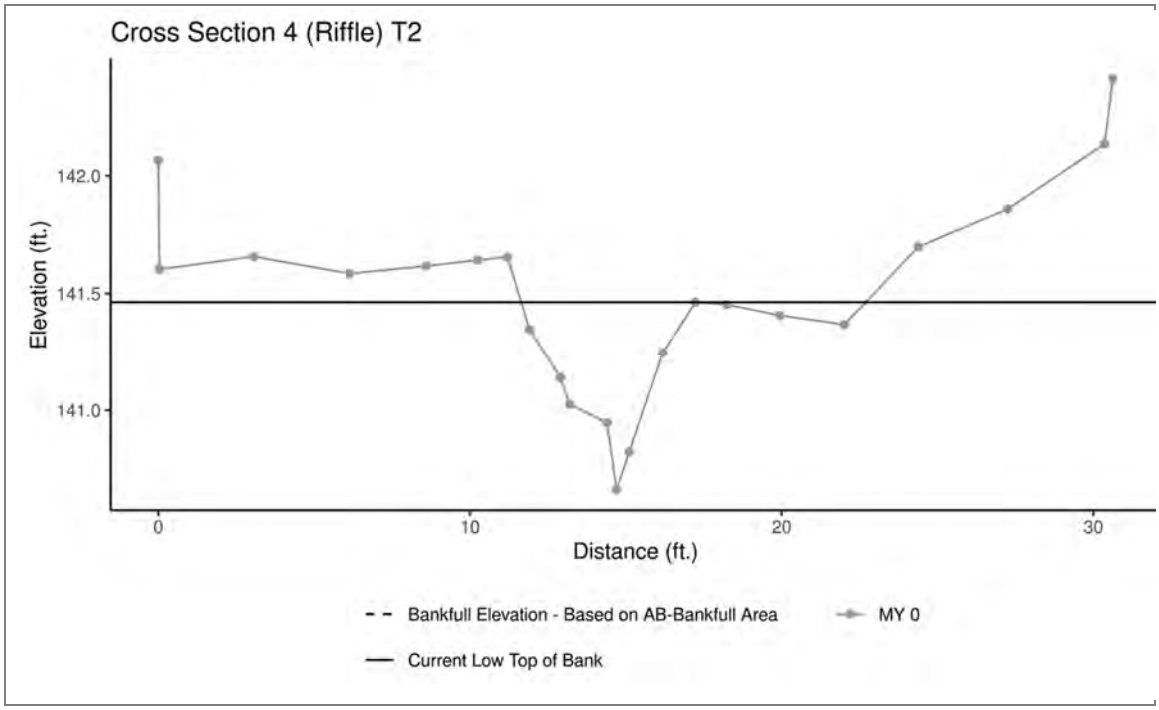
	MY0	MY1	MY2	MY3	MY6	MY7
Bankfull Elevation - Based on AB-Bankfull Area	148.82					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	147.78					
LTOB Elevation	148.82					
LTOB Max Depth	1.039					
LTOB Cross Sectional Area	3.20					

Downstream *(01/19/2021)*



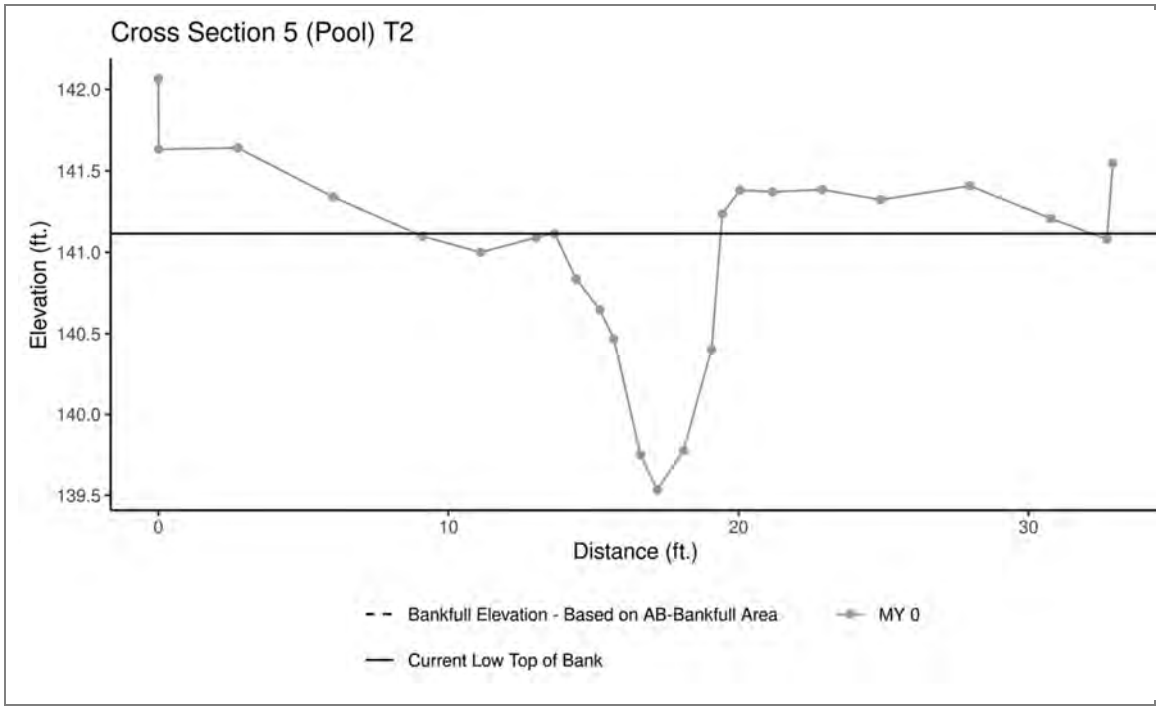
	MY0	MY1	MY2	MY3	MY6	MY7
Bankfull Elevation - Based on AB-Bankfull Area	130.69					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	130.04					
LTOB Elevation	130.69					
LTOB Max Depth	0.644					
LTOB Cross Sectional Area	1.67					

Downstream *(01/19/2021)*



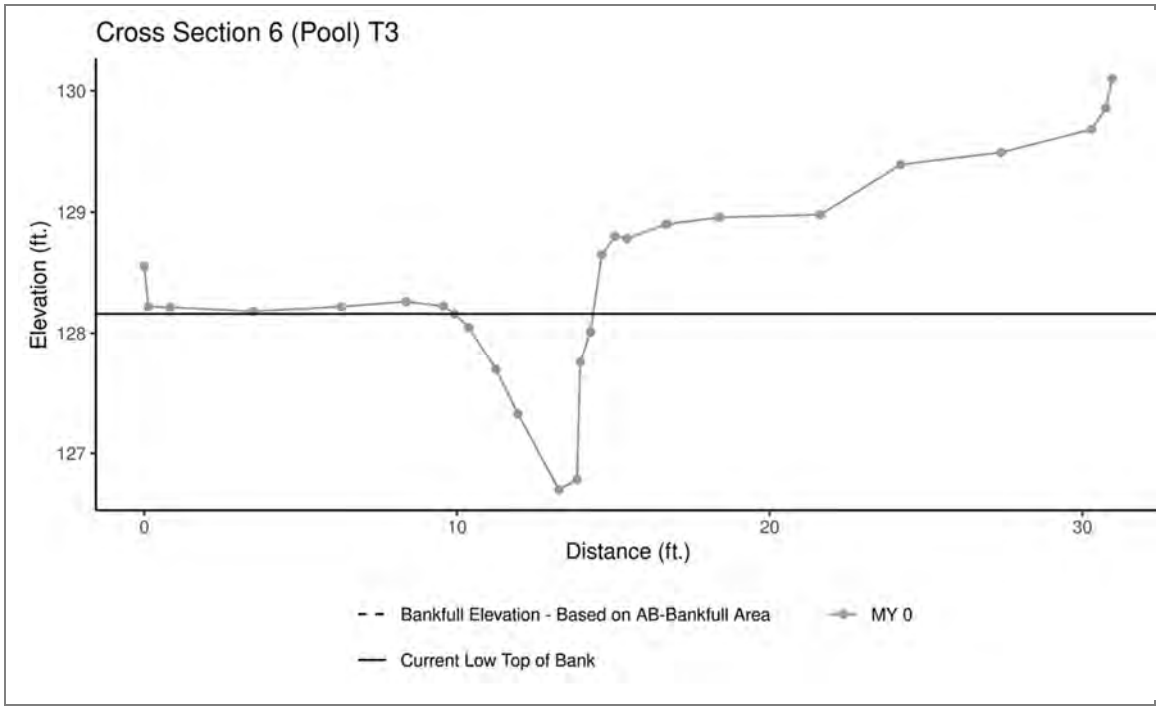
	MY0	MY1	MY2	MY3	MY6	MY7
Bankfull Elevation - Based on AB-Bankfull Area	141.46					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	140.66					
LTOB Elevation	141.46					
LTOB Max Depth	0.802					
LTOB Cross Sectional Area	1.99					

Downstream *(01/19/2021)*



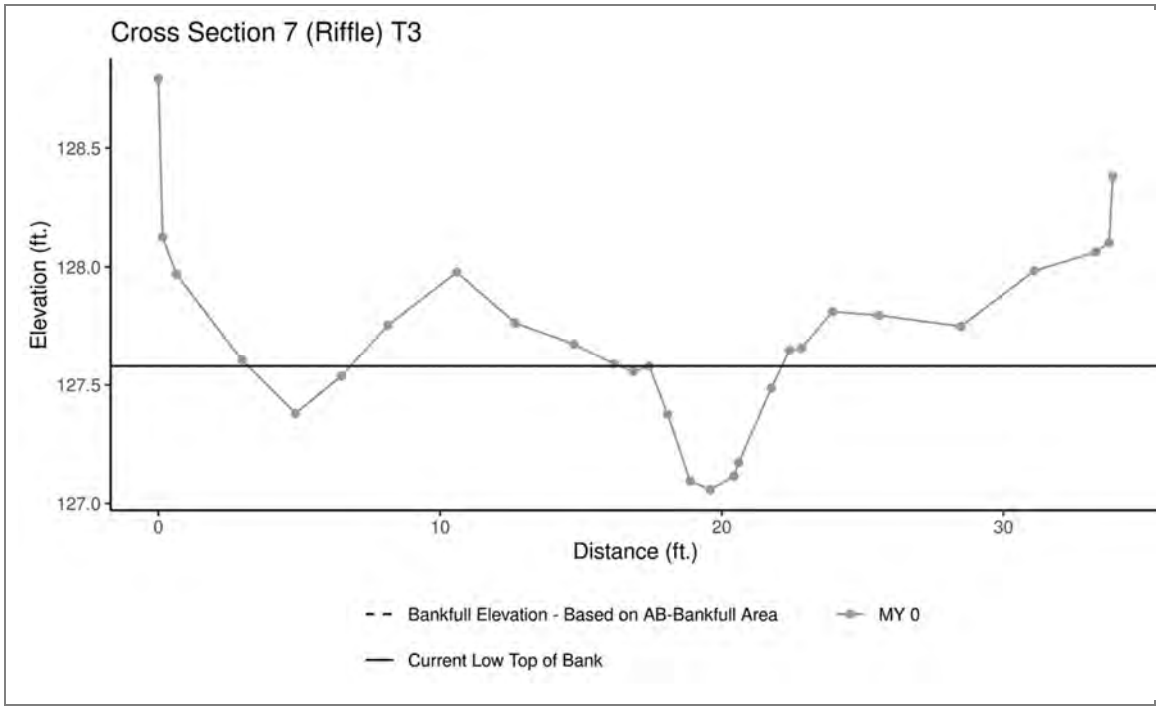
	MY0	MY1	MY2	MY3	MY6	MY7
Bankfull Elevation - Based on AB-Bankfull Area	141.12					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	139.53					
LTOB Elevation	141.12					
LTOB Max Depth	1.581					
LTOB Cross Sectional Area	4.88					

Downstream *(01/19/2021)*



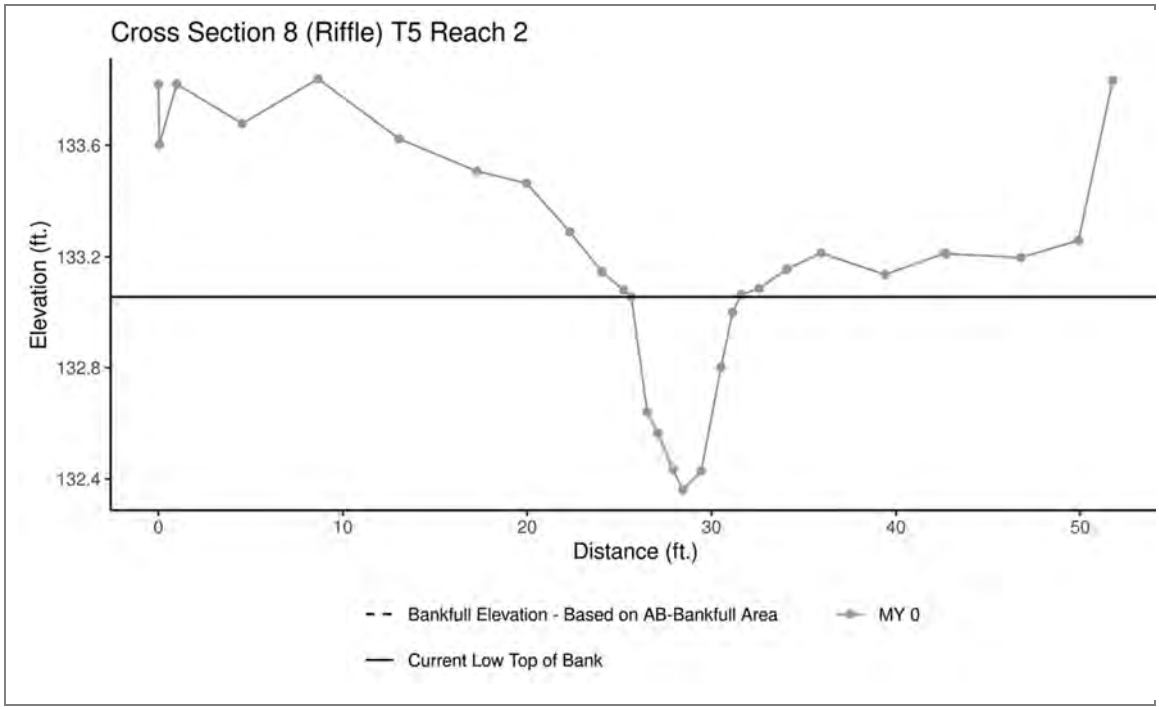
	MY0	MY1	MY2	MY3	MY6	MY7
Bankfull Elevation - Based on AB-Bankfull Area	128.16					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	126.70					
LTOB Elevation	128.16					
LTOB Max Depth	1.462					
LTOB Cross Sectional Area	3.25					

Downstream *(01/19/2021)*



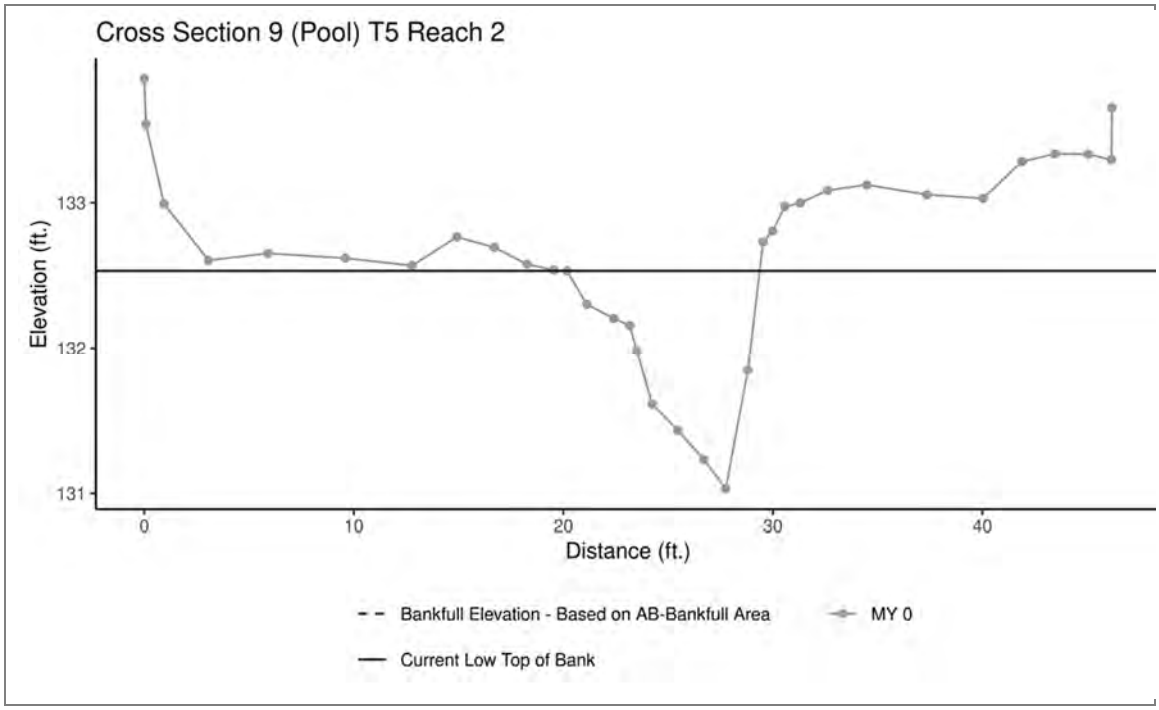
	MY0	MY1	MY2	MY3	MY6	MY7
Bankfull Elevation - Based on AB-Bankfull Area	127.58					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	127.06					
LTOB Elevation	127.58					
LTOB Max Depth	0.522					
LTOB Cross Sectional Area	1.50					

Downstream *(01/19/2021)*



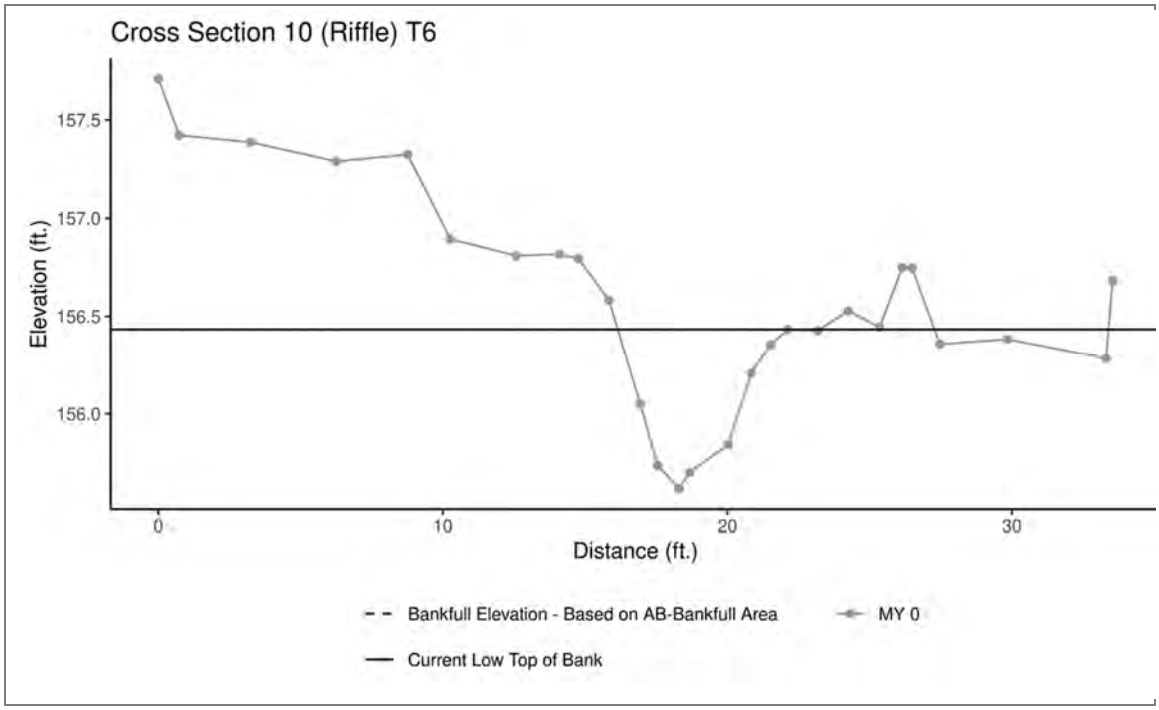
	MY0	MY1	MY2	MY3	MY6	MY7
Bankfull Elevation - Based on AB-Bankfull Area	133.06					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	132.36					
LTOB Elevation	133.06					
LTOB Max Depth	0.696					
LTOB Cross Sectional Area	2.49					

Downstream *(01/19/2021)*



	MY0	MY1	MY2	MY3	MY6	MY7
Bankfull Elevation - Based on AB-Bankfull Area	132.53					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	131.03					
LTOB Elevation	132.53					
LTOB Max Depth	1.500					
LTOB Cross Sectional Area	6.97					

Downstream *(01/19/2021)*



	MY0	MY1	MY2	MY3	MY6	MY7
Bankfull Elevation - Based on AB-Bankfull Area	156.43					
Bank Height Ratio - Based on AB-Bankfull Area	1.00					
Thalweg Elevation	155.62					
LTOB Elevation	156.43					
LTOB Max Depth	0.814					
LTOB Cross Sectional Area	2.69					

Downstream *(01/19/2021)*

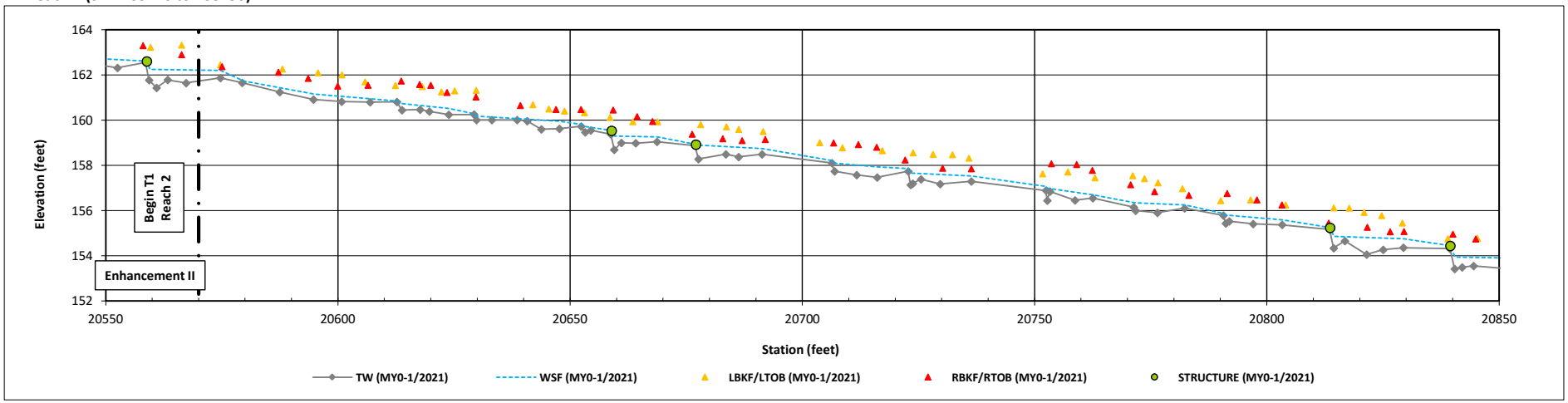
Longitudinal Profile Plots

Sassarixa Swamp Mitigation Site

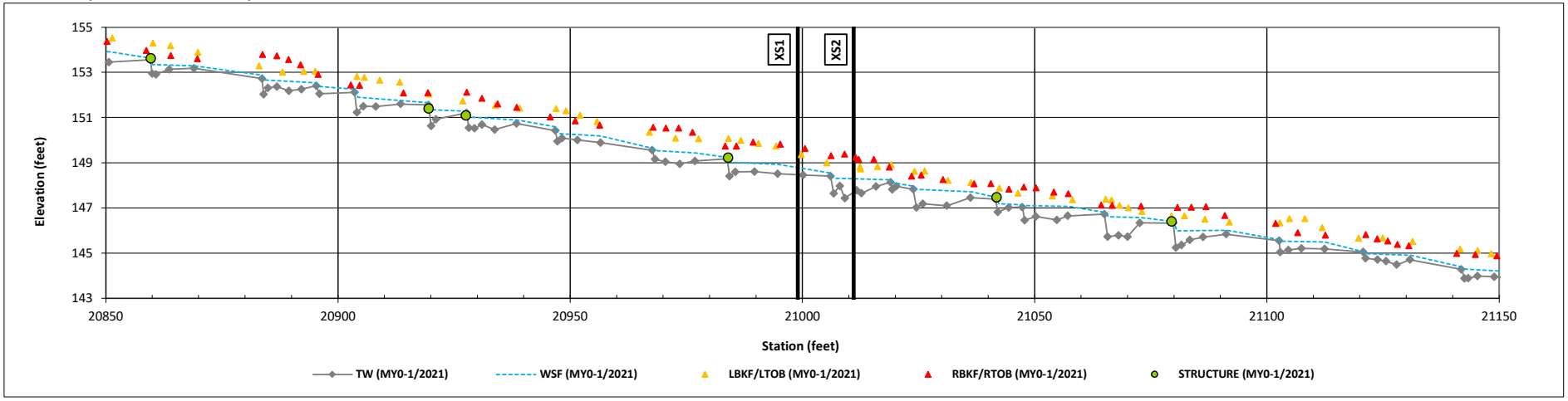
DMS Project No. 100040

Monitoring Year 0 - 2021

T1 Reach 2 (STA 205+70 to 208+50)



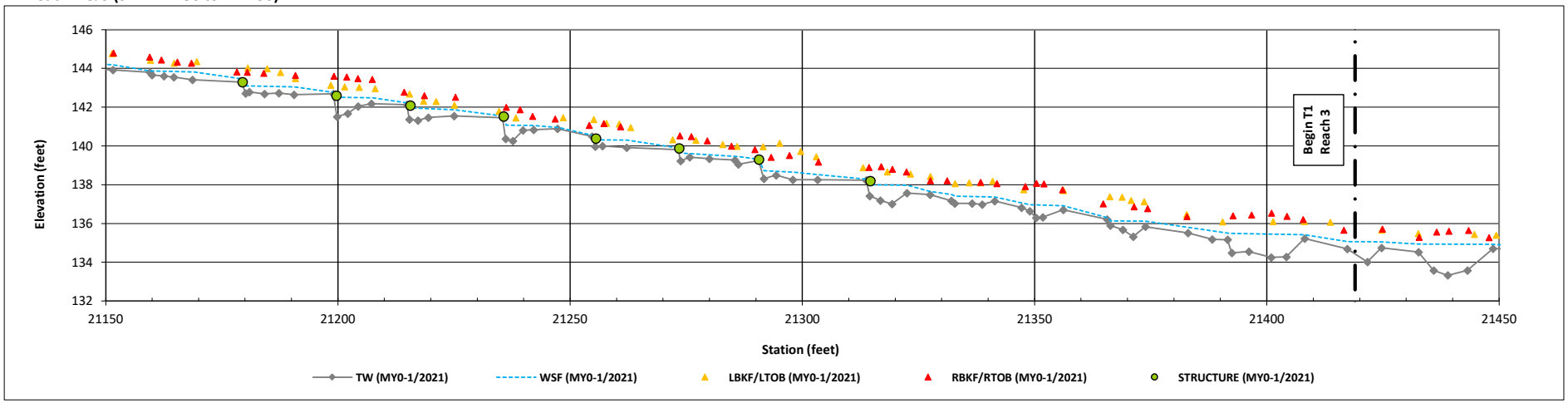
T1 Reach 2 (STA 208+50 to 211+50)



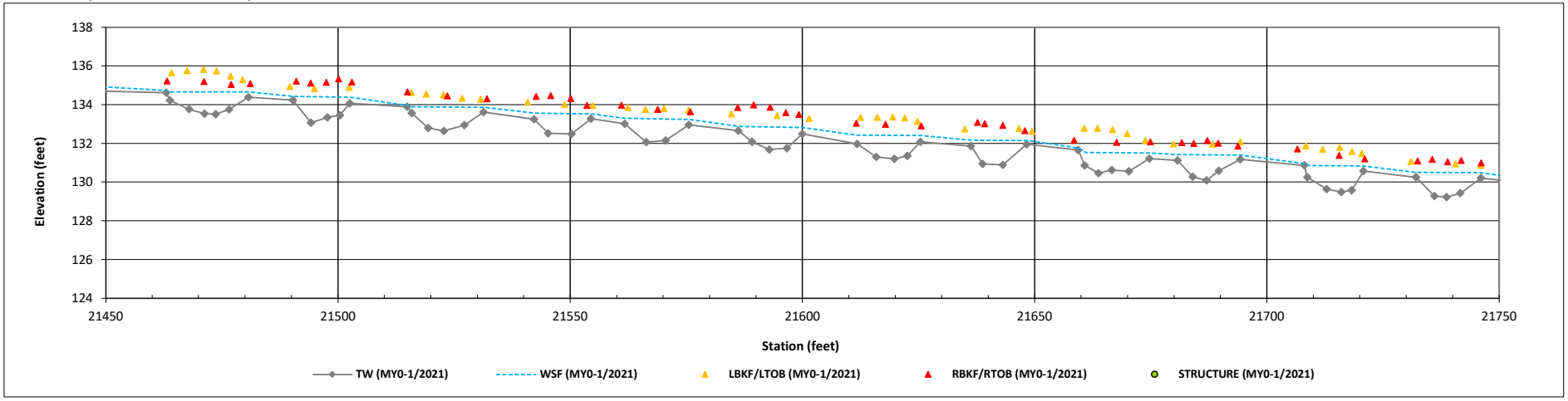
Longitudinal Profile Plots

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

T1 Reach 2 & 3 (STA 211+50 to 214+50)



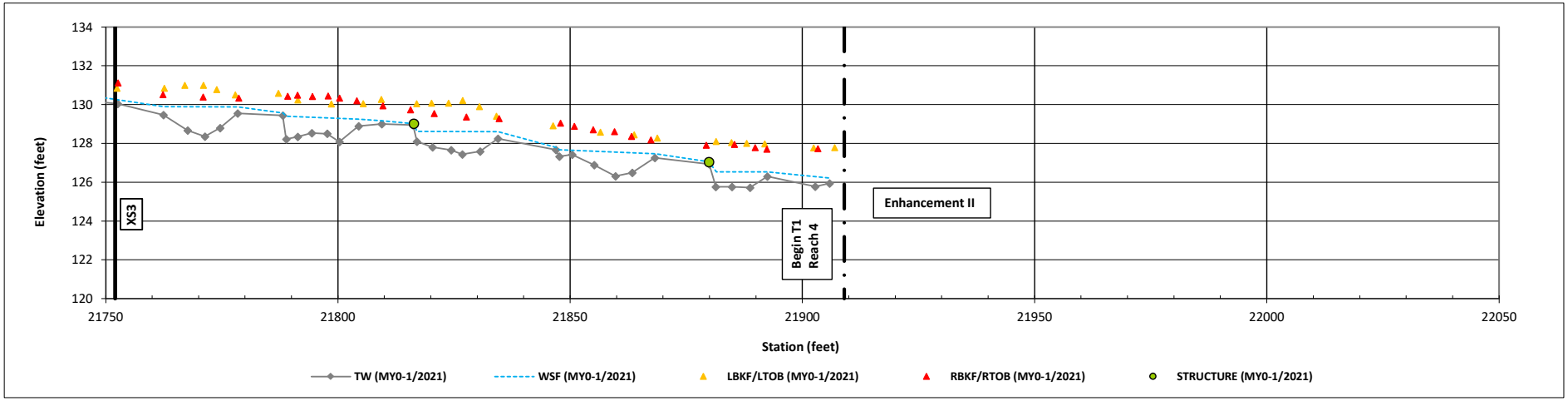
T1 Reach 3 (STA 214+50 to 217+50)



Longitudinal Profile Plots

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

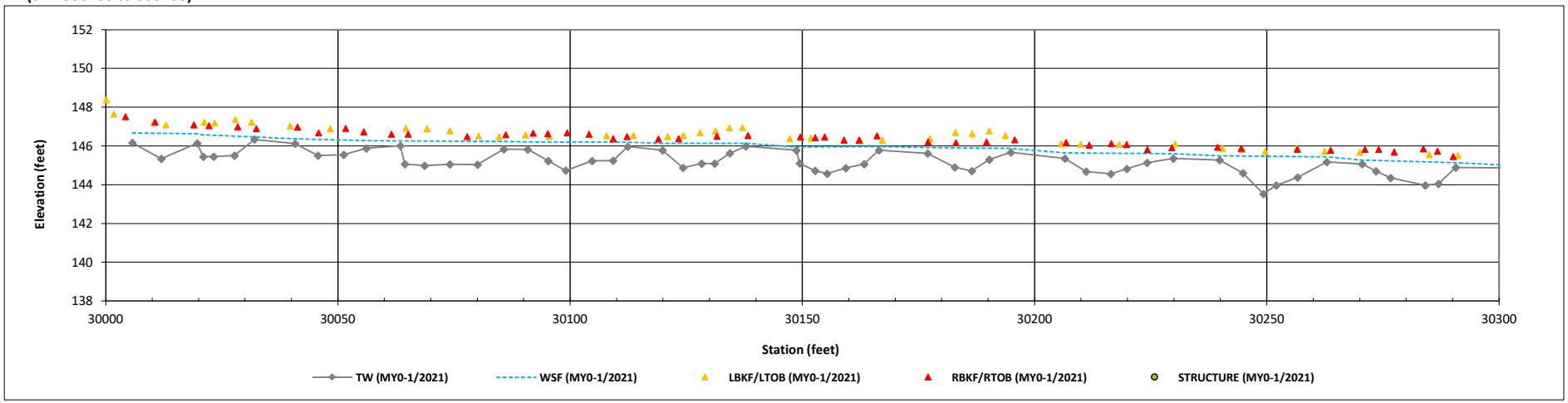
T1 Reach 3 (STA 217+50 to 219+09)



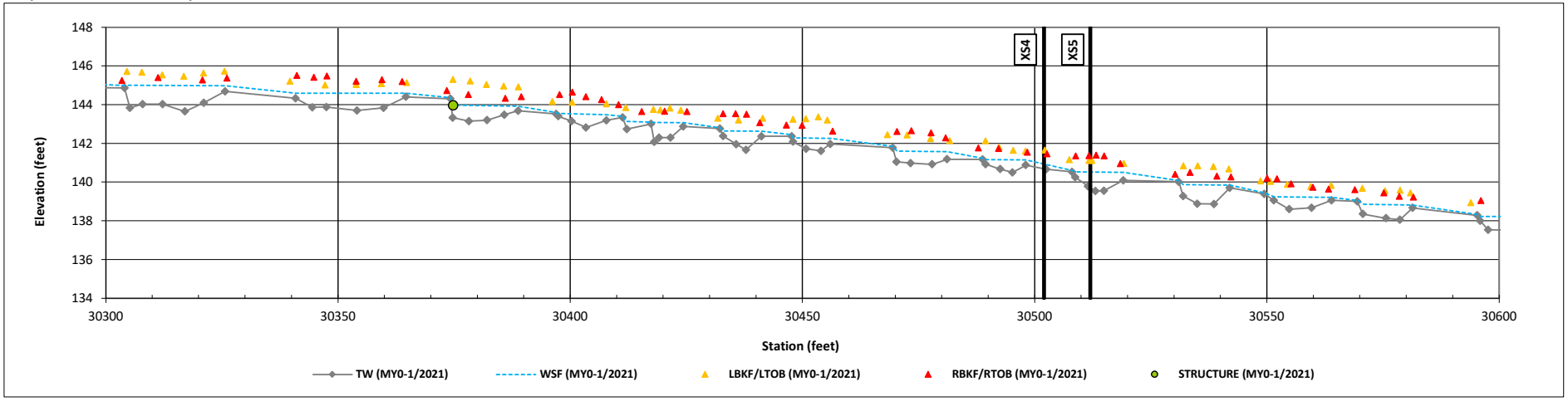
Longitudinal Profile Plots

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

T2 (STA 300+00 to 303+00)



T2 (STA 303+00 to 306+00)



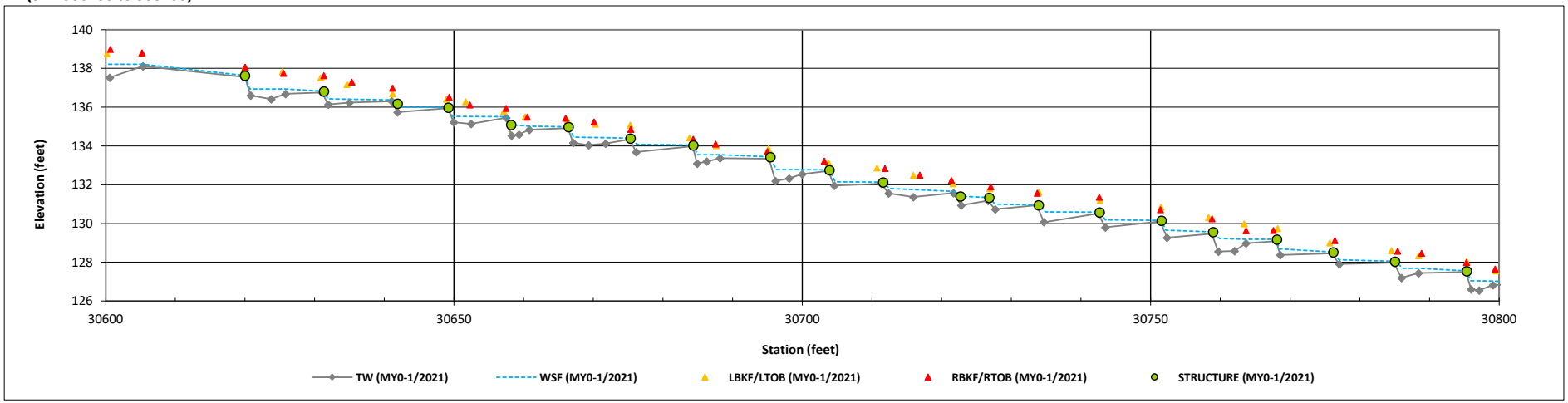
Longitudinal Profile Plots

Sassarixa Swamp Mitigation Site

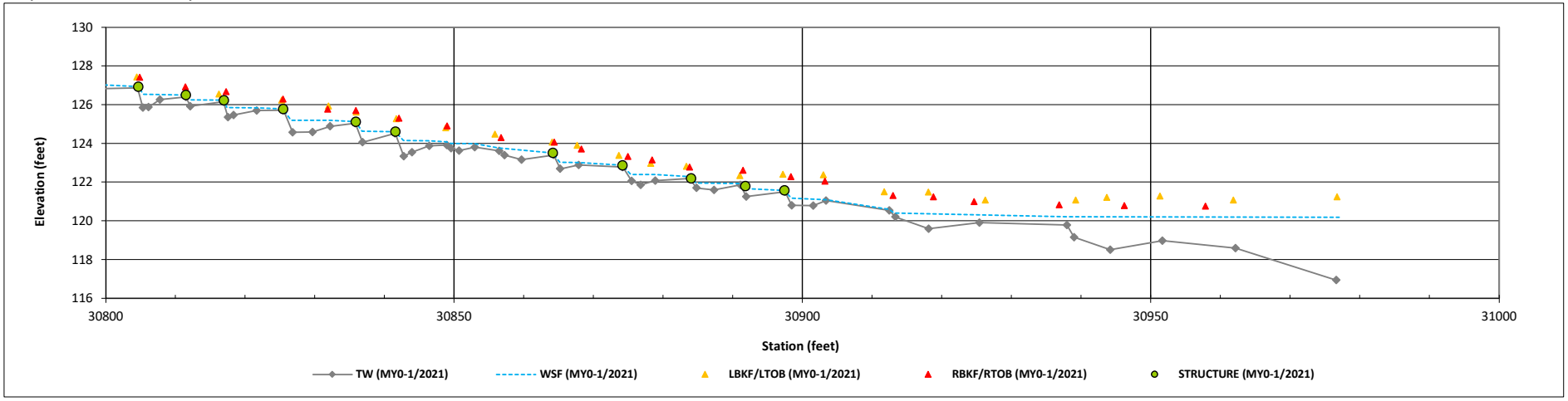
DMS Project No. 100040

Monitoring Year 0 - 2021

T2 (STA 306+00 to 308+00)



T2 (STA 308+00 to 309+76)



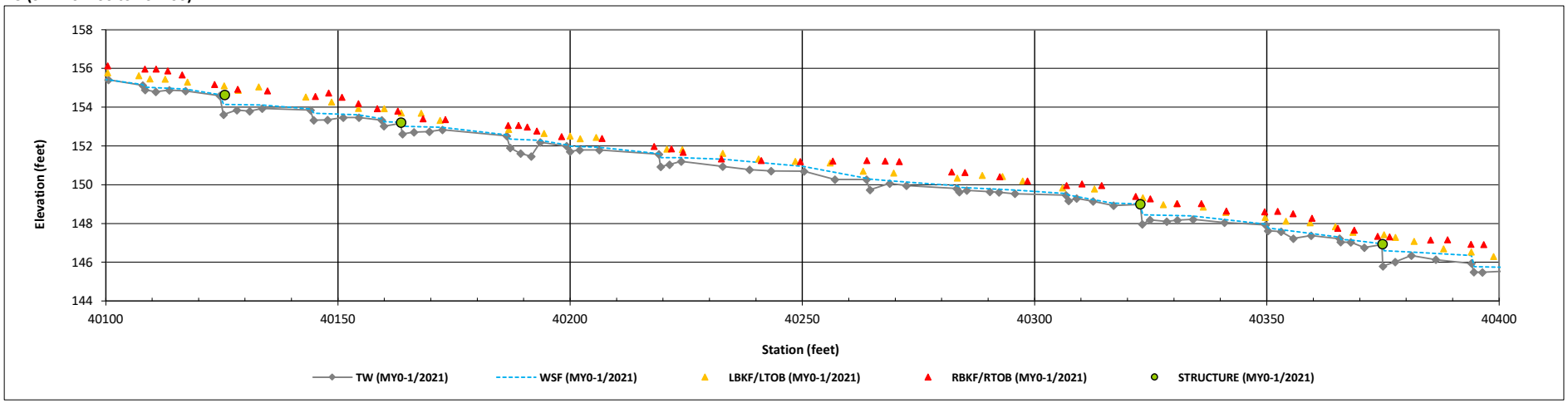
Longitudinal Profile Plots

Sassarixa Swamp Mitigation Site

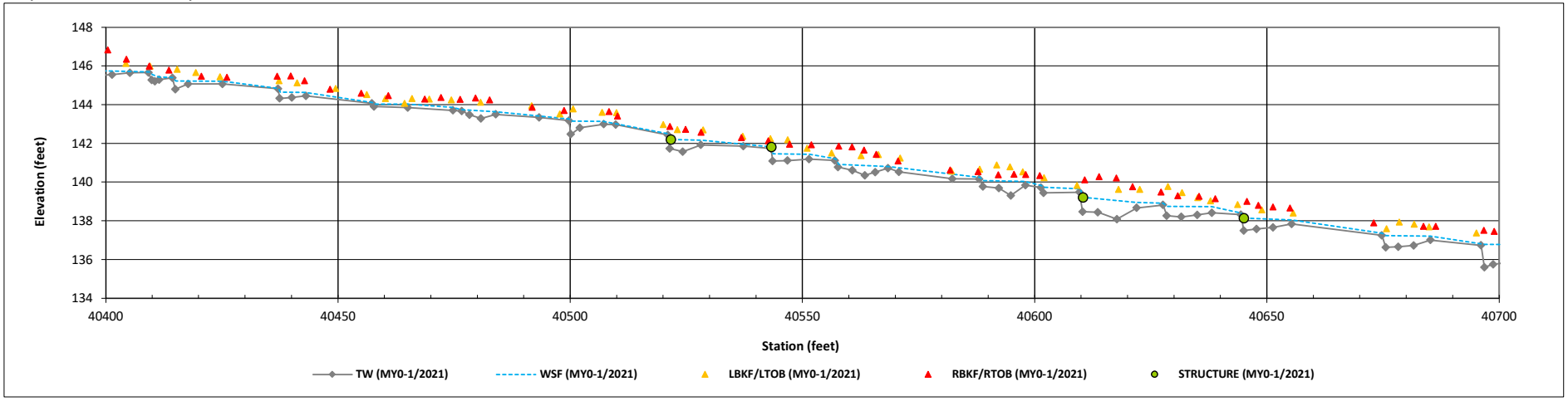
DMS Project No. 100040

Monitoring Year 0 - 2021

T3 (STA 401+00 to 404+00)



T3 (STA 404+00 to 407+00)



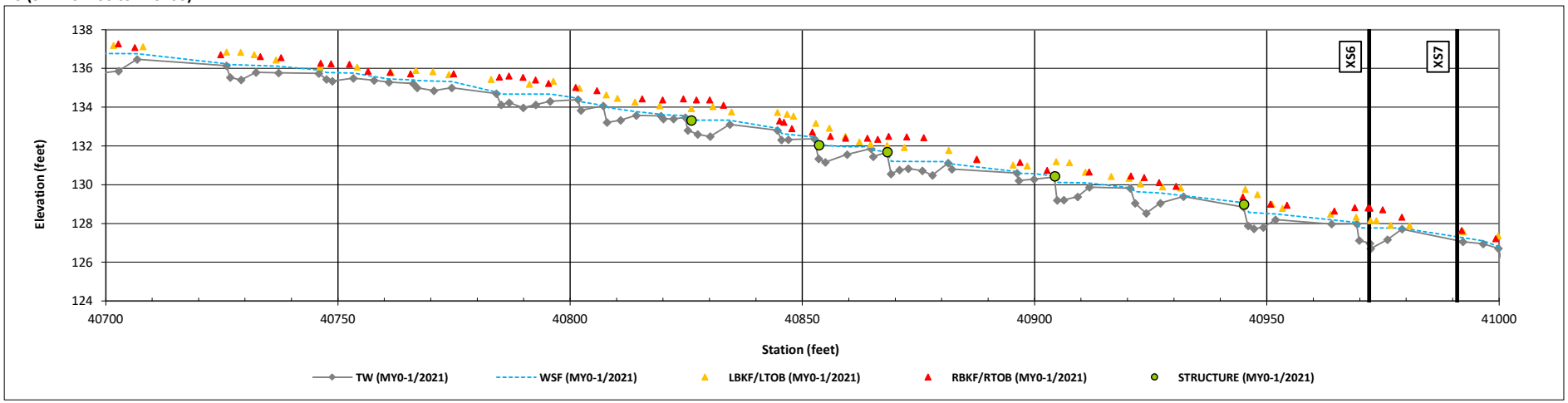
Longitudinal Profile Plots

Sassarixa Swamp Mitigation Site

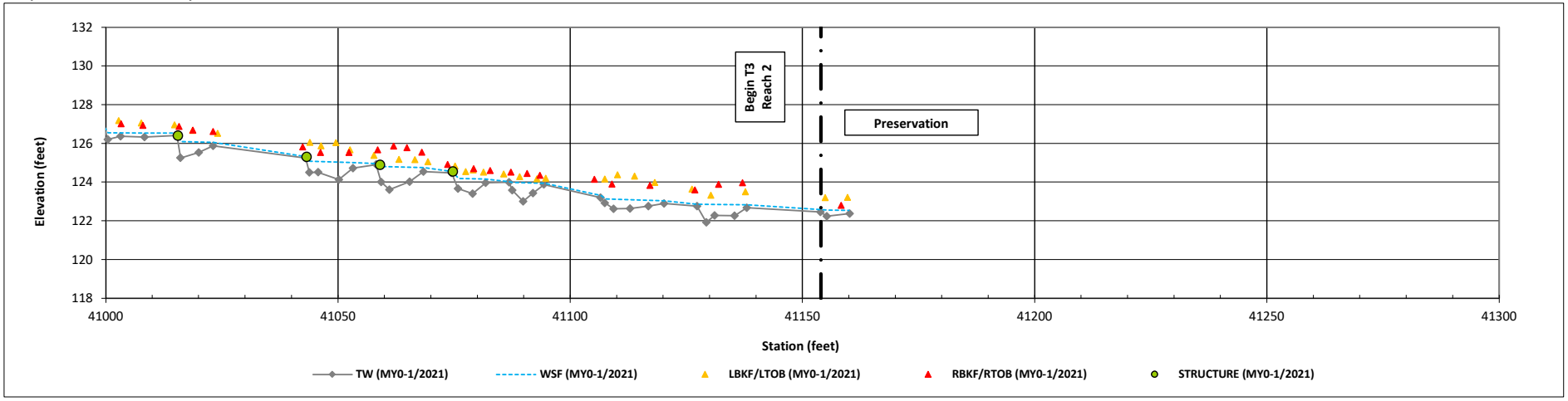
DMS Project No. 100040

Monitoring Year 0 - 2021

T3 (STA 407+00 to 410+00)



T3 (STA 410+00 to 411+54)



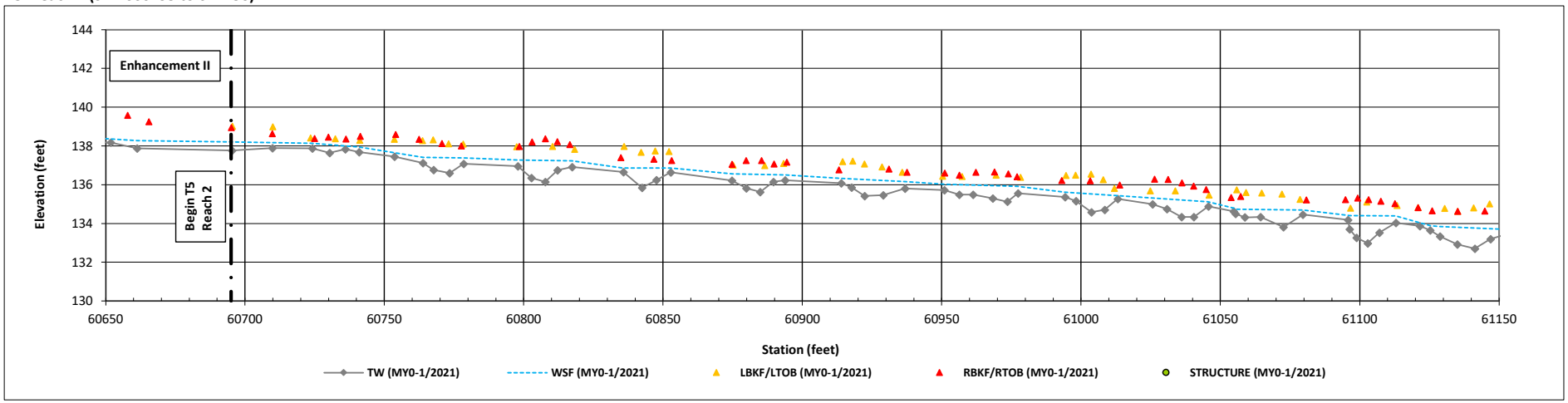
Longitudinal Profile Plots

Sassarixa Swamp Mitigation Site

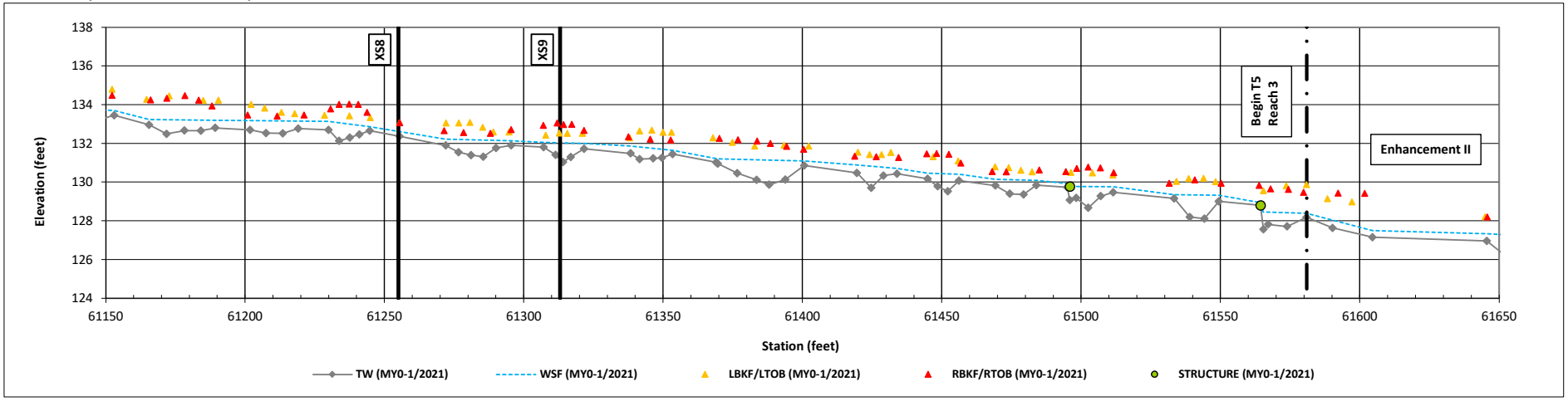
DMS Project No. 100040

Monitoring Year 0 - 2021

T5 Reach 2 (STA 606+95 to 611+50)



T5 Reach 2 (STA 611+50 to 615+81)



Longitudinal Profile Plots

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

T6 Reach 1 (STA 700+00 to 703+96)

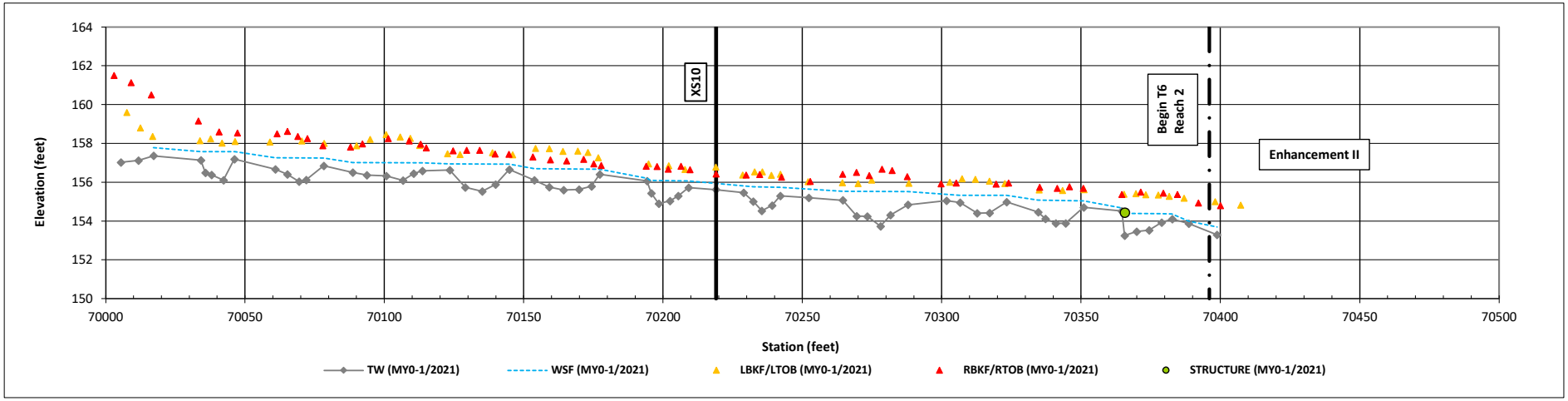


Table 8a. Baseline Stream Data Summary

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

Monitoring Year 0 - 2021

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**T1 R2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.4		1	3.6		5.2		1
Floodprone Width (ft)	8		1	>7.9		200		1
Bankfull Mean Depth	1		1	0.3		0.4		1
Bankfull Max Depth	0.7		1	0.4	0.5	0.9		1
Bankfull Cross Sectional Area (ft^2)	2.5		1	1.2		2.5		1
Width/Depth Ratio	4.9		1	11.0		11.0		1
Entrenchment Ratio	2.2		1	>2.2		34.6		1
Bank Height Ratio	3.0		1	1.0	1.2	1.0		1
Max part size (mm) mobilized at bankfull	---			---		---		
Rosgen Classification	G5			C5b/E5b		C5b/E5b		
Bankfull Discharge (cfs)	8.8			3.0		9.0		
Sinuosity	1.20			1.20		1.20		
Water Surface Slope ($ft/ft)^2$	0.0190	0.0300	2	0.0250	0.0410	0.0322		
Other	---			---		---		
Parameter	**T1 R3**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.4		1	4.2		4.3		1
Floodprone Width (ft)	8		1	>9.2		90		1
Bankfull Mean Depth	1		1	0.4		0.4		1
Bankfull Max Depth	0.7		1	0.4	0.6	0.6		1
Bankfull Cross Sectional Area (ft^2)	2.5		1	1.5		1.7		1
Width/Depth Ratio	4.9		1	12.0		11.1		1
Entrenchment Ratio	2.2		1	>2.2		21.9		1
Bank Height Ratio	3.0		1	1.0	1.2	1.0		1
Max part size (mm) mobilized at bankfull	---			---		---		
Rosgen Classification	G5			C5/E5		C5/E5		
Bankfull Discharge (cfs)	8.8			3.5		4.3		
Sinuosity	1.20			1.20		1.20		
Water Surface Slope ($ft/ft)^2$	0.0190	0.0300	2	0.0092	0.0250	0.0181		
Other	---			---		---		

Table 8a. Baseline Stream Data Summary

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

Monitoring Year 0 - 2021

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**T2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3		1	4.2		5.6		1
Floodprone Width (ft)	4		1	>9.2		75		1
Bankfull Mean Depth	0.5		1	0.4		0.4		1
Bankfull Max Depth	0.6		1	0.5		0.8		1
Bankfull Cross Sectional Area (ft^2)	1.5		1	1.5		2.0		1
Width/Depth Ratio	6		1	12.0		15.7		1
Entrenchment Ratio	1.2		1	>2.2		13.4		1
Bank Height Ratio	6.5		1	1.0	1.2	1.0		1
Max part size (mm) mobilized at bankfull	---			---		---		
Rosgen Classification	G5			C5b/E5b		C5b/E5b		
Bankfull Discharge (cfs)	5.4			2.0		4.3		
Sinuosity	1.14			1.40		1.40		
Water Surface Slope ($ft/ft)^2$	0.0290		1	0.0051	0.0064	0.0147		
Other	---			---		---		
Parameter	**T3**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.2	4.2	2	3.6		4.7		1
Floodprone Width (ft)	5	24	2	>7.9		35		1
Bankfull Mean Depth	0.42	0.5	2	0.3		0.3		1
Bankfull Max Depth	0.7	0.56	2	0.4	0.5	0.5		1
Bankfull Cross Sectional Area (ft^2)	1.7		2	1.0		1.5		1
Width/Depth Ratio	6.4	10	2	12.0		14.8		1
Entrenchment Ratio	1.1	7.1	2	>2.2		7.4		1
Bank Height Ratio	2.7	7.0	2	1.0	1.2	1.0		1
Max part size (mm) mobilized at bankfull	---			---		---		
Rosgen Classification	B5/G5			C5/E5b		C5/E5b		
Bankfull Discharge (cfs)	6.2	6.9	2	2.5		4.5		
Sinuosity	1.16			1.20		1.20		
Water Surface Slope ($ft/ft)^2$	0.0340		1	0.0280	0.0330	0.0312		
Other	---			---		---		

Table 8a. Baseline Stream Data Summary

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

Monitoring Year 0 - 2021

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**T5 R2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.1		1	5.6		5.9		1
Floodprone Width (ft)	27		1	>11		170		1
Bankfull Mean Depth	1.1		1	0.5		0.4		1
Bankfull Max Depth	1.4		1	0.6	0.8	0.7		1
Bankfull Cross Sectional Area (ft^2)	3.5		1	2.7		2.5		1
Width/Depth Ratio	2.8		1	12.0		14.0		1
Entrenchment Ratio	8.7		1	>2.2		16.9		1
Bank Height Ratio	1.6		1	1.0	1.2	1.0		1
Max part size (mm) mobilized at bankfull	---			---		---		
Rosgen Classification	E5			C5/E5		C5/E5		
Bankfull Discharge (cfs)	10.9			6.0		5.4		
Sinuosity	1.20			1.40		1.40		
Water Surface Slope ($ft/ft)^2$	0.0120		1	0.0086	0.0170	0.0111		
Other	---			---		---		
Parameter	**T6 R1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	4.1		1	6.4		6.0		1
Floodprone Width (ft)	7		1	>14		90		1
Bankfull Mean Depth	1.1		1	0.41		0.4		1
Bankfull Max Depth	1.5		1	0.5	0.7	0.8		1
Bankfull Cross Sectional Area (ft^2)	4.4		1	3.3		2.7		1
Width/Depth Ratio	3.7		1	12.0		13.3		1
Entrenchment Ratio	1.7		1	>2.2		15.1		1
Bank Height Ratio	2.0		1	1.0	1.2	1.0		1
Max part size (mm) mobilized at bankfull	---			---		---		
Rosgen Classification	G5			C5/E5		C5/E5		
Bankfull Discharge (cfs)	12.8			5.5		5.9		
Sinuosity	1.10			1.20		1.20		
Water Surface Slope ($ft/ft)^2$	0.0086		1	0.0049	0.0150	0.0107		
Other	---			---		---		

Table 9. Cross-Section Morphology Monitoring Summary

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

Monitoring Year 0 - 2021

	T1 Reach 2												T1 Reach 3						T2					
	Cross-Section 1 (Riffle)						Cross-Section 2 (Pool)						Cross-Section 3 (Riffle)						Cross-Section 4 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	149.35						148.82						130.69						141.46					
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00						1.00						1.00						1.00					
Thalweg Elevation	148.45						147.78						130.04						140.66					
LTOB[2] Elevation	149.35						148.82						130.69						141.46					
LTOB[2] Max Depth (ft)	0.9						1.0						0.6						0.8					
LTOB[2] Cross Sectional Area (ft^2)	2.5						3.2						1.7						2.0					

	T2						T3						T5 Reach 2					
	Cross-Section 5 (Pool)						Cross-Section 6 (Pool)						Cross-Section 7 (Riffle)						Cross-Section 8 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	141.12						128.16						127.58						133.06					
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00						1.00						1.00						1.00					
Thalweg Elevation	139.53						126.70						127.06						132.36					
LTOB[2] Elevation	141.12						128.16						127.58						133.06					
LTOB[2] Max Depth (ft)	1.6						1.5						0.5						0.7					
LTOB[2] Cross Sectional Area (ft^2)	4.9						3.3						1.5						2.5					

	T5 Reach 2						T6 Reach 1					
	Cross-Section 9 (Pool)						Cross-Section 10 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	132.53						156.43					
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00						1.00					
Thalweg Elevation	131.03						155.62					
LTOB[2] Elevation	132.53						156.43					
LTOB[2] Max Depth (ft)	1.5						0.8					
LTOB[2] Cross Sectional Area (ft^2)	7.0						2.7					

[1]Bank Height Ratio (BHR) takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation.

[2]LTOB Area and Max depth - These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

APPENDIX D. Project Timeline and Contact Info

Table 10. Project Activity and Reporting History
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

Activity or Deliverable		Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted		NA	January 2018
Mitigation Plan Approved		November 2019	November 2019
Construction (Grading) Completed		NA	January 2021
Planting Completed		NA	March 2021
As-Built Survey Completed		Febuary 2021	Febuary 2021
Baseline Monitoring Document (Year 0)	Stream Survey	January 2021	April 2021
	Vegetation Survey	March 2021	
Year 1 Monitoring	Stream Survey	2021	December 2021
	Vegetation Survey	2021	
Year 2 Monitoring	Stream Survey	2022	December 2022
	Vegetation Survey	2022	
Year 3 Monitoring	Stream Survey	2023	December 2023
	Vegetation Survey	2023	
Year 4 Monitoring			December 2024
Year 5 Monitoring	Stream Survey	2025	December 2025
	Vegetation Survey	2025	
Year 6 Monitoring			December 2026
Year 7 Monitoring	Stream Survey	2027	December 2027
	Vegetation Survey	2027	

Table 11. Project Contact Table
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 0 - 2021

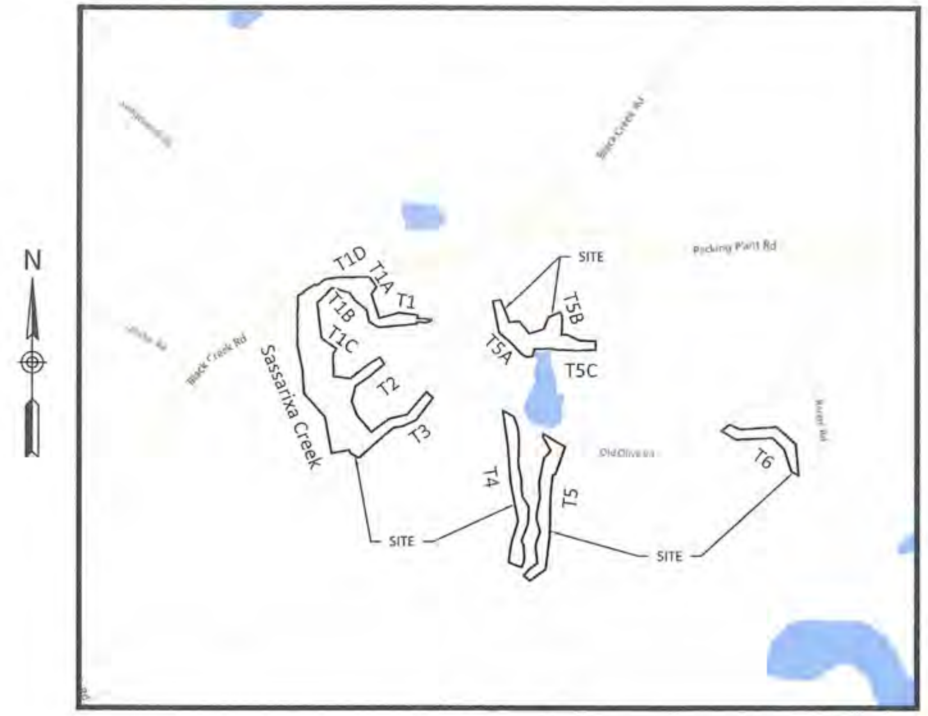
Designer Angela Allen, PE	**Wildlands Engineering, Inc.** 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor	**Land Mechanic Designs, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Jason Lorch 919.851.9986

APPENDIX E. Record Drawings

Sassarixa Swamp Mitigation Site

Neuse River Basin 03020201

Johnston County, North Carolina



Vicinity Map
Not to Scale

AS-BUILT AND
RECORD DRAWINGS
JUNE 2021

Stream Origins

Stream	Latitude	Longitude
Sassarixa Creek	N35° 28' 42.20"	W78° 26' 47.71"
T1	N35° 28' 37.81"	W78° 26' 29.83"
T1A	N35° 28' 42.25"	W78° 26' 37.42"
T1B	N35° 28' 40.77"	W78° 26' 39.59"
T1C	N35° 28' 33.68"	W78° 26' 44.27"
T1D	N35° 28' 43.01"	W78° 26' 38.46"
T2	N35° 28' 31.91"	W78° 26' 36.28"
T3	W78° 26' 36.28"	W78° 26' 28.15"
T4	N35° 28' 25.04"	W78° 26' 15.03"
T5	N35° 28' 21.72"	W78° 26' 08.08"
T5A	N35° 28' 39.23"	W78° 26' 16.24"
T5B	N35° 28' 38.28"	W78° 26' 07.29"
T5C	N35° 28' 34.05"	W78° 26' 00.85"
T6	N35° 28' 22.94"	W78° 25' 38.59"

Sheet Index

Cover Sheet	0.1
Project Overview	0.2
General Notes and Symbols	0.3
Stream Plan and Profile	1.1-1.59
Additional Grading Overview	2.0
Additional Grading	2.1-2.3
Planting Tables	3.0
Planting Plan Overview	3.1
Planting Plan	3.2-3.5
Fencing Plan Overview	5.0
Fencing Plans	5.1-5.13

Project Directory

Engineering:
Wildlands Engineering, Inc.
License No. F-0831
312 West Millbrook Road, Suite 225
Raleigh, NC 27609
Angela Allen, PE, Project Manager
Greg Turner, PE, Project Engineer
919.851.9986

Surveying:
Kee Mapping and Surveying, PA
88 Central Avenue
Asheville, NC 28801
Phillip B. Kee, PLS
828.575.9021

NCDEQ Contract No. 7425
DMS Project No. 100040
USACE Action ID No. 2018-00432
NCDWR Project No. 18-0198

CERTIFICATE OF SURVEY AND ACCURACY

I, PHILLIP B. KEE, CERTIFY THAT THE GROUND TOPOGRAPHIC SURVEY PORTION OF THIS PROJECT WAS COMPLETED UNDER MY DIRECT SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY DIRECT SUPERVISION; THAT THE RECORD DRAWINGS WERE PREPARED BY WILDLANDS ENGINEERING, INC. FROM DIGITAL FILES PROVIDED BY KEE MAPPING AND SURVEYING, PA AS SHOWN ON AN AS-BUILT SURVEY FOR " WILDLANDS ENGINEERING, INC; SASSARIXA SWAMP MITIGATION SITE (PH 1 & 2) ", JOB # 2010111-AB , DATED 05/27/21 ; THAT THIS SURVEY WAS PERFORMED AT THE 95% CONFIDENCE LEVEL TO MEET THE FEDERAL GEOGRAPHIC DATA COMMITTEE STANDARDS AND TO MEET THE REQUIREMENTS OF A TOPOGRAPHIC SURVEY TO THE ACCURACY OF CLASS A HORIZONTAL AND CLASS C VERTICAL WHERE APPLICABLE; THAT THE ORIGINAL DATA WAS OBTAINED BETWEEN THE DATES OF 11/11/20 - 05/13/21 ; THAT THE CONTOURS SHOWN AS BROKEN LINES MAY NOT MEET THE STATED STANDARD AND ALL COORDINATES ARE BASED ON NAD 83 (NSRS 2011) AND ALL ELEVATIONS ARE BASED ON NAVD 88; THAT THIS MAP MEETS THE SPECIFICATIONS FOR TOPOGRAPHIC SURVEYS AS STATED IN TITLE 21, CHAPTER 56, SECTION .1606; THAT THIS MAP WAS NOT PREPARED IN ACCORDANCE WITH G.S. 47-30, AS AMENDED AND DOES NOT REPRESENT AN OFFICIAL BOUNDARY SURVEY.

WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER, AND SEAL THIS 28TH DAY OF JUNE , 2021 , A.D.

NORTH CAROLINA PROFESSIONAL SEAL L-4647 LAND SURVEYOR PHILLIP B. KEE

DocuSigned by:
Phillip B. Kee
D965004A7692407
PHILLIP B. KEE, PLS L-4647

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NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER
6/28/2021

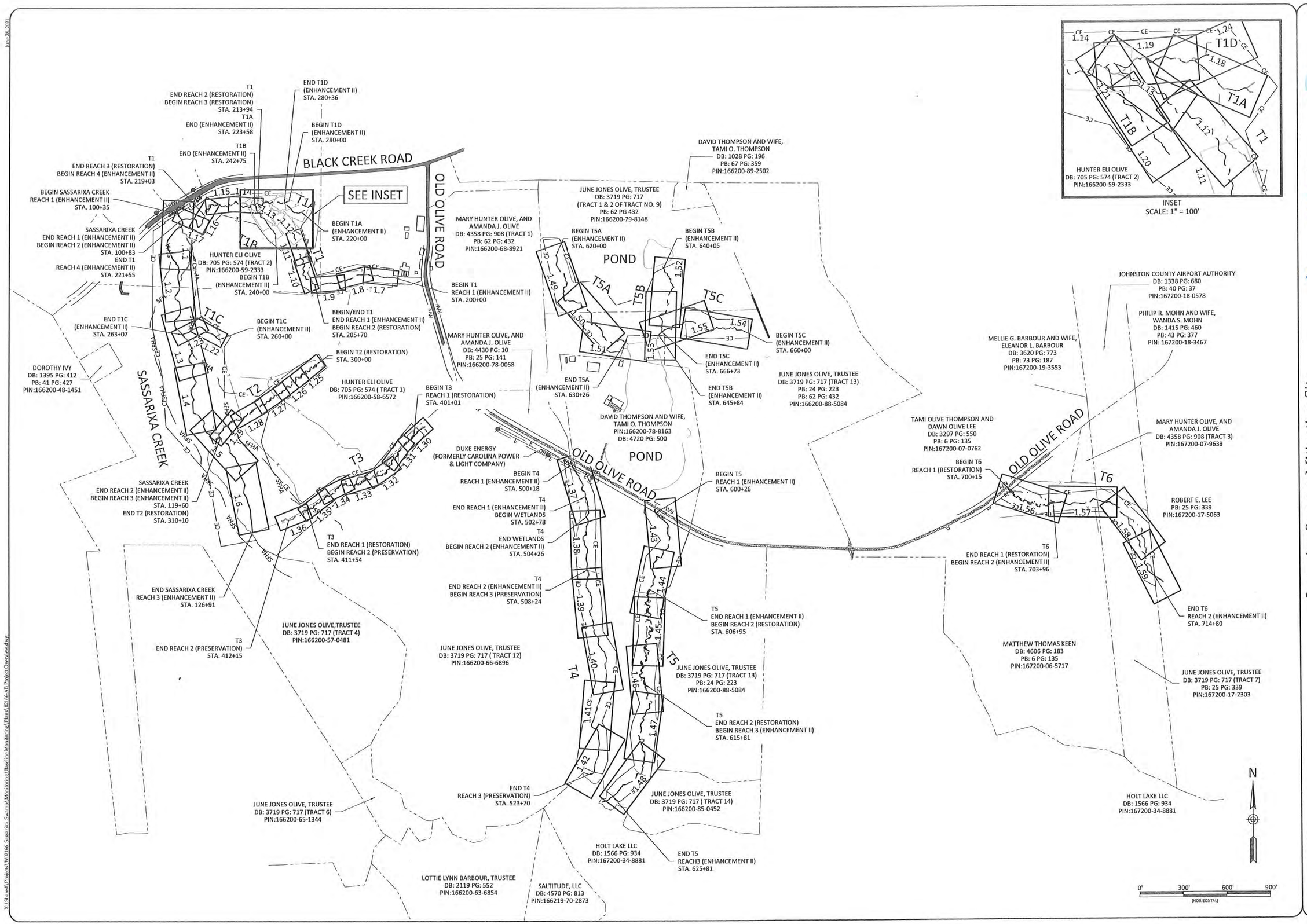
Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Cover Sheet

Revisions:

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Sheet 0.1



INSET
SCALE: 1" = 100'

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 043290 GREGORY A. TURNER

6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Project Overview

Revisions:

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Sheet 0.2

X:\Shared\Projects\WI0166_Sassarixa_Swamp\Monitoring\Baseline Monitoring\Plans\02166-AB Project Overview.dwg

Jun-28, 2021

Existing Features

- Existing Property Boundary
- Existing NCDOT Right-of-way (R/W)
- Existing Alignment
- Existing Guardrail
- Existing Overhead Utility (OHE)
- Existing Utility Easement (OUE)
- Existing Top of Bank (TB)
- Existing Edge of Pavement
- Existing Fence
- Special Flood Hazard Area (SFHA)
- Existing Treeline
- Existing Tree
- Existing Utility Pole
- Existing Spring
- Existing Fire Hydrant
- Existing Asphalt
- Existing Gravel Road
- Existing Bedrock
- Existing Debris
- Existing Wetland Area
- Existing Rip Rap
- CPP Corrugated Plastic Pipe
- PVC Polyvinyl Chloride Pipe
- CMP Corrugated Metal Pipe

Designed Features

- Designed Conservation Easement (CE)
- Designed Conservation Easement Crossing (CE-IX)
- Designed Bank Conservation Easement (CE-B)
- Not For Credit (10+00)
- Design Preservation Reach (10+00)
- Design Enhancement I Reach (10+00)
- Design Enhancement II Reach (10+00)
- Design Restoration Reach (10+00)
- Designed Bankfull
- Designed 5' Major Contour (540)
- Designed 1' Minor Contour
- Designed Five-Strand Barbed Wire Fence
- Designed High Tensile Wire Fence
- Designed Angled Log Riffle
- Designed Native Material Riffle
- Designed Woody Riffle
- Designed Lunker Log
- Designed Angled Log Sill
- Designed Log Vane
- Designed Brush Toe
- Designed Transplanted Sod Mat
- Designed Stream Bank Grading
- Designed Culvert
- Designed Rip Rap Outlet Protection

As-Built Features

- As-Built Thalweg
- As-Built Bankfull
- Limits of Disturbance (LOD)
- As-Built 5' Major Contour (540)
- As-Built 1' Minor Contour (541)
- Cross Section (XS#)
- Photo Point (PP ##)
- Ground Water Gauge (GWG)
- Crest Gauge (CG)
- Flow Gauge (FG)
- Barotroll Gauge (BAROTROLL)
- Vegetation Plot (VP ##, VEG)
- As-Built Riffle
- As-Built Lunker Log
- As-Built Angled Log Sill
- As-Built Log Vane
- As-Built Brush Toe
- As-Built Transplanted Sod Mat
- As-Built Culvert
- As-Built Rip Rap Outlet Protection

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NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. NEW

4/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

General Notes and Symbols

Revisions:
1. Added Log Vane symbol and Transplanted Sod Mat symbol to Designed Features legend.

Date: 09.04.2020
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Sheet 0.3

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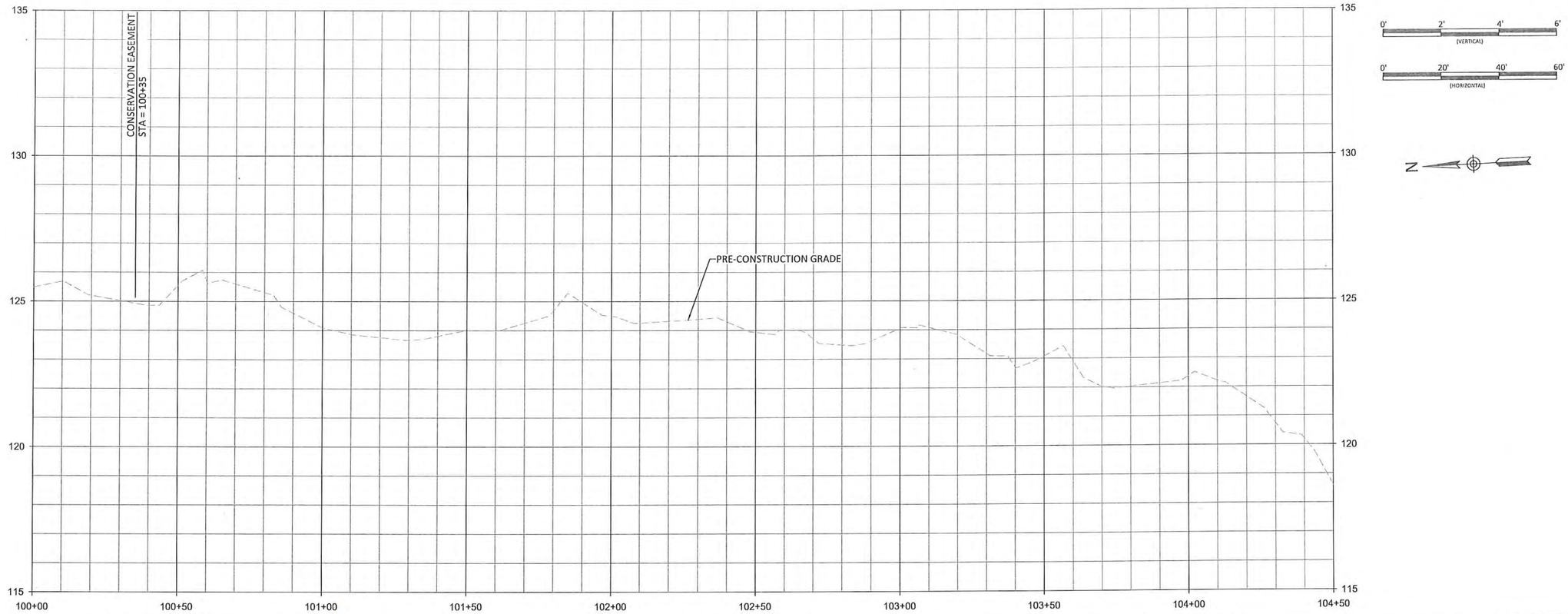
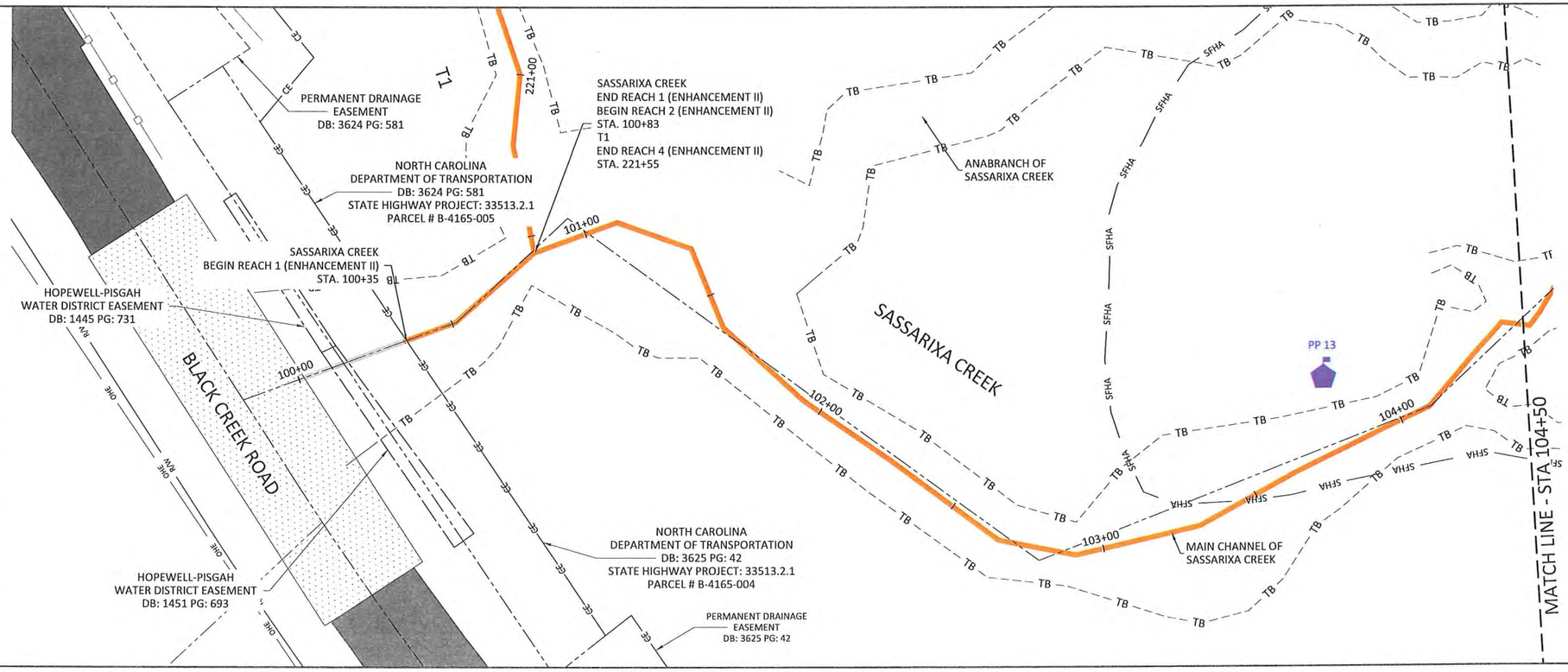
June 28, 2021





NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR T1 IS ADDRESSED ON SHEETS 1.7 THROUGH 1.17.

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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Sassarixa Creek
Stream Plan and Profile

Revisions:

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Sheet 1.1

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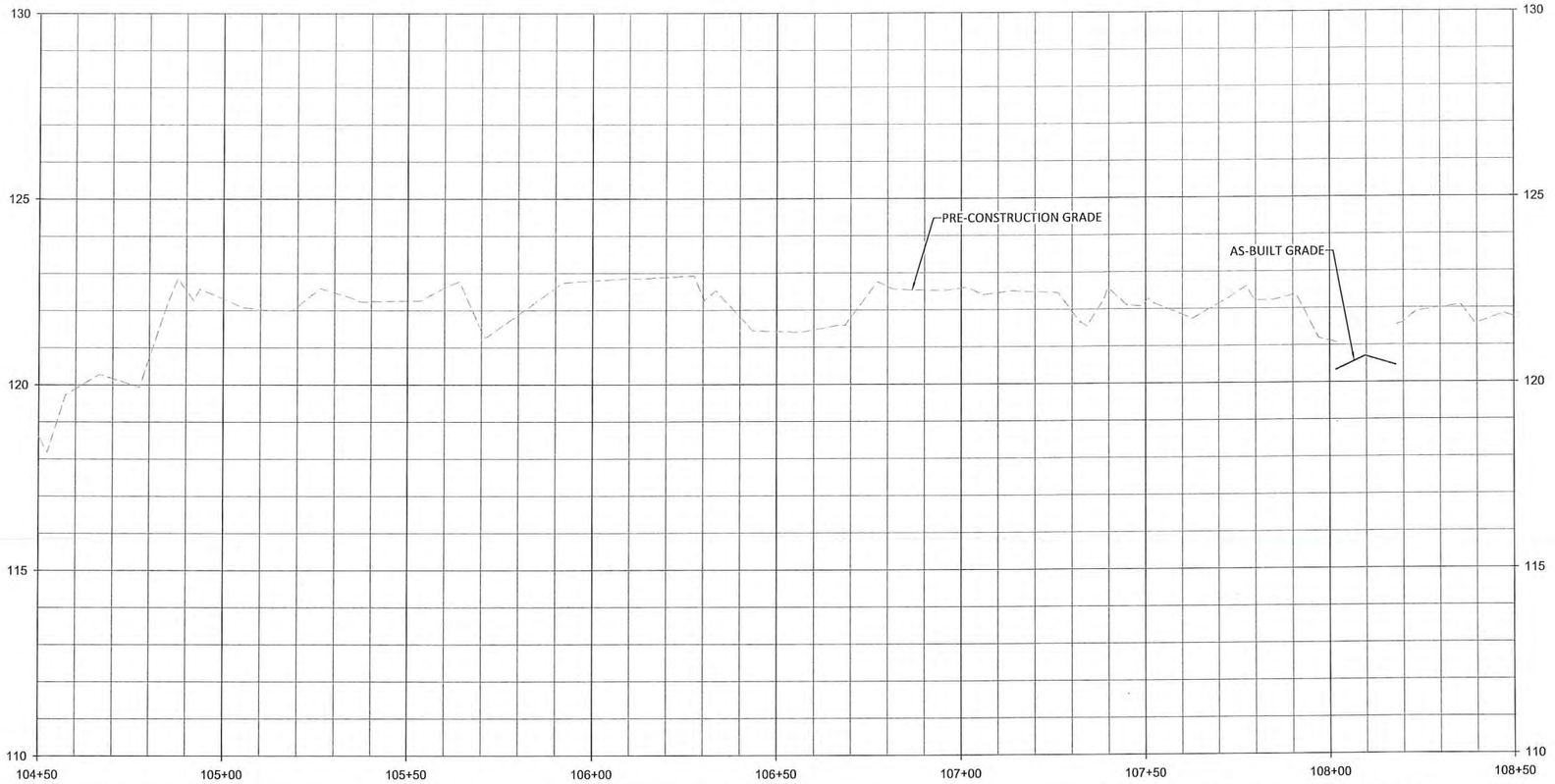
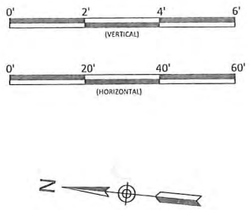
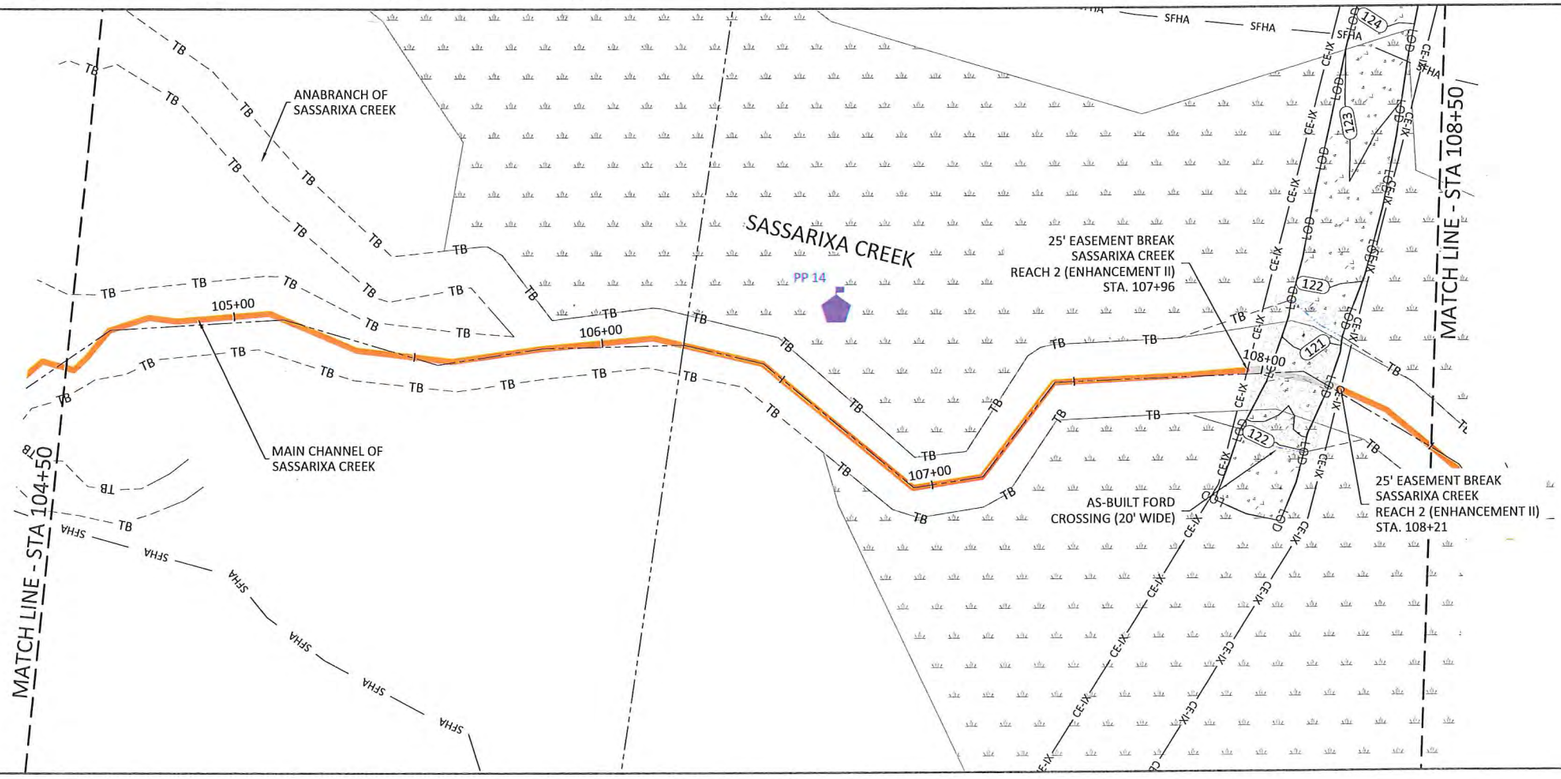
June 28, 2021







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Gregory A. Tummer
6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Sassarixa Creek
Stream Plan and Profile

Revisions:

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Sheet 1.2

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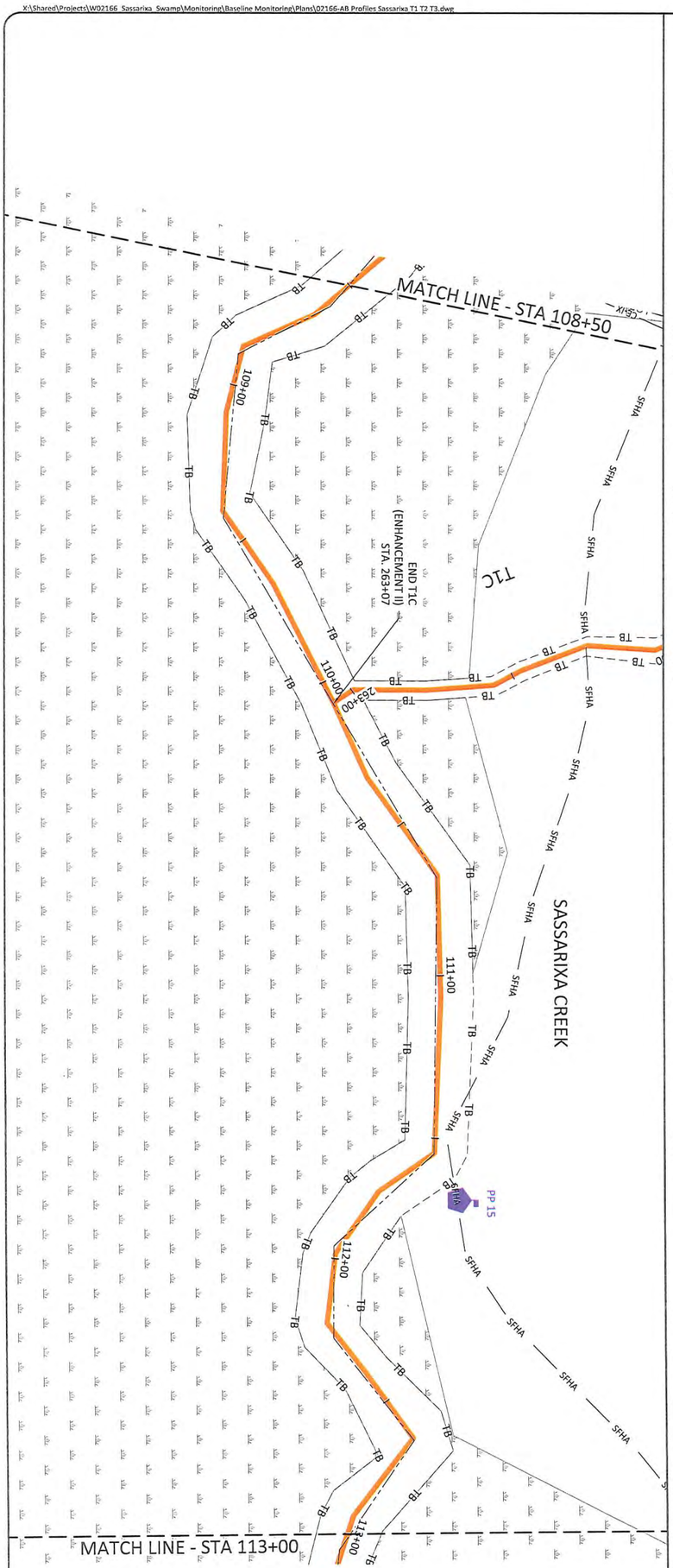

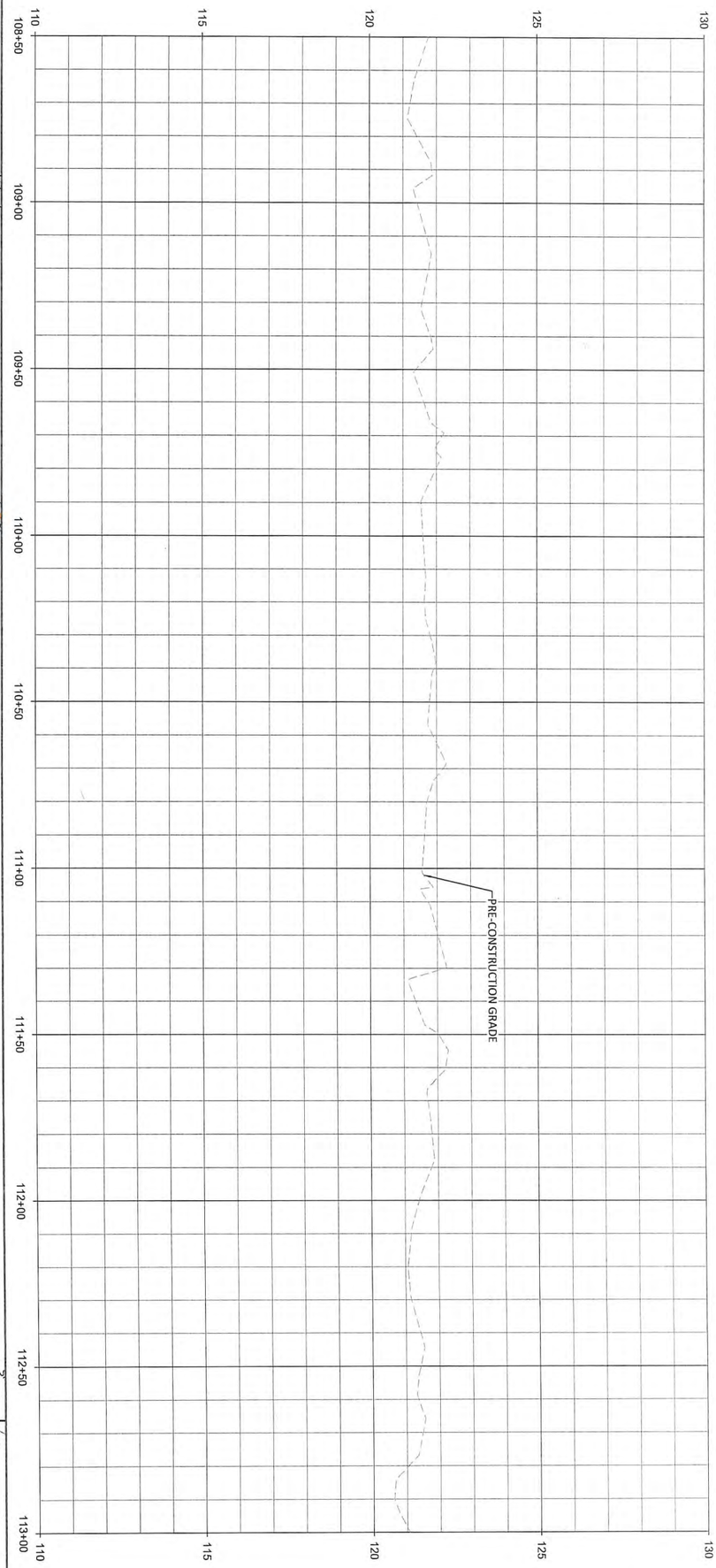

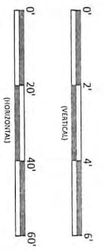

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2. AS-BUILT INFORMATION FOR T1C IS ADDRESSED ON SHEETS 1.22 THROUGH 1.23.

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.3
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Sassarixa Creek
Stream Plan and Profile

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6/28/2021

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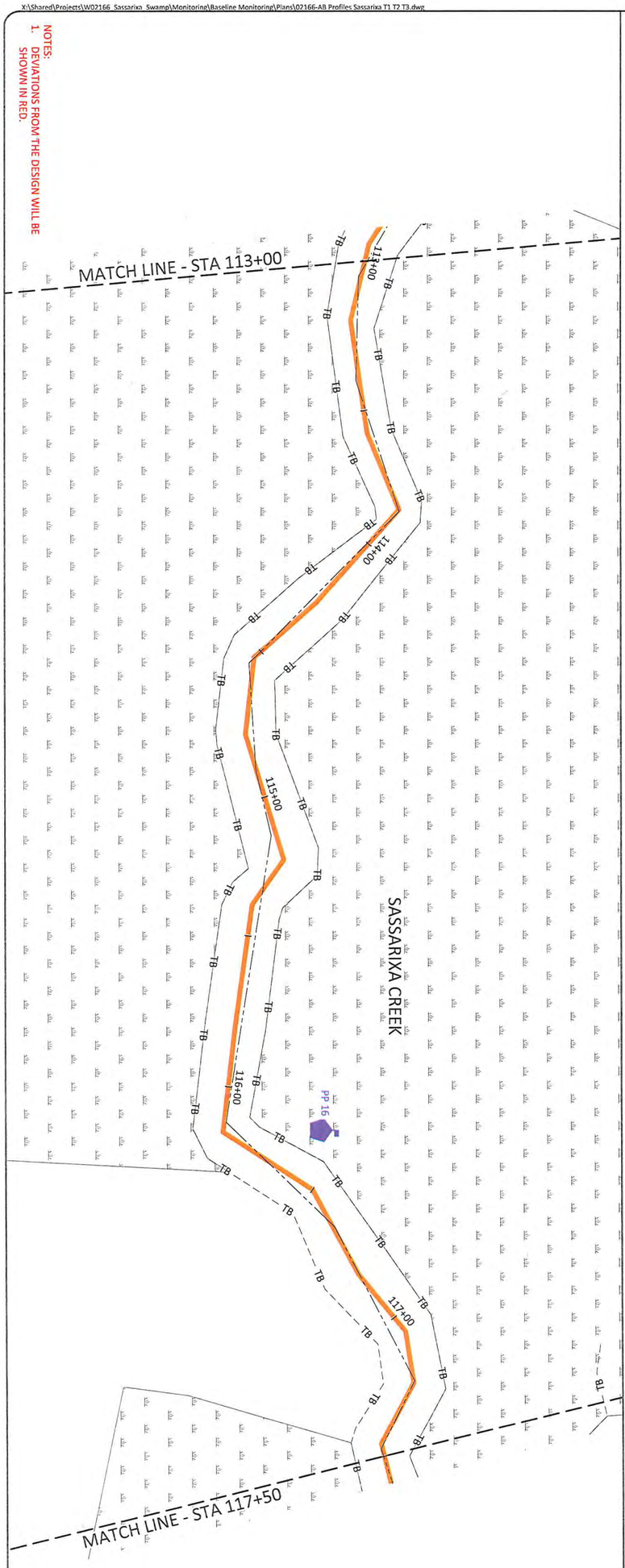

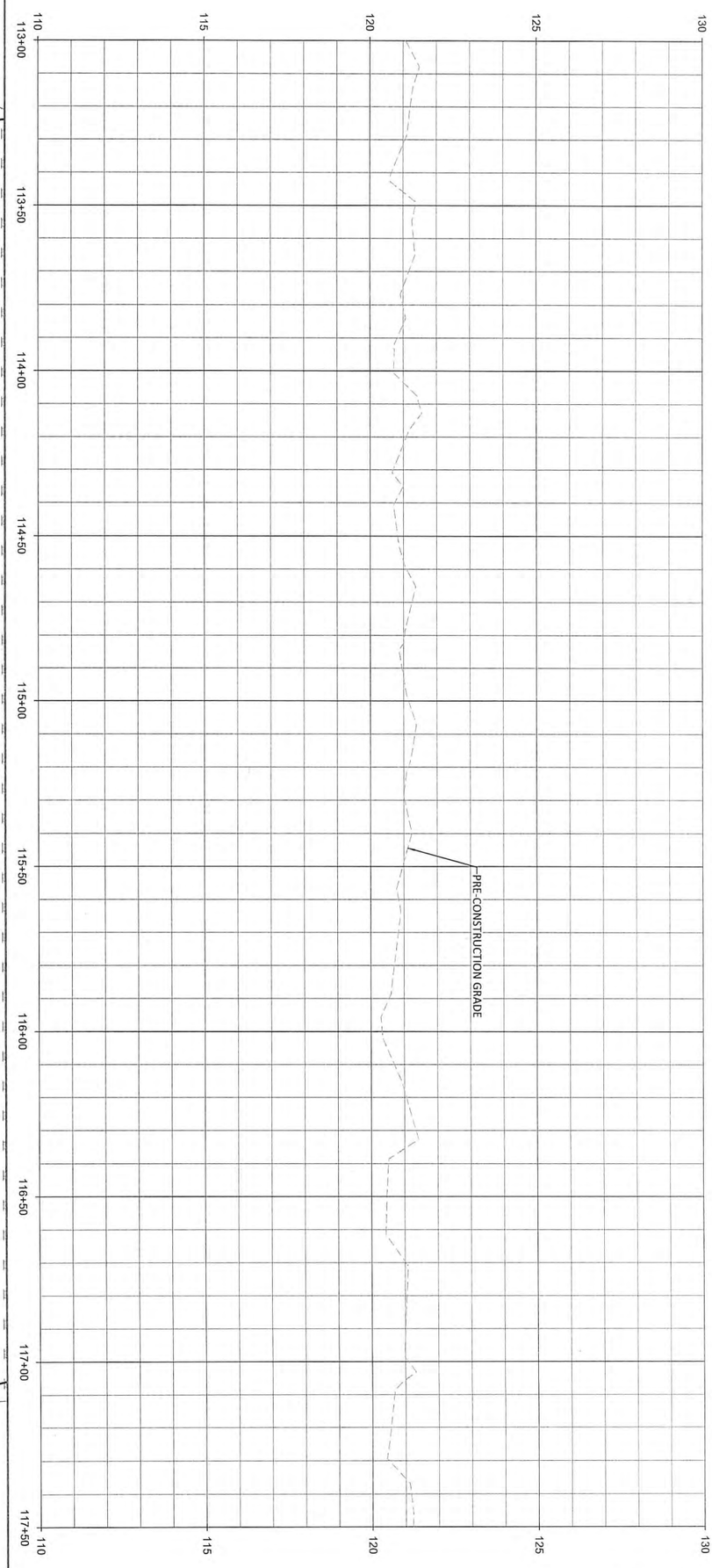

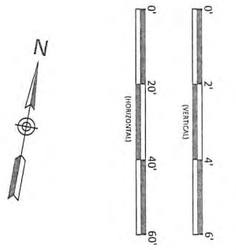

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.4
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Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Sassarixa Creek
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER

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6/28/2021

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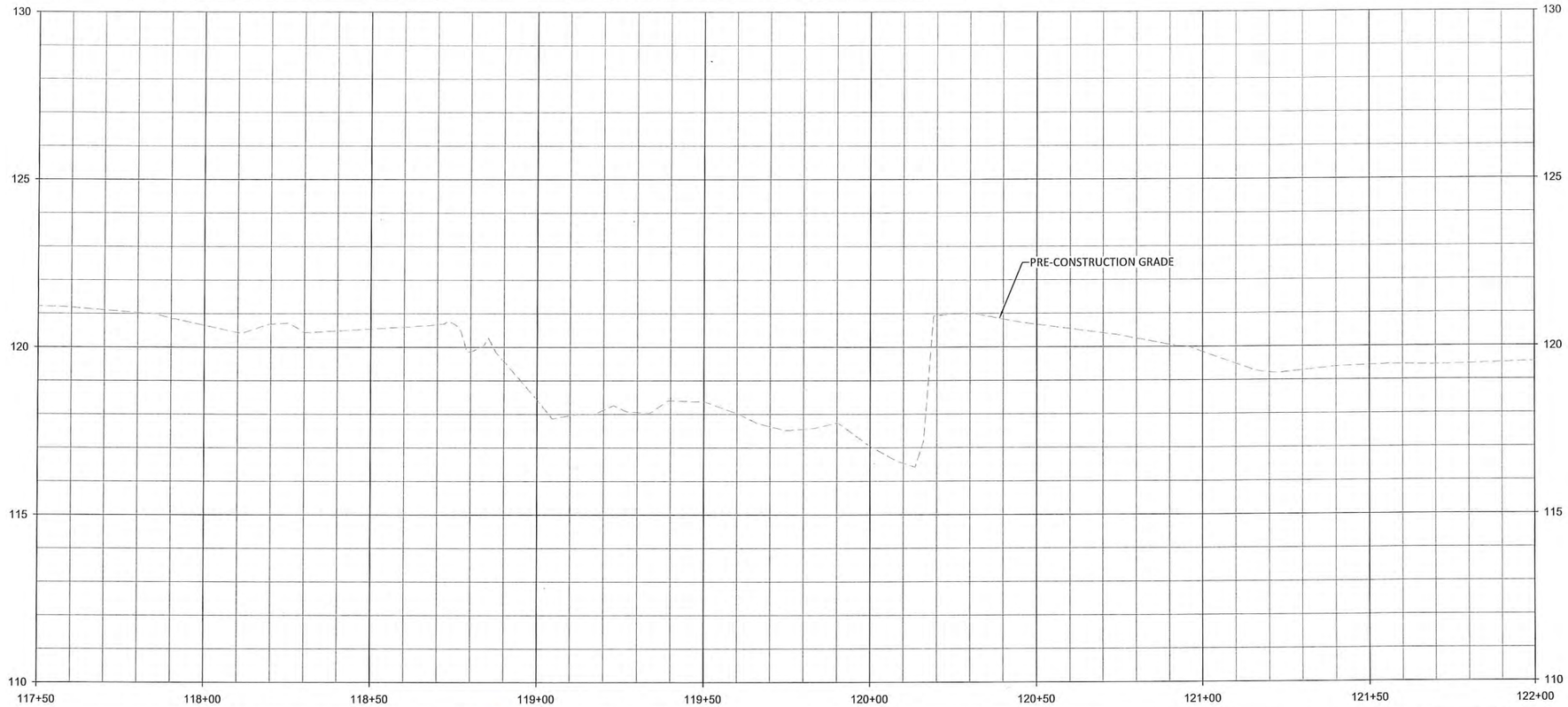

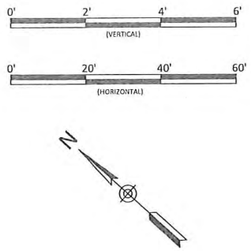

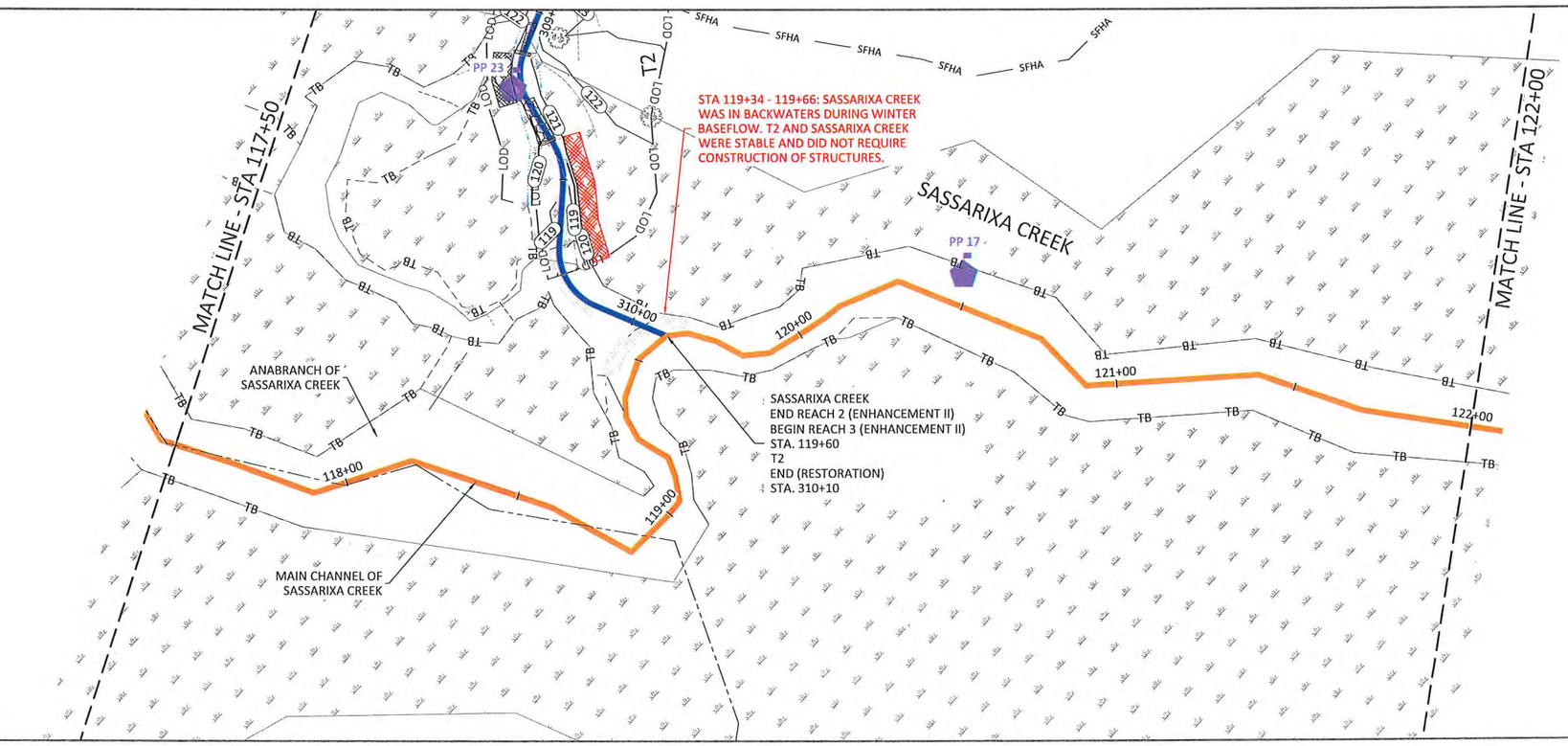

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 043290 GREGORY A. TURNER

6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Sassarixa Creek
Stream Plan and Profile

Revisions:

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Sheet 1.5

June 28, 2021

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June 28, 2021

NOTES:
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Tel: 919.851.9986
Firm License No. P-0831

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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Sassarixa Creek
Stream Plan and Profile

Revisions:

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Sheet 1.6

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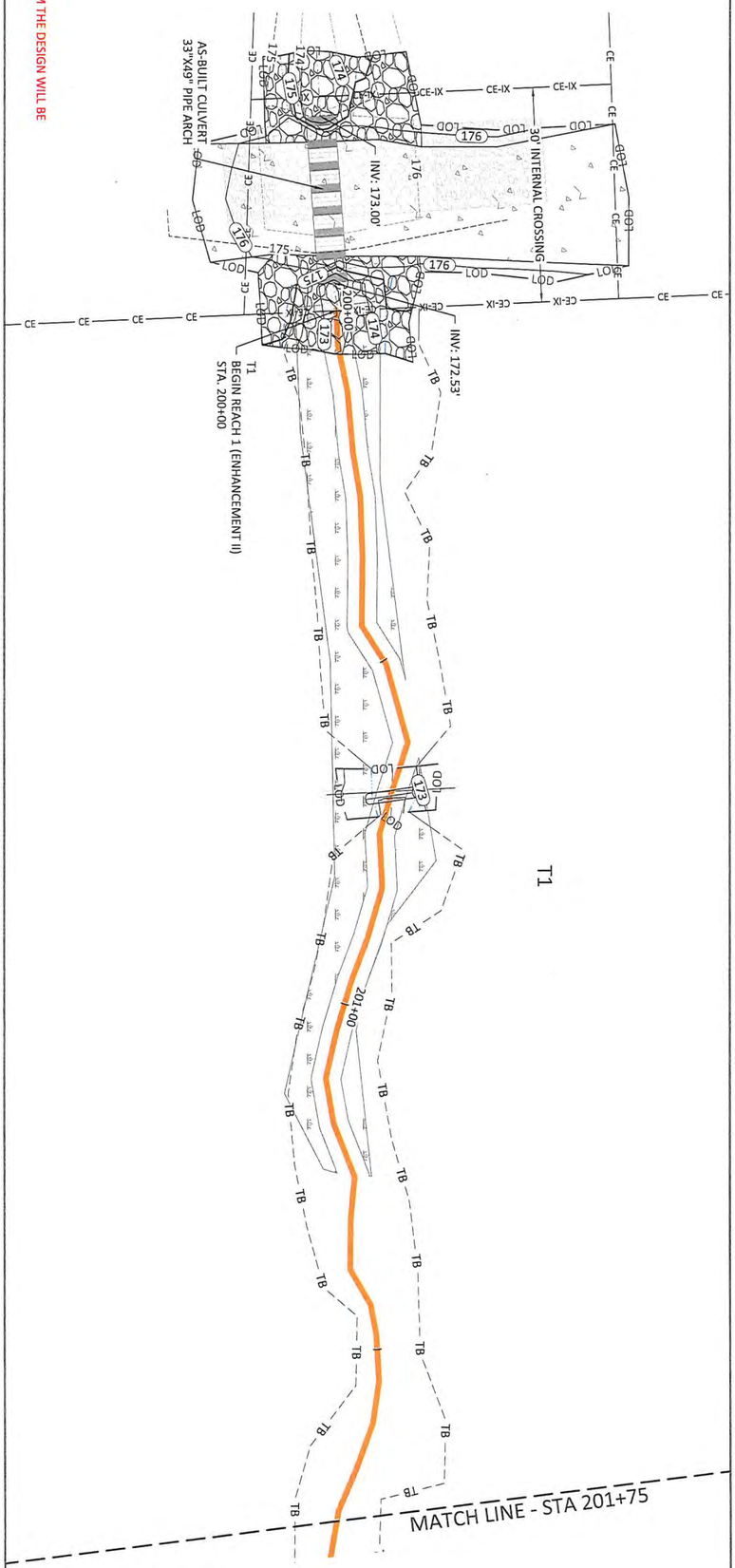
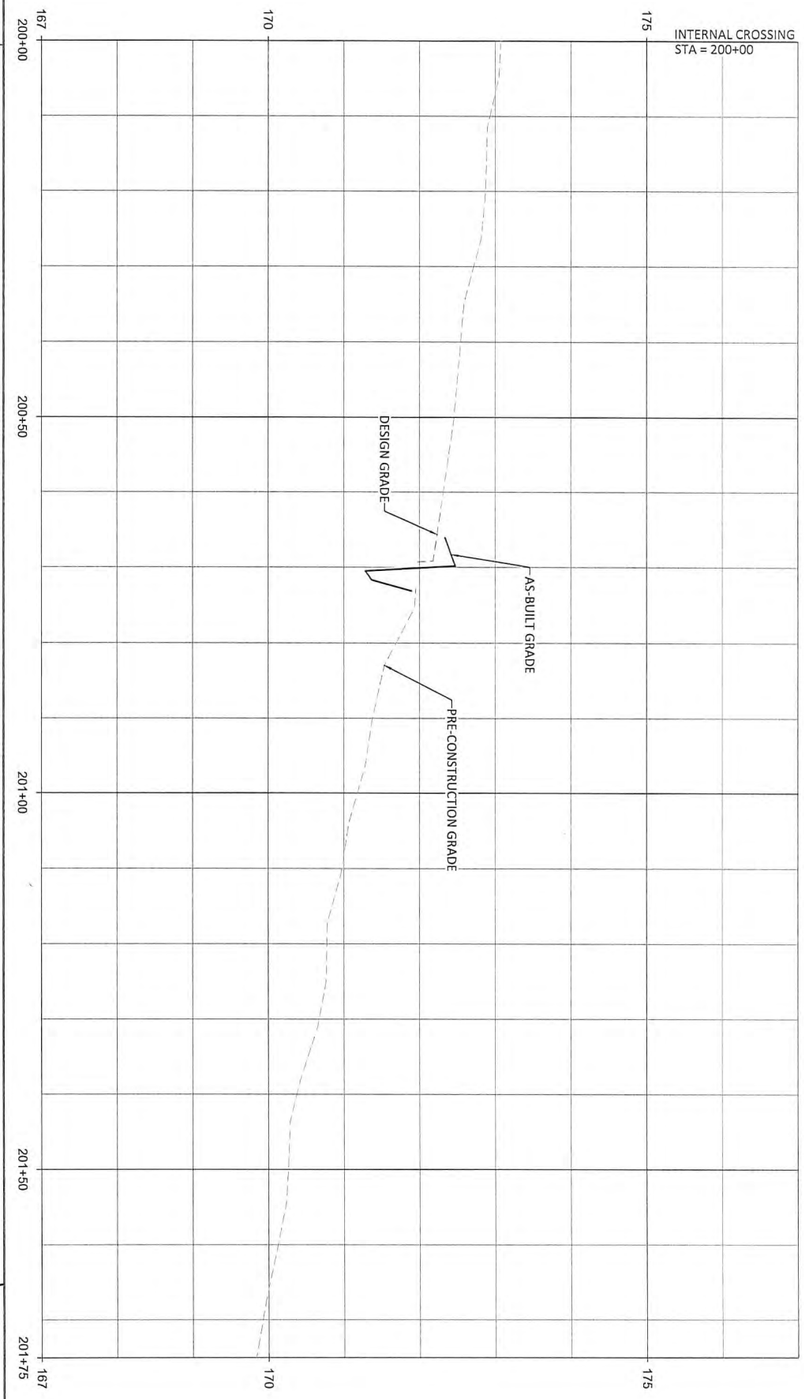
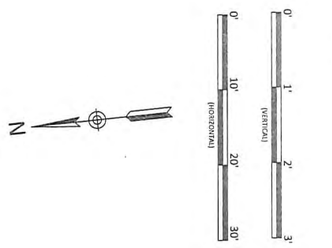
NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.







Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.7
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER
8/26/2021

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June 28, 2021

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6/25/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

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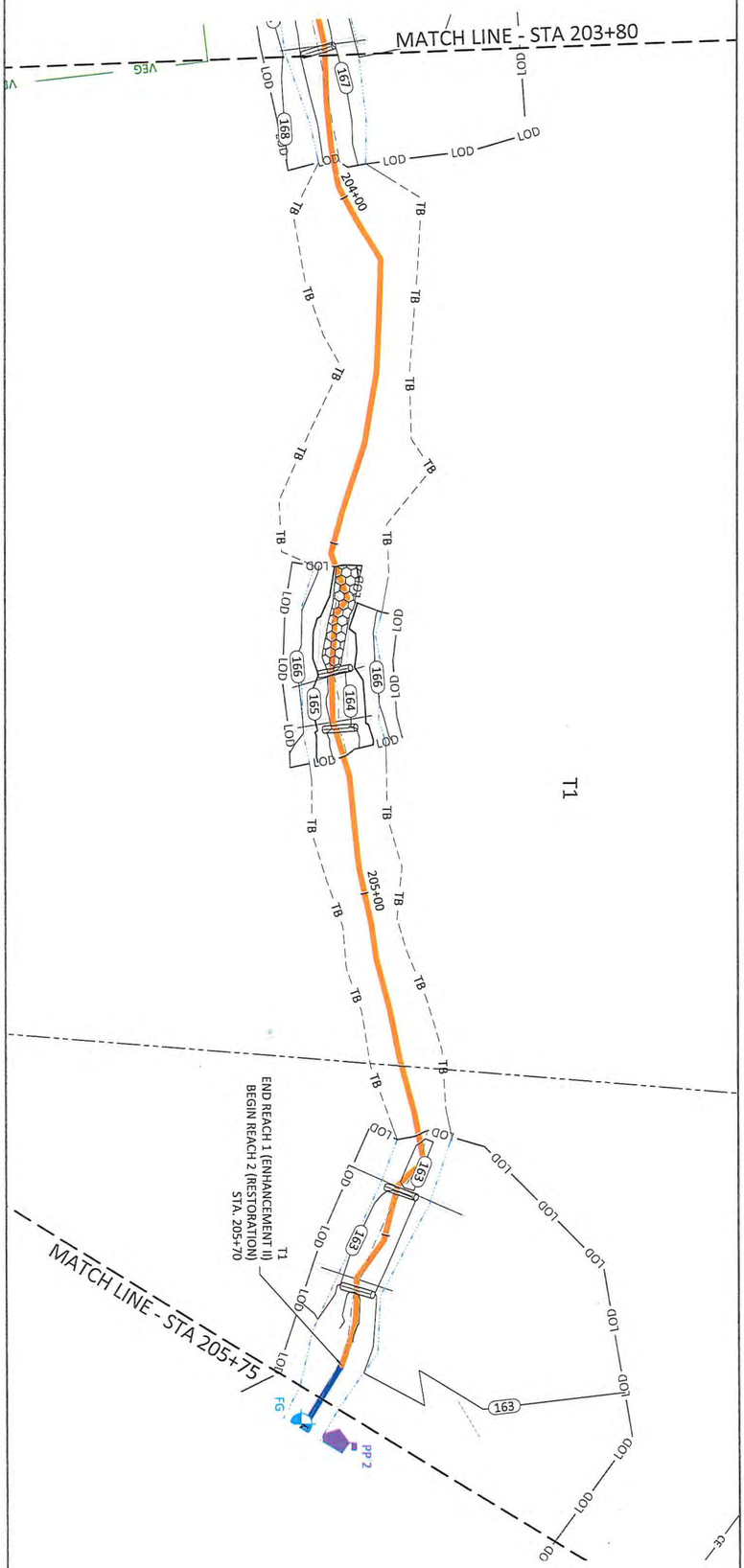
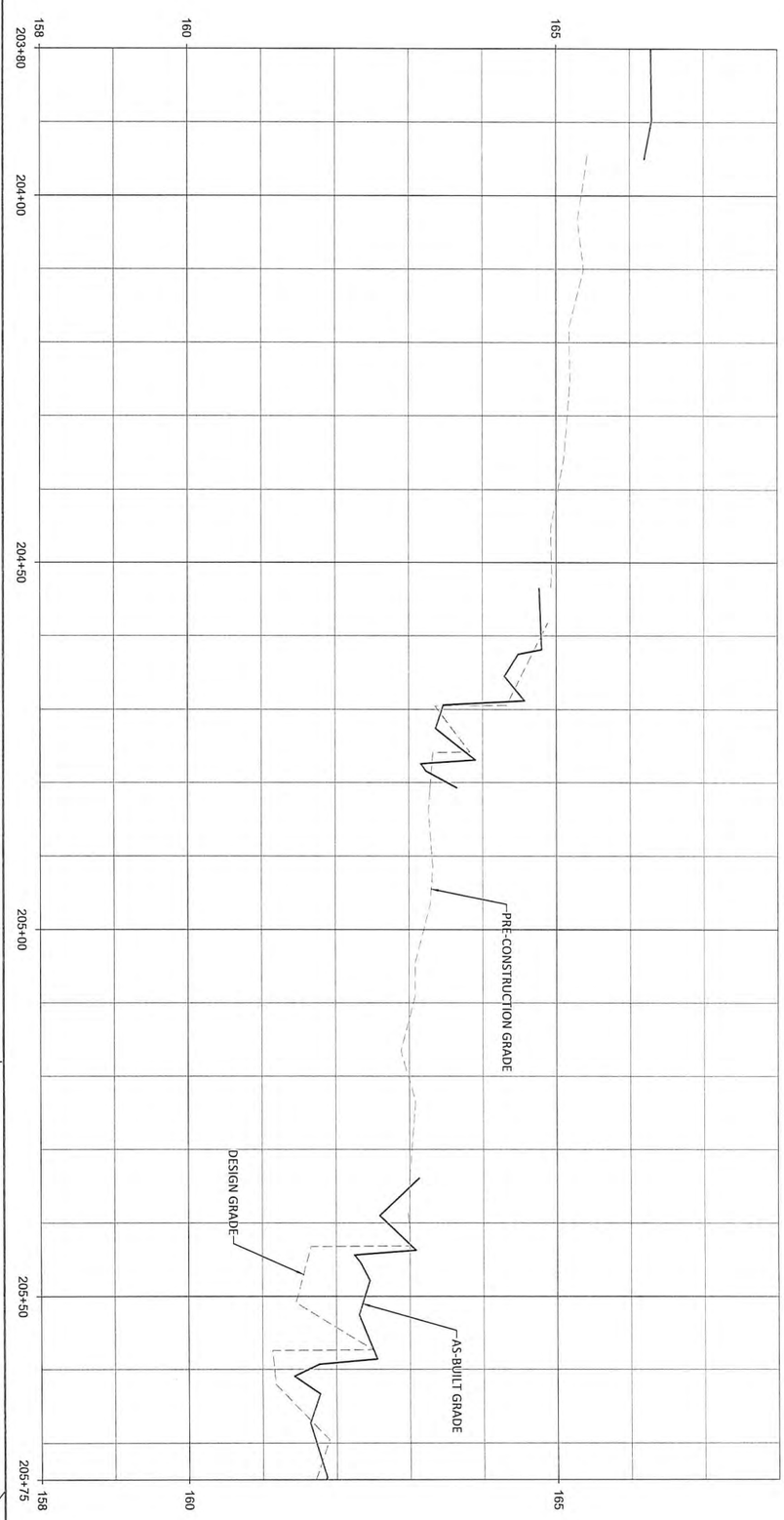
Sheet 1.8

X:\Shared\Projects\W02166 Sassarixa Swamp\Monitoring\Baseline Monitoring\Plans\02166-AB Profiles Sassarixa T1 T2 T3.dwg





N

0' 10' 20' 30' (HORIZONTAL)

0' 1' 2' 3' (VERTICAL)

NOTES:
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Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER
6/28/2021

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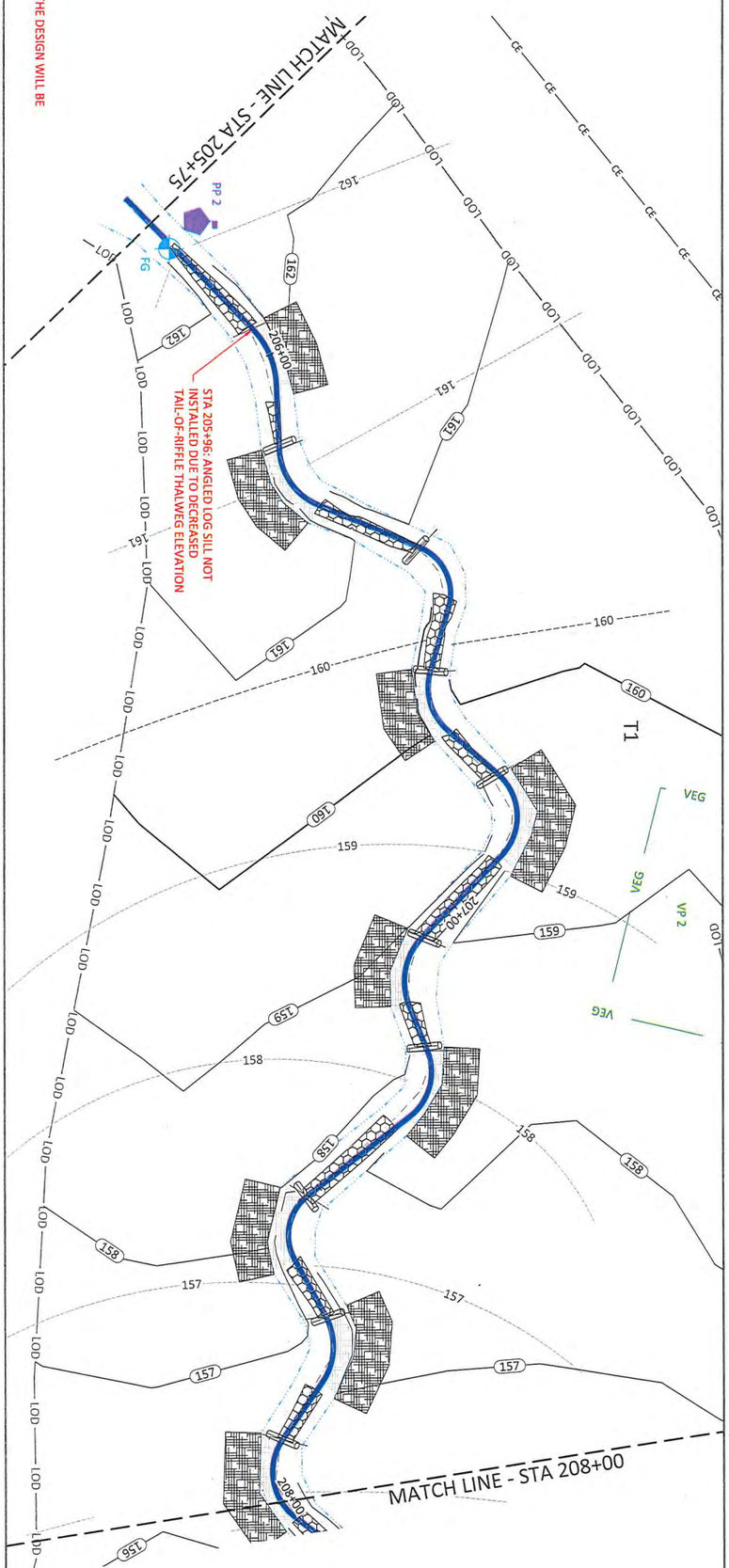

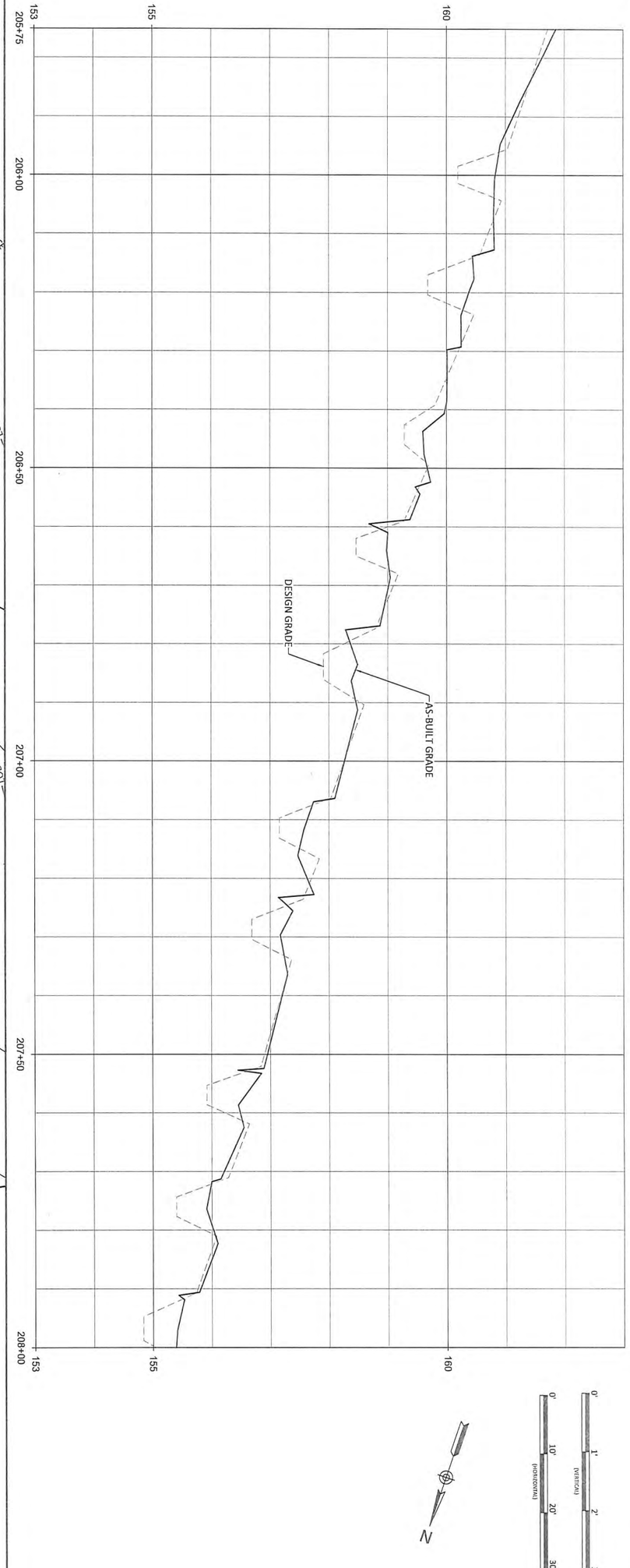

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
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1.10
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Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER
6/28/2021

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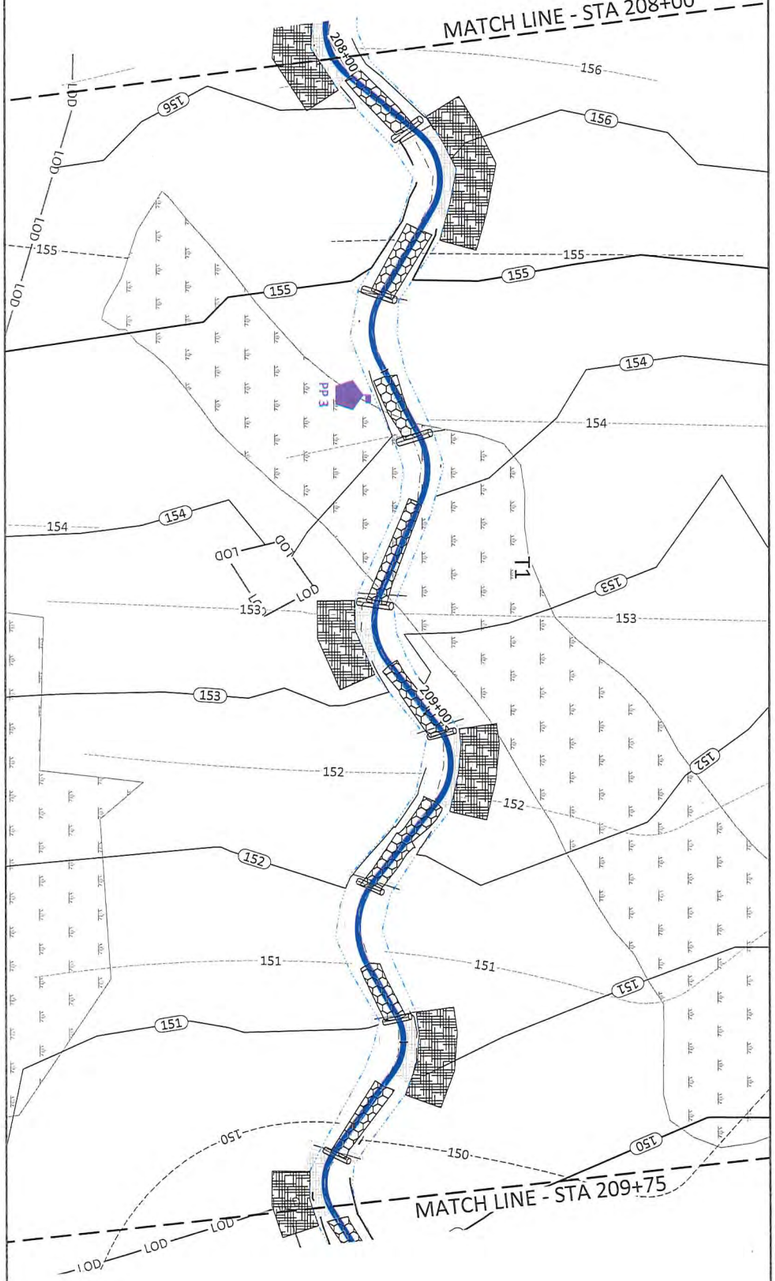

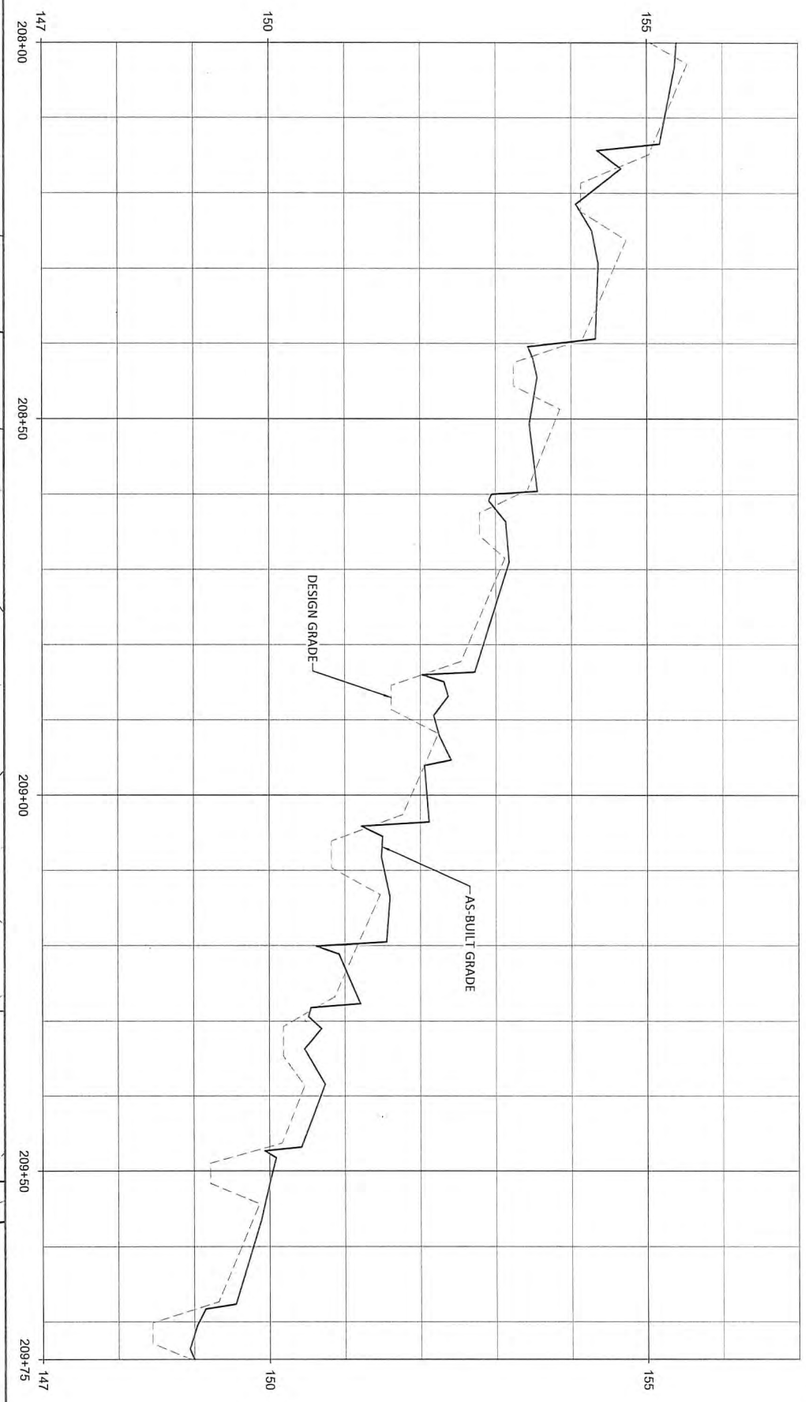

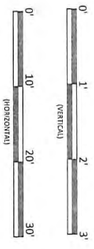

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
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1.11
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER
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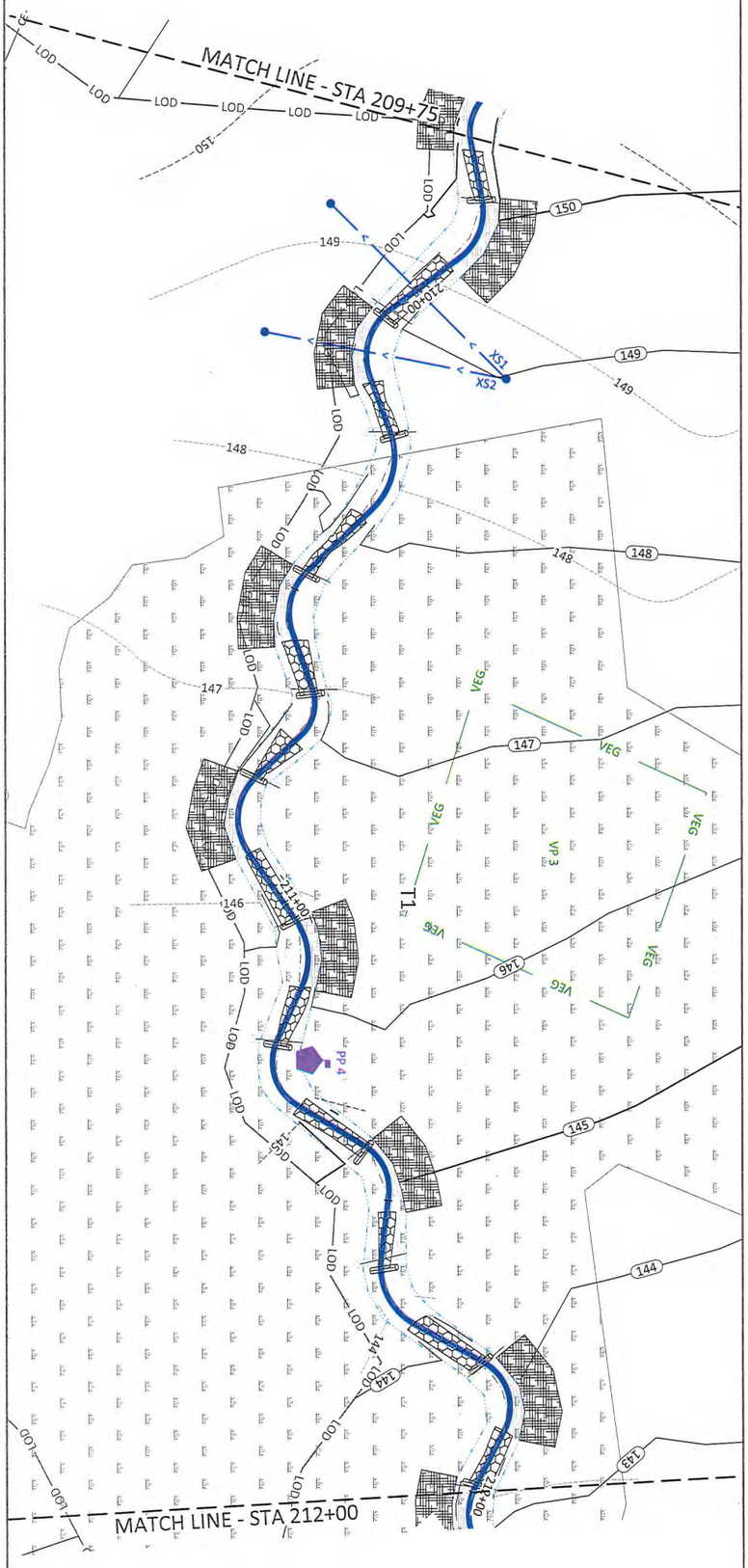

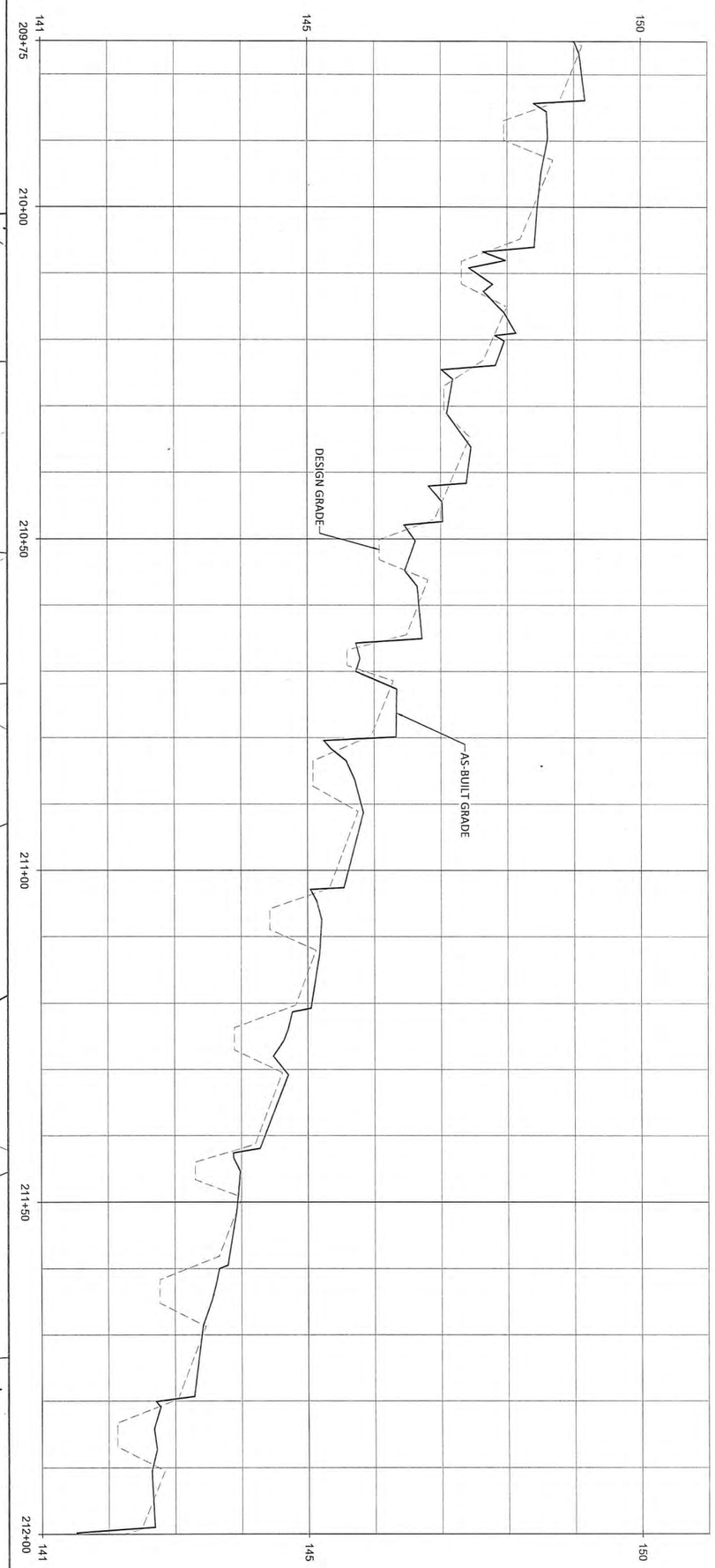

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
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1.12
Sheet

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER

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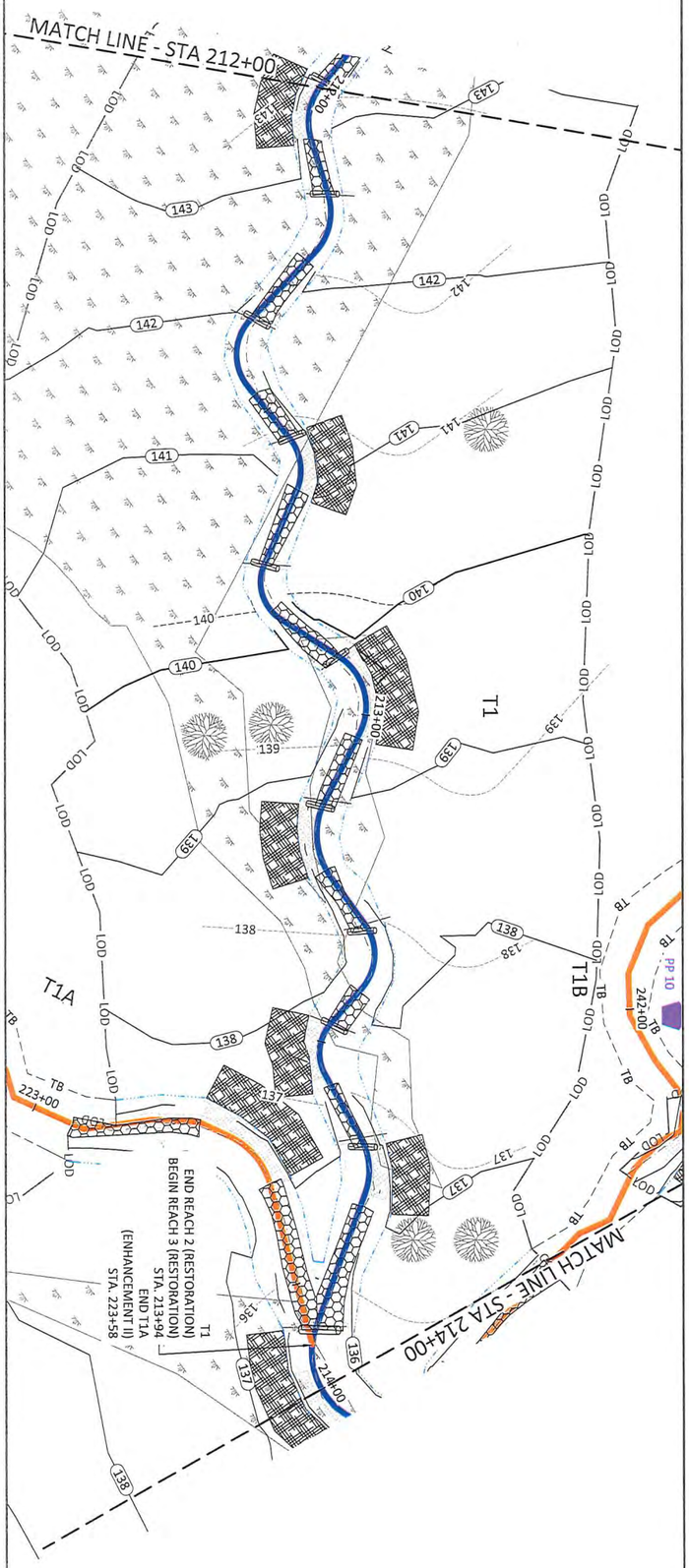

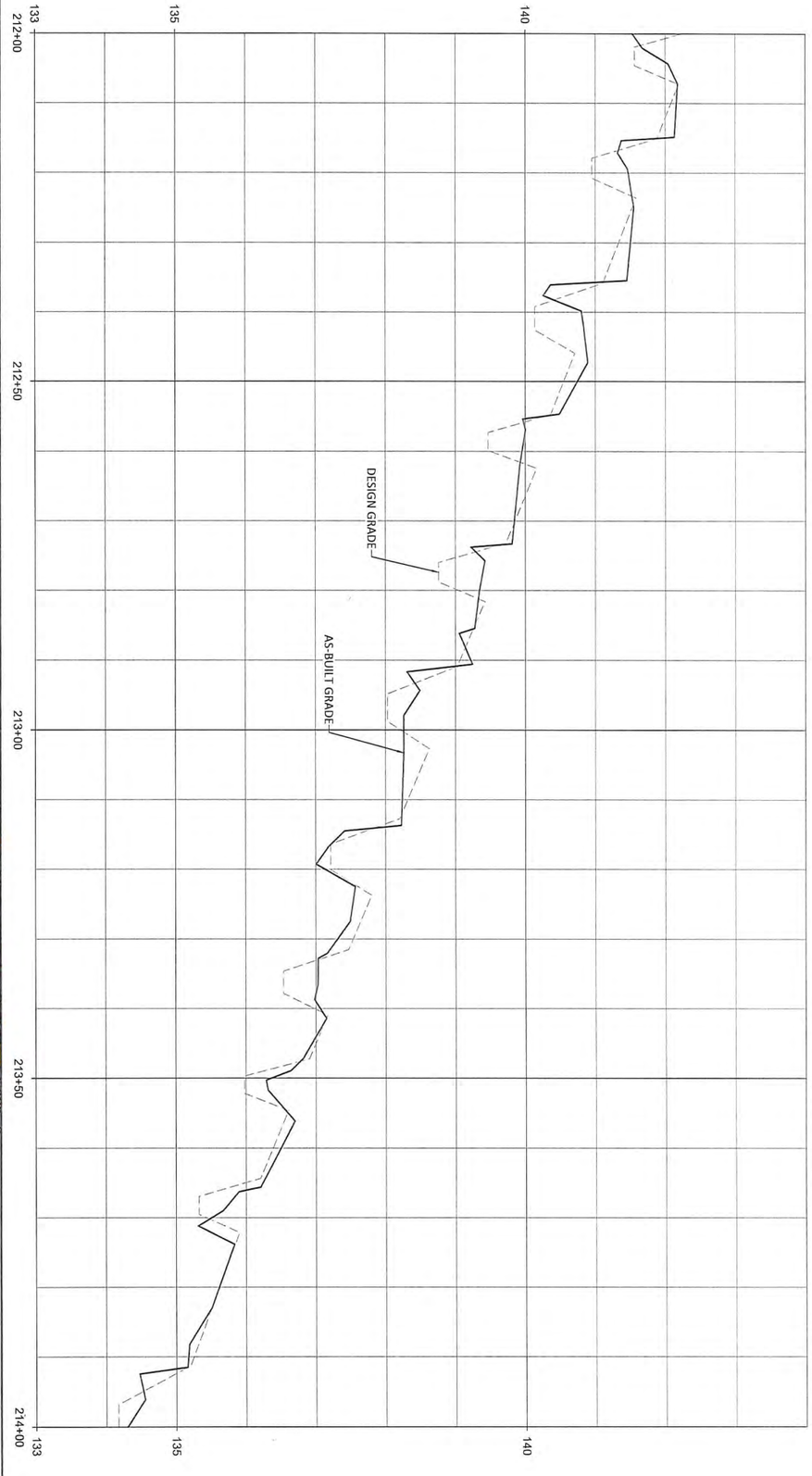

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR T1A IS ADDRESSED ON SHEETS 1.18 THROUGH 1.19.
3. AS-BUILT INFORMATION FOR T1B IS ADDRESSED ON SHEETS 1.20 THROUGH 1.21.

Date:	JUNE 28, 2021
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Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.13
Sheet

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER
6/28/2021

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2. AS-BUILT INFORMATION FOR T1B IS ADDRESSED ON SHEETS 1.20 THROUGH 1.21.

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

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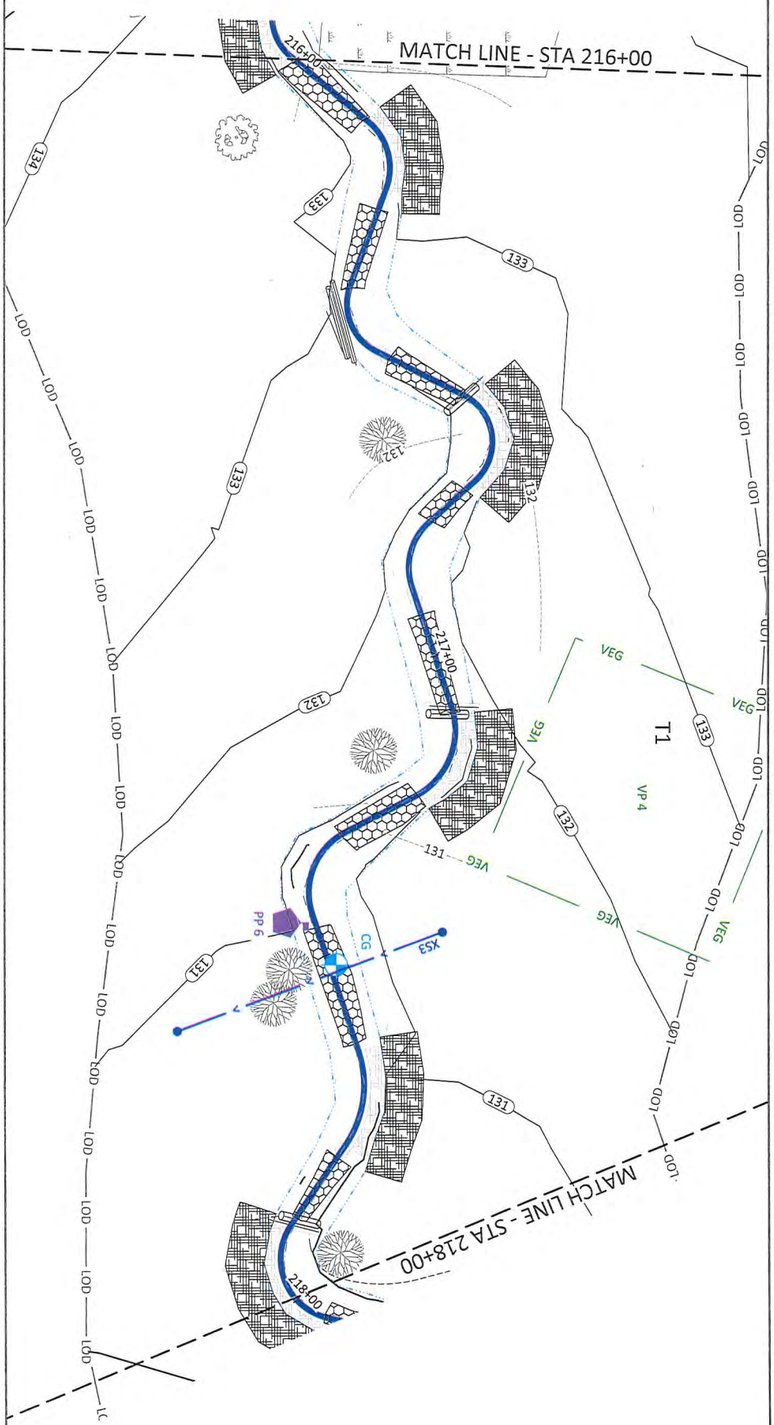
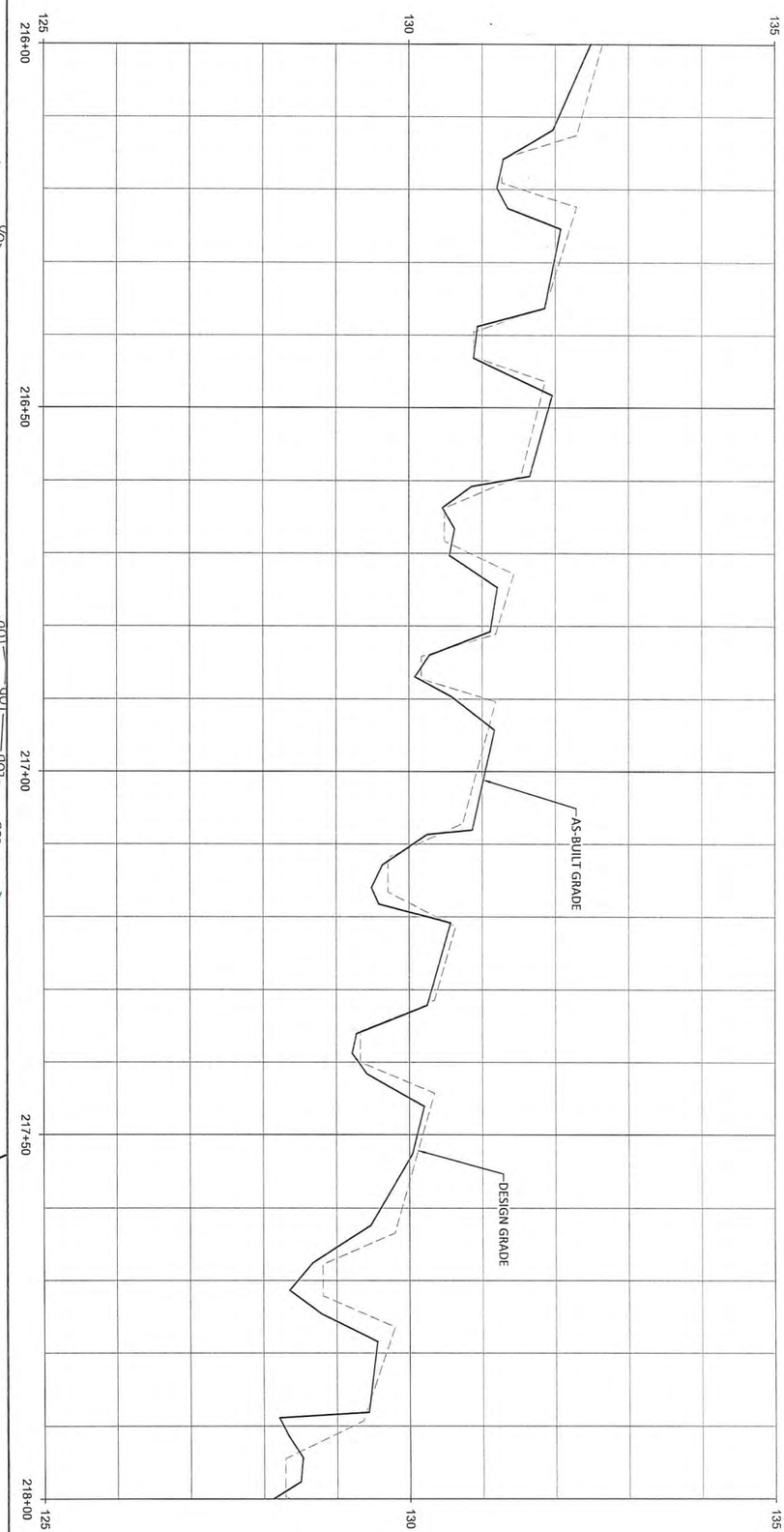
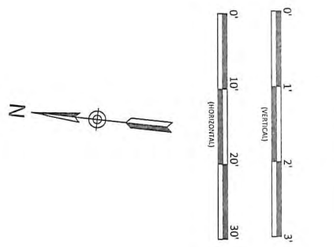
Sheet 1.14

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.







Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.15
Sheet

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

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6/28/2021

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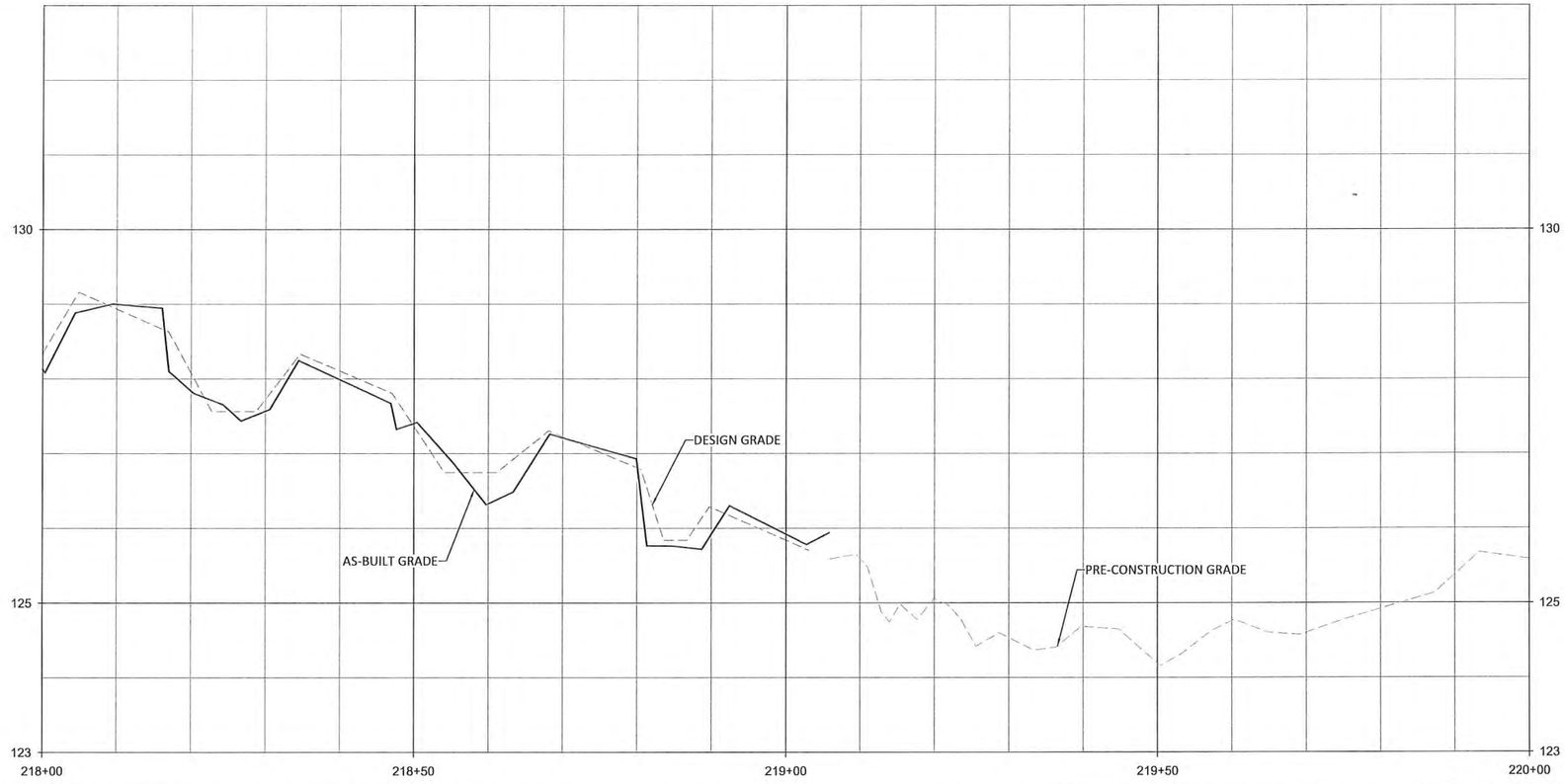
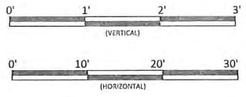
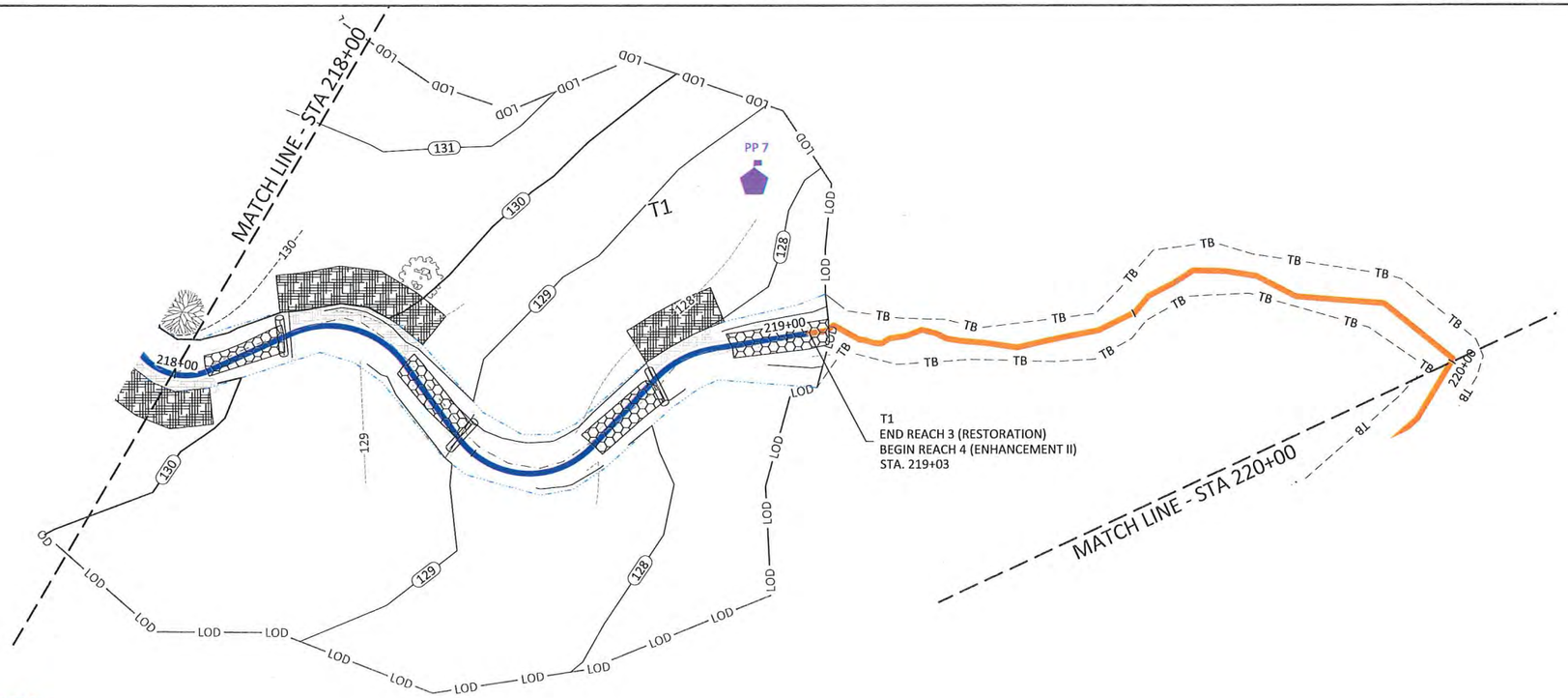
June 28, 2021







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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

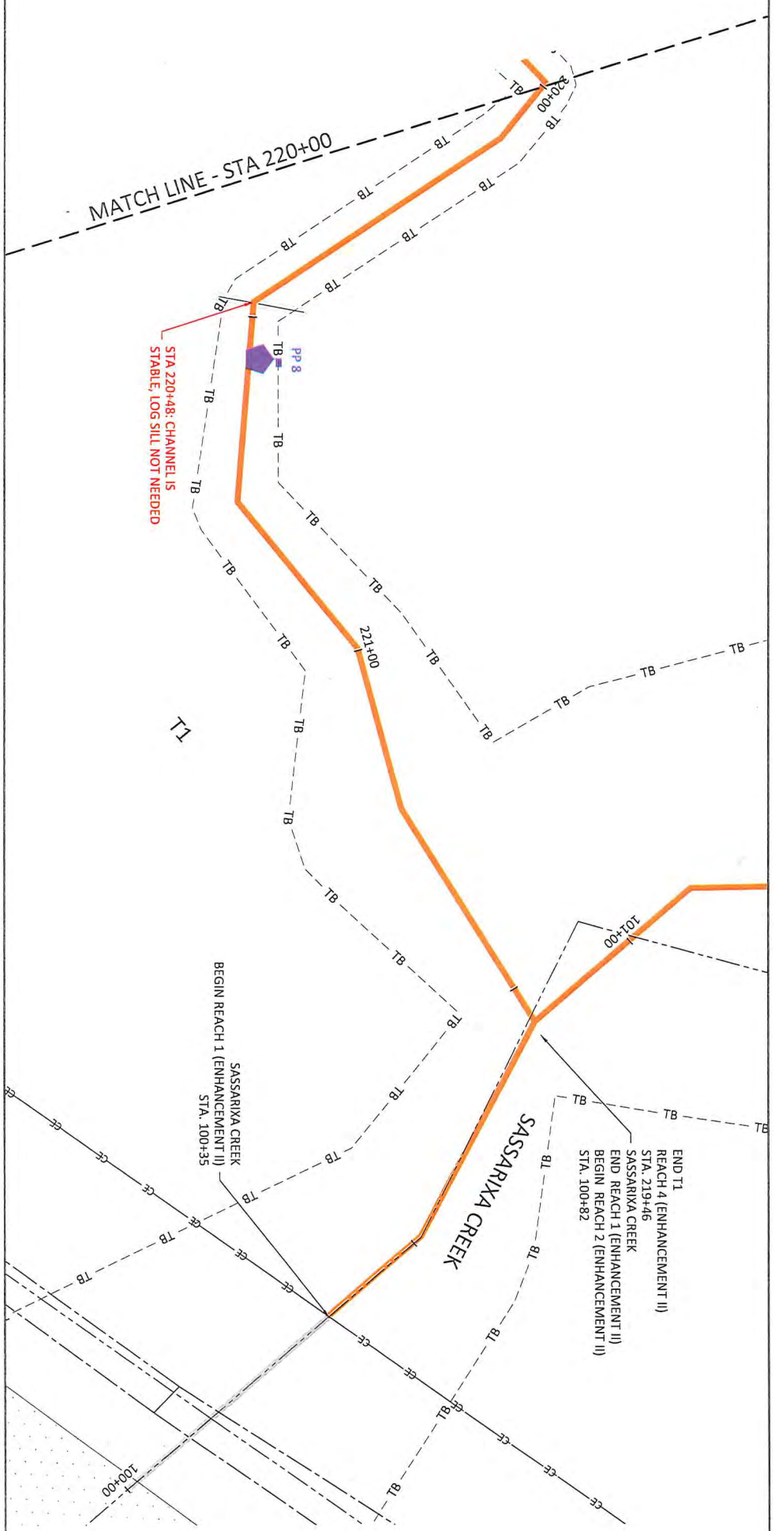
Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

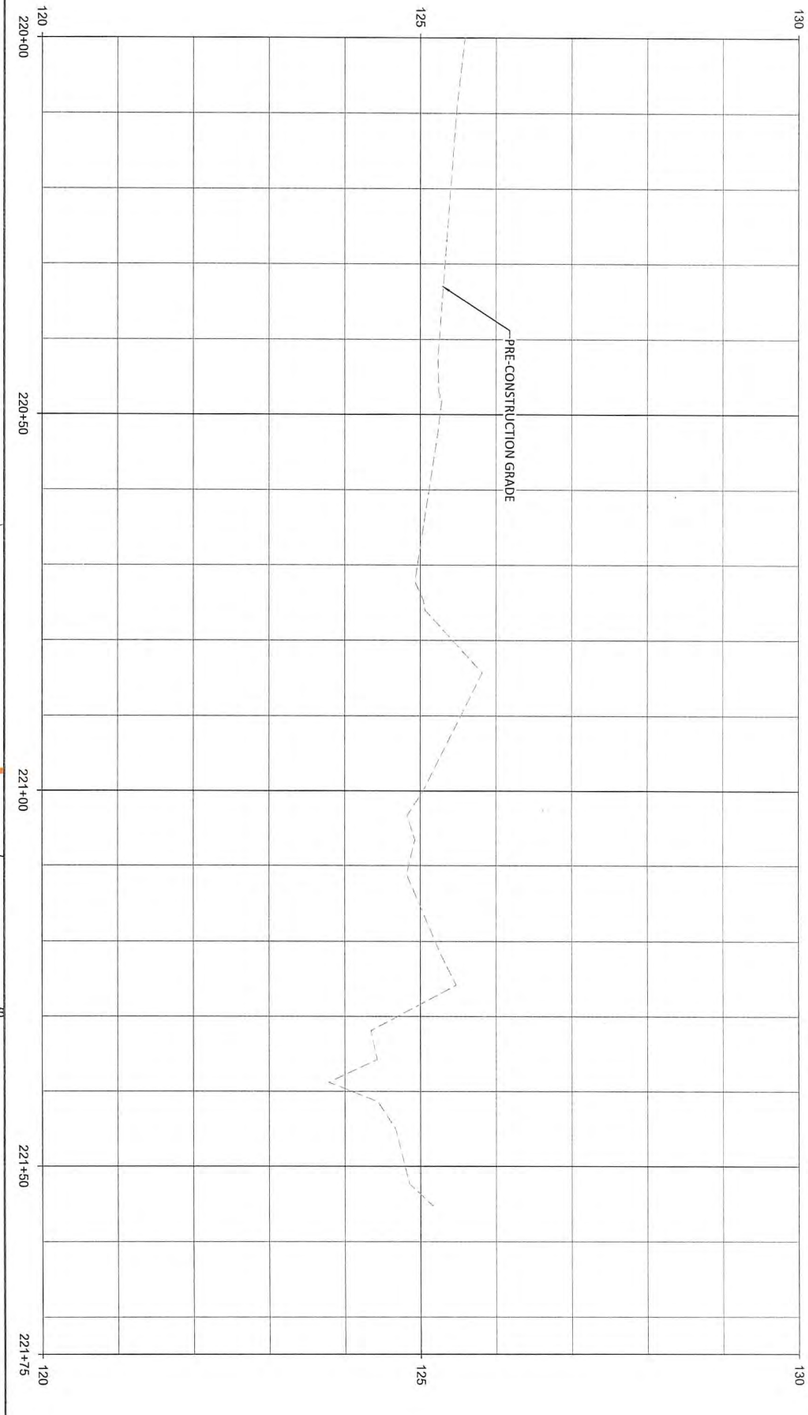
Revisions:

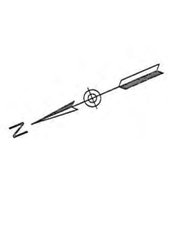
Sheet 1.16

X:\Shared\Projects\WI02166 Sassarixa Swamp\Monitoring\Baseline Monitoring\Plans\02166-AB Profiles Sassarixa T1 T2 T3.dwg

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR SASSARIXA CREEK IS ADDRESSED ON SHEETS 1.1 THROUGH 1.6.







Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.17
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1
Stream Plan and Profile

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6/28/2021

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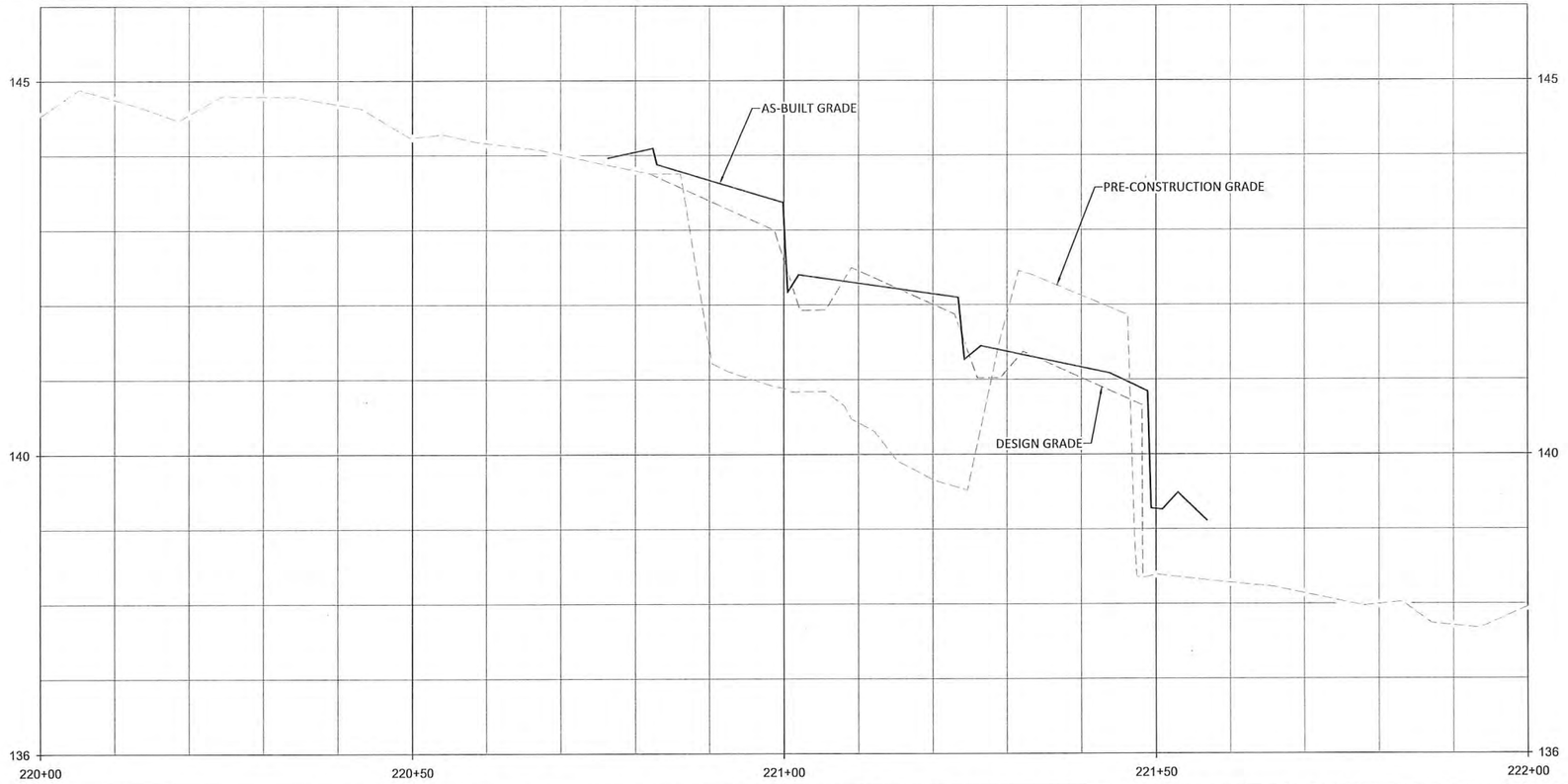

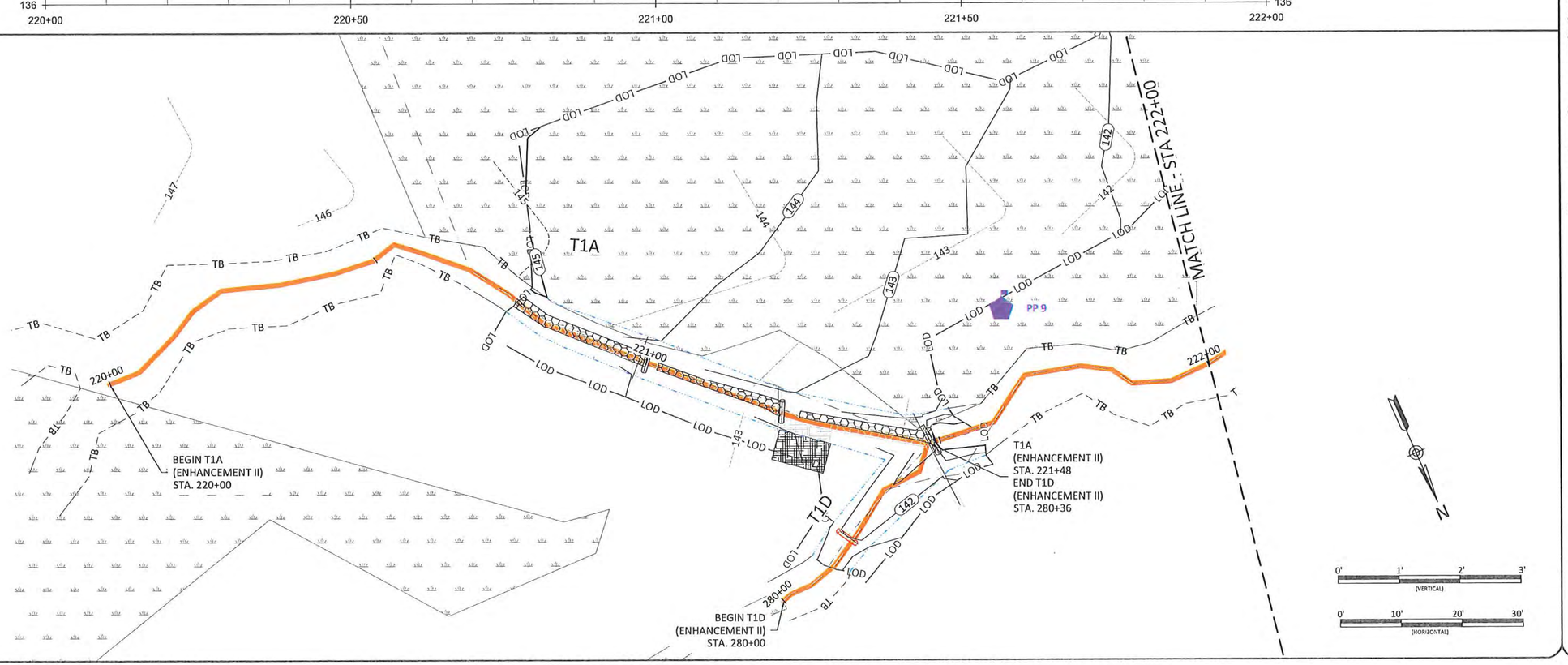

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR T1D IS ADDRESSED ON SHEET 1.24.

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1A
Stream Plan and Profile

Revisions:

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Sheet 1.18

June 28, 2021

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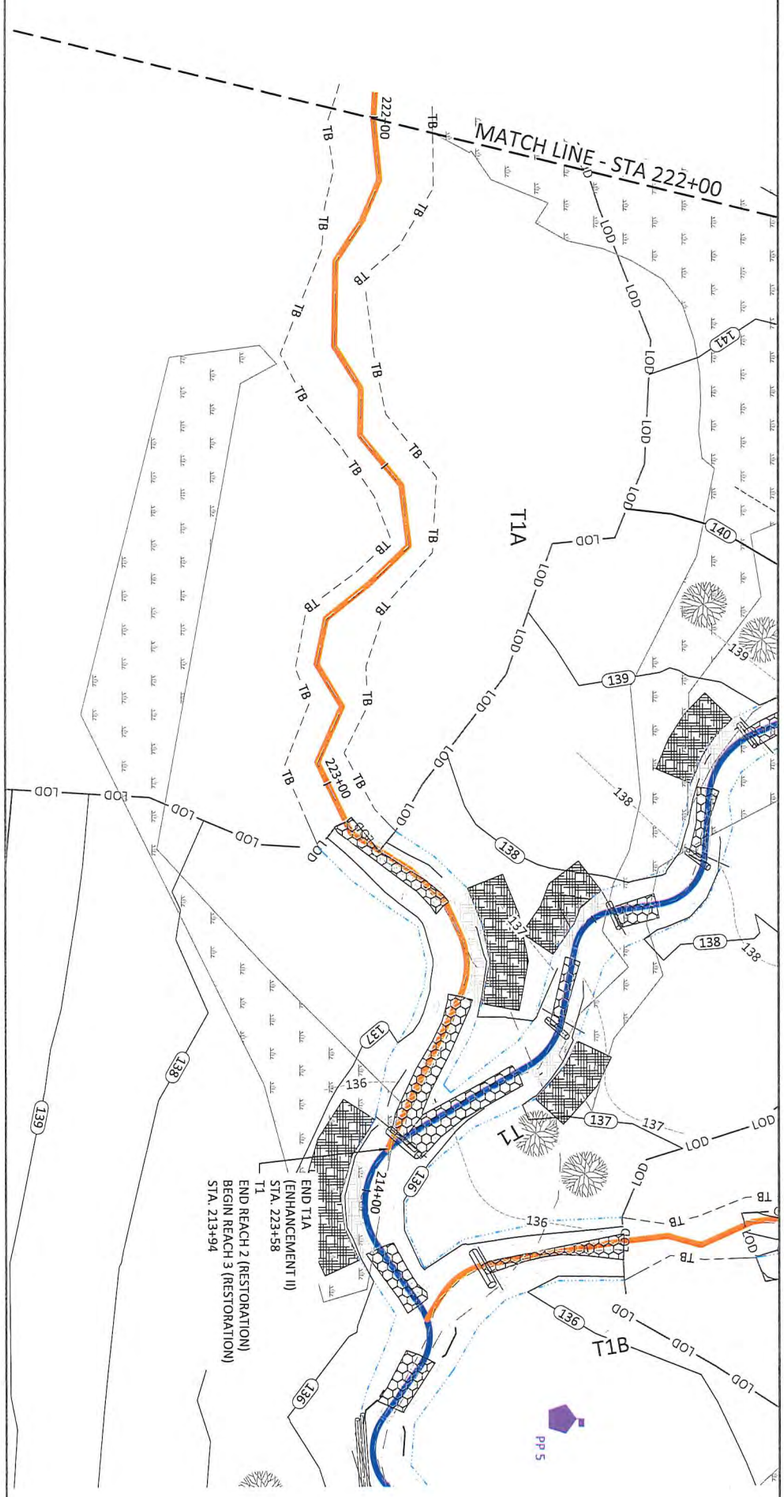
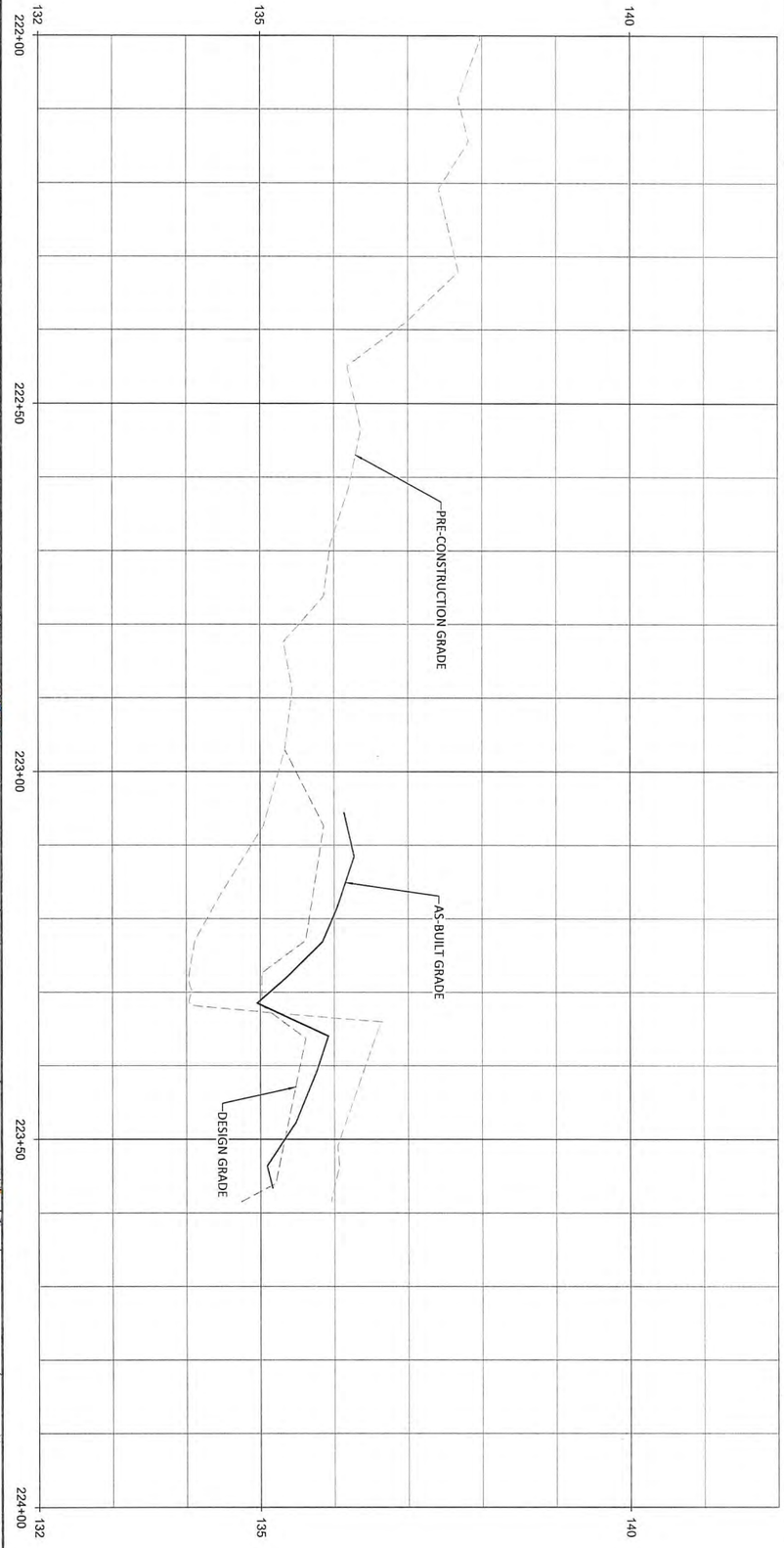
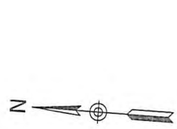
NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR T1 IS ADDRESSED ON SHEETS 1.7 THROUGH 1.17.
3. AS-BUILT INFORMATION FOR T1B IS ADDRESSED ON SHEETS 1.20 THROUGH 1.21.







Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
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1.19
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1A
Stream Plan and Profile

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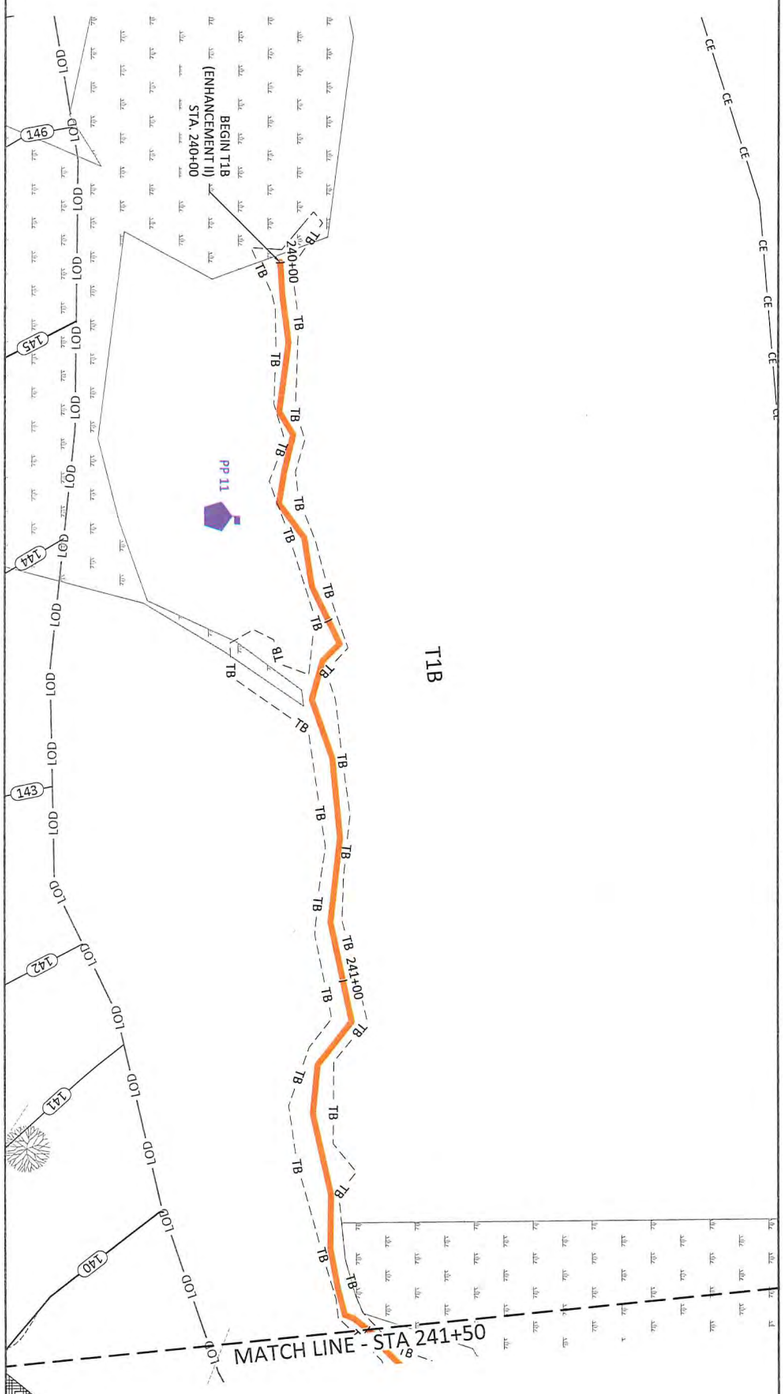

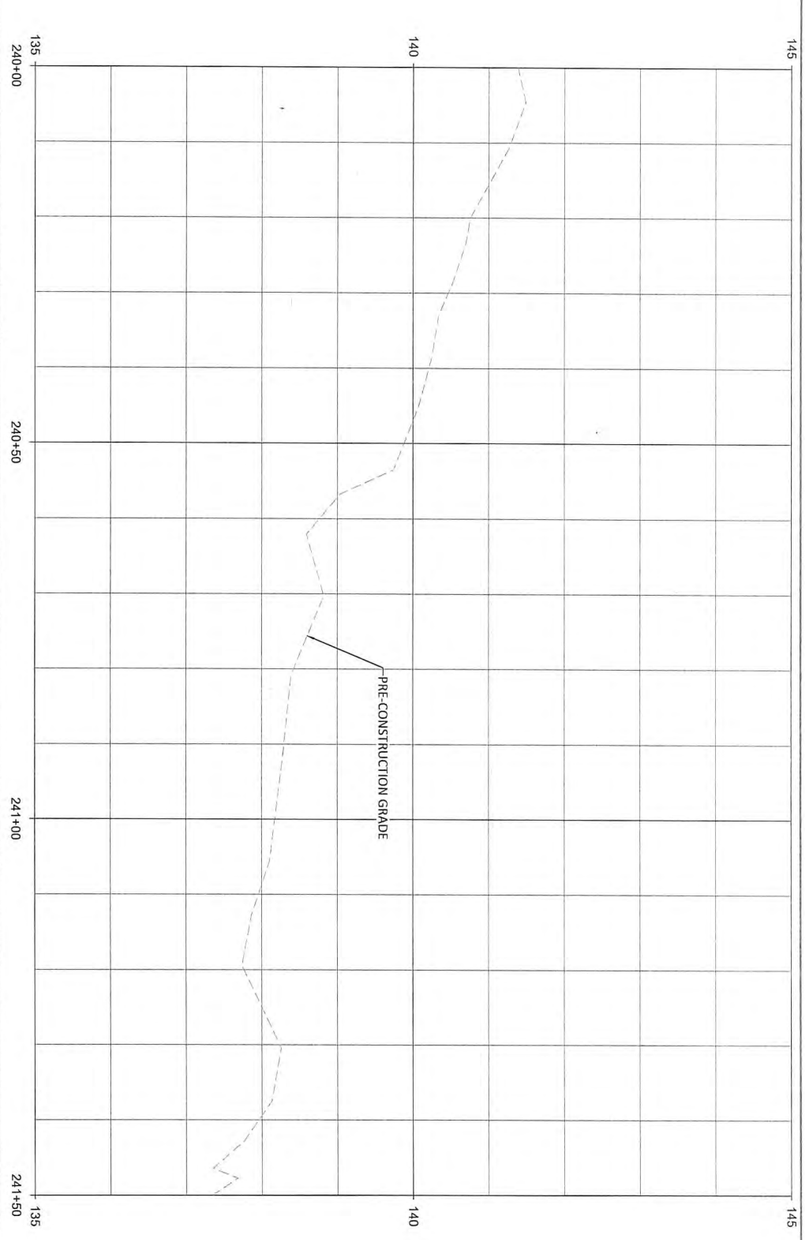

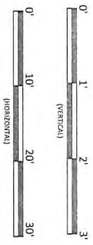

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1B
Stream Plan and Profile

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6/28/2021

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NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR T1 IS ADDRESSED ON SHEETS 1.7 THROUGH 1.17.
2. AS-BUILT INFORMATION FOR T1BA IS ADDRESSED ON SHEETS 1.18 THROUGH 1.19.

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1B
Stream Plan and Profile

Revisions:

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Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
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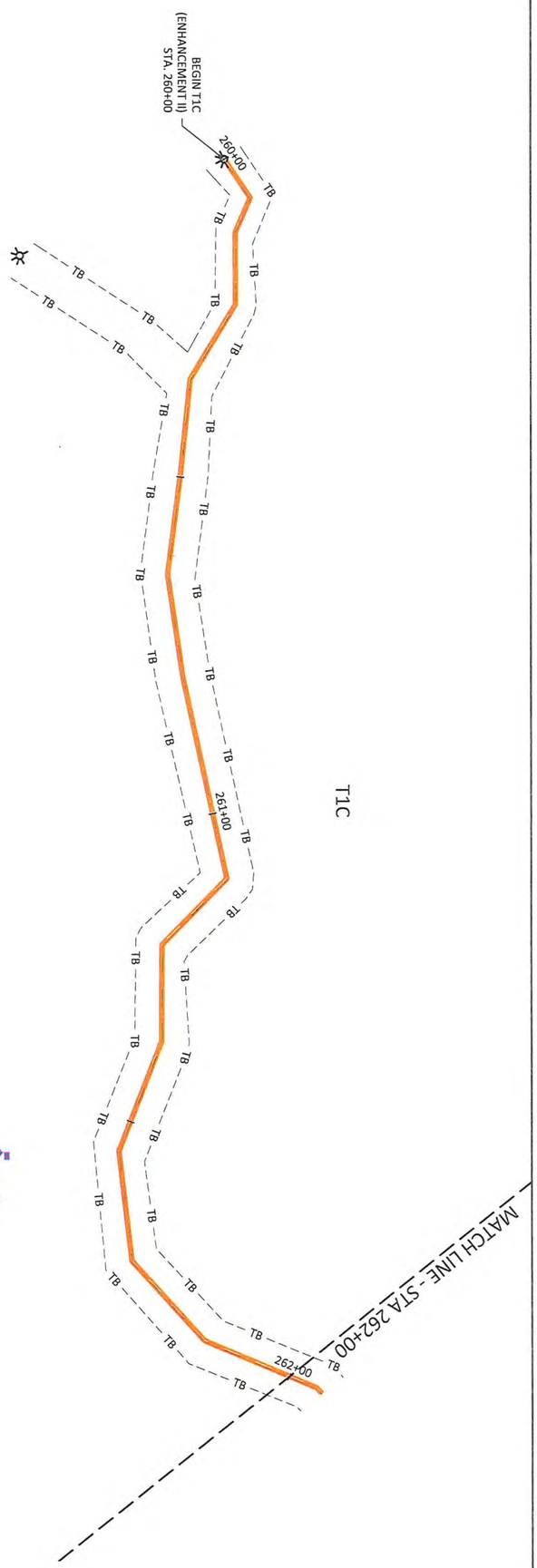
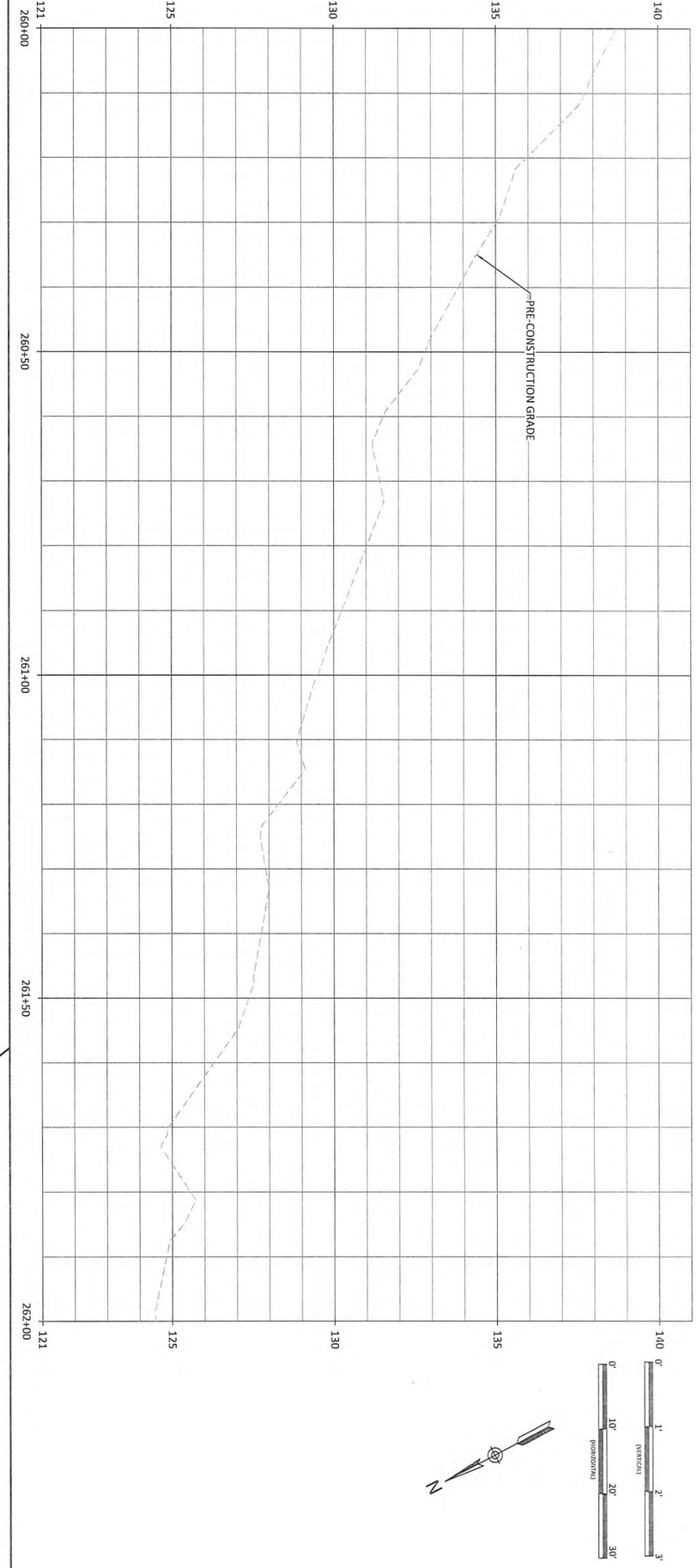
Sheet 1.21

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.





Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.22
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1C
Stream Plan and Profile

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6/28/2021

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NOTES:
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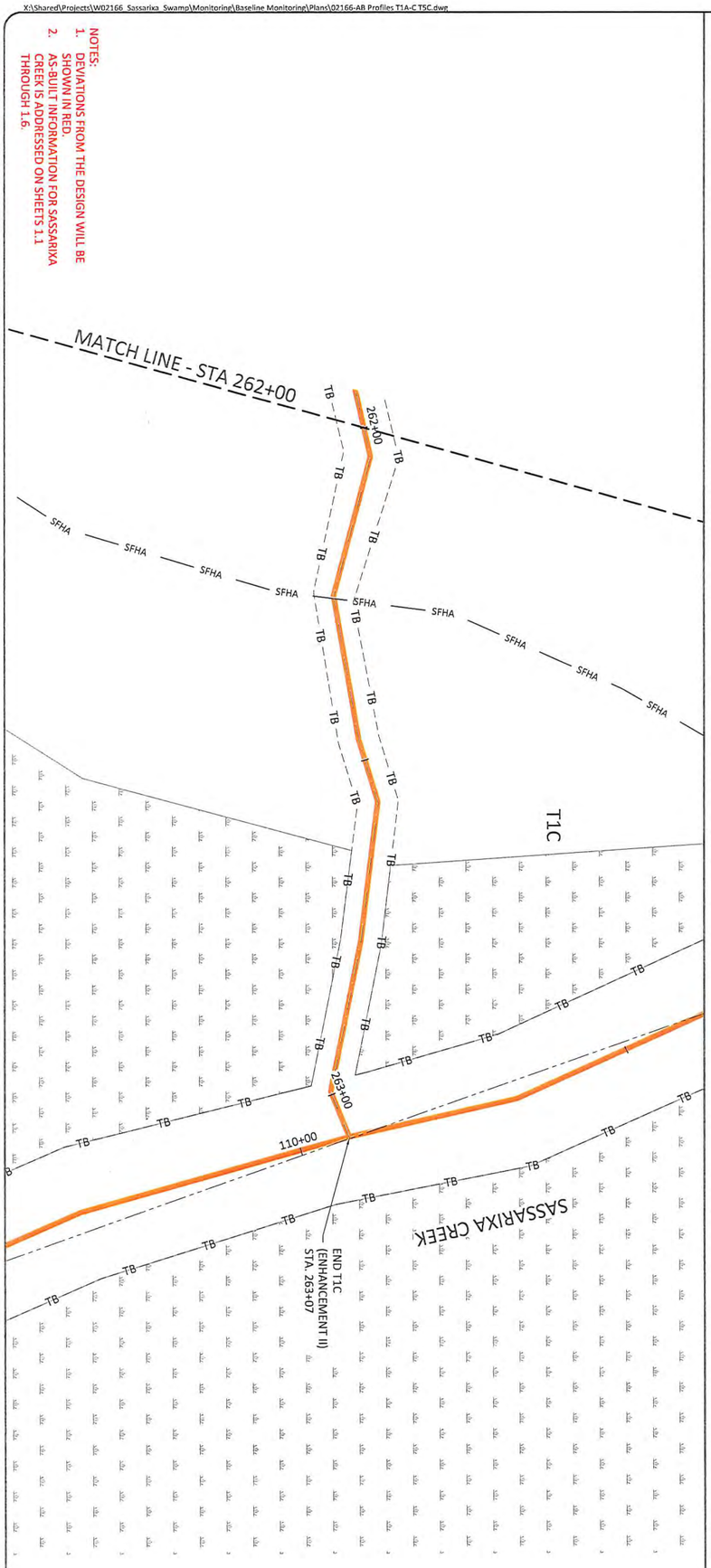

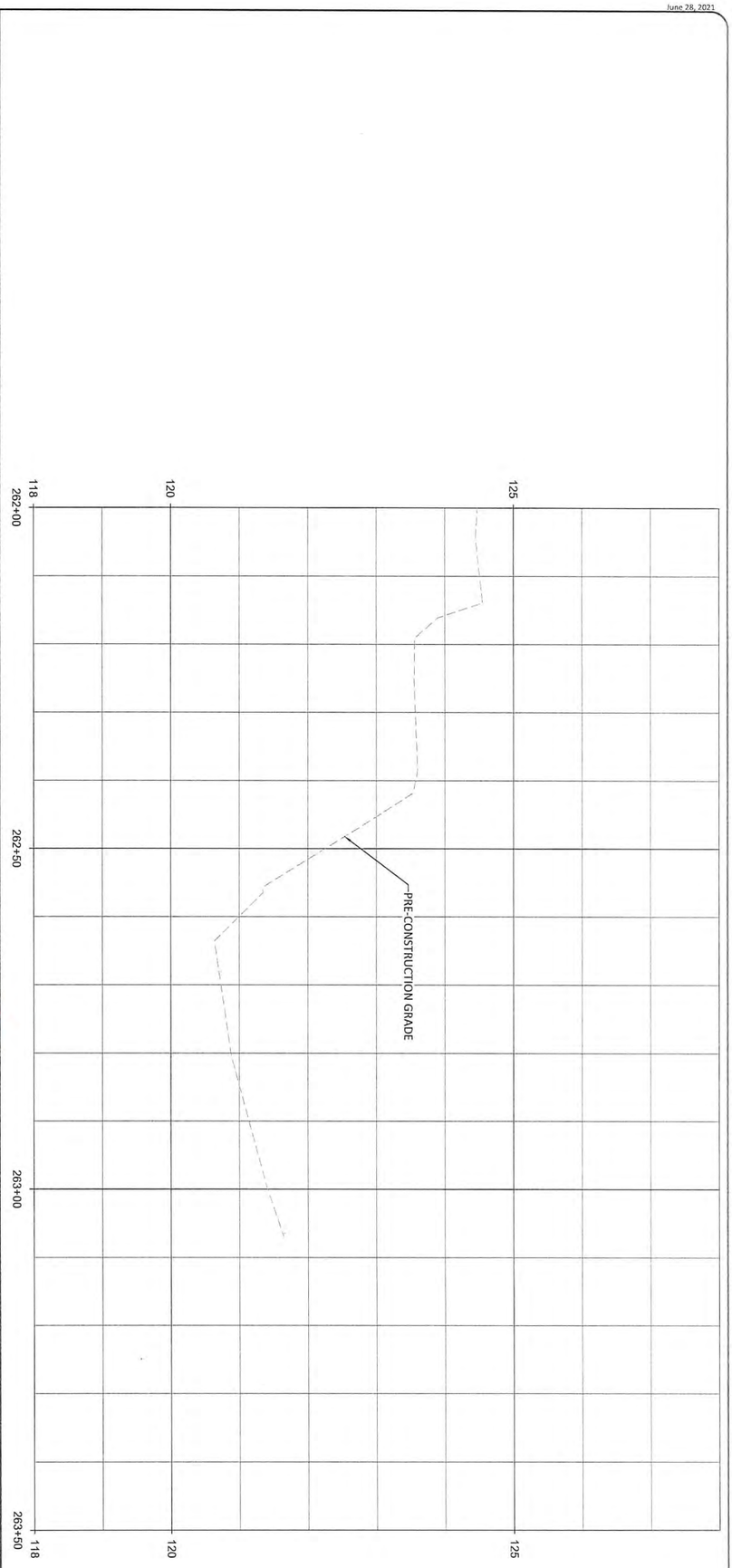

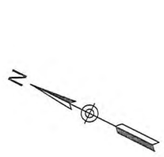

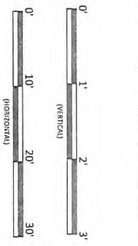

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.23
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1C
Stream Plan and Profile

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6/28/2021

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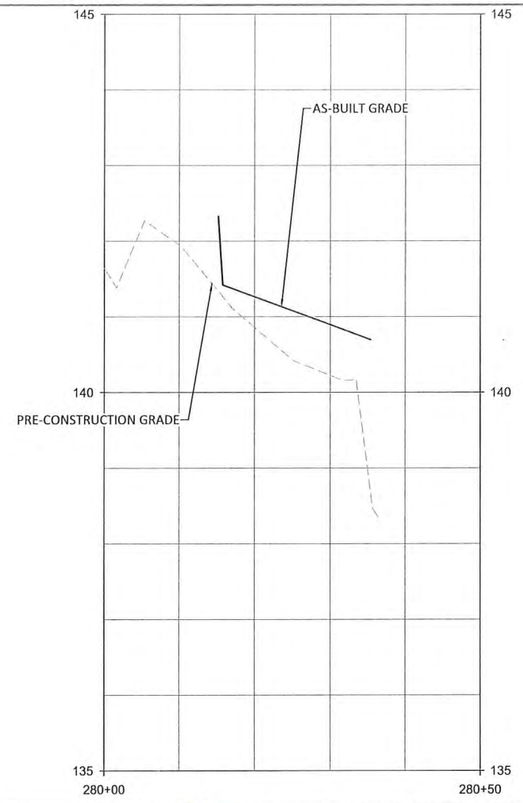

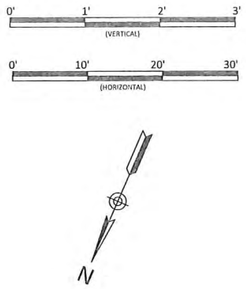

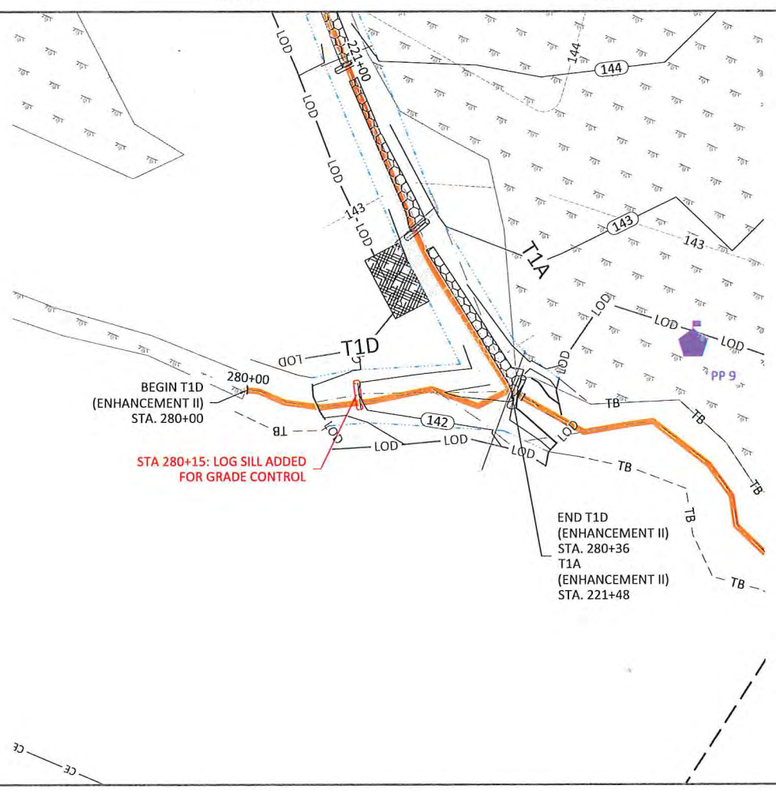

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR T1A IS ADDRESSED ON SHEETS 1.18 THROUGH 1.19.

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T1D
Stream Plan and Profile

Revisions:

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Sheet 1.24

June 28, 2021

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

0' 1' 2' 3' (VERTICAL)

0' 10' 20' 30' (HORIZONTAL)

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

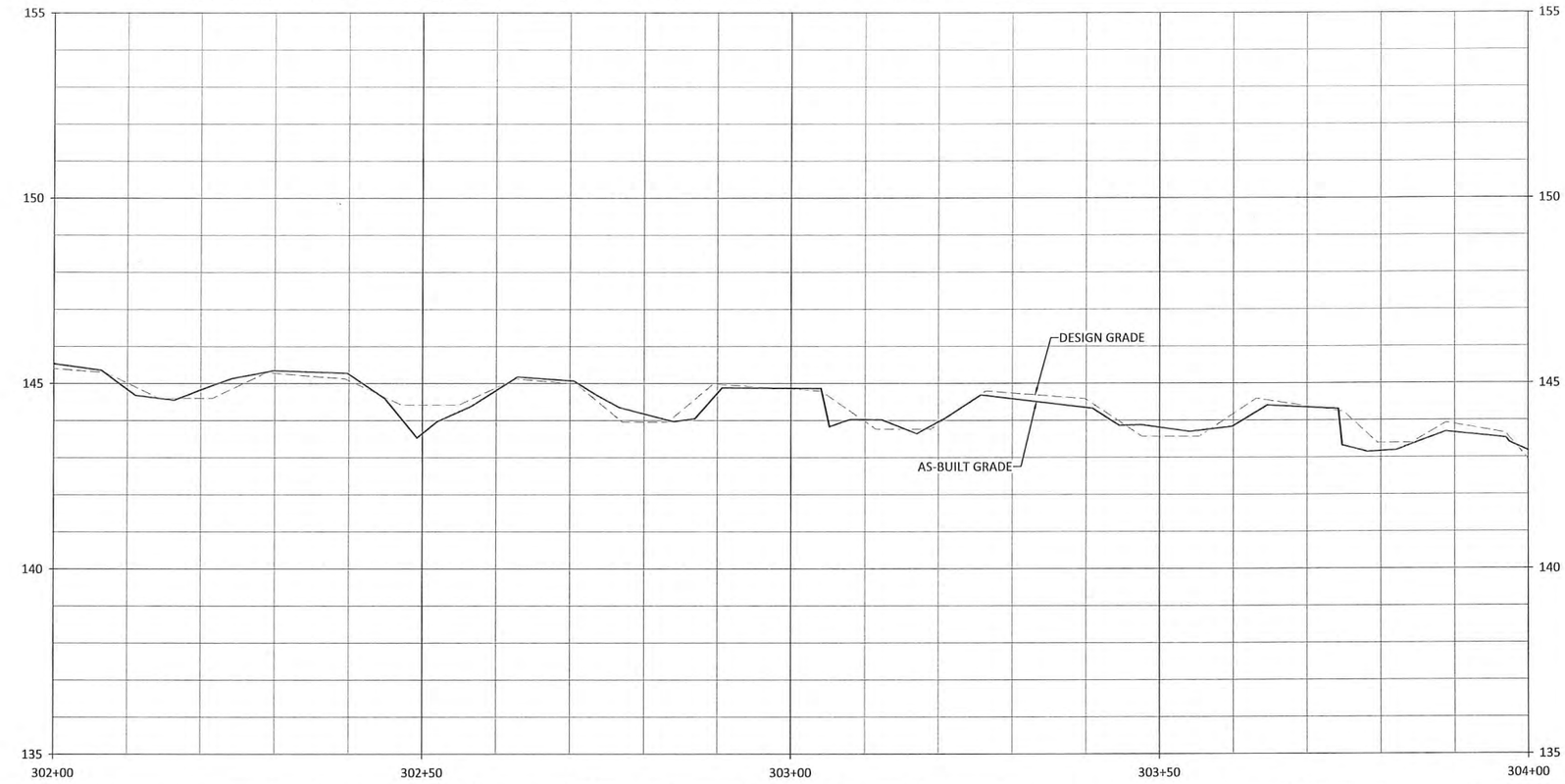
T2
Stream Plan and Profile

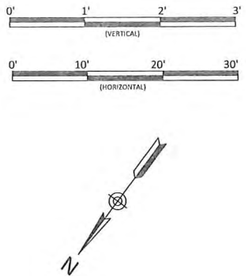
Revisions:

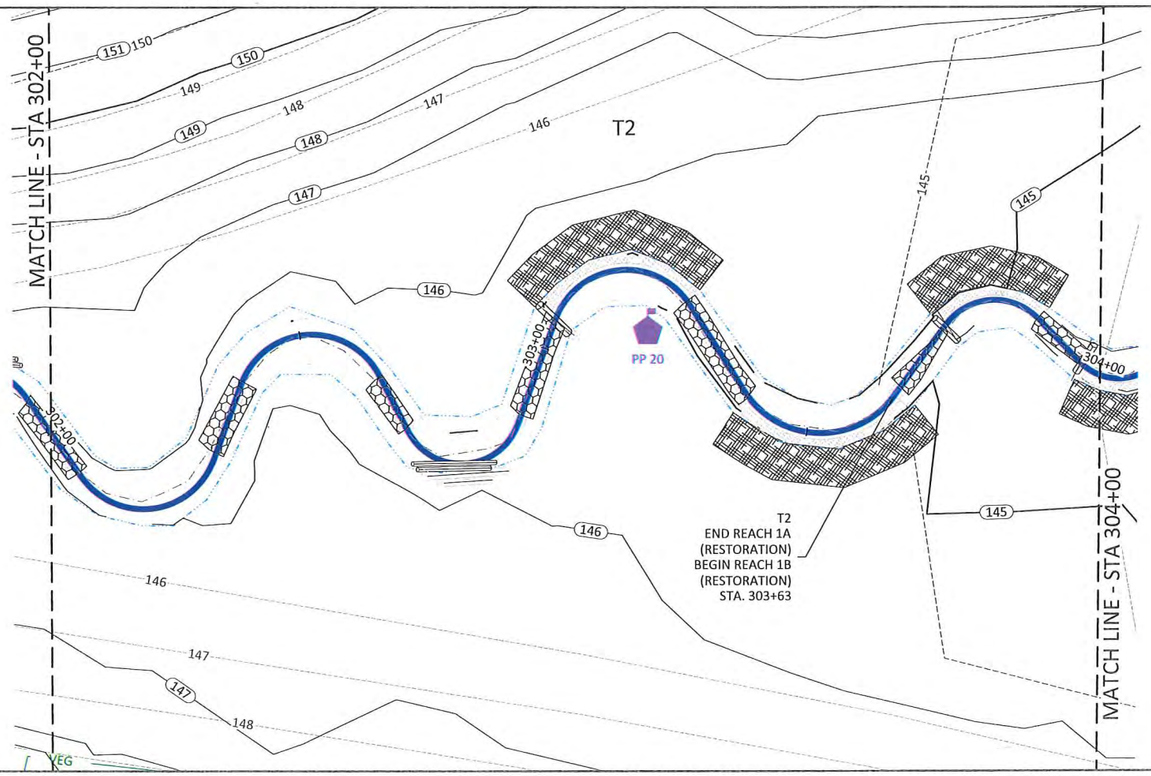
Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Sheet 1.25

X:\Shared\Projects\WI02166 Sassarixa Swamp\Monitoring\Baseline Monitoring\Plans\02166-AB Profiles Sassarixa T1 T2 T3.dwg







NOTES:
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T2
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

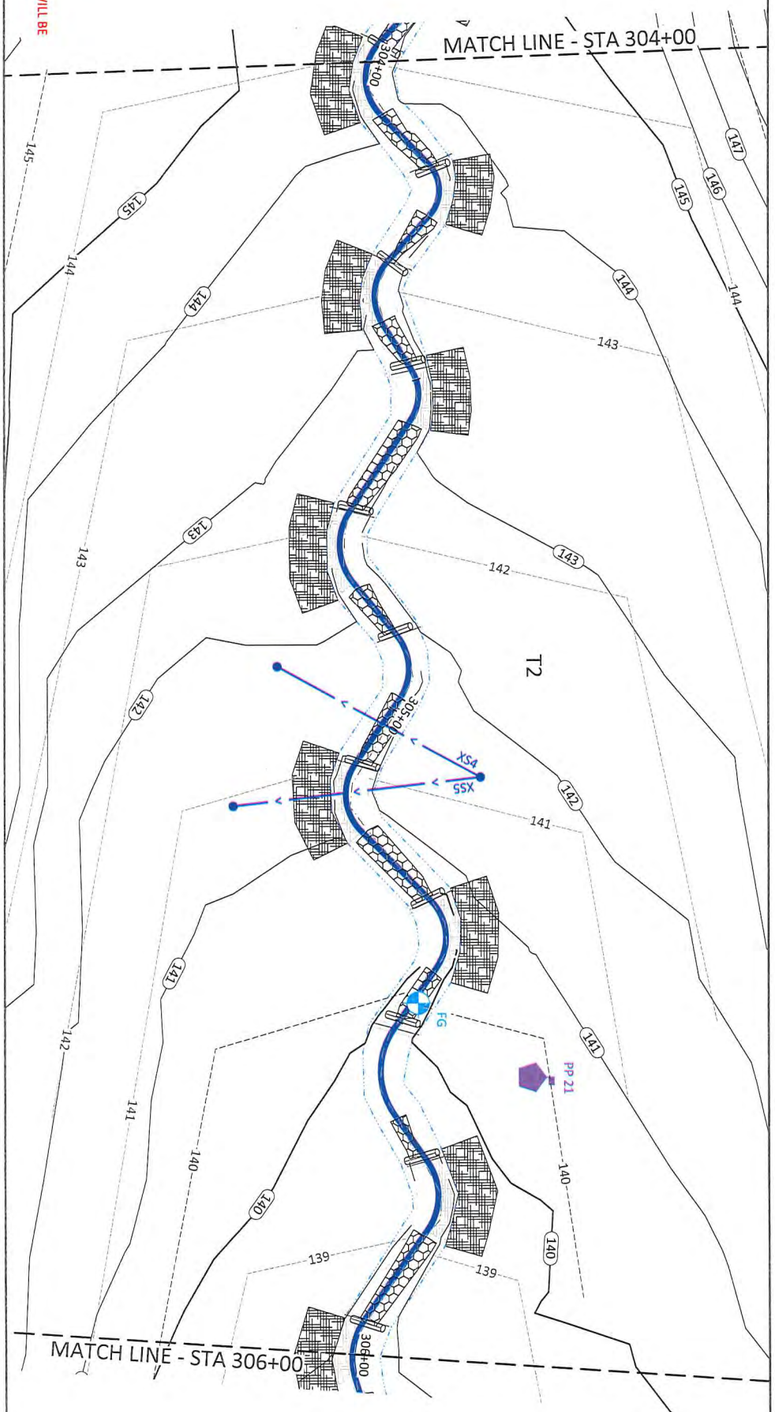
Revisions:

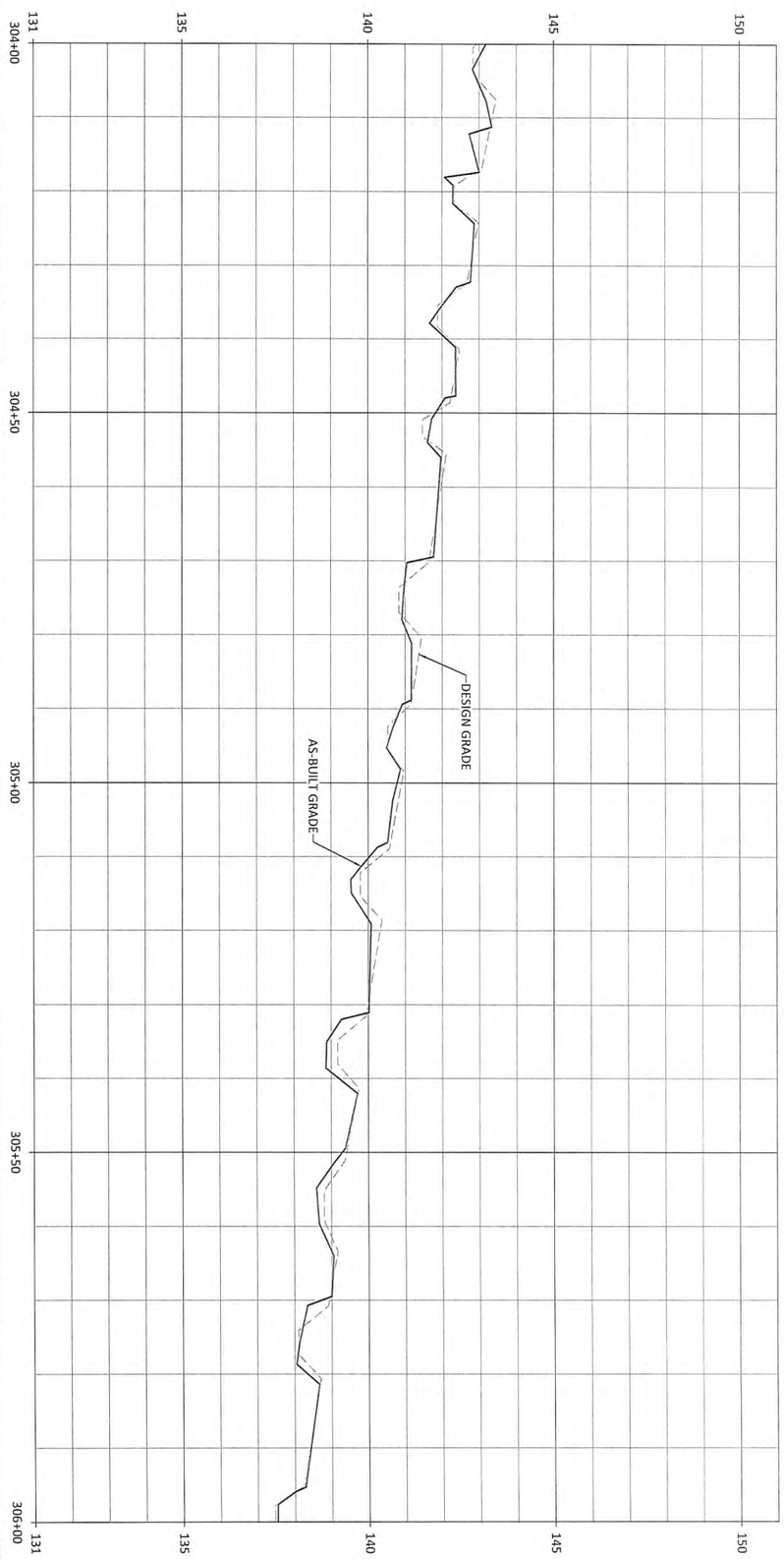
Sheet 1.26

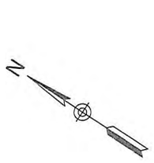
June 28, 2021

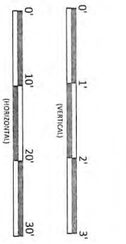
X:\Shared\Projects\WI02166_Sassarixa_SwampMonitoring\Baseline Monitoring\Plans\02166_as Profiles Sassarixa T1 T2 T3.dwg

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.









Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.27
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T2
Stream Plan and Profile

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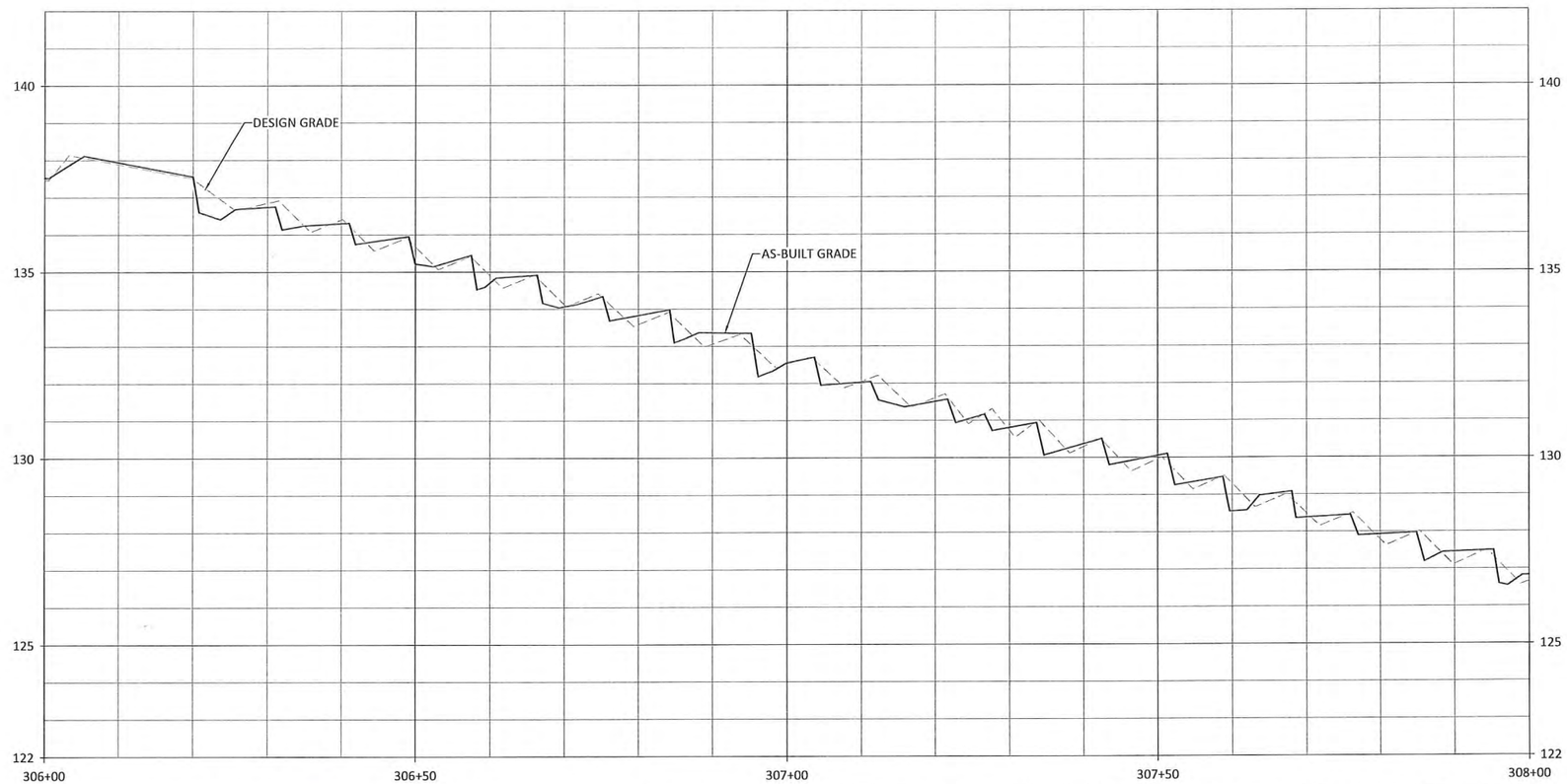

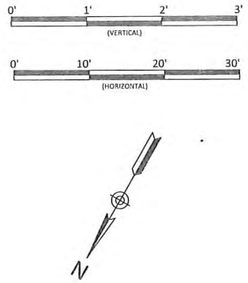

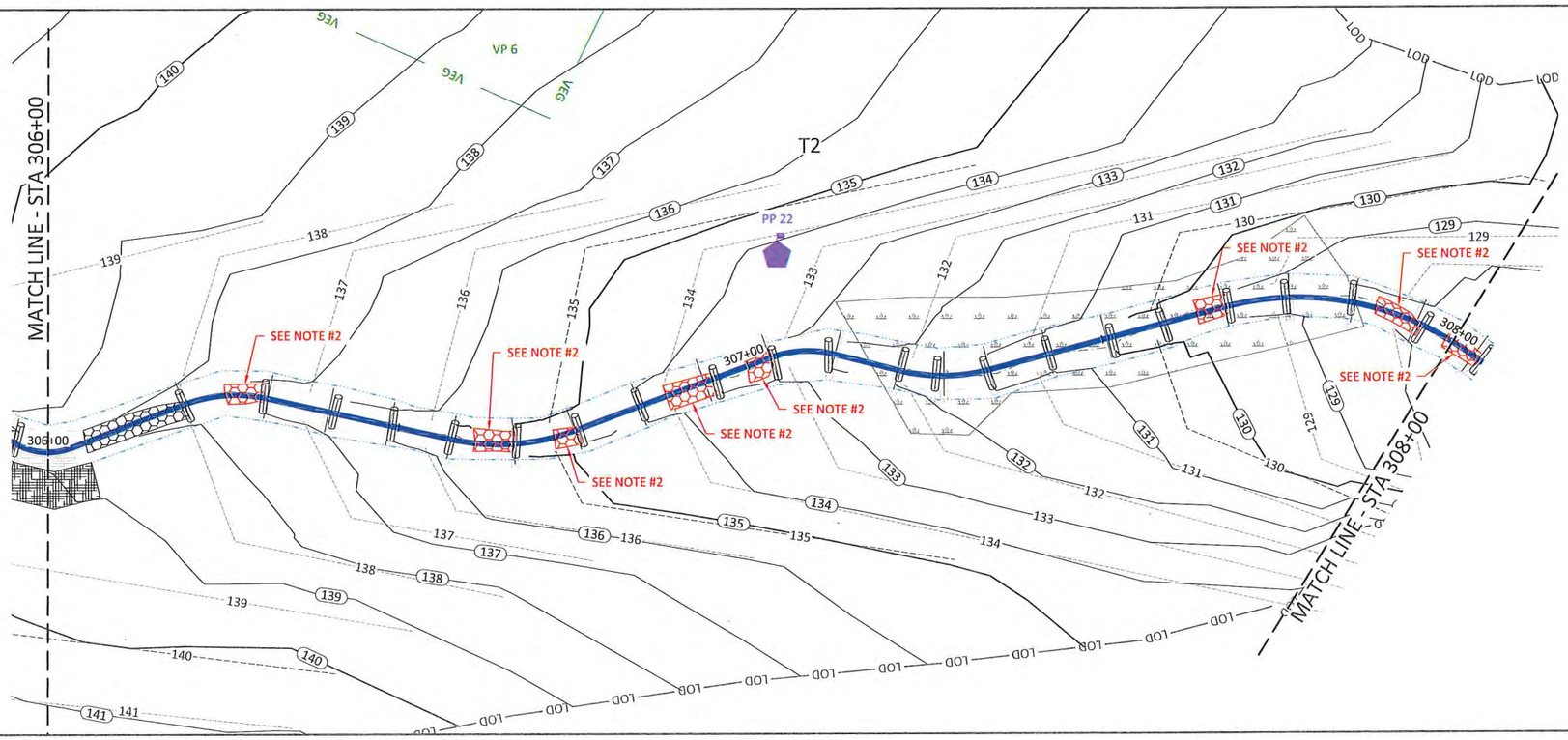

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. STA 306+26 - 306+31,
   STA 306+61 - 306+66,
   STA 306+72 - 306+75,
   STA 306+88 - 306+94,
   STA 307+00 - 307+04,
   STA 307+64 - 307+68,
   STA 307+89 - 307+95 AND
   STA 307+99 - 308+05:
   ROCK MATERIAL WAS ADDED BEHIND LOG DROPS TO PROVIDE ADDITIONAL ROUGHNESS TO CHANNEL DURING HIGH FLOW EVENTS AND STABILIZE LOG DROPS.

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T2
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Revisions:

Sheet 1.28

June 28, 2021

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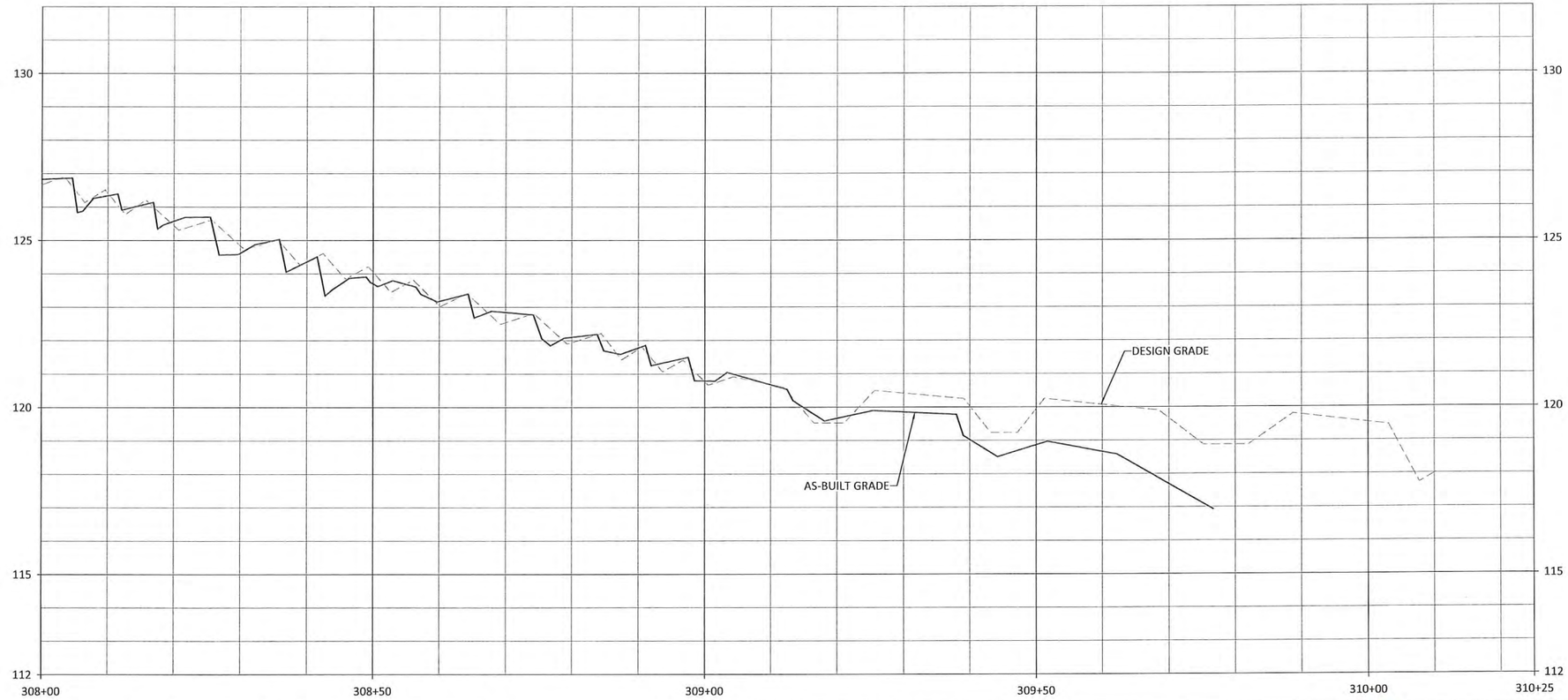

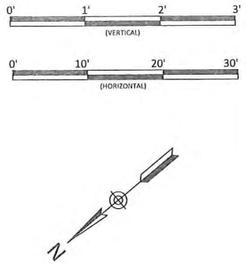

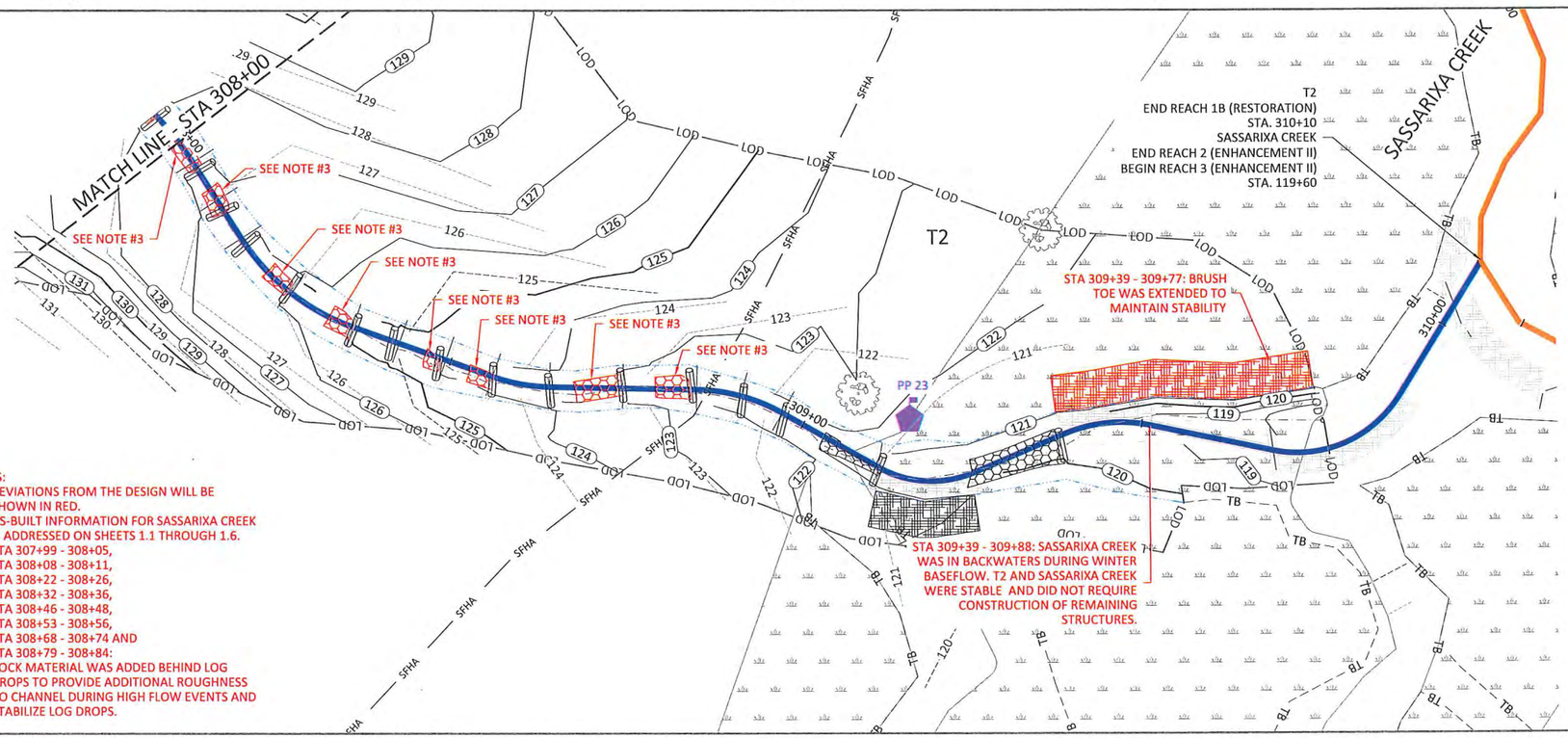

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. AS-BUILT INFORMATION FOR SASSARIXA CREEK IS ADDRESSED ON SHEETS 1.1 THROUGH 1.6.
3. STA 307+99 - 308+05,
   STA 308+08 - 308+11,
   STA 308+22 - 308+26,
   STA 308+32 - 308+36,
   STA 308+46 - 308+48,
   STA 308+53 - 308+56,
   STA 308+68 - 308+74 AND
   STA 308+79 - 308+84:
   ROCK MATERIAL WAS ADDED BEHIND LOG DROPS TO PROVIDE ADDITIONAL ROUGHNESS TO CHANNEL DURING HIGH FLOW EVENTS AND STABILIZE LOG DROPS.

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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T2
Stream Plan and Profile

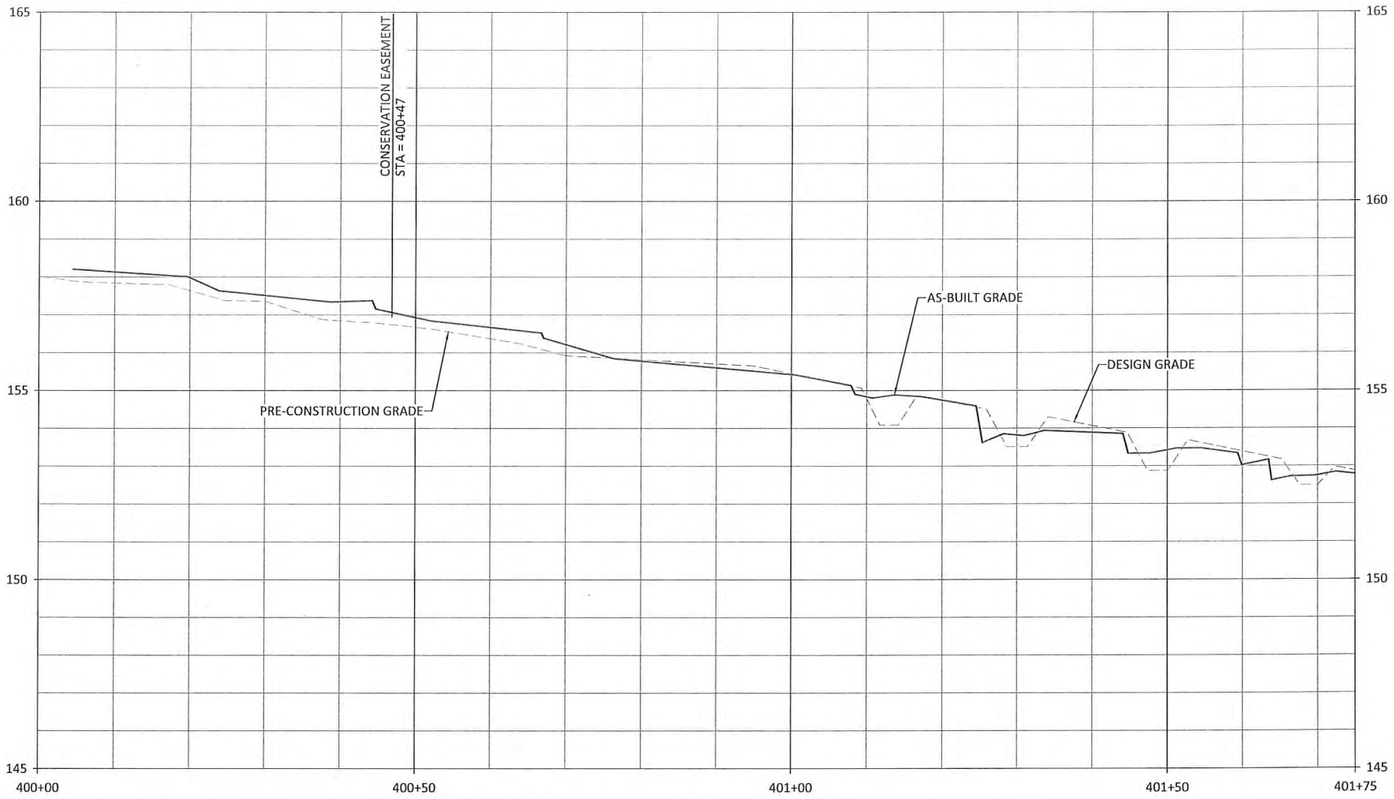
Revisions:

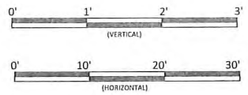
Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

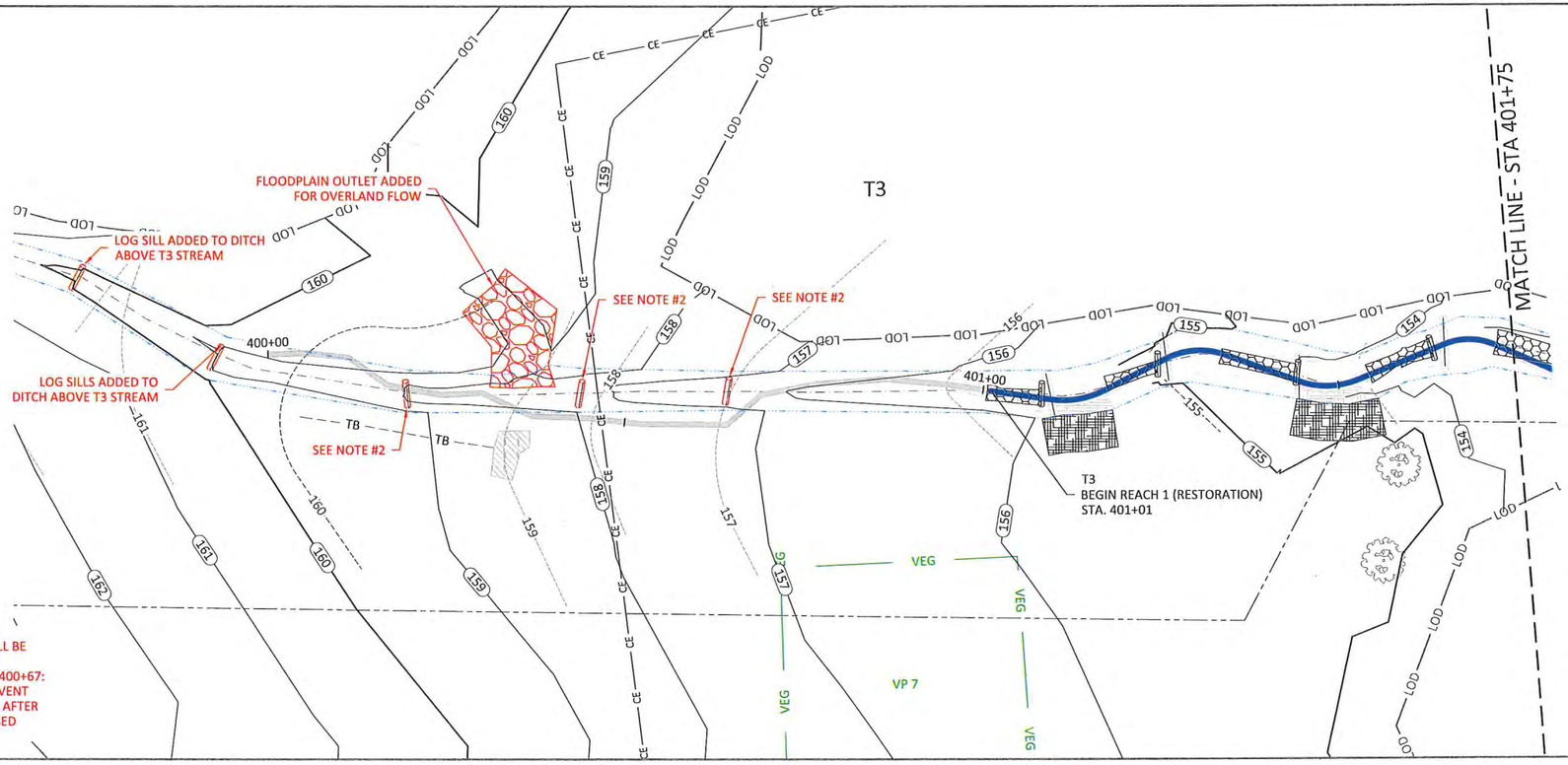
Sheet 1.29

June 28, 2021

X:\Shared\Projects\WO2166 Sassarixa Swamp\Monitoring\Baseline Monitoring\Plans\02166-AB Profiles Sassarixa T1 T2 T3.dwg







NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. STA 400+20, STA 400+44, AND STA 400+67: LOG SILLS WERE INSTALLED TO PREVENT FURTHER EROSION AND HEADCUTS AFTER PRE-CONSTRUCTION STORMS CAUSED EROSION.

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6/29/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T3
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn by:	CAW
Checked By:	ANA

Revisions:

Sheet 1.30

June 29, 2021

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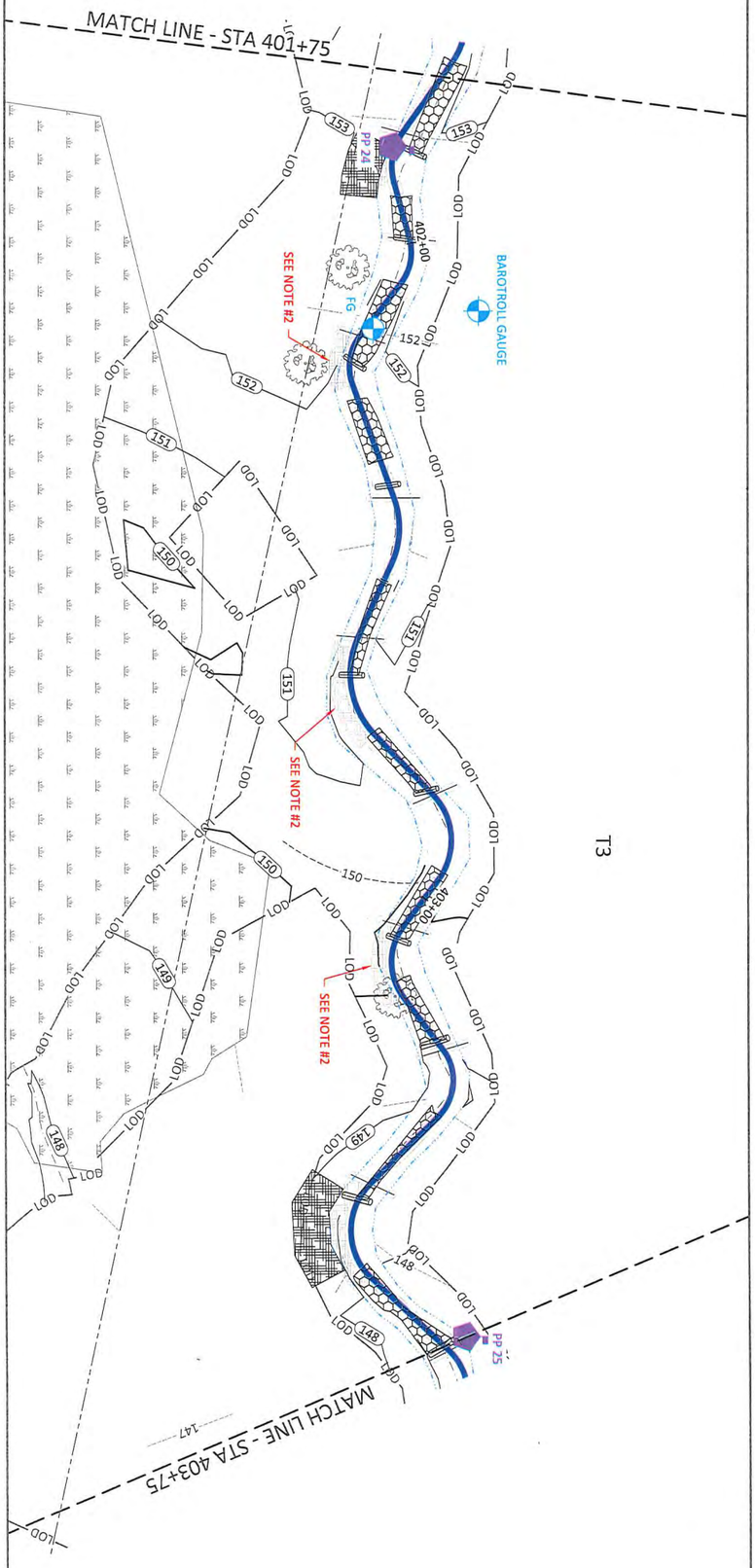
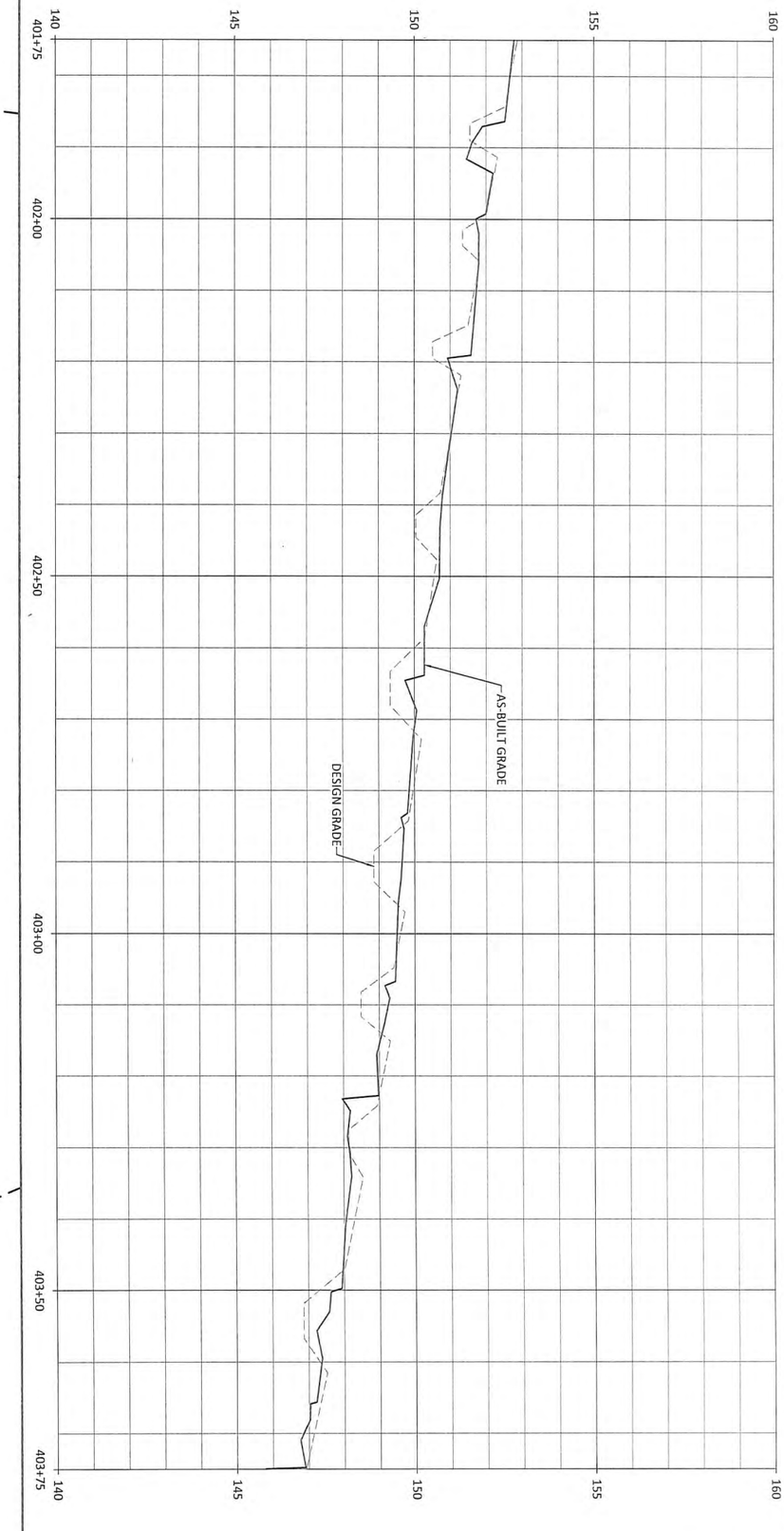
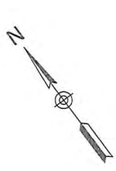
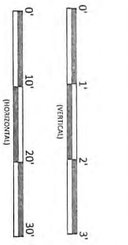
NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. STA 402+15 - 402+22, STA 402+59 - 403+73, AND STA 403+05 - 403+15, BRUSH TOE WAS NOT NEEDED IN THESE AREAS BECAUSE THE ROOTS OF TREES WE SAVED SERVED TO STABILIZE THE BANKS.



T3







Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.31
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T3
Stream Plan and Profile

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6/28/2021

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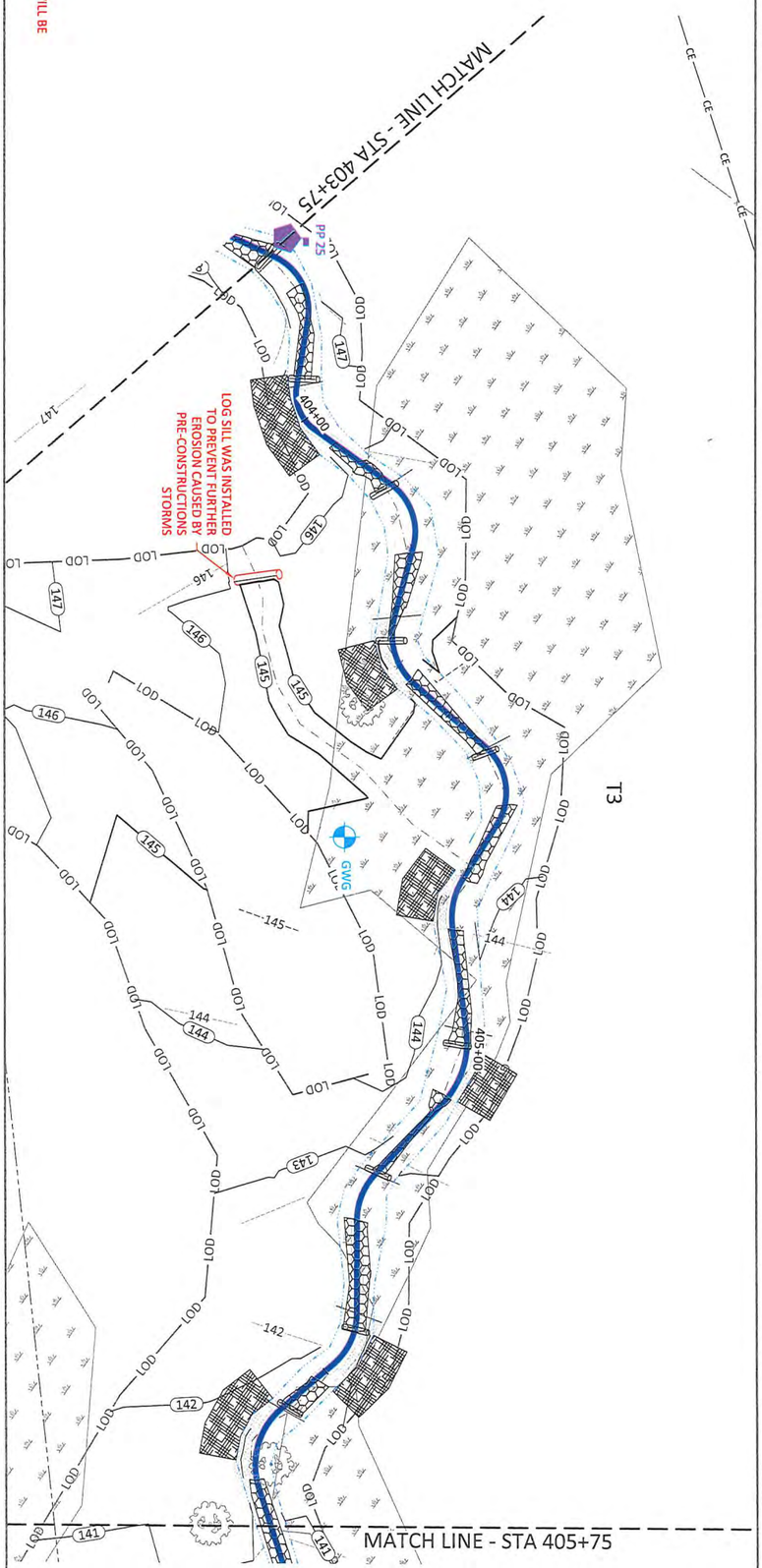
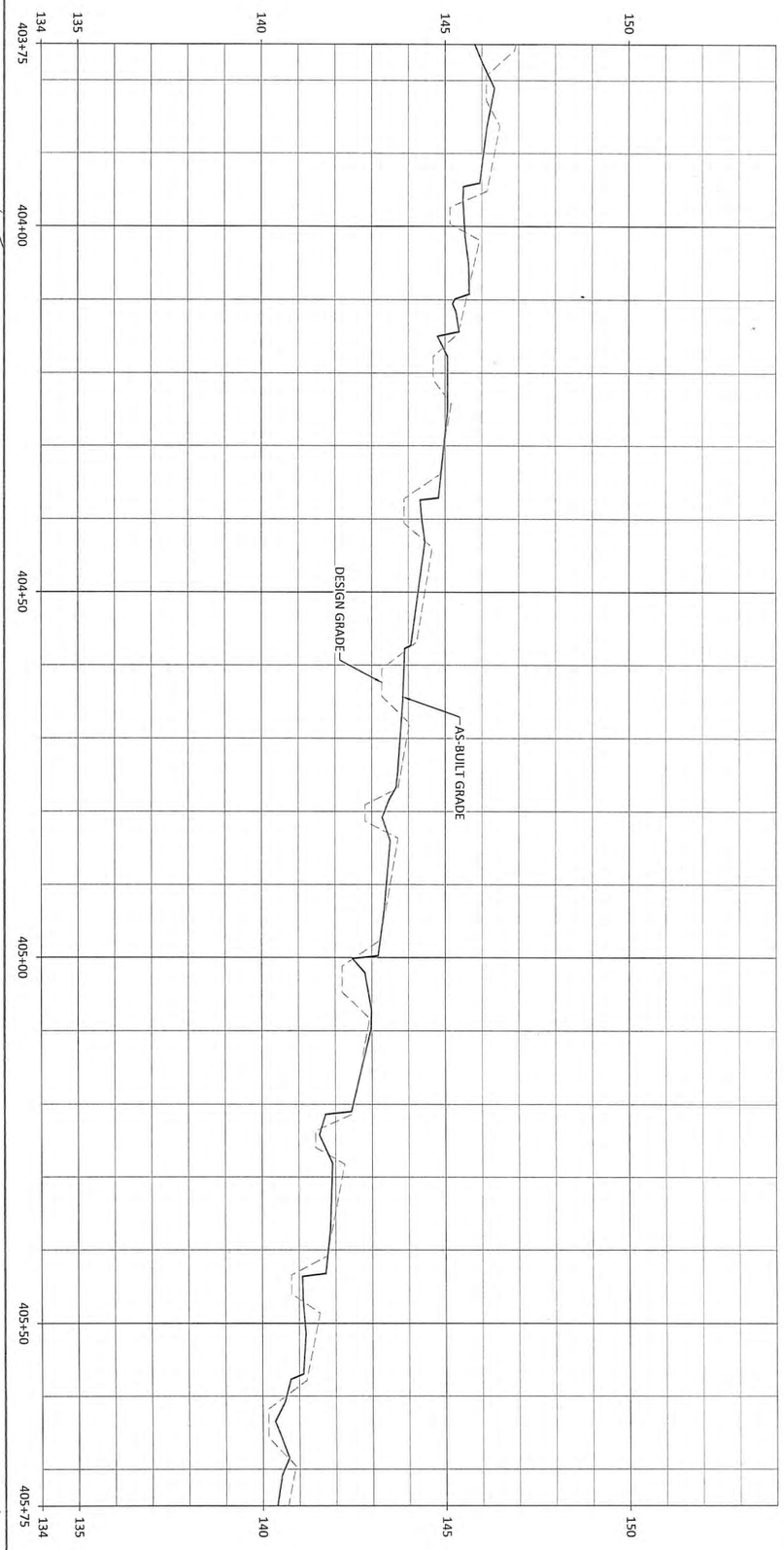
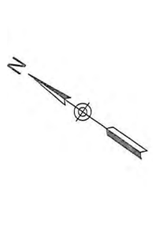
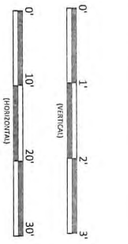
NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.









Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.32
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T3
Stream Plan and Profile

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6/28/2021

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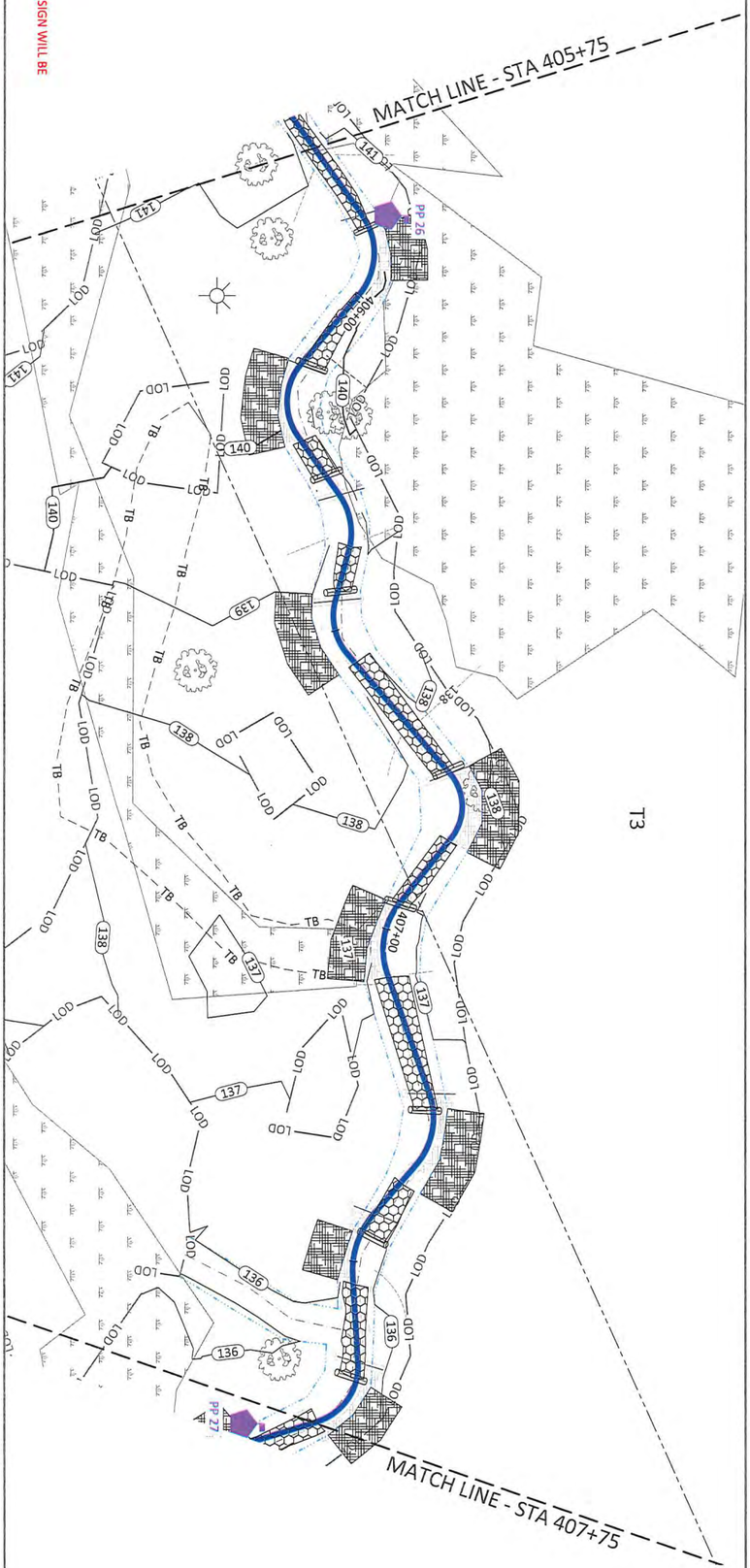
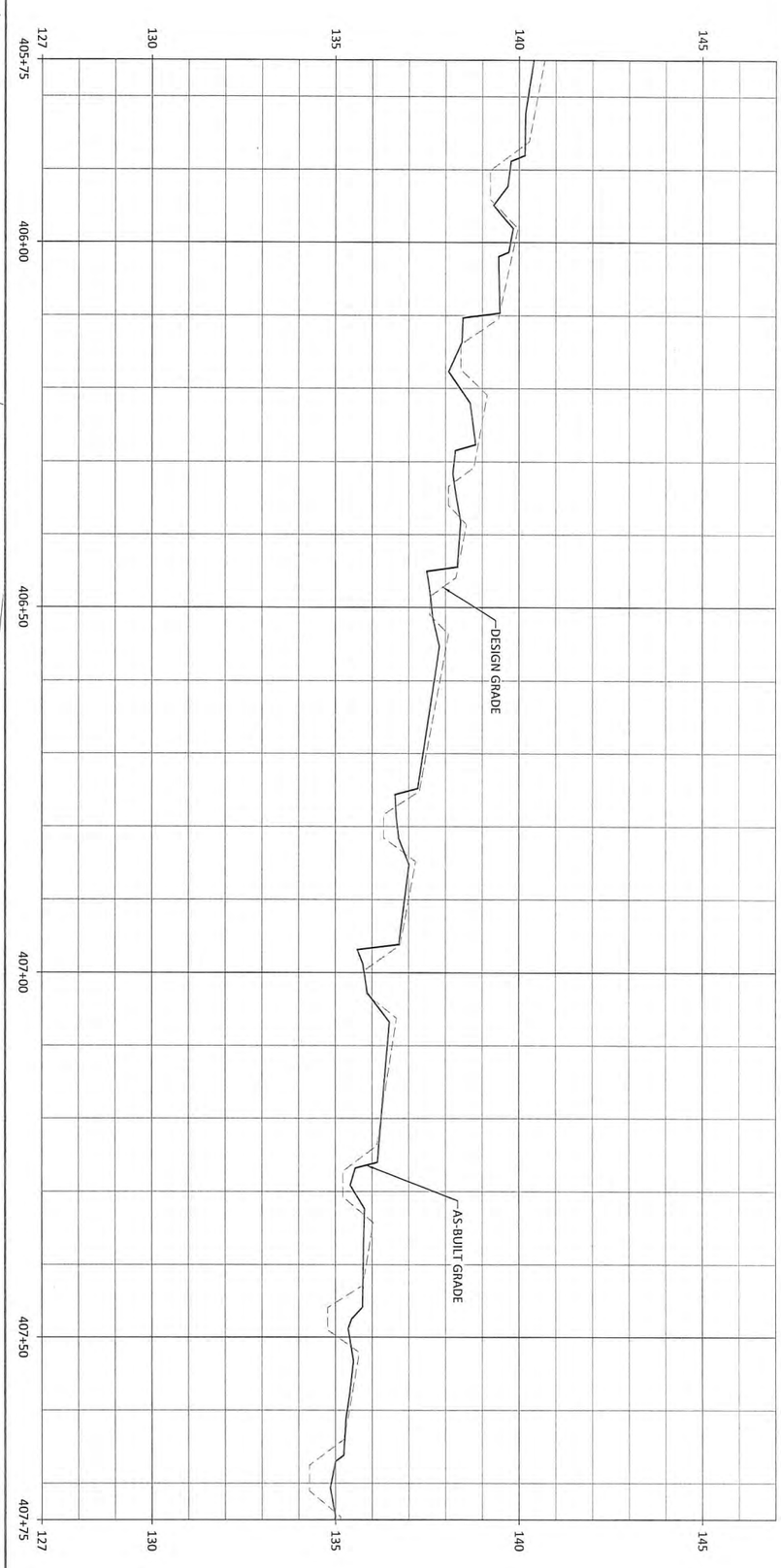
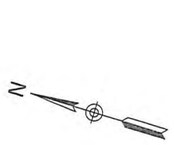
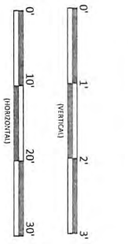
NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.









Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.33
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Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T3
Stream Plan and Profile

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6/28/2021

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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T3
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Revisions:

Sheet 1.34

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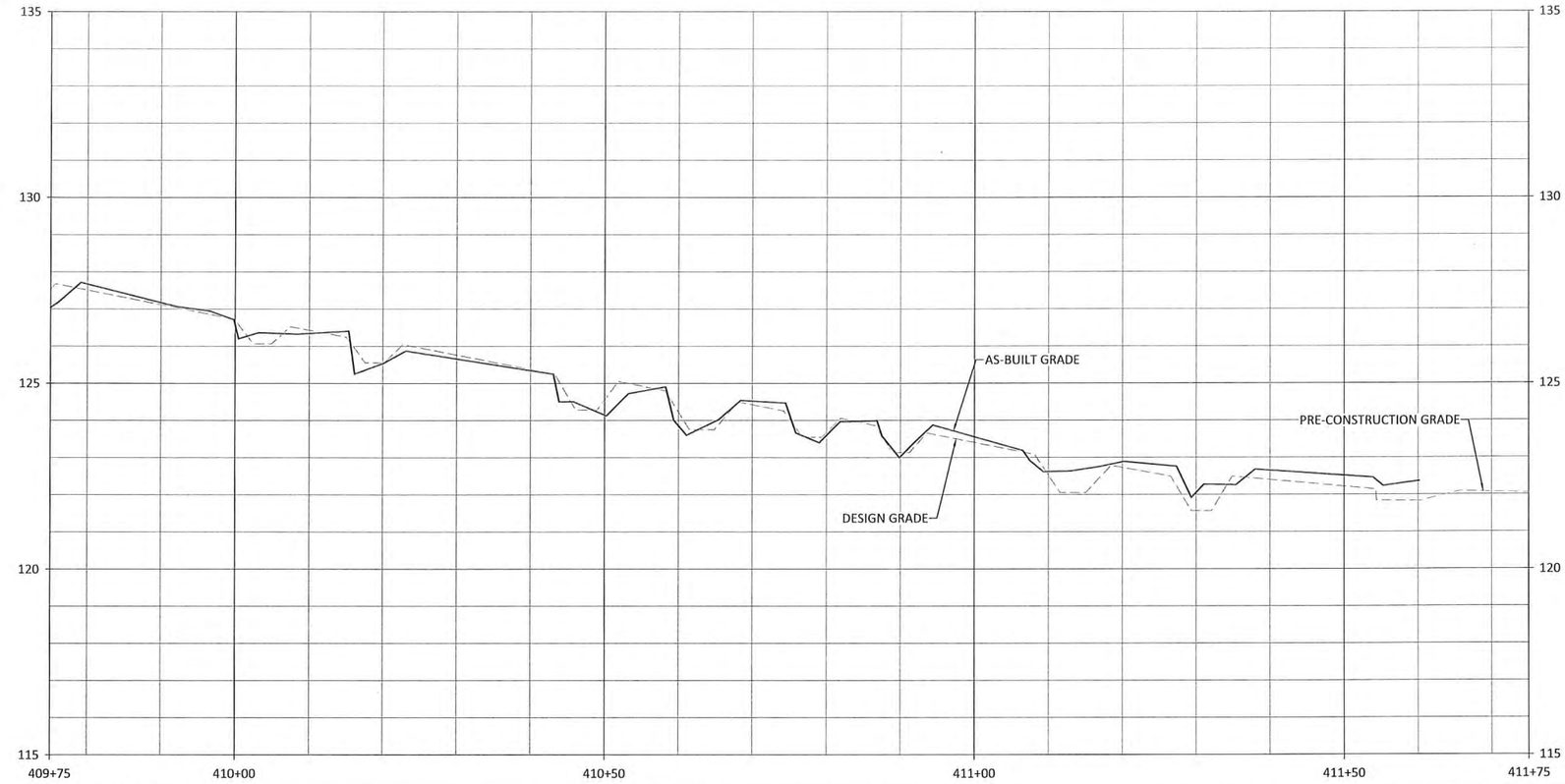
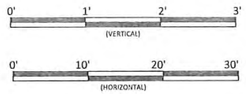
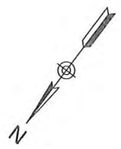
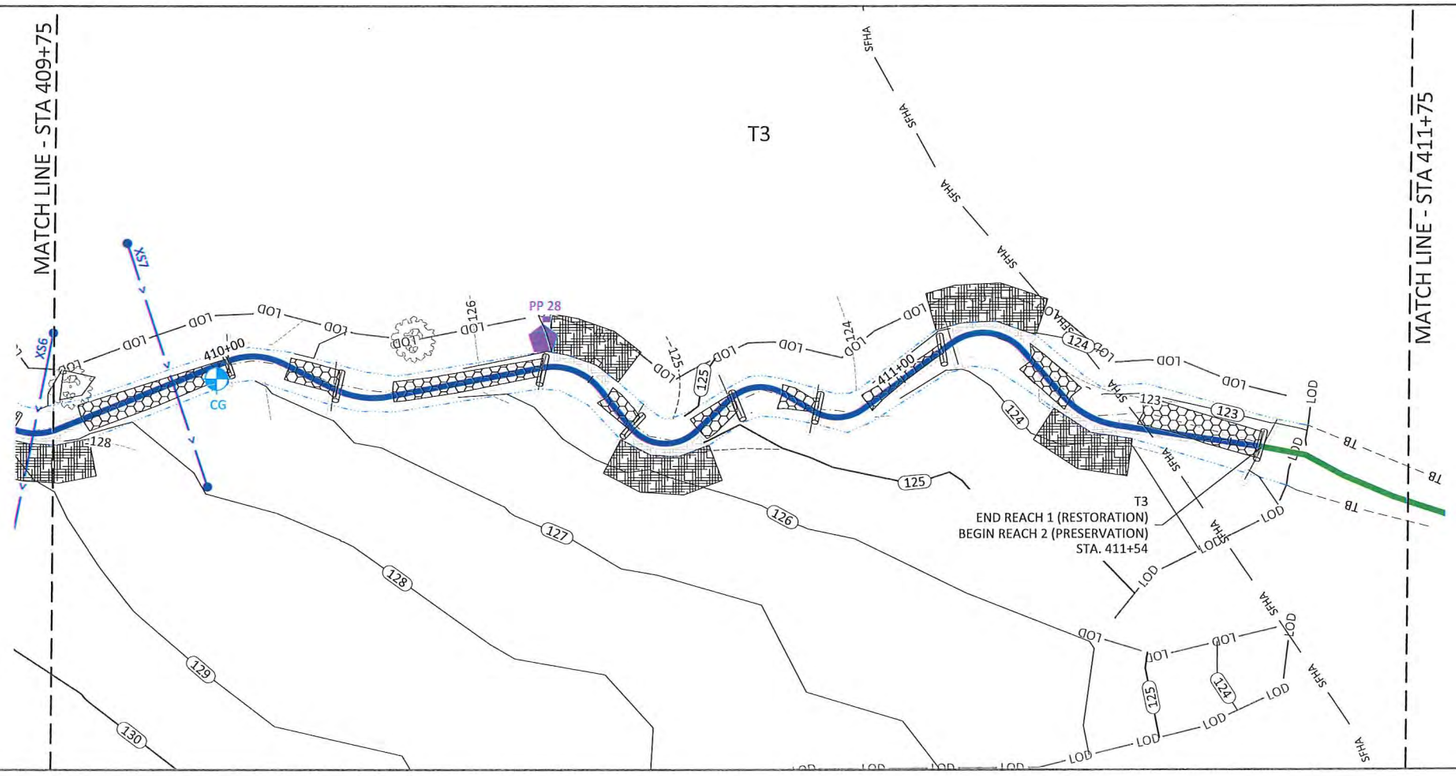
June 28, 2021









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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T3
Stream Plan and Profile

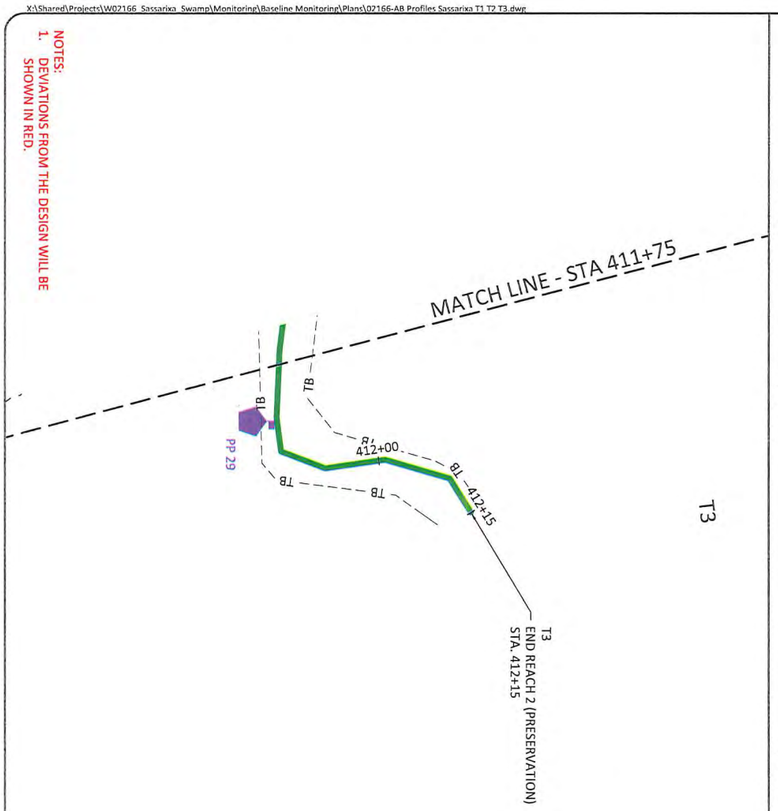
Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

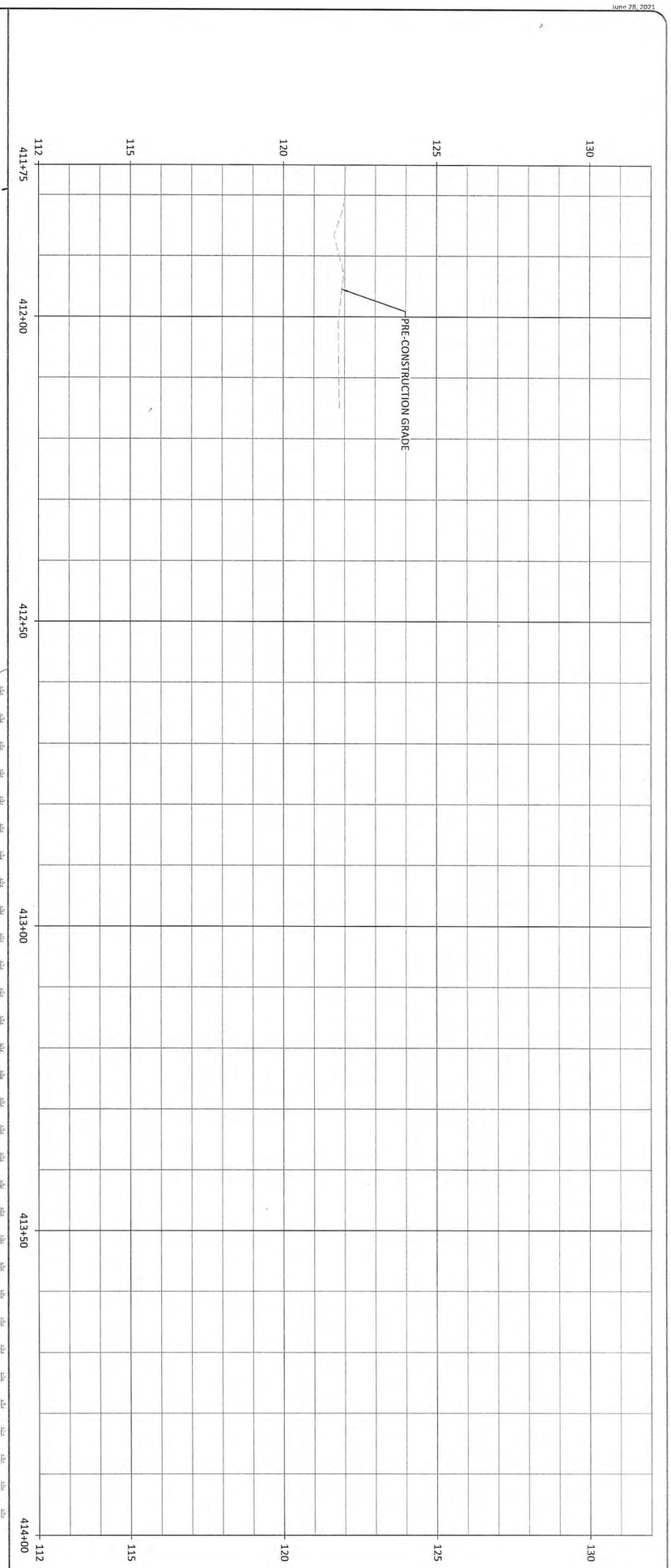
Revisions:

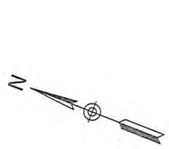
Sheet 1.35

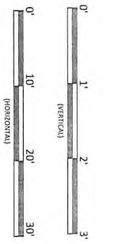
X:\Shared\Projects\WO2166_Sassarixa_Swamp\Monitoring\Baseline Monitoring\Plans\02166-AB Profiles Sassarixa T1 T2 T3.dwg

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.









Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Revisions:

1.36
Sheet

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T3
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER

4/28/2021

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T4
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

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Sheet 1.37

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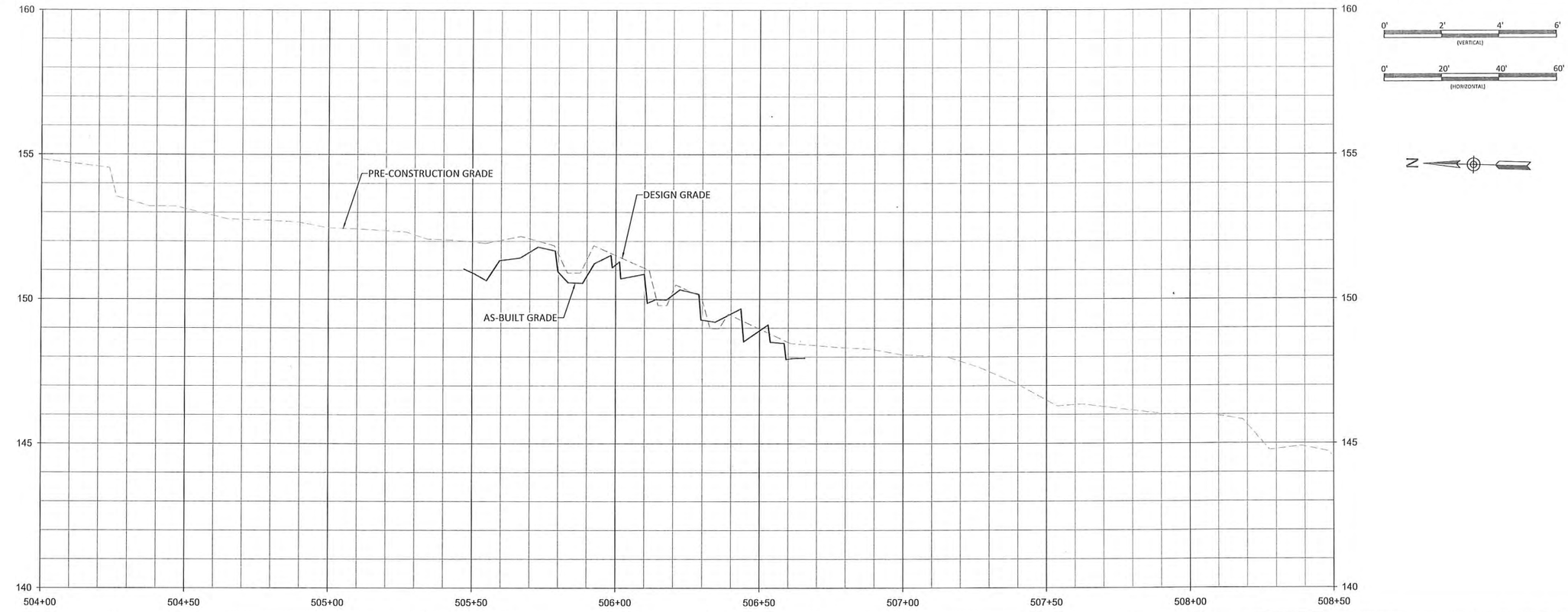
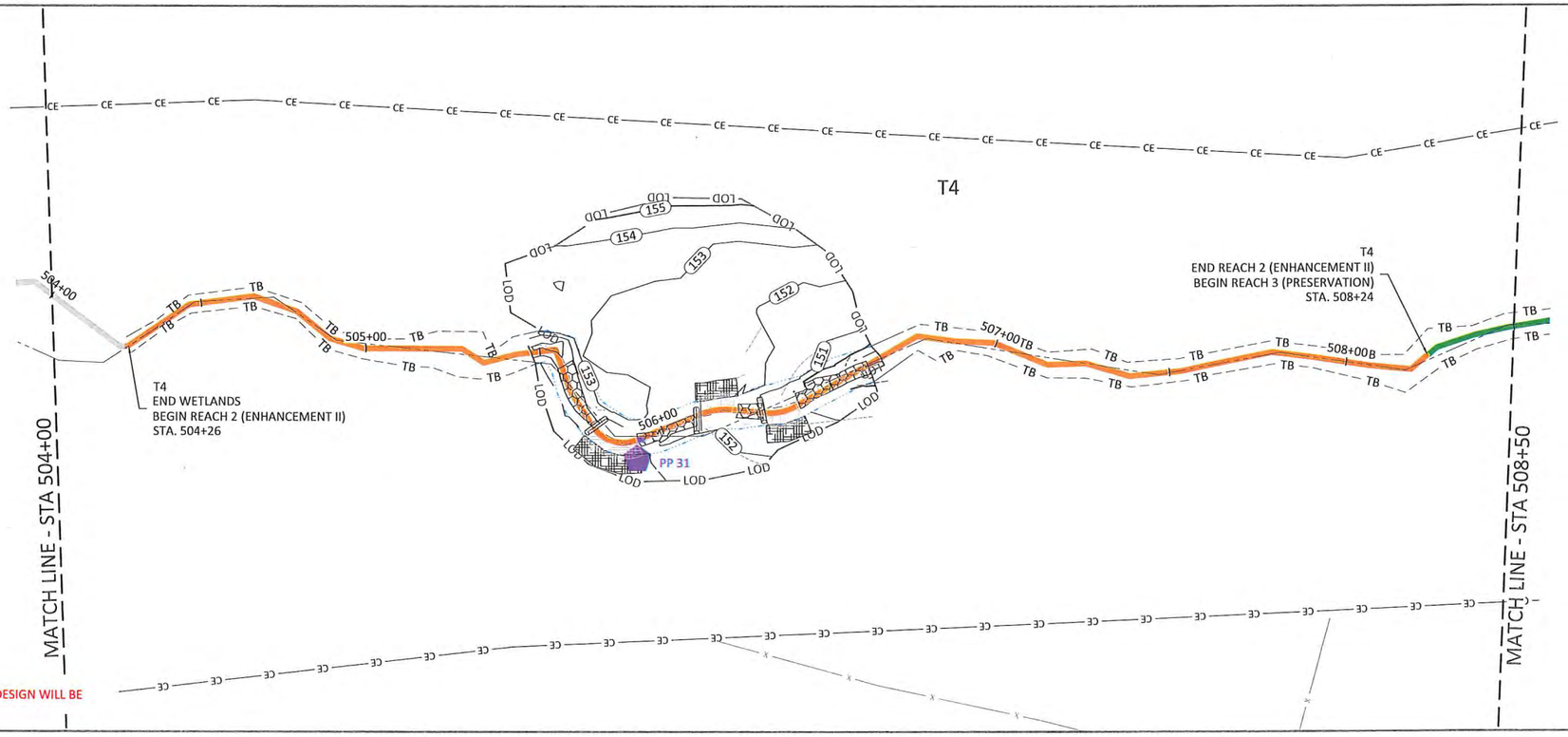


0' 2' 4' 6' (VERTICAL)

0' 20' 40' 60' (HORIZONTAL)

N



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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T4
Stream Plan and Profile

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Revisions:

1.38
Sheet

June 28, 2021

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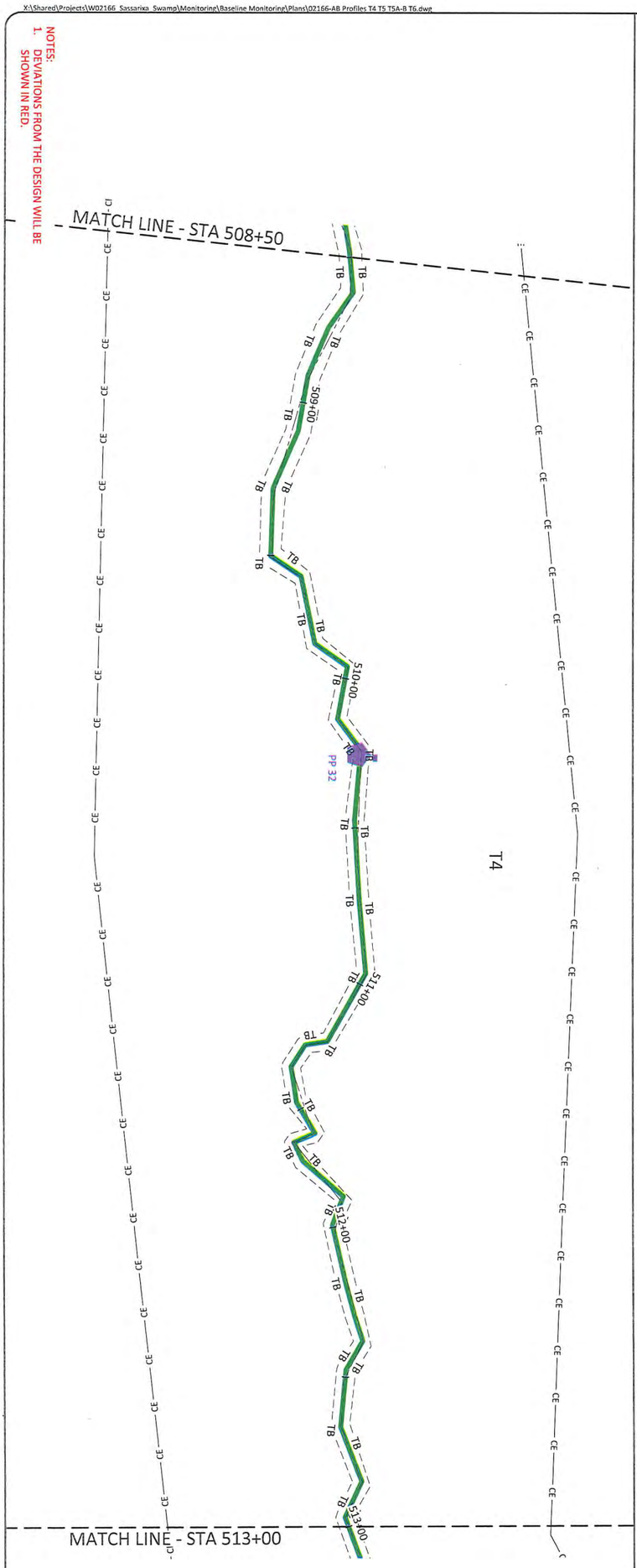

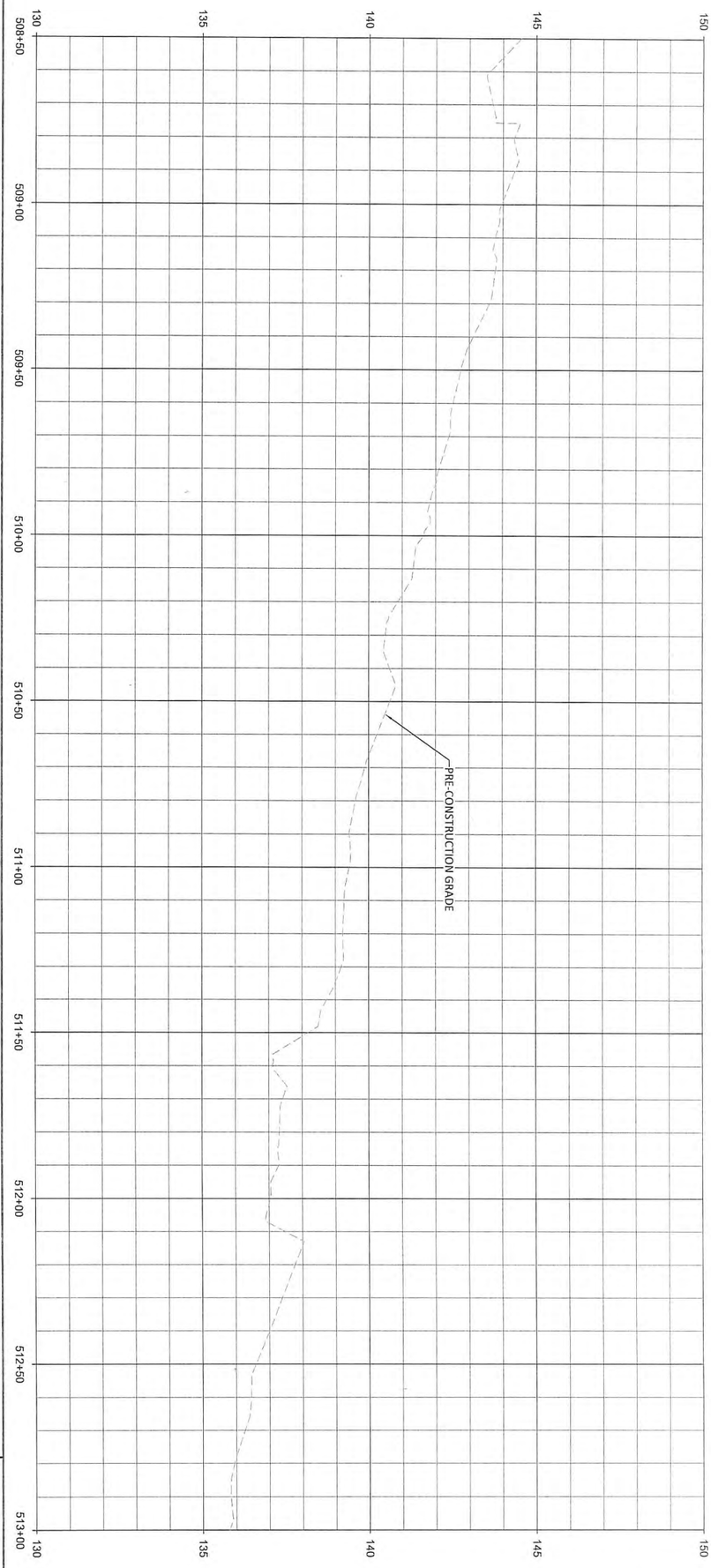

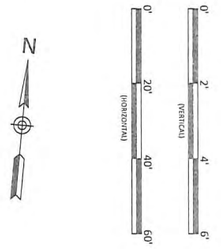

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Revisions:

1.39
Sheet

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T4
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER
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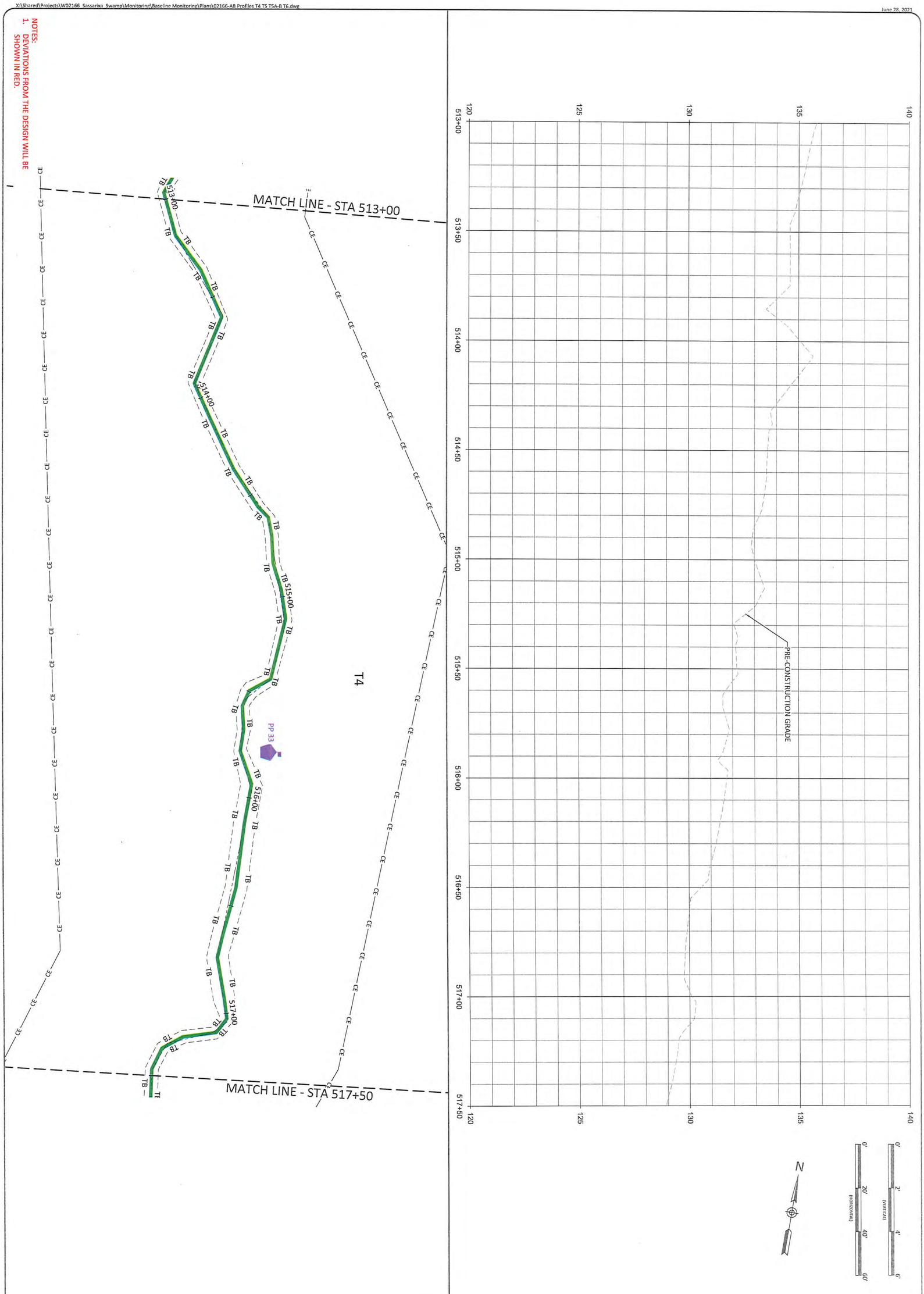

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
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1.40
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T4
Stream Plan and Profile

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER

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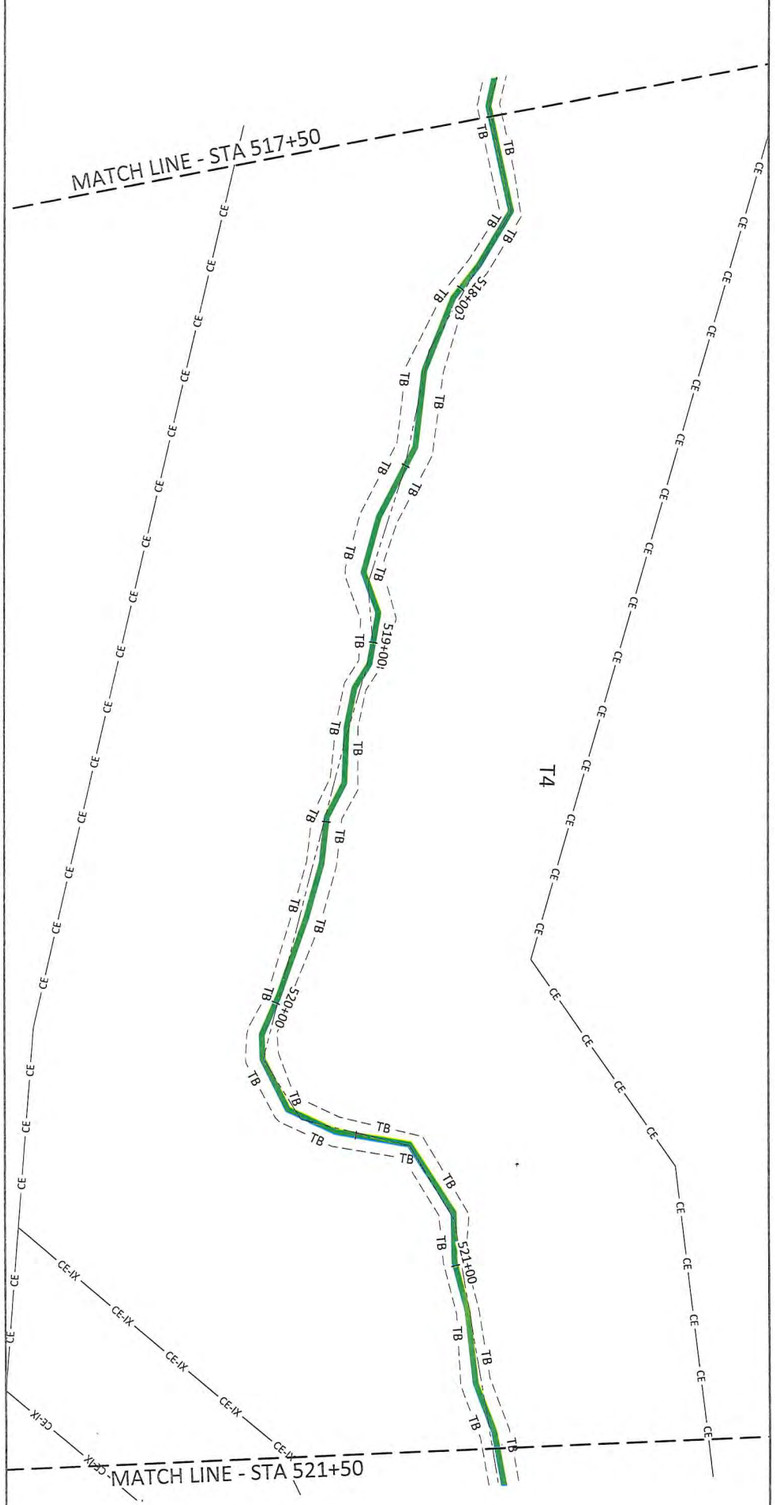

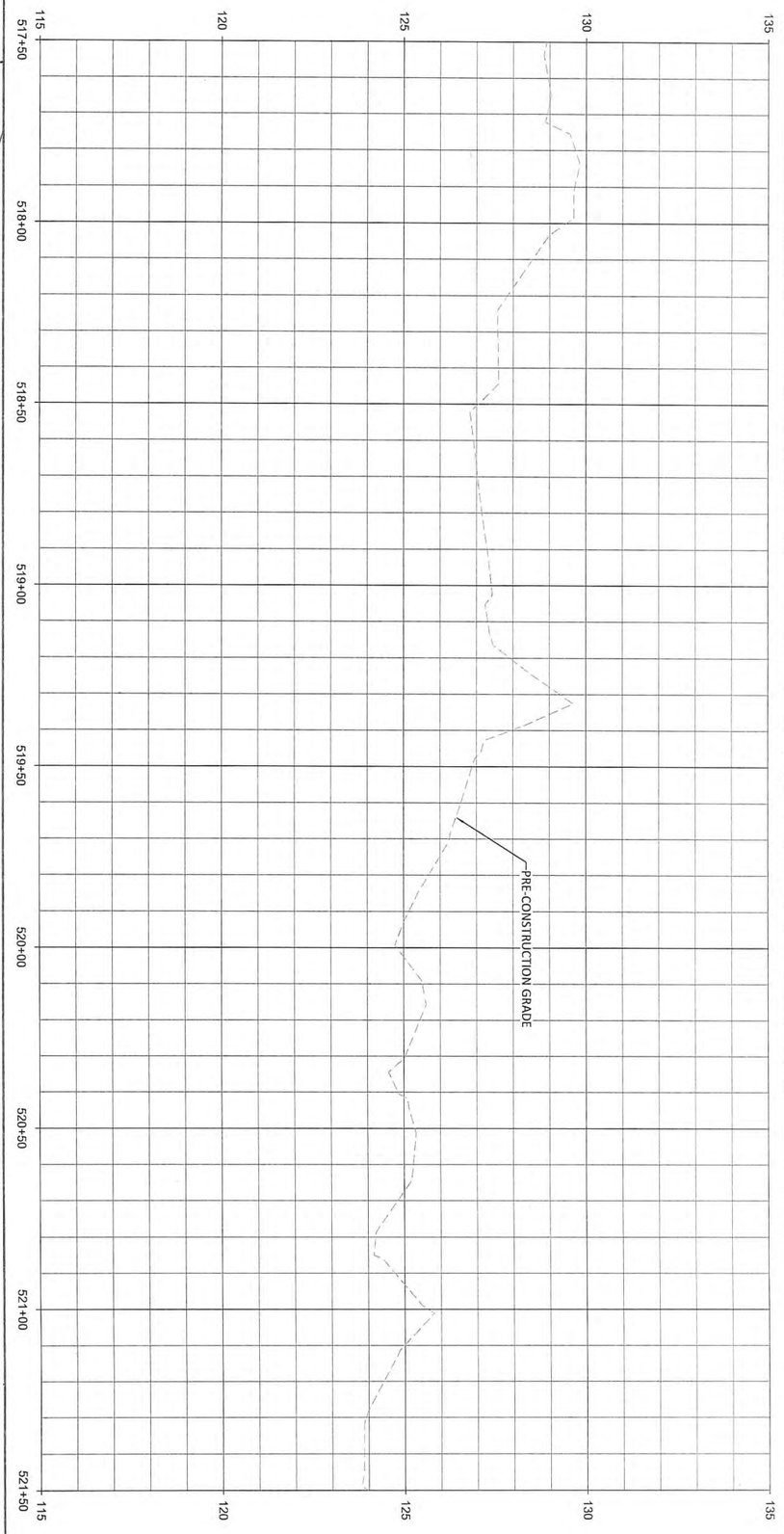

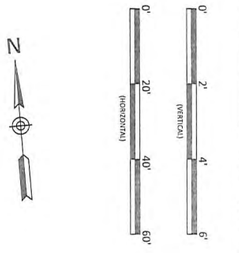

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
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1.41
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Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T4
Stream Plan and Profile

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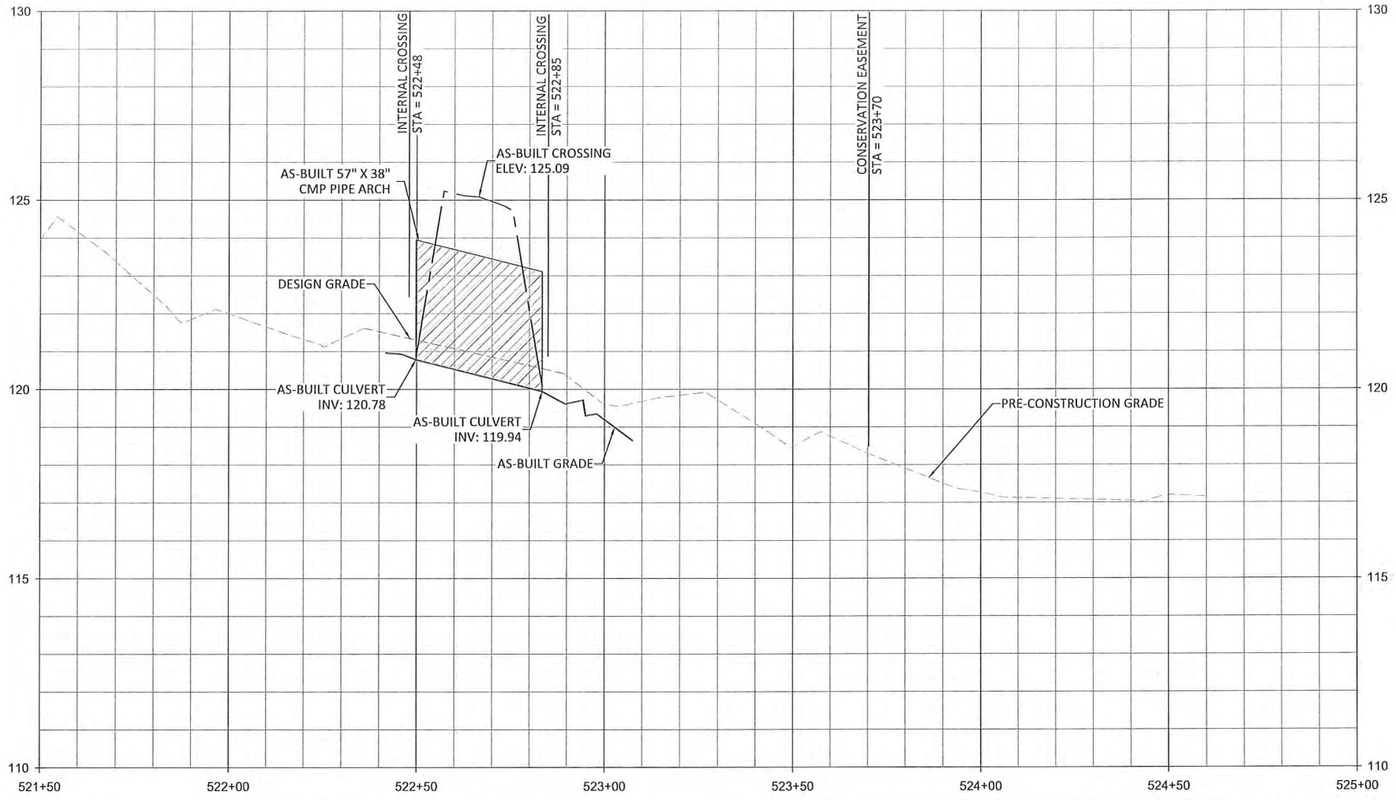

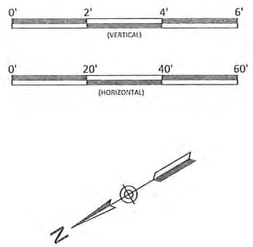

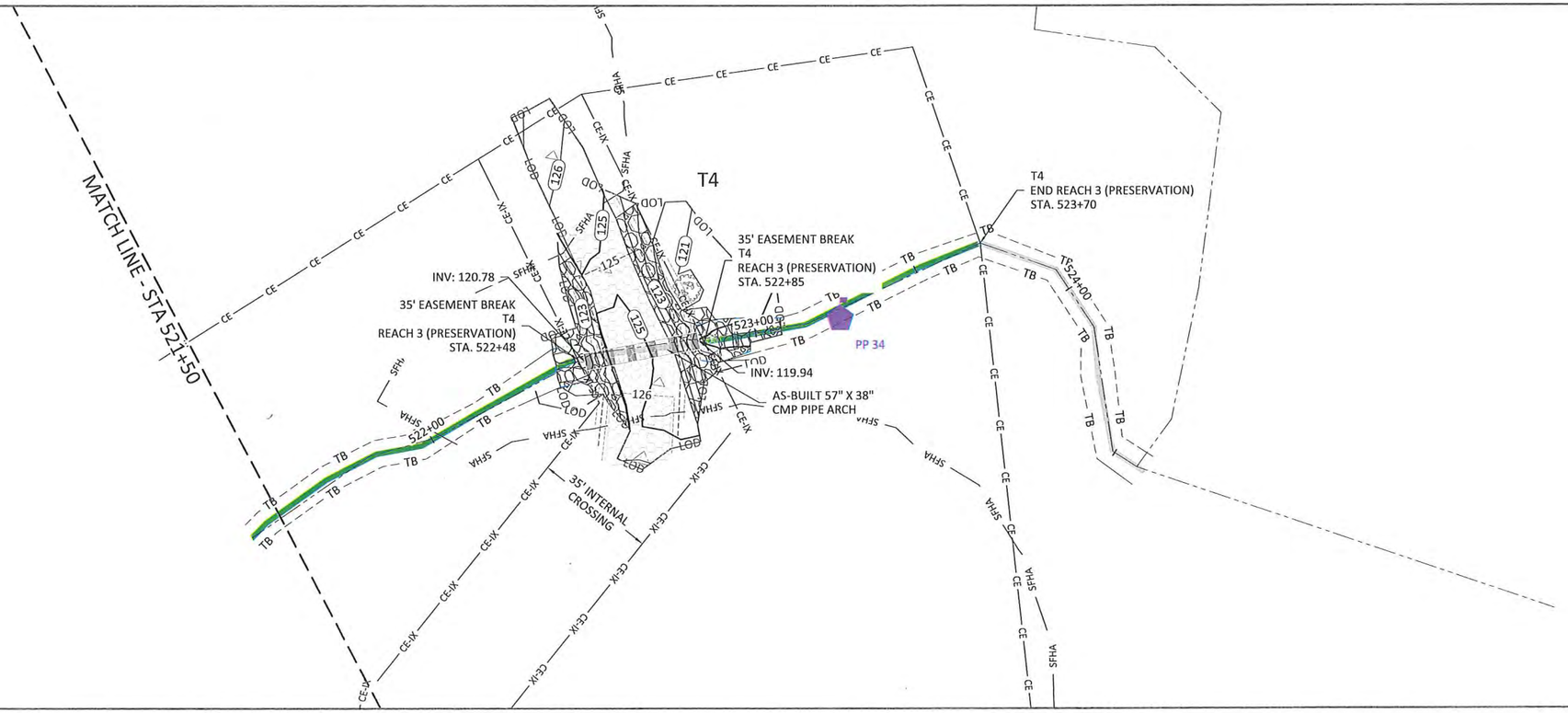

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T4
Stream Plan and Profile

Revisions:

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Sheet 1.42

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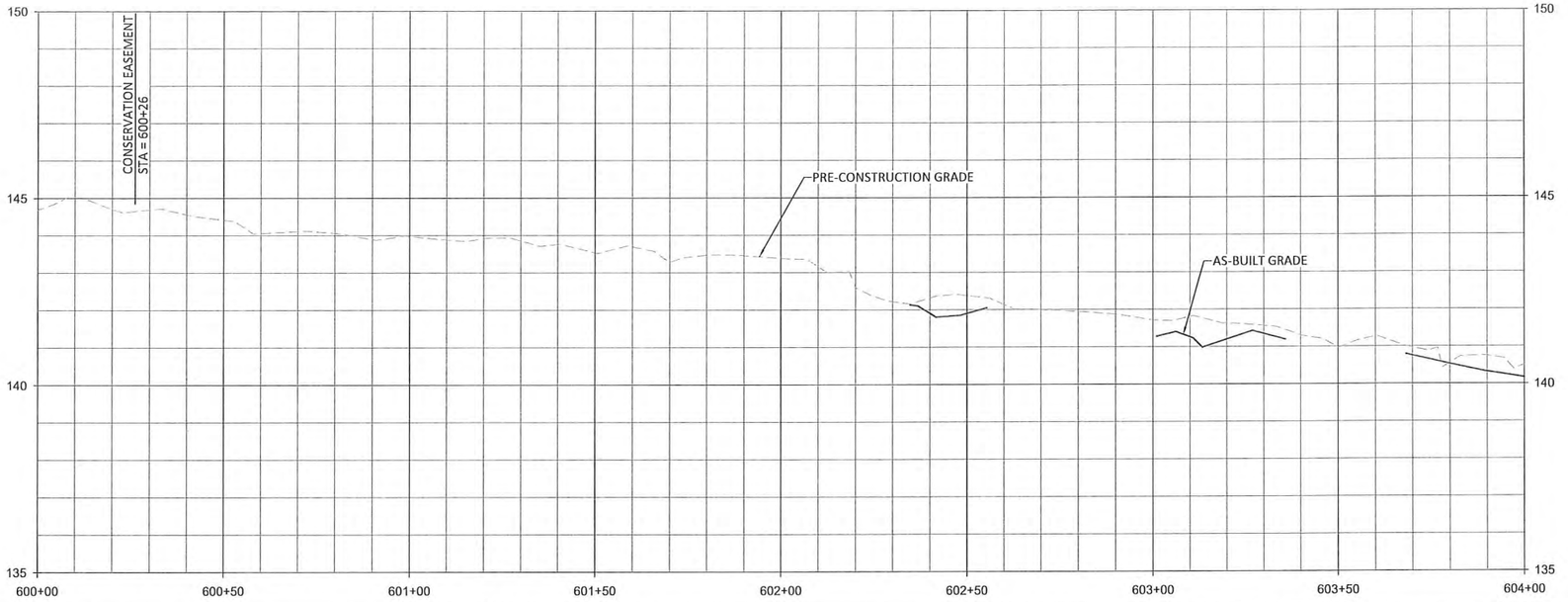
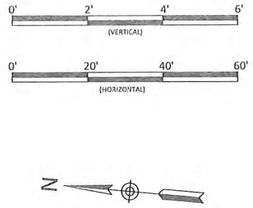
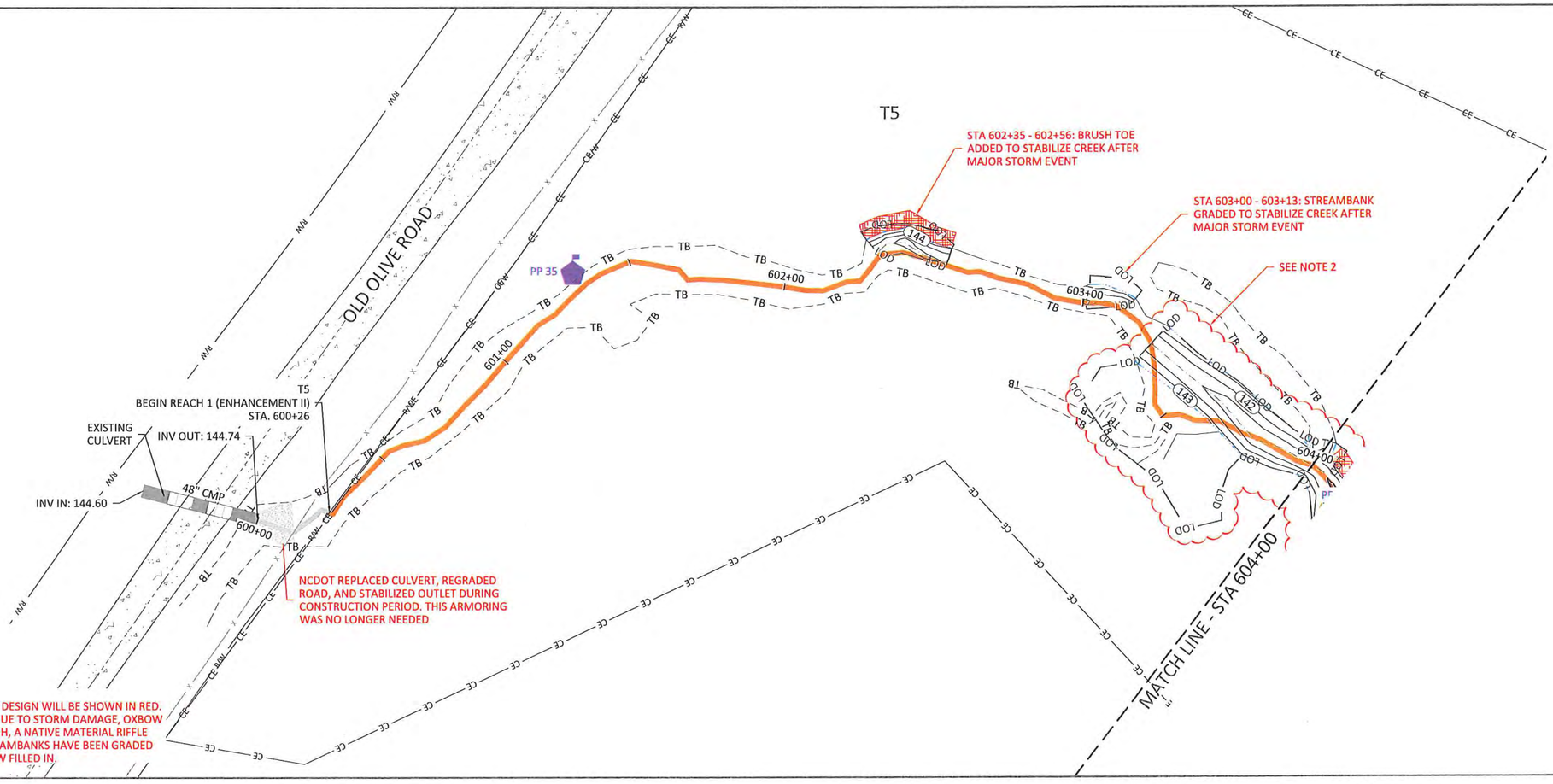
June 28, 2021







NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.
2. STA 603+27 - 605+81: DUE TO STORM DAMAGE, OXBOW HAS BEEN CUT THROUGH, A NATIVE MATERIAL RIFFLE HAS BEEN ADDED, STREAMBANKS HAVE BEEN GRADED AS NEEDED AND OXBOW FILLED IN.

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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Revisions:

Sheet 1.43

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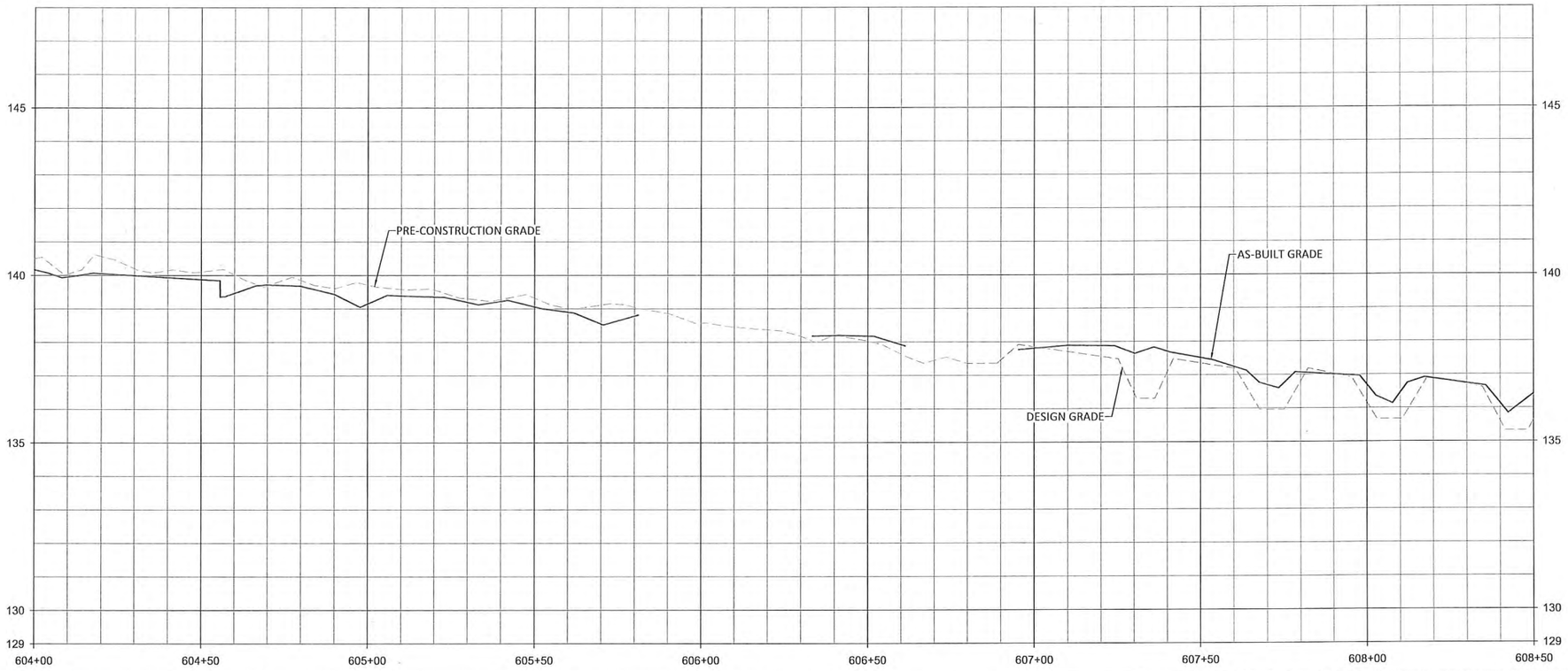
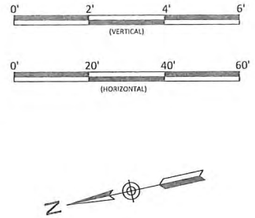
June 28, 2021





NOTES:
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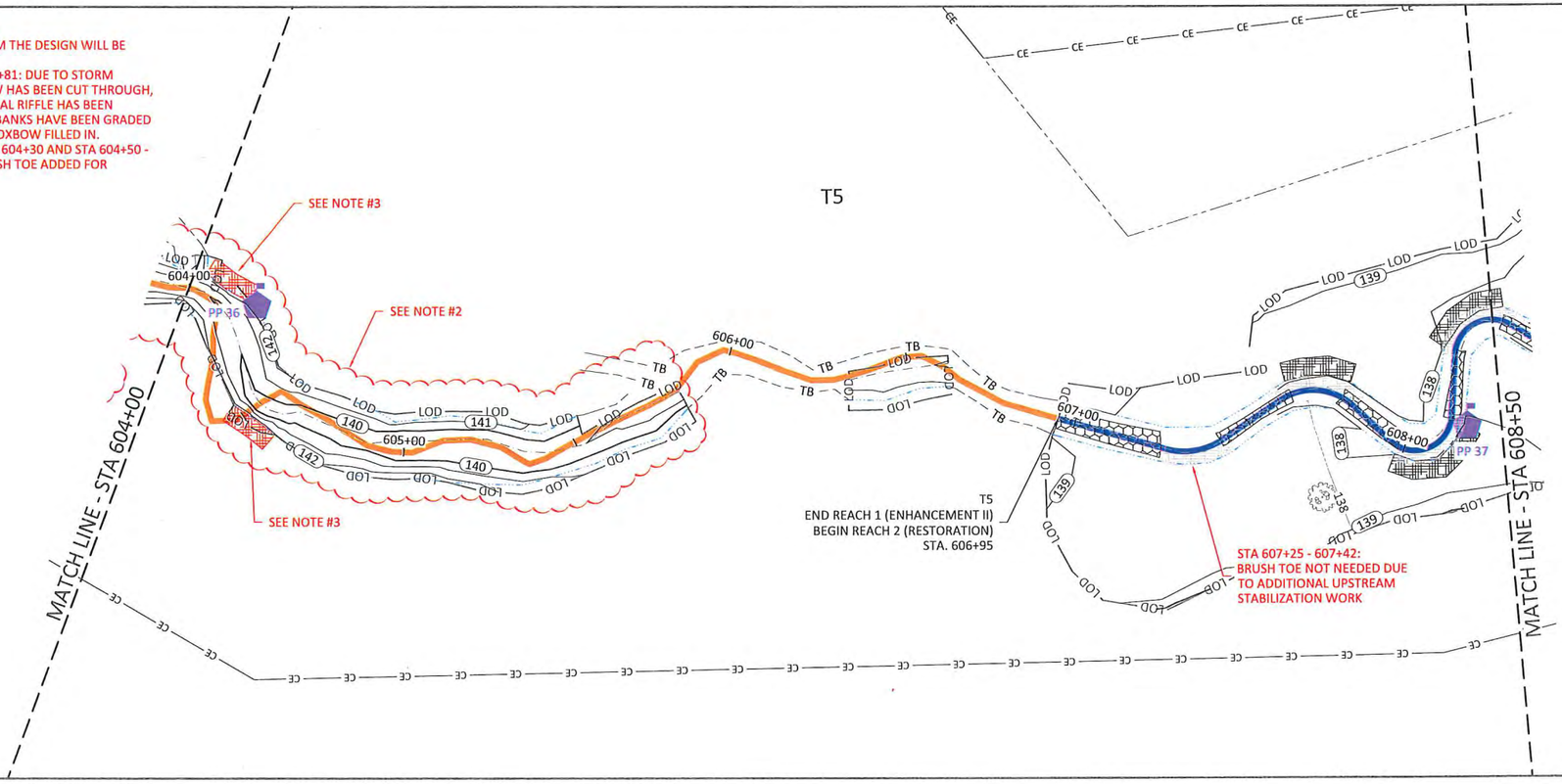
2. STA 603+27 - 605+81: DUE TO STORM DAMAGE, OXBOW HAS BEEN CUT THROUGH, A NATIVE MATERIAL RIFFLE HAS BEEN ADDED, STREAMBANKS HAVE BEEN GRADED AS NEEDED AND OXBOW FILLED IN.
3. STA 604+02 - STA 604+30 AND STA 604+50 - STA 604+54: BRUSH TOE ADDED FOR STABILIZATION.



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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Revisions:

Sheet 1.44

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NOTES:
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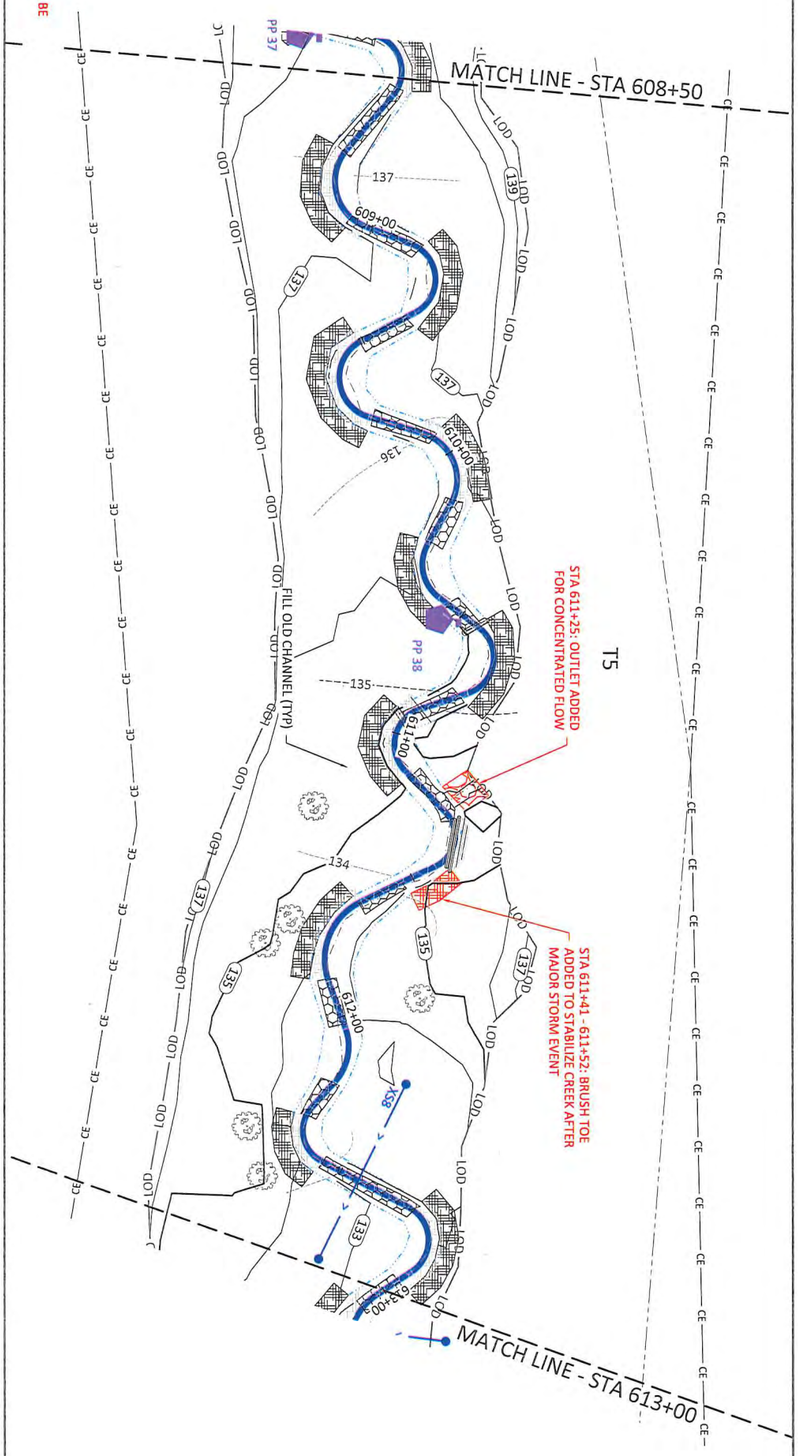

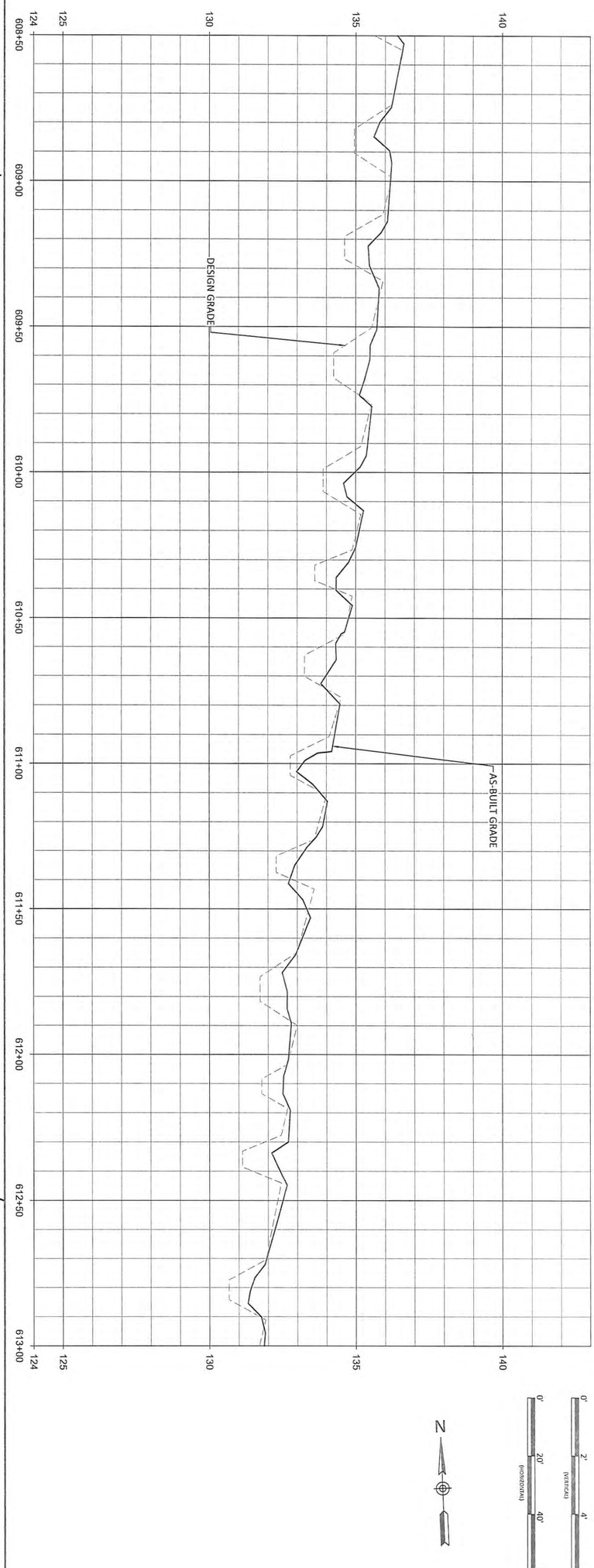

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.45
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5
Stream Plan and Profile

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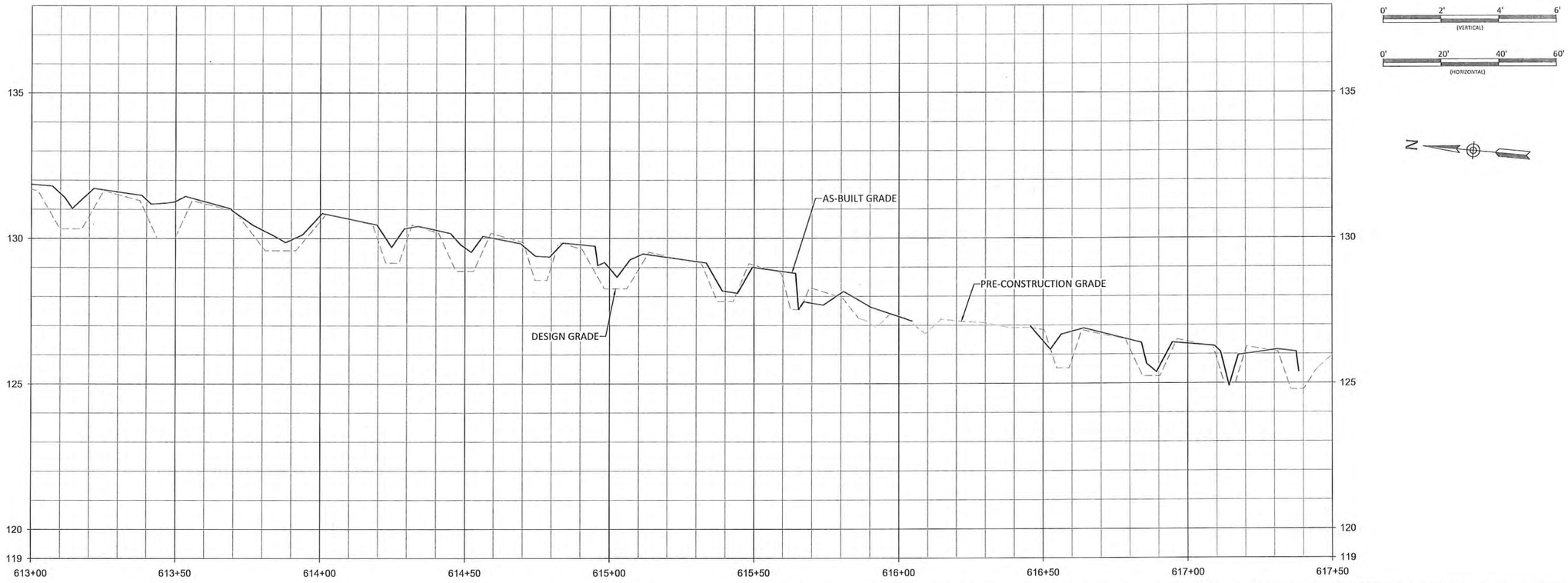
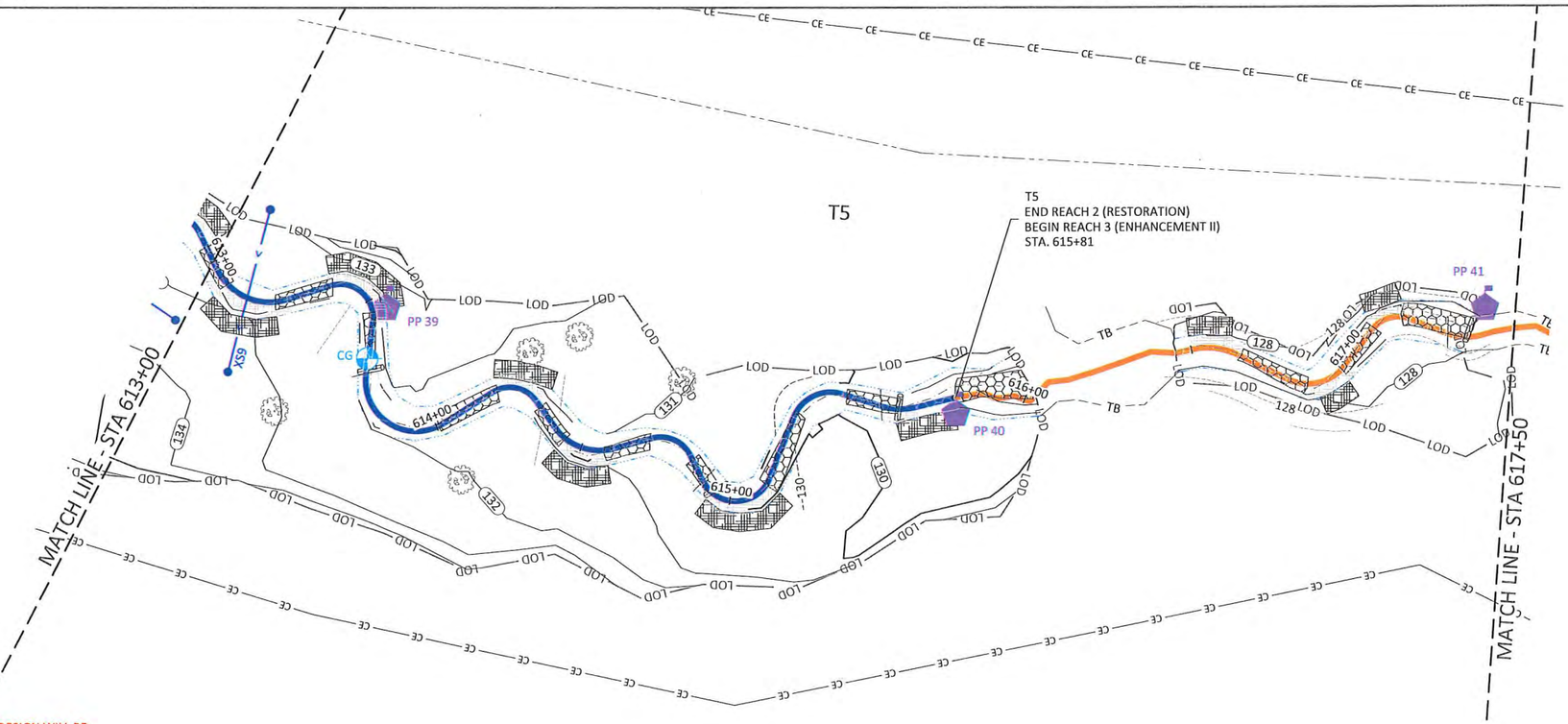
June 28, 2021





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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

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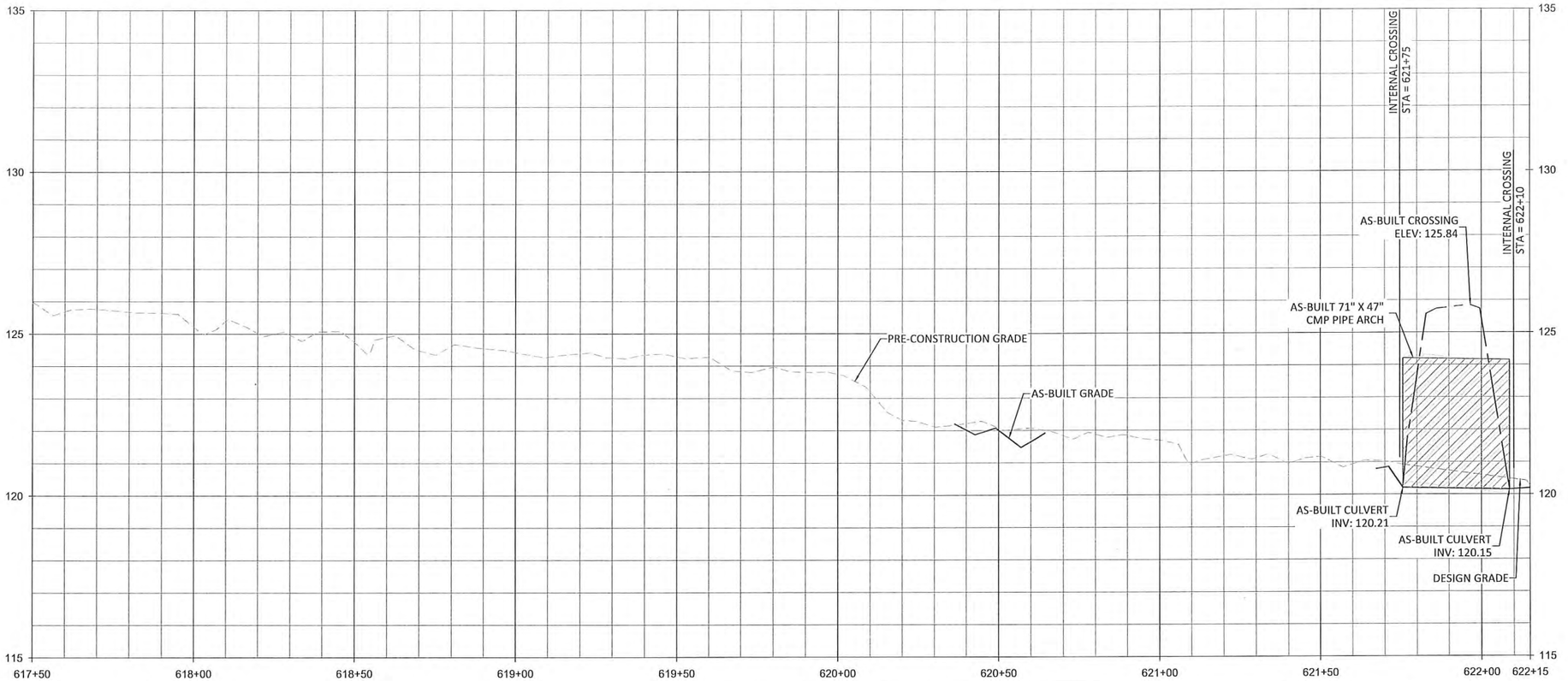
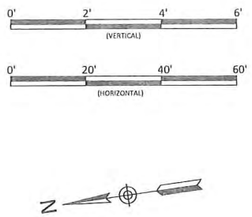
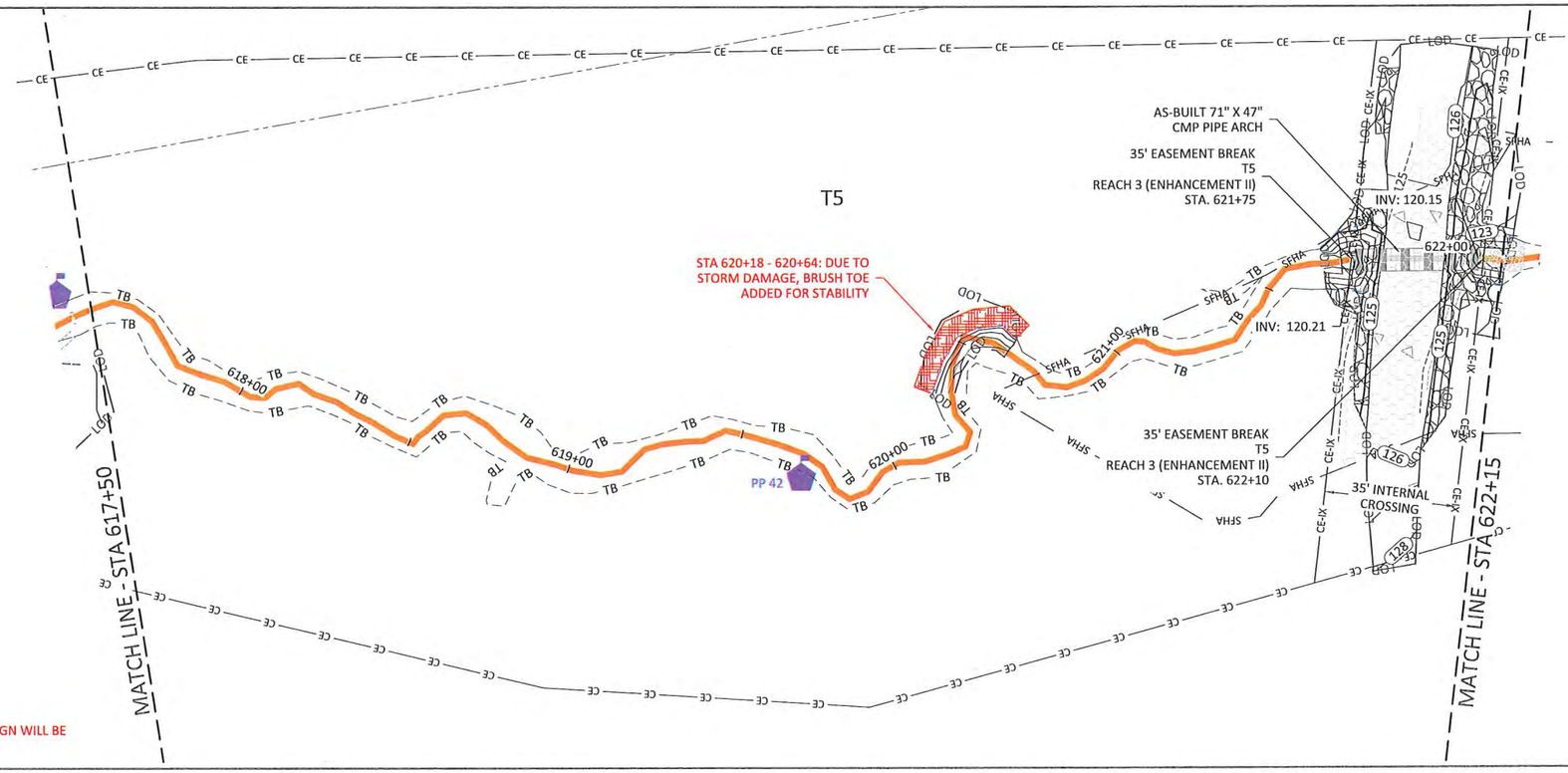
June 28, 2021







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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

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Sheet 1.47

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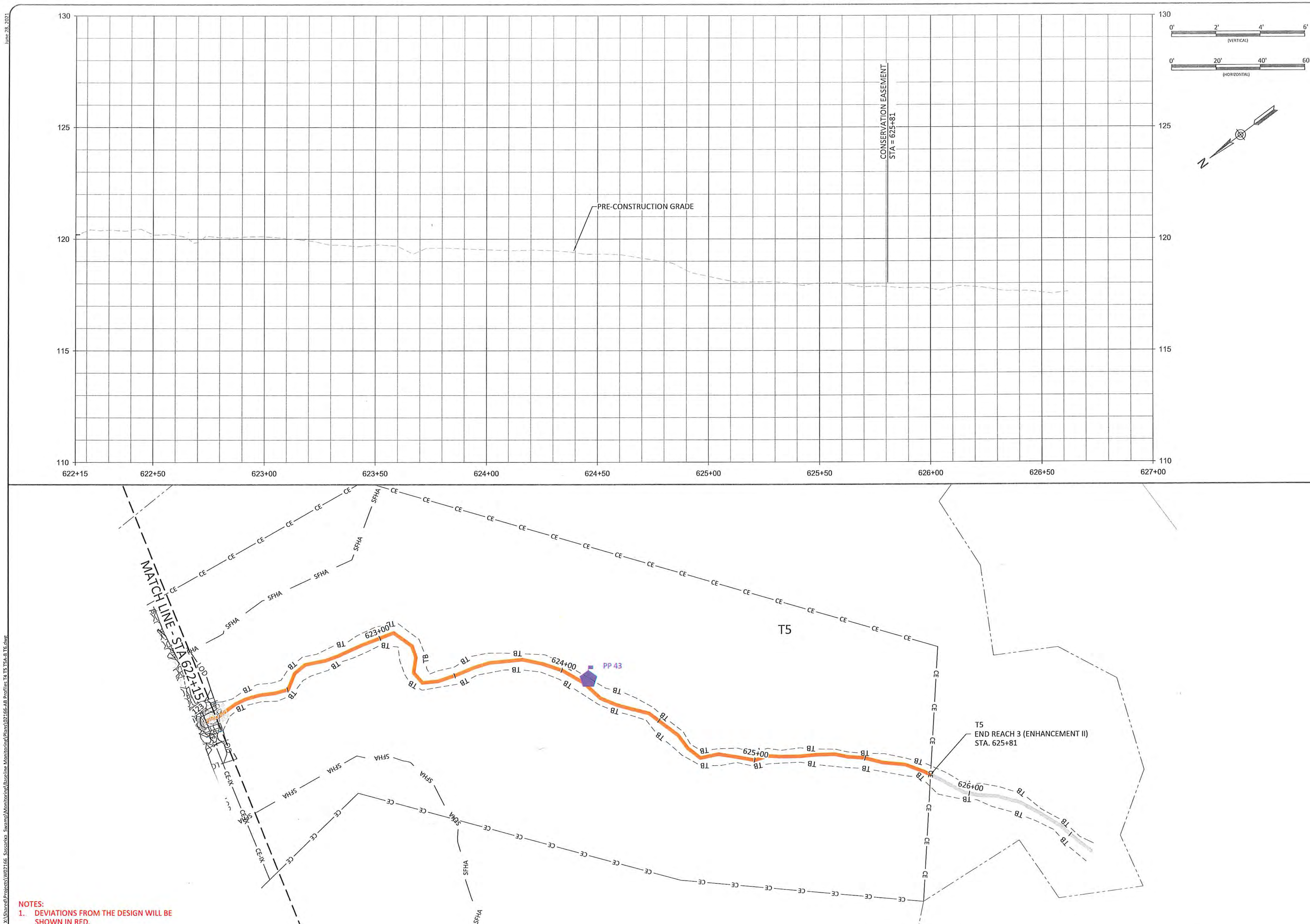

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

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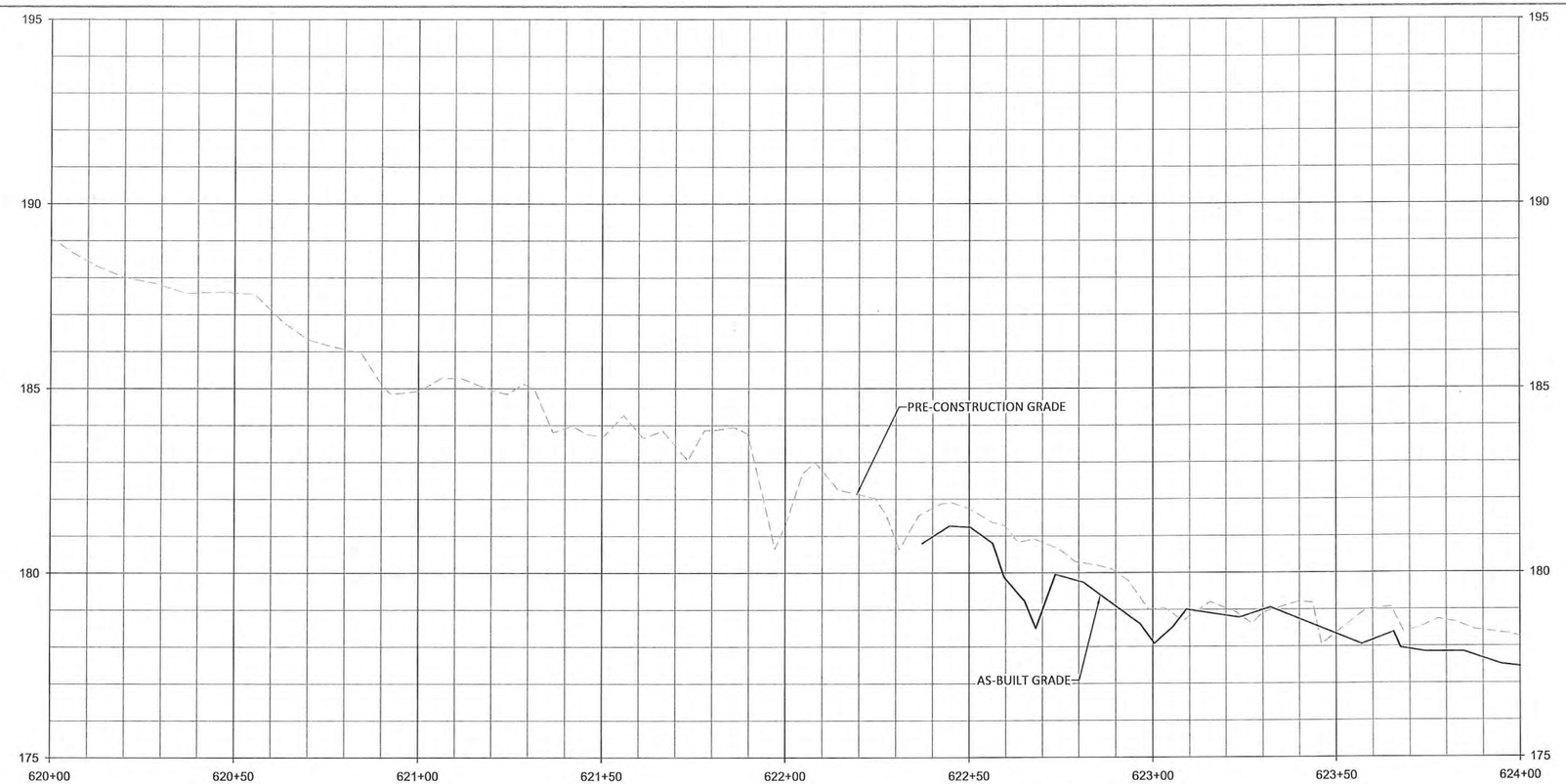
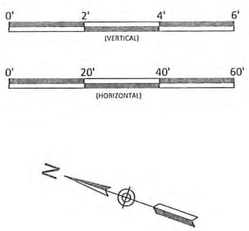
Sheet 1.48

June 28, 2021





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043290
GREGORY A. TUDOR

6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5A
Stream Plan and Profile

Revisions:

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Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

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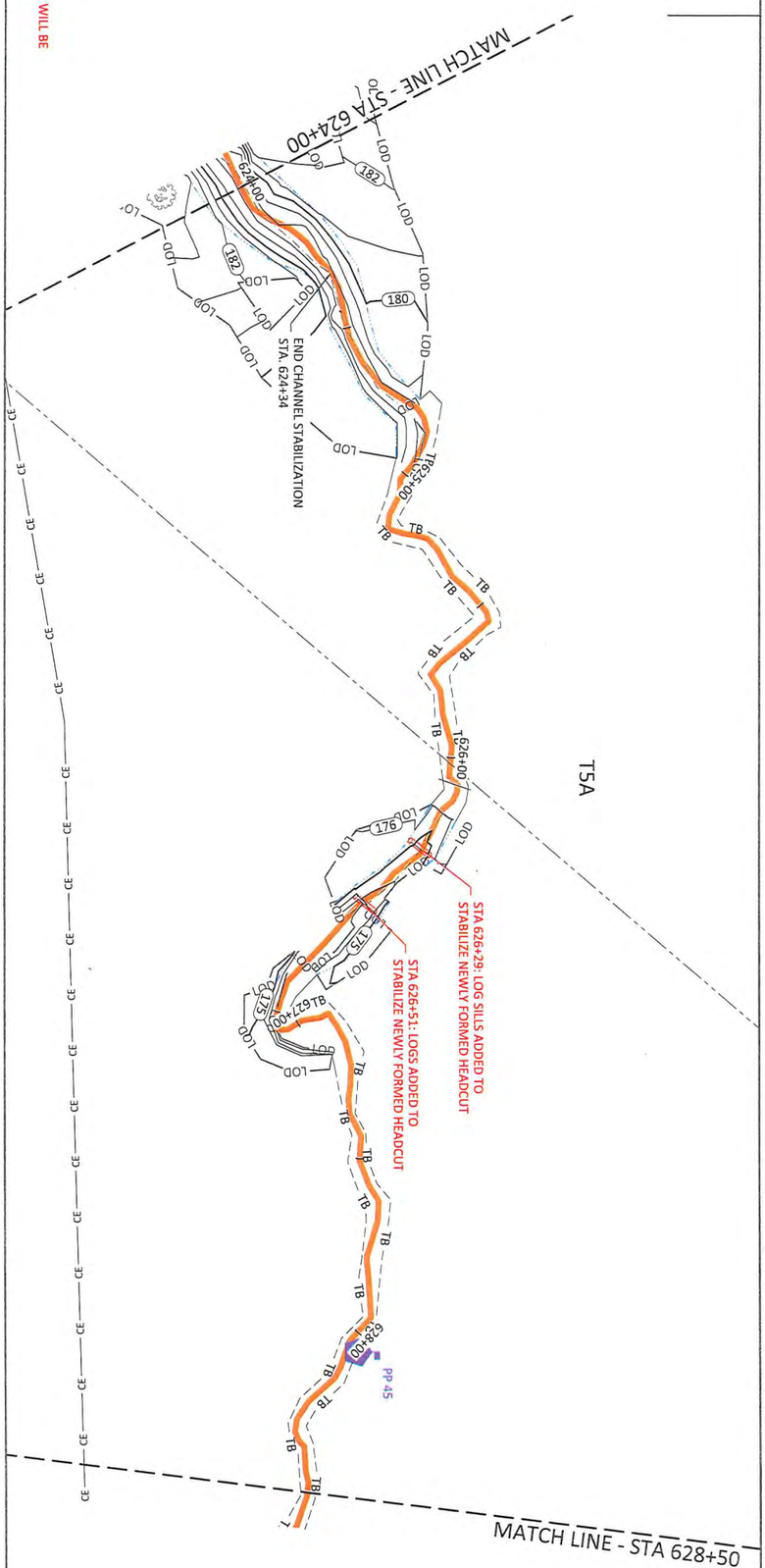

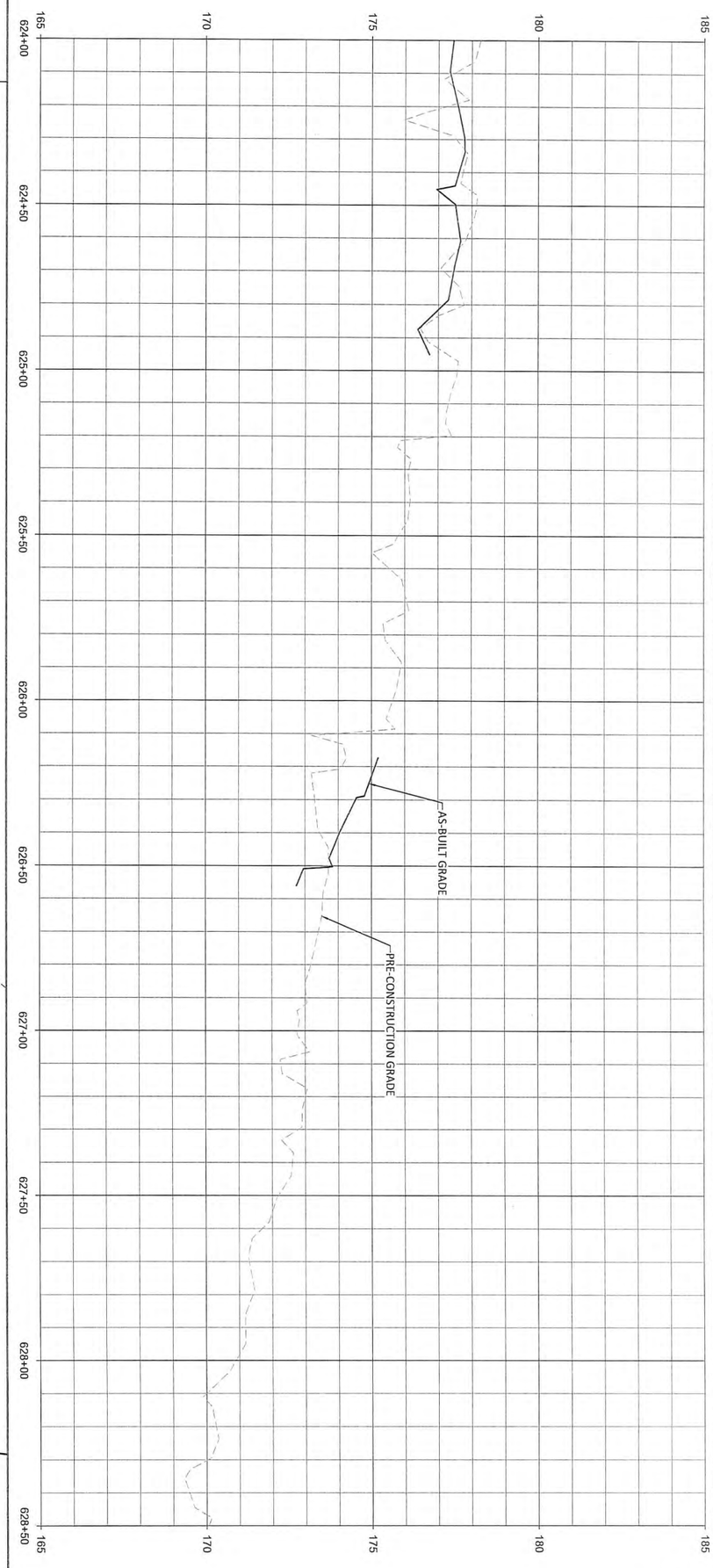

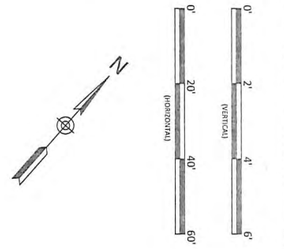

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Job Number:	005-02166
Project Engineer:	GAT
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5A
Stream Plan and Profile

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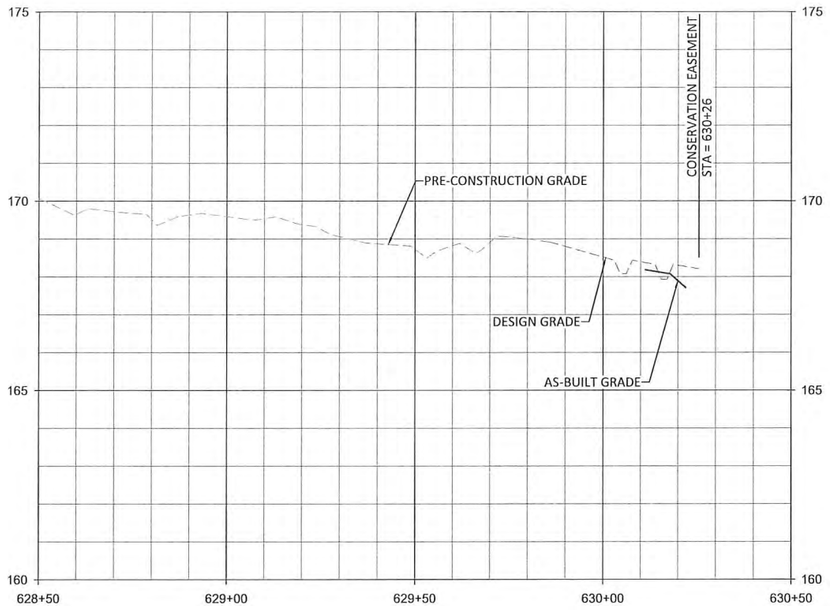

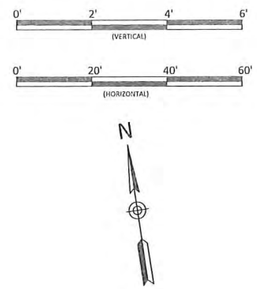

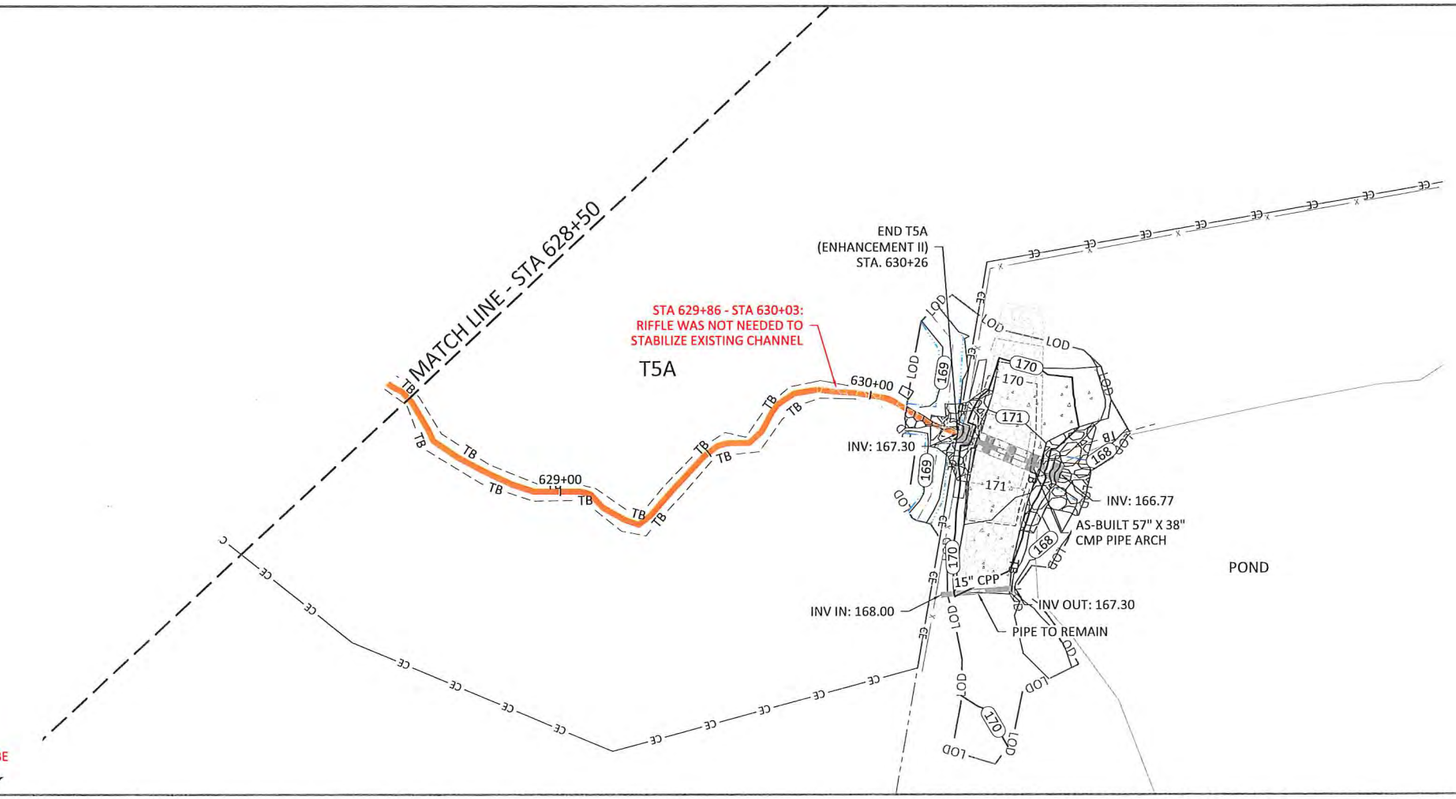

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SEAL
043290
GREGORY A. TUCKER
6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5A
Stream Plan and Profile

Revisions:

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Sheet 1.51

June 28, 2021

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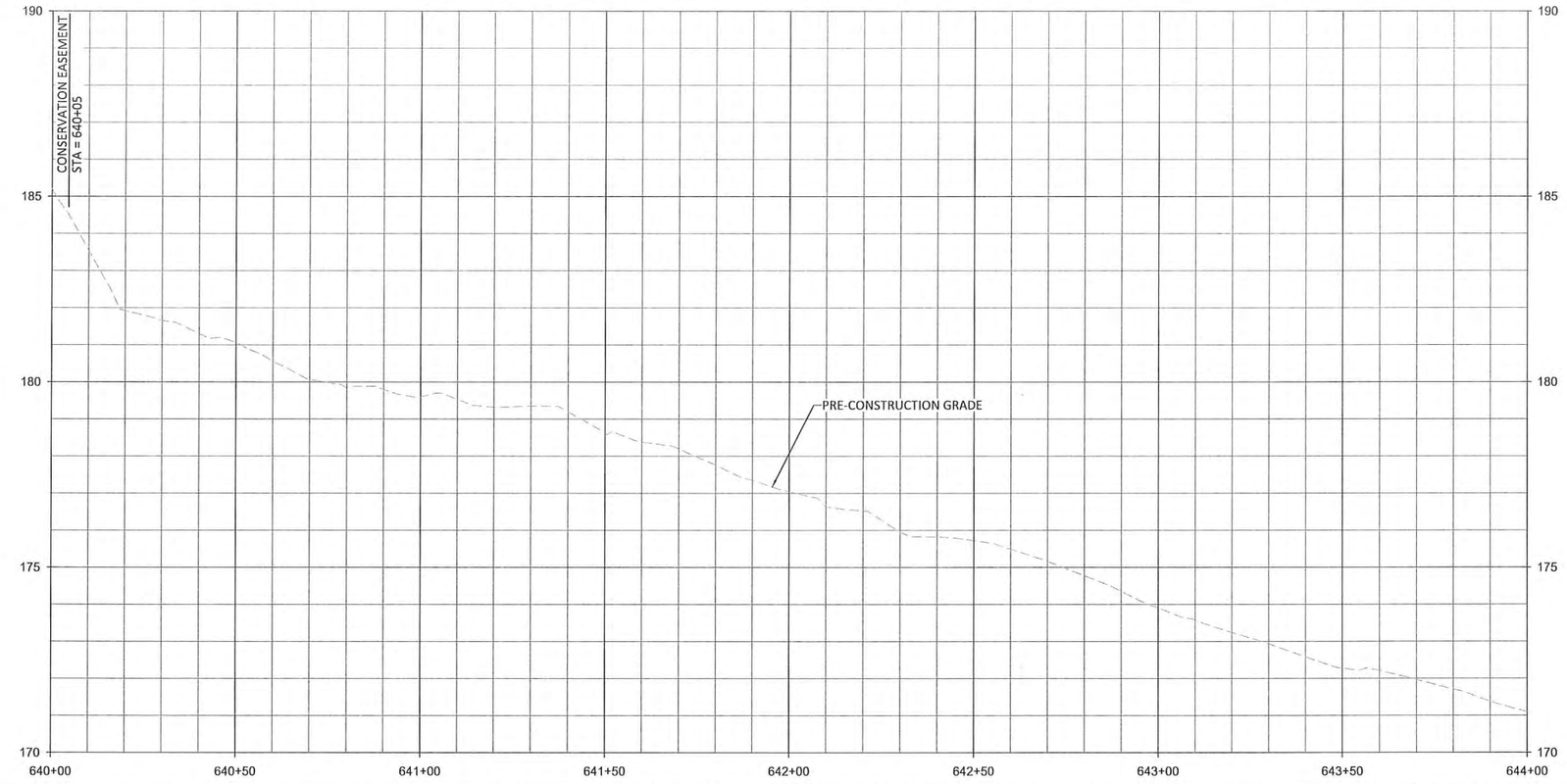
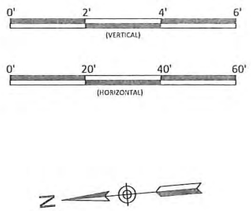
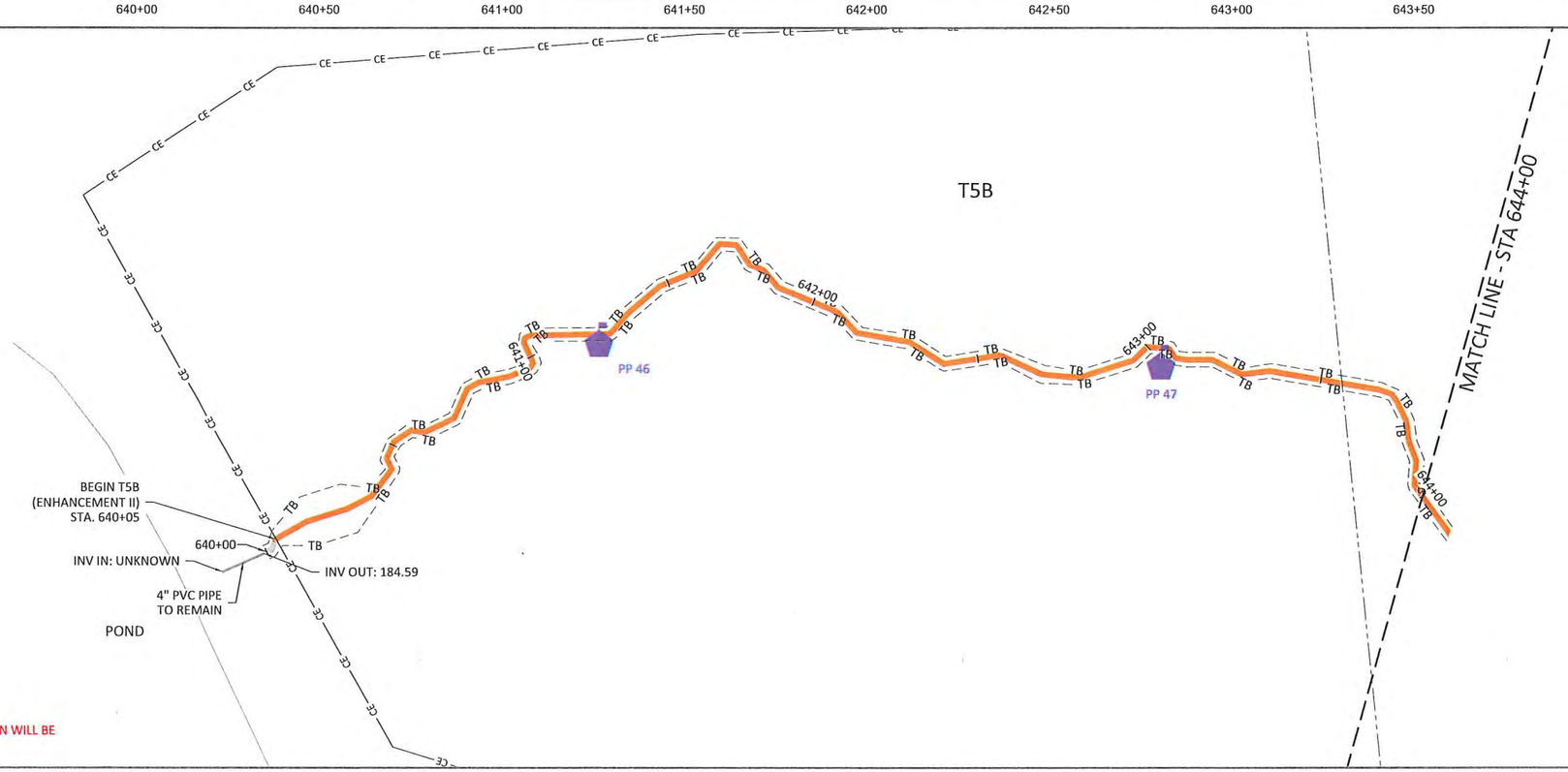
June 28, 2021







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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5B
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Revisions:

1.52
Sheet

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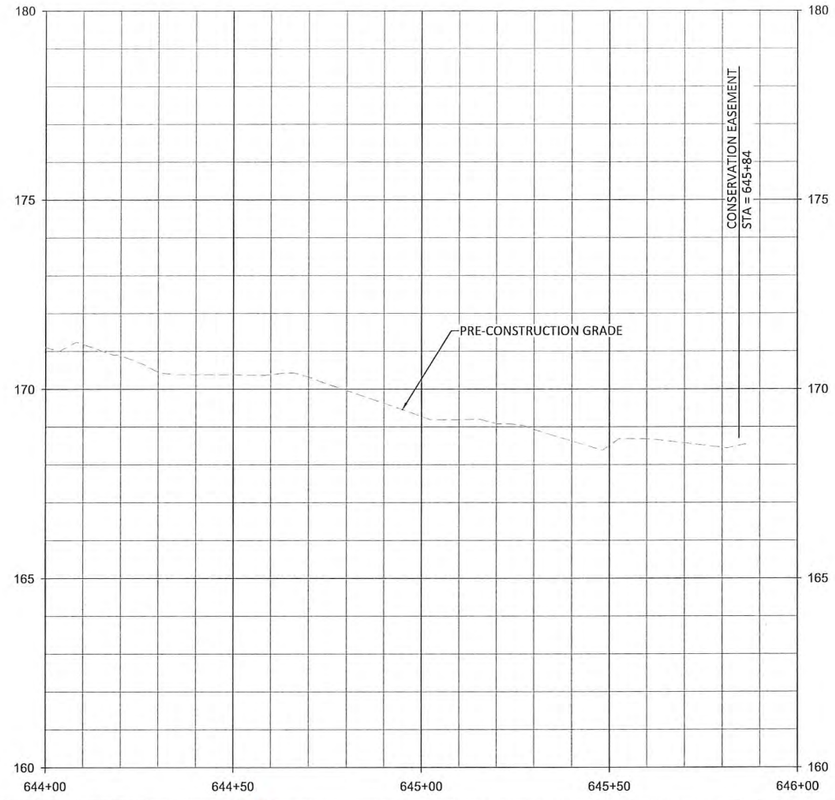

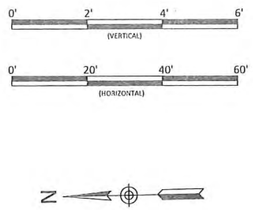

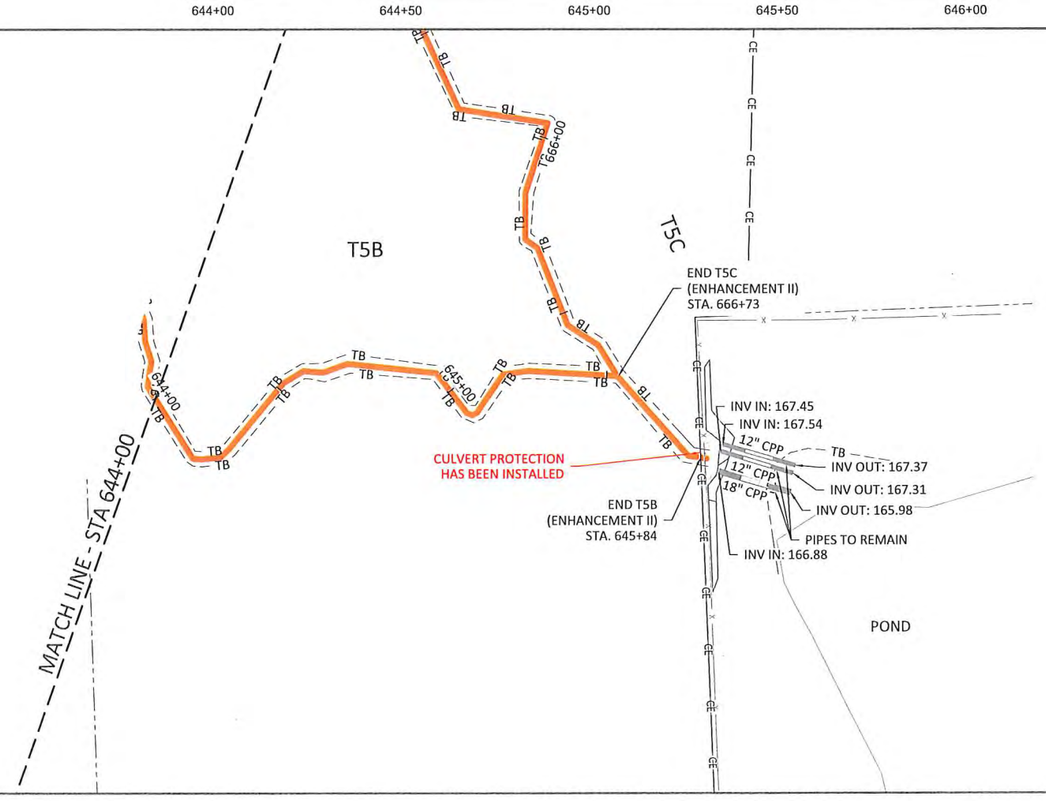

NOTES:
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5B
Stream Plan and Profile

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn by: CAW
Checked by: ANA

Revisions:

Sheet 1.53

June 28, 2021

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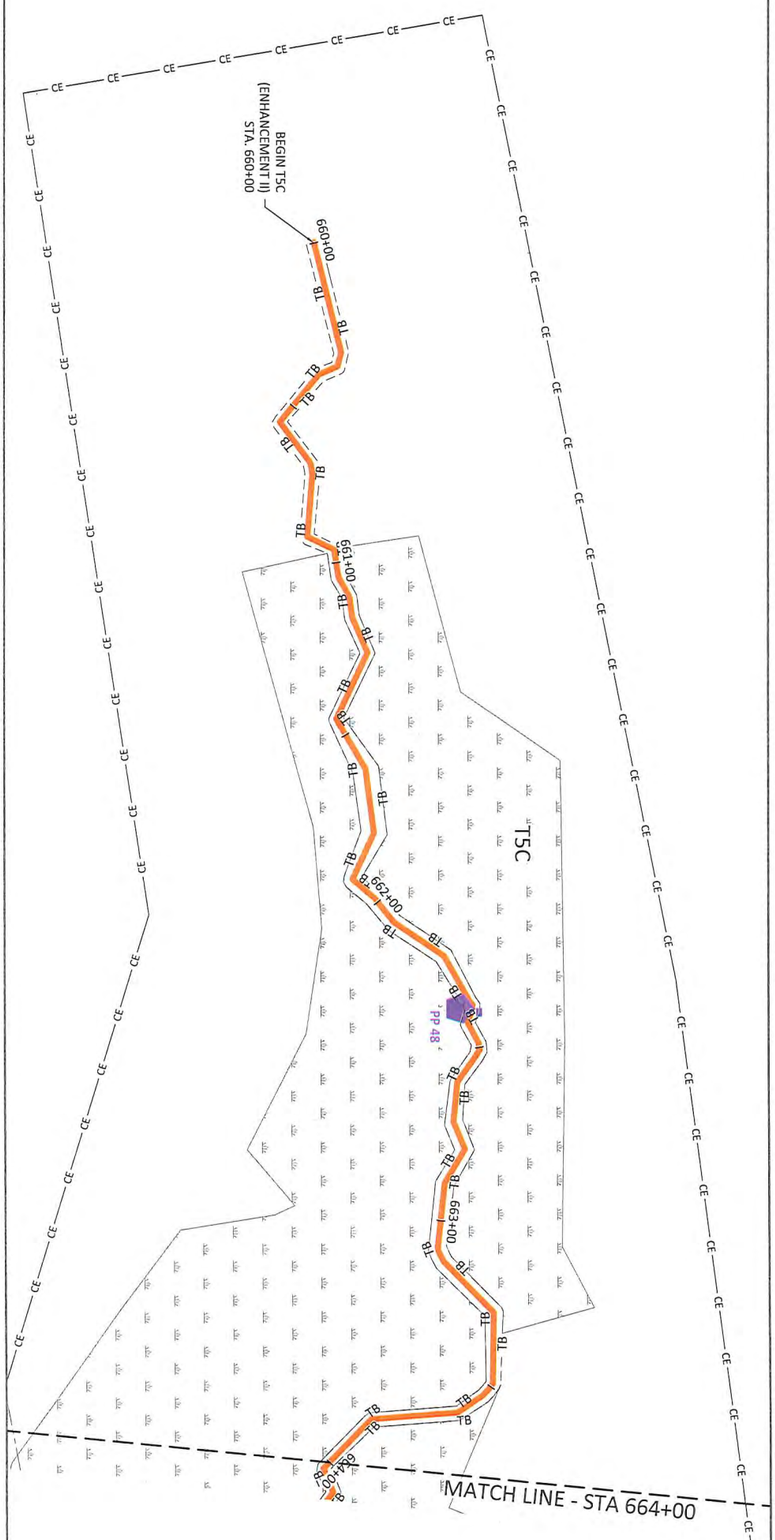

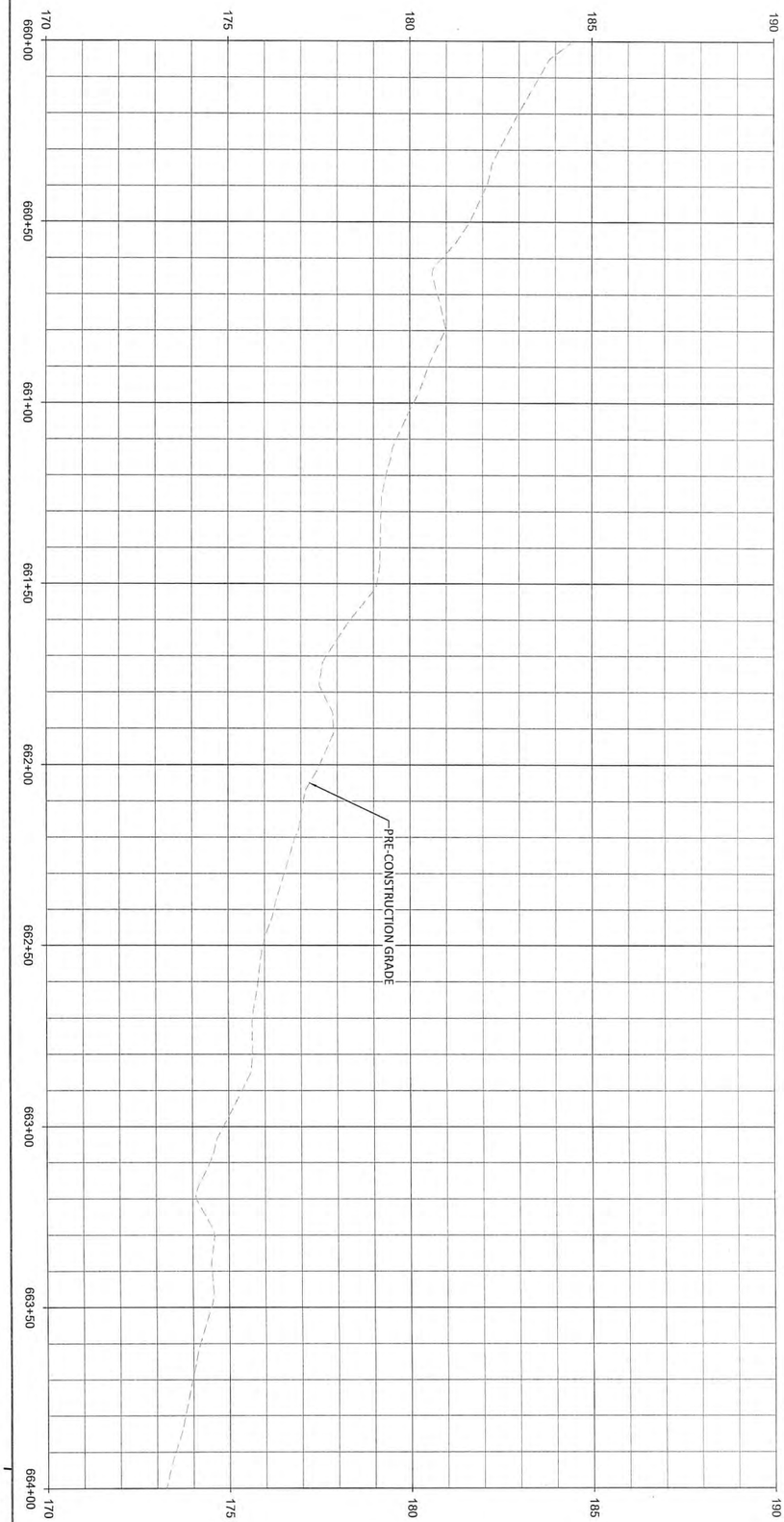

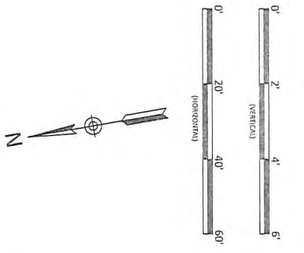

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

1.54
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5C
Stream Plan and Profile

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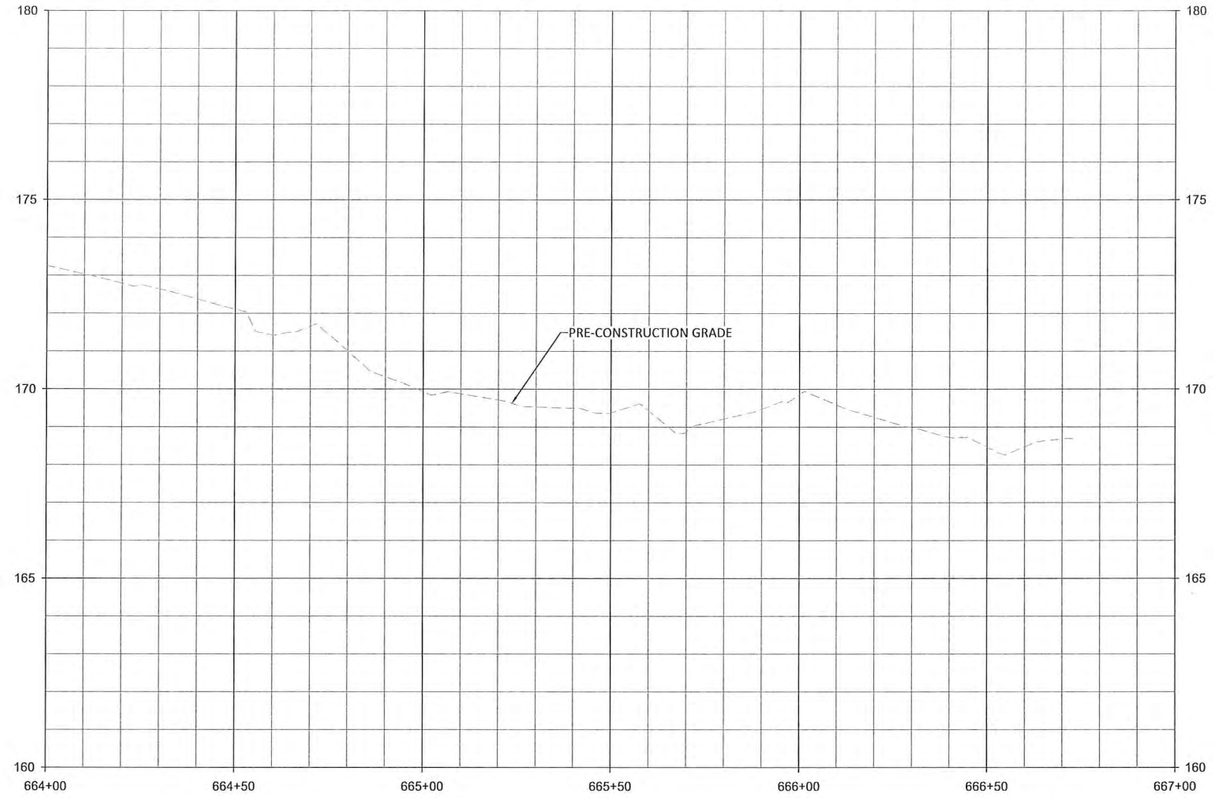

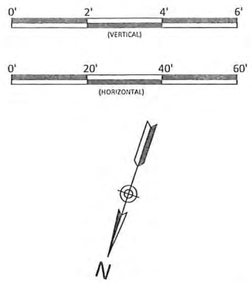

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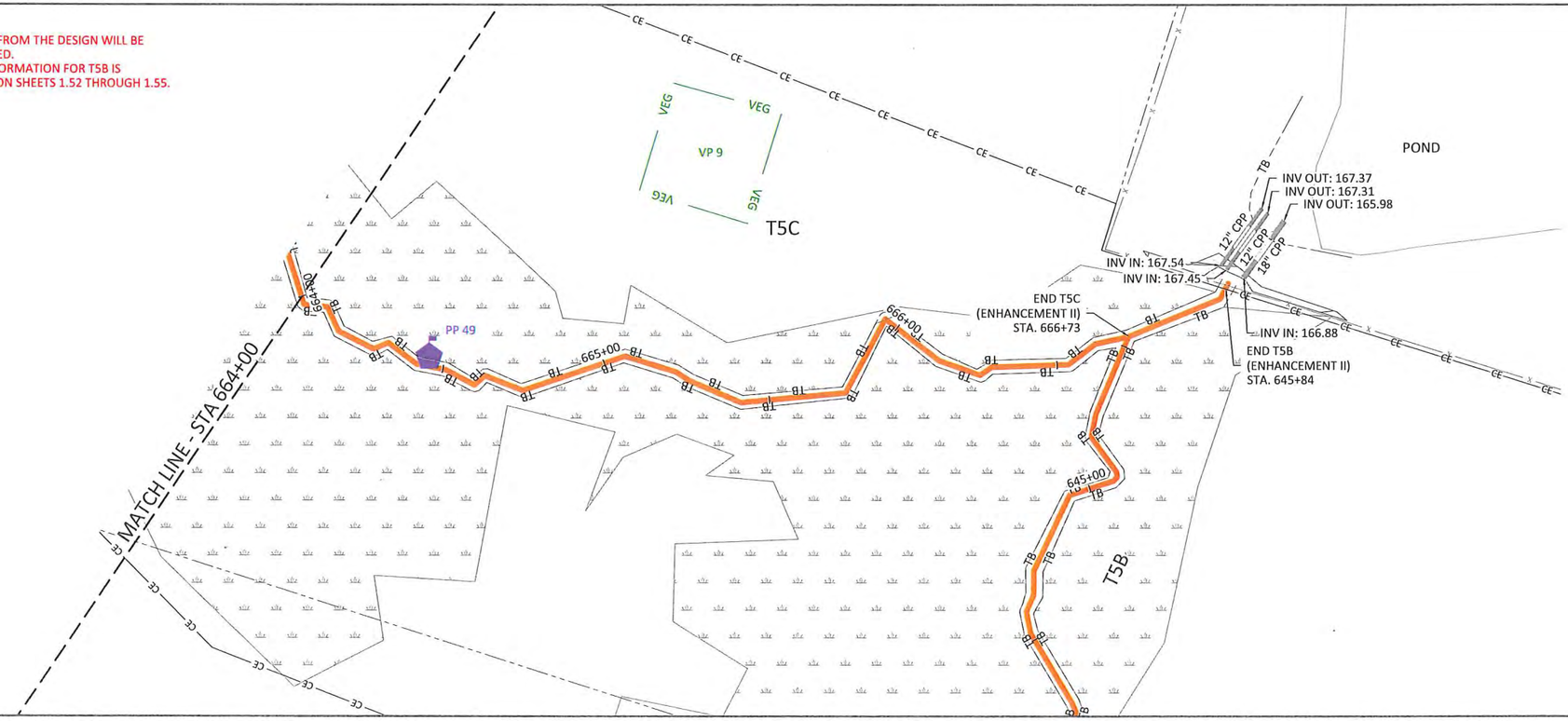

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5C
Stream Plan and Profile

Revisions:

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Sheet 1.55

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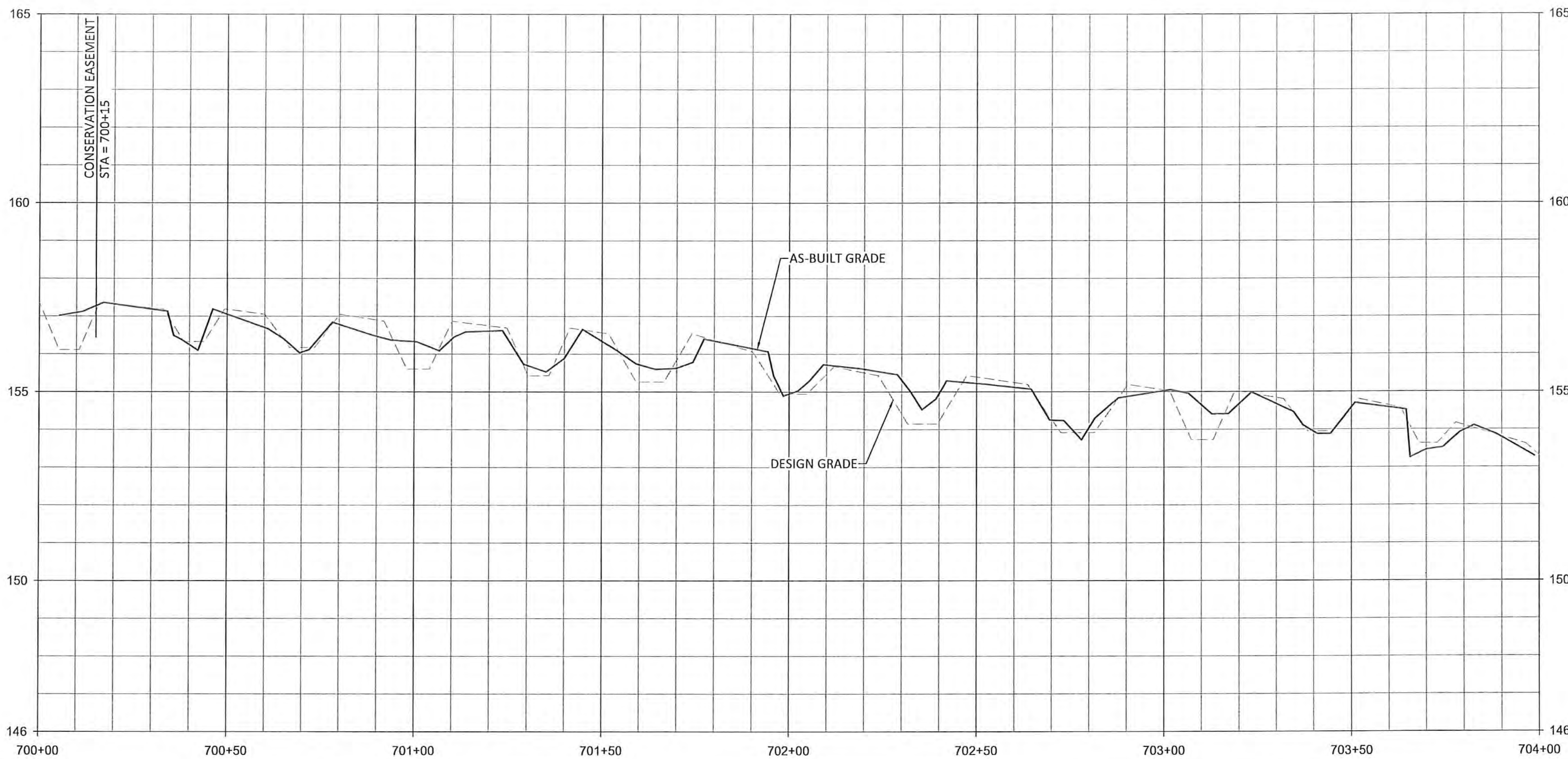

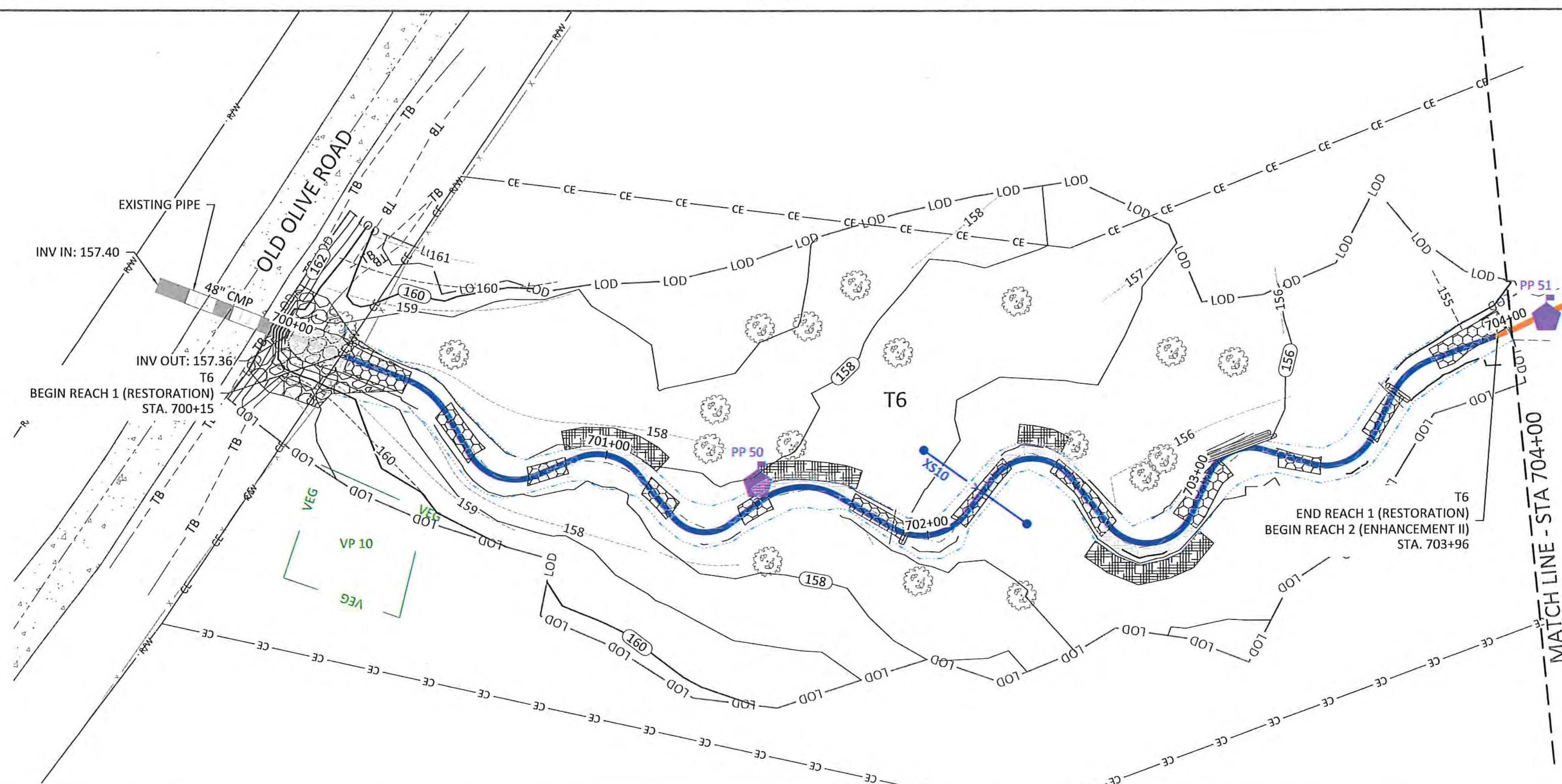

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0' 2' 4' 6' (VERTICAL)
0' 20' 40' 60' (HORIZONTAL)
N

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T6
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
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Sheet 1.56

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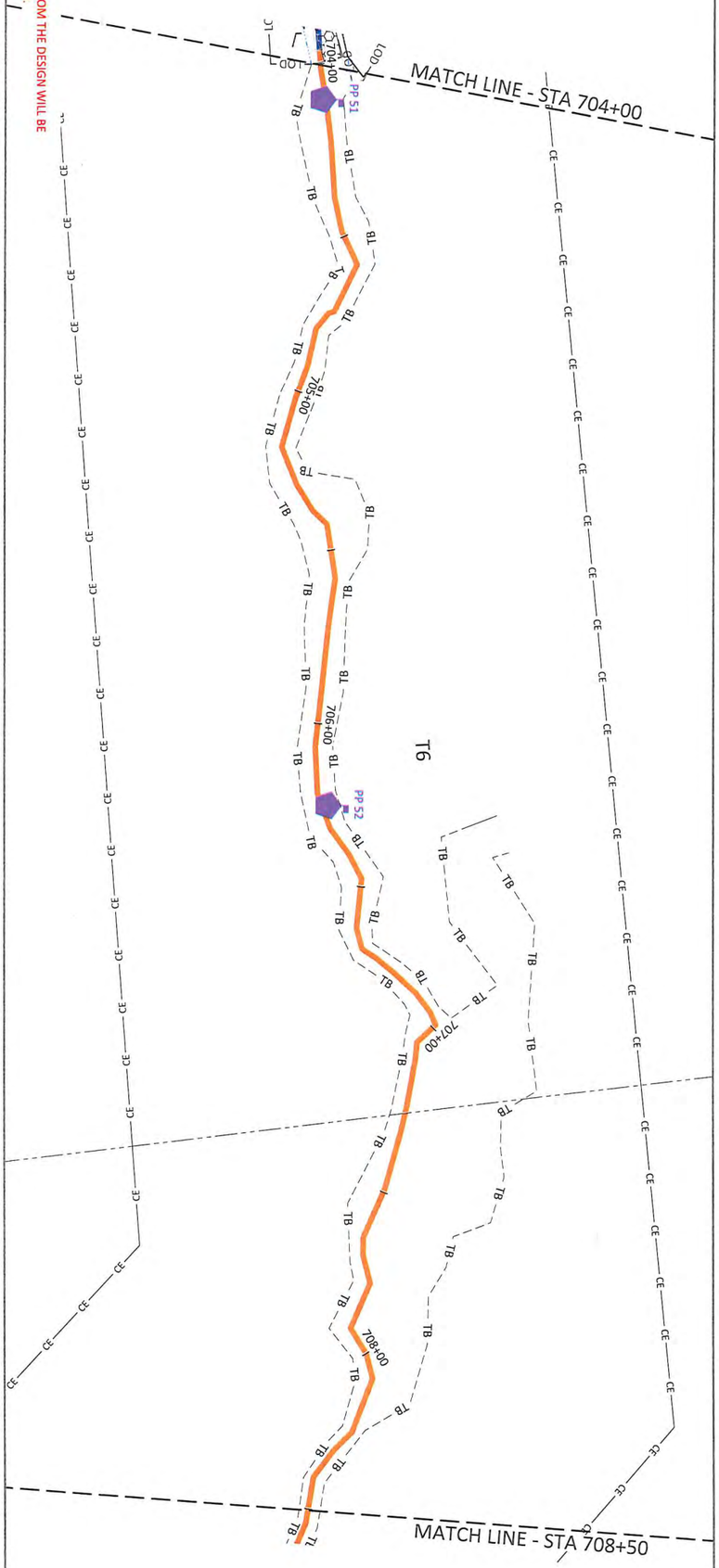

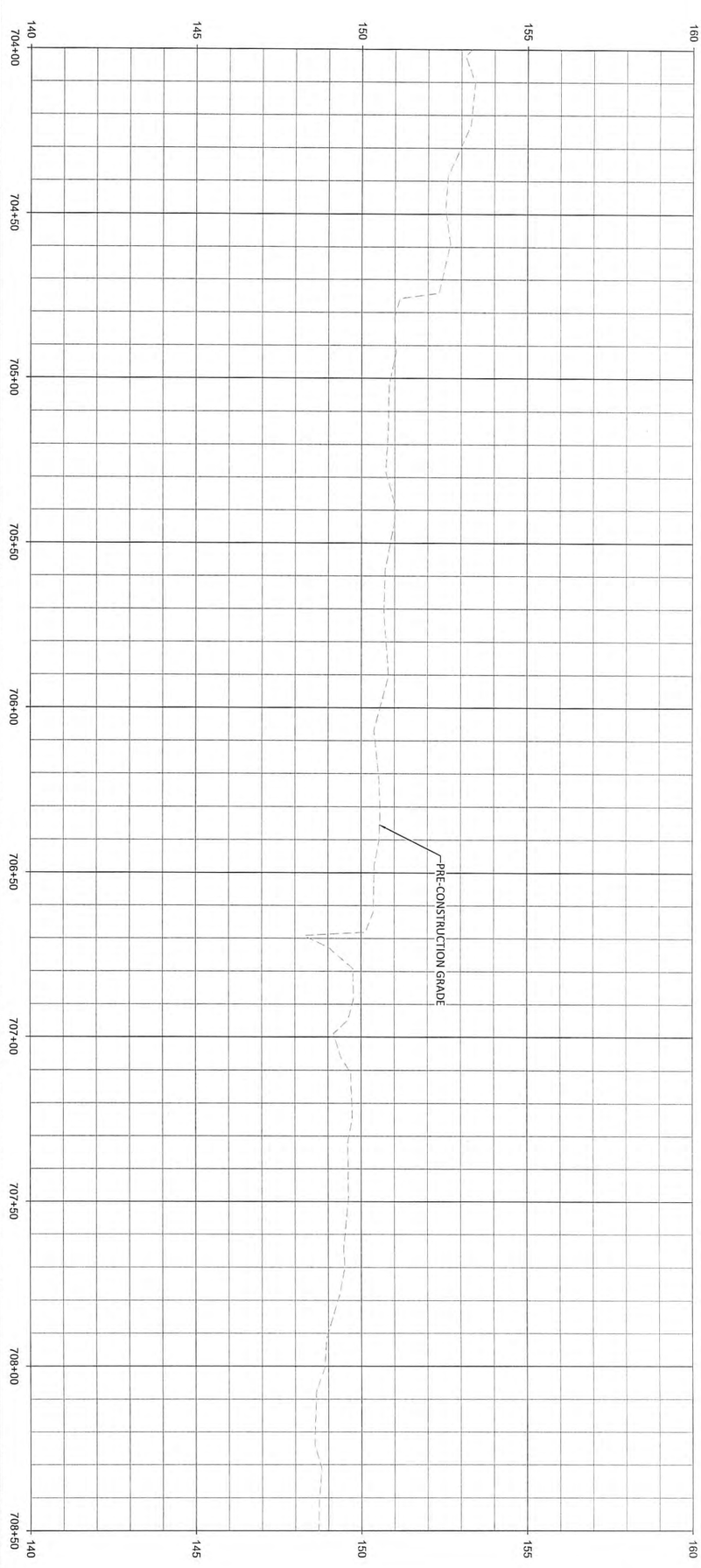

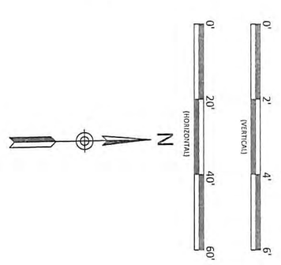

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
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1.57
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Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T6
Stream Plan and Profile

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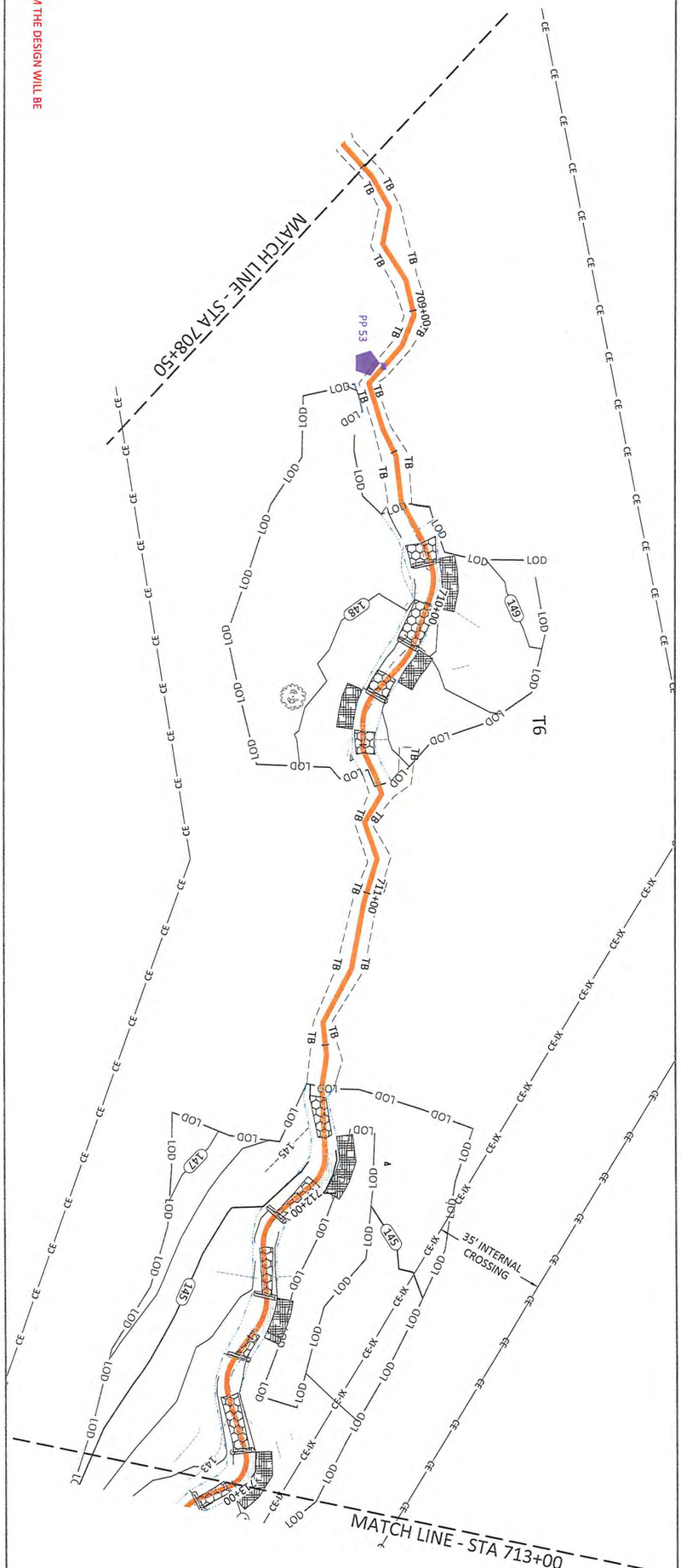

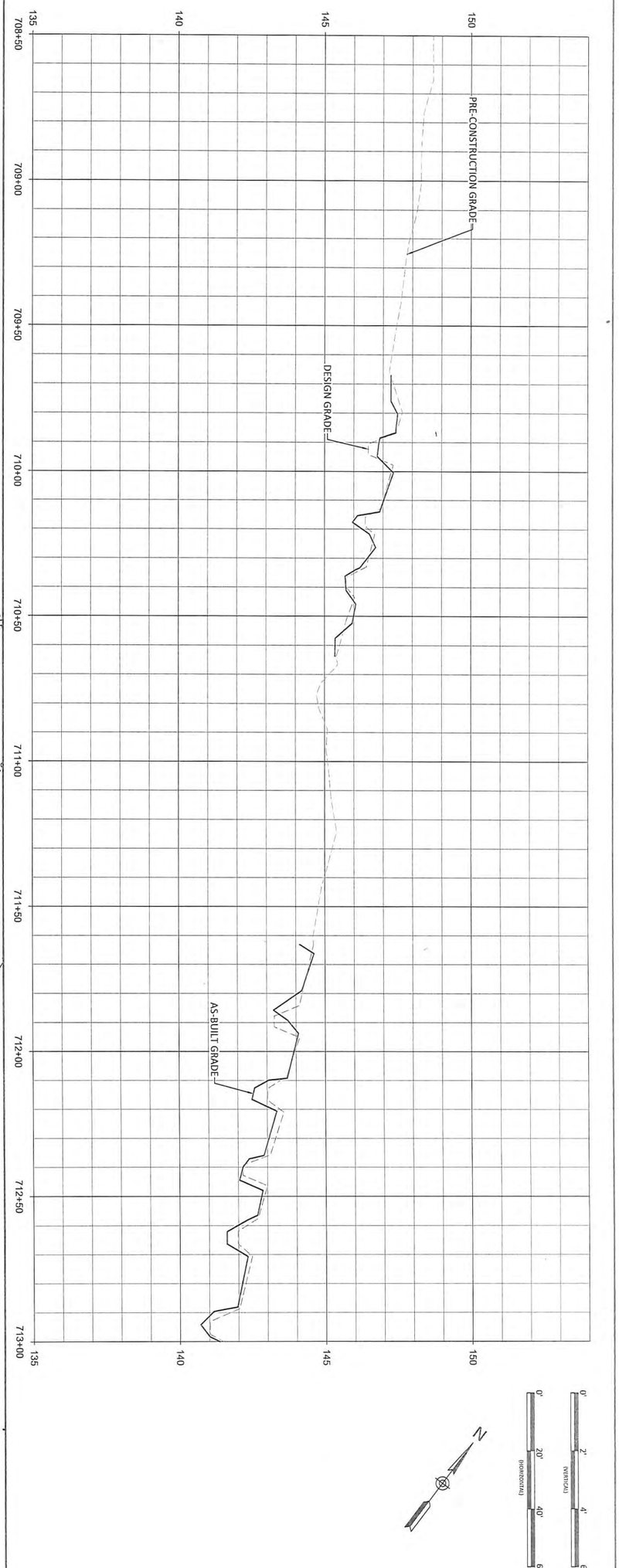

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Project Engineer:	GAT
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T6
Stream Plan and Profile

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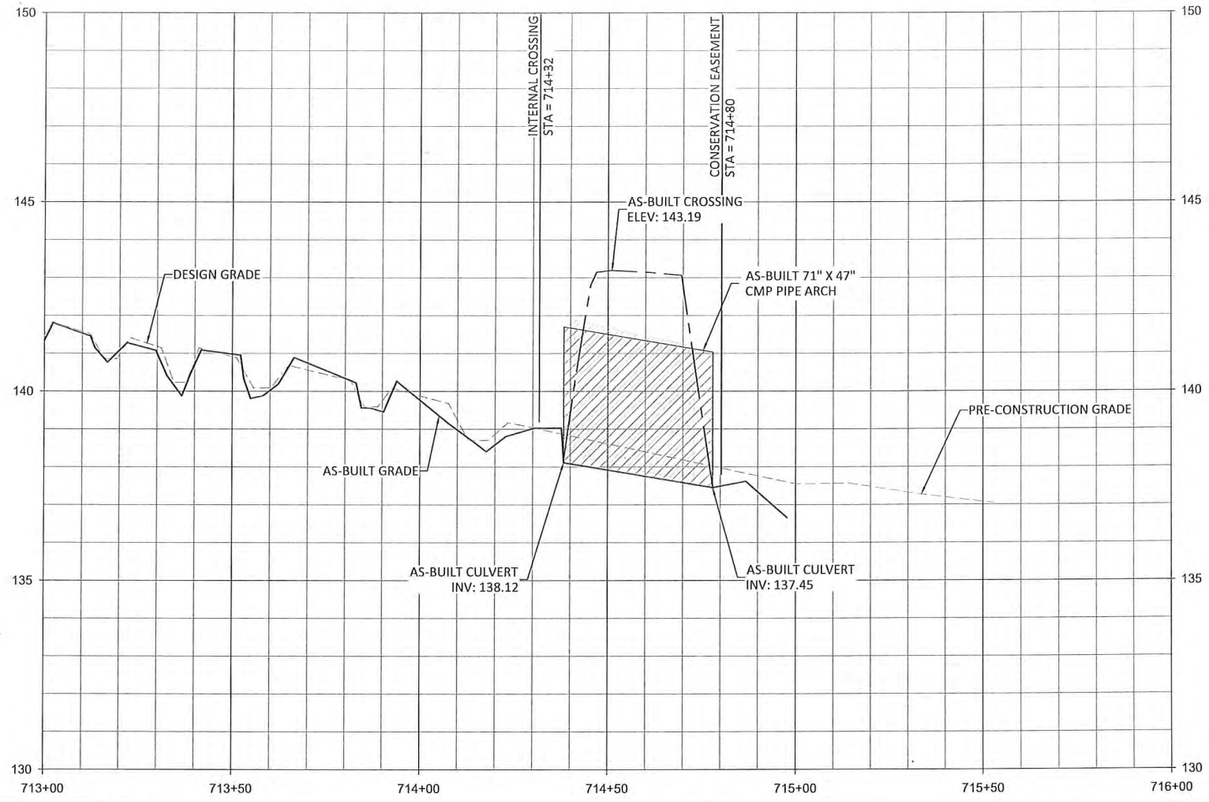

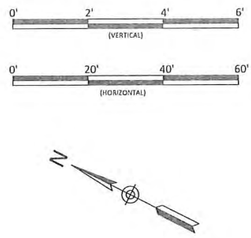

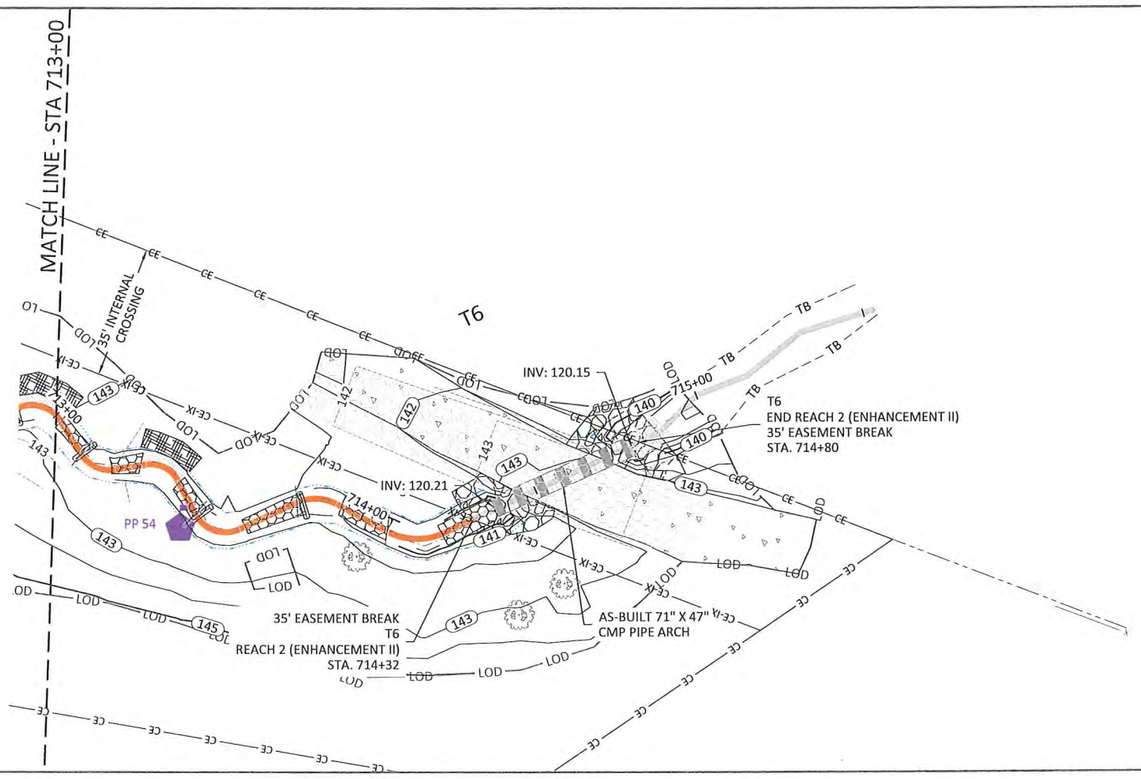

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T6
Stream Plan and Profile

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

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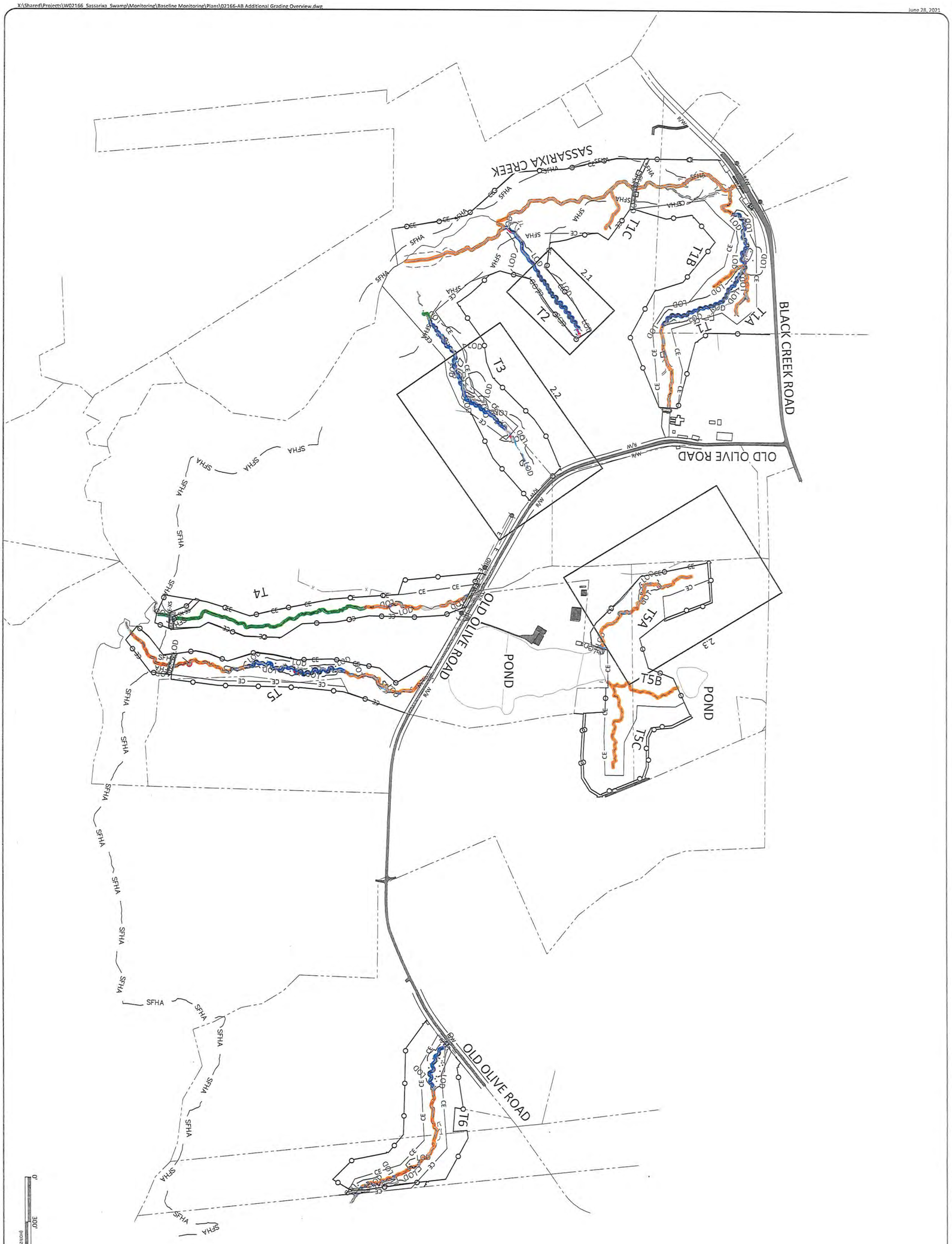

Date:	JUNE 28, 2021
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Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Additional Grading Overview
Additional Grading

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6/28/2021

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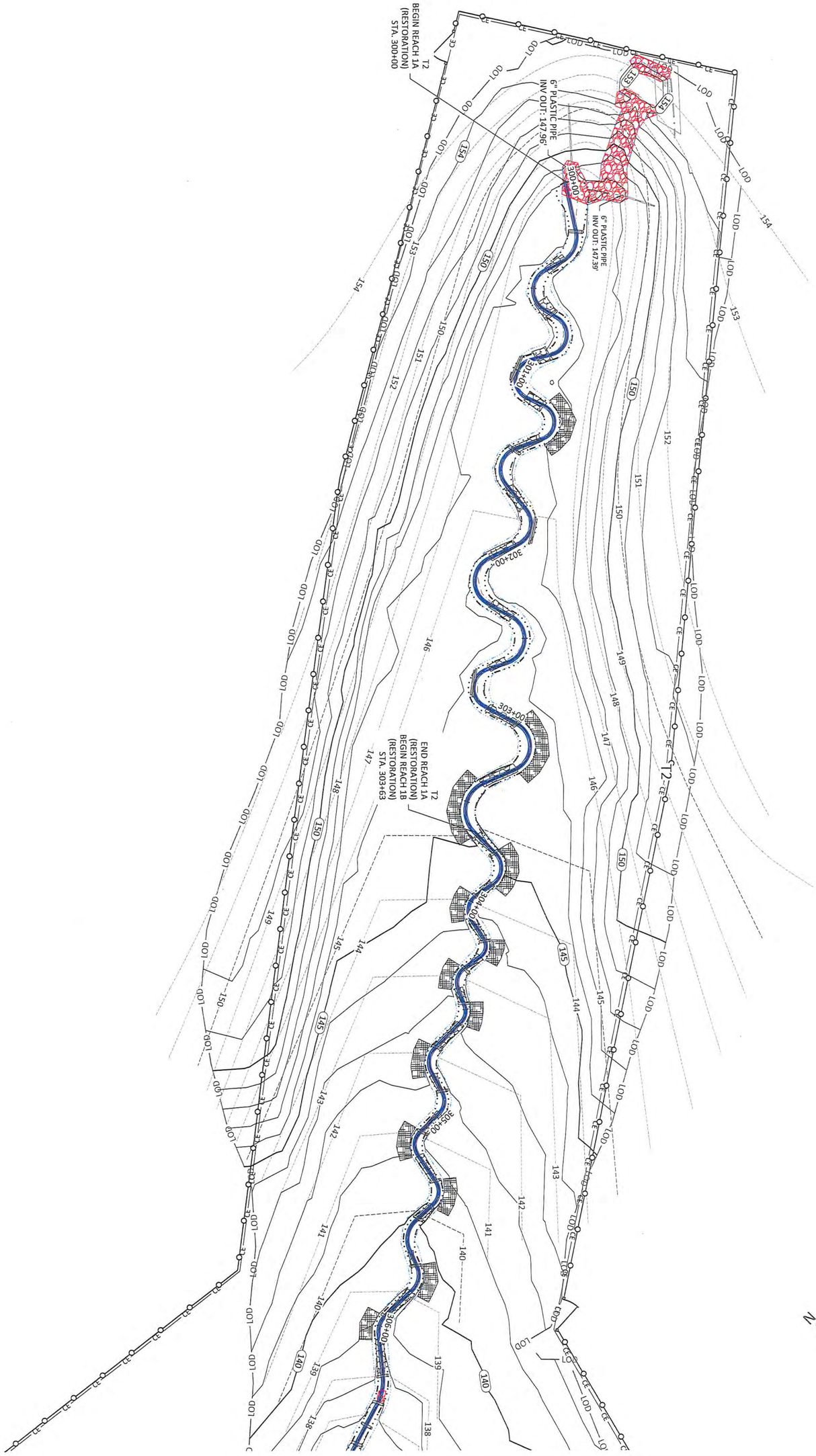

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
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2.1
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T2 Additional Grading
Additional Grading

NORTH CAROLINA PROFESSIONAL SEAL 043290 ENGINEER GREGORY A. TURNER

6/28/2021

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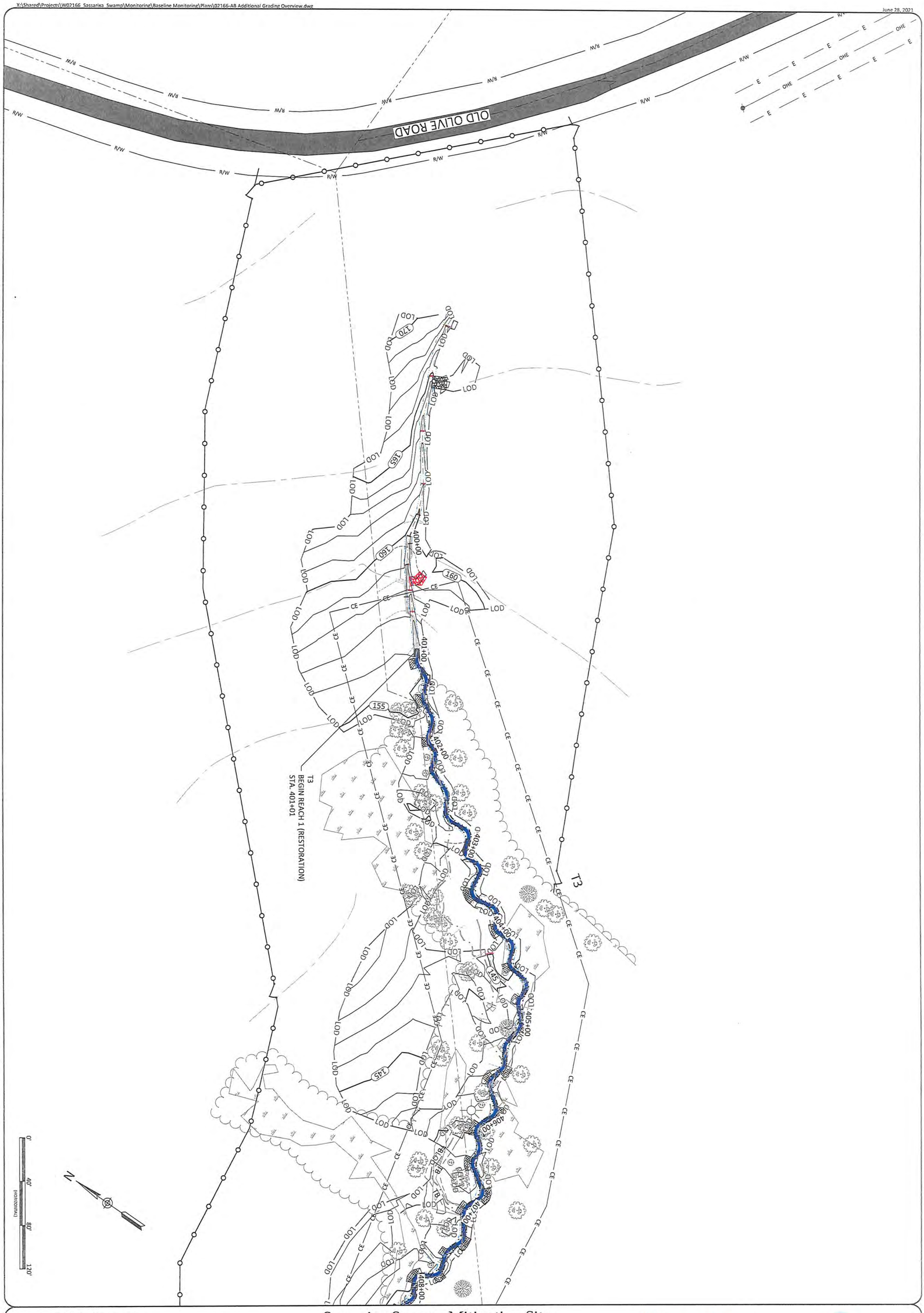

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
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Checked By:	ANA

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T3 Additional Grading
Additional Grading

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Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

T5A Additional Grading
Additional Grading

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June 28, 2021

Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Note: Non-hatched areas within easement are currently vegetated and were planted as needed to achieve target density. Buffer planting will occur within the Limits of Disturbance

Streambank Planting Zone

Live Stakes

Species	Common Name	Indiv. Spacing	Min. Size	Stratum	Wetland Indicator Status	% of Stems
Salix nigra	Black Willow	3-6 ft.	0.5"-1.5" cal.	Shrub	OBL	15%
Cornus amomum	Silky Dogwood	3-6 ft.	0.5"-1.5" cal.	Shrub	FACW	45%
Salix sericea	Silky Willow	3-6 ft.	0.5"-1.5" cal.	Shrub	OBL	40%
						100%
Herbaceous Plugs						
Juncus effusus	Common Rush	4 ft.	1.0"- 2.0" plug	Herb	OBL	40%
Carex alata	Broadwing Sedge	4 ft.	1.0"- 2.0" plug	Herb	OBL	40%
Panicum virgatum	Switchgrass	4 ft.	1.0"- 2.0" plug	Herb	FAC	20%
						100%

Black Willow is only acceptable to be planted on any stream with a top of bank width of 10' or greater. Use elderberry on any stream who's top of bank width is less than 10'.

Elderberry live stakes were unavailable at the time of planting. Black Willow installed instead.

Buffer Planting Zone

Bare Root

Species	Common Name	Max Spacing	Indiv. Spacing	Min. Caliper Size	Stratum	Wetland Indicator Status	# of Stems
Quercus phellos	Willow Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	15%
Platanus occidentalis	Sycamore	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	20%
Betula nigra	River Birch	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	20%
Quercus michauxii	Swamp Chestnut Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	15%
Quercus nigra	Water Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	7%
Acer negundo	Box Elder	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	10%
Populus deltoides	Eastern Cottonwood	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	7%
Magnolia virginiana	Sweetbay Mangolina	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	6%
							100%

Priority 1 Floodplain and Wetland Planting Zone

Bare Root

Species	Common Name	Max Spacing	Indiv. Spacing	Min. Caliper Size	Stratum	Wetland Indicator Status	# of Stems
Betula nigra	River Birch	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	20%
Acer negundo	Box Elder	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FAC	10%
Quercus pagoda	Cherry Bark Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	10%
Ulmus Alata	Winged Elm	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACU	5%
Platanus occidentalis	Sycamore	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	20%
Quercus michauxii	Swamp Chestnut Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	15%
Salix nigra	Black Willow	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	OBL	5%
Quercus phellos	Willow Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	10%
Quercus nigra	Water Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	FACW	5%
							100%

Permanent Riparian Seeding

Pure Live Seed (20 lbs / acre)

Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)	pH	Percentage
All Year	*Panicum rigidulum*	Redtop Panicgrass	Herb	1.6	5.0-7.5	8%
All Year	*Sorghastrum nutans*	Indiangrass	Herb	2.0	4.8-8.0	10%
All Year	*Elymus virginicus*	Virginia Wildrye	Herb	3.0	5.0-7.0	15%
All Year	*Bidens aristosa*	Bur Marigold	Herb	1.0	6.0-8.0	5%
All Year	*Helianthus angustifolius*	Narrowleaf Sunflower	Herb	1.0	4.0-7.0	5%
All Year	*Chasmanthium latifolium*	River Oats	Herb	1.0	5.0-7.0	5%
All Year	*Rudbeckia hirta*	Blackeyed Susan	Herb	1.0	6.0-7.0	5%
All Year	*Coreopsis lanceolata*	Lanceleaf Coreopsis	Herb	1.0	6.0-7.0	5%
All Year	*Carex vulpinoidea*	Fox Sedge	Herb	2.0	6.8-8.9	10%
All Year	*Panicum clandestinum*	Deertongue	Herb	3.4	4.0-7.5	17%
All Year	*Elymus riparius*	Riverbank Wildrye	Herb	1.0	4.5-7.2	5%
All Year	*Panicum virgatum*	Switchgrass	Herb	1.0	4.5-8.0	5%
All Year	*Chamaecrista fasciculata*	Partridge Pea	Herb	1.0	5.5-7.5	5%
						100%

*Wetland Status for Southeastern US

Most information provided by Ernst Conservation Seeds

Permanent Seeding Outside Easement

Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)	Percentage
All Year	*Festuca arundinacea*	Tall Fescue	Herb	40	70%
All Year	*Festuca rubra*	Creeping Red Fescue	Herb	40	10%
All Year	*Dactylis glomerata*	Orchardgrass	Herb	40	20%
					100%

Temporary Seeding

Pure Live Seed

Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)
Aug 15 - May 1	*Secale cereale*	Rye Grain	Herb	140
May 1 - Aug 15	*Setaria italica*	German Millet	Herb	50

NO CHANGES OR SUBSTITUTIONS WERE MADE TO THE LISTED PLANTING SPECIES

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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Planting Tables

Revisions:

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
Drawn By: CAW
Checked By: ANA

Sheet 3.0

X:\Shared\Projects\WI02166_Sassarixa_Swamp\Monitoring\Baseline Monitoring\Plans\02166-AB Planting Tables.dwg

Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Note: Non-hatched areas within easement are currently vegetated and were planted as needed to achieve target density. Buffer planting occured within the Limits of Disturbance

3.2

BLACK CREEK ROAD

OLD OLIVE ROAD

SASSARIXA CREEK

T1A

T1B

T1C

T1D

T2

T3

3.4

POND

T5A

T5B

T5C

3.3

POND

OLD OLIVE ROAD

T4

T5

3.5

OLD OLIVE ROAD

T6

N

0' 300' 600' 900'

(HORIZONTAL)

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Planting Plan Overview

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

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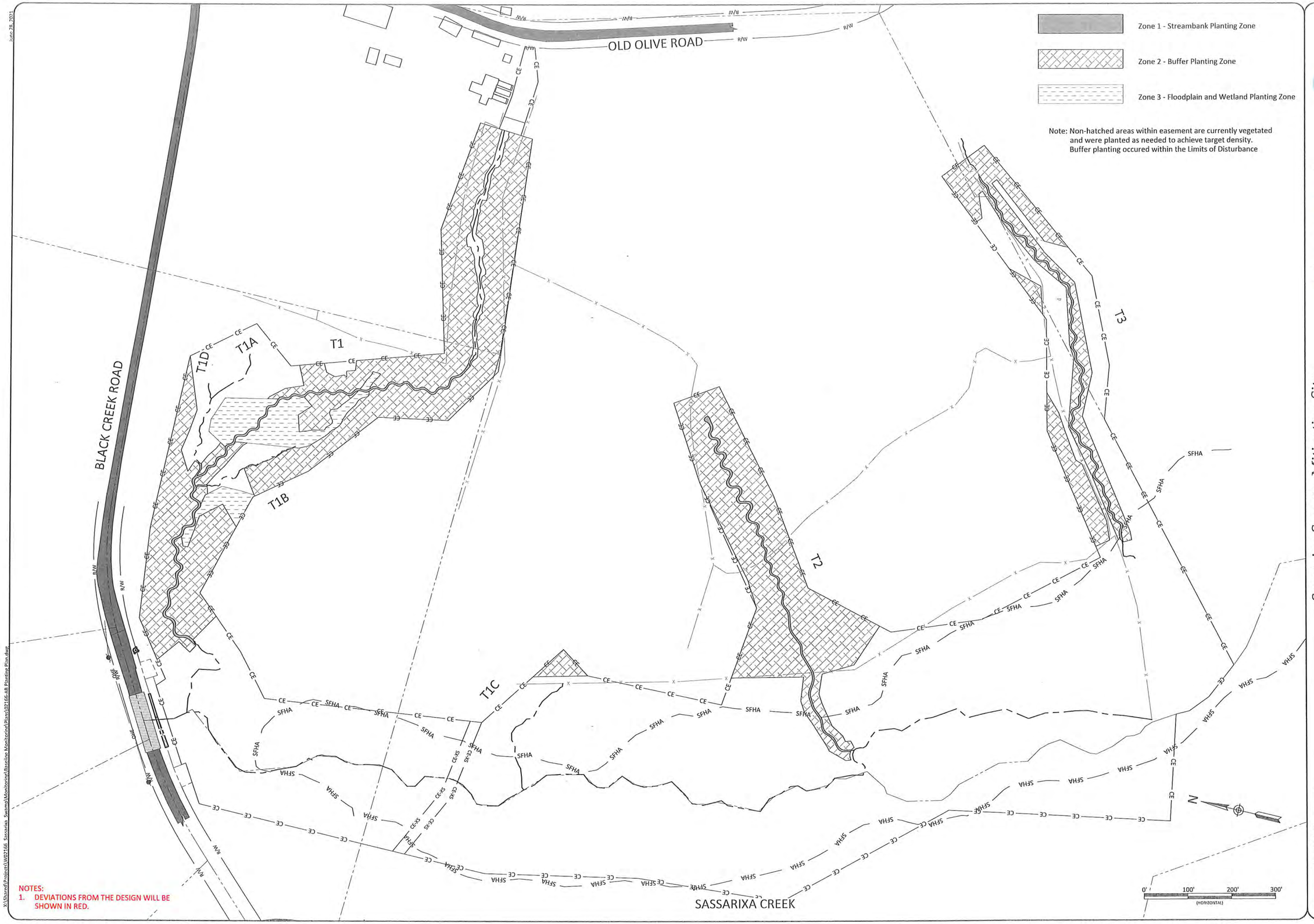

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Planting Plan

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June 28, 2021

June 28, 2021

Zone 1 - Streambank Planting Zone

Zone 2 - Buffer Planting Zone

Zone 3 - Floodplain and Wetland Planting Zone

Note:-Non-hatched areas within easement are currently vegetated and were planted as needed to achieve target density. Buffer planting occured within the Limits of Disturbance

POND

OLD OLIVE ROAD

T5

T4

PLANTED WITH WOODY STEMS TO MEET VEGETATED BUFFER SUCCESS CRITERIA

PLANTED WITH WOODY STEMS TO MEET VEGETATED BUFFER SUCCESS CRITERIA

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N

0' 100' 200' 300'
(HORIZONTAL)

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Planting Plan

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Planting Plan

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
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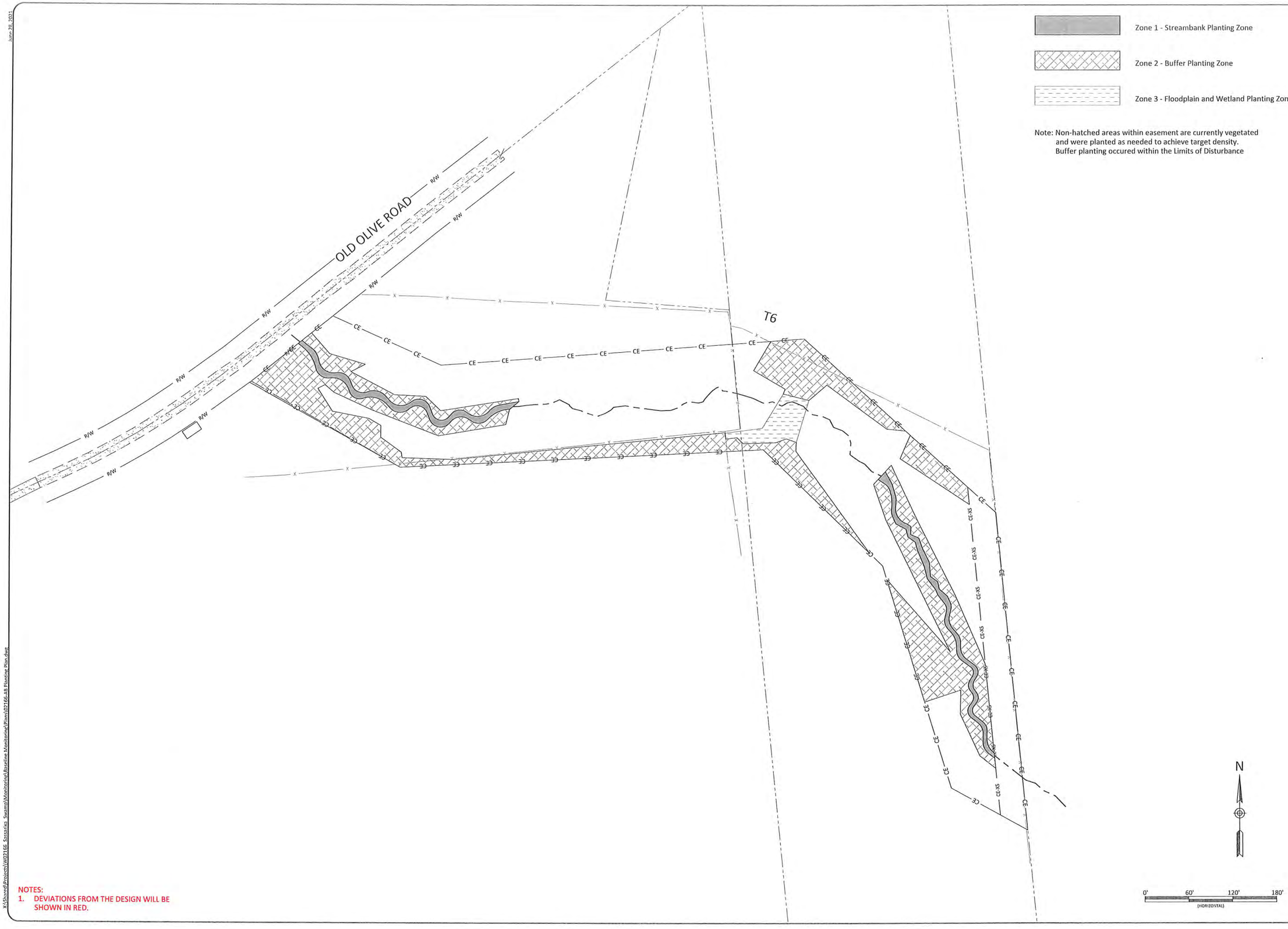
June 29, 2021

June 28, 2021



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8/26/2021

Sassarixa Swamp Mitigation Site
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Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
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Sheet 3.5

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12/8/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Fencing Plan Overview

Revisions:

Date: JUNE 28, 2021
Job Number: 005-02166
Project Engineer: GAT
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Checked By: ANA

Sheet 5.0

June 28, 2021

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June 28, 2021

DESIGNED FENCE

AS-BUILT FENCE

DESIGNED DOUBLE 2" TUBE STEEL GATE

DESIGNED 2" TUBE STEEL GATE

DOUBLE AS-BUILT 2" TUBE STEEL GATE

AS-BUILT 2" TUBE STEEL GATE

CONNECTED TO EXISTING FENCE

12' STEEL GATE INSTALLED PER OWNER REQUEST

FENCING NOT INSTALLED AS AGREED UPON WITH OWNER AND APPROVED BY DMS

2 - 12' STEEL GATES

2 - 12' STEEL GATES

12' STEEL GATE

OLD OLIVE ROAD

MATCHLINE - SHEET 5.2

CONNECTED TO EXISTING FENCE

12' STEEL GATE

T1A

T1

T1

VEG VP 1

VEG VP 2

VEG VP 3

0' 40' 80' 120'
(HORIZONTAL)

NOTES:
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6/28/2021

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Fencing Plan

Revisions:

Date:	JUNE 28, 2021
Job Number:	005-02166
Project Engineer:	GAT
Drawn By:	CAW
Checked By:	ANA

Sheet 5.1

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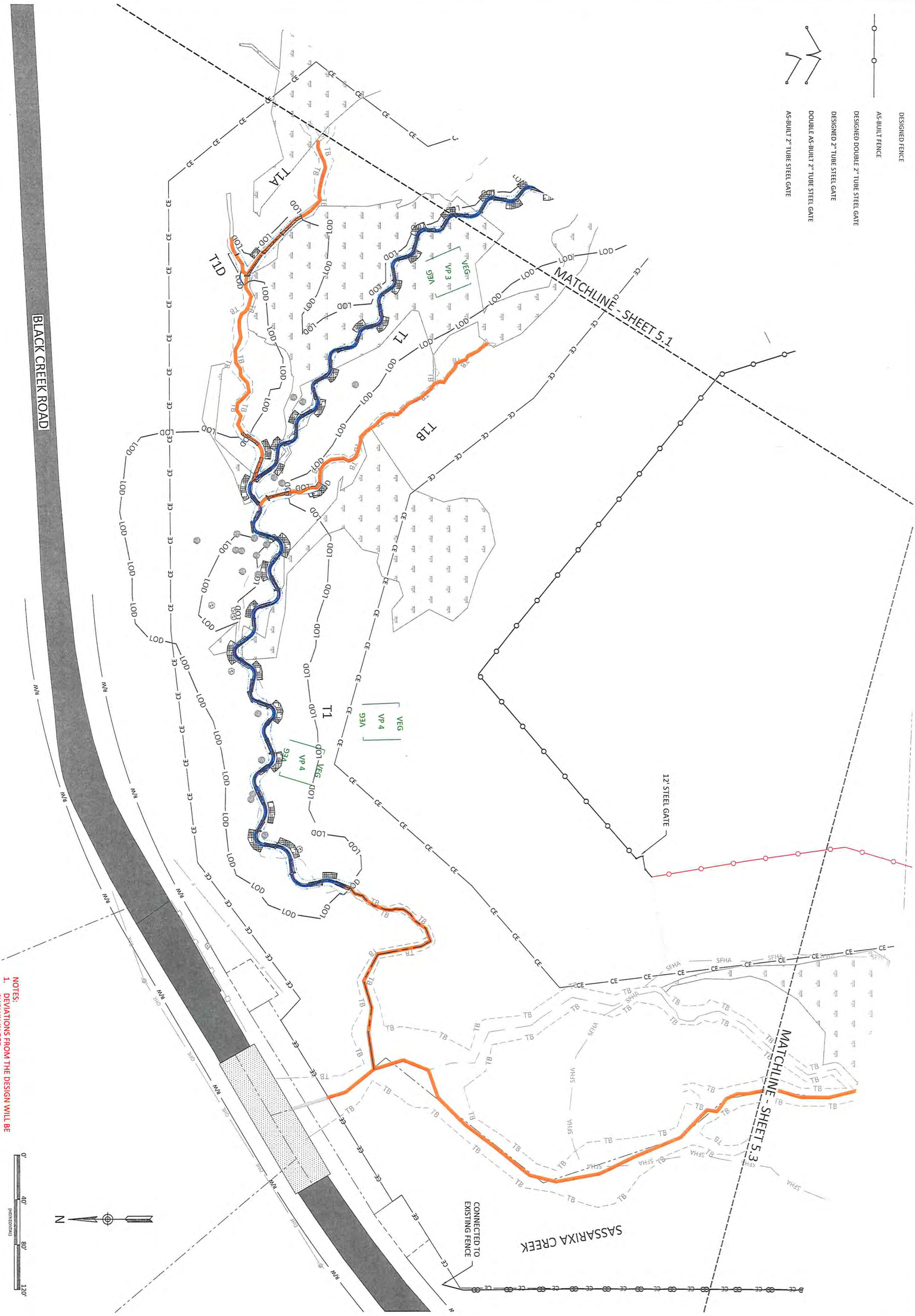

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Project Engineer:	GAT
Drawn By:	CAW
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5.2
Sheet

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Fencing Plan

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Tel: 919.851.9986
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June 28, 2021

DESIGNED FENCE
AS-BUILT FENCE
DESIGNED DOUBLE 2" TUBE STEEL GATE
DESIGNED 2" TUBE STEEL GATE
DOUBLE AS-BUILT 2" TUBE STEEL GATE
AS-BUILT 2" TUBE STEEL GATE

MATCHLINE - SHEET 5.2

DOUBLE 12' STEEL GATE

T1C

MATCHLINE - SHEET 5.4

SASSARIXA CREEK

DOUBLE 12' STEEL GATE

12' STEEL GATE INSTALLED PER OWNER REQUEST

NOTES:
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N

0' 40' 80' 120'
(HORIZONTAL)

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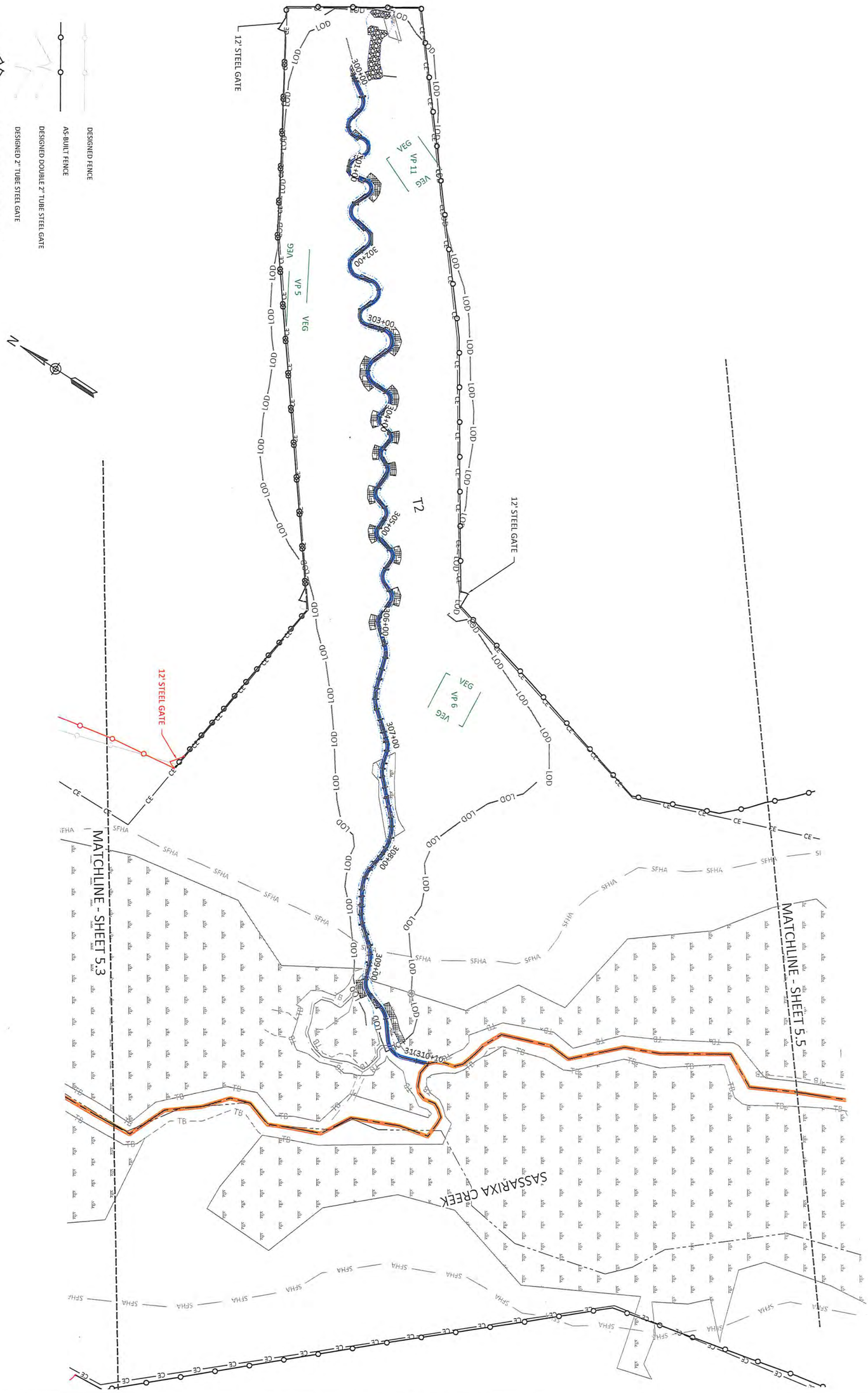

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Drawn By:	CAW
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5.4
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Fencing Plan

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NOTES:
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DESIGNED FENCE
AS-BUILT FENCE
DESIGNED DOUBLE 2" TUBE STEEL GATE
DESIGNED 2" TUBE STEEL GATE
DOUBLE AS-BUILT 2" TUBE STEEL GATE
AS-BUILT 2" TUBE STEEL GATE

Date:	JUNE 28, 2021
Job Number:	005-02166
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5.5
Sheet

Revisions:

Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

Fencing Plan

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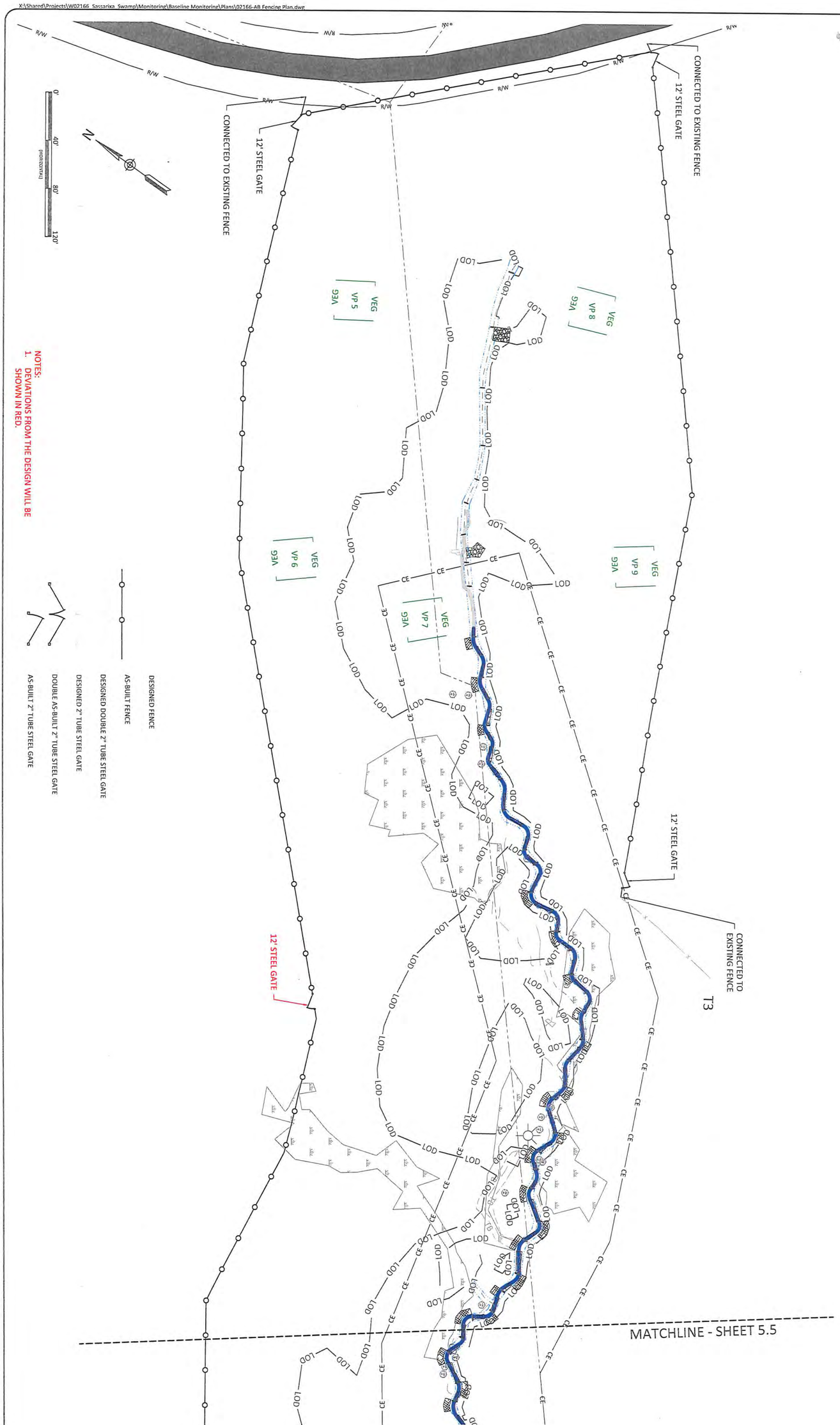

NOTES:

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DESIGNED FENCE

AS-BUILT FENCE

DESIGNED DOUBLE 2" TUBE STEEL GATE

DESIGNED 2" TUBE STEEL GATE

DOUBLE AS-BUILT 2" TUBE STEEL GATE

AS-BUILT 2" TUBE STEEL GATE

Date:	JUNE 28, 2021
Job Number:	005-02166
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5.6

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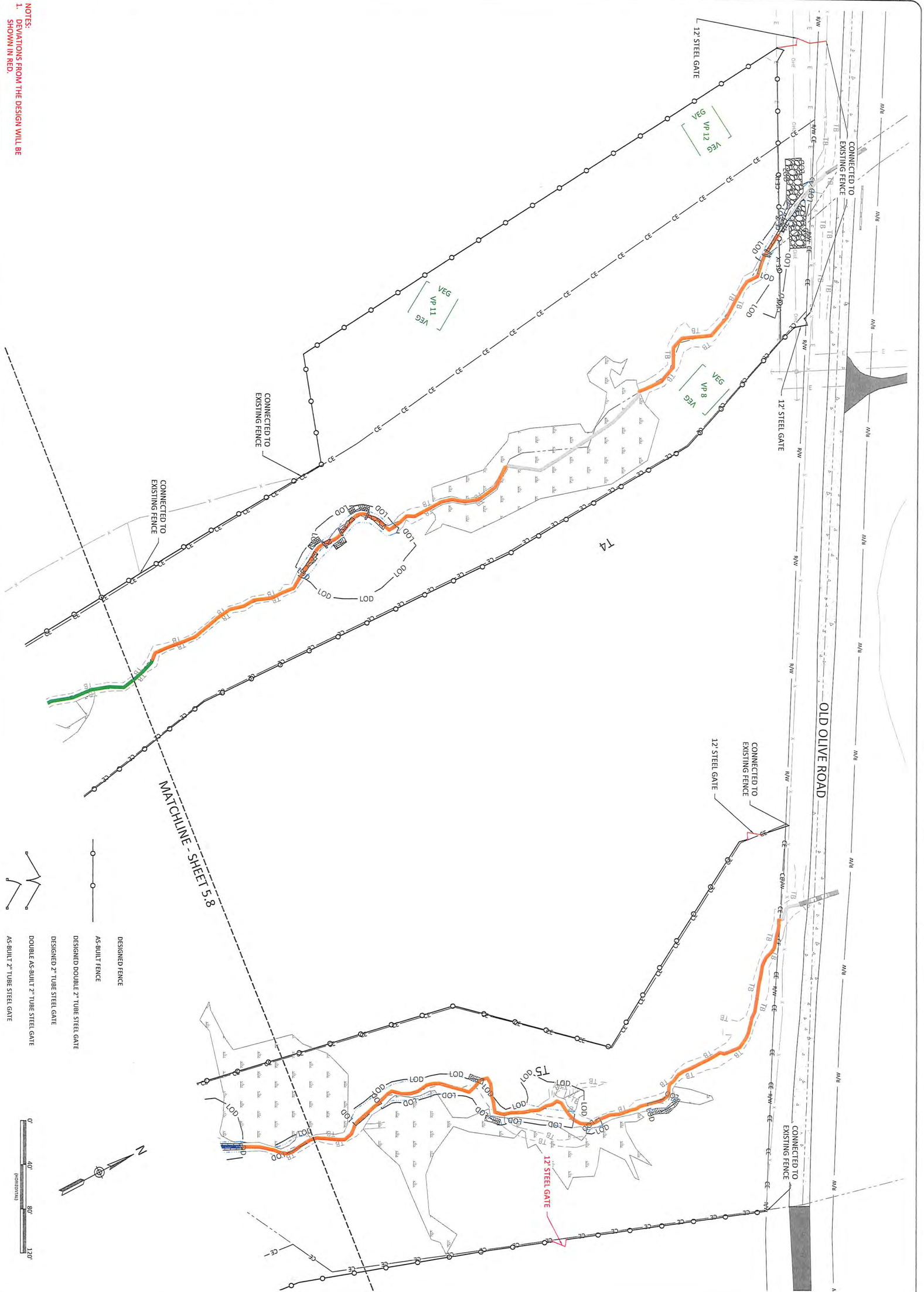

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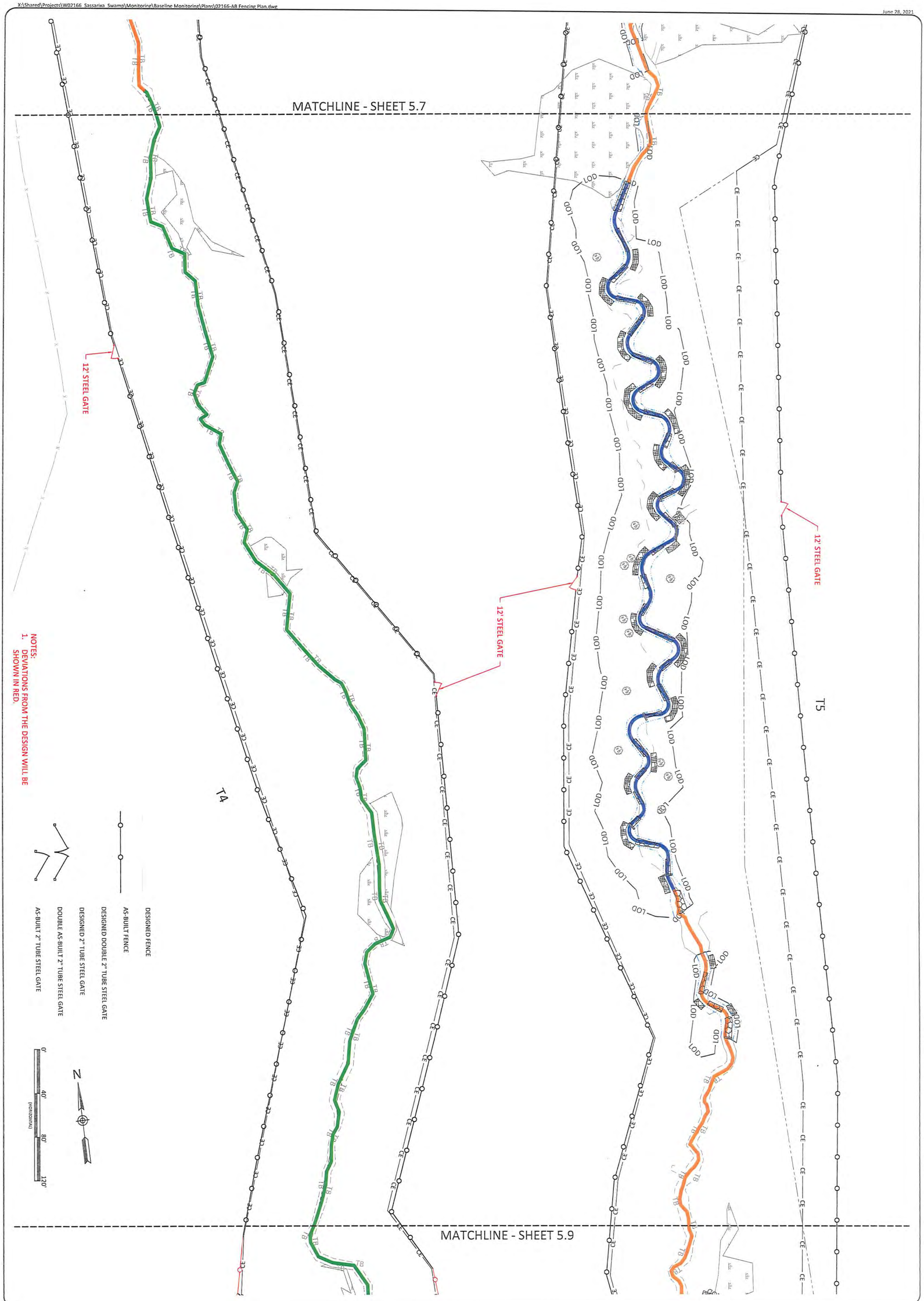

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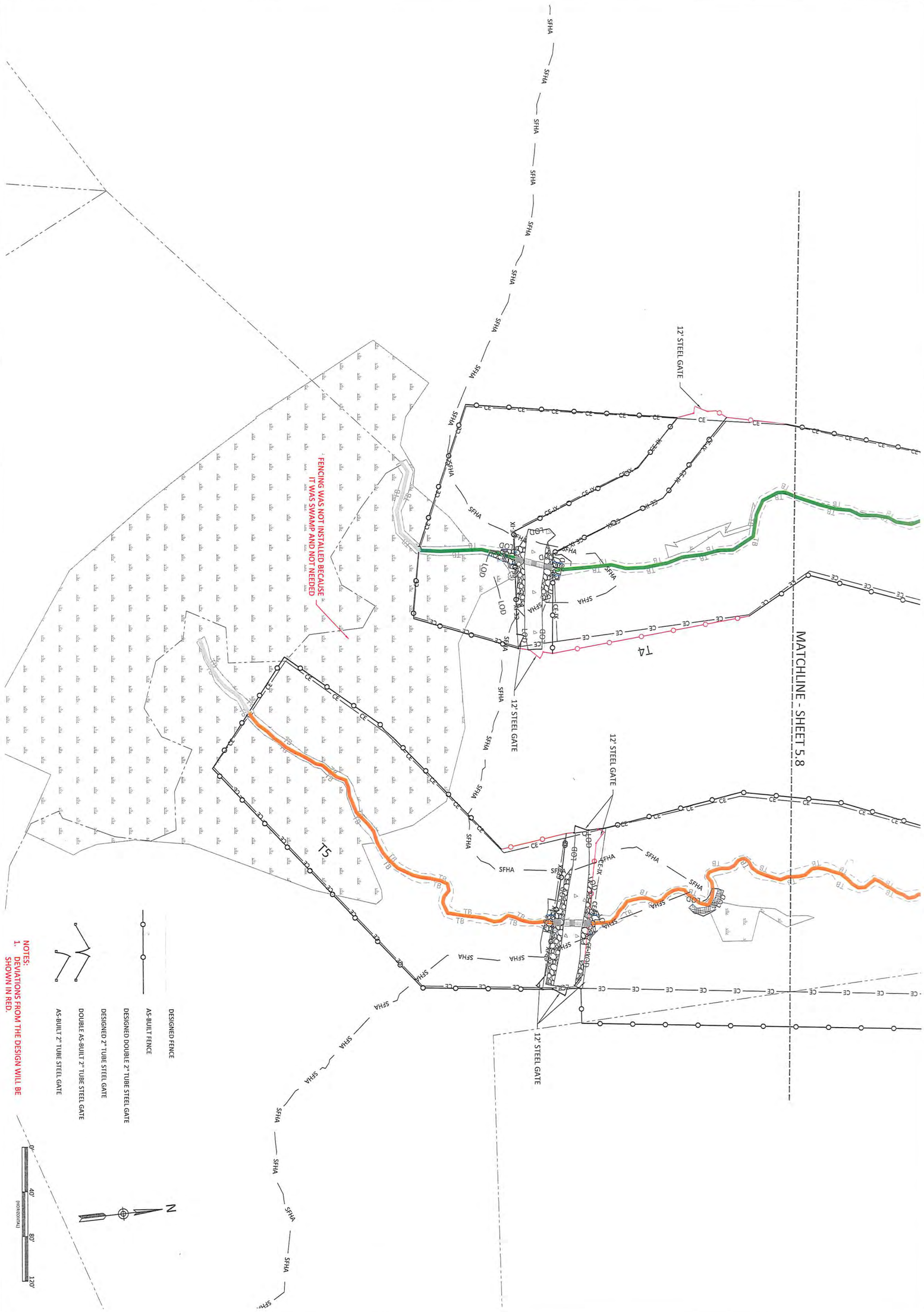

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Johnston County, North Carolina

Fencing Plan

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MATCHLINE - SHEET 5.11

POND

16' STEEL GATE

12' STEEL GATE

VEG VP 12 VEG

16' STEEL GATE

CONNECTED TO EXISTING FENCE

PRESERVE DRAIN TILES

CONNECTED TO EXISTING FENCE

12' STEEL GATE

T5A

12' STEEL GATE INSTALLED PER OWNER REQUEST

DESIGNED FENCE

AS-BUILT FENCE

DESIGNED DOUBLE 2" TUBE STEEL GATE

DESIGNED 2" TUBE STEEL GATE

DOUBLE AS-BUILT 2" TUBE STEEL GATE

AS-BUILT 2" TUBE STEEL GATE

NOTES:
1. DEVIATIONS FROM THE DESIGN WILL BE SHOWN IN RED.

N

0' 40' 80' 120'
(HORIZONTAL)

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Johnston County, North Carolina

Fencing Plan

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June 28, 2021

CONNECTED TO EXISTING FENCE
16' STEEL GATE
16' STEEL GATE
12' STEEL GATE
12' STEEL GATE
16' STEEL GATE
POND
VEG
VP 14
VEG
VEG
VP 13
VEG
VEG
VP 15
VEG
T5C
T5B
VEG
VP 9
VEG
16' STEEL GATE
CONNECTED TO EXISTING FENCE
PRESERVE EXISTING DRAIN TILES
MATCHLINE - SHEET 5.10
POND

DESIGNED FENCE
AS-BUILT FENCE
DESIGNED DOUBLE 2" TUBE STEEL GATE
DESIGNED 2" TUBE STEEL GATE
DOUBLE AS-BUILT 2" TUBE STEEL GATE
AS-BUILT 2" TUBE STEEL GATE

N

0' 40' 80' 120'
(HORIZONTAL)

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Sassarixa Swamp Mitigation Site
Johnston County, North Carolina

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June 28, 2021

OLD OLIVE ROAD

CONNECTED TO EXISTING FENCE

12' STEEL GATE

CONNECTED TO EXISTING FENCE

12' STEEL GATE

VEG VP 10 VEG

VEG VP 16 VEG

VEG VP 17 VEG

VEG VP 19 VEG

T6

CONNECTED TO EXISTING FENCE

12' STEEL GATE

MATCHLINE - SHEET 5.13

N

0' 40' 80' 120'
(HORIZONTAL)

DESIGNED FENCE

AS-BUILT FENCE

DESIGNED DOUBLE 2" TUBE STEEL GATE

DESIGNED 2" TUBE STEEL GATE

DOUBLE AS-BUILT 2" TUBE STEEL GATE

AS-BUILT 2" TUBE STEEL GATE

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Johnston County, North Carolina

Fencing Plan

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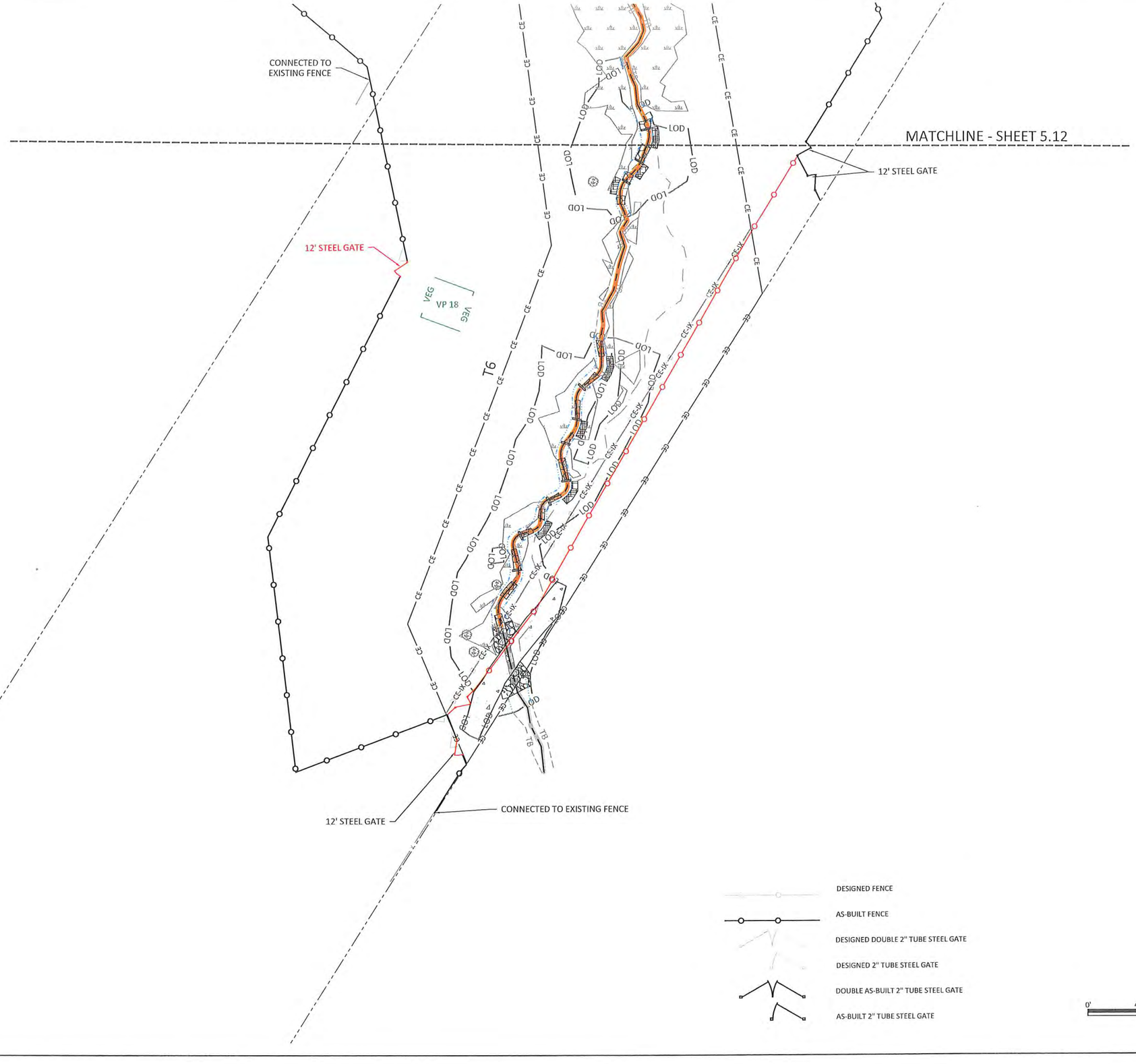

DESIGNED FENCE

AS-BUILT FENCE

DESIGNED DOUBLE 2" TUBE STEEL GATE

DESIGNED 2" TUBE STEEL GATE

DOUBLE AS-BUILT 2" TUBE STEEL GATE

AS-BUILT 2" TUBE STEEL GATE

N

0' 40' 80' 120'
(HORIZONTAL)

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Johnston County, North Carolina

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APPENDIX F. Buffer Baseline Monitoring Report

Buffer Baseline Monitoring Report

July 2021

SASSARIXA SWAMP MITIGATION SITE

Johnston County, NC
NCDEQ Contract No. 7425
DMS ID No. 100040
DWR Project Number 2018-0198

Neuse River Basin
HUC 03020201

RFP #: 16-007279

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

BUFFER BASELINE MONITORING REPORT

SASSARIXA SWAMP MITIGATION SITE

Johnston County, NC
NCDEQ Contract No. 7425
DMS ID No. 100040

Neuse River Basin
HUC 03020201

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

PREPARED BY:

Wildlands Engineering, Inc.
312 West Millbrook Road, Suite 225
Raleigh, NC 27609
Phone: (919) 851-9986

This Baseline Monitoring Plan has been written in conformance with the requirements of the following:

- 15A NCAC 02B .0295 Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers.
- NCDEQ Division of Mitigation Services In-Lieu Fee Instrument signed and dated July 28, 2010.

These documents govern DMS operations and procedures for the delivery of compensatory mitigation.

Contributing Staff:

Angela Allen, *Project Manager*
John Hutton, *Principal in Charge*
Jason Lorch, *Baseline Monitoring Plan*
Greg Turner, *Construction Administrator*
Carolyn Lanza, *Monitoring Lead*
Andrea Eckardt, *Lead Quality Assurance*

TABLE OF CONTENTS

1.0 Mitigation Project Summary 1
1.1 Project Goals 1
1.2 Pre-construction Site Conditions 1
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4.0 Annual Monitoring and Performance Criteria 3
4.1 Vegetation 4
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1.0 Mitigation Project Summary

The Sassarixa Swamp Mitigation Site (Site) is a riparian restoration project located in Johnston County approximately six miles southwest of Smithfield and five miles north of Four Oaks (Figure 1). Figure 2 depicts the service area of the Site which does not include the Falls Lake watershed in the Neuse River Basin. A conservation easement comprised of 65.06 acres along Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek was recorded on the Site (Figure 3). Before construction, the Site was characterized by a mix of active pastures, fields, and woodlands. The project is expected to generate 1,080,282.590 riparian buffer credits.

The Site is within Hydrologic Unit Code (HUC) 03020201130030 and North Carolina Department of Water Resources (NCDWR) Sub-basin 03-04-04. The Site drains to Holts Lake, which is a recreational lake classified as Nutrient Sensitive Waters (NSW). Holts Lake then drains to the Neuse River, which is a water supply for the City of Goldsboro.

1.1 Project Goals

The Sassarixa Swamp Mitigation Site is located in a new Targeted Local Watershed (TLW) that is not described in the 2010 Neuse River Basin Restoration Priorities (RBRP) Plan. The TLW was added in the 2015 Neuse 01 Cataloging Unit (CU) Update because there were more water quality issues than assets. The Site addresses the TLW stressors of agricultural land use/animal operations and the lack of protected riparian areas. The project will also address key CU wide restoration goals for the Neuse River 03020201 described in the RBRP (NC DWR 2009). Specific enhancements to water quality and ecological processes are outlined below:

- Decrease nutrient levels - Nutrient input will be decreased by filtering runoff from the agricultural fields through restored native buffer zones. The off-site nutrient input will also be absorbed on-site by dispersing flood flows through native vegetation, thereby reducing nutrient inputs to waters of the Neuse River Basin.
- Exclude cattle from project streams. - Install fencing around project areas adjacent to cattle pastures.
- Decrease water temperature and increase dissolved oxygen concentrations - Establishment and maintenance of riparian buffers will create additional long-term shading of the channel flow to reduce thermal pollution.
- Restore and enhance native floodplain vegetation - Plant native tree species in riparian zone where currently insufficient.
- Permanently protect the Site from harmful uses - Establish a conservation easement on the Site. Protect aquatic habitat; protecting water supply waters.

1.2 Pre-construction Site Conditions

Before construction, the 65.06-acre project was a mix of active pastures, fields, and woodlands along Sassarixa Creek and thirteen unnamed tributaries that drain into the Holts Lake watershed, which is part of the Neuse River Basin. Sassarixa Creek, T3, T4, T5, and T6 are all perennial streams; while T1, T1A, T1B, T1C, T1D, T2, T5a, T5b, and T5c are intermittent streams. The riparian buffer project attributes are listed in Table 1, located in Appendix 1.

The project includes several adjacent properties that have been owned and operated as a livestock farm by a single family since 1850, where livestock are continually rotated through all fields (with access to their associated streams). The western portion of the project includes Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek (T1, T1A, T1B, T1C, T1D, T2, and T3) (Figure 2). The eastern

portion of the site contains six unnamed tributaries to Black Creek (T4, T5, T5A, T5B, T5C, and T6). A review of historic aerials from 1950 to 2012, showed that onsite streams have existed in their approximate locations with very little change to riparian zones since 1950. Two alterations to the Site visible from aerial photography are the addition of the pond on T2 between 1964 and 1973, and the addition of the large pond below T5A, T5B, and T5C, between 1950 and 1961.

On February 9, 2018 (dated May 21, 2018), NCDWR conducted on-site determinations to review features and land use within the project boundary. In March 2019 Ms. Sam Dailey, with USACE, determined two additional features, T1B and T1C, within the project boundary as intermittent channels, resulting in an additional NCDWR site-viability letter dated April 3, 2019. The resulting NCDWR site viability letters and map confirming the Site as suitable for riparian buffer and nutrient offset mitigation are located in Appendix 2. Sassarixa Swamp and the seven unnamed tributaries along with six additional unnamed tributaries to Black Creek were determined to be appropriate for buffer and nutrient offset mitigation as related to the rules set forth in the Neuse Buffer Mitigation Rules: Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers (15A NCAC 02B .0295) and Neuse River Basin: Nutrient Sensitive Waters Management Strategy: Protection and Maintenance of Existing Riparian Buffers (15A NCAC 02B .0233).

2.0 Determination of Credits

The project is expected to generate 1,080,282.590 riparian buffer credits, through buffer restoration, buffer enhancement via cattle exclusion, coastal headwater buffer restoration per the Consolidated Buffer Mitigation Rules (15A NCAC 02B 0.0295 (o)(2)) and buffer preservation per the Consolidated Buffer Mitigation Rules (15A NCAC 02B 0.0295 (o)). There is also potential to convert some buffer credits to nutrient offset credits, dependent on the need. Mitigation credits are presented in Tables 2a and 2b and illustrated in Figure 3 (Appendix 1). Calculations are based upon the as-built survey included in Appendix 3.

Since approval of the Mitigation Plan, there have been some minor changes to credits. The final conservation easement changed resulting in a 0.04-acre subtraction to credits being claimed. Accuracy of survey and excluding wetland outlet features that were not planted account for an additional 2.68-acre subtraction.

3.0 Baseline Summary

The Wildlands Team restored riparian areas along Sassarixa Creek and seven unnamed tributaries to Sassarixa Creek, along with six unnamed tributaries to Black Creek on the Site. The buffer and nutrient offset mitigation took place in conjunction with Sassarixa Swamp Stream Mitigation Project. The project design ensured that no adverse impacts to existing riparian areas occurred. Figure 3 illustrates the as-built conditions for the Site. Detailed descriptions of the restoration activity follow in Sections 3.1 through 3.4. Overview site photographs are included in Appendix 4.

3.1 Parcel Preparation

Prior to stream construction, the Site was a mix of active pastures, fields, and woodlands. The pond along T2 was removed as part of the stream restoration. During stream construction, invasive plants were targeted and removed to reduce native competition. Soil amendments were added to certain graded areas after construction as directed by soil test results. Amendments included agricultural lime, slow release fertilizer, and soil conditioners (humic acid, organic material, soil biota stimulants). Haul roads and other high trafficked areas were also ripped to a depth of 18" where possible to reduce soil

compaction. The approved regulatory permits for the stream mitigation project are included in Appendix 5.

3.2 Riparian Area Restoration Activities

The vegetation plan for the riparian restoration area included permanent seeding and planting bare root trees. These vegetation efforts were coupled with the select treatment of invasive species to control their population. The species composition planted was selected based on the desired community type, occurrence of species in riparian areas adjacent to the Site, and best professional judgement. The total number of tree species planted across the buffer areas are as follows: willow oak (*Quercus phellos*) 1,379 stems, American sycamore (*Platanus occidentalis*) 1,907 stems, river birch (*Betula nigra*) 1,907 stems, water oak (*Quercus nigra*) 551 stems, swamp chestnut oak (*Quercus michauxii*) 1,396 stems, eastern cottonwood (*Populus deltoides*) 540 stems, box elder (*Acer negundo*) 1,350 stems, sweetbay magnolia (*Magnolia virginiana*) 463 stems, cherrybark oak (*Quercus pagoda*) 66 stems, American Elm (*Ulmus alata*) 33 stems, and black willow (*Salix nigra*) 33 stems. In total, 9,619 stems were planted across the site.

Trees were planted at a density sufficient to meet the performance standards outlined in the Rule 15A NCAC 02B .0295 of 260 trees per acre at the end of five years. An appropriate seed mix was applied as necessary to provide temporary ground cover for soil stabilization and reduction of sediment loss during rain events in disturbed areas. This was followed by an appropriate permanent seed mixture. Tree planting was completed in March 2021.

Vegetation management and herbicide applications will be implemented as needed during tree establishment in the restoration areas to prevent establishment of invasive species that could compete with the planted native species.

3.3 Riparian Area Enhancement Activities

Fencing was used to exclude cattle throughout the project as allowed by 15A NCAC 02B .0295(o) and minimal work was done on the streams through the enhancement areas. The enhancement areas have been protected in perpetuity under a conservation easement.

Vegetation management and herbicide applications were implemented prior to construction along existing forested areas to prevent the spread of invasive species that could compete with planted native species. Dense Chinese privet (*Ligustrum sinense*) and trifoliate orange (*Citrus trifoliata*) was removed along Sassarixa Creek. Sporadic trees of Bradford pear (*Pyrus calleryana*), tree-of-heaven (*Ailanthus altissima*), and princess tree (*Paulownia tomentosa*) were removed along T4 and T5. Invasive species will continued to be monitored and controlled as necessary.

3.4 Riparian Area Preservation Activities

No work was done in the buffer preservation areas, as allowed under 15A NCAC 02B .0295(o). The preservation area has been protected in perpetuity under a conservation easement.

4.0 Annual Monitoring and Performance Criteria

The performance criteria for the Site follows approved performance criteria presented in the guidance documents outlined in Request for Proposal (RFP) 16-007279 and the Consolidated Buffer Rule (15A NCAC 02B .0295). Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. The riparian restoration project has been assigned specific performance criteria components for vegetation that will be evaluated throughout the five-year post-construction monitoring for buffer restoration, buffer enhancement, cattle exclusion, and buffer preservation and seven-year post-construction monitoring for coastal headwater buffers. An outline of

the performance criteria and monitoring components follows. Monitoring components are included in Table 3 and vegetation plots are depicted in Figure 4 (Appendix 1).

4.1 Vegetation

Performance Standards for the Site will be based on the health and survival of a minimum density of 260 trees per acre after five years of monitoring, with a minimum of four native hardwood tree or shrub species composition and no one species comprising more than 50 percent of stems. Coastal headwater buffers will be visually assessed for seven years of monitoring. Height, visual assessment of damage, and vigor will be used as indicators of overall health. Desirable volunteer species may be included to meet the success criteria upon DWR approval. The extent of invasive species coverage will also be monitored and treated as necessary throughout the required five-year monitoring period.

Ten fixed 100 square meter vegetation monitoring quadrants were installed across the Site to measure the survival of the planted stems (Figure 4). Vegetation monitoring resulted in a stem density range of 445 to 648 planted stems per acre (Table 4). Vegetation monitoring follows the CVS-EEP Level 2 Protocol for Recording Vegetation (2008). All planted stems were marked with flagging tape and a reference photograph was taken from the southwestern corner of each vegetation plot during vegetation assessments. Each year, trees will be re-marked and plot photos will be taken along with overview photographs of the Site. Appendix 6 includes the baseline (MY0) vegetation plot data and vegetation performance standards summary tables, as well as plot photographs.

4.2 Overview Photographs

Photographs will be taken within the project area once a year to visually document stability for five years following construction. Baseline overview photographs are included in Appendix 4.

4.3 Visual Assessments

Visual assessments should support the performance standards for each metric as described above. Visual assessments will be performed within the Site on a semi-annual basis during the five-year monitoring period. Problem areas with vegetative health will be noted (e.g. low stem density, vegetation mortality, invasive species, or encroachment). Areas of concern will be mapped and photographed accompanied by a written description in the annual report. Problem areas will be re-evaluated during each subsequent visual assessment.

4.4 Annual Reporting Performance Criteria

Using the Division of Mitigation Services (DMS) Riparian Buffer and Nutrient Offset Buffer Baseline and Annual Monitoring Report Template version 2.0 (2017), monitoring reports will be prepared in the fall of each monitoring year and submitted to DMS. The monitoring period will extend five years beyond completion of construction or until performance criteria have been met.

For coastal headwater buffer restoration areas under Rule 15A NCAC 02B .0295 (o)(2) the success for coastal headwaters vegetation is dependent on the success of the coastal headwater system (T5C). As stated in the NCDMS Sassarixa Swamp Mitigation Plan, visual monitoring will take place for seven years to insure T5C stays a coastal headwater and will be reported in the annual Monitoring Reports. A technical memorandum will be used to document the success of T5C and the coastal headwater buffers for Monitoring Year 6 and 7. This will be included in the Appendix of the NCDMS Sassarixa Swamp Annual Monitoring Report.

4.5 Maintenance and Contingency Plans

The conservation easement has been properly and accurately marked by adding witness posts with easement placards along the easement boundary and at every corner. Adaptive management will be performed during the monitoring years to address minor issues as necessary. If during annual

monitoring it is determined the project's ability to achieve performance standards are jeopardized, Wildlands will notify and work with the DMS/NCDWR to develop contingency plans and remedial actions. Any actions implemented will be designed to achieve the success criteria specified previously and will include a work schedule and updated monitoring criteria (if applicable).

5.0 References

Breeding, R. 2010. Neuse River Basin Restoration Priorities. North Carolina Ecosystem Enhancement Program. Accessed at: https://files.nc.gov/ncdeq/Mitigation%20Services/Watershed_Planning/Neuse_River_Basin/FINAL%20RBRP%20Neuse%202010_%2020111207%20CORRECTED.pdf

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Natural Resources Conservation Service (NRCS), 2011. Web Soil Survey. Accessed at: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

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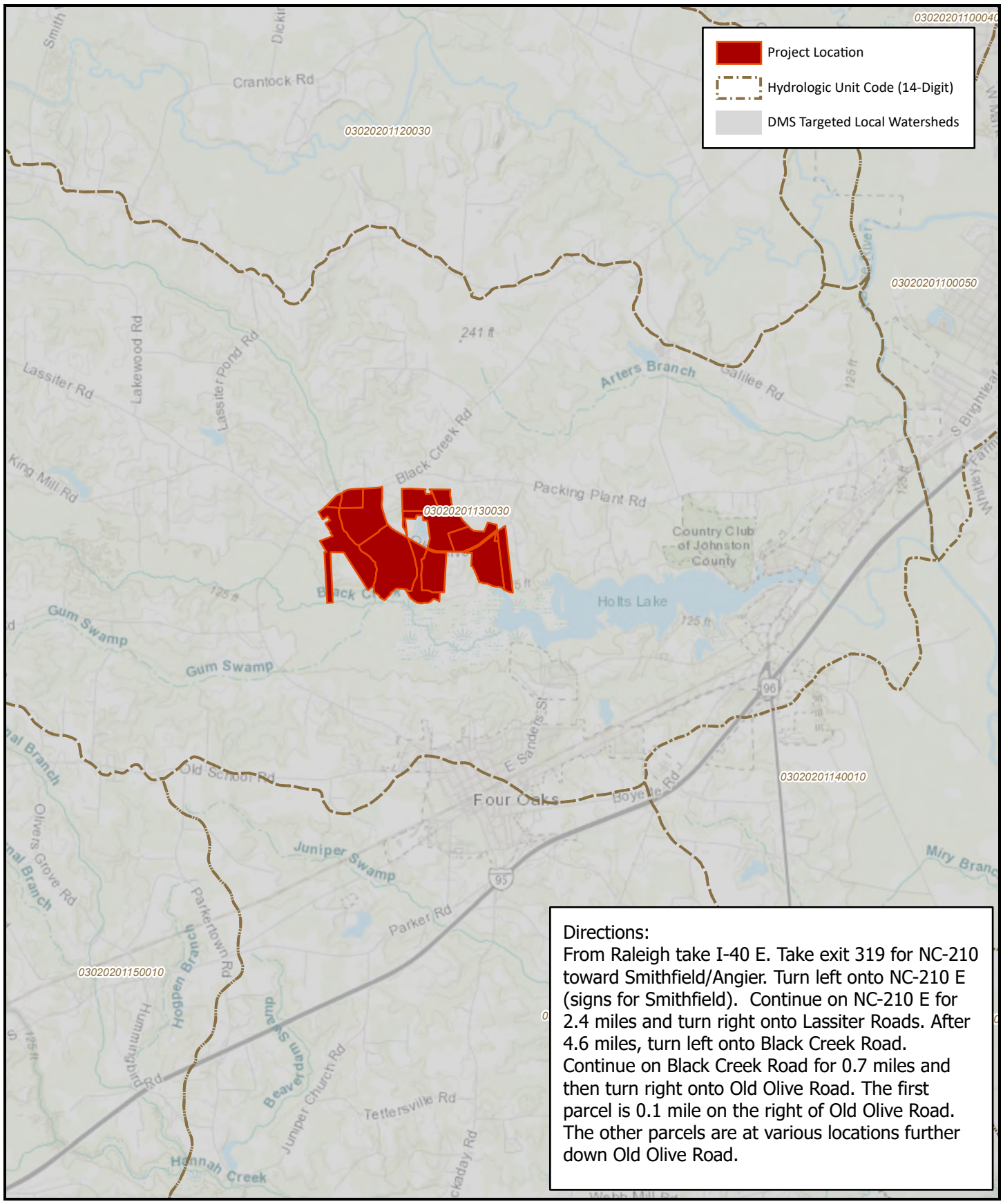
North Carolina Department of Environmental Quality, Division of Water Resources (NCDWR). 2015. 15A NCAC 02B .0295 Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers. Accessed at: http://reports.oah.state.nc.us/ncac/title%2015a%20-%20environmental%20quality/chapter%2002%20-%20environmental%20management/subchapter%20b/15a%20ncac%2002b%20.0295.pdf

North Carolina Department of Environmental Quality, Division of Water Resources (NCDWR). 2011. Surface Water Classifications. Accessed at: https://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/classifications#DWRPrimaryClassification

Wildlands Engineering, Inc. (2020). Sassarixa Swamp Mitigation Site – Riparian Buffer Mitigation Plan. North Carolina Department of Environmental Quality, Division of Mitigation Services (NCDMS), Raleigh, NC.

APPENDIX 1. General Figures and Tables



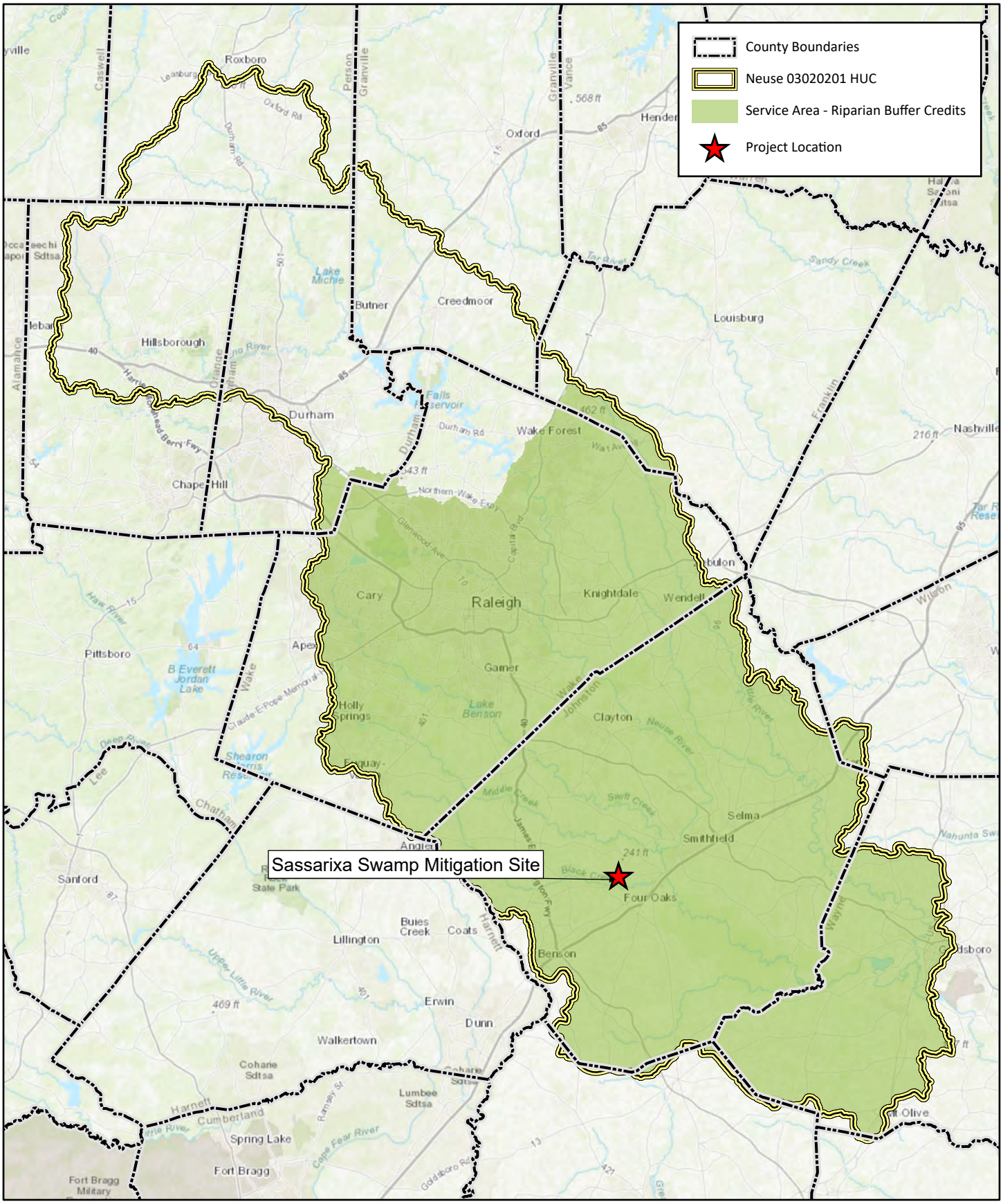
WILDLANDS ENGINEERING

0 0.5 1 Miles

N

Figure 1. Vicinity Map
Sassarixa Swamp Mitigation Site
Baseline Monitoring Report (MY0)
Neuse River Basin 03020201

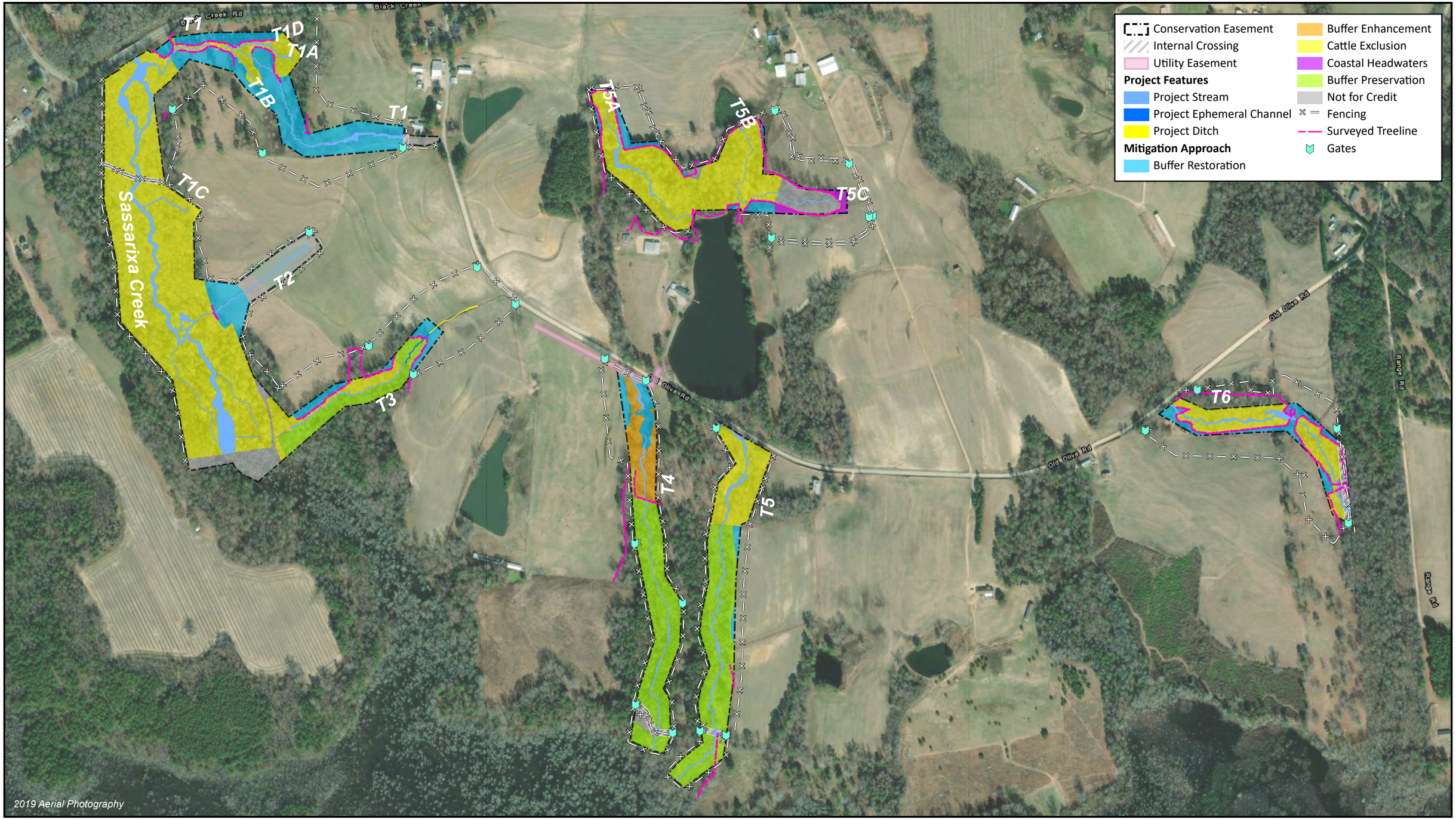
Johnston County, NC



WILDLANDS ENGINEERING

Figure 2. Service Area Map
Sassarixa Swamp Mitigation Site
Baseline Monitoring Report (MY0)
Neuse River Basin 03020201

Johnston County, NC



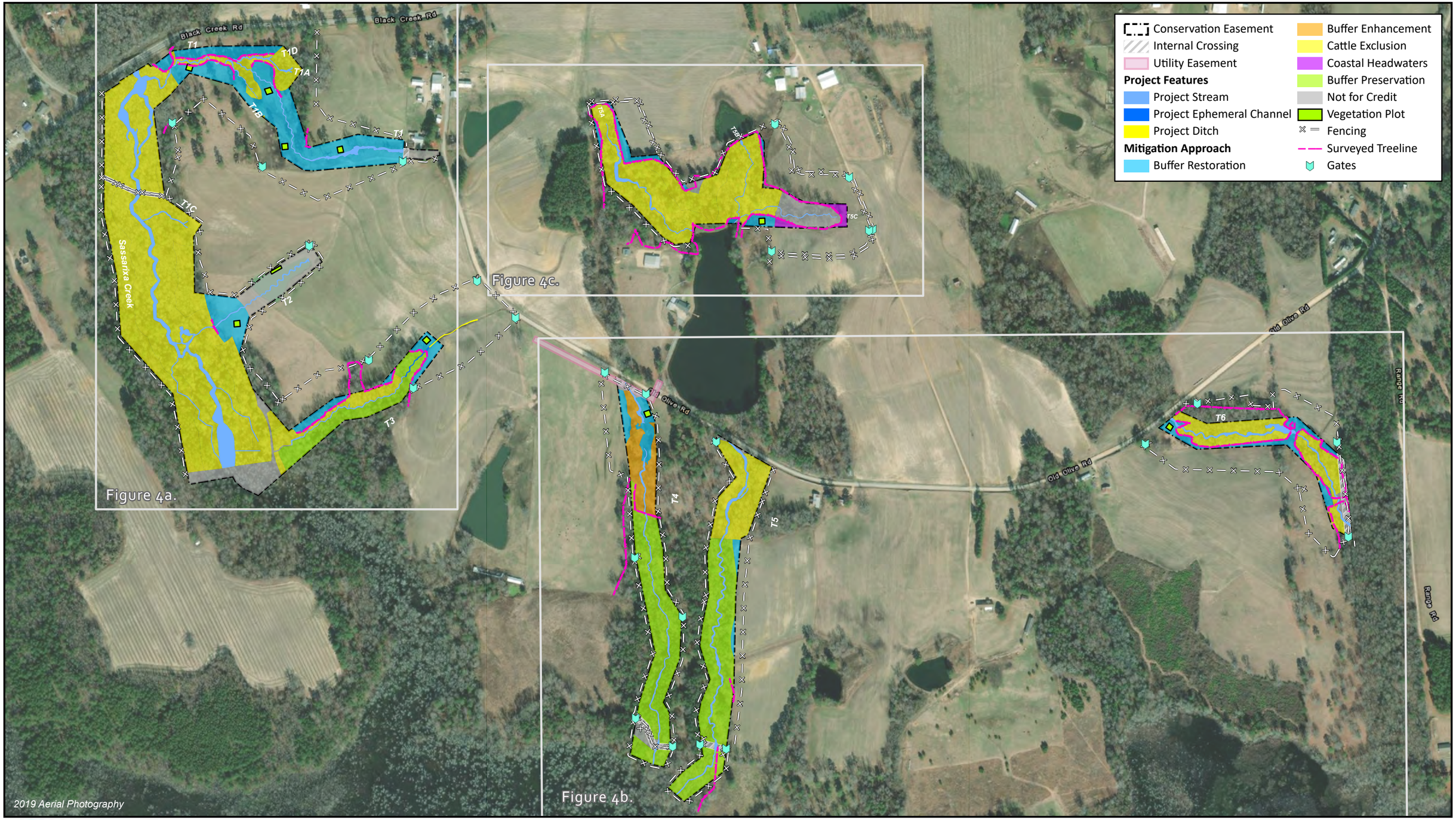
WILDLANDS ENGINEERING

0 500 1,000 Feet

N

Figure 3. Project Component / Asset Map
Sassarixa Swamp Mitigation Site
Baseline Monitoring Report (MY0)
Neuse River Basin (03020201)

Johnston County, NC



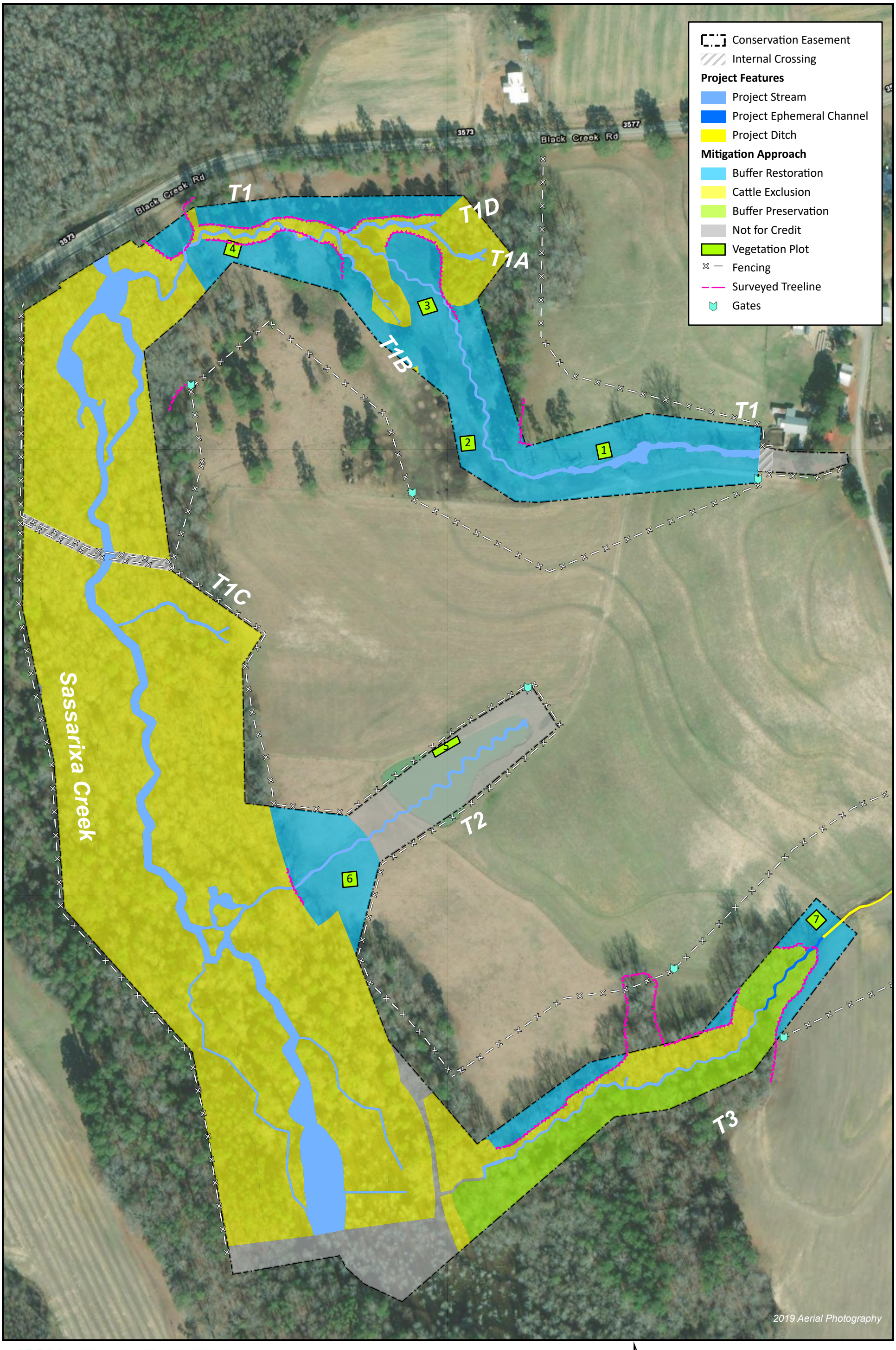
WILDLANDS ENGINEERING

0 500 1,000 Feet

N

Figure 4. Monitoring Plan View Map Key
Sassarixa Swamp Mitigation Site
Baseline Monitoring Report (MY0)
Neuse River Basin (03020201)

Johnston County, NC



WILDLANDS ENGINEERING

0 200 400 Feet

N

Figure 4a. Monitoring Plan View Map
Sassarixa Swamp Mitigation Site
Baseline Monitoring Report (MY0)
Neuse River Basin (03020201)

Johnston County, NC

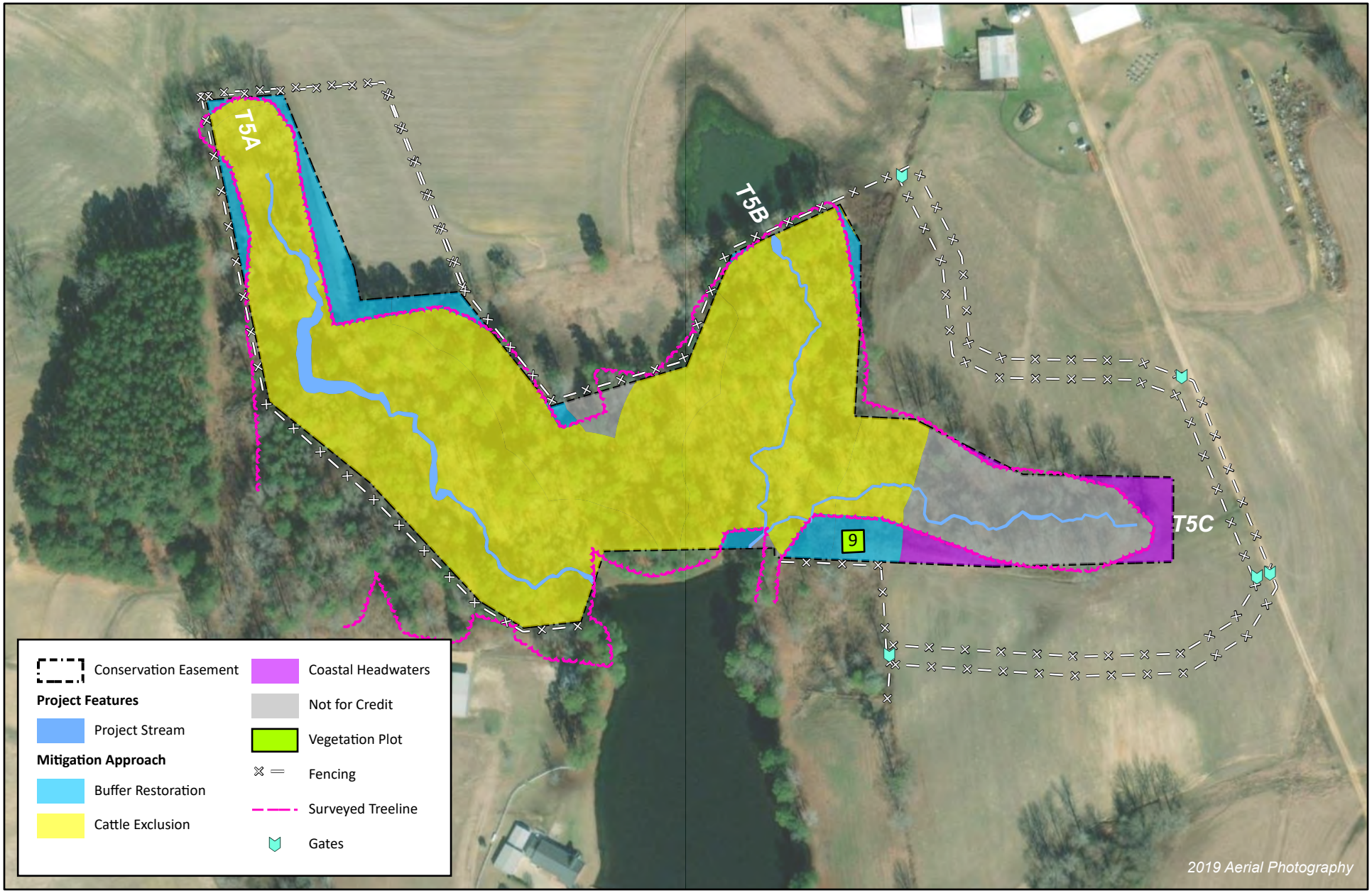
WILDLANDS ENGINEERING

0 300 600 Feet

N

Figure 4b. Monitoring Plan View Map
Sassarixa Swamp Mitigation Site
Baseline Monitoring Report (MY0)
Neuse River Basin (03020201)

Johnston County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 4c. Monitoring Plan View Map
Sassarixa Swamp Mitigation Site
Baseline Monitoring Report (MY0)
Neuse River Basin (03020201)

Johnston County, NC

Table 1. Buffer Project Attributes

Sassarixa Swamp Mitigation Site

Monitoring Year 0 - 2021

Project Name	Sassarixa Swamp Mitigation Site
Hydrologic Unit Code	03020201130030
River Basin	Neuse
Geographic Location (Lat, Long)	35° 28’ 19.75” N, 78° 26’ 9.60” W
Site Protection Instrument (DB/PG)	DB3624/PG581 DB3719/PG4717 DB4358/PG908 DB46061/PG183
Total Credits	1,080,282.59 ft^2
Types of Credits	Riparian Buffer
Mitigation Plan Date	November 2019
Initial Planting Date	March 5, 2021
Baseline Report Date	June 2021
MY1 Report Date	December 2021
MY2 Report Date	December 2022
MY3 Report Date	December 2023
MY4 Report Date	December 2024
MY5 Report Date	December 2025

Table 2a. Mitigation Credits

Sassarixa Swamp Mitigation Site

Monitoring Year 0 - 2021

Neuse 03020201 - Outside Falls Lake	**Project Area**
#N/A	**N Credit Conversion Ratio (ft^2/pound)**
#N/A	**P Credit Conversion Ratio (ft^2/pound)**

Credit Type	Location	Subject? (enter NO if ephemeral or ditch [1])	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (ft^2)	Total (Creditable) Area of Buffer Mitigation (ft^2)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Convertible to Riparian Buffer?	Riparian Buffer Credits	Convertible to Nutrient Offset?	Delivered Nutrient Offset: N (lbs)	Delivered Nutrient Offset: P (lbs)
Buffer	Rural	Yes	I / P	Restoration	0-50	T4	3,667	3,667	1	100%	1.00000	Yes	3,667.000	No	—	—
Buffer	Rural	Yes	I / P	Restoration	0-100	T1, T1A, T1B, T2, T4, T5, T5A, T5B, T6	356,716	356,716	1	100%	1.00000	Yes	356,716.000	Yes	18,613.918	—
Buffer	Rural	Yes	I / P	Restoration	101-200	T2, T4, T5A, T5B	48,375	48,375	1	33%	3.03030	Yes	15,963.766	Yes	2,524.272	—
Buffer	Rural	No	Ephemeral	Restoration	0-100	T3	15,114	15,114	1	100%	1.00000	Yes	15,114.000	Yes	788.669	—
Buffer	Rural	Yes	Coastal Headwater	Restoration	0-100	T5C	13,073	13,073	1	100%	1.00000	Yes	13,073.000	No	—	—
Buffer	Rural	Yes	I / P	Enhancement	0-50	T4	217	217	2	100%	2.00000	Yes	108.500	Yes	11.323	—
Buffer	Rural	Yes	I / P	Enhancement	0-100	T4	59,812	59,812	2	100%	2.00000	Yes	29,906.000	Yes	3,121.070	—
Buffer	Rural	Yes	I / P	Enhancement	101-200	T4	3,129	3,129	2	33%	6.06061	Yes	516.285	Yes	163.275	—
Buffer	Rural	Yes	I / P	Enhancement via Cattle Exclusion	20-29	Sassarixa Creek, T5	735	735	2	75%	2.66667	Yes	275.625	No	—	—
Buffer	Rural	Yes	I / P	Enhancement via Cattle Exclusion	0-50	Sassarixa Creek, T5, T6	6,000	6,000	2	100%	2.00000	Yes	3,000.000	No	—	—
Buffer	Rural	Yes	I / P	Enhancement via Cattle Exclusion	0-100	Sassarixa Creek, T1, T1A, T1B, T1C, T2, T3, T5, T5A, T5B, T6	1,070,780	1,070,780	2	100%	2.00000	Yes	535,390.000	No	—	—
Buffer	Rural	Yes	I / P	Enhancement via Cattle Exclusion	101-200	Sassarixa Creek, T1A, T2, T3, T5, T5A, T5C	358,197	358,197	2	33%	6.06061	Yes	59,102.467	No	—	—
						Totals (ft2):	**1,935,815**	**1,935,815**					**1,032,832.642**		**25,222.527**	**—**
						Total Buffer (ft2):	**1,935,815**	**1,935,815**								
						Total Nutrient Offset (ft2):	**0**	**N/A**								

Total Ephemeral Area (ft^2) for Credit:	**20,358**	**20,358**	
Total Eligible Ephemeral Area (ft^2):	**601,785**	**0.8%**	**Ephemeral Reaches as % TABM**
Total Eligible for Preservation (ft^2):	**645,272**	**18.3%**	**Preservation as % TABM**

Enter Preservation Credits Below

Credit Type	Location	Subject?	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Total (Creditable) Area for Buffer Mitigation (ft^2)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits
Buffer	Rural	Yes	I / P	Preservation	20-29	T4	750	750	10	75%	13.33333	56.250
	Rural	Yes	I / P		0-50	T4, T5	1,847	1,847	10	100%	10.00000	184.700
	Rural	Yes	I / P		0-100	T3, T4, T5	460,676	460,676	10	100%	10.00000	46,067.600
	Rural	Yes	I / P		101-200	T4	2,806	2,806	10	33%	30.30303	92.598
	Rural	No	Ephemeral		0-100	T3	5,244	5,244	5	100%	5.00000	1,048.800
						Preservation Area Subtotals (ft^2):	**471,323**	**471,323**				

Table 2b. Total Area of Buffer and Nutrient Offset Mitigation

Sassarixa Swamp Mitigation Site

Monitoring Year 0 - 2021

TOTAL AREA OF BUFFER MITIGATION (TABM)			
Mitigation Totals		**Square Feet**	**Credits**
Restoration:		436,945	404,533.766
Enhancement:		1,498,870	628,298.876
Preservation:		471,323	47,449.948
Total Riparian Buffer:		2,407,138	1,080,282.590
TOTAL NUTRIENT OFFSET MITIGATION			
Mitigation Totals		**Square Feet**	**Credits**
Nutrient Offset:	**Nitrogen:**	0	0.000
	Phosphorus:		0.000

Table 3. Monitoring Components

Sassarixa Swamp Mitigation Site

Monitoring Year 0 - 2021

Parameter	Monitoring Feature	Quantity	Frequency
Vegetation	CVS Level 2	10 Plots	Year 1-5
	Visual	T5C	Year 1-7
Visual Assessment		Yes	Semi-Annual
Exotic and Nuisance Vegetation			Semi-Annual
Project Boundary			Semi-Annual

APPENDIX 2. DWR Correspondence

Water Resources
ENVIRONMENTAL QUALITY

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Interim Director

May 21, 2018

John Hutton
Wildlands Engineering, Inc.
312 West Millbrook Rd, Suite 225
Raleigh, NC 27609
(via electronic mail: jhutton@wildlandseng.com)

DWR ID# 2018-0198
Johnston County

Re: Site Viability for Buffer Mitigation and Nutrient Offset & Buffer- Sassarixa Swamp Site
2-162 Olive Rd, Smithfield, NC
Neuse 03020201 (not in Falls WS)

Dear Mr. Hutton,

On February 9, 2018, Katie Merritt, with the Division of Water Resources (DWR), received a request from Wildlands Engineering, Inc. (WEI) for an onsite mitigation determination near the above-referenced site (Site). The Site is located in the Neuse River Basin within the 8-digit Hydrologic Unit Code 03020201. The Site is being proposed as part of a full-delivery stream and riparian buffer mitigation project for the Division of Mitigation Services (RFP #16-007279). Members of the Interagency Review Team (IRT) and Division of Mitigation Services were also present onsite. At your request, on February 23, 2018, Ms. Merritt performed an onsite assessment of riparian land uses adjacent to streams onsite, which are shown on the attached map labeled "Figure 6A".

Ms. Merritt's evaluation of the features and their associated mitigation determination for the riparian areas are provided in the table below. The evaluation was made from Top of Bank (TOB) out to 200' from each existing or *proposed* feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0240.

Feature	Classification	[1]Subject to Buffer Rule	Riparian Land uses adjacent to proposed Feature (0-200')	Buffer Credit Viable	[2]Nutrient Offset Credit Viable at 2,273 lbs/acre	Mitigation Type Determination w/in riparian areas
T1A	Stream @ DWR flag	No	Forested pasture actively grazed by cattle	Yes[4]	Yes *(non-forested areas only)*	Enhancement Site per 15A NCAC 02B .0295 (o) (6)
T1	Stream	Yes	Forested & Non-forested pasture actively grazed by cattle	Yes[4]	Yes *(non-forested areas only)*	**Fields** - Restoration Site per 15A NCAC 02B .0295 (n) **Forested Areas** - Enhancement Site per 15A NCAC 02B .0295 (o) (6)
Sassarixa Creek (R2-R3)	Stream	Yes	Forested pasture grazed by cattle	Yes[4]	No	**Forested Areas** - Enhancement Site per 15A NCAC 02B .0295 (o) (6) No cattle observed in riparian areas below R-3 (see map)

Feature	Classification	[1]Subject to Buffer Rule	Riparian Land uses adjacent to proposed Feature (0-200')	Buffer Credit Viable	[2]Nutrient Offset Credit Viable at 2,273 lbs/acre	Mitigation Type Determination w/in riparian areas
T2 Pond	Pond (not in line)	No	Agriculture	No	No	N/A
T2 (inside woodline)	Stream	Yes	*(starts in the woodline)* Forested pasture grazed by cattle	Yes[4]	No	**Forested Areas** - Enhancement Site per 15A NCAC 02B .0295 (o) (6)
T3 (R1)	Ditch	No	Left Bank – Hay crop fields Right Bank – Non-forested pasture grazed by cattle	No	Yes	Restoration Site per 15A NCAC 02B .0295 (n)
T3 (R2)	Ephemeral	No	Left Bank- hay crop fields and forest Right Bank – a narrow fringe of forested areas; fields are actively grazed by cattle.	*Yes[3,5]	Yes *(non-forested areas only)*	**Forested Areas** - Preservation Site per 15A NCAC 02B .0295 (o)(7) **Fields** - Restoration Site per 15A NCAC 02B .0295 (o)(7) **Must meet additional requirements under .0295 (o)(7) to be viable for buffer mitigation*
T3 (R3)	Stream	Yes	Forested, no cattle present	Yes[3]	No	Preservation Site per 15A NCAC 02B .0295 (o)(5)
T4 (R1)	Stream	Yes	Partial canopy forested pasture actively grazed by cattle	Yes[4]	Yes	**Buffer Mitigation** – Enhancement Site per 15A NCAC 02B .0295 (o) (6) **Nutrient Offset** – Enhancement Site per 15A NCAC 02B .0295 (n) *(planting required)*
T4 (R2)	Stream	Yes	Partial canopy forested pasture actively grazed by cattle	Yes[4]	Yes	**Buffer Mitigation** – Enhancement Site per 15A NCAC 02B .0295 (o) (6) **Nutrient Offset** – Enhancement Site per 15A NCAC 02B .0295 (n) *(planting required)*
T4 (R3)	Wetland/ Inconsistent channelization	No	Forested	No	No	N/A
T5 (R1)	Stream	Yes	Full-canopy forested pasture actively grazed by cattle	Yes[4]	No	Enhancement Site per 15A NCAC 02B .0295 (o) (6)
T5 (R2-R3)	Stream	Yes	Right Bank- Forested Left Bank- mostly forested with a crop field	Yes[3]	Yes *(field only)*	**Forested Areas** - Preservation Site per 15A NCAC 02B (o)(5) **Fields** - Restoration Site per 15A NCAC 02B .0295 (n)

Feature	Classification	[1]Subject to Buffer Rule	Riparian Land uses adjacent to proposed Feature (0-200')	Buffer Credit Viable	[2]Nutrient Offset Credit Viable at 2,273 lbs/acre	Mitigation Type Determination w/in riparian areas
T5A	Stream	No	Full-canopy forested pasture actively grazed by cattle with adjacent ag fields	Yes[4]	No	Enhancement Site per 15A NCAC 02B .0295 (o) (6)
T5A Wetland (see map)	Wetland *(impacts from cattle in T5 stream resulted in a wetland)*	No	Full-canopy forested pasture actively grazed by cattle	(see note)	No	Mitigation Note: Proposing stream restoration to reconnect T5A stream throughout. If stream restoration is approved by the IRT and a stream channel is constructed, then the new riparian areas will be viable as an Enhancement Site per 15A NCAC 02B .0295 (o) (6)
T5B	Stream	Yes	Full-canopy forested pasture actively grazed by cattle	Yes[4]	No	Enhancement Site per 15A NCAC 02B .0295 (o) (6)
T5C	Headwater Stream/ Wetland complex	No	Full canopy forested pasture surrounded by agriculture fields	*Yes *(fields only)*	No	**Fields** - Restoration Site per 15A NCAC 02B .0295 (o)(2) **Must be approved by the IRT as a Coastal Headwater Stream Mitigation Site to be viable for credit.*
T6	Stream	Yes	Combination of forested pasture and agriculture fields	Yes[4]	Yes *(field only)*	**Fields** - Restoration Site per 15A NCAC 02B .0295 (n) **Forested Areas** - Enhancement Site per 15A NCAC 02B .0295 (o) (6)

[1]Subjectivity calls for the features were determined by DWR in correspondence dated April 5, 2018 and April 6, 2018 using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS.

[2] *NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment*

[3]The area of preservation credit within a buffer mitigation site shall comprise of no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 0295 (o)(5) and 15A NCAC 0295 (o)(4). Site cannot be a Preservation only site to comply with this rule.

[4]The area described as an Enhancement Site was assessed and determined to comply with all of 15A NCAC 02B .0295(o)(6).

[5]The area of the mitigation site on ephemeral channel shall comprise no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 02B .0295 (o)(7).

Maps that are attached to this letter were provided by WEI and were initialed by Ms. Merritt on May 21, 2018. This letter should be provided in all stream, wetland, buffer and/or nutrient offset mitigation plans for this Site.

This letter does not constitute an approval of this site to generate mitigation credits. Pursuant to 15A NCAC 02B .0295, a mitigation proposal and a mitigation plan shall be submitted to DWR for written approval **prior** to conducting any mitigation activities in riparian areas and/or surface waters for buffer mitigation credit. Pursuant to 15A NCAC 02B .0240, a proposal regarding a proposed nutrient

load-reducing measure for nutrient offset credit shall be submitted to DWR for approval prior to any mitigation activities in riparian areas and/or surface waters.

All vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset mitigation credits. For any areas depicted as not being viable for nutrient offset credit above, one could propose a different measure, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset in accordance with 15A NCAC 02B .0240.

This viability assessment will expire on May 21, 2020 or upon the submittal of an As-Built Report to the DWR, whichever comes first. Please contact Katie Merritt at (919)-807-6371 if you have any questions regarding this correspondence.

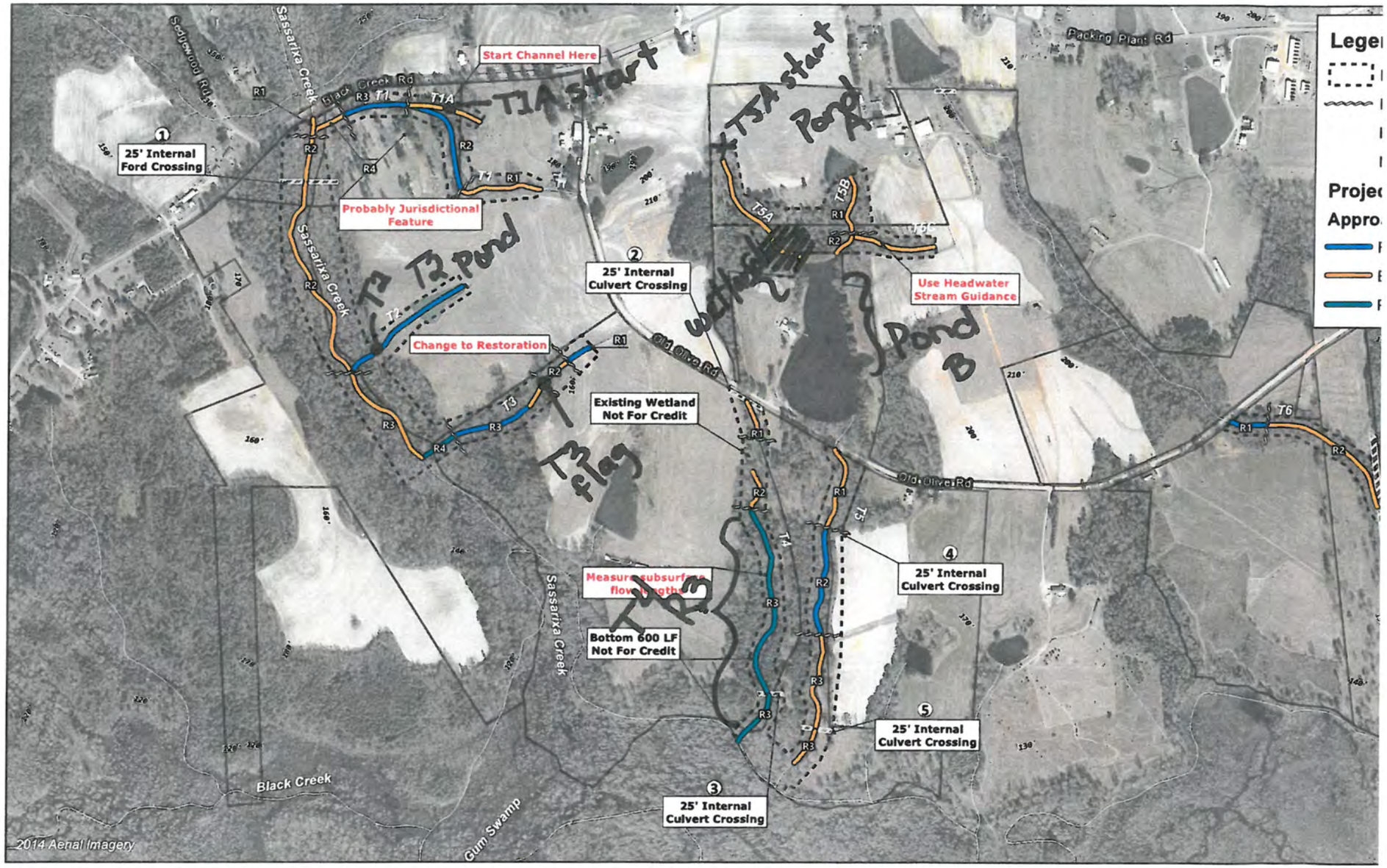
Sincerely,

Karen Higgins

Karen Higgins, Supervisor
401 and Buffer Permitting Branch

KAH/*km*
Attachments: Figure 6A

cc: File Copy (Katie Merritt)
DMS – Jeff Schaffer (via electronic mail)



WILDLANDS ENGINEERING

DWR#-2018-0198
KYM 4/4/18
(stream determination)

KYM 5/21/2018

Figure 6A

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Director

NORTH CAROLINA
Environmental Quality

April 3, 2019

Angela Allen
Wildlands Engineering, Inc.
312 West Millbrook Rd, Suite 225
Raleigh, NC 27609
(via electronic mail: aallen@wildlandseng.com)

DWR ID# 2018-0198
Johnston County

Re: Site Viability for Buffer Mitigation and Nutrient Offset & Buffer- Sassarixa Swamp (T1)
2-162 Olive Rd, Smithfield, NC
Neuse 03020201 (not in Falls WS)

Dear Ms. Allen,

On February 20, 2019, Katie Merritt, with the Division of Water Resources (DWR), received a request from you on behalf of Wildlands Engineering, Inc (WEI) to evaluate the potential for riparian buffer mitigation and nutrient offset on two additional features on the subject site. Features labeled T1B and T1C on the attached map labeled "Figure 3a Site Map" were evaluated by Sam Dailey with the US Army Corps of Engineers in March 2019 and these features were determined to be at least intermittent channels. The Site is also being proposed as part of a full-delivery stream and riparian buffer mitigation project for the Division of Mitigation Services (RFP #16-007279).

Ms. Merritt's evaluation of the features and their associated mitigation determination for the riparian areas are provided in the table below. This evaluation was made from Top of Bank (TOB) and landward 200' from each feature for buffer mitigation pursuant to 15A NCAC 02B .0295 (effective November 1, 2015) and for nutrient offset credits pursuant to 15A NCAC 02B .0240.

Feature	Classification onsite	[1]Subject to Buffer Rule	Riparian Land uses adjacent to Feature (0-200')	Buffer Credit Viable	[2]Nutrient Offset Viable at 2,273.02 lbs-N per acre	Mitigation Type Determination w/in riparian areas
T1B	Stream	No	Combination of forested and non-forested pasture actively grazed by cattle	[4]Yes	Yes *(non-forested areas only)*	**Fields** - Restoration Site per 15A NCAC 02B .0295 (o)(3) **Forested Areas** - Enhancement Site per 15A NCAC 02B .0295 (o) (6)
T1C	Stream	No	Forested pasture actively grazed by cattle; ag fields at the upstream portion	[4]Yes	Yes *(ag fields only)*	**Fields** - Restoration Site per 15A NCAC 02B .0295 (o)(3) **Forested Areas** - Enhancement Site per 15A NCAC 02B .0295 (o) (6)

[1]Subjectivity calls for the features were determined by DWR in correspondence dated March 21, 2019 using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS .

[2] *NC Division of Water Resources - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment*

[3]The area of preservation credit within a buffer mitigation site shall comprise of no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 0295 (o)(5) and 15A NCAC 0295 (o)(4). Site cannot be a Preservation Only site to comply with this rule.

[4]The area described as an Enhancement Site was assessed and determined to comply with all 15A NCAC 02B .0295(o)(6). Cattle exclusion fencing is required to be installed around the mitigation area to get buffer credit under this part of the rule.

[5]The area of the mitigation site on ephemeral channels shall comprise no more than 25 percent (25%) of the total area of buffer mitigation per 15A NCAC 02B .0295 (o)(7). Cattle exclusion fencing is required to be installed around the mitigation area to get buffer credit under this part of the rule.

Maps that are attached to this letter were prepared by WEI and initialed by Ms. Merritt on April 3, 2019. **This letter should be provided in all stream and wetland, buffer and/or nutrient offset mitigation plans for this Site.**

This letter does not constitute an approval of this site to generate mitigation credits. Pursuant to 15A NCAC 02B .0295, a mitigation proposal and a mitigation plan shall be submitted to DWR for written approval **prior** to conducting any mitigation activities in riparian areas and/or surface waters for buffer mitigation credit. Pursuant to 15A NCAC 02B .0240, a proposal regarding a proposed nutrient load-reducing measure for nutrient offset credit shall be submitted to DWR for approval prior to any mitigation activities in riparian areas and/or surface waters.

All vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset mitigation credits. For any areas depicted as not being viable for nutrient offset credit above, one could propose a different measure, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset in accordance with 15A NCAC 02B .0240.

This viability assessment will expire on April 3, 2021 or upon the submittal of an As-Built Report to the DWR, whichever comes first. This letter should be provided in all stream, wetland or buffer mitigation plans for this Site.

Please contact Katie Merritt at (919) 707-3637 if you have any questions regarding this correspondence.

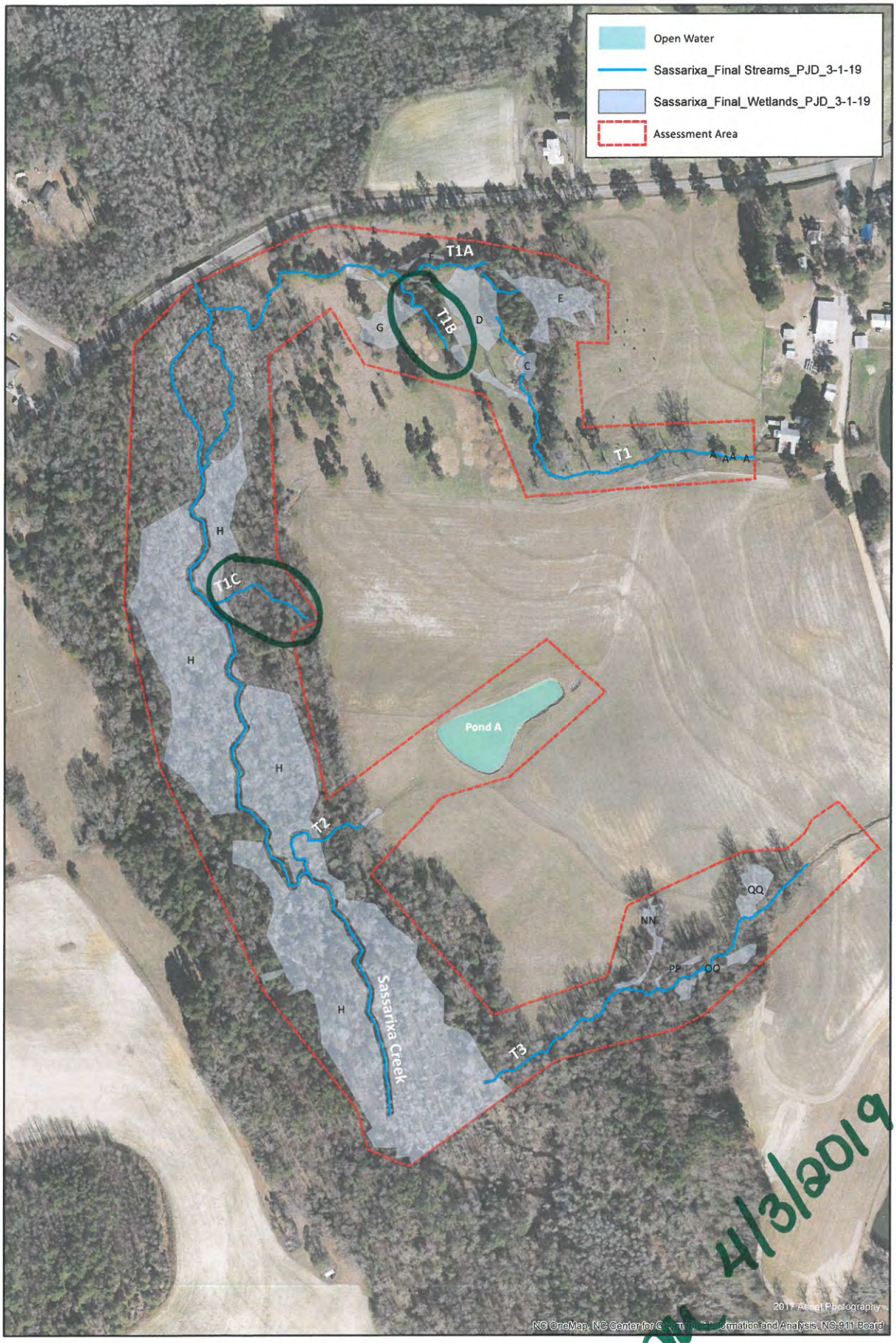
Sincerely,

Chantieka McDaniel

for Karen Higgins, Supervisor
401 and Buffer Permitting Branch

KAH/*km*
Attachments: Figure 3a

cc: File Copy (Katie Merritt)



WILDLANDS ENGINEERING

N

0 112.5 225 Feet

Figure 3a Site Map - Sheet 1
Sassarixa Swamp Mitigation Site
Neuse River Basin (03020201)

Johnston County, NC

From:	Merritt, Katie
To:	Angela Allen
Cc:	Dow, Jeremiah J; Wojoski, Paul A
Subject:	RE: [External] RE: Sassarixa Technical Memo- DWR response
Date:	Monday, August 19, 2019 01:56:00 PM

Hey Angela,
You may send it do Paul Wojoski, same address as indicated on the letter.

From: Angela Allen [mailto:aallen@wildlandseng.com]
Sent: Monday, August 19, 2019 1:51 PM
To: Merritt, Katie <katie.merritt@ncdenr.gov>
Cc: Dow, Jeremiah J <jeremiah.dow@ncdenr.gov>; Wojoski, Paul A <Paul.Wojoski@ncdenr.gov>
Subject: [External] RE: Sassarixa Technical Memo- DWR response

Katie,
Thank you for your thorough and timely review of this. I wanted to confirm whose attention I should make the appeal out to for the T4 call change. Andrea Eckardt mentioned Karen had temporarily been working another role.
Thank you,
Angela

From: Merritt, Katie <katie.merritt@ncdenr.gov>
Sent: Friday, August 16, 2019 4:48 PM
To: Angela Allen <aallen@wildlandseng.com>
Cc: Dow, Jeremiah J <jeremiah.dow@ncdenr.gov>; Wojoski, Paul A <Paul.Wojoski@ncdenr.gov>
Subject: Sassarixa Technical Memo- DWR response

Hey Angela,
In the mitigation plan for Sassarixa Creek, I received a memo from you dated July 22, 2019 requesting two things:

1) Request for T2, T5, T5A and T5C to be considered viable for buffer restoration and nutrient offset credits in areas of active cattle pasture
2) Request for Reclassification of T4 Reach 3 from a wetland to a jurisdictional stream

Regarding Item #2 above, the rule requires that you must submit an appeal to the Director of the Division of Water Resources. However, this request was provided to me in a mitigation plan. Therefore, I am unable to process your request for Item #2. You can submit your appeal request to the DWR by following the appeal process outlined in the letter attached to this email. It will be the Director's decision whether to grant or deny your request. I highly recommend you provide photo points showing where your pictures were taken along Reach 3 of T4 if pursuing the appeal to the Director.

Regarding Item #1 above, see response below:

-T2 begins at the tree line in the woods and ends at the confluence with Sassarixa Creek. If the agriculture fields fall within the 200' from TOB of the stream call, then those areas will be viable as a Restoration Site and viable for either buffer credit or nutrient offset credit, but not both. Please note, that T2 is shown on the mitigation plan as extending beyond the treeline, which is not consistent with the call made by DWR in the attached stream determination.
-T5 (R1) is fully forested with active pasture from TOB-200' and therefore is only viable for buffer enhancement credit. This assessment is final.
-T5 (R2-R3) is fully forested with agriculture fields beyond the tree line. if the agriculture fields fall within the 200' from TOB, then those areas will be viable as a Restoration Site and viable for either buffer credit or nutrient offset credit, but not both. This assessment is final
-T5A – If the agriculture fields fall within the 200' from TOB, then those areas will be viable as a Restoration Site and viable for either buffer credit or nutrient offset credit, but not both. This assessment is final.
-T5C was determined to be a headwater wetland system onsite and was not deemed a stream. The viability assessment is dependent on the IRT approving the area as a Coastal HW Stream, which is interpreted as being approved to use the Headwater Stream Guidance. This feature must comply with 15A NCAC 02B .0295 (o)(2) and therefore, only the buffer areas that are planted will be viable for buffer credit, and that includes just the fields. Therefore, if the agriculture fields fall within the 200' from where the center of the valley is located, then those areas will be viable as a Restoration Site per (o)(2) and viable for buffer credit only. Nutrient offset is not viable adjacent to coastal hw stream sites. This assessment is final.

Thank you,
Katie

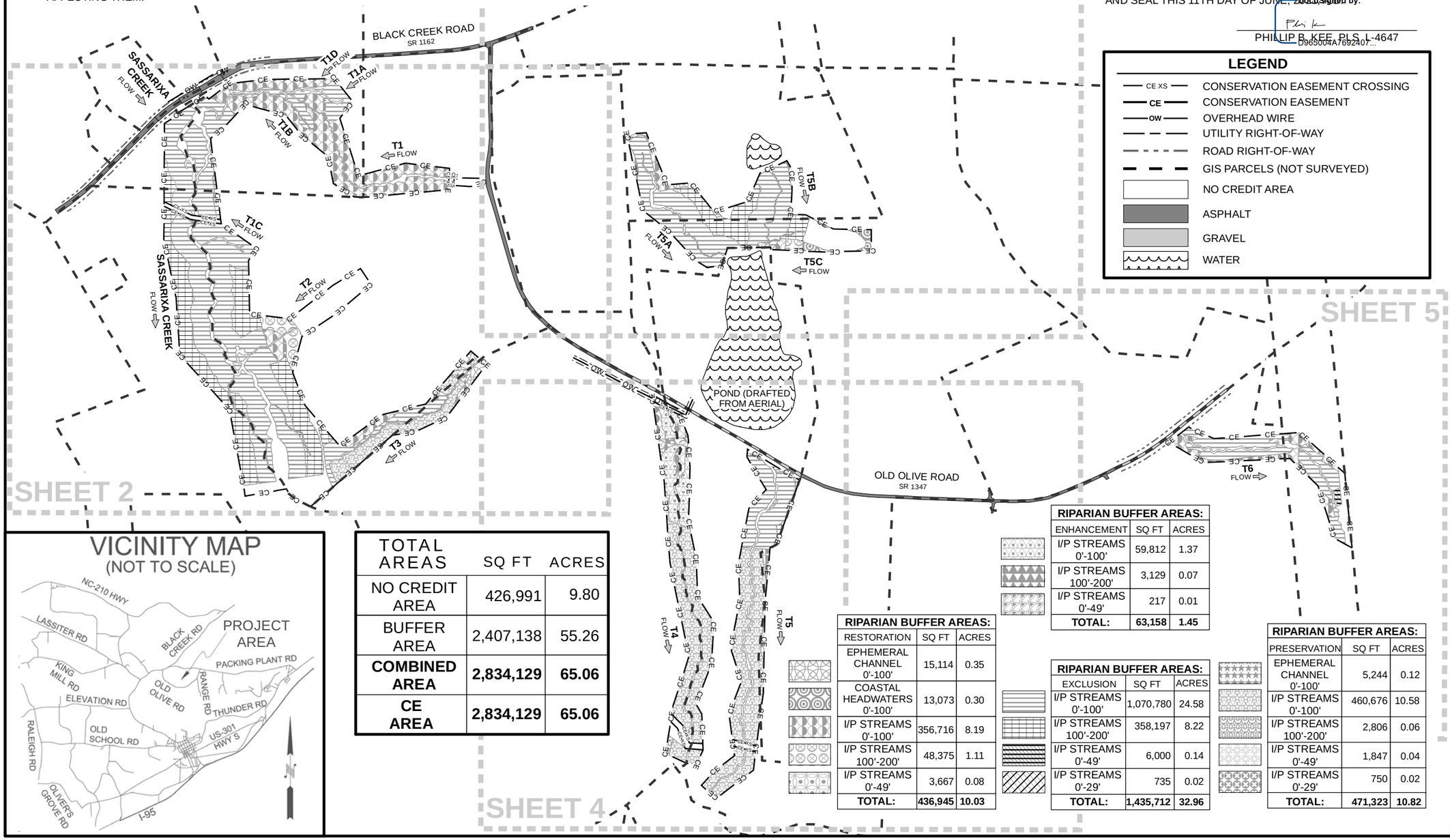
APPENDIX 3. As-Built Survey

SURVEYOR NOTES

1. ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES IN US SURVEY FEET. THE AREAS SHOWN HEREON WERE COMPUTED USING THE COORDINATE COMPUTATION METHOD.
2. THE PURPOSE OF THIS MAP IS TO SHOW THE AS-BUILT AREAS FOR RIPARIAN BUFFER CREDITS WITHIN THE CONSERVATION EASEMENT. THIS MAP IS NOT A BOUNDARY SURVEY. THE LAND PARCELS AND THEIR BOUNDARIES AFFECTED BY THIS CONSERVATION EASEMENT ARE NOT CHANGED BY THIS MAP.
3. LINES NOT SURVEYED ARE SHOWN AS DASHED LINES AND WERE TAKEN FROM INFORMATION REFERENCED HEREON.
4. PROPERTIES ARE SUBJECT TO ALL EASEMENTS, RIGHT OF WAYS, AND/OR ENCUMBRANCES AFFECTING THEM.
5. SEE CONSERVATION EASEMENT SURVEY AS RECORDED IN PB:90 PG:439-448 IN THE JOHNSTON COUNTY REGISTER OF DEEDS.
6. BUFFER AREAS ARE BASED ON THE THE AS-BUILT SURVEYS DATED FEBRUARY 12TH & APRIL 2ND, 2021 BY KEE MAPPING AND SURVEYING, THE EXISTING CONDITIONS TOPOGRAPHIC SURVEYS DATED JUNE 6TH & JULY 13TH, 2018 BY KEE MAPPING AND SURVEYING, THE CONSERVATION EASEMENT SURVEY AS RECORDED IN PB:90 PG:439-448 IN THE JOHNSTON COUNTY REGISTER OF DEEDS OFFICE AND INFORMATION PROVIDED BY WILDLANDS ENGINEERING INC.
7. JOHNSTON COUNTY GIS WEBSITE USED TO IDENTIFY ADOINING PROPERTY OWNERS.

N

GRID NORTH
NAD83 (2011)



VICINITY MAP
(NOT TO SCALE)

TOTAL AREAS	SQ FT	ACRES
NO CREDIT AREA	426,991	9.80
BUFFER AREA	2,407,138	55.26
COMBINED AREA	**2,834,129**	**65.06**
CE AREA	**2,834,129**	**65.06**

CERTIFICATE OF SURVEY AND ACCURACY

I, PHILLIP B. KEE, CERTIFY THAT THIS BUFFER MAP WAS DRAWN UNDER MY SUPERVISION, IS AN ACCURATE CALCULATION OF THE BUFFER AREAS AND IS BASED ON THE AS-BUILT SURVEYS DATED FEBRUARY 12TH & APRIL 2ND, 2021 BY KEE MAPPING AND SURVEYING, THE EXISTING CONDITIONS TOPOGRAPHIC SURVEYS DATED JUNE 6TH & JULY 13TH, 2018 BY KEE MAPPING AND SURVEYING, THE CONSERVATION EASEMENT SURVEY AS RECORDED IN PB:90 PGS:439-448 IN THE JOHNSTON COUNTY REGISTER OF DEEDS OFFICE AND INFORMATION PROVIDED BY WILDLANDS ENGINEERING INC.; THAT THE BOUNDARIES NOT SURVEYED ARE INDICATED AS DRAWN FROM INFORMATION AS REFERENCED; AND THAT THIS MAP DOES NOT REPRESENT AN OFFICIAL BOUNDARY SURVEY AND IS ONLY FOR THE PURPOSE OF DEPICTING THE RIPARIAN BUFFER AREAS.

WITNESS MY ORIGINAL SIGNATURE, LICENCE NUMBER, AND SEAL THIS 11TH DAY OF JUNE, 2021 A.D.

DocuSigned by:
D965004A7692407...
PHILLIP B. KEE, PLS L-4647

LEGEND

- CE XS — CONSERVATION EASEMENT CROSSING
- CE — CONSERVATION EASEMENT
- OW — OVERHEAD WIRE
- UTILITY RIGHT-OF-WAY
- ROAD RIGHT-OF-WAY
- GIS PARCELS (NOT SURVEYED)
- NO CREDIT AREA
- ASPHALT
- GRAVEL
- WATER

RIPARIAN BUFFER AREAS: RESTORATION	SQ FT	ACRES
EPHEMERAL CHANNEL 0'-100'	15,114	0.35
COASTAL HEADWATERS 0'-100'	13,073	0.30
I/P STREAMS 0'-100'	356,716	8.19
I/P STREAMS 100'-200'	48,375	1.11
I/P STREAMS 0'-49'	3,667	0.08
TOTAL:	**436,945**	**10.03**

RIPARIAN BUFFER AREAS: ENHANCEMENT	SQ FT	ACRES
I/P STREAMS 0'-100'	59,812	1.37
I/P STREAMS 100'-200'	3,129	0.07
I/P STREAMS 0'-49'	217	0.01
TOTAL:	**63,158**	**1.45**

RIPARIAN BUFFER AREAS: EXCLUSION	SQ FT	ACRES
I/P STREAMS 0'-100'	1,070,780	24.58
I/P STREAMS 100'-200'	358,197	8.22
I/P STREAMS 0'-49'	6,000	0.14
I/P STREAMS 0'-29'	735	0.02
TOTAL:	**1,435,712**	**32.96**

RIPARIAN BUFFER AREAS: PRESERVATION	SQ FT	ACRES
EPHEMERAL CHANNEL 0'-100'	5,244	0.12
I/P STREAMS 0'-100'	460,676	10.58
I/P STREAMS 100'-200'	2,806	0.06
I/P STREAMS 0'-49'	1,847	0.04
I/P STREAMS 0'-29'	750	0.02
TOTAL:	**471,323**	**10.82**

SEAL:

NORTH CAROLINA PROFESSIONAL SEAL L-4647 LAND SURVEYOR PHILLIP B. KEE
DocuSigned by: D965004A7692407...

NOT TO SCALE

THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.

BUFFER MAP FOR:
WILDLANDS ENGINEERING, INC.

NEUSE RIVER BASIN: 03020201
DMS SITE ID NO. 100040
SPO NOS. 51-DC, 51-DD, 51-DE, 51-DF. 51-DG, 51-DH

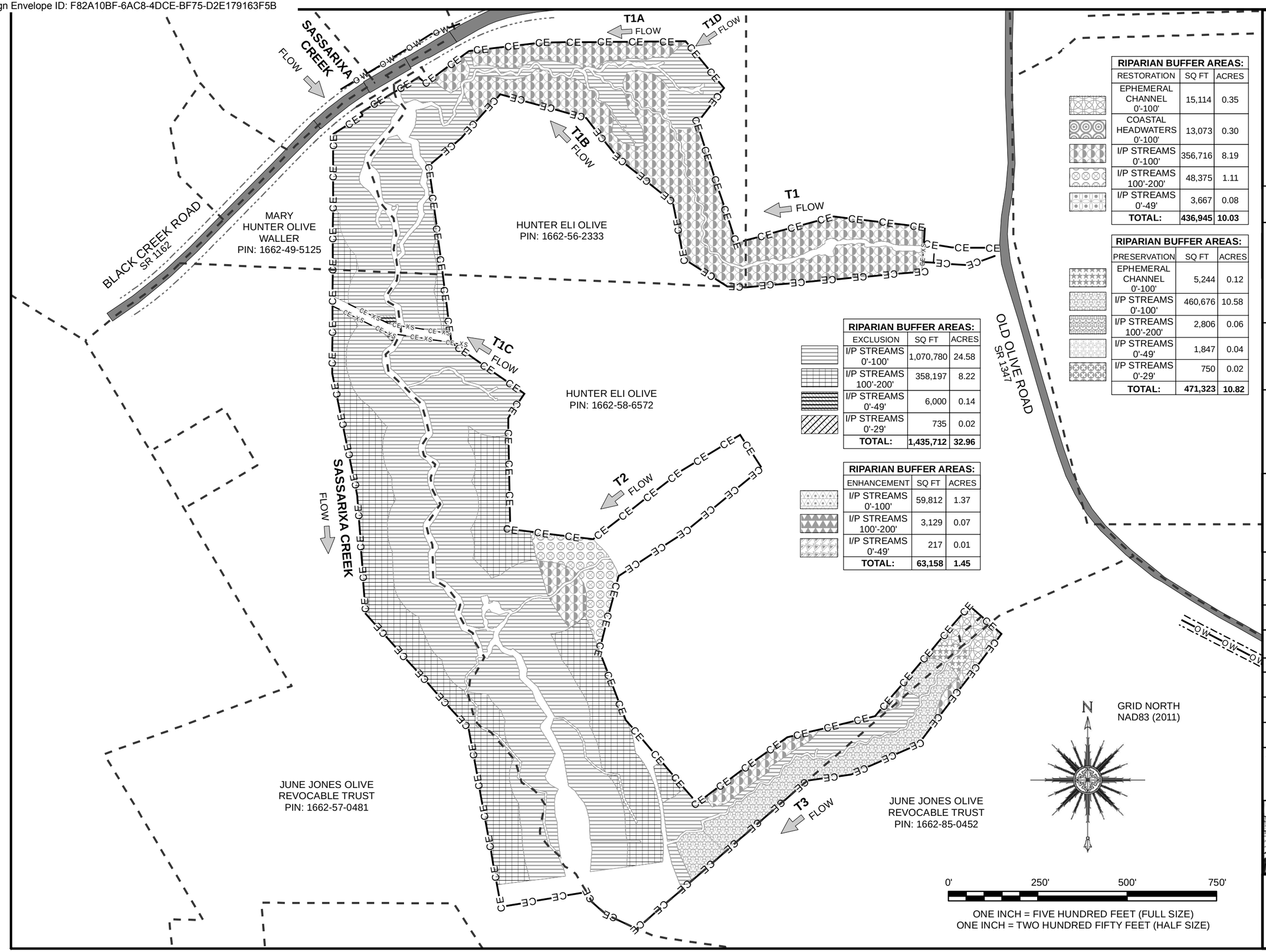
PROJECT:
SASSARIXA SWAMP MITIGATION SITE

TOWNSHIP: SMITHFIELD	COUNTY: JOHNSTON	STATE: NC
DRAWN BY: AB	CHECKED BY: LDP, PBK	
SCALE: AS SHOWN	DATE: 06/11/21	
JOB: #2010111-AB	SHEET SIZE: 11" x 17" (HALF SIZE)	

#	DATE	REVISIONS
1	06/11/21	BUFFER AREA EDITS

SHEET: 1 OF 5

Kee MAPPING & SURVEYING
P.O. Box 2566
Asheville, NC 28802
(828) 575-9021
www.keemap.com
License # C-3039



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RESTORATION	SQ FT	ACRES
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I/P STREAMS 0'-49'	217	0.01
TOTAL:	**63,158**	**1.45**

N
GRID NORTH
NAD83 (2011)

0' 250' 500' 750'

ONE INCH = FIVE HUNDRED FEET (FULL SIZE)
ONE INCH = TWO HUNDRED FIFTY FEET (HALF SIZE)

SEAL:

NORTH CAROLINA PROFESSIONAL SEAL L-4641 LAND SURVEYOR PHILLIP B. KEE

DocuSigned by:
D965004A7692407...

NOTE: SEE SHEET 1 FOR LEGEND, SURVEYOR'S NOTES & STATEMENT OF CERTIFICATION

THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.

BUFFER MAP FOR:
WILDLANDS ENGINEERING, INC.

NEUSE RIVER BASIN: 03020201
DMS SITE ID NO. 100040
SPO NOS. 51-DC, 51-DD, 51-DE, 51-DF. 51-DG, 51-DH

PROJECT:
SASSARIXA SWAMP MITIGATION SITE

TOWNSHIP: SMITHFIELD	COUNTY: JOHNSTON	STATE: NC
DRAWN BY: AB	CHECKED BY: LDP, PBK	
SCALE: AS SHOWN	DATE: 06/11/21	
JOB: #2010111-AB	SHEET SIZE: 11" x 17" (HALF SIZE)	

#	DATE	REVISIONS
1	06/11/21	BUFFER AREA EDITS

SHEET: 2 OF 5

Kee MAPPING & SURVEYING
P.O. Box 2566
Asheville, NC 28802
(828) 575-9021
www.keemap.com
License # C-3039

N

GRID NORTH
NAD83 (2011)

RIPARIAN BUFFER AREAS:		
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I/P STREAMS 0'-49'	6,000	0.14
I/P STREAMS 0'-29'	735	0.02
TOTAL:	**1,435,712**	**32.96**

RIPARIAN BUFFER AREAS:		
PRESERVATION	SQ FT	ACRES
EPHEMERAL CHANNEL 0'-100'	5,244	0.12
I/P STREAMS 0'-100'	460,676	10.58
I/P STREAMS 100'-200'	2,806	0.06
I/P STREAMS 0'-49'	1,847	0.04
I/P STREAMS 0'-29'	750	0.02
TOTAL:	**471,323**	**10.82**

RIPARIAN BUFFER AREAS:		
RESTORATION	SQ FT	ACRES
EPHEMERAL CHANNEL 0'-100'	15,114	0.35
COASTAL HEADWATERS 0'-100'	13,073	0.30
I/P STREAMS 0'-100'	356,716	8.19
I/P STREAMS 100'-200'	48,375	1.11
I/P STREAMS 0'-49'	3,667	0.08
TOTAL:	**436,945**	**10.03**

OLD OLIVE ROAD
SR 1347

TAMI O. THOMPSON
PIN: 1662-79-8148

JUNE JONES OLIVE
REVOCABLE TRUST
PIN: 1662-88-5084

DAVID THOMPSON
PIN: 1662-78-8163

POND (DRAFTED
FROM AERIAL)

T5A FLOW

T5B FLOW

T5C FLOW

0' 250' 500' 750'

ONE INCH = FIVE HUNDRED FEET (FULL SIZE)
ONE INCH = TWO HUNDRED FIFTY FEET (HALF SIZE)

SEAL:

NORTH CAROLINA PROFESSIONAL SEAL L-4547 LAND SURVEYOR PHILIP B. KEE

DocuSigned by:
D965004A7692407...

NOTE: SEE SHEET 1 FOR LEGEND, SURVEYOR'S NOTES & STATEMENT OF CERTIFICATION

THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.

BUFFER MAP FOR:
WILDLANDS ENGINEERING, INC.

NEUSE RIVER BASIN: 03020201
DMS SITE ID NO. 100040
SPO NOS. 51-DC, 51-DD, 51-DE, 51-DF. 51-DG, 51-DH

PROJECT:
SASSARIXA SWAMP MITIGATION SITE

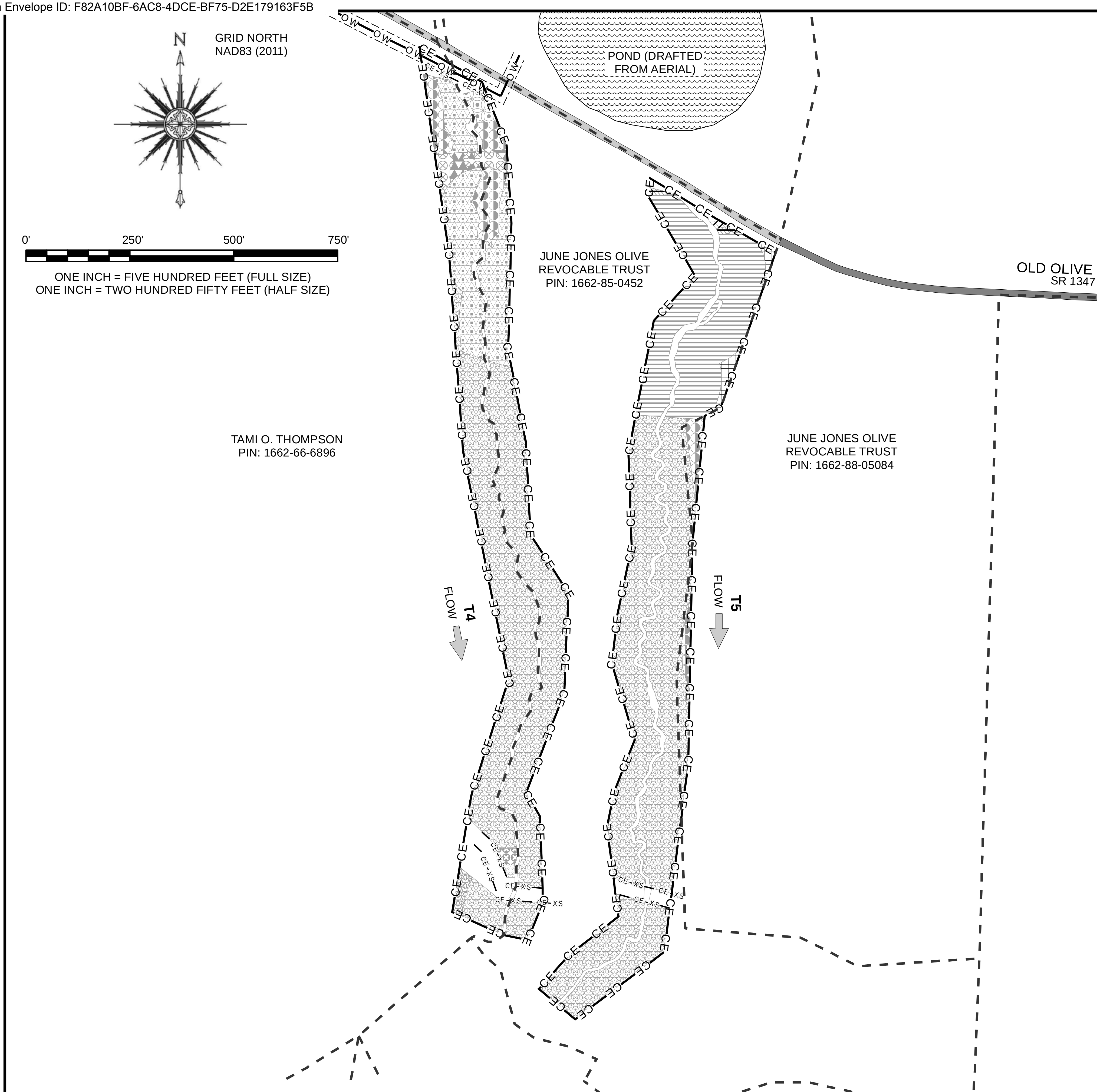
TOWNSHIP:	COUNTY:	STATE:
SMITHFIELD	JOHNSTON	NC

DRAWN BY:	CHECKED BY:
AB	LDP, PBK
SCALE: AS SHOWN	DATE: 06/11/21
JOB: #2010111-AB	SHEET SIZE: 11" x 17" (HALF SIZE)

#	DATE	REVISIONS
1	06/11/21	BUFFER AREA EDITS

SHEET: 3 OF 5

Kee MAPPING & SURVEYING
P.O. Box 2566
Asheville, NC 28802
(828) 575-9021
www.keemap.com
License # C-3039



RIPARIAN BUFFER AREAS:		
ENHANCEMENT	SQ FT	ACRES
I/P STREAMS 0'-100'	59,812	1.37
I/P STREAMS 100'-200'	3,129	0.07
I/P STREAMS 0'-49'	217	0.01
TOTAL:	**63,158**	**1.45**

RIPARIAN BUFFER AREAS:		
EXCLUSION	SQ FT	ACRES
I/P STREAMS 0'-100'	1,070,780	24.58
I/P STREAMS 100'-200'	358,197	8.22
I/P STREAMS 0'-49'	6,000	0.14
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NORTH CAROLINA PROFESSIONAL SEAL SURVEYOR PHILLIP B. K...

DocuSigned by:
D965004A7692407...

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DMS SITE ID NO. 100040
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PROJECT:
SASSARIXA SWAMP MITIGATION SITE

TOWNSHIP:	COUNTY:	STATE:
SMITHFIELD	JOHNSTON	NC

DRAWN BY: AB	CHECKED BY: LDP, PBK
SCALE: AS SHOWN	DATE: 06/11/21
JOB: #2010111-AB	SHEET SIZE: 11" x 17" (HALF SIZE)

#	DATE	REVISIONS
1	06/11/21	BUFFER AREA EDITS

SHEET: 4 OF 5

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0' 250' 500' 750'

ONE INCH = FIVE HUNDRED FEET (FULL SIZE)
ONE INCH = TWO HUNDRED FIFTY FEET (HALF SIZE)

N

GRID NORTH
NAD83 (2011)

OLD OLIVE ROAD
SR 1347

T6
FLOW

MATTHEW THOMAS KEEN
PIN: 1672-06-5717

JUNE JONES OLIVE
REVOCABLE TRUST
PIN: 1672-17-2303

RIPARIAN BUFFER AREAS:		
PRESERVATION	SQ FT	ACRES
EPHEMERAL CHANNEL 0'-100'	5,244	0.12
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SEAL:

NORTH CAROLINA PROFESSIONAL SEAL L-4904 LAND SURVEYOR PHILLIP B. KEE

DocuSigned by:
D965004A7692407...

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DMS SITE ID NO. 100040
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PROJECT:
SASSARIXA SWAMP MITIGATION SITE

TOWNSHIP:	COUNTY:	STATE:
SMITHFIELD	JOHNSTON	NC

DRAWN BY:	CHECKED BY:
AB	LDP, PBK
SCALE: AS SHOWN	DATE: 06/11/21
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SHEET: 5 OF 5

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APPENDIX 4. Overview Photographs

APPENDIX 5. Permit Approvals

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

NORTH CAROLINA
Environmental Quality

June 18, 2020

DWR # 18-0198
Johnston County

NC Division of Mitigation Services
Attn: Lin Xu
217 West Jones Street
Raleigh, North Carolina 27699

Wildlands Engineering, Inc.
Attn: Angela Allen
312 West Millbrook Road, Suite 225
Raleigh, North Carolina 27609

Subject: APPROVAL OF 401 WATER QUALITY CERTIFICATION WITH ADDITIONAL CONDITIONS

Sassarixa Swamp Mitigation Project

Dear Mr. Xu and Ms. Allen:

You have our approval for the impacts listed below for the purpose described in your application dated May 20, 2020, received by the Division of Water Resources (Division) May 20, 2020, with subsequent information on June 18, 2020. These impacts are covered by the attached Water Quality General Certification Number 4134 and the conditions listed below. This certification is associated with the use of Nationwide Permit Number 27 once it is issued to you by the U.S. Army Corps of Engineers. Please note that you should get any other federal, state or local permits before proceeding with your project, including those required by (but not limited to) Sediment and Erosion Control, Non-Discharge, and Water Supply Watershed regulations.

This approval requires you to follow the conditions listed in the enclosed certification(s) or general permit and the following additional conditions:

1. The following impacts are hereby approved provided that all of the other specific and general conditions of the Certification are met. No other impacts are approved, including incidental impacts. [15A NCAC 02H .0506(b) and/or (c)]

Type of Impact	**Amount Approved (units) Permanent**	**Amount Approved (units) Temporary**
Stream		
S1	975 (linear feet)	0 (linear feet)
S2	0	23
S3	85	0
S4	12	0
S5	354	0
S6	1,036	0
S7	126	0
S8	0	23
S9	947	0
S10	0	51
S11	206	0
S12	0	23
S13	3	0
S14	1,094	0
S15	0	23
Total	4,838	143
404/401 Wetlands		
W1	0.004 (acres)	0 (acres)
W2	0	0.006
W3	0	0.308
W4	0.029	0
W5	0	0.002
W6	0.002	0
W7	0	0.033
W8	0.003	0
W9	0.006	0
W10	0	0.023
W11	0	0.020
W12	0.014	0
W13	0	0.031
W14	0.014	0
W15	0	0.036
W16	0.026	0
W17	0	0.002
W18	0.005	0
W19	0	0.001
W20	0.001	0
W21	0	0.037

W22	0.012	0
W23	0	0.002
W24	0	0.002
W25	0.003	0
W26	0	0.002
W27	0	0.016
W28	0.006	0
Total	0.125	0.521
Open Water		
O1	0.91	0
Total	0.91	0

2. This approval is for the purpose and design described in your application. The plans and specifications for this project are incorporated by reference as part of the Certification. If you change your project, you must notify the Division and you may be required to submit a new application package with the appropriate fee. If the property is sold, the new owner must be given a copy of this approval letter and General Certification(s)/Permit/Authorization and is responsible for complying with all conditions. [15A NCAC 02H .0507(d)(2)]

3. The issuance of the 401 Water Quality Certification for the restoration/enhancement project does not represent an approval of credit yield for the project. [15A NCAC 02H .0500(h)]

4. You have our approval for your proposed final stream enhancements/restorations plan. The stream enhancements/restorations must be constructed, maintained, and monitored according to the plans approved by this Office and this Certificate of Coverage. Any repairs or adjustments to the site must be made according to the approved plans or must receive written approval from this Office to make the repairs or adjustments. [15A NCAC 02H .0506(h)]

This approval and its conditions are final and binding unless contested. [G.S. 143-215.5]

This Certification can be contested as provided in Articles 3 and 4 of General Statute 150B by filing a written petition for an administrative hearing to the Office of Administrative Hearings (hereby known as OAH) **within sixty (60) calendar days**.

A petition form may be obtained from the OAH at http://www.ncoah.com/ or by calling the OAH Clerk's Office at (919) 431-3000 for information. A petition is considered filed when the original and one (1) copy along with any applicable OAH filing fee is received in the OAH during normal office hours (Monday through Friday between 8:00am and 5:00pm, excluding official state holidays).

The petition may be faxed to the OAH at (919) 431-3100, provided the original and one copy of the petition along with any applicable OAH filing fee is received by the OAH within five (5) business days following the faxed transmission.

Mailing address for the OAH:

If sending via US Postal Service:	*If sending via delivery service (UPS, FedEx, etc):*
Office of Administrative Hearings 6714 Mail Service Center Raleigh, NC 27699-6714	Office of Administrative Hearings 1711 New Hope Church Road Raleigh, NC 27609-6285

One (1) copy of the petition must also be served to Department of Environmental Quality:

William F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NC 27699-1601

This letter completes the review of the Division under section 401 of the Clean Water Act. Please contact Erin Davis at 919-817-0360 or erin.davis@ncdenr.gov if you have any questions or concerns.

Sincerely,

DocuSigned by:
Paul Wojoski
949D91BA53EF4E0...

Paul Wojoski, Supervisor
401 & Buffer Permitting Branch

Enclosures: GC 4134

cc: Todd Tugwell, Kim Browning, USACE Raleigh Regulatory Field Office (via email)
DWR 401 & Buffer Permitting Branch file

Filename: 180198SassarixaSwamp(Johnston)_401_approval_ltr.June18,2020.docx

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER RESOURCES

WATER QUALITY GENERAL CERTIFICATION NO. 4134

GENERAL CERTIFICATION FOR PROJECTS ELIGIBLE FOR US ARMY CORPS OF ENGINEERS

- **NATIONWIDE PERMIT NUMBER 13 (BANK STABILIZATION),**
- **NATIONWIDE PERMIT NUMBER 27 (AQUATIC HABITAT RESTORATION, ESTABLISHMENT AND ENHANCEMENT ACTIVITIES), AND**
- **REGIONAL GENERAL PERMIT 197800080 (BULKHEADS AND RIP-RAP)**

Water Quality Certification Number 4134 is issued in conformity with the requirements of Section 401, Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Regulations in 15A NCAC 02H .0500 and 15A NCAC 02B .0200 for the discharge of fill material to surface waters and wetland areas as described in 33 CFR 330 Appendix A (B) (13 and 27) of the US Army Corps of Engineers regulations and Regional General Permit 197800080.

The State of North Carolina certifies that the specified category of activity will not violate applicable portions of Sections 301, 302, 303, 306 and 307 of the Public Laws 92-500 and 95-217 if conducted in accordance with the conditions hereinafter set forth.

Effective date: December 1, 2017

Signed this day: December 1, 2017

By

for Linda Culpepper
Interim Director

Activities meeting any one (1) of the following thresholds or circumstances require *written approval* for a 401 Water Quality Certification from the Division of Water Resources (DWR):

a) If any of the conditions of this Certification (listed below) cannot be met; or
b) Any permanent fill into or modification of wetlands and/or waters except for single and independent stream stabilization or enhancement projects involving in-stream structures that meet the following criteria:
    i. Designed based on current natural channel techniques; and
    ii. In-stream structures do not exceed a spacing of three structures per 100 feet of stream length up to a total of 500 feet of streambank stabilization; or
c) Any stream relocation; or
d) Complete dewatering and drawdowns to a sediment layer related to pond/dam maintenance or removal; or
e) Total temporary and permanent impacts to streambanks of greater than 150 feet for bank stabilization projects when non-natural armoring techniques (e.g. rip-rap, gabion baskets, deflection walls) are utilized; or
f) Total temporary and permanent impacts to streambanks of greater than 500 feet for bank stabilization projects when natural techniques (e.g. sloping, vegetation, geolifts) are used; or
g) Any permanent impacts to waters, or to wetlands adjacent to waters, designated as: ORW (including SAV), HQW (including PNA), SA, WS-I, WS-II, or North Carolina or National Wild and Scenic River.
h) Any permanent impacts to waters, or to wetlands adjacent to waters, designated as Trout except for bank stabilization projects that qualify for a Nationwide Permit #13 provided that:
    i. The total impacts are less than 100 feet in length;
    ii. The project is not adjacent to any other existing stabilization structures;
    iii. All conditions of this General Certification can be met, including adherence to any moratoriums as stated in Condition #10; and
    iv. A *Notification of Work in Trout Watersheds Form* is submitted to the Division at least 60 days prior to commencement of work; or
i) Any permanent impacts to coastal wetlands [15A NCAC 07H .0205], or Unique Wetlands (UWL); or
j) Any impact associated with a Notice of Violation or an enforcement action for violation(s) of NC Wetland Rules (15A NCAC 02H .0500), NC Isolated Wetland Rules (15A NCAC 02H .1300), NC Surface Water or Wetland Standards (15A NCAC 02B .0200), or State Regulated Riparian Buffer Rules (15A NCAC 02B .0200); or
k) Any impacts to subject water bodies and/or state regulated riparian buffers along subject water bodies in the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman Lake, Jordan Lake or Goose Creek Watersheds (or any other basin or watershed with State Regulated Riparian Area Protection Rules [Buffer Rules] in effect at the time of application) *unless:*
    i. The activities are listed as "EXEMPT" from these rules; or

ii. A Buffer Authorization Certificate is issued by the NC Division of Coastal Management (DCM); or

iii. A Buffer Authorization Certificate or a Minor Variance is issued by a delegated or designated local government implementing a state riparian buffer program pursuant to 143-215.23.

Activities included in this General Certification that do not meet one of the thresholds listed above do not require written approval.

I. ACTIVITY SPECIFIC CONDITIONS:

1. Any repairs or adjustments to the site shall be made according to the approved plans. Repairs that result in a change from the approved plans must receive written approval from DWR prior to commencement of the repairs. [15A NCAC 02H .0501 and .0502]

2. Written authorization for a compensatory mitigation project does not represent an approval of credit yield for the project. [15A NCAC 02H .0500(h)]

3. For all dam removal projects meeting the definition under G.S. 143-215.25 and requirements under G.S. 143-215.27 of a professionally supervised dam removal, the applicant shall provide documentation that any sediment that may be released has similar or lower level of contamination than sediment sampled from downstream of the dam in accordance with Session Law 2017-145.

II. GENERAL CONDITIONS:

1. When written authorization is required, the plans and specifications for the project are incorporated into the authorization by reference and are an enforceable part of the Certification. Any modifications to the project require notification to DWR and may require an application submittal to DWR with the appropriate fee. [15A NCAC 02H .0501 and .0502]

2. No waste, spoil, solids, or fill of any kind shall occur in wetlands or waters beyond the footprint of the impacts (including temporary impacts) as authorized in the written approval from DWR; or beyond the thresholds established for use of this Certification without written authorization. [15A NCAC 02H .0501 and .0502]

   No removal of vegetation or other impacts of any kind shall occur to state regulated riparian buffers beyond the footprint of impacts approved in a Buffer Authorization or Variance or as listed as an exempt activity in the applicable riparian buffer rules. [15A NCAC 02B .0200]

3. In accordance with 15A NCAC 02H .0506(h) and Session Law 2017-10, compensatory mitigation may be required for losses of greater than 300 linear feet of perennial streams and/or greater than one (1) acre of wetlands. Impacts associated with the removal of a dam shall not require mitigation when the removal complies with the requirements of Part 3 of Article 21 in Chapter 143 of the North Carolina General Statutes. Impacts to isolated and other non-404 jurisdictional wetlands shall not be combined with 404 jurisdictional wetlands for the purpose of determining when impact thresholds trigger a mitigation requirement. For linear publicly owned and maintained transportation projects that are not determined to be part of a larger common plan of development by the US Army Corps of Engineers, compensatory mitigation may be required for losses of greater than 300 linear feet per perennial stream.

   Compensatory stream and/or wetland mitigation shall be proposed and completed in compliance with G.S. 143-214.11. For applicants proposing to conduct mitigation within a project site, a complete mitigation proposal developed in accordance with the most recent guidance issued by the US Army Corps of Engineers Wilmington District shall be submitted for review and approval with the application for impacts.

4. All activities shall be in compliance with any applicable State Regulated Riparian Buffer Rules in Chapter 2 of Title 15A.

5. When applicable, all construction activities shall be performed and maintained in full compliance with G.S. Chapter 113A Article 4 (Sediment and Pollution Control Act of 1973). Regardless of applicability of the Sediment and Pollution Control Act, all projects shall incorporate appropriate Best Management Practices for the control of sediment and erosion so that no violations of state water quality standards, statutes, or rules occur. [15A NCAC 02H .0506(b)(3) and (c)(3) and 15A NCAC 02B .0200].

   Design, installation, operation, and maintenance of all sediment and erosion control measures shall be equal to or exceed the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*, or for linear transportation projects, the *NCDOT Sediment and Erosion Control Manual*.

   All devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) sites, including contractor-owned or leased borrow pits associated with the project. Sufficient materials required for stabilization and/or repair of erosion control measures and stormwater routing and treatment shall be on site at all times.

   For borrow pit sites, the erosion and sediment control measures shall be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*. Reclamation measures and implementation shall comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act and the Mining Act of 1971.

If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), SA, WS-I, WS-II, High Quality Waters (HQW), or Outstanding Resource Waters (ORW), then the sedimentation and erosion control designs shall comply with the requirements set forth in 15A NCAC 04B .0124, *Design Standards in Sensitive Watersheds.*

6. Sediment and erosion control measures shall not be placed in wetlands or waters except within the footprint of temporary or permanent impacts authorized under this Certification. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0501 and .0502]

7. Erosion control matting that incorporates plastic mesh and/or plastic twine shall not be used along streambanks or within wetlands. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02B .0201]

8. An NPDES Construction Stormwater Permit (NCG010000) is required for construction projects that disturb one (1) or more acres of land. The NCG010000 Permit allows stormwater to be discharged during land disturbing construction activities as stipulated in the conditions of the permit. If the project is covered by this permit, full compliance with permit conditions including the erosion & sedimentation control plan, inspections and maintenance, self-monitoring, record keeping and reporting requirements is required. [15A NCAC 02H .0506(b)(5) and (c)(5)]

   The North Carolina Department of Transportation (NCDOT) shall be required to be in full compliance with the conditions related to construction activities within the most recent version of their individual NPDES (NCS000250) stormwater permit. [15A NCAC 02H .0506(b)(5) and (c)(5)]

9. All work in or adjacent to streams shall be conducted so that the flowing stream does not come in contact with the disturbed area. Approved best management practices from the most current version of the *NC Sediment and Erosion Control Manual*, or the *NC DOT Construction and Maintenance Activities Manual*, such as sandbags, rock berms, cofferdams, and other diversion structures shall be used to minimize excavation in flowing water. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506(b)(3) and (c)(3)]

10. If activities must occur during periods of high biological activity (e.g. sea turtle nesting, fish spawning, or bird nesting), then biological monitoring may be required at the request of other state or federal agencies and coordinated with these activities. [15A NCAC 02H .0506(b)(2) and 15A NCAC 04B .0125]

    All moratoriums on construction activities established by the NC Wildlife Resources Commission (WRC), US Fish and Wildlife Service (USFWS), NC Division of Marine Fisheries (DMF), or National Marine Fisheries Service (NMFS) shall be implemented. Exceptions to this condition require written approval by the resource agency responsible for the given moratorium. A copy of the approval from the resource agency shall be forwarded to DWR.

Work within a designated trout watershed of North Carolina (as identified by the Wilmington District of the US Army Corps of Engineers), or identified state or federal endangered or threatened species habitat, shall be coordinated with the appropriate WRC, USFWS, NMFS, and/or DMF personnel.

11. Culverts shall be designed and installed in such a manner that the original stream profiles are not altered and allow for aquatic life movement during low flows. The dimension, pattern, and profile of the stream above and below a pipe or culvert shall not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed culvert shall be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. [15A NCAC 02H .0506(b)(2) and (c)(2)]

    Placement of culverts and other structures in streams shall be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20% of the culvert diameter for culverts having a diameter less than or equal to 48 inches, to allow low flow passage of water and aquatic life.

    If multiple pipes or barrels are required, they shall be designed to the mimic the existing stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel shall be avoided.

    When topographic constraints indicate culvert slopes of greater than 5%, culvert burial is not required, provided that all alternative options for flattening the slope have been investigated and aquatic life movement/connectivity has been provided when possible (e.g. rock ladders, cross vanes, etc.). Notification, including supporting documentation to include a location map of the culvert, culvert profile drawings, and slope calculations, shall be provided to DWR 60 calendar days prior to the installation of the culvert.

    When bedrock is present in culvert locations, culvert burial is not required provided that there is sufficient documentation of the presence of bedrock. Notification, including supporting documentation such as a location map of the culvert, geotechnical reports, photographs, etc. shall be provided to DWR a minimum of 60 calendar days prior to the installation of the culvert. If bedrock is discovered during construction, then DWR shall be notified by phone or email within 24 hours of discovery.

    If other site-specific topographic constraints preclude the ability to bury the culverts as described above and/or it can be demonstrated that burying the culvert would result in destabilization of the channel, then exceptions to this condition require application to and written approval from DWR.

Installation of culverts in wetlands shall ensure continuity of water movement and be designed to adequately accommodate high water or flood conditions. When roadways, causeways, or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges shall be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in destabilization of streams or wetlands.

The establishment of native woody vegetation and other soft stream bank stabilization techniques shall be used where practicable instead of rip-rap or other bank hardening methods.

12. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means to the maximum extent practicable (e.g. grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506(b)(5)]

13. Application of fertilizer to establish planted/seeded vegetation within disturbed riparian areas and/or wetlands shall be conducted at agronomic rates and shall comply with all other Federal, State and Local regulations. Fertilizer application shall be accomplished in a manner that minimizes the risk of contact between the fertilizer and surface waters. [15A NCAC 02B .0200 and 15A NCAC 02B .0231]

14. If concrete is used during construction, then all necessary measures shall be taken to prevent direct contact between uncured or curing concrete and waters of the state. Water that inadvertently contacts uncured concrete shall not be discharged to waters of the state. [15A NCAC 02B .0200]

15. All proposed and approved temporary fill and culverts shall be removed and the impacted area shall be returned to natural conditions within 60 calendar days after the temporary impact is no longer necessary. The impacted areas shall be restored to original grade, including each stream's original cross sectional dimensions, planform pattern, and longitudinal bed profile. For projects that receive written approval, no temporary impacts are allowed beyond those included in the application and authorization. All temporarily impacted sites shall be restored-and stabilized with native vegetation. [15A NCAC 02H .0506(b)(2) and (c)(2)]

16. All proposed and approved temporary pipes/culverts/rip-rap pads etc. in streams shall be installed as outlined in the most recent edition of the *North Carolina Sediment and Erosion Control Planning and Design Manual* or the *North Carolina Surface Mining Manual* or the *North Carolina Department of Transportation Best Management Practices for Construction and Maintenance Activities* so as not to restrict stream flow or cause dis-equilibrium during use of this Certification. [15A NCAC 02H .0506(b)(2) and (c)(2)]

17. Any rip-rap required for proper culvert placement, stream stabilization, or restoration of temporarily disturbed areas shall be restricted to the area directly impacted by the approved construction activity. All rip-rap shall be placed such that the original stream elevation and streambank contours are restored and maintained. Placement of rip-rap or other approved materials shall not result in de-stabilization of the stream bed or banks upstream or downstream of the area or in a manner that precludes aquatic life passage. [15A NCAC 02H .0506(b)(2)]

18. Any rip-rap used for stream or shoreline stabilization shall be of a size and density to prevent movement by wave, current action, or stream flows and shall consist of clean rock or masonry material free of debris or toxic pollutants. Rip-rap shall not be installed in the streambed except in specific areas required for velocity control and to ensure structural integrity of bank stabilization measures. [15A NCAC 02H .0506(b)(2)]

19. Applications for rip-rap groins proposed in accordance with 15A NCAC 07H .1401 (NC Division of Coastal Management General Permit for construction of Wooden and Rip-rap Groins in Estuarine and Public Trust Waters) shall meet all the specific conditions for design and construction specified in 15A NCAC 07H .1405.

20. All mechanized equipment operated near surface waters shall be inspected and maintained regularly to prevent contamination of surface waters from fuels, lubricants, hydraulic fluids, or other toxic materials. Construction shall be staged in order to minimize the exposure of equipment to surface waters to the maximum extent practicable. Fueling, lubrication and general equipment maintenance shall be performed in a manner to prevent, to the maximum extent practicable, contamination of surface waters by fuels and oils. [15A NCAC 02H .0506(b)(3) and (c)(3) and 15A NCAC 02B .0211 (12)]

21. Heavy equipment working in wetlands shall be placed on mats or other measures shall be taken to minimize soil disturbance. [15A NCAC 02H .0506 (b)(3) and (c)(3)]

22. In accordance with 143-215.85(b), the applicant shall report any petroleum spill of 25 gallons or more; any spill regardless of amount that causes a sheen on surface waters; any petroleum spill regardless of amount occurring within 100 feet of surface waters; and any petroleum spill less than 25 gallons that cannot be cleaned up within 24 hours.

23. If an environmental document is required under the State Environmental Policy Act (SEPA), then this General Certification is not valid until a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) is issued by the State Clearinghouse. If an environmental document is required under the National Environmental Policy Act (NEPA), then this General Certification is not valid until a Categorical Exclusion, the Final Environmental Assessment, or Final Environmental Impact Statement is published by the lead agency. [15A NCAC 01C .0107(a)]

24. This General Certification does not relieve the applicant of the responsibility to obtain all other required Federal, State, or Local approvals before proceeding with the project, including those required by, but not limited to, Sediment and Erosion Control, Non-Discharge, Water Supply Watershed, and Trout Buffer regulations.

25. The applicant and their authorized agents shall conduct all activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act), and any other appropriate requirements of State and Federal Law. If DWR determines that such standards or laws are not being met, including failure to sustain a designated or achieved use, or that State or Federal law is being violated, or that further conditions are necessary to assure compliance, then DWR may revoke or modify a written authorization associated with this General Water Quality Certification. [15A NCAC 02H .0507(d)]

26. The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this Certification. A copy of this Certification, including all conditions shall be available at the project site during the construction and maintenance of this project. [15A NCAC 02H .0507 (c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]

27. When written authorization is required for use of this Certification, upon completion of all permitted impacts included within the approval and any subsequent modifications, the applicant shall be required to return a certificate of completion (available on the DWR website: https://edocs.deq.nc.gov/Forms/Certificate-of-Completion). [15A NCAC 02H .0502(f)]

28. Additional site-specific conditions, including monitoring and/or modeling requirements, may be added to the written approval letter for projects proposed under this Water Quality Certification in order to ensure compliance with all applicable water quality and effluent standards. [15A NCAC 02H .0507(c)]

29. If the property or project is sold or transferred, the new permittee shall be given a copy of this Certification (and written authorization if applicable) and is responsible for complying with all conditions. [15A NCAC 02H .0501 and .0502]

III. GENERAL CERTIFICATION ADMINISTRATION:

1. In accordance with North Carolina General Statute 143-215.3D(e), written approval for a 401 Water Quality General Certification must include the appropriate fee. An applicant for a CAMA permit under Article 7 of Chapter 113A of the General Statutes for which a water quality Certification is required shall only make one payment to satisfy both agencies; the fee shall be as established by the Secretary in accordance with 143-215.3D(e)(7).

2. This Certification neither grants nor affirms any property right, license, or privilege in any waters, or any right of use in any waters. This Certification does not authorize any person to interfere with the riparian rights, littoral rights, or water use rights of any other person and this Certification does not create any prescriptive right or any right of priority regarding any usage of water. This Certification shall not be interposed as a defense in any action respecting the determination of riparian or littoral rights or other rights to water use. No consumptive user is deemed by virtue of this Certification to possess any prescriptive or other right of priority with respect to any other consumptive user regardless of the quantity of the withdrawal or the date on which the withdrawal was initiated or expanded.

3. This Certification grants permission to the Director, an authorized representative of the Director, or DWR staff, upon the presentation of proper credentials, to enter the property during normal business hours. [15A NCAC 02H .0502(e)]

4. This General Certification shall expire on the same day as the expiration date of the corresponding Nationwide Permit and/or Regional General Permit. The conditions in effect on the date of issuance of Certification for a specific project shall remain in effect for the life of the project, regardless of the expiration date of this Certification. This General Certification is rescinded when the US Army Corps of Engineers reauthorizes any of the corresponding Nationwide Permits and/or Regional General Permits or when deemed appropriate by the Director of the Division of Water Resources.

5. Non-compliance with or violation of the conditions herein set forth by a specific project may result in revocation of this General Certification for the project and may also result in criminal and/or civil penalties.

6. The Director of the North Carolina Division of Water Resources may require submission of a formal application for Individual Certification for any project in this category of activity if it is deemed in the public's best interested or determined that the project is likely to have a significant adverse effect upon water quality, including state or federally listed endangered or threatened aquatic species, or degrade the waters so that existing uses of the water or downstream waters are precluded.

History Note: *Water Quality Certification (WQC) Number 4134 issued December 1, 2017 replaces WQC March 3, 2017; WQC 3885 issued March 19, 2012; WQC Number 3689 issued November 1, 2007; WQC Number 3626 issued March 19, 2007; WQC Number 3495 issued December 31, 2004; and WQC Number 3399 issued March 2003.*

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2018-00432** County: **Johnston** U.S.G.S. Quad: **Four Oaks**

GENERAL PERMIT (REGIONAL AND NATIONWIDE) VERIFICATION

Permittee: **NC Division of Mitigation Services**
Attn: Mr. Tim Baumgartner
Address: **217 West Jones Street, Suite 3000A**
Raleigh, North Carolina 27603
Telephone: **919-707-8319**

Permittee: **Wildlands Engineering, Inc.**
Attn: Angela Allen
Address: **312 W. Millbrook Rd, Ste 225**
Raleigh, NC 27609
Telephone: **919-851-9986**

Size (acres) **61.4 acres**
Nearest Waterway **Black Creek**
USGS HUC **03020201**

Nearest Town **Four Oaks**
River Basin **Neuse River**
Latitude: **35.473294 °N** Longitude: **-78.437318°W**

Location description: **The NCDMS 6.97-acre Sassarixa Swamp Mitigation Site is located at 160 Old Olive Road, Smithfield, Johnston County, North Carolina. Waters on site drain into Sassarixa Creek and Black Creek, both are within the Neuse River Basin.**

Description of projects area and activity: **The co-applicants, NCDMS and Wildlands Engineering, Inc. have requested a Department of the Army permit authorization to discharge dredged and/or fill material into waters of the United States associated with the NCDMS Sassarixa Swamp Mitigation Site. Implementation of the proposed restoration and enhancement activities will result in the discharge of fill material into 4981 linear feet of stream channel, and 0.646 acres of wetlands associated with mechanized land clearing, excavation, placement of fill material, and stream relocation activities for the mitigation site. Compensatory mitigation is NOT required in conjunction with the aforementioned activities. Refer to the enclosed Table 1 for a detailed summary of impacts**

Applicable Law: ☒ Section 404 (Clean Water Act, 33 USC 1344)
☐ Section 10 (Rivers and Harbors Act, 33 USC 403)

Authorization: Regional General Permit Number and/or Nationwide Permit Number: **NWP 27 – Aquatic Habitat Restoration, Enhancement, and Establishment Activities**
SEE ATTACHED RGP or NWP GENERAL, REGIONAL AND SPECIAL CONDITIONS

Your work is authorized by the above referenced permit provided it is accomplished in strict accordance with the attached conditions and your submitted application and attached information dated May 20, 2020. Any violation of the attached conditions or deviation from your submitted plans may subject the permittee to a stop work order, a restoration order, a Class I administrative penalty, and/or appropriate legal action.

This verification will remain valid until the expiration date identified below unless the nationwide and/or regional general permit authorization is modified, suspended or revoked. If, prior to the expiration date identified below, the nationwide and/or regional general permit authorization is reissued and/or modified, this verification will remain valid until the expiration date identified below, provided it complies with all requirements of the modified nationwide permit. If the nationwide and/or regional general permit authorization expires or is suspended, revoked, or is modified, such that the activity would no longer comply with the terms and conditions of the nationwide permit, activities which have commenced (i.e., are under construction) or are under contract to commence in reliance upon the nationwide and/or

regional general permit, will remain authorized provided the activity is completed within twelve months of the date of the nationwide and/or regional general permit's expiration, modification or revocation, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend or revoke the authorization.

Activities subject to Section 404 (as indicated above) may also require an individual Section 401 Water Quality Certification. You should contact the NC Division of Water Resources (telephone 919-807-6300) to determine Section 401 requirements.

For activities occurring within the twenty coastal counties subject to regulation under the Coastal Area Management Act (CAMA), prior to beginning work you must contact the N.C. Division of Coastal Management in Morehead City, NC, at (252) 808-2808.

This Department of the Army verification does not relieve the permittee of the responsibility to obtain any other required Federal, State or local approvals/permits.

If there are any questions regarding this verification, any of the conditions of the Permit, or the Corps of Engineers regulatory program, please contact **Kimberly Browning, 919.554.4884 x60.**

Corps Regulatory Official: _____ Date: **June 30, 2020**
Expiration Date of Verification: **March 18, 2022**

Table 1. Authorized discharge of fill material into waters of the United States in association with the NCDMS Sassarixa Swamp Mitigation Site (SAW-2018-00432).

Stream Impacts

	3a. Reason for impact * (?)	3b.Impact type *	3c. Type of impact *	3d. S. name *	3e. Stream Type * (?)	3f. Type of Jurisdiction *	3g. S. width *	3h. Impact length *
S1	Stream Restoration/Enhancement	Permanent	Other	T1	Intermittent	Both	3 Average (feet)	975 (linear feet)
S2	Stream Restoration/Enhancement	Temporary	Other	T1	Intermittent	Both	3 Average (feet)	23 (linear feet)
S3	Stream Restoration/Enhancement	Permanent	Other	T1A	Intermittent	Both	8 Average (feet)	85 (linear feet)
S4	Stream Restoration/Enhancement	Permanent	Other	T1B	Intermittent	Both	3 Average (feet)	12 (linear feet)
S5	Stream Restoration/Enhancement	Permanent	Other	T2	Intermittent	Both	3 Average (feet)	354 (linear feet)
S6	Stream Restoration	Permanent	Relocation	T3	Perennial	Both	4 Average (feet)	1,036 (linear feet)
S7	Stream Enhancement	Permanent	Other	T4	Perennial	Both	7 Average (feet)	126 (linear feet)
S8	Stream Enhancement	Temporary	Other	T4	Perennial	Both	7 Average (feet)	23 (linear feet)
S9	Stream Restoration/Enhancement	Permanent	Relocation	T5	Perennial	Both	3 Average (feet)	947 (linear feet)
S10	Stream Enhancement	Temporary	Other	T5	Perennial	Both	3 Average (feet)	51 (linear feet)
S11	Stream Enhancement	Permanent	Other	T5A	Intermittent	Both	5 Average (feet)	206 (linear feet)
S12	Stream Enhancement	Temporary	Other	T5A	Intermittent	Both	4 Average (feet)	23 (linear feet)
S13	Stream Enhancement	Permanent	Rip Rap Fill	T5C	Intermittent	Both	4 Average (feet)	3 (linear feet)
S14	Stream Restoration/Enhancement	Permanent	Relocation	T6	Perennial	Both	4 Average (feet)	1,094 (linear feet)
S15	Stream Restoration/Enhancement	Temporary	Other	T6	Perennial	Both	4 Average (feet)	23 (linear feet)

Total Stream Impacts: Permanent- 4,838 LF, Temporary-143 LF

Wetland Impacts

2a. Site # * (?)	2a1 Reason * (?)	2b. Impact type * (?)	2c. Type of W. *	2d. W. name *	2e. Forested *	2f. Type of Jurisdiction * (?)	2g. Impact area *
W1	Streambank grading, grade control structure	P	Headwater Forest	Wetland A	No	Both	0.004 (acres)
W2	Floodplain grading	T	Riverine Swamp Forest	Wetland C	No	Both	0.006 (acres)
W3	Floodplain grading, temporary crossing	T	Headwater Forest	Wetland D	No	Both	0.308 (acres)
W4	Relocation	P	Headwater Forest	Wetland D	No	Both	0.029 (acres)
W5	Floodplain grading, stream structure	T	Headwater Forest	Wetland F	No	Both	0.002 (acres)
W6	Relocation	P	Headwater Forest	Wetland F	No	Both	0.002 (acres)
W7	Temporary crossing, floodplain grading, stream structure	T	Headwater Forest	Wetland G	No	Both	0.033 (acres)
W8	Relocation	P	Headwater Forest	Wetland G	No	Both	0.003 (acres)
W9	Relocation	P	Bottomland Hardwood Forest	Wetland H	Yes	Both	0.006 (acres)
W10	Floodplain grading	T	Bottomland Hardwood Forest	Wetland H	Yes	Both	0.023 (acres)
W11	Floodplain grading	T	Bottomland Hardwood Forest	Wetland I	Yes	Both	0.020 (acres)
W12	Relocation	P	Headwater Forest	Wetland I	Yes	Both	0.014 (acres)
W13	Floodplain grading, temporary crossing	T	Headwater Forest	Wetland J	Yes	Both	0.031 (acres)
W14	Relocation	P	Headwater Forest	Wetland J	Yes	Both	0.014 (acres)
W15	Floodplain grading	T	Headwater Forest	Wetland L	Yes	Both	0.036 (acres)
W16	Relocation	P	Headwater Forest	Wetland L	Yes	Both	0.025 (acres)
W17	Floodplain grading	T	Headwater Forest	Wetland S	Yes	Both	0.002 (acres)
W18	Floodplain grading	P	Headwater Forest	Wetland GG	No	Both	0.005 (acres)
W19	Floodplain grading	T	Headwater Forest	Wetland VV	Yes	Both	0.001 (acres)
W20	Relocation	P	Headwater Forest	Wetland VV	Yes	Both	0.001 (acres)
W21	Floodplain grading, temporary crossing	T	Headwater Forest	Wetland W	Yes	Both	0.037 (acres)
W22	Relocation	P	Headwater Forest	Wetland W	Yes	Both	0.012 (acres)
W23	Floodplain grading	T	Headwater Forest	Wetland X	Yes	Both	0.002 (acres)
W24	Floodplain grading, streambank grading, temporary crossing	T	Headwater Forest	Wetland Z	Yes	Both	0.002 (acres)
W25	Relocation	P	Headwater Forest	Wetland Z	Yes	Both	0.003 (acres)
W26	Streambank grading	T	Headwater Forest	Wetland BB	Yes	Both	0.002 (acres)
W27	Floodplain grading, temporary crossing	T	Headwater Forest	Wetland FF	Yes	Both	0.016 (acres)

W28	Relocation	P	Hardwood Flat	Wetland FF	Yes	Both	0.008

TOTAL WETLAND IMPACTS: Permanent- 0.125 ac, Temporary- 0.521 ac

Impacts are associated with aquatic resource restoration and enhancement activities and are expected to result in a net gain in Waters of the US.

SPECIAL CONDITIONS

1. **The permittee understands and agrees that the document entitled "Mitigation Plan – FINAL Sassarixa Swamp MitigationPlan" dated November 2019, and received May 20, 2020 is incorporated and made part of this permit. Execution of the work and terms given in the approved mitigation plan are a condition of this permit.**
2. **This Nationwide Permit verification does not imply suitability of this property for compensatory mitigation for any particular project. The use of any portion of this site as compensatory mitigation for a particular project will be determined during the permit review process for that project.**

COMPLIANCE CERTIFICATION

Action ID Number: SAW-2018-00432 **County: Johnston**

Permittee: NC Division of Mitigation Services
Attn: Mr. Tim Baumgartner

Wildlands Engineering, Inc.
Attn: Angela Allen

Project Name: NCDMS Sassarixa Swamp Mitigation Site

Date Verification Issued: June 30, 2020

Project Manager: Kim Browning

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

US ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
Regulatory Division Mitigation Office
Attn: Kim Browning
3331 Heritage Trade Drive, Suite 105
Raleigh, NC 27587

Please note that your permitted activity is subject to a compliance inspection by a U. S. Army Corps of Engineers representative. Failure to comply with any terms or conditions of this authorization may result in the Corps suspending, modifying or revoking the authorization and/or issuing a Class I administrative penalty, or initiating other appropriate legal action.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and condition of the said permit, and required mitigation was completed in accordance with the permit conditions.

_____ _____

Signature of Permittee **Date**

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
BRIAN WRENN
Acting Director

NORTH CAROLINA
Environmental Quality

July 6, 2020

LETTER OF APPROVAL

Wildlands Engineering, Inc.
ATTN: John Hutton, Vice President
1430 S Mint Street, Suite 104
Charlotte, NC 28203

RE: Project Name: Sassarixa Swamp Mitigation Site
Project ID: JOHNS-2020-013
Approved Acres: 45.39
County: Johnston, City: Smithfield, Address: Old Olive Road
River Basin: Neuse, Stream Classification: Other
Submitted By: Wildlands Engineering, Inc.
Date Received by LQS: July 1, 2020
Plan Type: Revised

Dear Mr. Hutton:

The subject erosion and sedimentation control plan has been approved. The enclosed Certificate of Approval must be posted at the job site. This plan approval shall expire three (3) years following the date of approval, if no land-disturbing activity has been undertaken, as is required by Title 15A NCAC 4B .0129.

As of April 1, 2019, all new construction activities are required to complete and submit an electronic Notice of Intent (eNOI) form requesting a Certificate of Coverage (COC) under the NCG010000 Construction General Permit. After the form is reviewed and found to be complete, you will receive a link with payment instructions for the $100 annual permit fee. After the fee is received, you will receive the COC via email. You MUST obtain the COC prior to commencement of any land disturbing activity. The eNOI form may be accessed at deq.nc.gov/NCG01. Please direct questions about the eNOI form to Annette Lucas at Annette.Lucas@ncdenr.gov or Paul Clark at Paul.Clark@ncdenr.gov. If the owner/operator of this project changes in the future, the new responsible party is required to apply for his/her own COC.
Title 15A NCAC 4B .0118(a) and the NCG01 permit require that the following documentation be kept on file at the job site:

1. The approved E&SC plan as well as any approved deviation.
2. The NCG01 permit and the COC, once it is received.
3. Records of inspections made during the previous 12 months.

Also, this letter gives the notice required by G.S. 113A-61.1(a) of our right of periodic inspection to insure compliance with the approved plan.

Title 15A NCAC 4B .0118(a) requires that a copy of the approved erosion control plan be on file at the job site. Also, this letter gives the notice required by G.S. 113A-61.1(a) of our right of periodic inspection to insure compliance with the approved plan.

North Carolina's Sedimentation Pollution Control Act is performance-oriented, requiring protection of existing natural resources and adjoining properties. If, following the commencement of this project, it is determined that the erosion and sedimentation control plan is inadequate to meet the requirements of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statute 113A-51 through 66), this office may require revisions to the plan and implementation of the revisions to ensure compliance with the Act.

Acceptance and approval of this plan is conditioned upon your compliance with Federal and State water quality laws, regulations, and rules. In addition, local city or county ordinances or rules may also apply to this land-disturbing activity. This approval does not supersede any other permit or approval.

Please note that this approval is based in part on the accuracy of the information provided in the Financial Responsibility Form, which you provided. You are requested to file an amended form if there is any change in the information included on the form. This permit allows for a land-disturbance, as called for on the application plan, not to exceed the approved acres. Exceeding the acreage will be a violation of this permit and would require a revised plan and additional application fee. In addition, it would be helpful if you notify this office of the proposed starting date for this project. Please notify us if you plan to have a preconstruction conference.

Your cooperation is appreciated.

Sincerely,

Sally Castle

Sally Castle, EI
Regional Engineering Associate
Land Quality Section

Enclosures: Certificate of Approval
NPDES NCG01 Fact Sheet

cc: Angela Allen, PE (aallen@wildlandseng.com) - Electronic Copy
Regional Office File

APPENDIX 6. Vegetation Plot Data

Table 4. Vegetation Plot Data

Sassarixa Swamp Mitigation Site

Monitoring Year 0 - 2021

Planted Acreage	13.03
Date of Initial Plant	2021-03-05
Date of Current Survey	2021-03-11
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	1	1			1	1	1	1
	Betula nigra	river birch	Tree	FACW	3	3			4	4	1	1
	Magnolia virginiana	sweetbay	Tree	FACW	1	1	2	2	1	1	1	1
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	3	3	4	4	2	2
	Populus deltoides	eastern cottonwood	Tree	FAC	1	1	3	3			2	2
	Quercus michauxii	swamp chestnut oak	Tree	FACW	2	2			2	2	4	4
	Quercus nigra	water oak	Tree	FAC	2	2	1	1			1	1
	Quercus phellos	willow oak	Tree	FACW	1	1	2	2	3	3	3	3
Sum				Performance Standard	14	14	11	11	15	15	15	15
Mitigation Plan Performance Standard				Current Year Stem Count		14		11		15		15
				Stems/Acre		567		445		607		607
				Species Count		8		5		6		8
				Dominant Species Composition (%)		21		27		27		27
				Average Plot Height		3		2		2		2
				% Invasives		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		14		11		15		15
				Stems/Acre		567		445		607		607
				Species Count		8		5		6		8
				Dominant Species Composition (%)		21		27		27		27
				Average Plot Height		3		2		2		2
				% Invasives		0		0		0		0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 4. Vegetation Plot Data

Sassarixa Swamp Mitigation Site

Monitoring Year 0 - 2021

Planted Acreage	13.03
Date of Initial Plant	2021-03-05
Date of Current Survey	2021-03-11
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	1	1	2	2	1	1	2	2
	Betula nigra	river birch	Tree	FACW	2	2	2	2	2	2	1	1
	Magnolia virginiana	sweetbay	Tree	FACW	1	1	1	1	1	1	1	1
	Platanus occidentalis	American sycamore	Tree	FACW	4	4	2	2	4	4	3	3
	Populus deltoides	eastern cottonwood	Tree	FAC	1	1					1	1
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1	1	4	4	3	3	5	5
	Quercus nigra	water oak	Tree	FAC					1	1		
	Quercus phellos	willow oak	Tree	FACW	2	2	3	3	2	2	1	1
Sum				Performance Standard	12	12	14	14	14	14	14	14
Mitigation Plan Performance Standard				Current Year Stem Count		12		14		14		14
				Stems/Acre		486		567		567		567
				Species Count		7		6		7		7
				Dominant Species Composition (%)		33		29		29		36
				Average Plot Height		3		3		2		3
				% Invasives		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		12		14		14		14
				Stems/Acre		486		567		567		567
				Species Count		7		6		7		7
				Dominant Species Composition (%)		33		29		29		36
				Average Plot Height		3		3		2		3
				% Invasives		0		0		0		0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 4. Vegetation Plot Data

Sassarixa Swamp Mitigation Site

Monitoring Year 0 - 2021

Planted Acreage	13.03
Date of Initial Plant	2021-03-05
Date of Current Survey	2021-03-11
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 9 F		Veg Plot 10 F	
					Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	3	3	1	1
	Betula nigra	river birch	Tree	FACW	3	3	2	2
	Magnolia virginiana	sweetbay	Tree	FACW	1	1	2	2
	Platanus occidentalis	American sycamore	Tree	FACW	5	5	3	3
	Populus deltoides	eastern cottonwood	Tree	FAC	2	2	2	2
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1	1	2	2
	Quercus nigra	water oak	Tree	FAC			1	1
	Quercus phellos	willow oak	Tree	FACW	1	1	2	2
Sum				Performance Standard	16	16	15	15
Mitigation Plan Performance Standard				Current Year Stem Count		16		15
				Stems/Acre		648		607
				Species Count		7		8
				Dominant Species Composition (%)		31		20
				Average Plot Height		2		2
				% Invasives		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		16		15
				Stems/Acre		648		607
				Species Count		7		8
				Dominant Species Composition (%)		31		20
				Average Plot Height		2		2
				% Invasives		0		0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 5. Vegetation Performance Standards Summary Table

Sassarixa Swamp Mitigation Site

Monitoring Year 0 - 2021

	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 5												
Monitoring Year 4												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1												
Monitoring Year 0	567	3	8	0	445	2	5	0	607	2	6	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 5												
Monitoring Year 4												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1												
Monitoring Year 0	607	2	8	0	486	3	7	0	567	3	6	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 5												
Monitoring Year 4												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1												
Monitoring Year 0	567	2	7	0	567	3	7	0	648	2	7	0
	Veg Plot 10 F											
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives								
Monitoring Year 5												
Monitoring Year 4												
Monitoring Year 3												
Monitoring Year 2												
Monitoring Year 1												
Monitoring Year 0	607	2	8	0								

VEGETATION PLOT PHOTOGRAPHS

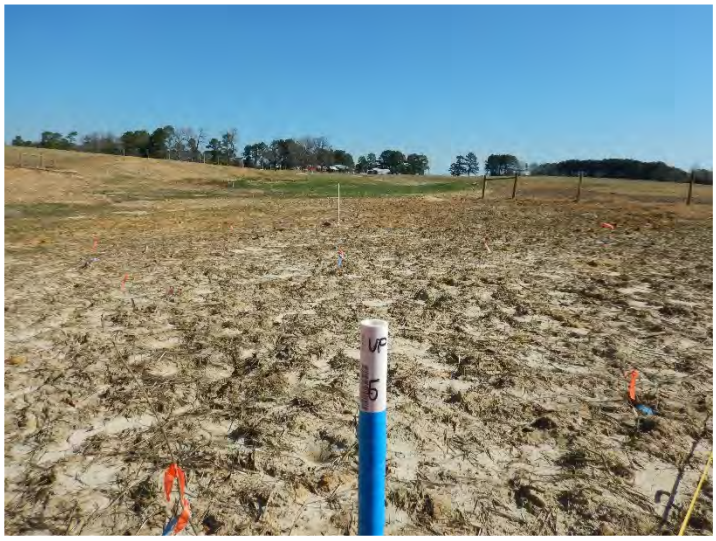
FIXED VEG PLOT 1 *(3/11/2021)*

FIXED VEG PLOT 2 *(3/11/2021)*

FIXED VEG PLOT 3 *(3/11/2021)*

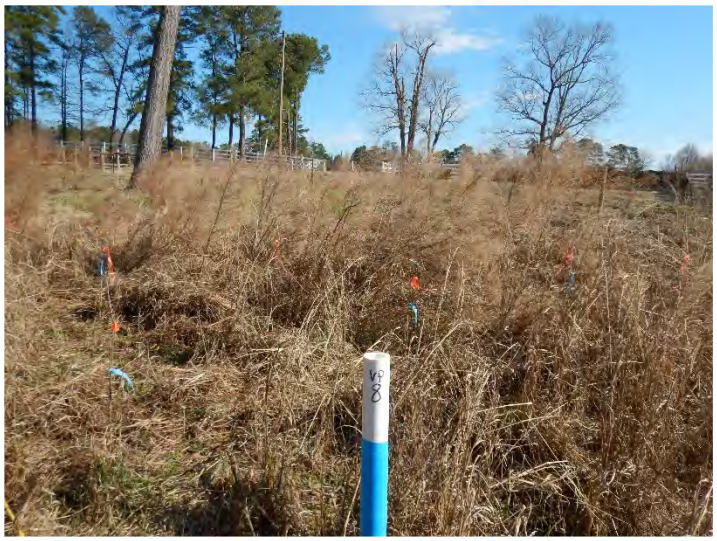
FIXED VEG PLOT 4 *(3/11/2021)*

FIXED VEG PLOT 5 *(3/11/2021)*



FIXED VEG PLOT 6 *(3/11/2021)*

FIXED VEG PLOT 7 *(3/11/2021)*



FIXED VEG PLOT 8 *(3/11/2021)*

FIXED VEG PLOT 9 *(3/11/2021)*

FIXED VEG PLOT 10 *(3/11/2021)*