As-built Baseline Monitoring Report

FINAL

Bear Swamp Stream & Wetland Mitigation Project

Robeson County, North Carolina

Monitoring Year 0

Data Collection Period:

March 2021

Submission Date:

July 2021

NCDEQ Contract No. 7516
DMS ID No. 100054
USACE Action ID No. SAW-2018-01154
NCDWR ID: 20180782
Lumber River Basin
HUC 03040203

Prepared For:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27603

Prepared By:

Ecosystem Planning and Restoration
1150 SE Maynard Road, Suite 140
Cary, NC 27511

Ecosystem Planning and Restoration, LLC
1150 SE Maynard Road, Suite 140
Cary, NC 27511

Phone: (919) 388-0787
www.eprusa.net

Mr. Kelly Phillips
NCDEQ – Division of Mitigation Services
610 East Center Avenue
Suite 301
Mooresville, NC 28115

July 15, 2021

RE: Response to Draft As-Built Baseline Monitoring Report (MY0) Comments dated June 7, 2021
Bear Swamp Stream & Wetland Mitigation Project
Lumber River Basin – CU# 03040203 - Robeson County, North Carolina
NCDMS Project # 100054, Contract # 7516

Dear Mr. Phillips,

Ecosystem Planning and Restoration (EPR) has reviewed the comments on the Draft As-Built Baseline Monitoring Report provided June 7, 2021. The comments have been addressed as described below and the Final Baseline Report and electronic deliverables have been revised in response to this review.

- *Page 1, paragraph 2 typo for wetland credit (showing 2.6 but should be 2.88).*
    - **EPR was contracted to provide 2.6 wetland mitigation credits, which is what this statement is referring to. The second to last sentence in page 1, paragraph 2 states that 2.88 acres of riparian wetlands were actually restored, but only 2.6 acres of this will go toward crediting. Any surplus credits that were produced will not be realized by EPR. This information is also presented in Table 1.**

- *Please add wetland polygons to the maps.*
    - **Pre-existing jurisdictional wetlands have been added to the CCPV. The wetland preservation and restoration polygons are also shown.**

- *Provide the drone video link.*
    - **The drone footage that was shot on 10/27/2021 will be provided via FTP link.**

- *Please complete the initial invasive treatment and as planned and update the report as you finalize the As-Built.*
    - **In addition to the 0.40 acres of Chinese privet that was treated in February 2021, small areas of additional privet have been treated in the past few months. No other major efforts have been made so far in 2021, but the privet will continue to be**

Ecosystem Planning and Restoration, LLC
1150 SE Maynard Road, Suite 140
Cary, NC 27511

Phone: (919) 388-0787
www.eprusa.net

treated over the next year and into MY2. EPR will continue to keep DMS updated on these efforts.

- *Consider making it more clear in the report and/or maps that the required 100-foot width is provided for the headwater stream.*
    - **A statement was added to clarify the easement width on page 1, paragraph 1.**

- *General comment: provide a section or description of changes from Mitigation Plan.*
    - **The only significant change in work from the mitigation plan was a reduction in clearing and grading within the downstream forested area as discussed in Section 1.3. This translates to a reduction in vegetation monitoring requirements as discussed in Section 2.2.1.**

- *Section 2.2.1 states vegetation plots decreased from 12 to 10 due to decreased in planted area. Describe where and how this area decreased from Mitigation Plan area. (i.e., was clearing planned for forested area and why did it not occur).*
    - **See previous response regarding where this information has been added to the Baseline report.**

- *Table 5 shows some areas as "invasive areas of concern." Please map these areas and show on CCPV.*
    - **These areas have been added to the CCPV.**

- *Table 3 shows wetland C with 'Norfolk' soil, which is non-hydric. Update to provide correct soil series or leave blank and describe as hydric.*
    - **Field investigations indicated that the soils in the area of Wetland C were hydric, but the NRCS soil map data showed the area as lying within the Norfolk loamy sand. That was why this was included in Table 3. Project Attribute Table in the row titled "Mapped Soil Series". The following row in Table 3 states that the soil status is "Hydric" as observed during detailed field investigations. A clarification has been added to the table.**

- *2.2.1, vegetation. Provide a list/table of number and species of trees planted. Should show what was planned (species, % and what was planted).*
    - **This information has been added as Table 8. Vegetation Planting Information in Appendix B. The subsequent tables have been relabeled accordingly.**

- *Table 7, Vegetation. Where are the 5 random plots? Those should be included in the MY0.*
    - **The 5 random plots were not surveyed during baseline monitoring (See section 2.2.1), as these plots will change year to year. EPR has not surveyed random plots**

Ecosystem Planning and Restoration, LLC
1150 SE Maynard Road, Suite 140
Cary, NC 27511

Phone: (919) 388-0787
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during baseline monitoring for other DMS full delivery sites and has typically begun reporting this data in the MY1 report.

- *Table 8. Provide specific dates when possible (day/month/year), especially for earthwork, planting, institution, MP approval.*
    - **The October 2020 DMS template only shows month/year for timeline dates. EPR has not included specific dates for other DMS full delivery sites.**

- *In the future, please provide CCPV on one page with labels. This site is too small to be broken out into two maps.*
    - **The CCPV has been reformatted to one page.**

- *Long pro is showing on drawings, but difficult to see because of scale and background. Can the previous ditch depth be graphed to show elevation change and background turned off?*
    - **The vertical scale on the profile was increased on sheets 3, 4, and 5 to improve legibility. Where the previous ditch ties in with the existing ground on sheet 5 the elevations are so similar that increasing the scale and/or turning off the background does not greatly improve legibility.**

- *Confirm there was no pre-restoration gauge data.*
    - **Pre-restoration gauge data has been added to the Baseline report in Appendix C.**

- *Confirm if there was field tile found during construction. This was a regulatory concern from the initial site visit and good to document for the record.*
    - **No field drain tile was found during construction; Section 1.3 has also been updated with this observation.**

<u>Digital File Review Comments</u>

- *Please submit veg plots as polygons.*
    - **The veg plot polygons have been added to the CCPV and included in the digital deliverable.**

- *Please submit the as-built cad or Microstation file.*
    - **The As-Built Microstation file has been included in the digital deliverable.**

- *The 2 features included in the "Pilot Channel Thalweg" shapefile do not connect. Please review and ensure that the features are contiguous. It's assumed that this shapefile*

Ecosystem Planning and Restoration, LLC
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Cary, NC 27511

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represents the stream asset features, however, note that the "Streams Clipped" shapefile cannot currently be opened in arcmap.

- **The stream features in the "Pilot Channel Thalweg" shapefile have been connected into one feature. That shapefile is called BearSwamp_Pilot Channel Thalweg. The "streams clipped" has been renamed BearSwamp_Existing_Stream and represents the pre-existing stream on the site.**

- *What are the species indicated as other? If it wasn't included in the species list, I can add it to the tool, and they can re-run the tool. In my opinion, there are too many others in the veg data.*
  - **Any unknown species surveyed during baseline monitoring was entered into the tool as "other". As noted in the report, because of the time of year, short time span from planting, and general stem/size requirements, most species could not be identified during baseline monitoring. Every stem was counted and measured, and all species identification will occur in MY1. The added Table 8 shows species that were planted.**

If you have any questions regarding the As-Built Baseline Report, please contact me at 919-623-5411 or via email at ajames@eprusa.net.

Sincerely, Amy James, PWS

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FIGURES

APPENDICES

1.0 PROJECT SUMMARY

Ecosystem Planning and Restoration, PLLC (EPR) implemented the Bear Swamp Stream and Wetland Mitigation Project (Project; Site) for the North Carolina Division of Mitigation Services (NCDMS) to provide 2,220 stream mitigation units (SMUs) and 2.6 riparian wetland mitigation units (WMUs) in the Lumber River Basin, Hydrologic Unit Code (HUC) 03040203 (Figure 1). The Project was instituted via NCDEQ-DMS RFP # 16-007337. The Project restored 2,331 linear feet of intermittent stream and restored or preserved 3.3 acres of riparian wetlands within a 15.3 conservation easement, resulting in mitigation units exceeding those contracted for streams (2,222.000 SMUs) and riparian wetlands (2.6 WMUs), respectively. The easement provides a minimum 50-foot buffer on either side of the stream and is well over 100 feet wide in most areas. Mitigation assets are listed in Table 1.

The Site is located in DMS targeted local watershed 03040203050010. The Site was utilized for intensive row crop production, including soybeans, cotton, and corn. As such, streams and existing wetlands in the project area were adversely impacted by agricultural activities, removal of riparian buffers, and stream channelization. The Site is situated in a WS-IV watershed that is approximately 61% agricultural land, 27% forest, and 13% low density residential development (Table 3). Prior to construction activities, the project stream was channelized and straightened, and adjacent headwater wetlands were not functioning due to drainage and removal of native vegetation. Photos and a more detailed description of site conditions before restoration are available in the Mitigation Plan (final version submitted March 2020).

1.1 Goals and Objectives

The Project goals were established based on an assessment of site conditions and restoration potential with careful consideration of the stressors identified in the Lumber River Basin Restoration Priorities (RBRP; NCEEP, 2008) and the Bear Swamp Local Watershed Plan (NCEEP, 2013). These goals and objectives are presented in Table 2.

1.2 Construction

Construction began in October 2020 and was completed in November 2020; planting, and baseline vegetation data collection was completed in March 2021. Table 9 in Appendix D outlines the project activity reporting history, and Table 10 contains the project contacts.

1.3 Restoration Work and Floodplain Grading

Earthwork mainly consisted of filling the old, channelized streambed and grading the site to topographic contours that mimic the pre-drained condition. Flow was directed into a pilot channel in the lowest part of the valley. Bulldozers were used to shape the valley and perform general grading in the old field area; however, smaller equipment was able to be used in the forested area, allowing for much less clearing than was assumed in the mitigation plan and permitting documents. No other changes in work were noted from the mitigation plan; however, this reduction in grading affected site monitoring features as discussed in Section 2.2.1. Additionally, the presence of field tiles was not able to be confirmed during the mitigation plan phase; however, no field tiles were encountered during construction.

1.4 Performance Criteria

Project success criteria were established in accordance with the *NCDMS Mitigation Plan Template* (ver. 06/2017), and *U.S. Army Corps of Engineers – Wilmington District Public Notice: Notification of Issuance of Guidance for Compensatory Stream and Wetland Mitigation Conducted for Wilmington District* (October 24, 2016). The monitoring plan for the site follows the guidance *NCDMS Annual Monitoring Report Format, Data, and Content Requirements* (October 2020). Table 2 details the United States Army Corps of Engineers (USACE) success criteria that evaluate whether project goals have been met throughout the monitoring period.

Table 1. Project Mitigation Quantities and Units

Project Component (reach or wetland ID, etc.)	Original Mitigation Plan (ft/ac)	As-built (ft/ac)	Mitigation Category (Thermal Regime; Wetland Type)	Original Restoration Level[1]	Original Mitigation Ratio (X:1)	Mitigation Units	Notes/Comments
UT to Bear Swamp	2,222.00	2,331.120	Warm	R[2]	1.00000	2,222.000	Full Channel Restoration, Planted Buffer, and Permanent Conservation Easement.
Wetland A	0.417[4]	0.417	Riparian	P	10.00000	0.042	Protect with Permanent Conservation Easement
Wetland B	2.490	2.490	Riparian	R	1.00000	2.490	Restore wetland indicators (vegetation, hydrology, and soil), as defined by the USACE.
Wetland C	0.348	0.348	Riparian	R	1.00000	0.348	
					Total Assets Summary:		**2,222.000 SMUs 2.880 WMUs**

Length and Area Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)	Non-riparian Wetland (acres)
Restoration	2,222.000	2.838	
Enhancement			
Enhancement I			
Enhancement II			
Rehabilitation			
Preservation		0.417	
High Quality Pres			

Overall Assets Summary

Asset Category	Overall Units
Stream	**2,222.000**
Riparian Wetland	**2.880[3]**

[1] R=Restoration; P=Preservation

[2] Headwater (or Valley) Stream Restoration

[3] Contracted amount of riparian wetland units is 2.6 acres; any surplus units will not be realized by EPR

[4] Only includes part of existing Wetland A being claimed as preservation

Table 2. Summary: Goals, Performance and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurements	Cumulative Monitoring Results
Replace riparian buffers	▪ Restore minimum 50-foot riparian buffers to filter runoff.	▪ Restored riparian buffers will provide woody debris and detritus for aquatic organisms, reduced water temperatures, and increased dissolved oxygen concentrations, as well as shade and diverse aquatic and terrestrial habitats that are appropriate for the ecoregion and setting.	▪ Vegetation success criteria of 320 native stems/acre in Year 3, 260 stems/acre in Year 5 and 210 native stems/acre in Year 7. ▪ Trees must average 7 feet in height at year 5, and 10 feet in height at year 7.	<u>Permanent and Annual Random Vegetation Plots</u> 5 permanent vegetation plots and 5 randomly selected vegetation plots 0.02 acre in size, surveyed during As-built, Years 1, 2, 3, 5, and 7 between July 1st and leaf drop. Data collection includes species, height, planted vs. volunteer, and age.	N/A for MY0
Repair channelized streams	▪ Restore appropriate bed form diversity, headwater stream/wetland form, and install in-stream structures to provide appropriate habitat. ▪ Restore self-sustaining stream/wetland headwaters	▪ Functional uplift will be achieved by reducing the impact of adjacent agriculture and restoring natural riparian vegetation, appropriate stream form, and adjacent headwater wetlands.	▪ Continuous surface flow within the valley or crenulation must be documented each year for at least 30 consecutive days.	<u>Stream Hydrology Monitoring</u> 2 pressure transducers and a rain gauge will record precipitation and streamflow data continuously through the monitoring period.	N/A for MY0
Preserve existing resources	▪ Place a conservation easement on existing riparian headwater stream/ wetland system at southern end of the project.		▪ Documentation of field indicators of channel formation and an ordinary high-water mark using photographs and applicable data sheets.	<u>Channel Formation</u> Documentation of applicable field indicators using photography and data sheets	N/A MY0
Improve Water Quality Where Degraded by Pollutant Inputs	▪ Restore and preserve riparian wetland systems. ▪ Restore riparian buffer vegetation to filter runoff and provide organic matter and shade. ▪ Remove cropland from active production.	▪ The addition of in-stream structures will provide greater bedform diversity, enhancing aquatic habitat for native species.	▪ Visual documentation of stream stability during annual monitoring.	<u>Visual Assessment</u> Conducted yearly for restored wetlands, stream channels, and in-stream habitat and grade control structures (debris jams and woody riffle).	Photo points and visual assessment indicate that all restored wetlands, stream channels, and in-stream habitat and grade control structures are performing as intended. No problem areas were observed.

Table 2. Summary: Goals, Performance and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurements	Cumulative Monitoring Results
Improve Functions Degraded by Loss of Channel-Riparian Zone Connection	▪ Restore self-sustaining stream/wetland headwaters. ▪ Restore minimum 50-foot riparian buffers that will include riparian wetlands and terrestrial edges.	▪ Functional uplift will occur by restoring the stream to its historic valley, raising the streambed, and connecting it to adjacent wetlands at lower flows.	▪ Water table gauges and wells document high water table conditions. ▪ Wetland hydrology success criteria of saturation or inundation for 12 percent of the growing season.	<u>Wetland Hydrology Monitoring</u> 5 pressure transducers (4 in restored wetland areas and 1 reference) will record groundwater levels continuously throughout the monitoring period.	N/A for MY0
Protect Against Future Threats	▪ Place a permanent conservation easement on the project area.		▪ Recordation and protection of a conservation easement meeting NCDMS guidelines	<u>Observations of Easement Encroachment</u> Document any encroachments into easement from adjoining land use	None observed

Table 3. Project Attribute Table

Project Background Information			
Project Name		Bear Swamp Stream and Wetland Restoration Project	
County		Robeson	
Project Area (acres)		15.3	
Project Coordinates (latitude and longitude)		latitude 34 deg 40' 549" N, longitude 79 deg 9' 19" W	
Planted Acreage (Acres of Woody Stems Planted)		12.07	
Project Watershed Summary Information			
Physiographic Province		Coastal Plain	
River Basin		Lumber	
USGS Hydrologic Unit 8-digit	03040203	USGS Hydrologic Unit 14-digit	03040203050010
Project Drainage Area (Acres and Sq. Mi.)		59.2 acres/ 0.09 Sq.Mi. (Total)	
Project Stream Thermal Regime		Warm	
Project Drainage Area Percentage of Impervious Area		<1%	
CGIA Land Use Classification		Agriculture/Pasture 61%, Forest 27%, 13% Residential/Developed	

Reach Summary Information			
Parameters	**UT1**		
Length of reach (linear feet)	2,432 (original length)		
Valley confinement (Confined, moderately confined, unconfined)	Unconfined		
Drainage area (Acres and Square Miles)	0.09 Sq.Mi., 59.2 Ac		
Perennial, Intermittent, Ephemeral	Intermittent (25.5)		
NCDWR Water Quality Classification	WS-IV; Sw		
Stream Classification (existing)	G5/B5c		
Stream Classification (proposed)	most similar to DA		
Evolutionary trend (Simon)	II		
FEMA classification	X		

Wetland Summary Information			
Parameters	**Wetland A**	**Wetland B**	**Wetland C**
Pre-project (acres)	0.417	0.00	0.00
Post-project (acres)	0.417	2.49	0.348
Wetland Type (non-riparian, riparian)	Riparian	Riparian	Riparian
Mapped Soil Series	Johnston	Bibb	Norfolk loamy sand
Soil Hydric Status	Hydric	Hydric	Hydric[1]

Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	USACE NWP 27 - ID# SAW-2018-01154
Water of the United States - Section 401	Yes	Yes	DWR 401 WQC No. 4134 -- ID # 18-0782
Division of Land Quality (Erosion and Sediment Control)	Yes	Yes	General Permit NCG010000 ID # ROBES-2020-028
Endangered Species Act	No	Yes	Categorical Exclusion Document; Appendix 6 in Mitigation Plan
Historic Preservation Act	No	Yes	
Coastal Zone Management Act	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

[1]: This soil unit is not considered hydric by the NRCS, but detailed field investigations found soils meeting hydric criteria (as presented in the Mitigation Plan).

2.0 BASELINE DATA ASSESSMENT

Monitoring Year 0 (MY0) data was collected in March 2021. Current site conditions and monitoring data are described in the following sections to evaluate whether the project is meeting the success criteria established in the mitigation plan.

2.1 Stream Monitoring

Stream monitoring involves field data collection to assess the hydrologic and geomorphic functions of UT1. Monitored parameters, methods, schedule/frequency, and extent are summarized in Table 2. These monitoring parameters follow USACE guidance but will also allow for monitoring of other parameters to document site performance related to the project goals listed in Table 2. The locations of the stream gauges and photo points are shown in Figure 2 Current Condition Plan View (CCPV).

2.1.1 Valley Profile

Because this project utilizes valley restoration, a full longitudinal profile was not required per the mitigation plan. A small pilot channel was dug along the low point of the valley during construction to route flow; the thalweg of this channel is shown in plan-view on the As-Built Plans (Appendix E) and on the CCPV (Figure 2).

2.1.2 Channel Formation

Headwater stream (or valley) restoration requires that evidence of channel formation be documented during each monitoring year. Applicable field indicators of channel formation are found in RGL 05-05 and outlined in the 2016 USACE Guidance. These will be documented with photographs and datasheets in the yearly monitoring report.

2.1.3 Channel Stability

Because this project utilizes valley restoration, no defined channel was constructed. Instead, a small pilot channel was dug to route flows along the valley after construction. It is important to note that this channel may move laterally across the valley over time. On a yearly basis during the monitoring period, stability of the channel will be assessed using photographs to visually document the condition of the restored project stream. Twelve (12) photo points were established along the initial pilot channel during baseline monitoring and are shown in the CCPV (Figure 2); the directionality of each is indicated on the Photolog in Appendix A. Photo points do not extend the full length of the channel as the forested area at the southern end of the project was left largely intact and instability would not be expected. Usually, these photographs are taken from the same location in the same direction each year. However, if the pilot channel moves laterally, the photo points will be adjusted accordingly to assess channel stability. Any changes will be documented in future monitoring reports. Visual assessments of channel stability will also be made regularly throughout the monitoring year. Any potential issues with the site will be documented, photographed, and reported in the yearly monitoring report.

2.1.4 Stream Hydrology

Two (2) pressure transducers were installed in UT1 to document days of continuous stream flow during the monitoring year. The locations of these gauges are shown in the CCPV (Figure 2).

This Project utilizes a tipping bucket rain gauge to accurately document rainfall at the Site. The rainfall data can be compared to the flow gauge data to verify that high flows at the Site are correlated with rainfall events. The monitoring gauges will be downloaded regularly throughout each monitoring year and data will be presented in the annual monitoring reports.

2.2 Riparian and Wetland Vegetation Monitoring

Riparian and wetland vegetation monitoring evaluates the growth and development of planted and volunteer vegetation across the site. Monitored parameters, methods, schedule/frequency, and extent are summarized in Table 2. These monitoring parameters follow USACE guidance but will also allow for monitoring of other parameters to document site performance related to the project goals listed in Table 2.

2.2.1 Baseline Vegetation Monitoring

Baseline vegetation monitoring occurred in March 2021, soon after site planting was completed (see Table 8 for planted species and percentages). While six (6) permanent ('fixed') vegetation plots were proposed in the mitigation plan, only five (5) permanent vegetation plots were installed since the as-built planted acreage was less than anticipated in the mitigation plan. The mitigation plan allowed for more clearing of the forested buffer area in the southern portion of the easement to provide flexibility to the construction contractor during the permitting process. However, during project construction, the contractor found that only very limited clearing in the permitted area was required, so a larger area of intact forest was left in place than was anticipated in both the mitigation plan and permits for this project. The number of random vegetation plots surveyed during monitoring will also be reduced from six (6) to five (5) based on planted acreage. The locations of the five fixed plots did not vary significantly from the locations suggested in the mitigation plan and include two plots in restored wetland areas.

The corners of the permanent vegetation plots were marked using steel t-posts and the location of each plot was surveyed during the as-built survey. The individual trees within each permanent plot were marked with pin flags to facilitate monitoring efforts in future years, though due to the time of year, short time span from planting, and general stem size/characteristics, most species identification could not be completed for the Baseline Report. The planted stems were counted and measured during baseline monitoring (Appendix B). More complete species data will be collected during Monitoring Year 1. In subsequent monitoring years, the location of the temporary random vegetation plots will be recorded using a GPS and species and height data will be collected. The temporary vegetation plots were not surveyed during baseline monitoring.

Planted stems per plot ranged from 13 to 21, or 526 to 850 stems per acre. The locations of the permanent vegetation plots are shown in the CCPV (Figure 2).

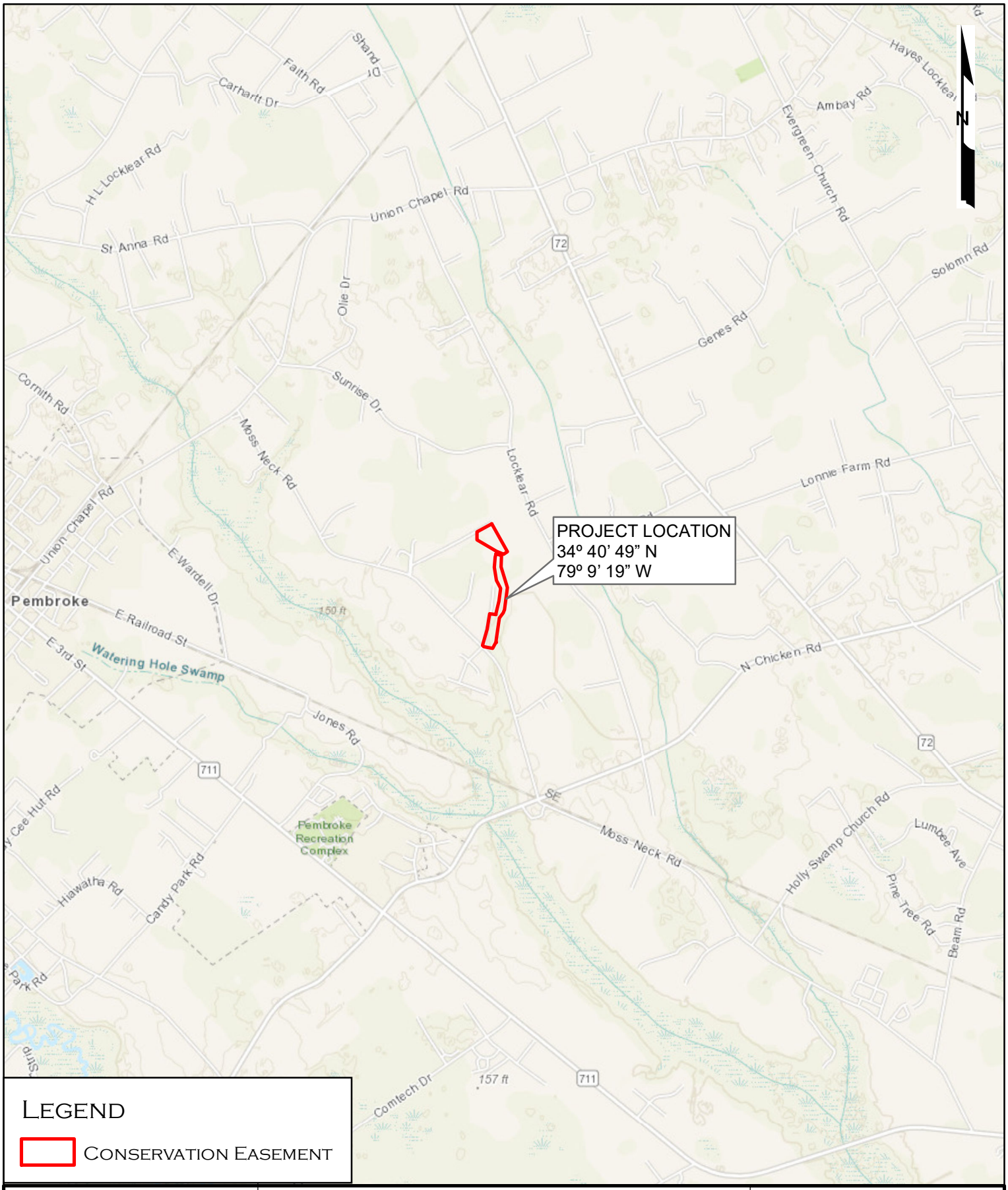
2.2.2 Invasive Species

Chinese privet (*Ligustrum sinense*) was the most common invasive species found within the forested section of the easement. Several other invasive species were identified along the field edge of the forested section, including Japanese privet (*Ligustrum japonicum*) and Chinaberry (*Melia azedarach*); however, these species were not as prevalent as Chinese privet. During construction, most of the forested area was left intact; therefore, much of the privet remained, totaling approximately 0.85 acre, mostly along the southeast border of the easement. In February 2021, approximately 0.40 acres was cut and stumps treated with Vastlan ™ (Triclopyr choline). EPR will work to cut and treat the remaining 0.45 acres (2.9% of conservation easement) of invasive species over the next year and into Monitoring Year 2. All treated areas will be planted with appropriate vegetation from the planting plan.

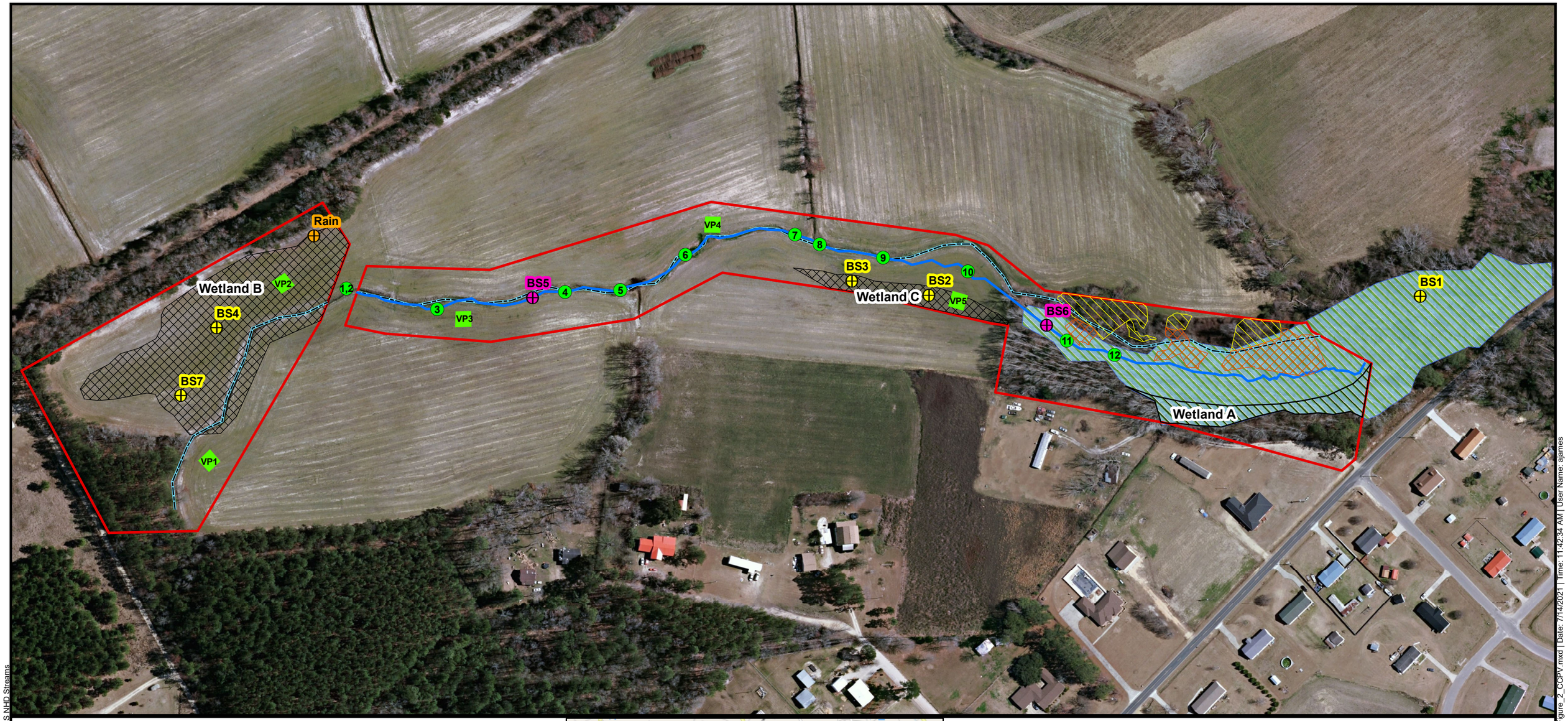
2.3 Wetland Hydrology

Four (4) groundwater wells were installed in restored wetland areas (2 each in Wetlands B and C) to document percent hydroperiod during the growing season. The locations of these wells are shown in the

CCPV (Figure 2) and are in approximately the same location as proposed in the mitigation plan. In addition, a fifth groundwater well was installed in the existing wetland area as a reference; the location of this well is also shown in the CCPV, though it was installed outside the easement (but still on the same landowner's property) due to access issues in this section of the wetland. Data from these wells will be provided in subsequent Monitoring Years.

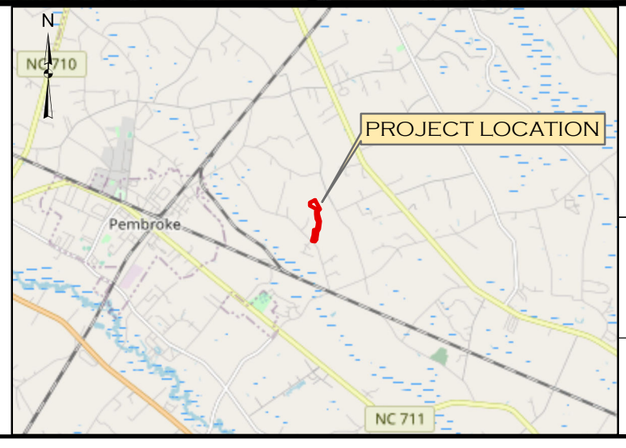


0 0.25 0.5 MILES	BEAR SWAMP STREAM & WETLAND RESTORATION VICINITY MAP	PREPARED FOR: NCDEQ DIVISION OF MITIGATION SERVICES
FIGURE 1	ROBESON COUNTY, NC	PREPARED BY: ECOSYSTEM PLANNING & RESTORATION



Vegetation Plots
Rain Gage
Stream Gage
Wetland Gage
Photo Points
Stream - Restoration
Pre-Existing Stream
Wetland - Preservation
Wetland - Restoration
Existing Wetlands
Conservation Easement

Invasive Areas of Concern
To be Treated
Treated



Bear Swamp Stream and Wetland Restoration Site

Current Condition Plan View: Asset Map
MY0: 2021

Robeson County, NC

Prepared for: NC Mitigation Services Environmental Quality

Prepared by: Ecosystem Planning & Restoration

N

0 100 200 Feet

1 inch = 200 feet

FIGURE 2

DATE:
July 2021

Sources: ESRI Aerial Imagery 2017; ESRI Topography; TIGER Roads; USGS NHD Streams

Path: R:\Projects\RDU0101_NCDEQ_Bear Swamp_FD\GIS\Maps\As-Built\Figure_2_CCPV.mxd | Date: 7/14/2021 | Time: 11:42:34 AM | User Name: ajames

3.0 REFERENCES

North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). DMS Vegetation Data Entry Tool, October 2020. https://ncdms.shinyapps.io/Veg_Table_Tool/

North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). Annual Monitoring Report Format, Data, and Content Requirements, October 2020.

North Carolina Ecosystem Enhancement Program (NC EEP). 2008. Lumber River Basin Restoration Priorities.

NC EEP. 2013. Summary of Findings and Recommendations for the Bear Swamp Local Watershed Plan.

U.S. Army Corps of Engineers. October 2016. Wilmington District Public Notice: Notification of Issuance of Guidance for Compensatory Stream and Wetland Mitigation Conducted for Wilmington District.

Appendix A

Visual Assessment Data

Table 4. Visual Stream Morphology Stability Assessment Table

Table 5. Vegetation Condition Assessment Table

Vegetation Photo Log

Photo Log

Table 4. Visual Stream Morphology Stability Assessment Table
Bear Swamp Stream and Wetland Mitigation Project (DMS No.100054)

Reach ID	**UT1**
Assessed Stream Length (ft)	**2,222**
Assessed Bank Length (ft)	**4444**

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
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.	5	5		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	22	22		100%
	Habitat	Debris jams/rootwads remain in contact with baseflow and provide cover	17	17		100%

Table 5. Vegetation Condition Assessment Table
Bear Swamp Stream and Wetland Mitigation Project (DMS No.100054)

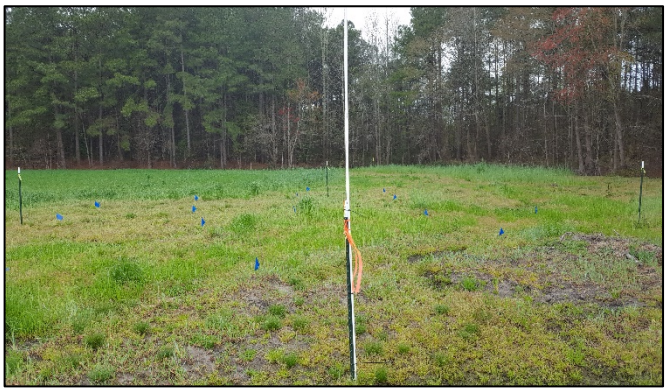
Planted Acreage **10.58**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.1 acres	0.00	0.0%
		Total	0.00	0.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.25 acres	0.00	0.0%
		Cumulative Total	0.00	0.0%

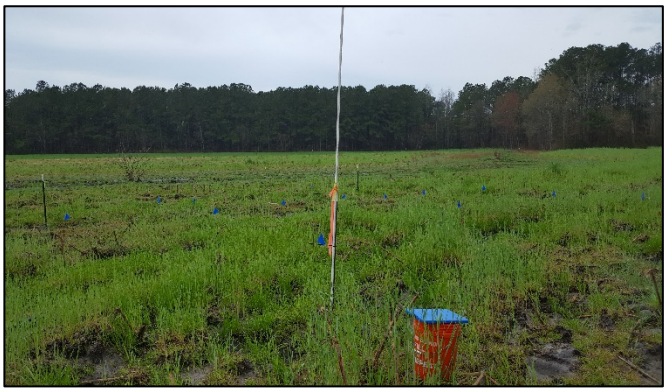
Easement Acreage **15.3**

Vegetation Category	Definitions	Mapping Threshold	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. Species included in summation above should be identified in report summary.	0.1 acres	0.45	2.9%
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	No Encroachments Noted	

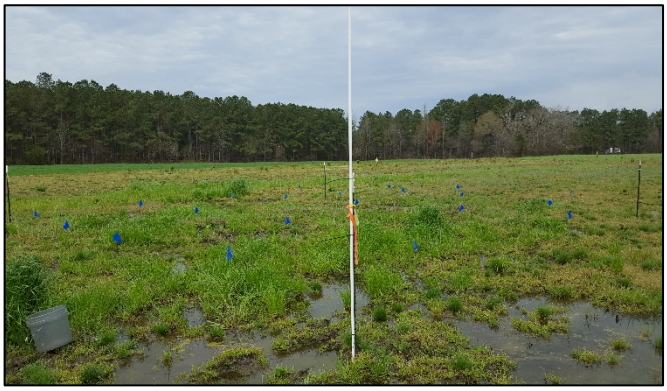
Bear Swamp Stream and Wetland Mitigation Project
Monitoring Year 0 (March 2021) - Vegetation Photo Log



Veg Plot 1 – East Corner (3/25/2021)

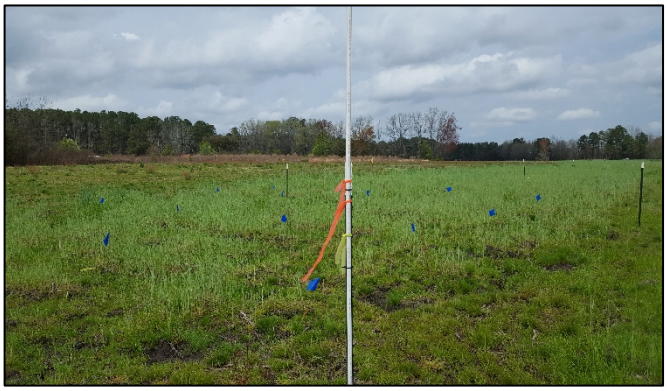


Veg Plot 2 – East Corner (3/25/2021)



Veg Plot 3 – SE Corner (3/25/2021)

Veg Plot 4 – SE Corner (3/25/2021)



Veg Plot 5 – SE Corner (3/25/2021)

Bear Swamp Stream and Wetland Mitigation Project
Monitoring Year 0 (March 2021) - Photo Log

Photo Point 1 – Sta. 10+00
Facing Upstream Towards Wetland B (3/25/2021)

Photo Point 2 – Sta. 10+00
Facing Downstream (3/25/2021)

Photo Point 3 – Sta. 11+75
Facing Downstream (3/25/2021)

Photo Point 4 – Sta. 14+60
Facing Upstream, Towards BS5 (3/25/2021)

Photo Point 5 – Sta. 15+90
Facing Downstream (3/25/2021)

Photo Point 6 – Sta. 17+45
Facing Upstream (3/25/2021)

Bear Swamp Stream and Wetland Mitigation Project
Monitoring Year 0 (March 2021) - Photo Log

Photo Point 7 – Sta. 20+00
Facing Downstream (3/25/2021)

Photo Point 8 – Sta. 20+50
Looking Upstream at Ditch from Stream (3/25/2021)

Photo Point 9 – Sta. 21+90
Facing Upstream (3/25/2021)

Photo Point 10 – UT1 Reach 3, Sta. 23+80
Facing Downstream (3/25/2021)

Photo Point 11 – Sta. 26+50
Facing Upstream, Towards BS6 (3/25/2021)

Photo Point 12 – Sta. 27+50
Facing Downstream (3/25/2021)

Bear Swamp Stream and Wetland Mitigation Project
Monitoring Year 0 (March 2021) - Photo Log

Permanent Ford Crossing
Facing West (3/25/2021)

Appendix B

Vegetation Plot Data

Table 6. Vegetation Plot Data

Table 7. Vegetation Performance Standards Summary Table

Table 8. Vegetation Planting Information

Table 6. Vegetation Fixed Plot Data

Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)

Planted Acreage	10.58
Date of Initial Plant	2021-03-19
Date(s) of Supplemental Plant(s)	#N/A
Date(s) Mowing	#N/A
Date of Current Survey	2021-03-25
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		Veg Plot 5 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Magnolia virginiana	sweetbay	Tree	FACW	1	1	4	4	4	4	1	1	3	3
	other				10	10	2	2	10	10	9	9	9	9
	Quercus sp.				1	1	2	2	3	3				
	Taxodium distichum	bald cypress	Tree	OBL	2	2	6	6	4	4	3	3	4	4
Sum	Performance Standard				14	14	14	14	21	21	13	13	16	16
Mitigation Plan Performance Standard	Current Year Stem Count					14		14		21		13		16
	Stems/Acre					567		567		850		526		648
	Species Count					4		4		4		3		3
	Dominant Species Composition (%)					71		43		48		69		56
	Average Plot Height					2		2		2		2		2
	% Invasives					0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					14		14		21		13		16
	Stems/Acre					567		567		850		526		648
	Species Count					4		4		4		3		3
	Dominant Species Composition (%)					71		43		48		69		56
	Average Plot Height					2		2		2		2		2
	% Invasives					0		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 7. Vegetation Peformance Standards Summary Table
Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)

Vegetation Performance Standards Summary Table												
	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		4	0	567		4	0	850		4	0
	Veg Plot 4 F				Veg Plot 5 F							
	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	526		3	0	648		3	0				

Does not meet interim criteria **Meets interim success criteria**

*Fixed plots are denoted with an F; MY0 data collection does not include random plots.

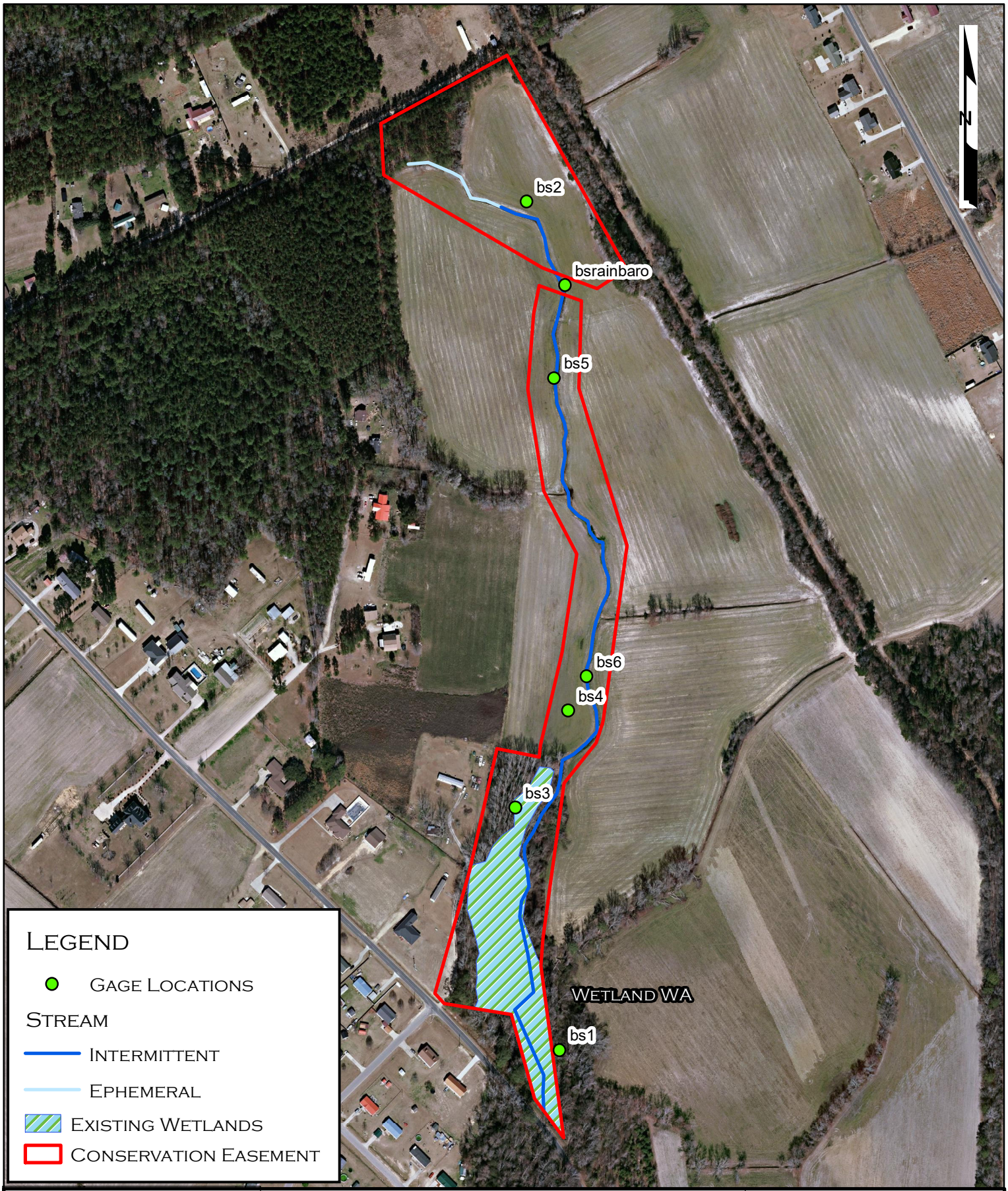
**Could not adequately determine many individuals to genus prior to leaf-out of planted stock.

Table 8. Vegetation Planting Information
Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)

Zone 1 - Riparian Buffer, Planted at 680 stems/acre				
Scientific Name	**Common Name**	**% by Species**	**Approx. Stem Count**	**Wetland Indicator Status**
Betula nigra	River Birch	5%	204	FACW
Carpinus caroliniana	Ironwood	5%	204	FAC
Liriodendron tulipifera	Tulip Poplar	5%	204	FACU
Magnolia virginiana	Sweet Bay	5%	204	FACW
Nyssa sylvatica	Black Gum	10%	408	FAC
Quercus laurifolia	Laurel Oak	15%	612	FACW
Quercus lyrata	Overcup Oak	15%	612	OBL
Quercus michauxii	Swamp Chestnut Oak	5%	204	FACW
Quercus pagoda	Cherrybark Oak	15%	612	FACW
Taxodium distichum	Bald Cypress	15%	612	OBL
Ulmus americana	American elm	5%	204	FACW
	Total	100%	4080	
Zone 2 - Forested Wetlands, Planted at 680 stems/acre				
Scientific Name	**Common Name**	**% by Species**	**Approx. Stem Count**	**Wetland Indicator Status**
Diospyros virginiana	Persimmon	5%	213	FAC
Magnolia virginiana	Sweet Bay	10%	425	FACW
Nyssa biflora	Swamp Black Gum	14%	595	OBL
Persea palustris	Red Bay	1%	43	FACW
Quercus laurifolia	Laurel Oak	15%	638	FACW
Quercus lyrata	Overcup Oak	15%	638	OBL
Quercus michauxii	Swamp Chestnut Oak	5%	213	FACW
Quercus pagoda	Cherrybark Oak	10%	408	FACW
Taxodium distichum	Bald Cypress	25%	1063	OBL
	Total	100%	4233	

Appendix C

Pre-construction Hydrologic Data



Bear Swamp Stream & Wetland Restoration

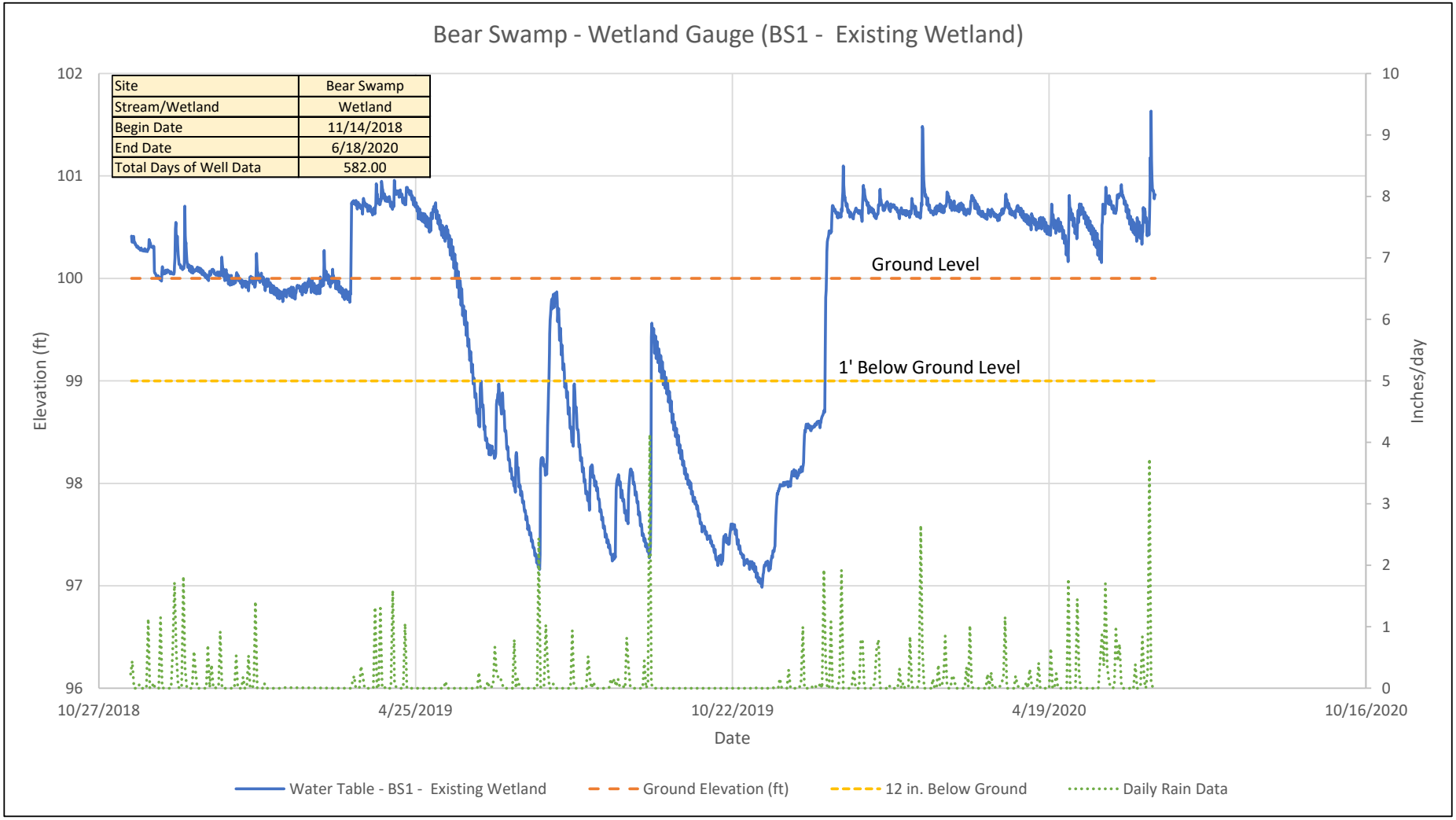
Pre-Construction Gage Locations

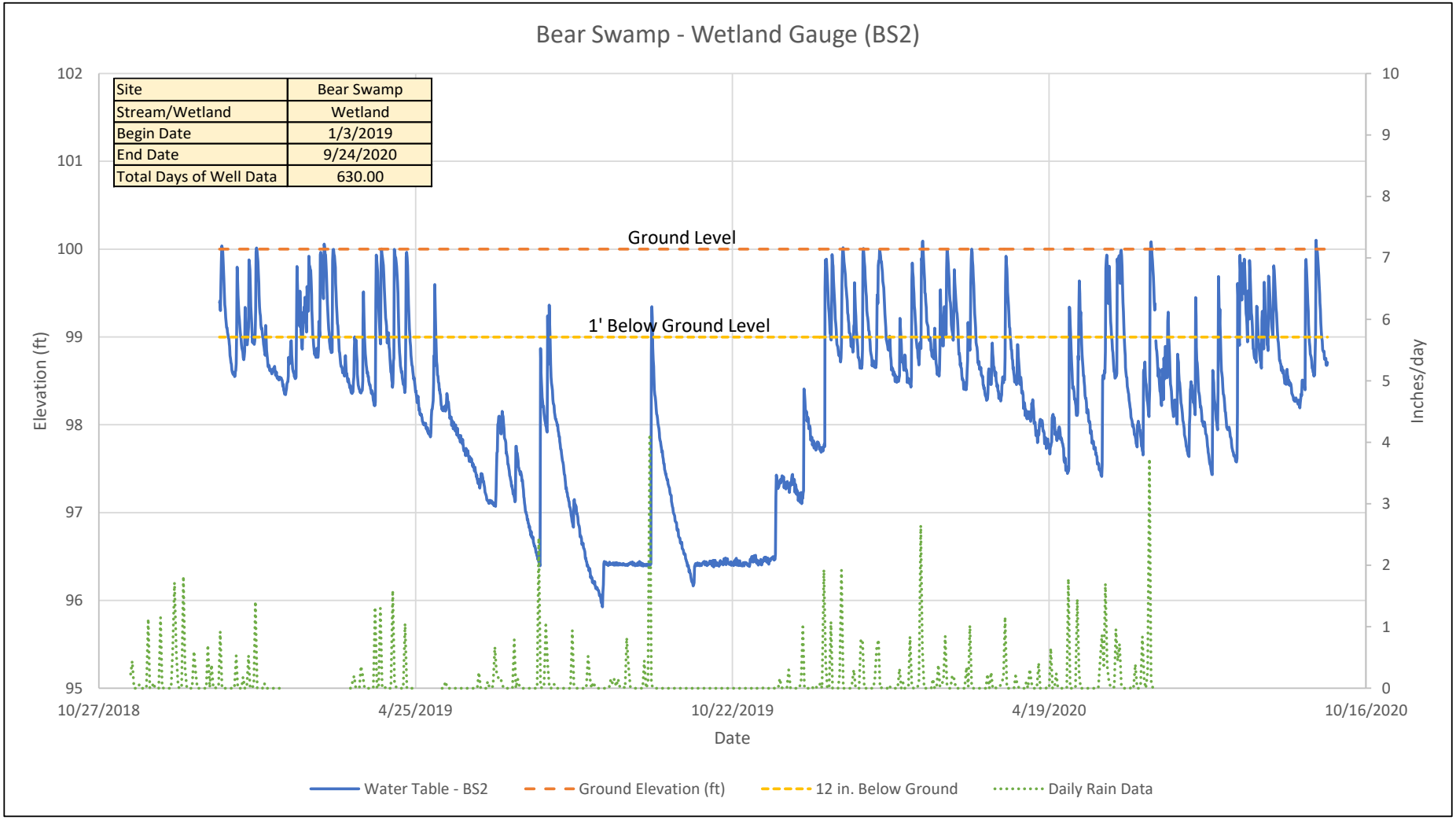
Robeson County, North Carolina

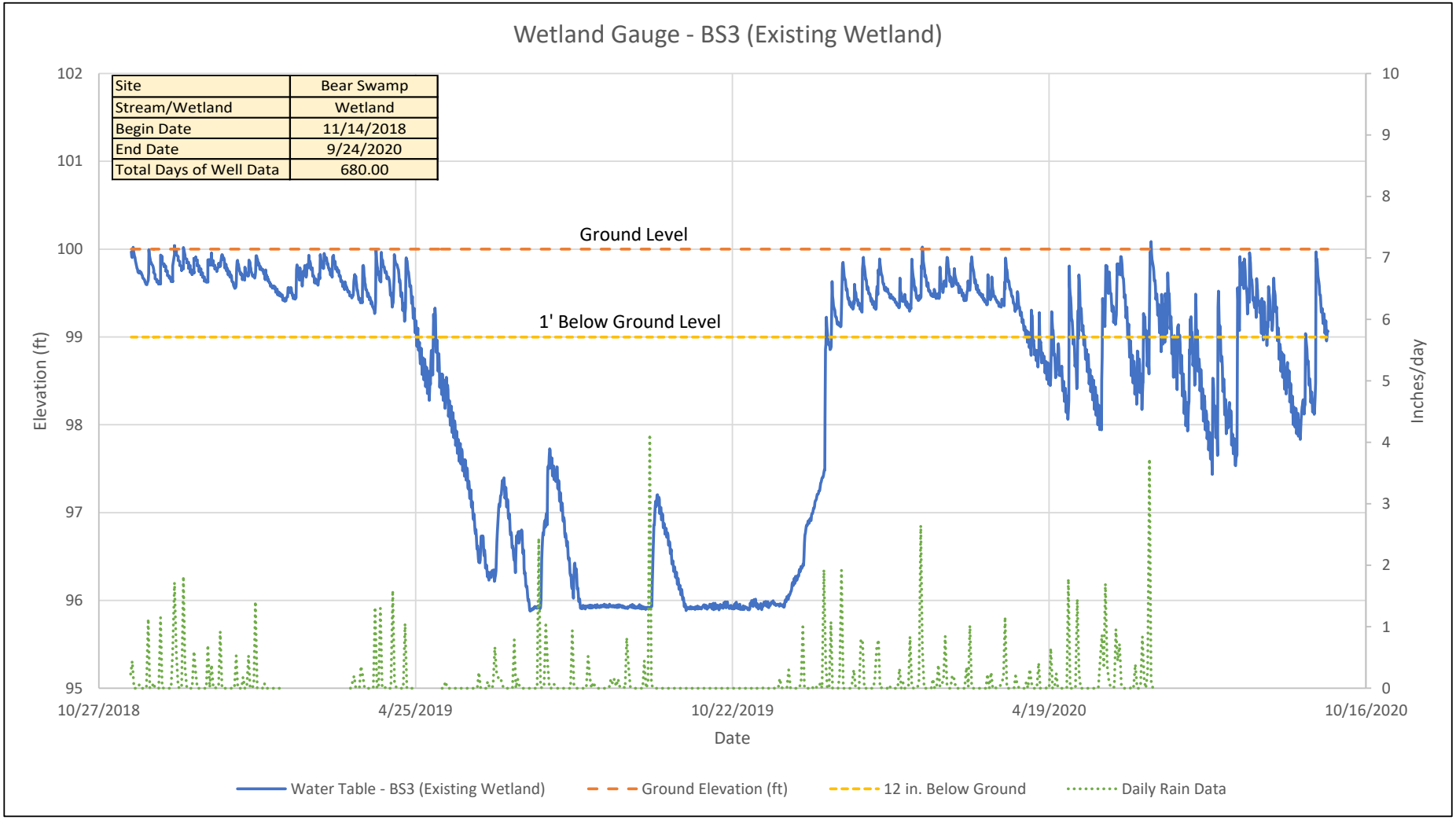
As-Built App C

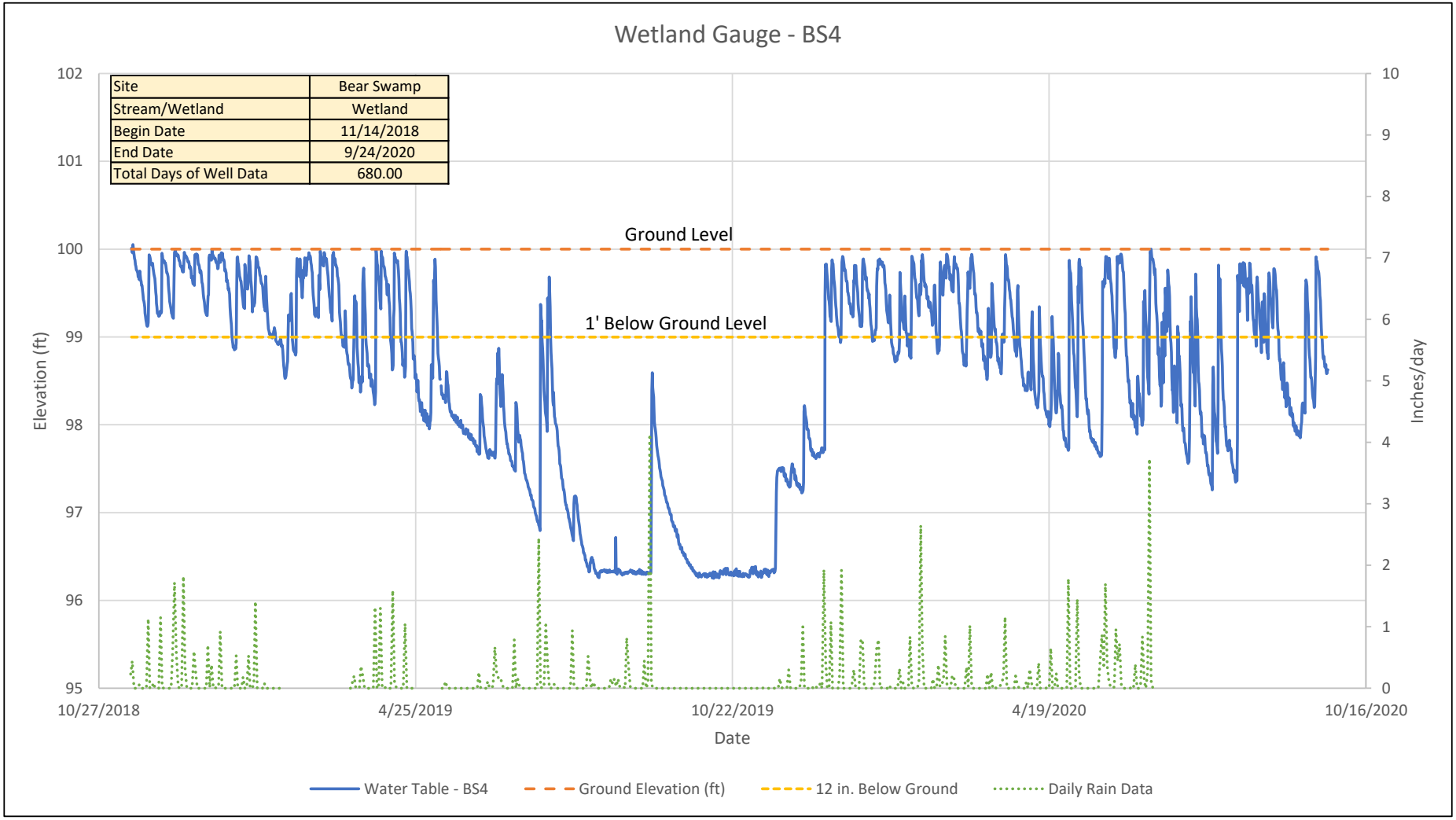
Prepared for:
NCDEQ
Division of
Mitigation Services

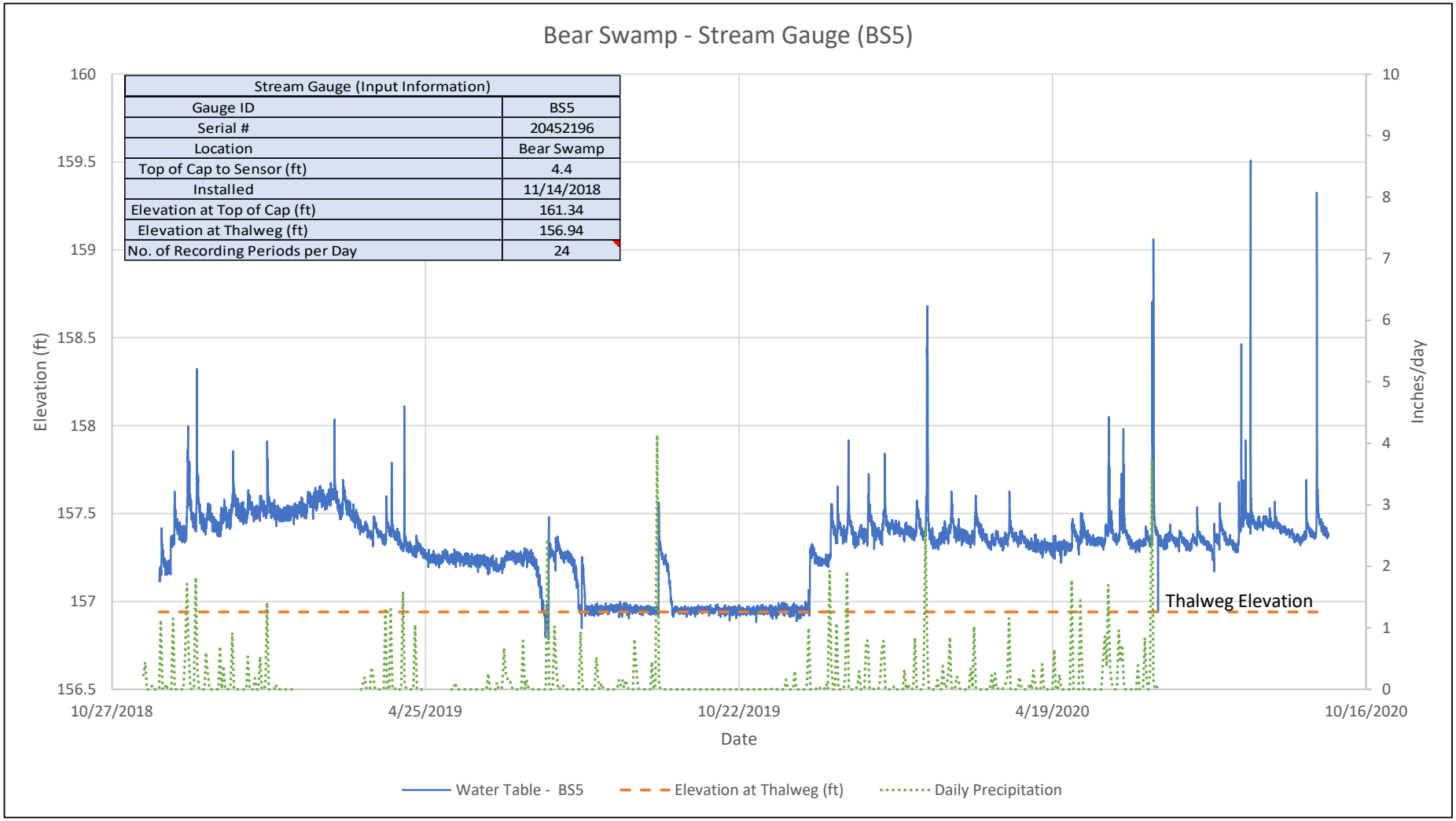
Prepared by:
Ecosystem
Planning &
Restoration

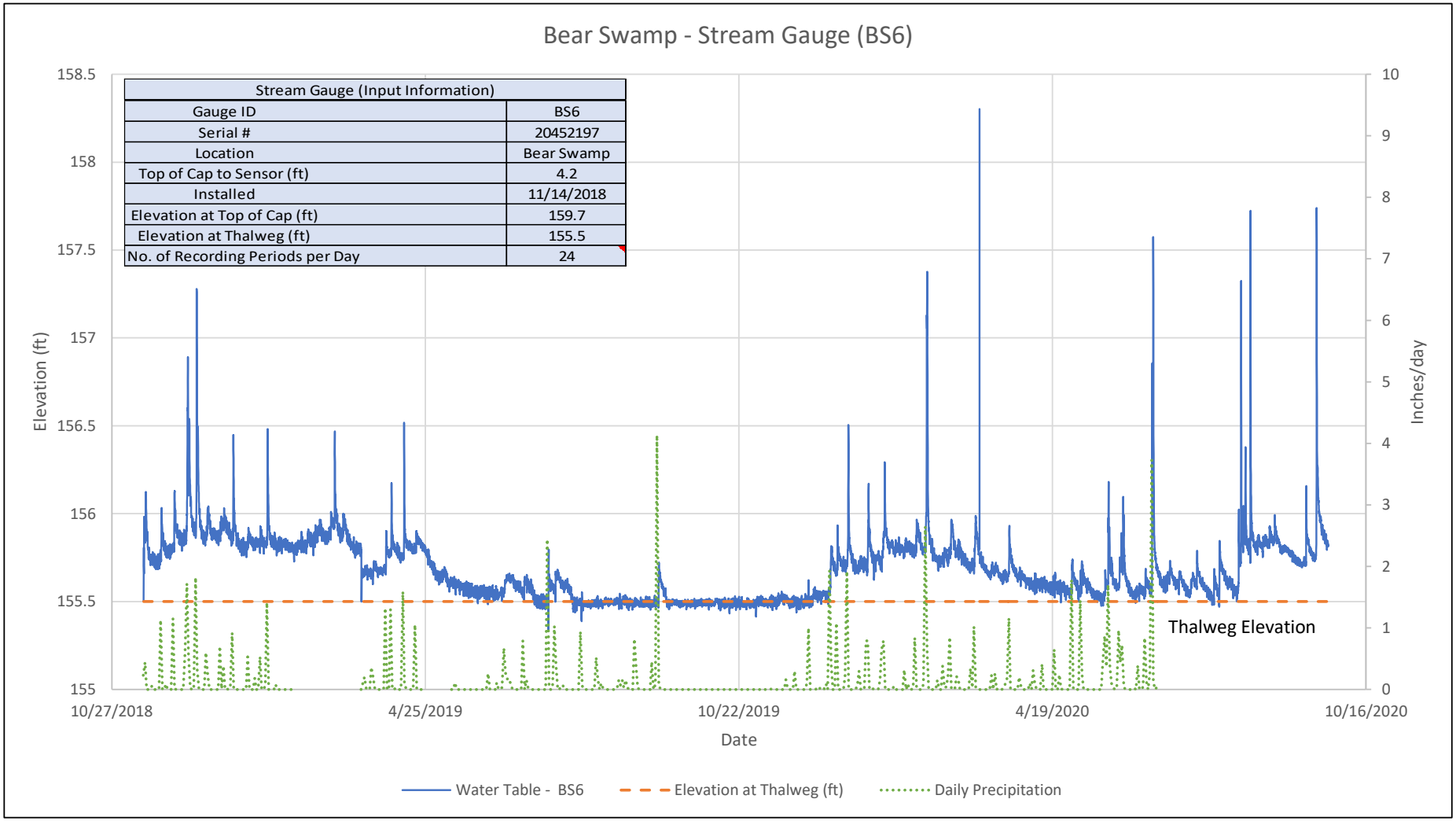

Bear Swamp - Wetland Gauge (BS1 - Existing Wetland)
Site | Bear Swamp
Stream/Wetland | Wetland
Begin Date | 11/14/2018
End Date | 6/18/2020
Total Days of Well Data | 582.00
Ground Level
1' Below Ground Level
Elevation (ft)
Inches/day
Date
10/27/2018
4/25/2019
10/22/2019
4/19/2020
10/16/2020
Water Table - BS1 - Existing Wetland
Ground Elevation (ft)
12 in. Below Ground
Daily Rain Data


Bear Swamp - Wetland Gauge (BS2)
Site
Bear Swamp
Stream/Wetland
Wetland
Begin Date
1/3/2019
End Date
9/24/2020
Total Days of Well Data
630.00
Ground Level
1' Below Ground Level
Elevation (ft)
Inches/day
Date
10/27/2018
4/25/2019
10/22/2019
4/19/2020
10/16/2020
Water Table - BS2
Ground Elevation (ft)
12 in. Below Ground
Daily Rain Data


Wetland Gauge - BS3 (Existing Wetland)
Site
Bear Swamp
Stream/Wetland
Wetland
Begin Date
11/14/2018
End Date
9/24/2020
Total Days of Well Data
680.00
Ground Level
1' Below Ground Level
Elevation (ft)
Inches/day
Date
10/27/2018
4/25/2019
10/22/2019
4/19/2020
10/16/2020
Water Table - BS3 (Existing Wetland)
Ground Elevation (ft)
12 in. Below Ground
Daily Rain Data


Wetland Gauge - BS4
Site
Bear Swamp
Stream/Wetland
Wetland
Begin Date
11/14/2018
End Date
9/24/2020
Total Days of Well Data
680.00
Ground Level
1' Below Ground Level
Elevation (ft)
Inches/day
Date
10/27/2018
4/25/2019
10/22/2019
4/19/2020
10/16/2020
Water Table - BS4
Ground Elevation (ft)
12 in. Below Ground
Daily Rain Data


Bear Swamp - Stream Gauge (BS5)
Stream Gauge (Input Information)
Gauge ID BS5
Serial # 20452196
Location Bear Swamp
Top of Cap to Sensor (ft) 4.4
Installed 11/14/2018
Elevation at Top of Cap (ft) 161.34
Elevation at Thalweg (ft) 156.94
No. of Recording Periods per Day 24
Elevation (ft)
Inches/day
Thalweg Elevation
10/27/2018
4/25/2019
10/22/2019
4/19/2020
10/16/2020
Date
Water Table - BS5
Elevation at Thalweg (ft)
Daily Precipitation


Bear Swamp - Stream Gauge (BS6)
Stream Gauge (Input Information)
Gauge ID
BS6
Serial #
20452197
Location
Bear Swamp
Top of Cap to Sensor (ft)
4.2
Installed
11/14/2018
Elevation at Top of Cap (ft)
159.7
Elevation at Thalweg (ft)
155.5
No. of Recording Periods per Day
24
Elevation (ft)
Inches/day
Thalweg Elevation
10/27/2018
4/25/2019
10/22/2019
4/19/2020
10/16/2020
Date
Water Table - BS6
Elevation at Thalweg (ft)
Daily Precipitation

Appendix D

Project Timeline and Contact Information

Table 9. Project Activity and Reporting History

Table 10. Project Contacts Table

Table 9. Project Activity and Reporting History
Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)

Elapsed Time Since grading complete: **0 yrs 6 months**
Elapsed Time Since planting complete: **0 yrs 1 months**
Number of reporting Years: **0**

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Institution Date	--	Jun-18
404 permit date	--	Apr-20
Final Mitigation Plan	2018 - 2019	Mar-20
Final Design – Construction Plans	--	Oct-20
Site Earthwork	October - November 2020	Nov-20
Bare-root plantings	--	Mar-21
As-built Survey	Nov-20	Nov-20
As-built Baseline Monitoring Report	Apr-21	N/A
Year 1 Monitoring	Nov-21	Nov-21
Year 2 Monitoring	2022	Nov-22
Year 3 Monitoring	2023	Nov-23
Year 4 Monitoring	2024	Nov-24
Year 5 Monitoring	2025	Nov-25
Year 6 Monitoring	2026	Nov-26
Year 7 Monitoring	2027	Nov-27

Table 10. Project Activity and Reporting History
Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)

Designer Primary project design POC	Ecosystem Planning and Restoration, PLLC 1150 SE Maynard Road, Suite 140, Cary, NC 27511 Kevin Tweedy, PE (919) 388-0787
Construction Contractor Construction contractor POC	Land Mechanics Design, Inc. 126 Circle G Lane, Willow Spring, NC 27592 Charles Hill
Survey Contractor Survey contractor POC	Kinder Land Surveying 203 W. Lebanon St., Mount Airy, NC 27030 Frank Kinder (336) 783-4200
Planting Contractor Planting contractor POC	Bruton Natural Systems Post Office Box 1197, Fremont, NC 27830 Chalie Bruton
Seeding Contractor Contractor POC	
Seed Mix Source	
Nursery Stock Supplier	Dykes and Son Nursery McMinnville, TN 37110 931-668-8833
	Mellow Marsh Farm Siler City, NC 27344 919-742-1200
Monitoring Performers	Ecosystem Planning and Restoration, PLLC
Monitoring POC	Amy James, EPR (919) 623-5411

APPENDIX E

As-Built Plans

PROJECT: BEAR SWAMP STREAM AND WETLAND RESTORATION SITE

NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES

ROBESON COUNTY

LOCATION: LOCKLEAR RD., ROBESON COUNTY, NC

NCDEQ DMS PROJECT ID# 100054

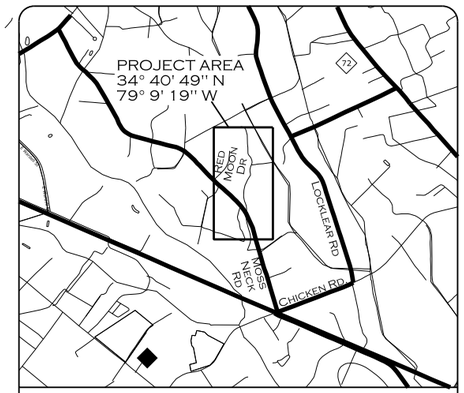
TYPE OF WORK: RECORD DRAWINGS

STATE	PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
NC	101	1	11

PROPOSED LENGTH

PROPOSED DESIGN STREAM LENGTH = 2,223 FEET

AS-BUILT STREAM LENGTH = 2,331 FEET



VICINITY MAP

INDEX OF SHEETS

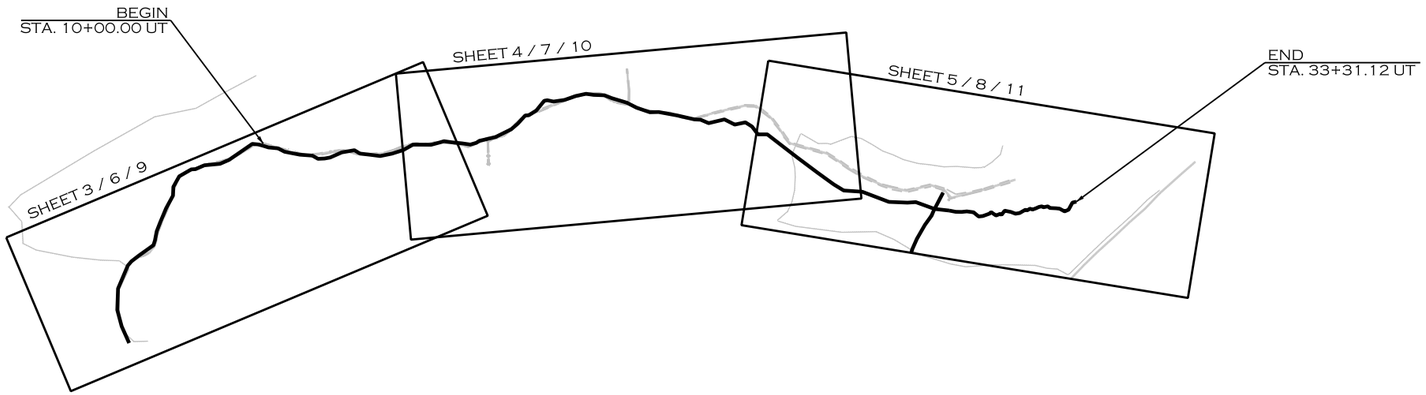
I, FRANKLIN G. KINDER, Professional Land Surveyor, L-4462, do hereby certify that this AS-BUILT SURVEY with this certification affixed was drawn from an actual field survey performed under my direct supervision; that the ratio of precision is greater than 1 part in 20,000; that this survey was prepared in accordance with G.S. 47-30 as amended. and further that the following information was used to perform the GPS portion of this survey:

Class of survey: A
Positional Accuracy: 0.05 FT - Vert. Accuracy 0.05 FT
Type of GPS field procedure: GNSS North Carolina CORS RTK Network
Dates of survey - NOVEMBER-DECEMBER 2020
Datum/Epoch - NAD83(2011)
Published Fixed Control Use: SAMPSON
Geoid Model: GEOID12B (-109.5)
Combined Grid Factor(s) .999991702
Units: U.S. SURVEY FOOT
Equipment Used: Spectra Precision SP60 ADVANCED GNSS RECEIVER

Witness my original Signature, seal and license number this 11 DECEMBER, 2020, A.D..

DATE FRANKLIN G. KINDER, PLS L-4462

NORTH CAROLINA PROFESSIONAL SEAL L-4462 LAND SURVEYOR FRANKLIN G. KINDER



NAD 83

GRAPHIC SCALES

40 20 0 40 80
PLANS

40 20 0 40 80
PROFILE (HORIZONTAL)

5 2.5 0 5 10
PROFILE (VERTICAL)

REVISIONS

NO.	DESCRIPTION	ENGR.	APPROV.	DATE
1	RECORD DRAWINGS	WSH	KLT	04/06/21

PREPARED FOR:

NC Mitigation Services ENVIRONMENTAL QUALITY

NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NC 27699-1652

LINDSAY CROCKER
PROJECT MANAGER

PREPARED IN THE OFFICE OF:

EPR Ecosystem Planning & Restoration
1150 SE MAYNARD RD.
SUITE 140
CARY NC 27511
LICENSE # P-1182

FALL 2020
COMPLETION DATE:

WILLIAM SCOTT HUNT, III, PE
PROJECT ENGINEER

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III

07.15.2021

SIGNATURE: P.E.

STREAM CONVENTIONAL SYMBOLS

GRADE CONTROL WOODY RIFFLE (WR)

SOD MATS (SM)

DEBRIS JAM (DJ-T#)

— SF — SAFETY FENCE

— TP — TAPE FENCE

— ||| — TEMPORARY SILT FENCE

—(CE)— CONSERVATION EASEMENT

– - 20 – - EXISTING MAJOR CONTOUR

– – – – – EXISTING MINOR CONTOUR

— 20 — PROPOSED MAJOR CONTOUR

— 21 — PROPOSED MINOR CONTOUR

— 20 — AS-BUILT MAJOR CONTOUR

— 21 — AS-BUILT MINOR CONTOUR

–--–--– LIMITS OF DISTURBANCE

— — – BANKFULL BENCH (GRADE)

—·–·— PROPERTY LINE

ACCESS ROAD

10+00 PROPOSED STREAM THALWEG

PROPOSED STREAM TOP OF BANKS

10+00 AS-BUILT STREAM THALWEG

AS-BUILT STREAM TOP OF BANKS

FOOT BRIDGE

TEMPORARY STREAM CROSSING - WOOD MAT

PERMANENT FORD STREAM CROSSING (PFC)

TRANSPLANTED VEGETATION

TREE REMOVAL

TREE PROTECTION

IMPERVIOUS DIKE

DITCH PLUG

CHANNEL FILL

GRADE BANK 2:1 OR FLATTER

EXISTING WETLANDS

FLOW DISSIPATOR

MONITORING FEATURES

VP VEGETATION MONITORING PLOT

MONITORING GAUGE

PHOTO POINT

**NOTE: ALL ITEMS ABOVE MAY NOT BE USED ON THIS PROJECT

GENERAL NOTES

1. CONSTRUCTION WAS COMPLETED NOVEMBER 2020.
2. AS-BUILT TOPOGRAPHIC SURVEY WAS COMPLETED BY FRANKLIN G. KINDER, PLS, KINDER LAND SURVEYING, IN DECEMBER 2020.
3. AS-BUILT SURVEYED FEATURES, INCLUDING CONTOURS, ARE SHOWN IN DARK BLACK, PROPOSED DESIGN FEATURES AND EXISITNG FEATURES, INCLUDING CONTOURS, ARE SHOWN IN GREY, AND ANY FIELD CHANGES THAT WERE MADE DURING CONSTRUCTION ARE SHOWN IN RED.

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III

07.15.2021

REVISIONS

NO.	DESCRIPTION	ENGR.	APPROV	DATE
1	RECORD DRAWINGS	WSH	KLT	04/06/21

PREPARED FOR:

NC Mitigation Services ENVIRONMENTAL QUALITY

NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NC 27699-1652

BEAR SWAMP STREAM AND WETLAND
RESTORATION SITE
ROBESON COUNTY, NC
NCDEQ DMS PROJECT ID# 100054

PREPARED IN THE OFFICE OF:

EPR ECOSYSTEM PLANNING & RESTORATION

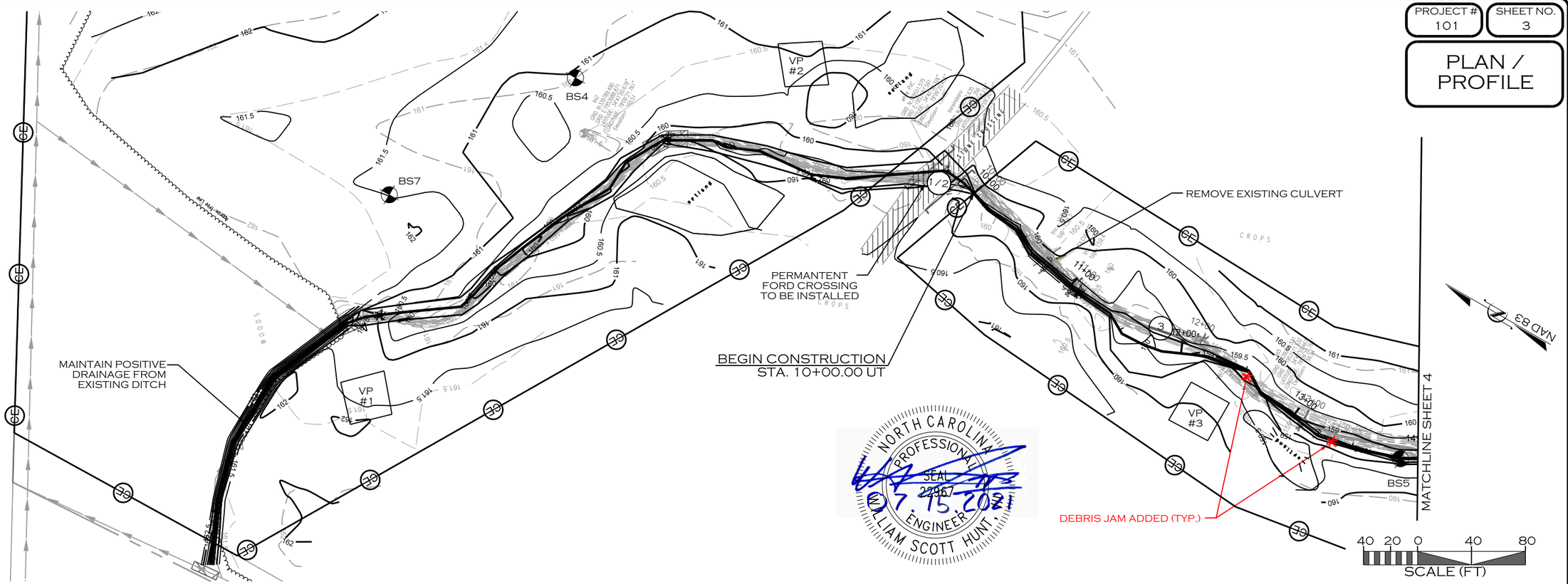
1150 SE MAYNARD RD., SUITE 140
CARY NC 27511
LICENSE # P-1182

PROJECT ENGINEER

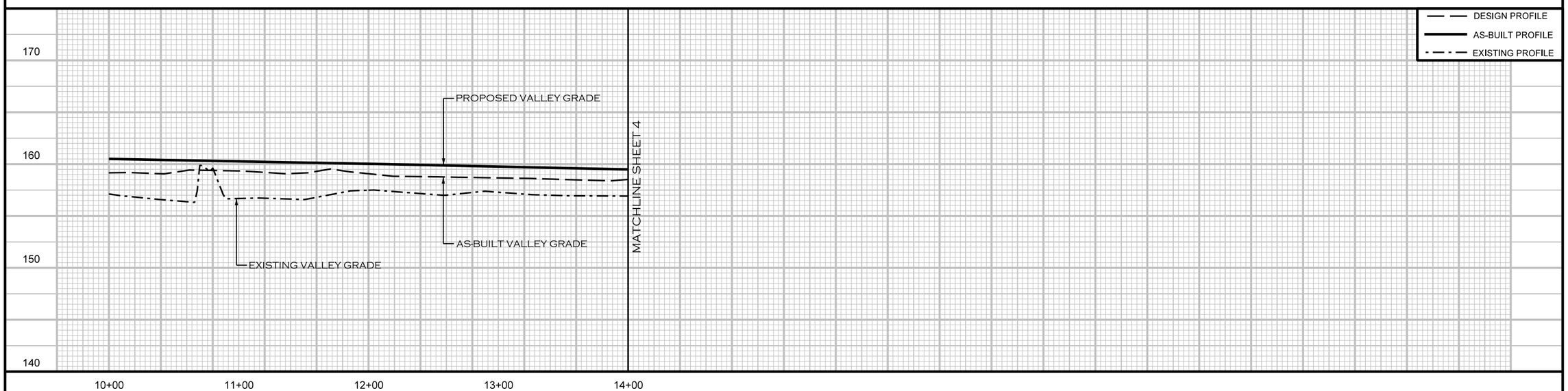
6/21/2021
R:\PROJECTS\RDU0101_NCDEQ_BEAR SWAMP_FD\CADD\PLANS\ASBUILT\BS_ASB_PSH_02.DGN
MKOCH

PROJECT #	SHEET NO.
101	3

PLAN / PROFILE



NORTH CAROLINA PROFESSIONAL SEAL 29967 ENGINEER WILLIAM SCOTT HUNT, III
07.15.2021



REVISIONS				
NO.	DESCRIPTION	ENGR.	APPROV	DATE
1	RECORD DRAWINGS	WSH	KLT	04/06/21

PREPARED FOR:
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NC 27699-1652

BEAR SWAMP STREAM AND WETLAND
RESTORATION SITE
ROBESON COUNTY, NC
NCDEQ DMS PROJECT ID# 100054

PREPARED IN THE OFFICE OF:
ECOSYSTEM PLANNING & RESTORATION
1150 SE MAYNARD RD., SUITE 140
CARY NC 27511
LICENSE # P-1182

PROJECT ENGINEER

7/14/2021
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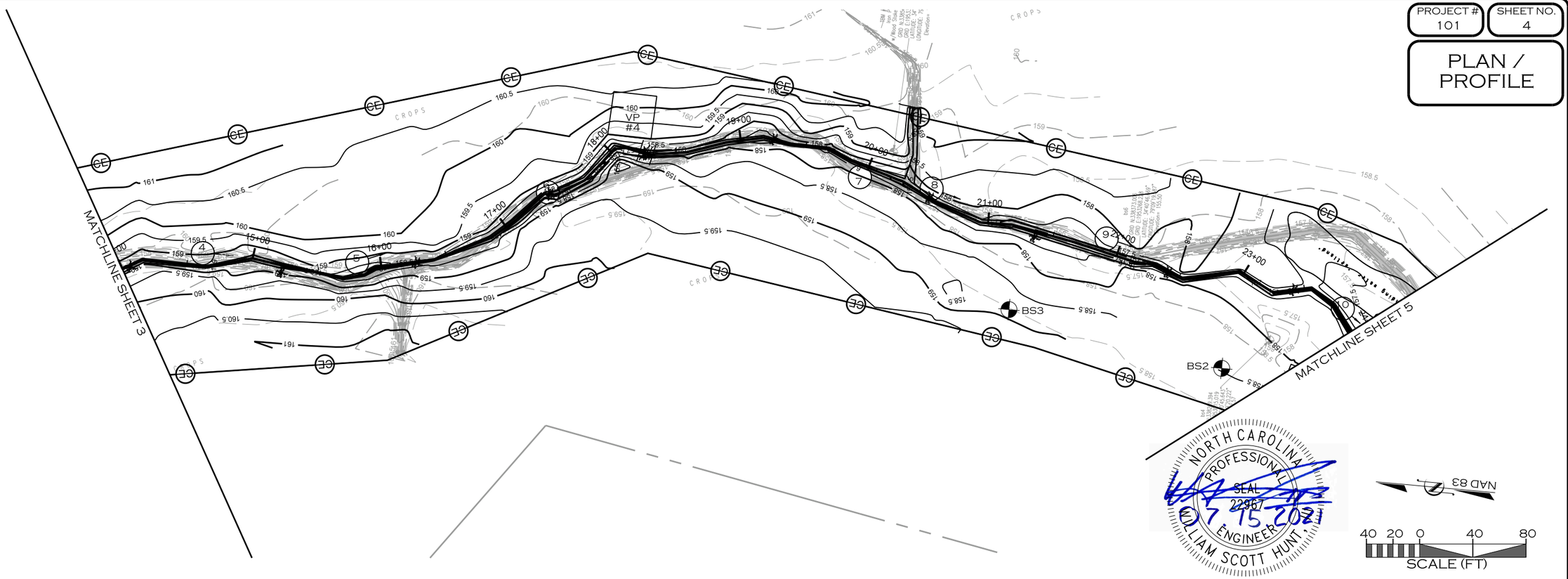
MKOHN

PROJECT #	SHEET NO.
101	4

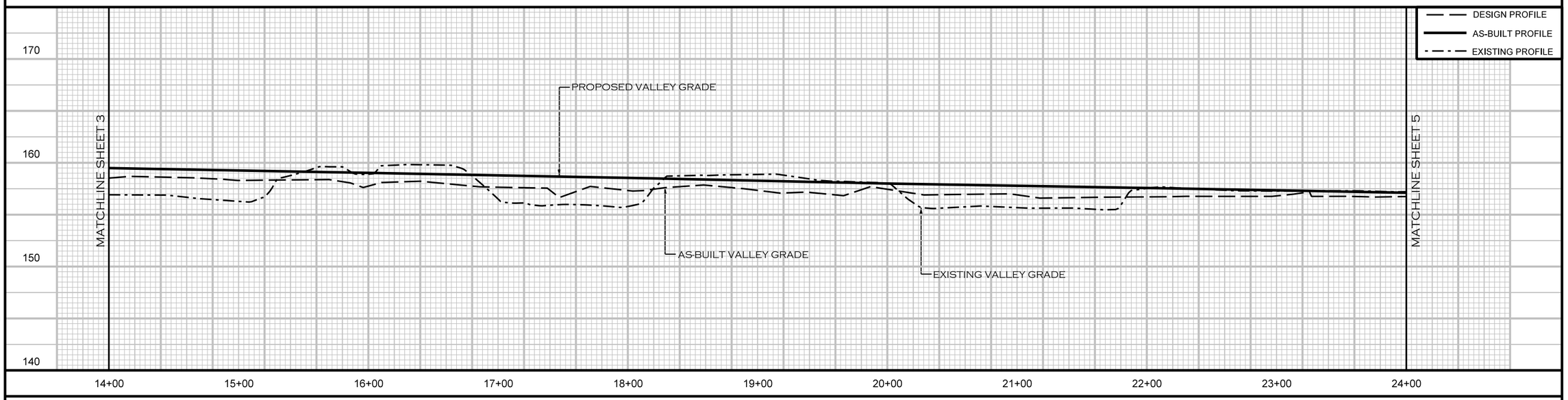
PLAN / PROFILE



NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, PE
07.15.2021

NAD 83

40 20 0 40 80
SCALE (FT)



REVISIONS				
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LICENSE # P-1182

PROJECT ENGINEER

6/21/2021
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WSCOTT

PROJECT # 101 | SHEET NO. 5

PLAN / PROFILE

END HEADWATER STREAM CONSTRUCTION AND CONNECT TO LOW POINT OF EXISTING VALLEY

MAINTAIN POSTITIVE DRAINAGE FROM EXSTING DITCH

END CONSTRUCTION STA. 33+31.12 UT

MATCHLINE SHEET 4

ALONG UT, EXCAVATE AND SHAPE LOW FLOW CHANNEL PER DETAIL, MINIMIZING DISTURBANCE TO EXISTING WETLANDS AND RIPARIAN VEGETATION

GRADE CONTROL WOODY RIFFLE ADDED (TYP.)

DEBRIS JAM ADDED (TYP.)

GRADE EXISTING DITCH AND SOIL BERMS WITHIN PROPOSED EASEMENT TO EXISTING VALLEY AND FLOODPLAIN CONTOURS, MAINTAIN POSITIVE DRAINAGE FROM EXISTING DITCH

DEBRIS JAM ADDED (TYP.)

BS1 BS6 VP #5

NAD 83

NORTH CAROLINA PROFESSIONAL SEAL 22907 ENGINEER WILLIAM SCOTT HUNT, 7.15.2021 N.C.S.R. #1567

40 20 0 40 80
SCALE (FT)

DESIGN PROFILE
AS-BUILT PROFILE
EXISTING PROFILE

MATCHLINE SHEET 4

EXISTING VALLEY GRADE

PROPOSED VALLEY GRADE

AS-BUILT VALLEY GRADE

170 160 150 140

24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00

REVISIONS				
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ROBESON COUNTY, NC
NCDEQ DMS PROJECT ID# 100054

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CARY NC 27511
LICENSE # P-1182

PROJECT ENGINEER

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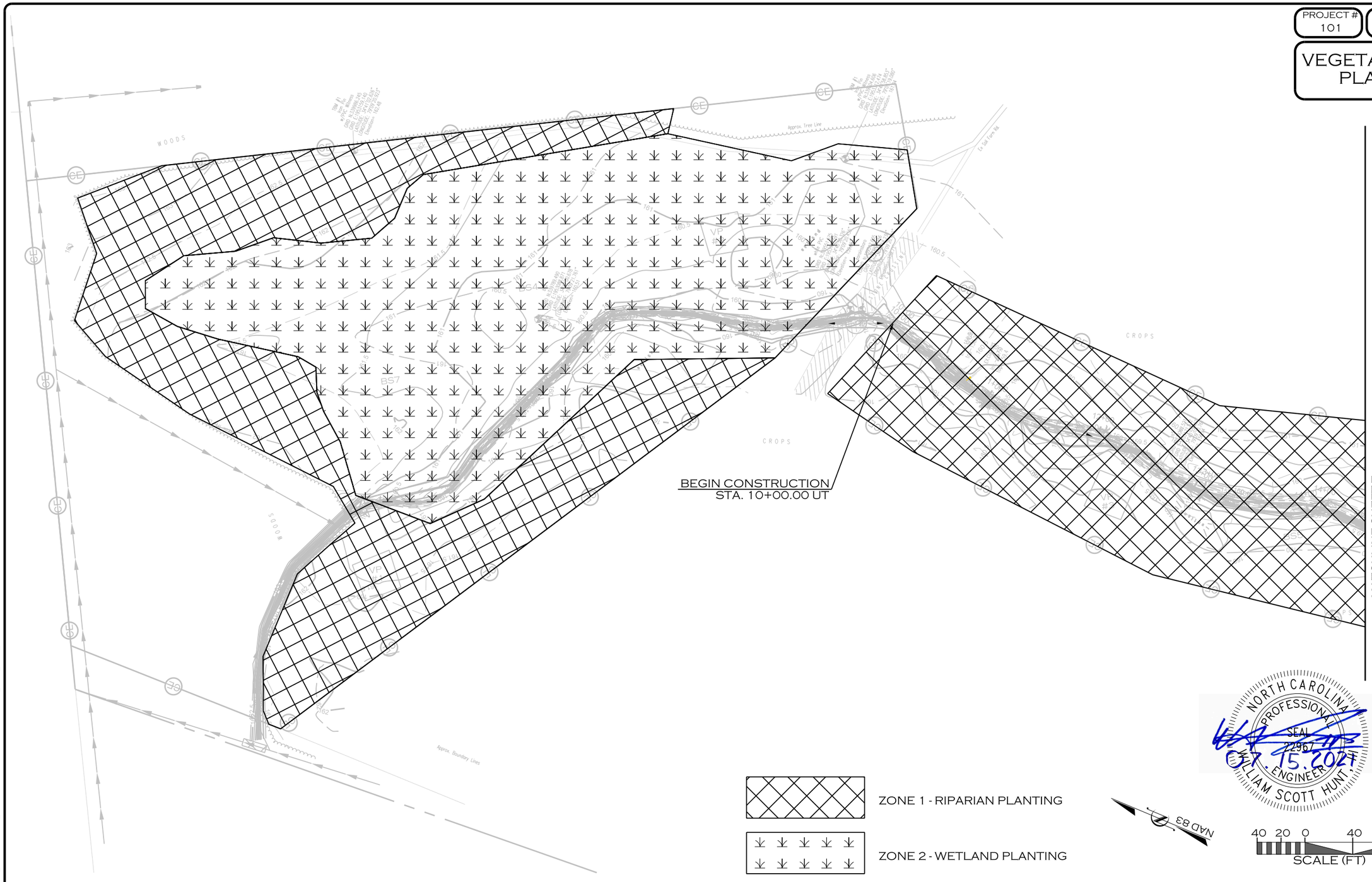
MKOCH

PROJECT # 101 | SHEET NO. 6

VEGETATION PLAN



ZONE 1 - RIPARIAN PLANTING

ZONE 2 - WETLAND PLANTING

NAD 83

40 20 0 40 80
SCALE (FT)

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT
07.15.2021

REVISIONS				
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CARY NC 27511
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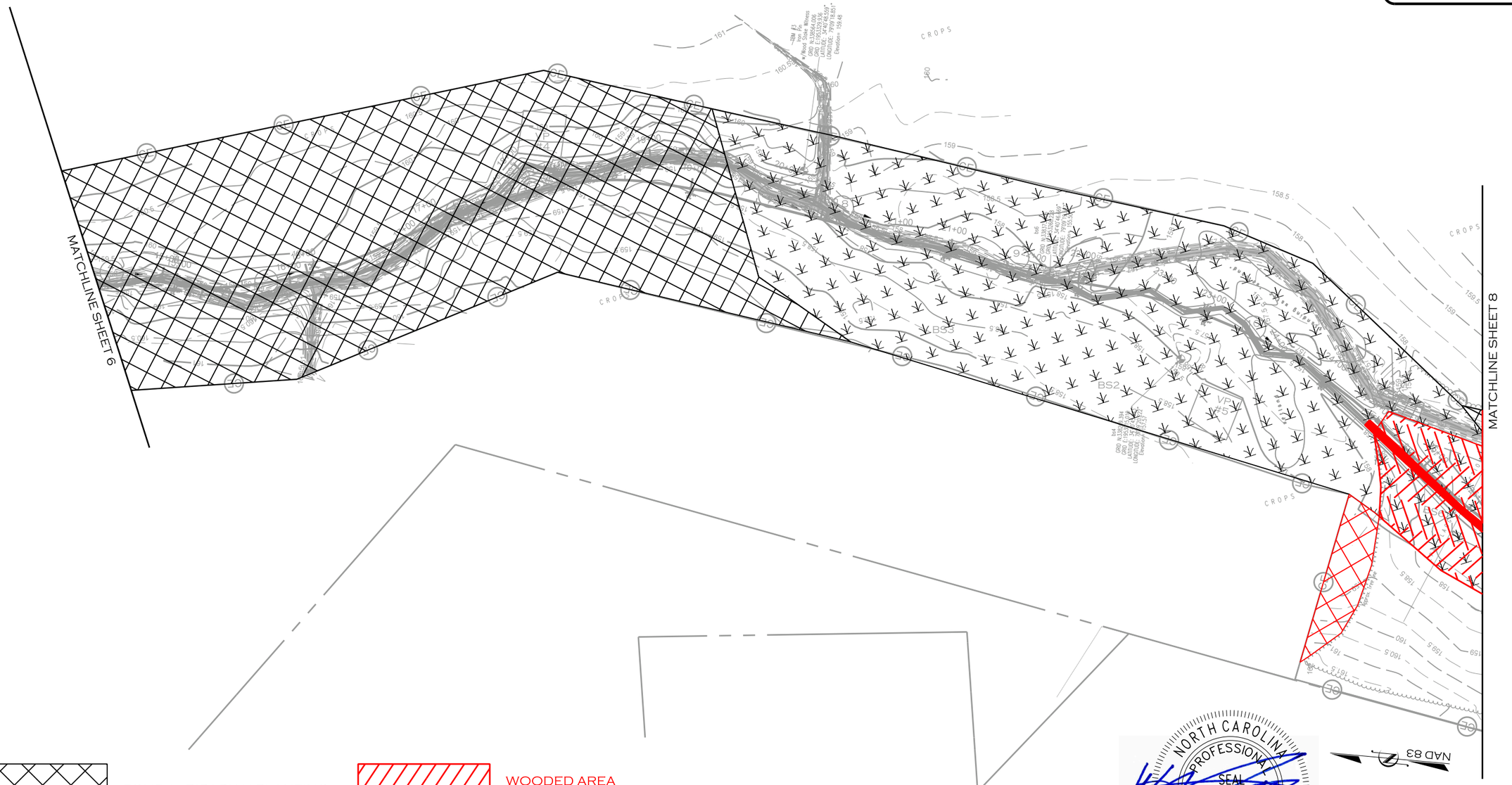
WSCOTT

PROJECT # 101 | SHEET NO. 7

VEGETATION PLAN



ZONE 1 - RIPARIAN PLANTING

ZONE 2 - WETLAND PLANTING

WOODED AREA (NOT PLANTED)

CONSTRUCTED STREAM CHANNEL PLANTED

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, II
07.15.2021

REVISIONS				
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BEAR SWAMP STREAM AND WETLAND
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ROBESON COUNTY, NC
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CARY NC 27511
LICENSE # P-1182

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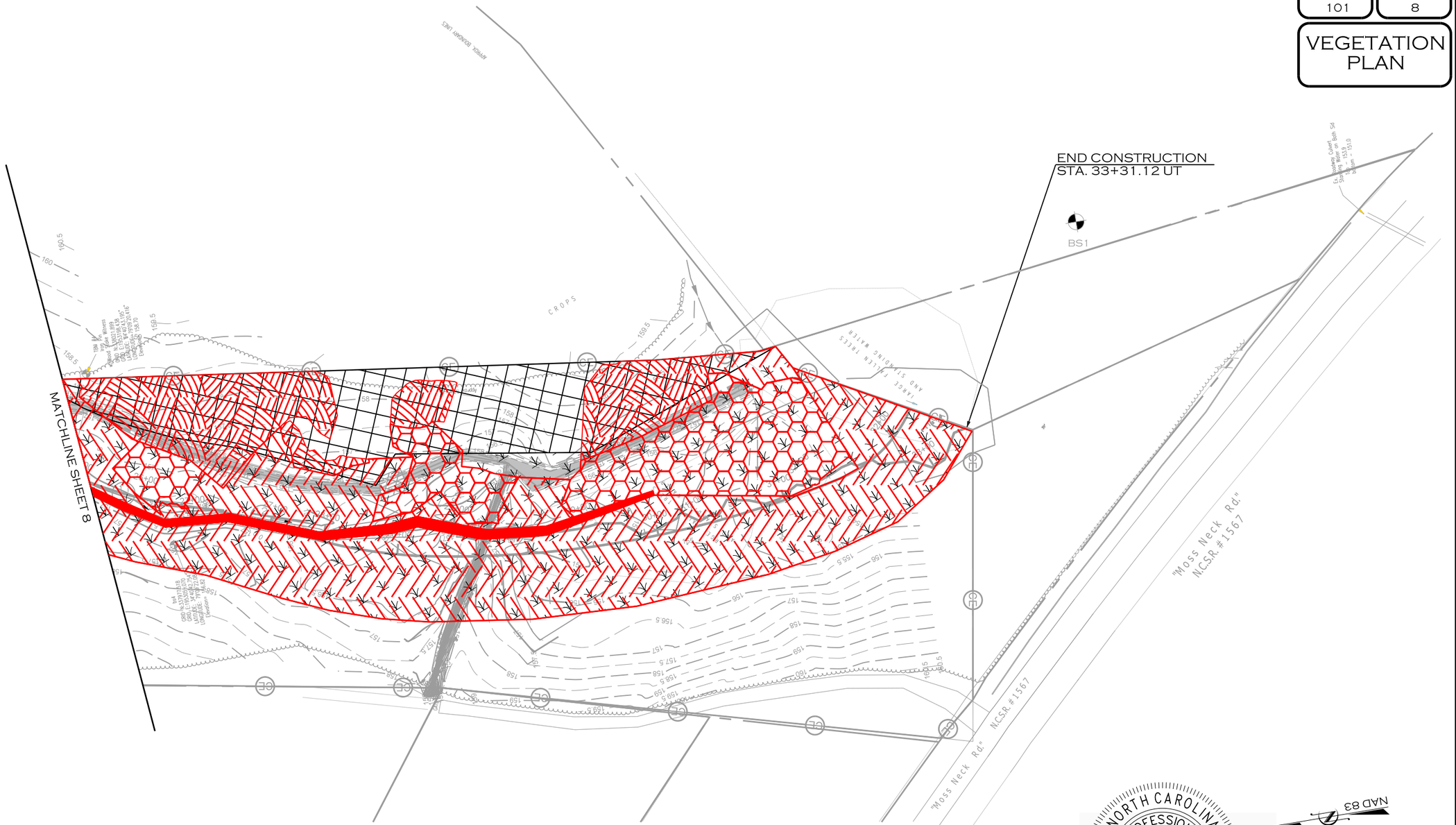
MKOEN

PROJECT # 101 | SHEET NO. 8

VEGETATION PLAN



ZONE 1 - RIPARIAN PLANTING

ZONE 2 - WETLAND PLANTING

WOODED AREA (NOT PLANTED)

CONSTRUCTED STREAM CHANNEL PLANTED

INVASIVE SPECIES TREATED AREA

INVASIVE SPECIES TO BE TREATED AREA

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT

07.15.2021

NAD 83

40 20 0 40 80

SCALE (FT)

REVISIONS				
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NC Mitigation Services ENVIRONMENTAL QUALITY

NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NC 27699-1652

BEAR SWAMP STREAM AND WETLAND RESTORATION SITE
ROBESON COUNTY, NC
NCDEQ DMS PROJECT ID# 100054

PREPARED IN THE OFFICE OF:

EPR ECOSYSTEM PLANNING & RESTORATION
1150 SE MAYNARD RD., SUITE 140
CARY NC 27511
LICENSE # P-1182

PROJECT ENGINEER

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MKOHN

PROJECT # 101 | SHEET NO. 9

GRADING PLAN

FINAL GRADED SURFACE TO BE FILLED AND ROUGHED TO HOLD WATER ON SURFACE

FILL EXISTING DITCH (TYP.)

DITCH PLUG (TYP.)

GRADE EXISTING DITCH WITHIN PROPOSED EASEMENT TO SHEET FLOW TO RESTORED VALLEY

BEGIN CONSTRUCTION
STA. 10+00.00 UT
ELEV. 160.5'

MATCHLINE SHEET 10

NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, III
07.15.2021

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CARY NC 27511
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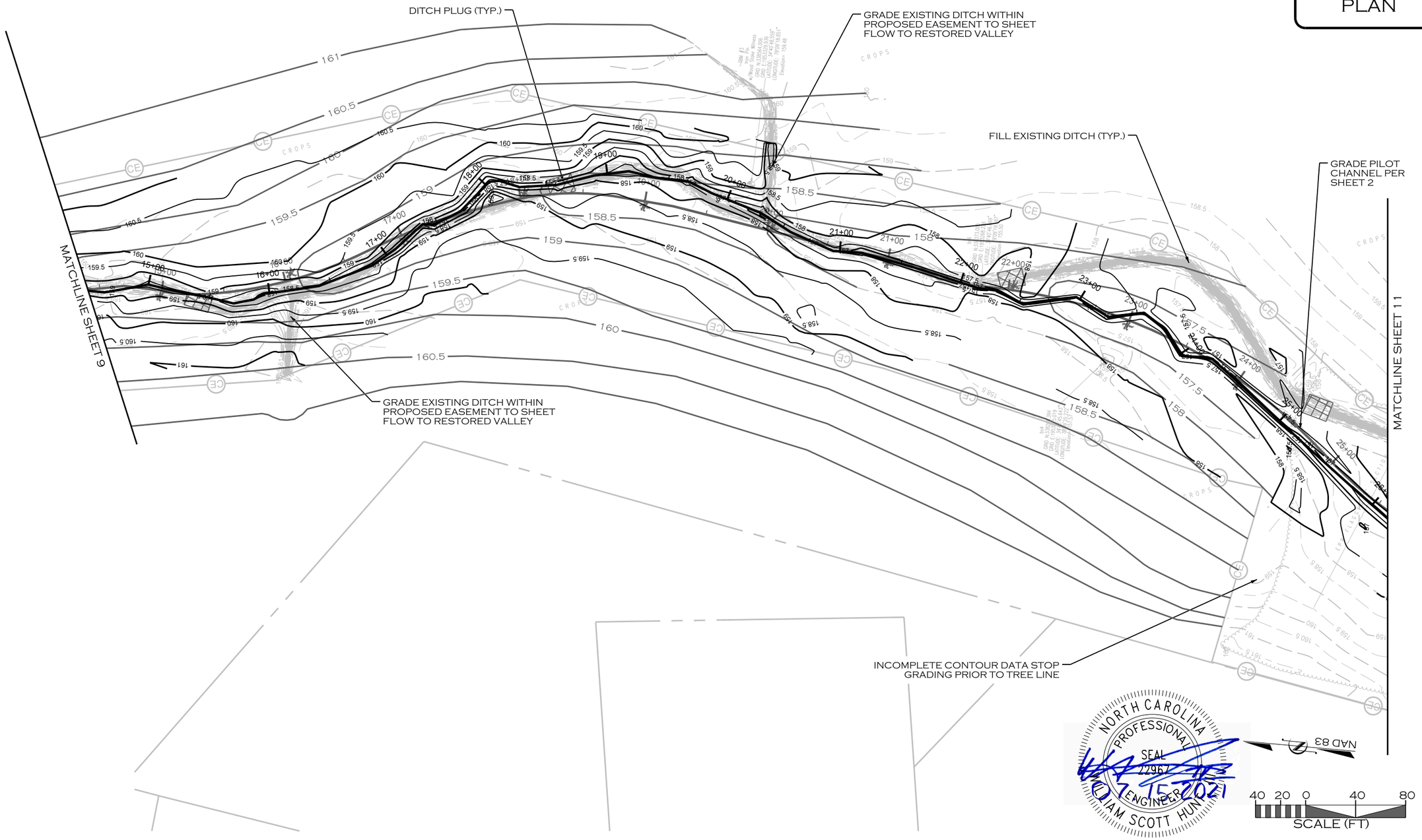
WSCOX

PROJECT #	SHEET NO.
101	10

GRADING PLAN



NORTH CAROLINA PROFESSIONAL SEAL 42967 ENGINEER WILLIAM SCOTT HUNTER
7/15/2021

REVISIONS				
NO.	DESCRIPTION	ENGR.	APPROV	DATE
1	RECORD DRAWINGS	WSH	KLT	04/06/21

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NC DEPARTMENT OF ENVIRONMENTAL QUALITY
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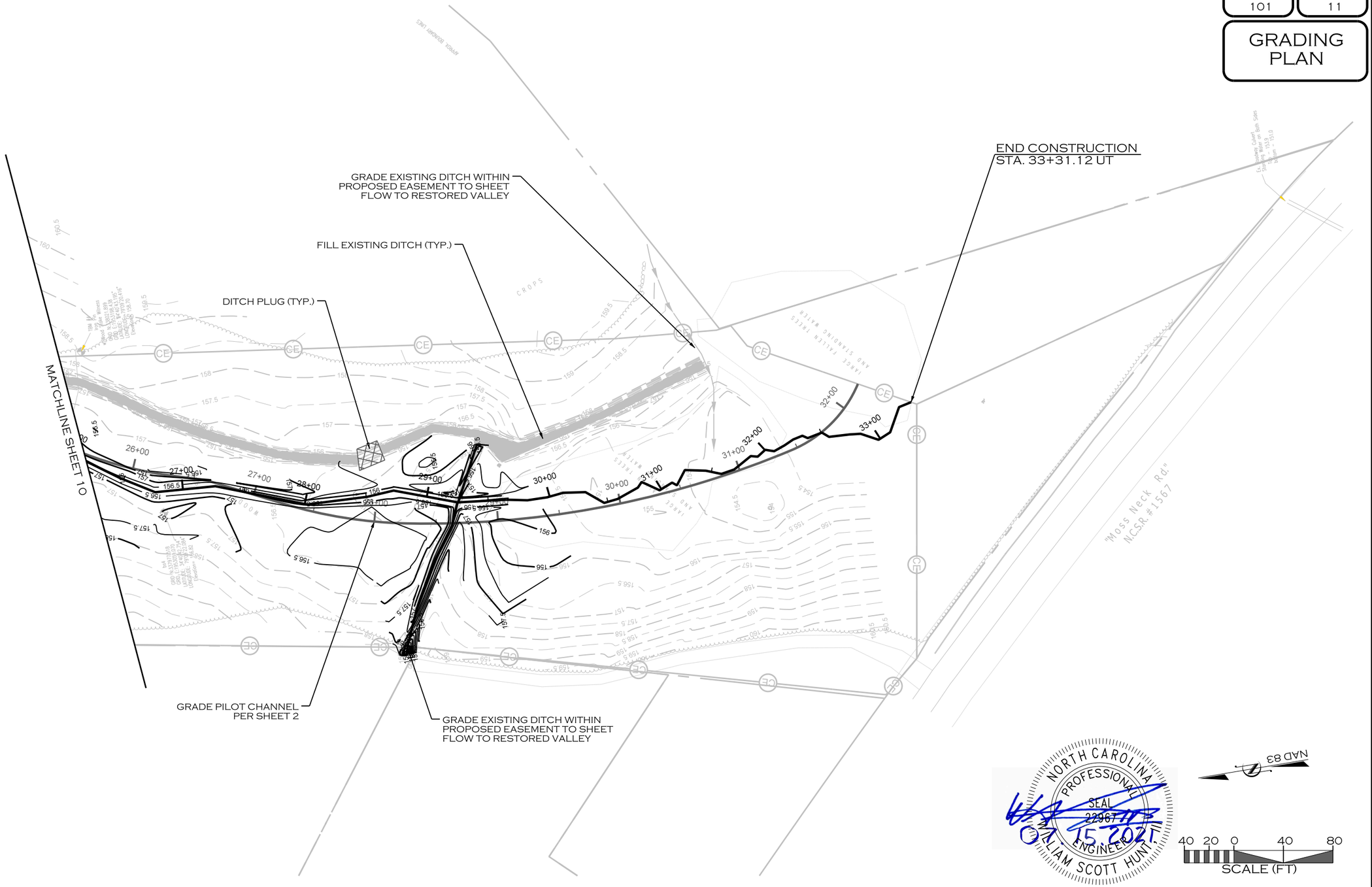
WSCOX

PROJECT #	SHEET NO.
101	11

GRADING PLAN



NORTH CAROLINA PROFESSIONAL SEAL 22967 ENGINEER WILLIAM SCOTT HUNT, II
6/15/2021

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WSCOX