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NORTH CAROLINA
Environmental Quality

July 21, 2022

Jamey McEachran
Resource Environmental Solutions, LLC
3600 Glenwood Ave., Suite 100
Raleigh, NC 27612

Subject: Task 5 Draft As-Built Baseline Monitoring Report Comments – Thunder Swamp Mitigation Project (DMS #100185)
Neuse River 03020201; Wayne County, NC
Contract No. 0402-04

Dear Ms. McEachran:

On July 8, 2022, DMS received the Draft as-built baseline monitoring report for the Thunder Swamp Buffer Mitigation Project from Resource Environmental Solutions, LLC (RES). DMS has completed our review of the draft report and has the following comments:

1. Please change the title to baseline monitoring report.

2. On page 2 of Section 4.1 – The buffer mitigation area listed in the second sentence (10.58 acres) is different from the number listed on page 1 of section 2.1 (9.65 acres). Please check and make a change.

3. On page 3 of Section 4.2 – Please consider changing the title of the section to "Vegetation Tables" or "Vegetation Assessment Tables".

4. Figure 3 – Please have the As-built Map sealed by the professional land surveyor with the Ascension Land Surveying.

5. Appendix C – Please include overview photos of the project if available. The Overview photos help documenting the project's overall vegetative growth and ground cover

Please make the requested revisions and provide one (1) pdf copy and one hard copy of the revised baseline monitoring report. If you have any questions, please contact me at any time. I can be reached at (919) 219-8476 or email me at lin.xu@ncdenr.gov.

Sincerely,

Lin Xu

Lin Xu
Project Manager
NCDEQ Division of Mitigation Services

Attachment

cc: file

M E M O R A N D U M

3600 Glenwood Avenue, Suite 100 Raleigh, North Carolina 27612 919.770.5573 tel. 919.829.9913 fax

TO: **Lin Xu – NCDMS**

FROM: **Jamey McEachran – RES**
Matt DeAngelo – RES

DATE: **August 18, 2022**

RE: **Response to Draft As-Built Baseline Monitoring Report Comments – Thunder Swamp Mitigation Project (DMS #100181) Neuse River 03020201; Wayne County, NC; Contract No. 0402-04**

DMS Comments, Lin Xu:

1. Please change the title to baseline monitoring report.
   Revised.

2. On page 2 of Section 4.1 – The buffer mitigation area listed in the second sentence (10.58 acres) is different from the number listed on page 1 of section 2.1 (9.65 acres). Please check and make a change.
   The "9.65 acres" instance has been removed. This was just a conversion on the square feet credits to acres, which was unnecessary. The 10.58-acre number is the actual planted area within the riparian restoration areas.

3. On page 3 of Section 4.2 – Please consider changing the title of the section to "Vegetation Tables" or "Vegetation Assessment Tables".
   Revised.

4. Figure 3 – Please have the As-built Map sealed by the professional land surveyor with the Ascension Land Surveying.
   A surveyor certificate has been added to the figure with the surveyor's seal and signature.

5. Appendix C – Please include overview photos of the project if available. The Overview photos help documenting the project's overall vegetative growth and ground cover.
   Two additional overview photos were added (taken 7/21/2022) and show the herbaceous cover establishing.

Baseline Monitoring Report

FINAL

THUNDER SWAMP MITIGATION PROJECT

NCDMS Project #100181 (Contract #0402-04)
RFP #16-20200402
DWR Project #2021-0306 V3

Wayne County, North Carolina
Neuse River Basin
HUC 03020201

Provided by:

Resource Environmental Solutions, LLC
for Environmental Banc & Exchange, LLC (EBX)

Provided for:
NC Department of Environmental Quality
Division of Mitigation Services

August 2022

Table of Contents

1 Mitigation Project Summary

1.1 Project Location and Description

Environmental Banc & Exchange, LLC (EBX), a wholly-owned subsidiary of Resource Environmental Solutions (RES), is pleased to provide the Thunder Swamp Mitigation Project (Project), a full-delivery buffer mitigation project for the Division of Mitigation Services (DMS) (DMS Project #100181). The Thunder Swamp Project is within the Neuse River Basin within the 8-digit HUC 03020201, 030202011170030 and DWR Sub-basin Number 03-04-12. The Project easement is located in Wayne County in Mt. Olive, NC and can be accessed by NC Highway 55 just west of downtown Mt. Olive (**Figure 1**). The coordinates are 35.205212° and -78.095683°.

This buffer project provides riparian buffer mitigation credits for unavoidable impacts due to development within the Neuse River Basin, United States Geological Survey (USGS) 8-digit Cataloguing Unit 03020201 (Neuse 01), excluding Falls Lake Watershed (**Figure 1**). This Buffer Mitigation Plan is in accordance with the Consolidated Buffer Mitigation Rule 15A NCAC 02B .0295 and Nutrient Offset Credit Trading Rule 15A NCAC 02B .0703. The Thunder Swamp Project consists of a contiguous conservation easement that totals approximately 13.34 acres and includes three unnamed stream tributaries to Thunder Swamp. Thunder Swamp is a USGS-named stream that eventually drains to the Neuse River. Pre-existing land use within the Project was crop production and riparian forest. Water quality stressors previously affecting the Project included heavily manipulated/relocated and maintained stream channels, nutrient loadings from active crop production, and lack of forested riparian buffers.

The Thunder Swamp Project is comprised of three intermittent stream channels: DJ1, DJ2, and DJ3 and one ephemeral stream channel, DJ7. All streams have been straightened and are incised. Furthermore, the fifty-foot riparian buffers of two stream reaches (DJ1 and DJ3) were determined to be subject to the Neuse buffer protection rules ("Subject"), whereas the other two stream reaches (DJ2 and DJ7) are not subject to the Neuse buffer protection rules ("Non-subject"). This Project was also codeveloped with a buffer mitigation and nutrient offset bank that extends riparian buffer areas associated with this Project's streams as well as incorporate additional stream features on the property.

The goal of the Project is to restore and preserve ecological function to the existing streams and their associated riparian buffer areas by establishing appropriate plant communities while minimizing temporal and land disturbing impacts. This is being accomplished through the planting, establishment, and protection of a hardwood forest community. The result will be a riparian area that functions to mitigate nutrient and sediment inputs from the surrounding uplands. Buffer and surrounding riparian area improvements will filter runoff from agricultural fields, thereby reducing nutrient and sediment loads to Project channels and provide water quality benefit to the overall watershed. The Project will provide significant functional uplift to the watershed and will assist DMS with achieving its mitigation goals in the Neuse 01 watershed, excluding the Falls Lake Watershed.

2 Regulatory Considerations

2.1 Determination of Credits

This Project has the potential to generate up to 420,320.284 ft^2 riparian buffer mitigation credits within a 13.34-acre conservation easement. These will be derived from buffer restoration and buffer preservation. The riparian buffer mitigation credits generated will service the Neuse 01 watershed, excluding the Falls Lake Watershed. The total potential buffer mitigation credits that the Thunder Swamp Mitigation Project will generate are detailed in **Table 1, Appendix A.** Where viable, buffer mitigation credits can be converted to nutrient offset credit in accordance with the Nutrient Offset Credit Trading Rule, 15A NCAC 02B .0703.

2.2 Asset Map

See **Figure 2, Appendix A**.

3 Baseline

3.1 Planting

The initial planting of bare root trees occurred in Spring 2022. All riparian restoration areas are planted from top of bank back at least 50 feet from streams with bare root tree seedlings on a nine by six-foot spacing to achieve an initial density of approximately 792 trees per acre. In addition, these areas were seeded with an herbaceous seed mix to provide rapid herbaceous cover and promote immediate buffer effectiveness as well as habitat for pollinators and other wildlife. The seed blend contains both temporary and permanent seed and includes taproot species. The seed was sown utilizing a no-till drill. Planting occurred in all areas proposed for riparian buffer restoration and meets the performance standards outlined in the Rule 15A NCAC 02B .0295. This includes treating invasive species and planting of at least four species of native hardwood bare root trees. Mixed-Mesic Hardwood Forest (Coastal Plain subtype) (Schafale 2012) is the target community type and was used for all areas within the Project. This community composition is highly diverse and is suitable given the Project's soil and landscape characteristics and will provide water quality and ecological benefits. The list of planted bare root tree species and their percentage of total species composition can be found in **Appendix B**. Wherever possible, mature vegetation has been preserved and incorporated into the buffer.

3.2 Other Activities

Other activities involved with the Project included ditch plugging and bank stabilization efforts, including benching, grading, matting, tree removal, and live staking where bank stability was compromised and where erosional rills, sink holes, and gullies were identified. One agricultural ditch (Ditch A) was plugged in order to eliminate concentrated flow from entering Reach DJ2 and ensuring diffuse flow within the riparian area. The ditch footprint was then planted heavily with live stakes. Areas of actively eroding banks were stabilized by grading and/or benching banks to a stable dimension followed by matting, seeding, and planting. One such area also required the removal of two large sweetgum trees, as they were at risk of falling and collapsing the stream bank. Live stakes were be planted on stream banks where stability was compromised, such as existing areas of erosion. There were also two identified erosional rills that conveyed concentrated flow within the riparian area. These were be stabilized by installing hay bales and coir log check dams followed by live stake planting and will ensure diffuse flow within the riparian area. All construction activities were authorized by DWR per the issued Buffer Authorization. Construction activities are called out on **Figure 3** and a Construction Detail Sheet is included in **Appendix A**.

4 Annual Monitoring

4.1 Methods

Annual vegetation monitoring and visual assessments will be conducted. Monitoring plots were installed a minimum of 100 meters squared in size and cover at least two percent of the planted mitigation area. These plots were randomly placed throughout the planted riparian buffer mitigation area (10.58 acres) and are representative of the riparian restoration conditions. The following data is recorded for all trees in the plots: species, height, planting date (or volunteer), and grid location. All stems in plots are flagged with flagging tape. Data is processed using the "Vegetation Table Shiny Tool" made available by DMS in December

2021 and is reported in accordance with the most recent DMS requirements and templates. In the field, the four corners of each plot were permanently marked with PVC at the origin and metal conduit at the other corners. There are 9 fixed vegetation monitoring plots (**Figure 3**). These plots were planted and monitored in conjunction with plots 10-25 of the Thunder Swamp Phase II project site.

Photos are to be taken at all vegetation plot origins each monitoring year and be provided in the annual reports. Visual inspections and photos will be taken to ensure that areas are being maintained and compliant. The measures of vegetative success for the Project are the survival of at least four native hardwood tree species, where no one species is greater than 50 percent of stems, at a density of at least 260 stems per acre at the end of Year 5. Native volunteer species may be included to meet the performance standards as determined by NC Division of Water Resources (DWR).

A visual assessment of the conservation easement is also performed each year to confirm:

- Easement boundary markers/signage are in good condition throughout the site;
- No encroachment has occurred;
- No invasive species in areas where invasive species were treated;
- Diffuse flow is being maintained in the conservation easement areas; and
- There has not been any cutting, clearing, filling, grading, or similar activities that would negatively affect the functioning of the buffer.

Component/ Feature	Monitoring	Maintenance through project close-out
Vegetation	Annual vegetation monitoring	Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be treated by mechanical and/or chemical methods. Any vegetation requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations. Vegetation maintenance activities will be documented and reported in annual monitoring reports. Vegetation maintenance will continue through the monitoring period.
Invasive and Nuisance Vegetation	Visual Assessment	Invasive and noxious species will be monitored and treated so that none become dominant or alter the desired community structure of the Project. Locations of invasive and nuisance vegetation will be mapped.
Project Boundary	Visual Assessment	Project boundaries shall be identified in the field to ensure clear distinction between the mitigation project and adjacent properties. Boundaries are marked with signs identifying the property as a mitigation project and will include the name of the long-term steward and a contact number. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by Project conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as-needed basis. Easement monitoring and staking/ signage maintenance will continue in perpetuity as a stewardship activity.

4.2 Vegetation Assessment Tables

See **Appendix B**.

4.3 Results and Discussion

Establishment and monitoring of 9 fixed vegetation plots was completed on May 12th, 2022. Vegetation tables are in **Appendix B** and associated photos are in **Appendix C**. MY0 monitoring data indicates that all plots are exceeding the interim success criteria of 320 planted stems per acre. Planted stem densities ranged from 648 to 931 planted stems per acre with a mean of 792 planted stems per acre across all plots.

A total of 12 species were documented within the plots. Volunteer species were not noted at baseline monitoring but are expected to establish in upcoming years. The average tree height observed was 1.4 feet.

Visual assessment of vegetation outside of the monitoring plots indicates that the herbaceous vegetation is becoming well established throughout the project. Some invasives have been observed and treated as necessary. Easement boundary markers and signs are clearly visible and in good condition. Additionally, there were no signs of encroachment or undocumented concentrated flow in the easement area.

4.4 Maintenance and Management

Chinese Privet will continue to be treated in the preservation areas as needed in the following monitoring year.

5 References

NC Environmental Management Commission. 2014. Rule 15A NCAC 02B.0295 - Mitigation Program Requirements for the Protection and Maintenance of Riparian Buffers.

NC Environmental Management Commission. 2020. Rule 15A NCAC 02B.0714 – Neuse River Basin: Nutrient Sensitive Waters Management Strategy: Protection and Maintenance of Existing Riparian Buffers.

NC Department of Environmental Quality, Division of Mitigation Services. 2021. Vegetation Table Shiny Tool. https://ncdms.shinyapps.io/Veg_Table_Tool/.

Resource Environmental Solutions, LLC (2022). Thunder Swamp Mitigation Project. Final Mitigation Plan.

Schafale, M.P. 2012. Classification of the Natural Communities of North Carolina, Fourth Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, NCDENR, Raleigh, NC.

Appendix A

Background Tables & Site Maps

Table 1. Thunder Swamp, DMS# 100181, Project Credits

Neuse 03020201 - Outside Falls Lake	Project Area
19.16394	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	0-100	DJ1, DJ2, DJ3	362,948	362,948	1	100%	1.00000	Yes	362,948.000	Yes	18,939.112	—
Buffer	Rural	Yes	I / P	Restoration	101-200	DJ1, DJ2, DJ3	67,467	67,467	1	33%	3.03030	Yes	22,264.132	Yes	3,520.518	—
Buffer	Rural	No	Ephemeral	Restoration	0-100	DJ7	20,363	20,363	1	100%	1.00000	Yes	20,363.000	Yes	1,062.569	—
Buffer	Rural	No	Ephemeral	Restoration	101-200	DJ7	286	286	1	33%	3.03030	Yes	94.380	Yes	14.924	—
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						Totals (ft2):	451,064	451,064					405,669.512		23,537.122	0.000
						Total Buffer (ft2):	451,064	451,064								
						Total Nutrient Offset (ft2):	0	N/A								

Total Ephemeral Area (ft^2) for Credit:	20,746	20,746	
Total Eligible Ephemeral Area (ft^2):	135,271	3.8%	Ephemeral Reaches as % TABM
Total Eligible for Preservation (ft^2):	150,355	15.0%	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
	Rural	No	Ephemeral		0-100	DJ7	97	97	5	100%	5.00000	19.400
	Rural	Yes	I / P		101-200	DJ1	4,932	4,932	10	33%	30.30303	162.756
	Rural	No	I / P		0-100	DJ2	66,114	66,114	5	100%	5.00000	13,222.800
	Rural	No	I / P		101-200	DJ2	18,876	18,876	5	33%	15.15152	1,245.816
												—
						Preservation Area Subtotals (ft^2):	90,019	90,019				

TOTAL AREA OF BUFFER MITIGATION (TABM)			
Mitigation Totals		Square Feet	Credits
Restoration:		451,064	405,669.512
Enhancement:		0	0.000
Preservation:		90,019	14,650.772
Total Riparian Buffer:		541,083	420,320.284
TOTAL NUTRIENT OFFSET MITIGATION			
Mitigation Totals		Square Feet	Credits
Nutrient Offset:	Nitrogen:	0	0.000
	Phosphorus:		0.000

1. The Randleman Lake buffer rules allow some ditches to be classified as subject according to 15A NCAC 02B .0250 (5)(a).

last updated 08/03/2020

Table 2: Summary: Goals, Performance and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Restore and preserve native vegetation.	Established and increased forested riparian buffers to 50 feet and greater along both sides of the channel along the project reaches with a hardwood riparian plant community;	Reduction in floodplain sediment inputs from runoff, increased bank stability, increased LWD, and increased organic material in streams	Survival of at least four native hardwood tree species, where no one species is greater than 50 percent of stems, at a density of at least 260 stems per acre at the end of MY5	Nine fixed vegetation plots	N/A

Table 3. Project Attribute Table			
Project Name	Thunder Swamp Mitigation Project		
County	Wayne		
Project Area (acres)	13.34		
Planted Area (acres)	10.58		
Project Coordinates (latitude and longitude decimal degrees)	35.205212, -78.095683		
Project Watershed Summary Information			
Physiographic Province	Rolling Coastal Plain		
River Basin	Neuse		
USGS Hydrologic Unit 8-digit	3020201		
DWR Sub-basin	03-04-12		
Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	No	N/A	N/A
Water of the United States - Section 401	No	N/A	N/A
Buffer Authorization - Neuse Riparian Buffer Protection Rules	Yes	Yes	Appendix A
Endangered Species Act	Yes	Yes	Categorical Exclusion
Historic Preservation Act	Yes	Yes	Categorical Exclusion
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

Table 4. Project Timeline and Contacts

Activity or Deliverable	Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted	NA	Dec-20
Mitigation Plan Approved	NA	Feb-22
Construction (Grading) Completed	NA	Apr-22
Planting Completed	NA	04-May-22
As-built Survey Completed	NA	Jul-22
MY-0 Baseline Report	May-22	Jul-22
MY1+ Monitoring Reports		
Remediation Items (e.g. beaver removal, supplements, repairs etc.)		
Encroachment		

Thunder Swamp #100181	
Provider	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Mitigation Provider POC	Jamey Mceachran (919) 623-9889
Designer	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Primary project design POC	Ben Carroll, PE (336) 514-0927
Construction Contractor	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Construction contractor POC	Paul Dunn

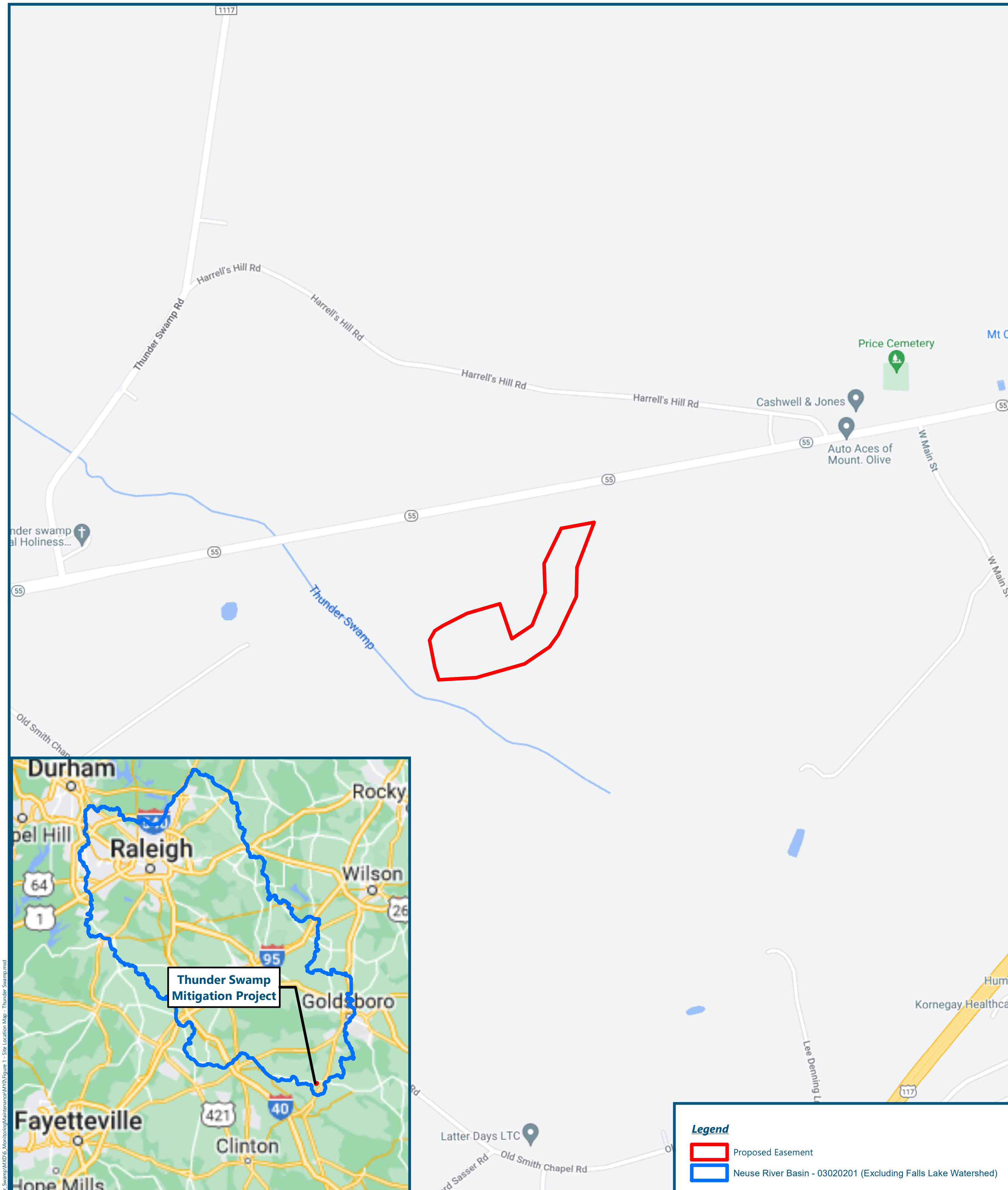


Figure 1 - Site Location Map

N
W E
S

0 500 1,000
Feet

Thunder Swamp Mitigation Project

Wayne County, North Carolina

Date: 7/7/2022

Drawn by: MDD

Checked by: JRM

1 inch = 1,000 feet

Restoring a resilient earth for a modern world

CERTIFICATE OF SURVEY AND ACCURACY

I, CHRISTOPHER L. COLE, CERTIFY THAT THE AS-BUILT INFORMATION SHOWN
IS BASED UPON A SURVEY PERFORMED UNDER MY SUPERVISION FROM AN ACTUAL
SURVEY MADE UNDER MY SUPERVISION;
THAT THE ELATIVE POSITIONAL ACCURACY DOES NOT EXCEED 0.10 FEET + 50 PPM;
THAT A GLOBAL POSITIONING SYSTEM (GPS) SURVEY WAS PERFORMED UNDER MY DIRECT
SUPERVISION AND THE FOLLOWING INFORMATION WAS
USED TO PERFORM THE GPS SURVEY:

1. CLASS OF SURVEY: A
2. RELATIVE POSITIONAL ACCURACY: DOES NOT EXCEED 0.10 FEET + 50 PPM
3. TYPE OF GPS SURVEY PROCEDURE:
RTK SURVEY USING A JAVAD LS PLUS IN CONJUNCTION WITH A T3 BASE STATION
4. DATE OF SURVEY: MARCH 23RD, 2021
5. DATUM/EPOCH: NAD 83 (2011)(EPOCH 2010)
6. PUBLISHED/FIXED-CONTROL: CORS NETWORK
7. GEOID MODEL: GEOID12B
8. COMBINED GRID FACTOR: 0.99987066
9. UNITS: U.S. SURVEY FEET

THIS MAP MEETS THE REQUIREMENTS OF THE STANDARDS OF PRACTICE
FOR LAND SURVEYING IN NORTH CAROLINA (21 NCAC 56. 1600).

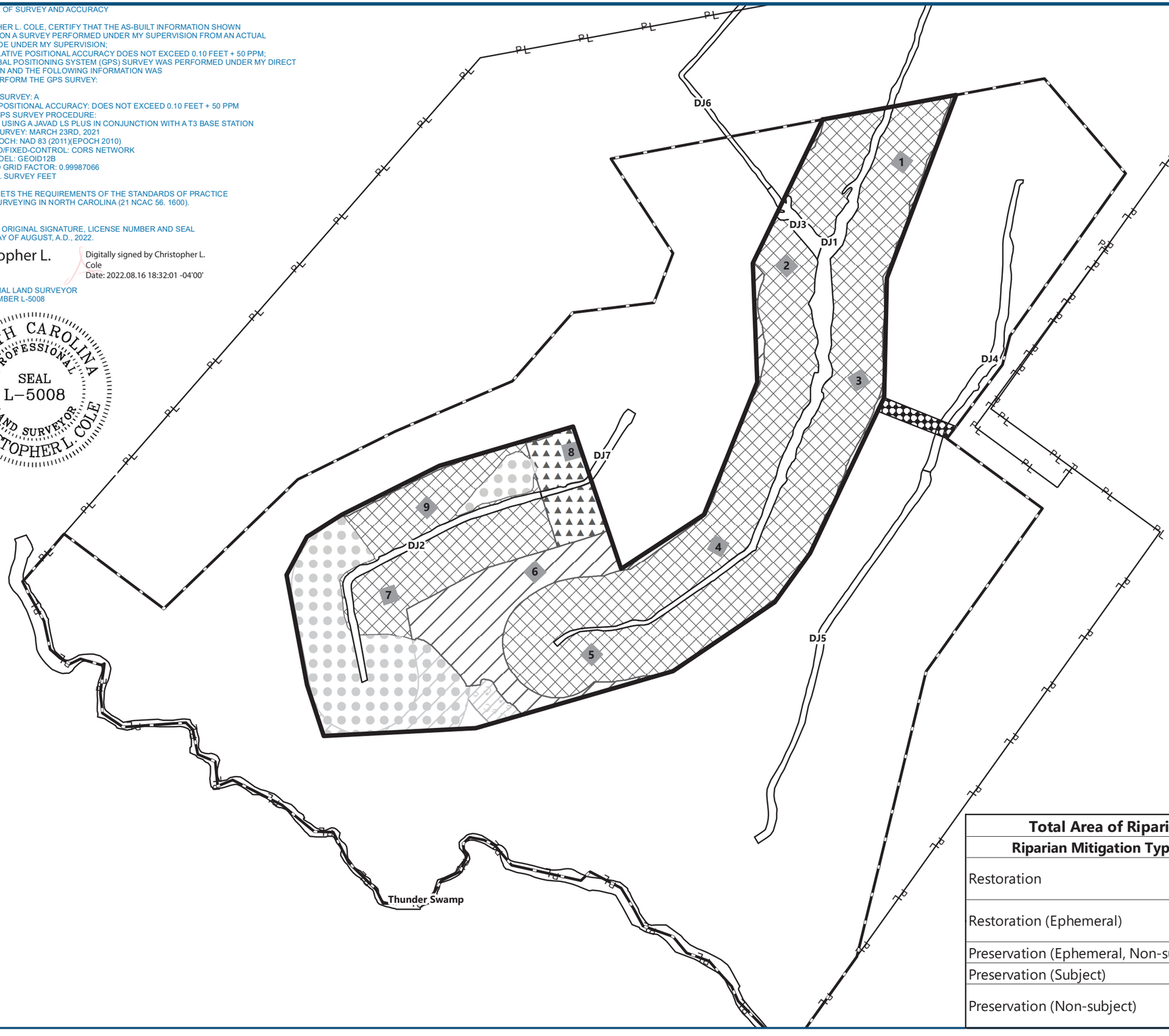
WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER AND SEAL
THIS 17TH DAY OF AUGUST, A.D., 2022.

Christopher L. Cole

Digitally signed by Christopher L. Cole
Date: 2022.08.16 18:32:01 -04'00'

PROFESSIONAL LAND SURVEYOR
LICENSE NUMBER L-5008

NORTH CAROLINA PROFESSIONAL SEAL L-5008 LAND SURVEYOR CHRISTOPHER L. COLE



res

Restoring a Resilient Earth for a Modern World

N
W E
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0 100 200
Feet

Figure 2 - As-built Map

Thunder Swamp Mitigation Project

Wayne County, North Carolina

Date: 8/16/2022	**Drawn by: MDD**
Checked by: JRM	**1 inch = 200 feet**

Legend

- Recorded Easement (13.34 ac)
- Thunder Swamp Phase II Bank Easement
- Internal Crossing
- Project Parcel Boundary
- Surveyed Top of Bank
- Vegetation Plot

Riparian Buffer Mitigation Approach

- Riparian Restoration (0-100')
- Riparian Restoration (101-200')
- Riparian Restoration (0-100'), Ephemeral
- Riparian Restoration (101-200'), Ephemeral
- Riparian Preservation (0-100'), Subject
- Riparian Preservation (101-200'), Subject
- Riparian Preservation (0-100'), Non-subject
- Riparian Preservation (101-200'), Non-subject

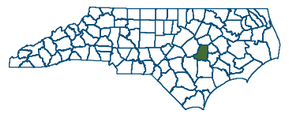
Total Area of Riparian Buffer Mitigation

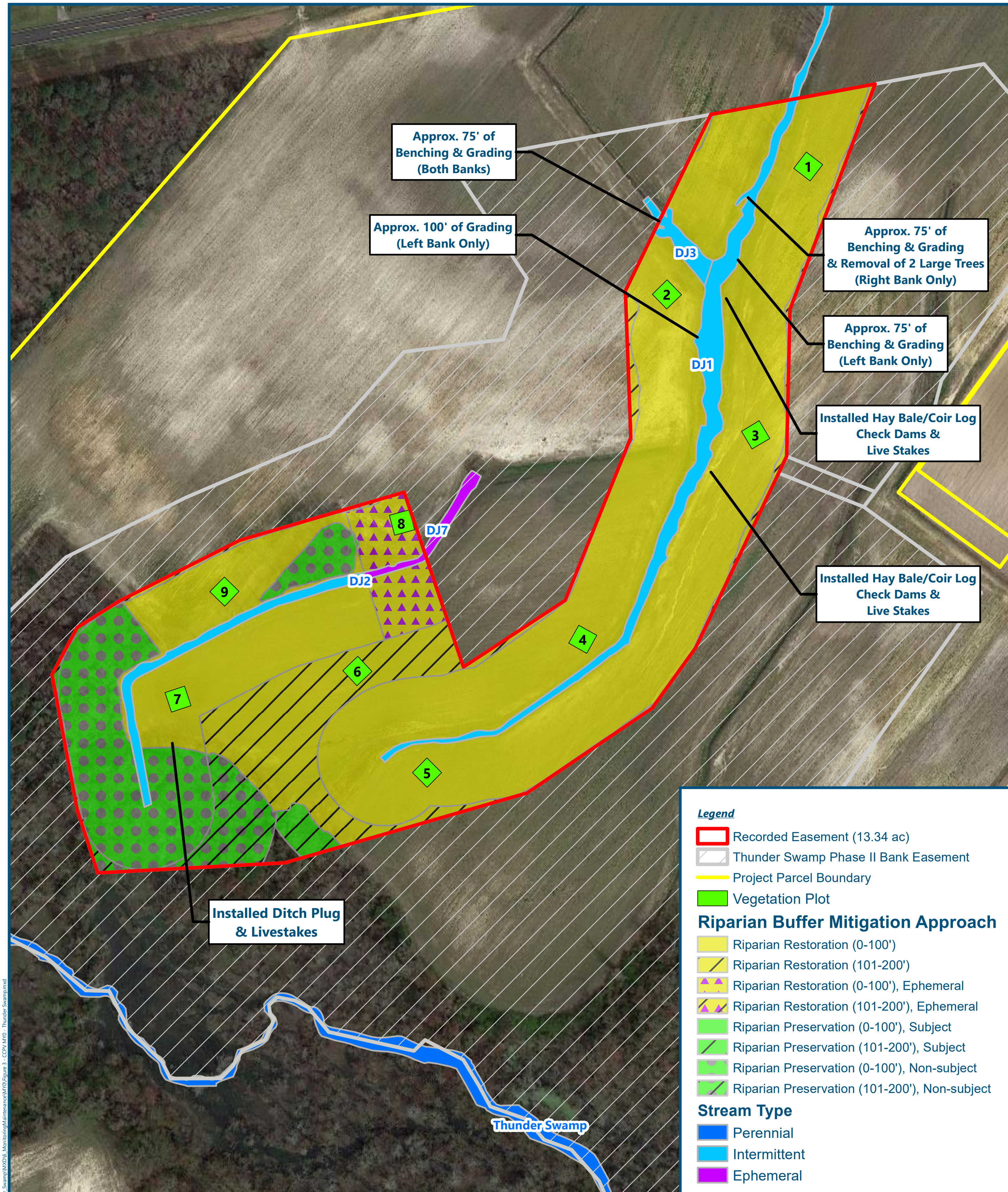
Riparian Mitigation Type	Zone	Square Feet
Restoration	0-100	362,948
	101-200	67,467
Restoration (Ephemeral)	0-100	20,363
	101-200	286
Preservation (Ephemeral, Non-subject)	0-100	97
Preservation (Subject)	101-200	4,932
Preservation (Non-subject)	0-100	66,114
	101-200	18,876

REFERENCE

1) Horizontal Datum is NAD83 UTM Zone 17N

2) Map Projection is NAD_1983_StatePlane_ North_Carolina_FIPS_3200_Feet





N W E S

0 100 200

Feet

Figure 3 - CCPV MY0 2022

Thunder Swamp Mitigation Project

Wayne County, North Carolina

Date: 7/7/2022

Drawn by: MDD

Checked by: JRM

1 inch = 200 feet

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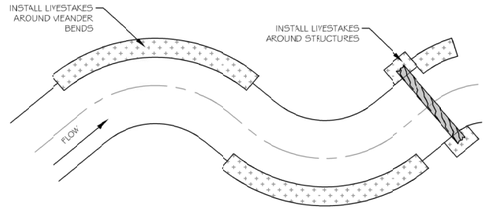
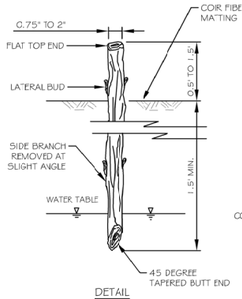
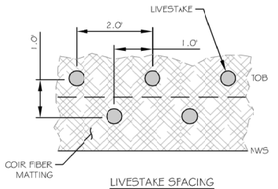


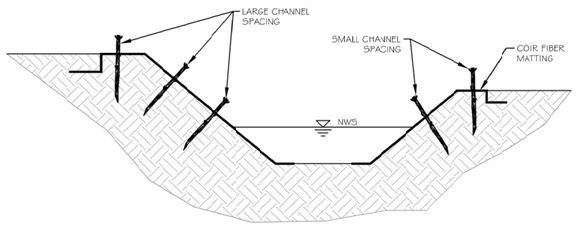
PLAN VIEW



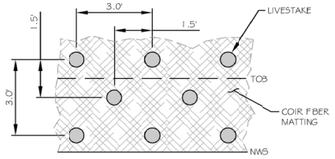
DETAIL



LIVESTAKE SPACING
SMALL CHANNEL



TYPICAL SECTION

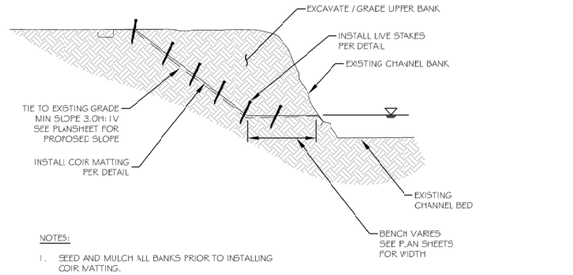


LIVESTAKE SPACING
LARGE CHANNEL

NOTES:

1. SEE TABLE ON PLANTING SHEET FOR ACCEPTABLE SPECIES AND COMPOSITION.
2. LIVE STAKES SHOULD BE 2 TO 3 FEET LONG AND 0.75 TO 2 INCHES IN DIAMETER.
3. LIVE STAKES SHALL BE PLANTED ON 1.5' ALTERNATING SPACING ON LARGE CHANNELS (POOL DEPTH > 2FT) AND 1.0' ALTERNATING SPACING ON SMALL CHANNELS (POOL DEPTH < 2FT).
4. LIVE STAKES SHALL BE PLANTED ON ALL RESTORATION REACHES AND ALONG ALL ENHANCEMENT REACHES.

LIVE STAKING
NTS

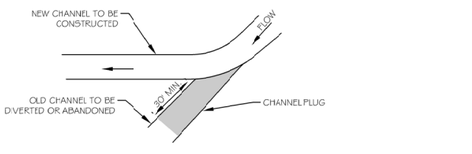


NOTES:

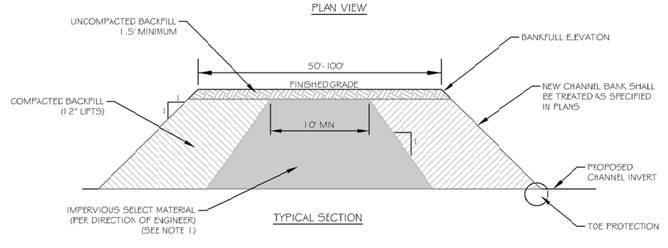
1. SEED AND MULCH ALL BANKS PRIOR TO INSTALLING COIR MATTING.

TYPICAL BANK GRADING
NTS

NOTE:
1. IF IMPERVIOUS SELECT MATERIAL IS NOT FOUND ON SITE, SUITABLE MATERIAL MUST BE OBTAINED FROM AN OFF-SITE SOURCE.



PLAN VIEW

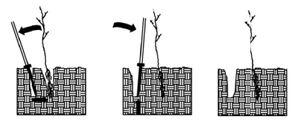


TYPICAL SECTION

CHANNEL PLUG
NTS

DIBBLE PLANTING METHOD
USING THE KBC PLANTING BAR

1. INSERT PLANTING BAR AS SHOWN AND PULL HANDLE TOWARD PLANTER.
2. REMOVE PLANTING BAR AND PLACE SEEDING AT CORRECT DEPTH.
3. INSERT PLANTING BAR 2 INCHES TOWARD PLANTER FROM SEEDING.



4. PULL HANDLE OF BAR TOWARD PLANTER, FIRMING SOIL AT BOTTOM.
5. PUSH HANDLE FORWARD FIRMING SOIL AT TOP.
6. LEAVE COMPACTION HOLE OPEN. WATER THOROUGHLY.

PLANTING NOTES:

PLANTING BAG
DURING PLANTING, SEEDLINGS SHALL BE KEPT IN A MOIST CANVAS BAG OR SIMILAR CONTAINER TO PREVENT THE ROOT SYSTEMS FROM DRYING.

KBC PLANTING BAR
PLANTING BAR SHALL HAVE A BLADE WITH A TRIANGULAR CROSS SECTION, AND SHALL BE 12 INCHES LONG, 4 INCHES WIDE AND 1 INCH THICK AT CENTER.

ROOT PRUNING
ALL SEEDLINGS SHALL BE ROOT PRUNED, IF NECESSARY, SO THAT NO ROOTS EXTEND MORE THAN 10 INCHES BELOW THE ROOT COLLAR.

NOTES

BARE ROOTS SHALL BE PLANTED 6 FT. TO 10 FT. ON CENTER, RANDOM SPACING, AVERAGING 8 FT. ON CENTER. APPROXIMATELY 680 PLANTS PER ACRE.

BARE ROOT PLANTING
NTS

res
3600 Glenwood Ave, Suite 100
Raleigh, NC 27612
Main: 919.829.9909
www.res.us

Engineering Services Provided By:
RES Enviromental Operating Company, LLC
License: F-1428

SEAL

PLOT DATE:
PLOTDATE

REVISIONS:

RELEASED FOR:
PRELIMINARY

PROJECT NAME:
PROJNAME
LOCATION

DRAWING TITLE:
SHEETTITLE

PROJECT NUMBER:	PROJNO
PROJECT MANAGER	PROJMGR
DESIGNED:	DESIGNER
DRAWN:	DRAFTER
CHECKED:	CHECKEDBY

SHEET NUMEER:

SHEETNO

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

NORTH CAROLINA
Environmental Quality

March 10, 2022

DWR # 2021-0306 v4
Wayne County

Danny Gray Jackson and Margaret Jernigan Jackson
301 Jones Turner Roa
Mount Olive, North Carolina 28365

Resources Environmental Solutions, LLC
ATTN: Katie Webber
3600 Glenwood Avenue – Suite 100
Raleigh, North Carolina 27612

Subject: **AUTHORIZATION CERTIFICATE PER THE NEUSE RIPARIAN BUFFER PROTECTION RULES (15A NCAC 02B .0714) WITH ADDITIONAL CONDITIONS**
Thunder Swamp Mitigation Project

Dear Ms. Webber:

You have our approval for the impacts listed below for the purpose described in your application received by the Division of Water Resources (Division) on January 10, 2022. This Buffer Authorization does not relieve the permittee 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/or Stormwater regulations. **This Authorization Certificate shall expire five (5) years from the date of this letter.**

The following impacts are hereby approved, provided that all of the Conditions listed below, and all the conditions of the Neuse Buffer Rules are met. No other impacts are approved, including incidental impacts [15A NCAC 02B. 0611(b)(2)].

Type of Impact	Amount Approved (units) Permanent	Amount Approved (units) Temporary	Plan location/ Reference Attached
Buffers - Zone 1			
B1 – grading/benching	3,510 ft^2 (square feet)	0 ft^2 (square feet)	
B2 – grading/benching	3,095 ft^2 (square feet)	0 ft^2 (square feet)	
B3 – rill repair	238 ft^2 (square feet)	0 ft^2 (square feet)	
B4 – bank stabilization	3951 ft^2 (square feet)	0 ft^2 (square feet)	
B5 – rill repair	366 ft^2 (square feet)	0 ft^2 (square feet)	
B6 – grading/benching	6,882 ft^2 (square feet)	0 ft^2 (square feet)	

1. No Waste, Spoil, Solids, or Fill of Any Kind
No waste, spoil, solids, or fill of any kind shall occur in wetlands, waters, or riparian areas beyond the footprint of the impacts depicted in the Buffer Authorization Application. All forestry operations activities shall be performed so that no violations of state water quality standards, statutes, or rules occur [15A NCAC 02H .0502 and .0502].

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 Authorization. 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 Authorization and is responsible for complying with all conditions. [15A NCAC 02B .0507(d)(2)]

3. This approval and its conditions are final and binding unless contested. {G.S. 143-215.5}

This Buffer Authorization 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). 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.

Within **sixty (60) calendar days** of receipt of this notice, a petition must be filed with the OAH. 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:

Office of Administrative Hearings
6714 Mail Service Center
Raleigh, NC 27699-6714

If sending via delivery service (UPS, FedEx, etc.):

Office of Administrative Hearings
1711 New Hope Church Road
Raleigh, NC 27609-6285

One (1) copy of the petition must also be served to DENR:

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 the Neuse Riparian Buffer Rules as described in 15A NCAC 02B .0714. Please contact Chris Pullinger at 252-948-3918 or chris.pullinger@ncdenr.gov if you have any questions or concerns.

Sincerely,

Robert Tankard

Robert Tankard, Assistant Regional Supervisor
Water Quality Regional Operations Section
Division of Water Resources, NCDEQ

cc: Katie Webber, Resource Environmental Solutions, LLC (via e-mail: kwebber@res.us)
Katie Merritt, DWR Central Office (via e-mail)
Emily Thompson, Washington Regulatory Field Office, USACE (via e-mail)
Randall Jones, WaRO DEMLR (via e-mail)
DWR Laserfiche

Appendix B

Vegetation Assessment Data

Bare Root Tree Species Planted at Thunder Swamp DMS

Common Name	Species	% of Total Species	Planted Amount
River Birch	Betula nigra	10%	854
Buttonbush	Cephalanthus occidentalis	5%	427
Persimmon	Diospyros virginiana	10%	854
Green Ash	Fraxinus pennsylvanica	5%	427
Overcup Oak	Quercus lyrata	10%	854
American Sycamore	Platanus occidentalis	10%	854
Northern Red Oak	Quercus rubra	10%	854
Swamp Chestnut Oak	Quercus michauxii	10%	854
Water Oak	Quercus nigra	10%	854
Willow Oak	Quercus phellos	10%	854
Shumard's Oak	Quercus shumardii	10%	854

TOTAL 8,540 Trees

Planted Acreage	10.58
Date of Initial Plant	2022-05-04
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	2022-05-12
Date of Current Survey	2022-05-12
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		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Betula nigra	river birch	Tree	FACW			3	3	1	1	5	5	1	1	2	2					4	4
	Cephalanthus occidentalis	common buttonbush	Shrub	OBL	2	2											6	6				
	Diospyros virginiana	common persimmon	Tree	FAC			1	1	3	3	1	1			2	2			2	2	5	5
	Fraxinus pennsylvanica	green ash	Tree	FACW					1	1	4	4	1	1	2	2	2	2			2	2
	Nyssa biflora	swamp tupelo	Tree	OBL					2	2							1	1				
	Platanus occidentalis	American sycamore	Tree	FACW			2	2			1	1	6	6					3	3	3	3
	Quercus lyrata	overcup oak	Tree	OBL	5	5	1	1	2	2			1	1			2	2			2	2
	Quercus michauxii	swamp chestnut oak	Tree	FACW	3	3	2	2	4	4	1	1	2	2	3	3			1	1	1	1
	Quercus nigra	water oak	Tree	FAC	2	2	2	2					2	2								
	Quercus phellos	willow oak	Tree	FACW	8	8	8	8	1	1	4	4	2	2	4	4	6	6	5	5	2	2
	Quercus rubra	northern red oak	Tree	FACU	1	1	4	4	2	2	4	4			3	3	2	2	5	5		
	Quercus shumardii	Shumard's oak	Tree	FAC							1	1	1	1	2	2	3	3	3	3	1	1
Sum	Performance Standard				21	21	23	23	16	16	21	21	16	16	18	18	22	22	19	19	20	20
Mitigation Plan Performance Standard	Current Year Stem Count					21		23		16		21		16		18		22		19		20
	Stems/Acre					850		931		648		850		648		729		891		769		810
	Species Count					6		8		8		8		8		7		7		6		8
	Dominant Species Composition (%)					38		35		25		24		38		22		27		26		25
	Average Plot Height (ft.)					3		4		4		4		3		4		3		4		4
	% Invasives					0		0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					21		23		16		21		16		18		22		19		20
	Stems/Acre					850		931		648		850		648		729		891		769		810
	Species Count					6		8		8		8		8		7		7		6		8
	Dominant Species Composition (%)					38		35		25		24		38		22		27		26		25
	Average Plot Height (ft.)					3		4		4		4		3		4		3		4		4
	% Invasives					0		0		0		0		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.

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	850	3	6	0	931	4	8	0	648	4	8	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	850	4	8	0	648	3	8	0	729	4	7	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	891	3	7	0	769	4	6	0	810	4	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.

Visual Vegetation Assessment

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.	0.10 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10acres	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.	0.10 acres	0.00	0.0%
		Cumulative Total	0.00	0.0%

Easement Acreage **50**

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.	0.10 acres	0.00	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	# Encroachments noted	

Appendix C

As-built Photos

Thunder Swamp Phase I General Site Photos MY0 2022

Grading (5/3/2022)

Grading (5/3/2022)

Vegetation (7/21/2022)

Vegetation (7/21/2022)

Easement marker posts and signs installed (5/6/2022)

Easement Marker Replacement (6/8/2022)

Thunder Swamp Phase I MY0 Vegetation Monitoring Plot Photos

Vegetation Plot 1 (5/10/2022)

Vegetation Plot 2 (5/12/2022)

Vegetation Plot 3 (5/10/2022)

Vegetation Plot 4 (5/12/2022)

Vegetation Plot 5 (5/10/2022)

Vegetation Plot 6 (5/12/2022)

Vegetation Plot 7 (5/11/2022)

Vegetation Plot 8 (5/12/2022)

Vegetation Plot 9 (5/11/2022)