FINAL MITIGATION PLAN

Matthew Site
Johnston County, North Carolina

Neuse River Basin
HUC 03020201

DMS Project #: 100043
Contract #: 7419
USACE Action ID: SAW-2018-01256
DWR Project #2017-0624
RFP: 16-007279

Prepared for:

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

Prepared by:

Resource Environmental Solutions, LLC
For Environmental Banc & Exchange, LLC
302 Jefferson Street, Suite 110
Raleigh, NC 27605
919-209-1052

September 2019

This mitigation plan has been written in conformance with the requirements of the following:

- *Federal rule for compensatory mitigation project sites as described in the Federal Register Title 33 Navigation and Navigable Waters Volume 3 Chapter 2 Section § 332.8 paragraphs (c)(2) through (c)(14).*
- *NCDEQ Division of Mitigation Services In-Lieu Fee Instrument signed and dated July 28, 2010*

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

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

CESAW-RG/Browning August 9, 2019

MEMORANDUM FOR RECORD

SUBJECT: Matthew Mitigation Site - NCIRT Comments during 30-day Mitigation Plan Review

PURPOSE: The comments listed below were posted to the NCDMS Mitigation Plan Review Portal during the 30-day comment period in accordance with Section 332.8(g) of the 2008 Mitigation Rule.

NCDMS Project Name: Matthew Site, Johnston County, NC

USACE AID#: SAW-2018-01256

NCDMS #: 100043

30-Day Comment Deadline: August 9, 2019

DWR Comments, Mac Haupt and Erin Davis:

1. Section 6.4- Vegetation and Planting Plan- DWR recommends the inclusion of a couple more or substituting in some trees better adapted to wetlands or areas of potential ponding.
    a. water tupelo- Nyssa aquatic
    b. Swamp cottonwood- Populus heterophylla
    c. Green ash
2. In addition, during the site visit the IRT noted it may be difficult to establish trees in a Juncus marsh, therefore, what measures will you take to control the Juncus before planting? Moreover, in the last paragraph of this Section, it states that the latest planting may be before May 31st to ensure the 180 days needed for the first year of monitoring. DWR does not want to see any planting past April 30th.
3. Section 7.2.1- Wetland Hydrology Criteria- DWR accepts the proposed 12% criteria, however, please realize any modification of the hydroperiod (in the first two years) will have to come with IRT approval.
4. Related to the vegetation target community, does RES want to consider some verbiage in the Mitigation Plan that would state some small (size ??) open water/marsh areas may persist through the monitoring period?
5. Figure 11- Monitoring Plan Map- DWR recommends adding 3 wetland monitoring gauges, two to the rehabilitation area and one to the proposed re-establishment area (will note preferred location during Design Sheet discussion).
6. Design Sheet E1- RES has a typical for a woody riffle (which is good!), however, it does not appear in the legend, nor does it appear on any of the design sheets. DWR strongly recommends that most of riffles be woody riffles.
7. Design Sheet S2- the legend for this sheet did not print out correctly, also, DWR does like the engineered sediment packs at the designated outlets. Please add wetland monitoring gauge stream left on reach RL1-A approximately station 8+50.

8. Design Sheet S4- please add a wetland monitoring adjacent to reach RL1-A at approximately station 19+00. Also, please add a gauge on stream right at station 21+75.
9. Design Sheet S6- wetlands should be shown on the sheet. Also, during the site visit we spoke about stabilizing an emergency outlet to the pond (that feeds reach RL-2). As I recall, the outlet was degraded and would pose a threat to the site. Please respond whether RES plans to stabilize this outlet, no work is shown on the sheet.
10. Design Sheet S7- wetlands should be shown on the sheet.
11. Related to the proposed wetland re-establishment below the dam, my field notes talked about removing some spoil along the stream for some wetland enhancement credit. I do recall some spoil and trash material that could be removed, however, did not believe the extent of the spoil was as extensive as is shown in various figures. One soil profile does confirm this- #107. DWR questions the extent of the spoil for wetland WF.
12. Reach RL2- While this stream reach may have a drainage area of 490 acres, because of two upstream ponds, DWR has concerns that this would likely limit flow during dry periods. RES should be aware that this reach may evolve into more of a wetland versus a stream depending on precipitation.
13. DWR did not see any discussion of the nature of the sediment or muck in the pond/lake bottom. Will any of this substrate be removed? Will other more structurally stable soil be brought in for construction of the stream channel? Please provide some verbiage regarding your methods and a detailed construction sequence for dealing with the lake sediment.
14. Design Sheet 1- What are the structures that will be used for bank stabilization and protection of the structure at the top of the project?
15. The site has been logged since our site visit. There appear to be a couple of drainages coming into the easement area (as seen on Google Earth) on the north side of the easement that may warrant the sediment pack application, DWR recommends looking at these areas and consider the appropriate action.

Kim Browning, USACE:

1. General Comment: For crediting purposes, where there is a confluence, only one stream should be measured where the two channels join, rather than measuring both channels. The design sheets are small so it's difficult to tell if this was done here.
2. Please depict fixed photo points/digital image stations on Figures11.
3. General Comment Wetland rehabilitation/reestablishment—It would be beneficial to add some coarse woody debris to the depressional areas and throughout the wetland for habitat, and to help store sediment, increase water storage/infiltration, and absorb water energy during overbank events.
4. The perched DOT culverts pose an obstruction to aquatic passage. I'm glad you started credit downstream for anticipated culvert repair.
5. At the February 2018 IRT visit, it was mentioned that the entire footprint of the dam would be removed to include tributary RL3. What happened to this trib?
6. Was there a repair on the emergency outlet of the pond feeding RL2? This need was discussed at the IRT site visit, but it's unclear if this concern was addressed.
7. I'm pleased to see the engineered sediment packs considering the runoff coming off the adjacent pastures. Near STA 5+00 there was a large cattle wallow. Will this area be stabilized? Is there a potential for this area to degrade again with future cattle access and potentially impact the project in the future.
8. Section 7.3: Volunteers are only counted if on the approved planting list, after being established for 2 years. Sweetgum and red maple are not on the approved planting list and are not approved to be counted towards vegetative success. Please remove all references to this.
9. Page 28: The last date for planting should be April 30, not May 31.
10. Section 6.2.1: Please discuss what will be done with sediment in pond bottom and the existing Juncus.
11. Section 7.3: Please add "260" to five-year old trees.
12. RL1-A: it appears that restoration will flow through wetlands WE and WD. Please discuss how function will be maintained and there will be no loss of wetlands.

13. Section 7.1.2: Entrenchment ratio should be no less than 2.2 for C/E type streams, not 1.4 as indicated in this section. Please update Table 15 as well.

Kim Browning
Mitigation Project Manager
Regulatory Division

M E M O R A N D U M

302 Jefferson Street, Suite 110 Raleigh, North Carolina 27605 919.209.1052 tel. 919.829.9913 fax

TO: **NCIRT and NCDMS**

FROM: **Brad Breslow - RES**

DATE: **September 10, 2019**

RE: **Response to Matthew Mitigation Site NCIRT Comments during 30-day Mitigation Plan Review**
DMS Project ID No. 100043, Contract #7419, USACE Action ID #SAW-2018-01256

RES would like to indicate that the Final Mitigation Plan includes some minor changes in wetland areas (both existing and proposed), resulting in a small adjustment to wetland credits. These changes were due to a discrepancy between the existing, surveyed top of bank and wetland delineation polygons as well as PJD updates (as submitted with the PCN) based on most up-to-date site conditions where a previously open water area has converted to wetland (within WA). The final wetland areas have been fixed to align with surveyed top of bank and include the previously open water area within WA. These changes result in slight overall increase in wetland area.

- Existing wetland area increased from 12.07 ac to 12.216 ac
- Proposed wetland area has increased from 14.054 ac to 14.165 ac
- Therefore, resulting WMUs increased from 7.154 to 7.207

Likewise, existing linear feet of stream has been updated to better align with surveyed contours and most recent visual site assessment. These changes are also reflected in the PJD updates as submitted with the PCN. The change in existing linear feet of stream does not result in a change in proposed stream length or SMUs. Note that in **Table 14**, existing lengths are based on jurisdictional length; whereas, the design sheets use stationing that assumes RL1-A extends up to the road culvert.

NCDWR Comments, Mac Haupt and Erin Davis:

General

1. Related to the vegetation target community, does RES want to consider some verbiage in the Mitigation Plan that would state some small (size ??) open water/marsh areas may persist through the monitoring period?
   RES appreciates the suggestion. **Section 6.4.1** has been revised to include the following statement: "…This community type represents a diverse community where wet-tolerant hardwoods can establish throughout while very wet species (e.g. Cypress and Gums) can thrive in the transitional swamp areas. While reforestation is an important goal of this Project, it is expected that some open water and/or marsh pockets may persist in depressions within the swamp areas. These microtopographic features will further enhance community complexity and habitat diversity."

Further, **Section 8.6** has been revised to include this statement: "…As discussed in **Section 6.4.1**, it is expected that some open water/marsh pockets may persist in localized areas within the Project area. Therefore, RES will attempt to avoid establishing vegetation plots in these potential areas. In the event that these areas become too large (greater than 0.1 acres) or more widespread throughout the Project, RES will document and map the areas to determine if any adaptive management is necessary."

2. Related to the proposed wetland re-establishment below the dam, my field notes talked about removing some spoil along the stream for some wetland enhancement credit. I do recall some spoil and trash material that could be removed, however, did not believe the extent of the spoil was as extensive as is shown in various figures. One soil profile does confirm this- #107. DWR questions the extent of the spoil for wetland WF.
   The fill/spoil area in question comes directly from the soil delineation performed by George K Lankford, LLC and is depicted in the sealed Final Site Hydric Soils Detailed Study (Soils Report), which is included in **Appendix M**. To clarify, Figure 3 of that report depicts many soil borings within the fill/spoil area; however, the actual soil boring profiles displayed in the report are representative profiles for the given area (e.g. #107 and #119B). Therefore, based on the findings and recommendations in the soils report along with the site's existing characteristics both upstream and downstream of the disturbed areas, RES believes that "WF," as proposed in the Mitigation Plan, is a suitable wetland re-establishment area.

3. Reach RL2- While this stream reach may have a drainage area of 490 acres, because of two upstream ponds, DWR has concerns that this would likely limit flow during dry periods. RES should be aware that this reach may evolve into more of a wetland versus a stream depending on precipitation.
   RES is aware that maintaining flow may become an issue due to the existing impoundment upstream of the reach. RES will document any flow issues (if observed) during monitoring.

4. DWR did not see any discussion of the nature of the sediment or muck in the pond/lake bottom. Will any of this substrate be removed? Will other more structurally stable soil be brought in for construction of the stream channel? Please provide some verbiage regarding your methods and a detailed construction sequence for dealing with the lake sediment.
   RES does not anticipate removing a significant amount of muck/sediment during construction since much of the pond has been drained (and is drying out) due to the breach resulting from Hurricane Matthew. RES stabilized and lowered the breach during the summer of 2018 to maintain positive drainage through the pond and to aid in the dewatering of the pond sediment. Additionally, RES has been monitoring and removing beavers as necessary. If during construction portions of the old pond bed are still too wet to work in, the area will be dewatered, the wet soil excavated, mixed with spoil obtained from the dam and berm removals, and placed back within the pond bed at proposed grades.

5. The site has been logged since our site visit. There appear to be a couple of drainages coming into the easement area (as seen on Google Earth) on the north side of the easement that may warrant the sediment pack application, DWR recommends looking at these areas and consider the appropriate action.
   Two ESPs have been added to sheet S7 to address concentrated flow from the drainages observed on aerial imagery.

Section 6

6. **Section 6.4** - Vegetation and Planting Plan- DWR recommends the inclusion of a couple more or substituting in some trees better adapted to wetlands or areas of potential ponding.
    a. water tupelo- Nyssa aquatic
    b. Swamp cottonwood- Populus heterophylla
    c. Green ash

    The planting list has been updated accordingly; however, Swamp cottonwood does not appear to be commercially available. Many bottomland hardwoods are included though. Also, as per recent discussions with DMS and IRT, green ash has been omitted from this planting list.

7. In addition, during the site visit the IRT noted it may be difficult to establish trees in a Juncus marsh, therefore, what measures will you take to control the Juncus before planting? Moreover, in the last paragraph of this Section, it states that the latest planting may be before May 31st to ensure the 180 days needed for the first year of monitoring. DWR does not want to see any planting past April 30th.
    RES treated the old pond bed in July of 2019 via aerial herbicide application and will do so again prior to construction if necessary. Related verbiage has been included in the Final Mitigation Plan. Also, the Final Mitigation Plan has been updated to state that planting will be completed no later than April 30.

Section 7

8. **Section 7.2.1** - Wetland Hydrology Criteria- DWR accepts the proposed 12% criteria, however, please realize any modification of the hydroperiod (in the first two years) will have to come with IRT approval.
    RES understands that any hydroperiods less than 12% within the first two years of monitoring will need IRT approval.

Figures

9. **Figure 11 – Monitoring Plan Map** - DWR recommends adding 3 wetland monitoring gauges, two to the rehabilitation area and one to the proposed re-establishment area (will note preferred location during Design Sheet discussion).
    Wetland monitoring gauges have been added to the preferred locations

Design Sheets

10. **Design Sheet E1** - RES has a typical for a woody riffle (which is good!), however, it does not appear in the legend, nor does it appear on any of the design sheets. DWR strongly recommends that most of riffles be woody riffles.
    Woody Riffle detail has been renamed Typical Woody Riffle. Callouts have been added to the Notes/Legend sheet to reflect its use in all riffle sections unless otherwise noted

11. **Design Sheet S2** - The legend for this sheet did not print out correctly, also, DWR does like the engineered sediment packs at the designated outlets. Please add wetland monitoring gauge stream left on reach RL1-A approximately station 8+50.
    Wetland monitoring gauge has been added to the preferred location (depicted on **Figure 11**)

12. **Design Sheet S4** - Please add a wetland monitoring adjacent to reach RL1-A at approximately station19+00. Also, please add a gauge on stream right at station 21+75.
    Wetland monitoring gauges have been added to the preferred locations (depicted on **Figure 11**)

13. **Design Sheet S6** - Wetlands should be shown on the sheet. Also, during the site visit we spoke about stabilizing an emergency outlet to the pond (that feeds reach RL-2). As I recall, the outlet was degraded and would pose a threat to the site. Please respond whether RES plans to stabilize this outlet, no work is shown on the sheet.
    Notes have been added to Sheet S6 indicating contractor to regrade and stabilize the outfall area.

14. **Design Sheet S7** - Wetlands should be shown on the sheet.
    Wetland areas have been shown on Sheets S6 and S7

15. **Design Sheet 1** - What are the structures that will be used for bank stabilization and protection of the structure at the top of the project?
    A plunge pool and boulder toe are proposed just downstream of the culvert. Additional stabilization measures will include installing turf reinforcement matting along the left upper bank and floodplain bench. See revised Sheet S1.

USACE Comments, Kimberly Browning

General

1. For crediting purposes, where there is a confluence, only one stream should be measured where the two channels join, rather than measuring both channels. The design sheets are small so it's difficult to tell if this was done here.
   This has already been accounted for within the stream component tables. Sheet S7 shows the termination of stream RL2 at STA 8+91, the intersection of the centerlines of RL2 and RL1. However, the callout on the same sheet shows restoration for RL2 ending at STA 8+76, the intersection of the centerline of RL2 with the TOB of RL1.

2. Wetland rehabilitation/reestablishment - It would be beneficial to add some coarse woody debris to the depressional areas and throughout the wetland for habitat, and to help store sediment, increase water storage/infiltration, and absorb water energy during overbank events.
   A note has been added to Sheet W1 to install large woody debris throughout the wetland re-establishment areas. The size and number of woody debris piles will be dependent on the amount/type of woody debris available onsite.

3. The perched DOT culverts pose an obstruction to aquatic passage. I'm glad you started credit downstream for anticipated culvert repair.
   Thank you. RES appreciates your feedback.

4. At the February 2018 IRT visit, it was mentioned that the entire footprint of the dam would be removed to include tributary RL3. What happened to this trib?
   RL3 is not a jurisdictional stream; therefore, it was removed from the project.

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5. Was there a repair on the emergency outlet of the pond feeding RL2? This need was discussed at the IRT site visit, but it's unclear if this concern was addressed.
   See DWR comment #13 above.

6. I'm pleased to see the engineered sediment packs considering the runoff coming off the adjacent pastures. Near STA 5+00 there was a large cattle wallow. Will this area be stabilized? Is there a potential for this area to degrade again with future cattle access and potentially impact the project in the future?
   This area is located outside of the easement and is a jurisdictional wetland. There are currently no plans to fill or stabilize this area since RES has no control. However, an ESP is proposed just inside the easement downstream of the depression that should address any potential runoff/sediment issues.

7. RL1-A - it appears that restoration will flow through wetlands WE and WD. Please discuss how function will be maintained and there will be no loss of wetlands.
   A paragraph has been added to **Section 6.2.1** to discuss the positive impact of stream restoration on these wetlands. Also, **Section 6.5** has been revised to summarize the impacts discussion.

Section 6

8. **Section 6.2.1** - Please discuss what will be done with sediment in pond bottom and the existing Juncus.
   See DWR comment #4 above for discussion of sediment. As for Juncus, RES treated the old pond bed in July of 2019 via aerial herbicide application and will do so again prior to construction if necessary. Related verbiage has been included in the Final Mitigation Plan.

9. **Page 28 -** The last date for planting should be April 30, not May 31.
   Section has been updated to state that planting will be completed no later than April 30.

Section 7

10. **Section 7.1.2** - Entrenchment ratio should be no less than 2.2 for C/E type streams, not 1.4 as indicated in this section. Please update Table 15 as well.
    All instances of "1.4" have been revised to "2.2"

11. **Section 7.3 -** Volunteers are only counted if on the approved planting list, after being established for 2 years. Sweetgum and red maple are not on the approved planting list and are not approved to be counted towards vegetative success. Please remove all references to this.
    References to sweetgum and red maple have been removed and will not be counted toward success.

12. **Section 7.3 -** Please add "260" to five-year old trees.
    260 has been included

Figures

13. Please depict fixed photo points/digital image stations on Figure 11.
    Section 8.2 has been revised to clarify the locations of digital image stations. Specifically, the revised statement reads, "Digital images will be taken at fixed representative locations to record each monitoring event, as well as any noted problem areas or areas of concern. Fixed image locations will exist at each cross section, each vegetation plot, each stage recorder, and each groundwater well." RES believes that these images, along with images of any problem areas, will provide sufficient visual evidence of the Project's progression. Additionally, **Figure 11** has been revised to include a note stating the locations of fixed image locations. It is RES' opinion that adding many more points at each of these locations to the figure will distract in an already complex visual.

M E M O R A N D U M

302 Jefferson Street, Suite 110 Raleigh, North Carolina 27605 919.209.1062 tel.
919.829.9913 fax

TO: North Carolina Division of Mitigation Services

FROM: Brad Breslow - RES

DATE: July 3, 2019

RE: Response to Matthew Draft Mitigation Plan Comments DMS Project ID No. 100043, Contract #7419

GENERAL

a) Table 5 (Regulatory Consideration) and Page 12, 3.6.1 and Appendix I. A July 2018 email from Samantha Dailey indicates that a signed PJD is forthcoming in 45 days. Please include the JD. Wetland re-establishment is not the correct mitigation descriptor for existing wetland that are proposed for functional improvement within the current footprint, wetland rehabilitation is the correct descriptor (jurisdictional pond area).
RES has still not received the PJD from USACE; however, according to an email dated March 21, 2019 between Todd Tugwell and Tim Baumgartner, email confirmations of a JD from a USACE project manager are deemed sufficient for the submittal of a Draft Mitigation Plan to the IRT. Therefore, page 12 has been updated to reference this email, and the email has been included in Appendix I. Additionally, all instances of Re-establishment (Pond Conversion) has been changed to Rehabilitation (Pond Conversion).

b) Asset table and stream length calculation. There are some differences between the asset tables stream length submitted for the report and the geometry calculated for the shapefiles in the MP center lines. Can RES provide an updated shape, revise the table or explain?
RES has provided an updated polyline shapefile with the correct geometries.

c) Table 1 and Table 14. Please show stream measurements out to the foot, wetland measurement out 3 significant digits, and show all assets out 3 significant digits. This is for consistency between assets and DMS accounting/debit ledgers for the IRT (Example stream credit should be 3,253.400 and wetlands would be 7.156).
Table 1, Table 14, and all other instances have been updated accordingly: New SMU amount is 3,253.400 and WMU is 7.154.

WATERSHED APPROACH

a) Page 4. The 2010 Neuse RBRP was amended in 2018. Please insert this reference to the update. 'Basinwide Goals' listed here are actually goals for all watershed basins. Update to reflect. The 'CU specific' goal does match, but bullet #1 should say DMS, not EEP. Refer to DMS Watershed Planning website for more information.

This section has been updated to be consistent with the 2018 Amendment and some statements have been reworded to clarify difference between "Basinwide Goals" and "CU-Specific" goals.

b) Page 5, last paragraph. Remove reference to landowner responsibility for fence maintenance. The grantor and grantee rights and reservations will be described in the conservation easement, not the Mitigation Plan.
Sentence has been removed.

BASELINE AND EXISTING CONDITIONS

a) Page 8, 3.4.1 states that a No-Rise certification or CLOMR/LOMR will be secured by RES with Johnston County. Please include the No-Rise certificate if it is produced, and the local floodplain development permit if the coordination with Johnston County is completed.
RES has not yet acquired a No-Rise certification; however, all FEMA permitting will be completed before construction activities begin.

b) Page 10, 3.5.1 stated that RL1-A and RL2 were determined to be perennial streams based on USGS and NRCS soils maps and other information. However, USGS map included in the draft mitigation plan only shows the pond and NRCS soils map was not included. Please verify and make any necessary change.
The USGS map does show the pond; however, it also depicts a stream line both above and below the pond (RL1 stream) and another stream line above the other pond just outside the Project (RL2 stream). Also, a new figure has been included in Appendix G that displays both the USGS and NRCS Soils Map, both of which show stream lines for RL1 and RL2. This figure is now referenced in Section 3.5.1. Ultimately, this map evidence, along with aerial imagery and large size of drainage areas, is evidence of perennial streams.

c) Page 11, Channel stability. It appears that the method RES employed to discern stream stability (bridge type assessment) was only applicable to a small downstream portion of the project and that they had additional limitations that had to be manipulated. Please provide a concise statement about what this information tells the reader and why it justifies proposed work.
This tool is one of many channel stability assessment methods, and it is our professional opinion that this method provides a good qualitative assessment for channel stability. The method provides an overview of stability and identifies whether potential issues stem from landscape, near channel or in-stream characteristics/issues.

d) Page 13, Wetland A and B areas don't match table submitted for JD. Is the difference between these two the impacted area (stream footprint) or can you explain?
The difference in these areas is due to surveyed property lines and adjustments in easement shape. The PJD "Study Area" was based on Johnston County GIS parcel boundaries, whereas the current proposed easement is based on surveyed property lines and design considerations. Ultimately, upon final approval of the Matthew Mitigation Plan, an updated aquatic resources table will be submitted with the PCN package.

MITIGATION PROJECT GOALS AND OBJECTIVES

a) Page 20. Section 4.2 – Term restoration is used in this paragraph for wetlands identified on as being currently jurisdictional.
The term "restored" has been updated to "rehabilitated."

b) Page 20. See comment above about the "general RBRP goals" rather than 2010 Neuse goal. The listed project goals and project objectives on Page 20 are similar, but do not match the ones listed on Table 9. The point of using the new Mitigation Plan template and functional pyramid are to have goals and objectives align. In Project Goals, section 5, Second goal is unclear, water transport from watershed to channel does not occur in channels. This also seems to conflict with Table 9.0, level 1. Is the unmeasurable objective listed in level 4 related to T, DO, and nutrients? Can you revise/consolidate to make these consistent, and clear?
RBRP goals addressed per above comment.

Goals and objectives on page 20 and Table 9 have been reworked to better align; however, RES would like to highlight that Table 9 is meant to provide a shorthand list of Project goals and objectives that demonstrate obvious connections to functions within the Stream Functions Pyramid and measurement methods.

Also, RES agrees that second goal was unclear, and therefore, deleted.

Additionally, the unmeasurable objective listed in level 4 does relate to T, DO, and nutrients and has been revised to be clearer.

c) Table 10 does not appear to exist in the document, although it is referenced on page 20. Should this refer to Table 9 instead?
Yes, it should refer to Table 9, and this reference on page 20 has been updated.

MITIGATION WORK PLAN

a) Page 22. 6.1.1 stated that UT to Hannah was selected as the reference stream for the project. It seems that UT to Hannah is a small stream and with a drainage area about half of the drainage area of the proposed restored reach. Please include a USGS map for UT to Hannah creek and explain it is proper reference for the proposed restored reaches.
The drainage area for UT to Hannah Creek is similar in size as the area for the upstream portion of Reach RL1-A (STA 0+47 to STA 16+47). However, the drainage area nearly doubles for the portion of Reach RL1-A located downstream of the confluence of RL2. Bankfull flow estimates calculated for the reference reach range between 29 to 31 cfs, and the calculated design discharge for the downstream section of RL1-A was 31 cfs. While there is a significant difference in drainage area, RES determined that the reference reach was still appropriate since the channel design is based on the ability to convey the design discharge which closely matches the bankfull flows of the reference reach.

b) Page 25. Table 11 has RL1-A (US) and RL1-A (DS). Please explain the difference between those two.
Reach RL1-A includes the entire restoration reach beginning at HWY 96 and extends downstream of the dam to STA 26+16. Reach RL1-A (US) is the portion of the reach that is located above the confluence with RL2; RL1-A (DS) is the section between reaches RL2 and RL1-B. Due to an increase in drainage area at the confluence with Reach RL2, RL1-A was separated into two design segments to account for the change in design parameters.

c) Page 26. Although the sediment supply description is qualitative, it appears to just be a speculative discussion. It might be beneficial to estimate T through RUSLE/RUSLE2 on the agricultural land or discuss how crops/rotation/land use may or may not contribute to sediment supply or remove discussion.

Discussion removed per comment.

d) Page 29. the Project target community chosen is Bottomland Hardwood, but the reference site does not have many of the target species. Additionally, the target community contains many additional species that may be categorized as Bottomland Hardwood and transitional into Cypress-Gum Swamp. Review selected vegetation type as it applies to target community and existing soils and remove reference if non-applicable.
The mention of the reference reach, in regard to vegetative community, has been removed from Section 64.1. Instead, a combination of species identified in the preservation area of the Project along with species described in the 2012 Guide to the Natural Communities of North Carolina, Fourth Approximation (Schafale, 2012) for coastal plain wetland-type communities were used to determine the most appropriate species for the restoration project. Hence, the target community for the Project has been updated to Brownwater Bottomland Hardwoods (Swamp Transition Subtype) to better align with site conditions and proposed species list. Additionally, green ash (Fraxinus pennsylvanica) was added to the Proposed Plan List (Table 13), and a sentence was added to Section 6.4.1 to include sweetgum and red maple as potential high-dispersal species that may, conditionally, be counted toward vegetation success.

PERFORMANCE STANDARDS

a) Page 34, Section 7.1.2 Cross sections – Bankfull events don't document channel stability, they document floodplain access.
This sentence has been removed.

b) Page 35, Section 7.3. – Volunteer species included in the planting plan may be counted towards success, may wish to include these if needed.
Section 7.3 has been revised to address the potential to count volunteers toward success (e.g. sweetgum and red maple). Please note that Section 6.4.1 was also revised to include and discuss these high-dispersal species.

MONITORING PLAN

a) Page 36, Section 8.3 – Please be clear on what type of monitoring is proposed and what equipment will be used; i.e. Crest gauges are not continuous gauge recorders.
RES has adopted the term "Continuous Stage Recorder" to describe our equipment used to document bankfull events. These continuous stage recorders are devices that utilize automatic-logging pressure transducers that can document the height, frequency, and duration of bankfull events. The Mitigation Plan has been revised to be clearer.

b) Page 38, Table 15. Same comment as #11, project objectives versus functional objectives. Update project objectives to match this table or modify this table to match listed project objectives.
Table 15 has been revised to better align with Table 9 per these comments.

FIGURES

a) Figure 8. Wetland areas listed don't match PJD submission. Please explain discrepancy.
The difference in these areas is due to surveyed property lines and adjustments in easement shape. The PJD "Study Area" was based on Johnston County GIS parcel boundaries, whereas the current proposed easement is based on surveyed property lines and design considerations. Ultimately, upon final approval of the Matthew Mitigation Plan, an updated aquatic resources table will be submitted with the PCN package.

APPENDICES

Appendix A

a) Plan Sheets. Brush toe protection has been proposed on almost every bend. Given the size of proposed channels, it seems to be overly protective. Please justify.
RES uses brush toe protection not only for bank protection, but also to introduce wood into the proposed channel to improve habitat. However, we have removed a few locations of the brush toes that were placed along areas where stresses would be lower (subtle bends/bends with high radius of curvature).

b) Plan Sheets. Please include Department and Division names on the title sheet, and list DMS project manager and RS design engineer's names on it as well.
Title sheet revised per comment.

c) Plan Sheets. On Sheet 1A, a table listed the preservation piece as RL1-A. However, it was referred as RL1-B. Please change it.
Sheet A1 was revised per comment.

Appendix C

a) Need finalized conservation easement (appendix C) to acquire permits. Update this section before final version of Mitigation Plan is printed (401/404 permit applications can't be submitted until the easement is finalized and task 2 of the project is completed).
A finalized conservation easement will be added to Appendix C when obtained.

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1 PROJECT INTRODUCTION

1.1 Project Components

The Matthew Site ("Project") is located within a rural watershed in Johnston County, North Carolina approximately two miles south of Four Oaks. The Project lies within the Neuse River Basin, North Carolina United States Geological Survey (USGS) 8-digit Cataloguing Unit 03020201 and 14-digit hydrologic unit code (HUC) 03020201150020, a Targeted Local Watershed (TLW) and the Division of Water Resources (NCDWR) sub-basin 03-04-04 (**Figure 1**). The Project proposes to restore 3,230 linear feet (LF) and preserve 234 LF of streams as well as restore 12.102 acres and preserve 2.063 acres of wetland that will provide water quality benefit for 1,460 acres of drainage area. The Project is in the Rolling Coastal Plain Level IV ecoregion.

The Project area is comprised of a 19.19-acre easement involving two unnamed tributaries within the footprint of a breached pond, totaling 3,058 existing LF, that drain directly to Juniper Swamp, which eventually drains to Hannah Creek. The Project area also includes riparian wetlands that have been impounded and filled. The stream and wetland mitigation components are summarized in **Table 1**. The Project is accessible from state route NC-96. Coordinates for the Project areas are approximately 35.42503, -78.40849 at the NC Department of Transportation (DOT) culvert entering the Project.

1.2 Project Outcomes

The streams and wetlands proposed for restoration have been significantly impacted by a large impoundment constructed over a hundred years ago. Proposed improvements to the Project will help meet the river basin needs expressed in the 2010 Neuse River Basin Restoration Priorities (RBRP).

Through stream and wetland restoration and preservation, the Project presents 3,572 LF of proposed stream, generating 3,253.400 Warm Stream Mitigation Units (SMU) and 14.165 acres of proposed wetland, generating 7.207 Wetland Mitigation Units (WMU) (**Table 1**). This mitigation plan is consistent with the February 22, 2018 Post Contract IRT Meeting Minutes and IRT response emails (**Appendix B**).

Table 1. Matthew Project Components Summary

Stream Mitigation			
Mitigation Approach	**Linear Feet**	**Ratio**	**Warm SMU**
Restoration	3,230	1:1	3,230.000
Preservation	234	10:1	23.400
Preservation (No Credit)	108	N/A	0.000
Total	**3,572**		**3,253.400**
Wetland Mitigation			
Mitigation Approach	**Area (acres)**	**Ratio**	**WMU**
Rehabilitation (Pond Conversion)	10.202	2:1	5.101
Re-establishment (Fill Removal)	1.900	1:1	1.900
Preservation	2.063	10:1	0.206
Total	**14.165**		**7.207**

2 WATERSHED APPROACH

The Project was selected based on its potential to support the objectives and goals of the DMS 2010 Neuse RBRP (amended August 2018). The Neuse RBRP identified several restoration needs for the entire Neuse River Basin, as well as for HUC 03020201, specifically. The Project watershed was identified as a TLW (HUC 03020201150020, Hannah Creek), a watershed that exhibits both the need and opportunity for stream, wetland, and riparian buffer restoration. Approximately 54% of this TLW is agricultural land, 38% is forested, and 7% is developed. Basinwide goals for all Catalog Units (CUs) outlined in the 2010 Neuse RBRP (amended August 2018) and CU Specific Goals for the Neuse 01 include:

Basinwide Goals for all CUs

1. *Promote nutrient reduction in municipal areas through the implementation of stormwater best management practices;*

2. *Promote nutrient and sediment reduction in agricultural areas by restoring and preserving wetlands, streams, and riparian buffers; and*

3. *Continue targeted implementation of projects under the Nutrient Offset and Buffer programs, as well as focusing DOT sponsored restoration in areas where they will provide the most functional improvement to the ecosystem.*

CU 03020201 Specific Goals

1. *Support the Falls Lake Watershed Management Plan; a separate prioritization process for DMS will be developed in next 1-2 years;*

2. *Continue to implement planning initiatives including the NCDMS Phase IV LWP for the Upper Neuse (incorporates updates for DMS LWPs including Ellerbe Creek, Lake Rogers/Ledge Creek, Lick Creek, Little Lick Creek, and Upper Swift Creek), the Upper Neuse River Basin Association's Upper Neuse Watershed Management Plan, and the DMS Neuse 01 Regional Watershed Plan; and*

3. *Protect, augment and connect Natural Heritage Areas and other conservation lands.*

Agriculture and urban development are significant contributing factors to water quality impairment and habitat degradation in this watershed, and the Project will help address these identified stressors as described in Section 2.1.

2.1 Site Selection

Currently, the majority of the Project area is within the footprint of a recently breached pond. Downstream of the impoundment, the stream is highly unstable and incised before stabilizing and exhibiting higher function exiting the Project. Additionally, historical wetlands were impounded within the pond while much of the wetlands below the impoundment were filled. The Project will directly and indirectly address stressors identified in the RBRP by reconstructing natural channels within the pond footprint, stabilizing eroding stream banks and establishing floodplain connectivity, reducing sediment and nutrient loads, and restoring forested wetlands and buffers. Project-specific goals and objectives will be addressed further in **Section 5**. Watershed planning priority boundaries are shown on **Figure 1**, and the Project's drainage areas are shown on **Figure 2**.

The Project will address one of the goals outlined in the 2010 Neuse RBRP. The Project includes restoration and preservation of streams, wetlands, and their associated buffers that will promote nutrient and sediment reduction in agricultural areas (RBRP Basinwide Goal 2).

The land required for the construction, management, and stewardship of this Project includes portions of one parcel in Johnston County with the following ownership in **Table 2 & Figure 3**. Additionally, the Project will include a Temporary Construction Easement on property owned by Brenda Lee, Johnston County Tax Parcel ID# 167100-60-2057. This adjacent parcel is shown on **Figure 3**. Once finalized, a copy of the land protection instrument will be included in **Appendix C**. The Division of Mitigation Services (DMS) Conservation Easement model template will be utilized to draft the site protection instruments.

Table 2. Project Parcel and Landowner Information

Owner of Record	PIN Or Tax Parcel ID#	Stream Reach
Ronnie L. Lawhorn and Sara A. Lawhorn	167000-69-8017 (Johnston County)	All

3 BASELINE AND EXISTING CONDITIONS

3.1 Watershed Summary Information

3.1.1. Drainage Area and Land Cover

The Project area is comprised of two unnamed tributaries that flow northwest to southeast and drain into Juniper Swamp. The total drainage area for the Project is 1,460 acres (2.28 mi^2); the drainage area of Reach RL1 is 1,460 acres (2.28 mi^2) and Reach RL2 is 490 acres (0.77 mi^2). **Table 3** presents a watershed summary. Primary land use within the Project drainage area consists of approximately 38.2% agricultural land (pasture and row crops), 33.3% urban/residential, 26.4% forest, and 2.1% water (**Figure 4**).

Table 3. Project Watershed Summary Information

Level IV Ecoregion	65m – Rolling Coastal Plain
River Basin	Neuse
USGS Hydrologic Unit 8-digit	03020201
USGS Hydrologic Unit 14-digit	03020201150020
DWR Sub-basin	03-04-04
Project Drainage Area (acres)	1,460
Percent Impervious Surface	7%

3.1.2. Surface Water Classification

The Project's two tributaries drain directly to Juniper Swamp, which has been assigned class C and Nutrient Sensitive Waters (NSW) (NCDWQ 2011). Class C waters are protected for uses such as secondary recreation, fishing, wildlife, fish consumption, aquatic life including propagation, survival and maintenance of biological integrity, and agriculture. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner. NSW designation is intended for waters needing additional nutrient management due to being subject to excessive growth of microscopic or macroscopic vegetation (NCDWQ 2011).

3.2 Landscape Characteristics

3.2.1. Physiography and Topography

The Project is located in the Rolling Coastal Plain level IV ecoregion within the Southeastern Plains level III ecoregion. This region of rolling, irregular plains consists of moderately low gradient streams, although greater than the Middle Atlantic Coastal Plains to the east, consist of broad interstream areas of well-drained soil that is dominated by agricultural fields of corn, soybeans, tobacco, cotton, sweet potatoes, peanuts, and wheat interspersed with pasture, woodland, and forest (Griffith et al. 2002). The Project generally has a natural low relief with a concave-linear geomorphic position that slopes upward to the upland areas. The topography of the project area is generally rolling with elevations ranging from 122 feet to 158 feet.

3.2.2. Geology and Soils

According to geology data from the North Carolina Geologic Survey, published in 1985, the Project is within geologic map unit Km, occurring in the Coastal Plain Belt. This map unit is associated with sedimentary type rocks of the Middendorf formation that formed in the Cretaceous period within the Mesozoic Era between 63 and 138 million years ago. This formation is composed of sand, sandstone, and mudstone that are gray to pale gray with mottled orange casts; often with clay balls and iron-cemented concretions. Beds are laterally discontinuous and cross-bedding is common.

The NRCS depicts three mapping units across the Project site and include three soil series. The soil series found on the Project are described below and summarized in **Table 4**.

Project soils are mapped by the NRCS within the easement as Bibb sandy loam, Gilead sandy loam, and Uchee loamy coarse sand, and water (**Figure 5**). Bibb sandy loam makes up approximately 39 percent of the easement and is poorly drained and found on floodplains with minimal to no slopes. Gilead sandy loam makes up approximately 4.9 percent of the easement and is moderately well drained and found on ridges and marine terraces with two to eight percent slopes. Making up only 2.5 percent of the easement area is Uchee loamy coarse sand that is well drained and found on ridges and broad interstream divides on marine terraces with two to six percent slopes. The remaining 53.5 percent of the easement area, formerly the pond bottom, is mapped as water.

Table 4. Mapped Soil Series

Map Unit Symbol	Map Unit Name	Percent Hydric	Drainage Class	Hydrologic Soil Group	Landscape Setting
Bb	Bibb sandy loam, 0 to 2 percent slope, frequently flooded	90%	Poorly Drained	A/D	Floodplains
GeB	Gilead sandy loam, 2 to 8 percent slopes	0%	Moderately Well Drained	C	Ridges on marine terraces
UcB	Uchee loamy coarse sand, 2 to 6 percent slopes	0%	Well Drained	C	Ridges and broad interstream divides on marine terraces

A detailed hydric soil evaluation was also conducted to describe and delineate the extent of hydric soils that are potentially suitable for hydrologic restoration, rehabilitation, and re-establishment for wetland mitigation. Therefore, more detailed soils information is included in the report and included in **Appendix M**.

3.2.3. Existing Vegetation

Vegetation at the Project is representative of two general wetland communities; an early successional herbaceous community that is currently emerging within the recently exposed pond bed and a mature forested wetland below the site's existing dam.

The exposed pond bed is currently undergoing succession since Hurricane Matthew breached a segment of dam in October 2016. As the pond drained, a community of common rush (*Juncus effuses*) has become the prominent species within the pond footprint, with the invasive alligator weed (*Alternanthera philoxeroides*) intermixed, while dog fennel (*Eupatorium capillifolium*) prevails toward the upland fringes.

The forested wetland is on the floodplain of the main tributary below the existing dam. It has a mostly closed canopy consisting of red maple (*Acer rubrum*) and water oak (*Quercus nigra*). Along the channel and wetter areas, swamp tupelo (*Nyssa biflora*) and black willow (*Salix nigra*) are dominant. The shrub stratum consists of swamp titi (*Cyrilla racemiflora*), highbush blueberry (*Vaccinium corymbosum*), tag alder (*Alnus serrulata*), American holly (*Ilex opaca*), Chinese privet (*Ligustrum sinense*), and coastal doghobble (*Leucothoe axillaris*). The herbaceous stratum is sparse compared to the moderately dense canopy and shrub cover. Species include Nepalese browntop (*Microstegium vimineum*), wartremoving herb

(*Murdannia keisak*), and jewelweed (*Impatiens capensis*). Woody vines are locally common and include laurel greenbrier (*Smilax laurifolia*) and Japanese honeysuckle (*Lonicera japonica*).

3.3 Land Use – Historic, Current, and Future

Historical topographic mapping as depicted in the USGS Four Oaks Quadrangle of 1906 indicates that the majority of the Project has been impounded for at least 113 years (**Figure 6)**. In addition, historical imagery shows minimal change over this time, until the dam eventually breached due to flooding from Hurricane Matthew in October of 2016 (**Figure 6**). Also, the riparian corridor of the stream below the dam was heavily manipulated during construction of the pond by the dumping of fill material and is evident by the presence of large spoil piles throughout.

Currently, the pond is in a state of transition after Hurricane Matthew breached a section of the dam. The historic pond footprint is surrounded by the shoreline escarpment of the former pond. The Project area remains in an agricultural community with some neighboring forested property, though timber harvest is evident and active. Several watershed characteristics, such as groundwater, vegetation, surface drainage, and soil parameters have been modified from the long-term impoundment of Project tributaries.

The future land use for the Project area will include 19.19 acres of conservation easement that will be protected in perpetuity. The Project easement will have 3,572 linear feet of high functioning streams, a minimum 50-foot riparian buffer, 14.165 acres of riparian wetlands and will exclude livestock with fencing where appropriate. Outside the Project, the area will likely remain in agricultural use; however, the Project will connect two natural wildlife corridors that will present compounded benefits to the local watershed.

3.4 Regulatory Considerations

3.4.1. Federal Emergency Management Agency (FEMA)/ Hydrologic Trespass

According to the North Carolina Floodplain Mapping Information System, the majority of the Project is included within the mapped FEMA 100-year floodplain (Zone AE); however, no regulated floodway is mapped (FEMA 2018) (**Figure 7**). The design and permitting of the mitigation work will include coordination with the Johnston County Floodplain Administrator and a No-Rise Certification or CLOMR/LOMR will be secured. Hydraulic modeling will be required to determine that restoration activities will have no effect on 100-year flood elevations downstream. No hydrologic trespass will be permitted to adjacent properties upstream or downstream of the Project.

3.4.2. Environmental Screening and Documentation

To ensure that a project meets the "Categorical Exclusion" criteria, the Federal Highways Administration (FHWA) and NCDMS have developed a categorical exclusion (CE) checklist that is included as part of each mitigation project's Environmental Screening process. The CE Approval Form for the Matthew Project is included in **Appendix K** and was approved by DMS and FHWA in October 2018.

3.4.3. Threatened and Endangered Species

Plants and animals with a federal classification of endangered or threatened are protected under provisions of Sections 7 and 9 of the Endangered Species Act of 1973, as amended. The USFWS database (2017) lists three endangered or threatened species that may occur in proximity to the Project: Red-cockaded woodpecker (*Picoides borealis*), yellow lance (*Elliptio lanceolate*), and Michaux's sumac (*Rhus michauxii*). The USFWS was consulted during the CE process and the USFWS stated that the proposed action is not likely to adversely affect any federally-listed endangered or threatened species. Documentation of this correspondence is included in **Appendix K**.

The Fish and Wildlife Coordination Act requires consultation with state fish and wildlife agencies when "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted…or otherwise controlled or modified. The North Carolina Wildlife Resources Commission (NCWRC) was consulted during the CE process and the NCWRC stated that there are no records of any state or federally listed species at the site nor any in the immediate vicinity of the site. Documentation is included in **Appendix K.**

3.4.4. Cultural Resources

A review of North Carolina State Historic Preservation Office (SHPO) GIS Web Service (accessed 09 January 2018) database did not reveal any listed or potentially eligible historic or archeological resources on the proposed project properties. There are no documented historic sites within a half mile radius of the site. Additionally, no architectural structures or archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes. RES consulted with the SHPO during the CE and the SHPO had "conducted a review of the project and are aware of no historic resources which would be affected by the project." Cultural Resources screening met the Categorical Exclusion Criteria for FHWA and DMS projects and documentation is included in **Appendix K**.

Table 5. Regulatory Considerations

Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States - Section 404	Yes	No	Appendix K
Waters of the United States - Section 401	Yes	No	Appendix K
Endangered Species Act	Yes	Yes	Appendix K
National Historic Preservation Act	Yes	Yes	Appendix K
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	No	Appendix L
Magnuson Stevens Act - Essential Fisheries Habitat	No	N/A	N/A
DOT Right-of-way Permit	Yes	No	N/A

3.5 Reach Summary Information

The Project area is comprised of two unnamed tributaries that flow generally northwest to southeast and drain into Juniper Swamp. The Project is split into three reaches (RL1-A, RL1-B, and RL2) (**Figure 8**). Results of preliminary data collection are presented in **Table 6**. Note that most of reach RL1-A and all RL2 have historically been impounded and are currently in an unstable state of transition since Hurricane Matthew breached a section of dam in October 2016. Therefore, no meaningful channel characteristic data could be collected for these reaches; however, data was collected at the downstream segment of RL1-A, below the existing dam. Morphological parameters are located in **Appendix B.**

Table 6. Summary of Existing Channel Characteristics

Reach	Drainage Area (ac)	A_{BKF} [1] (ft^2)	Width (ft)	Mean Depth (ft)	Width:Depth Ratio	Bank Height Ratio	Entrenchment Ratio	Sinuosity	Slope (ft/ft)
RL1-A	1,426	12-13.2	9.4-8.2	1.3-1.6	7.4-5.4	1.1	1.0 - >2.2	1.17	0.0020
RL1-B	1,460	8.5	8.0	1.1	7.6	1.1	>2.2	1.32	0.0020
RL2	490	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1] A_{BKF}= cross-sectional area (measured at approximate bankfull stage as estimated using existing conditions data and NC Regional Curve equations where field indicators were not present)

3.5.1. Channel Classification

The Project streams have been classified as perennial streams; however, the NCDWR Stream Identification Form version 4.11 (Stream ID Form) was only completed for reach RL1-B. As for reaches RL1-A and RL2, for reasons stated above in **Section 3.5**, the Stream ID Form could not be utilized to discern proper stream determinations. Therefore, based on USGS and NRCS soils maps depictions, size of drainage area, and aerial imagery, it was determined that RL1-A and RL2 are perennial streams. **Table 7** summarizes these stream parameters and the Stream ID Form as well as a stream identification map, which includes USGS and NRCS Johnston County Soil Survey mapped streams, can be found in **Appendix G**. Stream determinations have been verified by the USACE and DWR (**Appendix I**).

Table 7. Summary of Stream Parameters

Reach	Hydrology Status	Stream Determination Score	Reach Length (LF)	Rosgen Stream Classification
RL1-A	Perennial	N/A	1,767	E5
RL1-B	Perennial	41.5	342	E4
RL2	Perennial	N/A	949	N/A

3.5.2. Existing Channel Morphology

Reach RL1-A

Above Existing Dam – Within Pond Footprint

Reach RL1-A, upstream of the existing dam, was formerly not present due to the 12-acre agriculture pond. Since then, a portion of the dam breached during Hurricane Matthew in October 2016, and the reach is now slightly evident within the pond footprint. The reach originates at a DOT culvert within the NC-96 right-of-way and flows southeastward through the breached dam. Due to the unconsolidated pond bottom, the stream reach is evolving, and there are no dominant channel characteristics. Also, due to the nature of the pond footprint, the riparian buffer is in poor condition and lacks trees and significant woody vegetation.

Below Existing Dam

This downstream segment of Reach RL1-A, starting below the existing dam, flows southeastward until it transitions to reach RL1-B. It is predominantly a sand channel with moderate to high sediment load. The channel is not in its original location as it relocated after the hurricane breached part of the dam. It is incised, both laterally and vertically unstable, and is actively degrading. Its floodplain has been highly manipulated by the addition of fill and spoil materials relict from the construction of the dam along with dam debris from the hurricane breach. The riparian vegetation consists of mature trees and some understory, including several invasive species. The USACE Stream Quality Assessment Worksheet score for this reach is 42 (**Appendix H**).

Reach RL1-B

Reach RL1-B begins where RL1-A ends and flows in a southeasterly direction before bending about 90 degrees to the southwest and flowing out of the Project to Juniper Swamp. The channel is much less incised and more stable than the upstream reach RL1-A. The bed substrate is mostly sand and fine gravel, and the reach has a moderate to high sediment load due to upstream conditions. However, the floodplain is accessible as is evidenced by accumulation of recent alluvial deposits throughout. The riparian vegetation is mostly in good condition barring the lack of woody vegetation along some of the banks and immediate floodplain where mostly herbaceous cover is dominant. The USACE Stream Quality Assessment Worksheet score for this reach is 64 (**Appendix H**).

Reach RL2

Identical to reach RL1-A above the dam, reach RL2 was formerly not present due to the 12-acre agriculture pond. Since the dam breached during Hurricane Matthew in October 2016, the reach is now slightly evident within the pond footprint. The reach originates at the outfall (24" CMP) of a small pond adjacent to the Project and flows southward until it confluences with RL1-A. Due to the unconsolidated pond bottom, the stream reach is evolving, and there are no dominant channel characteristics. Also, due to the nature of the pond footprint, the riparian buffer is in poor condition and lacks trees or woody vegetation.

3.5.3. Channel Stability Assessment

A modified version of the channel stability assessment method provided in "Assessing Stream Channel Stability at Bridges in Physiographic Regions" by Johnson (2006) was used to assess channel stability for the Project's existing channels. This method may be rapidly applied on a variety of stream types in different physiographic regions having a range of bed and bank materials.

The original channel assessment method was designed to evaluate 13 stability indicators in the field. These parameters are: watershed characteristics (frequency of watershed disturbances such as agricultural activities, urbanization, etc.), flow habit, channel pattern, entrenchment/channel confinement, bed material, bar development, presence of obstructions/debris jams, bank soil texture and coherence, average bank angle, bank vegetation/protection, bank cutting, mass wasting/bank failure, and upstream distance to bridge. See **Appendix B** for a detailed description of the stability indicators. As this method was initially developed to assess stability at bridges, a few minor adjustments were made to remove indicators that contradict stability characteristics of natural channels in favor of providing hydraulic efficiency at bridges. First, the "channel pattern" indicator was altered such that naturally meandering channels scored low as opposed to straightened/engineered channels that are favorable for stability near bridges. Secondly, the last indicator, "upstream distance to bridge", was removed from the assessment as bridges are not a focus of channel stability for this project. The 12 indicators were then scored in the field, and a rating of excellent, good, fair, or poor was assigned to each project reach based on the total score.

The channel assessment results (scores and ratings) for the Project are provided in **Table 8.** As for reaches RL1-A (above dam) and RL2, for reasons stated above in **Section 3.5**, the CSA method could not be utilized to discern proper assessments. Reach RL1-A (below dam) received a "Fair" rating and reach RL1-B received a "Good" rating. Both reaches have been manipulated by a poor watershed and the long-term pond impoundment upstream along with the associated, recent dam breach. Reach RL1-A was observed to have relatively high bank angles and was found to be actively eroding and entrenched. As for reach RL1-B, bank angles were low, erosion was minor, and it was not entrenched.

Table 8. Channel Stability Assessment Results

		RL1-A (Below Dam)	RL1-B
1	**Watershed characteristics**	10	10
2	**Flow habit**	8	7
3	**Channel pattern**	11	4
4	**Entrenchment/channel confinement**	9	2
5	**Bed material**	10	7
6	**Bar development**	10	5
7	**Obstructions/debris jams**	11	3
8	**Bank soil texture and coherence**	8	7
9	**Average bank angle**	10	4
10	**Bank vegetation/protection**	5	8
11	**Bank cutting**	7	2
12	**Mass wasting/bank failure**	9	2
13	**Upstream distance to bridge**	NA	NA
	Score	**108**	**61**
	Rating*	**Fair**	**Good**

***** Excellent (0 < Score <= 36), Good (36 < Score <= 72), Fair (72 < Score <= 108), Poor (108 < Score <= 144)

3.6 Wetland Summary Information

3.6.1. Jurisdictional Wetland Information

A survey of existing wetlands was performed on September 20, 2017 and April 26, 2018, and GPS locations were recorded on May 17, 2018. Wetland boundaries were delineated using current methodology outlined in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987). Soils were characterized and classified using the Field Indicators of Hydric Soils in the United States, Version 7.0 (USDA-NRCS 2010).

A preliminary jurisdictional determination (PJD) request was sent to the USACE on June 21, 2018 and revised materials were submitted on November 30, 2018. The confirmed PJD package has not yet been completed by USACE; however, an email verification of jurisdictional waters at the Project was received from the USACE on February 13, 2018. In another email from USACE dated March 21, 2019, they declared that an email from a USACE project manager that concurs with a PJD map will be sufficient for the purpose of submitting a Draft Mitigation Plan to the IRT. All of these documents and correspondence can be found in **Appendix I**.

Within the boundaries of the proposed Project, five jurisdictional wetlands are present (**Figure 8**). The five Jurisdictional Wetlands are labeled as WA (Wetland A), WB (Wetland B), WC (Wetland C), WD (Wetland D), WE (Wetland E). There are approximately 12.216 acres of wetlands within the proposed easement area: WA is approximately 10.199 acres in size; WB is approximately 0.429 acres in size; WC is approximately 0.102 acres in size; WD is approximately 0.808 acres in size; WE is approximately 0.758 acres in size. Existing conditions of each wetland are described below:

Wetland A

Formerly an impoundment, this 10.199-acre wetland is undergoing early succession, and, in its most current state is dominated by common rush. Also, interspersed throughout the area are open water pockets, specifically located below the road culvert to the north and just above the dam to the south.

Wetland B
Wetland B is 0.429 acres and lies to the northeast of the downstream portion of the former impoundment. It is a mixture of forested wetland and emergent herbaceous wetland. Typical vegetation in the forested area consists of red maple and swamp tupelo, while the herbaceous area is dominated by common rush.

Wetland C
Wetland C is a small, 0.102-acre wetland located downstream of the former impoundment, off the left bank of reach RL1-B. It is a forested wetland that contains red maple, Atlantic white cedar (*Chamaecyparis thyoides*), tag alder, highbush blueberry, sweetbay (*Magnolia virginiana*), jewelweed, Japanese honeysuckle, and roundleaf greenbriar (*Smilax rotundifolia*). It has been disconnected from the rest of the riparian wetlands by historic fill material and spoil piles.

Wetland D
Wetland D is 0.808 acres and comprises much of the riparian area downstream of the former impoundment, off the left bank of reach RL1-B. It is a forested wetland dominated by black willow, red maple, tulip poplar (*Liriodendron tulipifera*), swamp titi, Chinese privet, American holly, wartremoving herb, evening trumpetflower (*Gelsemium sempervirens*), Japanese honeysuckle, and laurel greenbrier. The extent of this wetland has been diminished by historic fill material and spoil piles remnant of the construction of the impoundment.

Wetland E
Wetland E is 0.758 acres and comprises much of the riparian area downstream of the former impoundment, off the right bank of reach RL1-B. This wetland is part of the same system as WD, separated only by the stream channel (RL1-B), and it also has been manipulated and reduced in size due to fill and spoil areas.

3.6.2. Hydric Soil Indicators

Within the pond bed, indicators are usually at the surface. The typical soil surface consists of very dark gray or brown to black sandy loam surface usually with brown or dark brown mottles from 12 inches to greater than 30 inches. This dark surface is underlain by a gray to dark grey horizon with mottles. The mottles are concentrations of iron, manganese, and organic matter. Some areas with silty soils are also present in the floodplain. The hydric soil indicators found include the A11-Thick Dark Surface, A12-Thick Dark Surface, F1-Loamy Mucky Mineral, F3-Depleted Matrix, F6-Redox Dark Surface, F8-Redox Depressions, and F7-Depleted Dark Surface. These indicators show a thicker dark surface than typical of the Bibb series and are more like a Johnston inclusion.

3.6.3. Existing Hydrology

Hydrology at the Matthew Site is the result of a high water table of the lower landscape position and from numerous seepages along the base of the upland slopes. Overbank events add to surface hydrology of surrounding floodplain. Farther from the streams at the upland-wetland interface, subsurface lateral flow through the soils maintains wetland hydrology. At the dam, the subsoil flow path parallel to the stream is restricted or blocked by the structure and fill material. The dam also creates a constriction of flow, inhibiting normal flow volumes parallel to the stream. On the south side of the floodplain below the dam, a ditch from the old pond outlet intercepts the slope seepage. The channel constriction and loss of seepage has resulted in an area of drained hydric soils below the dam (**Appendix M**).

Based upon the site evaluation, it was assumed that hydric soil is present beneath the current dam structure and the narrow berm to the northeast of the pond bed. Because of the presence of hydric soil upstream and downstream of the dam structure, it can be predicted that hydric soil was present beneath the dam structure prior to pond construction and flooding of the pond. This hydric soil material likely still exists beneath much of the fill. The hydric soils currently lacking hydrology downstream of the fill materials exhibit hydric

indicators, but currently lack hydrology due to a ditch along the edge of the floodplain and the obstruction of natural flow patterns of the floodplain (**Appendix M**).

3.6.4. National Wetland Inventory

The USFWS National Wetland Inventory Map (NWI) depicts one wetland area and one open water area within the Project (**Figure 9**). The riparian floodplain area in the downstream portion of the Project, below the dam, is classified as Palustrine Broad-Leaved Deciduous Forest, Temporarily Flooded wetland (PFO1A). The pond footprint within the Project is classified as Palustrine Unconsolidated Bottom, Permanently Flooded, Diked/Impounded open water (PUBHh). Additionally, NWI depicts palustrine forest wetlands in the floodplain of the Project's main stem both upstream and downstream of the Project limits.

3.7 Potential Constraints

There are no major constraints at the Project, but significant considerations during construction include DOT right-of-way access at the upstream end of the project to allow for channel improvements at the culvert outfall associated with the crossing at NC HWY 96. The dam breach event during Hurricane Matthew also exposed a waterline just downstream of the NC HWY 96 crossing that will be addressed by the local water utility in coordination with the mitigation project. During construction, unconsolidated sediments may constrain access to the interior channels. As discussed in **Section 3.4.1**, a FEMA No-Rise Certification or CLOMR/LOMR will be secured prior to construction. The proposed mitigation site is also not located within five miles of any air transport facility.

3.8 Site Photographs

Pond Footprint – Looking Upstream (7/30/2018)

Pond Footprint – Looking Upstream (7/30/2018)

Pond Footprint – Looking Downstream (7/30/2018)

Pond Footprint – Looking Upstream (9/25/2018)

Culverts – Top of Project at NC-96 (9/25/2018)

Top of Project – Looking Downstream (9/25/2018)

RL1-A, WC, WD, Debris – Looking Downstream (9/25/2018)

Initial Dam Breach near WC, Spoil, Debris – Looking Upstream (9/25/2018)

RL1-A, Spoil, Debris – Looking Downstream (9/25/2018)

RL1-A – Looking Downstream (9/25/2018)

RL1-B, WD, WE – Looking Downstream (10/9/2018)

RL1-B, WD, WE – Looking Upstream (10/9/2018)

4 FUNCTIONAL UPLIFT POTENTIAL

4.1 Stream Functional Uplift

The Stream Functions Pyramid Framework (Harman et al. 2012) uses stream functions to describe project objectives, existing condition assessments and monitoring, performance metrics, and design criteria. The Framework separates stream functions into five categories, ordered into a hierarchy, which communicate the interrelations among functions and illustrate the dependence of higher-level functions (biology, physicochemical and geomorphology) on lower level functions (hydrology and hydraulics). Functions that affect the greatest number of other functions are illustrated at the base of the Pyramid, while functions that have the least effect on other functions are illustrated at the top.

Fischenich (2006) found that the most critical functions include those that address hydrodynamic processes, sediment transport processes, stream stability and riparian buffer restoration. By addressing these fundamental functions and processes, a restored stream and riparian system can support more dependent functions that typically require time to establish, such as diverse biological communities, chemical and nutrient processes, diverse habitats and improved water and soil quality. The objectives of this Project will address the most critical functional objectives that will allow for a more restored stream and riparian area over time.

A functional based approach broadens the reach-scale goals of a restoration project by contextualizing the functional uplift to the watershed scale. By applying an ecosystem restoration approach, the proposed Project will provide localized ecological and water quality benefits that could in combination with other restoration projects within the watershed have beneficial impacts on the Neuse River Basin. The restoration approach at the reach scale of this Project will benefit the hydraulic and geomorphology functions of the system but could also benefit the upper-level functions (physicochemical and biology) over time and in combination with other restoration projects within the watershed. Anticipated functional benefits and improvements within the Project area, as based on the Function-Based Framework, are outlined in **Table 9.**

4.1.1. Anticipated Functional Benefits and Improvements

Hydrology

According to the Stream Functions Pyramid Framework, hydrology is defined as the transport of water from the watershed to the channel. The Project will locally address the significant hydrologic disturbance of a consequential agricultural impoundment; however, it is not anticipated that the Project will have a significant effect on hydrology at the watershed scale.

Hydraulic

The hydraulic function of the Pyramid is defined as transport of water in the channel, on the floodplain, and through sediments. The greatest potential uplift at the Project will be achieved through removing the berm of the former dam, lateral berms, and constructing sinuous, single-thread channels within the pond footprint. This reconnects existing streams from upstream to downstream and enables healthy transport of water through the system. Furthermore, restoration activities will re-establish a floodplain and maintain channel-floodplain connectivity throughout the Project. Additionally, channels will be designed and constructed with adequate energy dissipation and grade control to achieve stable flow dynamics. Currently, hydraulic parameters for reaches RL1-A and RL2 are not functioning and will be functioning post-restoration.

Geomorphology

Geomorphology, as defined within the Pyramid Framework, is the transport of wood and sediment to create bed forms and dynamic equilibrium. Sediment transport will be improved in reaches that are currently functioning-at-risk or not-functioning by removing pond dams and berms and constructing sinuous, single-

thread, channels within the pond footprint that maintain stable dimension, plan, and profile to allow for transport of sediment. Additional reduction will be achieved by establishing a functional buffer. Channel stability and bedform diversity will be improved in restoration reaches by installing a mix of rock and log structures to promote a natural combination of riffle-pool and step-pool sequences. Channel substrate will be supplemented by off-site material to ensure bed stability and habitat creation. Transport and storage of woody debris will be improved through increases in channel roughness from plantings and structures installation. Existing riparian vegetation for reaches RL1-A and RL2 are functioning-at-risk due to lack of woody vegetation. Therefore, riparian buffers will be planted out to a minimum of 50 feet to improve the riparian vegetation to functioning levels, while also providing terrestrial habitat. All of these functional parameters are interconnected and depend on each other; therefore, improving this wide range of parameters will result in long-term functional geomorphic uplift.

Physicochemical

The Pyramid Framework defines the physicochemical category as temperature and oxygen regulation and the processing of organic matter and nutrients. Although this Project would support the overarching goal in the Neuse River Basin Priorities to promote nutrient and sediment reduction in agricultural areas, it is difficult to measure nutrient and sediment reduction at this project level because they can be affected by many variables. However, several restoration actions that will be realized by the Project are known to reduce nutrients and sediment even though they may not be measurable at the project level. These activities include removing farm impoundments, filtering runoff through buffer areas, and improving denitrification and nutrient uptake through buffer zones and riparian wetlands. Additional benefits may also come from functional uplift of the lower-level stream functions (hydraulics and geomorphology), which will reduce sediment and nutrients in the system through channel establishment, bank stabilization, and reforestation. Temperature regulation will also be improved through the restoration of canopy tree species to the stream buffer areas. Oxygen regulation will occur through two actions: first, the temperature of the water directly impacts the amount of gas held by the water. Therefore, by planting the buffer to shade the channel, water temperature is decreased, and dissolved oxygen is increased. Second, by constructing stable channels within the pond footprint that include drop structures, mixing zones will form where oxygen dissolves much faster than the current exchange rate. The processing of organic matter will be improved once healthy riffles are shallow enough to catch twigs and branches that then retain leaves. Many of these physicochemical benefits occur slowly and are dependent on multiple variables within the stream ecosystem. Therefore, it is not practical or feasible to directly measure these parameters within the monitoring time frame of this project. With that said, it is logical to use existing riparian buffer and visual performance standards to demonstrate the positive correlation between geomorphic parameters and physicochemical parameters. For example, as riparian buffer trees grow, as represented in annual monitoring reports, it is anticipated that canopy cover is actively shading the stream channel and reducing water temperature. This is not a substitute for direct physicochemical monitoring, but it is a useful tool to help project the long-term benefits of the Project in terms of its functional uplift.

Biology

The highest category of the Pyramid is biology and is defined as the biodiversity and life histories of aquatic and terrestrial life, specifically referring to animals. As mentioned for the physicochemical stream function, it will be difficult to see measurable results of the functional uplift of the biological functions at a project scale during the monitoring time frame of the project. However, since the life histories of many species likely to benefit from stream and wetland restoration are depending on the lower-level functions, the functional uplift from the hydraulic and geomorphic levels would likely have a positive effect on the biology over time and in combination with other projects within the watershed is anticipated. Again, there is no substitute for direct biological monitoring, but it is important to understand the hierarchy of the Stream Functions Pyramid Framework in order to help project long-term benefits of the Project, though only categories two and three (hydraulics and geomorphology) will be directly measured during the seven-year monitoring period.

4.2 Wetland Functional Uplift

By removing dam structures, berms, fill material/spoil, and construction debris, successful hydrologic restoration can be attained by the Project and will provide numerous soil-related functional uplifts. These include, trapping of sediments, nutrients, and pollutants, increased infiltration of runoff, re-establishment of natural oxidation-reduction cycling, improved nutrient and chemical transformations, increased organic carbon accumulation, improved soil structure (surface primarily), and increases in microbial and fungal populations and diversity important for soil health. Additionally, the wetland area contained within the existing pond bed can be rehabilitated and stabilized by planting a forest community typical of the area floodplains. Large scale benefits will include connecting the upstream and downstream riparian wetland corridors that will accommodate a diversity of wildlife.

5 MITIGATION PROJECT GOALS AND OBJECTIVES

Through the comprehensive analysis of the Project's maximum functional uplift using the Stream Functions Pyramid Framework and conclusions based on a Site Hydric Soils Detailed Study (**Appendix M**), specific, attainable goals and objectives will be realized by the Project. These goals clearly address the degraded water quality and nutrient input from agricultural practices that were identified as major watershed stressors in the 2010 Neuse RBRP (amended August 2018). The Project will address outlined RBRP Goal 2 (listed in **Section 2**).

The Project goals are:

- Re-establish hydrology to a historical stream/wetland complex that has been impacted by agricultural impoundments for over 113 years.
- To transport water in a stable, non-erosive manner and maintain a stable water table in riparian floodplain wetlands that will also contribute to stream baseflow;
- Improve flood flow attenuation on site and downstream by allowing for overbank flows and connection to the floodplain;
- Create diverse bedforms and stable channels that achieve healthy dynamic equilibrium and provide suitable habitat for life
- Improve in-stream habitat;
- Limit sediment and nutrient inputs into stream system;
- Re-establish, rehabilitate, and preserve wetlands;
- Restore, enhance, and preserve native wetland and riparian vegetation;
- Indirectly support the goals of the 2010 Neuse RBRP (amended August 2018) to improve water quality and to reduce sediment and nutrient loads; and
- To support the life histories of aquatic and riparian plants and animals through stream restoration activities

The Project objectives to address the goals are:

- Design and reconstruct stream channels sized to convey bankfull flows that will maintain a stable dimension, profile, and planform;
- Add in-stream structures and bank stabilization measures to improve bedform diversity and protect restored streams;
- Install habitat features such as brush toes, constructed riffles, woody materials, and pools of varying depths to restored streams;
- Remove dams, berms, fill material, spoil piles, and debris to restore wetland hydrology and maintain appropriate hydroperiod for Bibb soil series;
- Increase forested riparian buffers to at least 50 feet on both sides of the channel along the Project reaches with a hardwood riparian plant community;
- Install approximately 937 linear feet of livestock exclusion fencing along the western easement boundary to ensure livestock will not have stream or wetland access;
- Treat exotic invasive species; and
- Establish a permanent conservation easement on the Project that will perpetually protect streams, wetlands, and their associated buffers.

Anticipated functional uplift, benefits, and improvements within the Project area, as based on the Function Based Framework are outlined in **Table 9.**

Table 9. Functional Benefits and Improvements

Level	Function	Goal	Objective	Measurement Method
1	***Hydrology**** *Transport of water from the watershed to the channel*	maintain a stable water table in riparian floodplain wetlands that will also contribute to stream baseflow	Maintain appropriate wetland hydrology for Bibb soil series	Groundwater wells
2	***Hydraulic*** *Transport of water in the channel, on the floodplain, and through the sediments*	to transport water in a stable, non-erosive manner	Improve flood bank connectivity by reducing bank height ratios and increasing entrenchment ratios	Stage recorders Bank Height Ratio Entrenchment Ratio
3	**Geomorphology** *Transport of wood and sediment to create diverse bedforms and dynamic equilibrium*	to create a diverse bedform and stable channels that achieve healthy dynamic equilibrium and provide suitable habitat for life	Limit erosion rates and increase channel stability to reference reach conditions Improve bedform diversity (pool spacing, percent riffles, etc.) Increase buffer width to at least 50 feet	As-built stream profile Cross sections Visual monitoring Vegetation plots
4	**Physicochemical°** *Temperature and oxygen regulation; processing of organic matter and nutrients*	Indirectly support the goals of the 2010 Neuse RBRP (amended August 2018) to achieve appropriate levels for water temperature, dissolved oxygen concentration, and other important nutrients including but not limited to Nitrogen and Phosphorus through buffer/wetland planting and wetland hydrologic restoration	*Unmeasurable Objective/Expected Benefit* Promote sediment filtration, nutrient cycling, and organic accumulation through natural wetland biogeochemical processes *Unmeasurable Objective/Expected Benefit* Establish native hardwood riparian buffer to provide canopy shade and absorb nutrients Exclude cattle with 937 feet of new fencing	Groundwater wells (*indirect measurement*) Vegetation plots (*indirect measurement*) Established fencing and perpetual conservation easement *(indirect measurement*)
5	**Biology *** *Biodiversity and life histories of aquatic life histories and riparian life*	to achieve functionality in levels 1-4 to support the life histories of aquatic and riparian plants and animals through stream restoration activities	*Unmeasurable Objective/Expected Benefit* Improve aquatic habitat by installing habitat features, constructing pools of varying depths, and planting the riparian buffer and wetlands	As-Built Survey (*in-direct measurement*)

*° These categories are measured indirectly; *These categories are not quantifiably measured*

6 MITIGATION WORK PLAN

6.1 Reference Stream

The restoration portions of the Project are currently characterized by agricultural and livestock practices. Physical parameters of the Project were used, as well as other reference materials, to determine the target stream type. The "Classification of the Natural Communities of North Carolina" was also used to narrow the potential community types that would have existed at the Project (Schafale, 2012). An iterative process was used to develop the final information for the Project design.

Targeted reference conditions included the following:

- Located within the physiographic region and ecoregion,
- Similar land use on site and in the watershed,
- Similar soil types on site and in the watershed,
- Ideal, undisturbed habitat – several types of woody debris present,
- Similar topography,
- Similar slope,
- Pattern common among coastal plain streams, and
- Minimal presence of invasive species.

6.1.1. Reference Characterization

The reference stream is an unnamed tributary (UT) to Hannah Creek located in Johnston County, NC less than three miles from the project. The portion of the reference reach that was surveyed and analyzed is approximately 275 feet long and has a drainage area of 1.24 square miles (795 acres). The land use in the watershed is characterized by mostly agricultural (52 percent), mixed pines and hardwoods (42 percent), residential (four percent), and open water (two percent). The channel has a sand/gravel bed, a slope of 0.3 percent and is classified as an E4/5 stream type. The shallow sections have a width to depth ratio between 9 and 10, and an entrenchment ratio greater than 3.

6.1.2. Reference Discharge

Several hydrologic models/methods were used to develop a bankfull discharge for the reference reach. Existing drainage area, land use, slope, roughness, and cross-sectional area were all factors considered when performing the calculations. Using a combination of Coastal Plain Regional Curves, in-house spreadsheet tools, and a project specific regional flood frequency analysis, the existing discharge was found to be around 29-31 cubic feet per second (ft^3/s). See **Section 6.2.2** for a more detailed description of the hydrologic analyses performed for this project.

6.1.3. Reference Riparian Vegetation

The reference reach riparian community is characteristic of a bottomland hardwood forest community. This community was determined to have had past disturbance altering the species composition. Common species include red maple, tulip poplar, sweetgum (*Liquidambar styraciflua*), and swamp tupelo. Some invasive species are present, most notably Chinese privet and multiflora rose (*Rosa multiflora*).

6.2 Design Parameters

6.2.1. Stream Restoration Approach

The Project will include Restoration and Preservation. Stream restoration will incorporate the design of a single-thread meandering channel, with parameters based on data taken from reference site, published empirical relationships, regional curves developed from existing project streams, and NC Regional Curves. Analytical design techniques will also be a crucial element of the project and will be used to determine the design discharge and to verify the design as a whole. A conceptual plan is provided in **Figure 10** and the design plan sheets of the restoration approach is found in **Appendix A.**

The Project has been broken into the following design reaches:

Reach RL1-A – Priority I Restoration is proposed along this reach for 2,438 linear feet both upstream and downstream of the dam. The upstream end is fed from three perched 54-inch crossline culverts under NC HWY 96, and construction activities will include installing a plunge pool to stabilize the existing outfall. The conservation easement will begin approximately 125 feet downstream of the culverts. This will allow for DOT and public utilities to maintain the crossing and water line, respectively. Additionally, the easement is setback from the road such that the adjacent landowner to the north may access and maintain the existing barn located approximately 25 to 40 feet from the proposed channel.

Restoration activities will include constructing a channel sized to provide frequent out of bank flows to allow improved floodplain and wetland connectivity. In-stream structures such as log vanes, log sills, brush toes and constructed riffles will be installed for vertical and lateral stability and to improve bedform diversity. Additional work will include removing the dam, existing pipes, a bridge, and riprap piles.

The restoration activities on the lower extent of Reach RL1-A will impact existing wetlands WE and WD before transitioning to reach RL1-B as preservation. However, the stream restoration will result in net positive wetland area as surrounding riparian areas will be restored as wetlands by raising the channel bed elevation, thus raising groundwater elevation and allowing for more frequent overbank events. Also, the surrounding wetland re-establishment involved with this Project, including removal of the upstream dam, spoil piles, and debris, as well as replanting a bottomland hardwood community, will further improve existing wetlands.

Reach RL1-B – Preservation is proposed for this reach downstream of RL1-A. This section begins where the channel has stabilized from the hurricane breach and continues flowing to the south west off of the Project. Preservation activities will consist of supplemental planting throughout the riparian buffer.

Reach RL2 – Priority I Restoration is proposed for this reach. Flowing out of a pond just north of the Project, the proposed channel will be constructed beginning at the existing pond outfall (24" CMP) and will confluence with RL1-A near stationing 16+50. Restoration activities will involve constructing a meandering channel sized to improve floodplain connectivity. In-stream structures such as log vanes, log sills, brush toes and constructed riffles will be installed for stability and to improve bedform diversity.

6.2.1.1 Typical Design Sections

Typical cross sections for riffles and pools are shown on the design plan sheets in **Appendix A**. The cross-section dimensions were developed for the two design reaches based on reference reaches by using an in-house spreadsheet. The cross sections were altered slightly to facilitate constructability; however, the cross-

sectional area, width to depth ratio, and side slopes were preserved. Typical pool sections include pools located on straight reaches and pools on meander bends.

6.2.1.2 Meander Pattern

The design plans showing the proposed channel alignment are provided in **Appendix A**. The meander pattern was derived directly from the analog reach and was altered in some locations to provide variability in pattern, to avoid on site constraints, existing bank failures, to follow the low points, and to make the channel more constructible. The morphologic parameters summarized in the **Appendix B** were applied wherever these deviations occurred.

6.2.1.3 Longitudinal Profiles

The design profiles are presented in **Appendix A**. These profiles extend throughout the entire project for the proposed channel alignment. The profiles were designed using the analog reach bed features that were sized with the scaling factors. The bed slopes and bankfull energy gradients were determined for each design reach based on the existing ground slope and the sinuosity of the design reach. Log and rock structures will be utilized in the design to control grade, divert flows, and provide additional habitat diversity and stability.

6.2.1.4 In-Stream Structures

Structures will be incorporated into the channel design to provide additional stability and improve aquatic habitat. Native materials and vegetation will be used for revetments and grade control structures where applicable. Additionally, rock structures will be utilized intermittently along Reaches RL1-A and RL2 to provide increased stability and habitat. Typical structures that will protect the channel bed and/or banks will include riffle grade controls, log sills and log vanes.

Woody debris will be placed throughout the channel at locations and at a frequency that is similar to those observed in the analog reaches. Woody habitat features installed will include dead brush, root wads, brush toes, and log vanes. To provide additional bank stability, sod mats harvested on site will be installed along stream banks during construction if and when feasible. Sod mats will only be harvested and used if comprised of appropriate vegetation. The use of sod mats that include aggressive turf grasses will be avoided. Sod mats are natural sections of vegetation taken from the banks when they were cut during construction and are about nine inches thick. Before installation, proposed banks are graded lower than specified to accommodate the thickness of the mat. The mats are placed on top of the bank to act as a natural stabilizer of native species, and they grow much faster than the combination of coir fiber matting and seeding. Other bank stability measures include the installation of live stakes, log sills, brush toes, log vanes, and log toes. Typical details for proposed in-stream structures and revetments are in **Appendix A**.

6.2.2. Data Analysis

6.2.2.1 Stream Hydrologic Analysis

Hydrologic evaluations were performed for the design reaches using multiple methods to determine and validate the design bankfull discharge and channel geometry required to provide regular floodplain inundation. The use of various methods allows for comparison of results and eliminates reliance on a single model. Peak flows (**Table 10**) and corresponding channel cross sectional areas were determined for comparison to design parameters using the following methods:

- Regional Flood Frequency Analysis,
- AutoCAD's Hydraflow Hydrographs, and
- NC Regional Curves for the Rural Coastal Plain.

Regional Flood Frequency Analysis

A flood frequency analysis was completed for the study region using historic gauge data on all nearby USGS gauges with drainage areas less than 6,400 acres (10 mi^2) which passed the Dalrymple homogeneity test (Dalrymple, 1960). This is a subset of gauges used for USGS regression equations. Regional flood frequency equations were developed for the 1.1-, 1.5-, and 2-year peak discharges based on the gauge data. Discharges were then computed for the design reach. These discharges were compared to those predicted by the discharge regional curve and USGS regional regression 2-year discharge equations.

AutoCAD's Hydraflow Express

Hydraflow Express was used to simulate the rainfall-runoff process and establish peak flows for the watersheds. This model was chosen over the U.S. Army Corps of Engineers model HEC-HMS because it allows the user to adjust the peak shape factor. Rainfall data reflecting both a 284 and 100 peak shape factor were used along with a standard Type II distribution, and NRCS hydrology (time of concentrations and runoff curve numbers), to simulate the rainfall-runoff process.

Regional Curve Regression Equations

The North Carolina Rural Coastal regional curves by Doll et al. (2003) and Sweet and Geratz (2003) for discharge were used to predict the bankfull discharge for the Project. The regional curves predicted flows that are similar to those predicted by the 1.1-year flood frequency, while the Hyrdaflow values were much higher. The regional curve equations for NC discharges by Doll et al. (2003):

(1) $Q_{bkf}=16.56*(DA)^{0.72}$ (Doll et al., 2003)

(2) $Q_{bkf}=8.79*(DA)^{0.76}$ (Sweet and Geratz, 2003)

Where Q_{bkf}=bankfull discharge (ft^3/s) and DA=drainage area (mi^2).

Table 10. Peak Flow Comparison

Reach	Drainage Area (Ac)	FFQ $Q_{1.1}$	FFQ $Q_{1.5}$	NC Regional Curve Q (1)	NC Regional Curve Q (2)	Hydraflow Q_1	Hydraflow Q_2	Design Q
RL1-A (US)	853	28	60	20	11	27	44	20
RL1-A (DS)	1426	43	85	29	16	102	163	31
RL2	490	17	42	14	7	30	47	16

6.2.2.2 Design Discharge

Based upon the hydrologic analyses described above, design discharges were selected that fall between the FFQ 1.1 and the NC Regional Curve revised values. The selected flows for the restoration reaches are 20-31 ft^3/s for RL1 and 16 ft^3/s for RL2. These discharges will provide frequent inundation of the adjacent floodplain.

6.2.2.3 Sediment Transport Analysis

An erosion and sedimentation analysis was performed to confirm that the restoration design creates a stable gravel bed channel that neither aggrades nor degrades over time. Typically, sediment transport is assessed to determine a stream's ability to move a specific grain size at specified flows. Various sediment transport equations are applied when estimating entrainment for sand and gravel bed streams found in the Coastal Plain. The US Army Corps of Engineers (USACE) report, *Stability Thresholds for Stream Restoration Materials* (Fischenich, 2001), was used to obtain permissible shear stresses and velocities. Data found in

this document was obtained from multiple sources using different testing conditions. The following methods and published documents were utilized during the sediment transport analysis:

- Permissible Shear Stress Approach, and
- Permissible Velocity Approach.

Shear Stress Approach

Shear stress is a commonly used tool for assessing channel stability. Allowable channel shear stresses are a function of bed slope, channel shape, flows, bed material (shape, size, and gradation), cohesiveness of bank materials, vegetative cover, and incoming sediment load. The shear stress approach compares calculated shear stresses to those found in the literature.

Critical shear stress is the shear stress required to initiate motion of the channels median particle size (D_{50}).

Table 11. Comparison of Allowable and Proposed Shear Stresses

Reach	Proposed Bed Shear Stress at Bankfull Stage (lbs/ft^2)	Existing Critical Shear Stress (lbs/ft^2)	Allowable Shear Stress[1]		
			Sand/Sily/Clay (lbs/ft^2)	Coarse Gravel (lbs/ft^2)	Vegetation (lbs/ft^2)
RL1-A (US)	0.23	0.05	0.03 to 0.26	0.33 to 0.67	0.7 to 1.7
RL1-A (DS)	0.27	0.05	0.03 to 0.26	0.33 to 0.67	0.7 to 1.7
RL2	0.25	0.05	0.03 to 0.26	0.33 to 0.67	0.7 to 1.7

[1](Fischenich, 2001)

Review of the above table shows that the proposed bed shear stresses for the Project design reaches are above the critical shear stress of the existing channel material. Therefore, all proposed riffles will be supplemented with a substrate mix that has a critical shear stress greater than the proposed bed shear stress at bankfull.

Velocity Approach

Published data are readily available that provide entrainment velocities for different bed and bank materials. A comparison of calculated velocities to these permissible velocities is a simple method to aid in the verification of channel stability. **Table 12** compares the proposed velocities calculated using Manning's equation with the permissible velocities.

Table 12. Comparison of Permissible and Proposed Velocities

Reach	Manning's "n" Value	Design Velocity (ft/s)	Proposed Bed Material	Permissible Velocity[1] (ft/sec)
RL1-A (US)	0.05	1.6	Sand to Coarse gravel	1.75 - 6
RL1-A (DS)	0.05	1.7	Sand to Coarse gravel	1.75 - 6
RL2	0.05	1.8	Sand to Coarse gravel	1.75 - 6

[1](Fischenich, 2001)

6.2.3. Wetland Restoration and Preservation

The Matthew Project offers a total ecosystem restoration opportunity. As such, the wetland restoration is closely tied to the stream restoration and pond dam removal. The Project will provide 7.207 WMUs through a combination of wetland re-establishment, rehabilitation, and preservation.

Wetland rehabilitation via "pond conversion" is proposed within the pond footprint, including wetland, WA, with a credit ratio of 2:1. The construction of the farm pond has altered surface drainage and even since the breach, is still partially impounded and flow is constricted. The primary restoration activity will be the removal of the pond dam and its associated large berm along the eastern edge. Additionally, stream restoration within this pond footprint will re-establish stable stream channels that will maintain a constant surface-groundwater connection that provides retention and storage within the floodplain, and thus healthy wetland hydroperiods.

Wetland re-establishment via "fill removal," with a credit ratio of 1:1, is proposed in the area below the dam that consists of hydric soils surrounding Wetlands WC, WD, and WE that lack sufficient wetland hydrology. This re-established wetland area will be referred to as "WF" (Wetland F). This area currently lacks hydrology due to the construction of the farm pond that has altered surface drainage and has created constricted flow, inhibiting normal flow volumes parallel to the stream both at the surface and within the subsurface. In addition, fill material from the construction of the pond has filled these pre-existing wetlands and buried hydric soils. Furthermore, a ditch from the old pond outlet along the western edge of the floodplain drains upland overland flow and seepage away from the natural floodplain. This wetland area will be re-established by removing the dam, removing fill material below the dam, and aligning a stable stream channel via stream restoration efforts. Additional activities will include the removal of dam material debris that was littered throughout the floodplain during the breach of Hurricane Matthew, followed by surface roughening and creation of shallow depressions throughout the area in order to mimic natural conditions and provide an appropriate landscape for diverse habitat.

Preservation with a 10:1 credit ratio is proposed for jurisdictional wetlands WB, WC, WD, and WE. Some of these areas that are impacted by stream restoration efforts will be planted with supplemental, native hardwood trees.

The wetland restoration areas will directly connect to the existing high-quality bottomland hardwood wetland preservation area. The resulting wetland will function as a large, contiguous bottomland hardwood wetland community.

6.3 Sediment Control Areas

A suite of sediment load attenuation structures in the form of Engineered Sediment Packs (**Appendix A, Details**) will be installed along the easement boundary where concentrated flow enters the conservation easement in several areas (**Figure 10**). These structures will be installed within the conservation easement so that they are protected. Catastrophic failure or maintenance of the structure is not anticipated as this structure will be installed in a low-gradient area, and the area proposed to diffuse flow will be well vegetated.

6.4 Vegetation and Planting Plan

6.4.1. Plant Community Restoration

The restoration of the plant communities is an important aspect of the restoration Project. The selection of plant species is based on what was observed in the forest surrounding the restoration Project and what is typically native to the area. Specifically, species identified in the preservation area of the Project along with species described in the 2012 Guide to the Natural Communities of North Carolina, Fourth Approximation

(Schafale, 2012) for coastal plain wetland-type communities were used to determine the most appropriate species for the restoration project.

A Brownwater Bottomland Hardwoods (Swamp Transition Subtype) (Schafale, 2012) will be the target community along the Project reaches and wetlands. This community type represents a diverse community where wet-tolerant hardwoods can establish throughout while very wet species (e.g. Cypress and Gums) can thrive in the transitional swamp areas. While reforestation is an important goal of this Project, it is expected that some open water and/or marsh pockets may persist in depressions within the swamp areas. These microtopographic features will further enhance community complexity and habitat diversity. The target community will be used for the planting areas within the Project, shown in **Appendix A**. The plant species list has been developed and can be found in **Table 13**. Hardwood species typical of the target community were observed in adjacent and nearby communities and were judged to be appropriate for this site.

The restoration of plant communities along the Project will provide stabilization and diversity. For rapid stabilization of the stream banks (primarily outside meanders), silky dogwood (*Cornus amomum*) and black willow (*Salix nigra*) were chosen for live stakes along the restored channel because of their rapid growth patterns and high success rates. Willows grow at a faster rate than the species planted around them, and they stabilize the stream banks. Willows will also be quicker to contribute organic matter to the channel. When the other species are bigger, the black willows will slowly stop growing or die out because the other species would outgrow them and create shade that the willows do not tolerate. The live stake species will be planted along the outside of the meander bends three feet from the top of bank, creating a three-foot section along the top of bank. The live stakes will be spaced one per three linear feet with alternate spacing vertically.

It is anticipated that the vegetation planting/replanting will be conducted between November 15 and March 15, per the October 2016 USACE/NCIRT monitoring guidance; however, if construction is completed after March 15, the Project will be planted no later than April 30. Furthermore, there will be at least 180 days until the initiation of the first year of monitoring.

Table 13. Proposed Plant List

Bare Root Planting Tree Species				
Species	**Common Name**	**Spacing (ft)**	**Unit Type**	**% of Total Species Composition**
Taxodium distichum	Bald cypress	9x6	Bare root	15
Platanus occidentalis	American sycamore	9x6	Bare root	10
Betula nigra	River birch	9x6	Bare root	10
Cephalanthus occidentalis	Buttonbush	9x6	Bare Root	10
Nyssa biflora	Swamp tupelo	9x6	Bare root	10
Chamaecyparis thyoides	Atlantic white cedar	9x6	Bare root	10
Quercus phellos	Willow oak	9x6	Bare root	10
Quercus lyrata	Overcup oak	9x6	Bare root	10
Nyssa aquatica	Water tupelo	9x6	Bare Root	5
Quercus michauxii	Swamp chestnut oak	9x6	Bare root	5
Quercus laurifolia	Laurel oak	9x6	Bare root	5

Live Staking and Live Cuttings Bundle Tree Species		
Species	**Common Name**	**% of Total Species Composition**
Salix nigra	Black willow	60
Cornus ammomum	Silky dogwood	40

6.4.2. On-Site Invasive Species Management

Treatment for invasive species will be required within all grading limits associated with stream restoration. Invasive species will require different and multiple treatment methods, depending on plant phenology and the location of the species being treated (**Appendix J**). All treatment will be conducted as to maximize its effectiveness and reduce chances of detriment to surrounding native vegetation. Treatment methods will include mechanical (cutting with loppers, clippers, or chain saw) and chemical (foliar spray, cut stump, and hack and squirt techniques). Invasive or aggressive plants containing mature, viable seeds will be removed from the Project and properly disposed. All herbicide applicators will be supervised by a certified ground pesticide applicator with a North Carolina Department of Agriculture and Consumer Services (NCDA&CS) license and adhere to all legal and safety requirements according to herbicide labels, and NC and Federal laws. Management records will be kept on the plant species treated, type of treatment employed, type of herbicide used, application technique, and herbicide concentration and quantities used. These records will be included in all reporting documents. Notably, although common rush is not an exotic invasive species, it can be a nuisance species and it is possible that allelopathic properties upon its decomposition can potentially inhibit tree growth. Therefore, the old pond bed was already treated for alligatorweed (*Alternanthera philoxeroides*) and common rush by aerial herbicide application, in July 2019, in order to establish a favorable growing site for target, planted trees. If necessary, RES will treat the old pond bed again prior to construction.

6.4.3. Soil Restoration

After construction activities, the subsoil will be scarified and any compaction will be deep tilled before the topsoil is placed back over the Project. Any topsoil that is removed during construction will be stockpiled and placed over the Project during final soil preparation. This process should provide favorable soil

conditions for plant growth. Rapid establishment of vegetation will provide natural stabilization for the Project.

6.5 Mitigation Summary

Natural channel design techniques have been used to develop the restoration designs described in this document. The combination of the analog and analytical design methods was determined to be appropriate for this Project because the watershed is rural, the causes of disturbance are known and have been abated, and there are minimal infrastructure constraints. The original design parameters were developed from the measured analog/reference reach data and applied to the subject stream. The parameters were then analyzed and adjusted through an iterative process using analytical tools and numerical simulations of fluvial processes.

The designs presented in this report provide for the restoration of natural coastal plain channel features and stream bed diversity to improve benthic habitat. The proposed design will allow flows that exceed the design bankfull stage to spread out over the floodplain and into adjacent wetlands. Native woody material will be installed throughout the restored reaches to reduce bank stress, provide grade control, and increase habitat diversity.

Forested riparian buffers of at least 50 feet on both sides of the channel will be established along the Project reaches. An appropriate riparian plant community (Brownwater Bottomland Hardwoods, Swamp Transition Subtype) will be established to include a diverse mix of species. The plant species list has been developed and can be found in **Table 13**. Although there is one planting zone, certain targeted species will be planted in the appropriate target community location. Replanting of native species will occur where the existing buffer is impacted during construction. Replanting of native species will occur where the existing buffer is impacted during construction.

Wetland restoration will be accomplished through rehabilitation via “pond conversion” and re-establishment via “fill removal.” The primary activity for “pond conversion” will be the removal of the pond dam and its associated large berm along the eastern edge. Re-establishment via “fill removal” will involve removing the dam and removing fill material below the dam. Additionally, stream restoration efforts will re-establish surface-groundwater connections that will provide retention and storage within these riparian wetlands. All restored wetland areas will be planted with native bottomland hardwood and swamp vegetation. The remaining functional, jurisdictional wetlands will be preserved.

A combination of agricultural BMPs will be used on site; riparian buffer planting, bank stabilization, stream restoration, livestock exclusion, and agricultural sediment load attenuation structures. This combination of BMPs will ultimately lead to the functional uplift of the site by minimizing sedimentation, nutrient input, and fecal coliform input from ongoing livestock and agricultural production outside of the conservation easement.

Due to the nature of the project, complete avoidance of stream, wetland, and buffer impacts is not possible. Proposed stream impacts, including stream relocation, is a necessary restoration practice that will contribute to the functional uplift of the Project’s aquatic resources. Wetland impacts associated with restoration efforts will have a positive impact on wetlands, providing an overall increase in wetland area and function with improved hydrology and addition of native trees and shrubs along the streams. Stream and wetland restoration will also impact existing buffers, though all these areas will be planted with a diverse tree community. All impacts will be accounted for in the Pre-Construction Notification (PCN) form.

6.6 Determination of Credits

Mitigation credits presented in **Table 14** are projections based upon site design (**Figure 10** and **Appendix A**). Upon completion of site construction, the project components and credit data will only be revised to be consistent with the as-built condition if there is a large discrepancy. Any deviation from the mitigation plan post approval, including adjustments to credits, will require a request for modification. This will be approved by the USACE. All credits will be released in accordance with credit release schedules outlined in the 2016 Wilmington District Stream and Wetland Compensatory Mitigation Update (**Appendix D**).

Table 14. Matthew Site (ID-100043) - Mitigation Components

Project Component (reach ID)	Wetland Position and Hydro Type	Existing Footage or Acreage	Stationing	Mitigation Plan Footage or Acreage	As-Built Footage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Credits	Notes/Comments
RL1-A		1,767	1+78 to 26+16	2,438	TBD	R	P1	1:1	2,438.000	Channel restoration, riparian planting, livestock exclusion
RL1-B		234	26+16 to 28+50	234	TBD	P	N/A	10:1	23.400	Supplemental planting, livestock exclusion
RL1-B		108	28+50 to 29+58	108	TBD	P (No Credit)	N/A	N/A	0.000	Channel within easement; however, no credit
RL2		949	0+84 to 8+76	792	TBD	R	P1	1:1	792.000	Channel restoration, riparian planting, livestock exclusion
WA	RR	10.199		10.202	TBD	R		2:1	5.101	Dam and berm removal, stream restoration, native planting
WB	RR	0.429		0.429	TBD	P		10:1	0.043	
WC	RR	0.102		0.102	TBD	P		10:1	0.010	
WD	RR	0.808		0.807	TBD	P		10:1	0.081	
WE	RR	0.758		0.725	TBD	P		10:1	0.073	
WF	RR	0.000		1.900	TBD	R		1:1	1.900	Dam, fill, spoil, and debris removal; stream restoration, native planting

Length and Area Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)
		Riverine	Non-Riverine	
Restoration	3,230.000	12.102		
Enhancement				
Enhancement I				
Enhancement II				
Creation				
Preservation	234.000	2.063		
High Quality Pres				

Overall Assets Summary

Asset Category	Overall Credits
Stream	**3,253.400**
RP Wetland	**7.207**
NR Wetland	**NA**

7 PERFORMANCE STANDARDS

The success criteria for the Project will follow the 2016 USACE Wilmington District Stream and Wetland Compensatory Mitigation Update and subsequent agency guidance. Specific success criteria components are presented below.

7.1 Stream Restoration Success Criteria

7.1.1. Bankfull Events

Four bankfull flow events must be documented within the seven-year monitoring period. The bankfull events must occur in separate years. Otherwise, the stream monitoring will continue until four bankfull events have been documented in separate years.

7.1.2. Cross Sections

There should be little change in as-built cross sections. If changes do take place, they should be evaluated to determine if they represent a movement toward a less stable condition (for example down-cutting or erosion) or are minor changes that represent an increase in stability (for example settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Cross sections shall be classified using the Rosgen stream classification method, and all monitored cross sections should fall within the quantitative parameters defined for channels of the design stream type. Bank height ratio shall not exceed 1.2, and the entrenchment ratio shall be no less than 2.2 within restored riffle cross sections.

7.1.3. Digital Image Stations

Digital images will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal images should not indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral images should not indicate excessive erosion or continuing degradation of the banks over time. A series of images over time should indicate successional maturation of riparian vegetation.

7.2 Wetland Restoration Success Criteria

7.2.1. Wetland Hydrology Criteria

The Natural Resources Conservation Service (NRCS) has a current WETs table (1989-2018) for Johnston County upon which to base a normal rainfall amount and average growing season. The closest comparable data station was determined to be the WETS station for Smithfield, NC. The growing season for Johnston County is 242 days long, extending from March 18 to November 15, and is based on a daily minimum temperature greater than 28 degrees Fahrenheit occurring in five of ten years.

Based upon field observation across the site, the NRCS mapping units show a good correlation to actual site conditions in areas of the site. Mitigation guidance for soils in the Coastal Plain suggests a hydroperiod for the Bibb soil of 12-16 percent of the growing season. The hydrology success criterion for the Site is to restore the water table so that it will remain continuously within 12 inches of the soil surface for at least 12 percent of the growing season (approximately 29 days) at each groundwater gauge location. However, due to the extensive management history of the Project and soil compaction, there may be a reduced hydroperiod for the first two years after construction.

7.3 Vegetation Success Criteria

Specific and measurable success criteria for plant density within the riparian buffers on the Project will follow IRT Guidance. The interim measures of vegetative success for the Project will be the survival of at least 320 planted three-year old trees per acre at the end of Year 3, 260 five-year old trees at seven feet in height at the end of Year 5, and the final vegetative success criteria will be 210 trees per acre with an average height of ten feet at the end of Year 7. Volunteer trees that are listed on the approved planting list will be counted, identified to species, and included in the yearly monitoring reports, and may be counted towards the success criteria of total planted stems. Moreover, any single species can only account for up to 50 percent of the required number of stems within any vegetation plot. Any stems in excess of 50 percent will be shown in the monitoring table but will not be used to demonstrate success.

8 MONITORING PLAN

Annual monitoring data will be reported using the DMS Monitoring Report Template dated June 2017 and NC IRT monitoring template. The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, research purposes, and assist in decision making regarding project close-out. Monitoring reports will be prepared annually and submitted to DMS. Monitoring of the Project will adhere to metrics and performance standards established by the USACE's April 2003 Wilmington District Stream Mitigation Guidelines and the NC IRT's October 2016 Wilmington District Stream and Wetland Compensatory Mitigation Update. **Table 15** outlines the links between project objectives and treatments and their associated monitoring metrics and performance standards within the context of functional uplift based on the Stream Functions Pyramid Framework and a Site Hydric Soils Detailed Study. **Figure 11** depicts the proposed monitoring plan, including approximate numbers and locations of monitoring devices for the Project.

8.1 As-Built Survey

An as-built survey will be conducted following construction to document channel size, condition, and location. The survey will include a complete profile of thalweg, water surface, bankfull, and top of bank to compare with future geomorphic data. Longitudinal profiles will not be required in annual monitoring reports unless requested by USACE. Stream channel stationing will be marked with stakes placed near the top of bank every 200 feet.

8.2 Visual Monitoring

Visual monitoring of all mitigation areas will be conducted a minimum of twice per monitoring year (MY) by qualified individuals. The visual assessments will include vegetation density, vigor, invasive species, and easement encroachments. Visual assessments of stream stability will include a complete streamwalk and structure inspection. Digital images will be taken at fixed representative locations to record each monitoring event, as well as any noted problem areas or areas of concern. Fixed image locations will exist at each cross section, each vegetation plot, each stage recorder, and each groundwater well. Results of visual monitoring will be presented in a plan view exhibit with a brief description of problem areas and digital images. Photographs will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of channel structures. Longitudinal photos should indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral photos should not indicate excessive erosion or continuing degradation of the banks over time. A series of photos over time should indicate successional maturation of riparian vegetation.

8.3 Stream Hydrology Events

Continuous stage recorders, devices that utilize automatic-logging pressure transducers that are capable of documenting the height, frequency, and duration of bankfull events, will be installed on Priority 1 Restoration reaches. A minimum of one stage recorder will be installed on each tributary that is greater than 1,000 feet in length, with one gauge required for every 5,000 feet of length on each tributary and a maximum of five gauges per tributary.

8.4 Cross Sections

Permanent cross sections will be installed at an approximate frequency of one per 20 bankfull widths with half in pools and half in riffles on all Restoration reaches. Morphological data will be measured and recorded for all cross-sections; however, only riffle cross sections will include bank height ratio and entrenchment ratio measurements. Cross sections will be monitored in Years 1, 2, 3, 5, and 7.

8.5 Wetland Hydrology

Wetland hydrology will be monitored to document hydrologic conditions in the wetland restoration areas. This will be accomplished with automatic recording pressure transducer gauges installed in representative locations across the restoration areas as well as the preservation wetland areas for reference conditions. The gauges will be downloaded quarterly and wetland hydroperiods will be calculated during the growing season. Gauge installation will follow current NCIRT guidance. Visual observations of primary and secondary wetland hydrology indicators will also be recorded during quarterly site visits.

8.6 Vegetation Monitoring

Vegetation monitoring plots will be a minimum of 0.02 acres in size and cover a minimum of two percent of the planted area. There will be 14 plots within the planted area (16.4 acres). Plots will be a mixture of fixed and random plots, with 10 fixed plots and four random plots. Planted area indicates all area in the easement that will be planted with trees. The following data will be recorded for all trees in the fixed plots: species, height, planting date (or volunteer), and grid location. For random plots, species and height will be recorded for all woody stems. The location (GPS coordinates and orientation) of the random plots will be identified in the annual monitoring reports. As discussed in **Section 6.4.1**, it is expected that some open water/marsh pockets may persist in localized areas within the Project area. Therefore, RES will attempt to avoid establishing vegetation plots in these potential areas. In the event that these areas become too large (greater than 0.1 acres) or more widespread throughout the Project, RES will document and map the areas to determine if any adaptive management is necessary. Vegetation will be planted and plots established at least 180 days prior to the initiation of the first year of monitoring. Monitoring will occur in Years 1, 2, 3, 5, and 7 between July 1st and leaf drop. Invasive and noxious species will be monitored so that none become dominant or alter the desired community structure of the Project. If necessary, RES will develop a species-specific treatment plan.

8.7 Scheduling/Reporting

A baseline monitoring report and as-built drawings documenting stream restoration activities will be developed within 60 days of the planting completion on the Project. The report will include all information required by DMS mitigation plan guidelines, including elevations, photographs and sampling plot locations, gauge locations, and a description of initial species composition by community type. The report will also include a list of the species planted and the associated densities. Baseline vegetation monitoring will include species, height, date of planting, and grid location of each stem. The baseline report will follow DMS As-Built Baseline Monitoring Report Template June 2017, USACE guidelines, and the October 2017 Mitigation Credit Calculation Memo.

The monitoring program will be implemented to document system development and progress toward achieving the success criteria. The restored stream morphology will be assessed to determine the success of the mitigation. The monitoring program will be undertaken for seven years or until the final success criteria are achieved, whichever is longer.

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to DMS. The monitoring reports will include all information and be in the format required by USACE.

Table 15. Monitoring Requirements

Level	Treatment	Objective	Monitoring Metric	Performance Standard
1 ***Hydrology***	Convert land-use of Project reaches from impounded open water to streams and riparian wetlands	Maintain appropriate wetland hydrology for Bibb soil series	Groundwater wells with pressure transducers: Downloaded quarterly	Water table within 12 inches of the ground surface for 12% of growing season
2 ***Hydraulic***	Reduce bank height ratios and increase entrenchment ratios by reconstructing channels to mimic reference reach conditions	Improve flood bank connectivity by reducing bank height ratios and increase entrenchment ratios	Stage recorders: Inspected semiannually	Four bankfull events occurring in separate years
			Cross sections: Surveyed in MY 1, 2, 3, 5 and 7	Entrenchment ratio shall be no less than 2.2 within restored reaches
				Bank height ratio shall not exceed 1.2
3 ***Geomorphology***	Establish a riparian buffer to limit erosion and sediment input to Project streams. Establish stable banks with livestakes, erosion control matting, and other in stream structures.	Limit erosion rates and maintain channel stability Improve bedform diversity (pool spacing, percent riffles, etc.) Increase buffer width to 50 feet	As-built stream profile	N/A
			Cross sections: Surveyed in MY 1, 2, 3, 5 and 7	Entrenchment ratio shall be no less than 2.2 within restored reaches
				Bank height ratio shall not exceed 1.2
			Visual monitoring: Performed at least semiannually	Identify and document significant stream problem areas; i.e. erosion, degradation, aggradation, etc.
			Vegetation plots: Surveyed in MY 1, 2, 3, 5 and 7	MY 1-3: ≥320 trees/acre MY 5: ≥260 trees/acre (7 ft. tall) MY 7: ≥210 trees/acre (10 ft. tall)
4 ***Physicochemical***	Exclude livestock from riparian areas with exclusion fence and conservation easement, restore wetland hydrology, and plant a wetland riparian buffer	*Unmeasurable Objective/Expected Benefit* Promote sediment filtration, nutrient cycling, and organic accumulation through natural wetland biogeochemical processes	Groundwater wells with pressure transducers: Downloaded quarterly (*indirect measurement*)	Water table within 12 inches of the ground surface for 12% of growing season
		Unmeasurable Objective/Expected Benefit Establish native hardwood riparian buffer and exclude livestock.	Vegetation plots: Surveyed in MY 1, 2, 3, 5 and 7 (*indirect measurement*)	MY 1-3: ≥320 trees/acre MY 5: ≥260 trees/acre (7 ft. tall) MY 7: ≥210 trees/acre (10 ft. tall)
			Visual assessment of established fencing and conservation signage: Performed at least semiannually (*indirect measurement*)	Inspect fencing and signage. Identify and document any damaged or missing fencing and/or signs

9 ADAPTIVE MANAGEMENT PLAN

In the event the mitigation site or a specific component of the mitigation site fails to achieve the necessary performance standards as specified in the mitigation plan, the sponsor shall notify the members of the IRT and work with the IRT to develop contingency plans and remedial actions. Additionally, routine maintenance activities for the Project are outlined in **Appendix F**.

10 LONG-TERM MANAGEMENT PLAN

The site will be transferred to the NCDEQ Stewardship Program (or 3rd party if approved). This party shall serve as conservation easement holder and long-term steward for the property and will conduct periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. Funding will be supplied by the responsible party on a yearly basis until such time an endowment is established. The NCDEQ Stewardship Program is developing an endowment system within the nonreverting, interest-bearing Conservation Lands Conservation Fund Account. The use of funds from the Endowment Account will be governed by North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable.

The Stewardship Program will periodically install signage as needed to identify boundary markings as needed. Any livestock or associated fencing or permanent crossings will be the responsibility the owner of the underlying fee to maintain.

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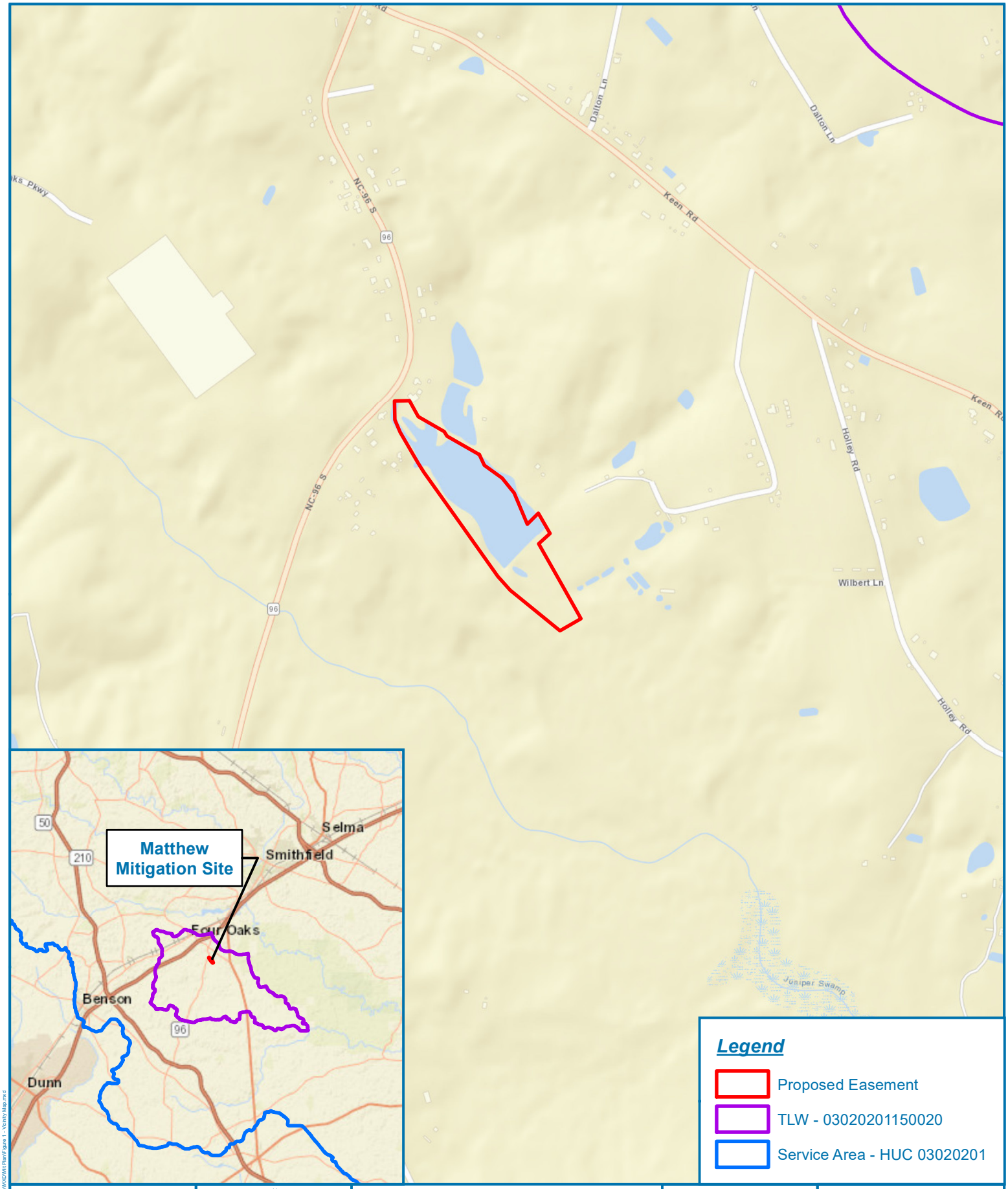

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Figure 1 - Vicinity Map

Matthew Mitigation Site

Johnston County, North Carolina

Date:	4/3/2019
Drawn by:	MDD
Checked by:	BPB
	1 inch = 1,000 feet

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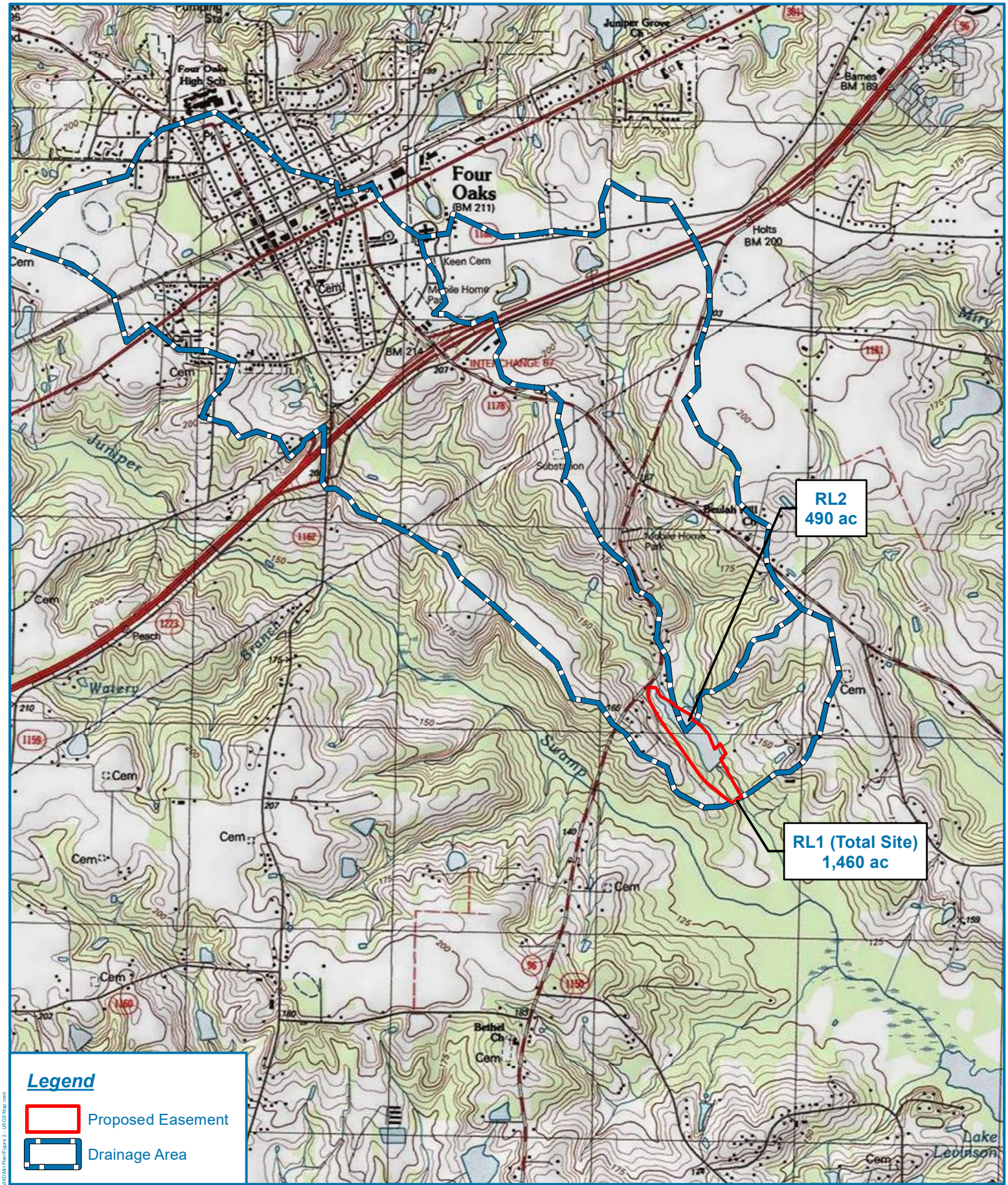

Legend

- Proposed Easement
- Drainage Area

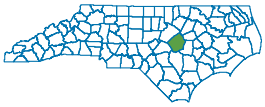

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Figure 2 - USGS Map

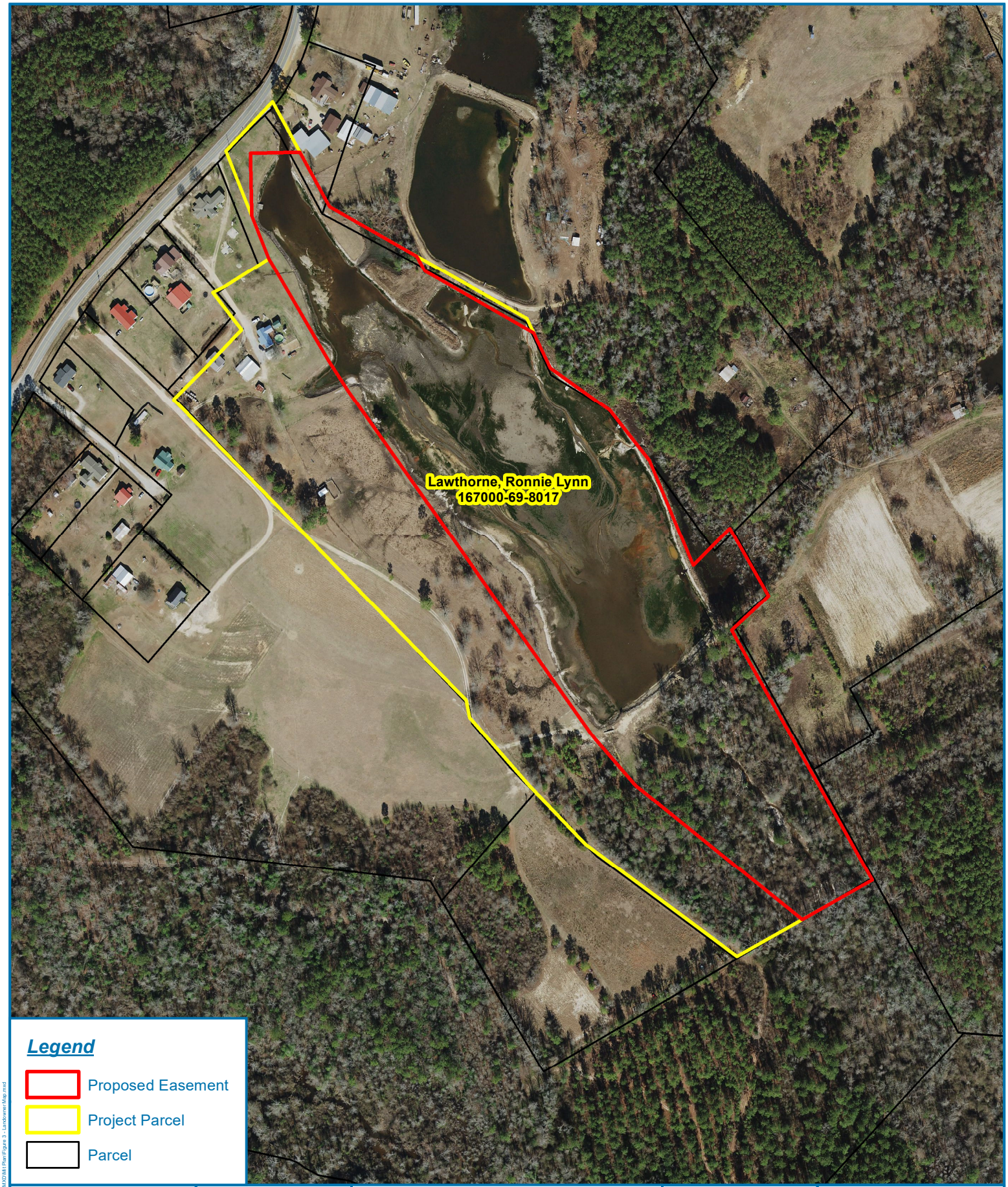
Matthew Mitigation Site

Johnston County, North Carolina

Date:	4/3/2019
Drawn by:	MDD
Checked by:	BPB
	1 inch = 2,000 feet

res

Document Path: S:\@RES GIS\Projects\NC\Matthew\MXD\M1 Plan\Figure 2 - USGS Map.mxd



Legend

- Proposed Easement
- Project Parcel
- Parcel

N
W E
S

0 150 300

Feet

Figure 3 - Landowner Map

Matthew Mitigation Site

Johnston County, North Carolina

Date: 4/3/2019

Drawn by: MDD

Checked by: BPB

1 inch = 300 feet

res

Document Path: S:\@RES GIS\Projects\NC\Matthew\MXD\Mit Plan\Figure 3 - Landowner Map.mxd

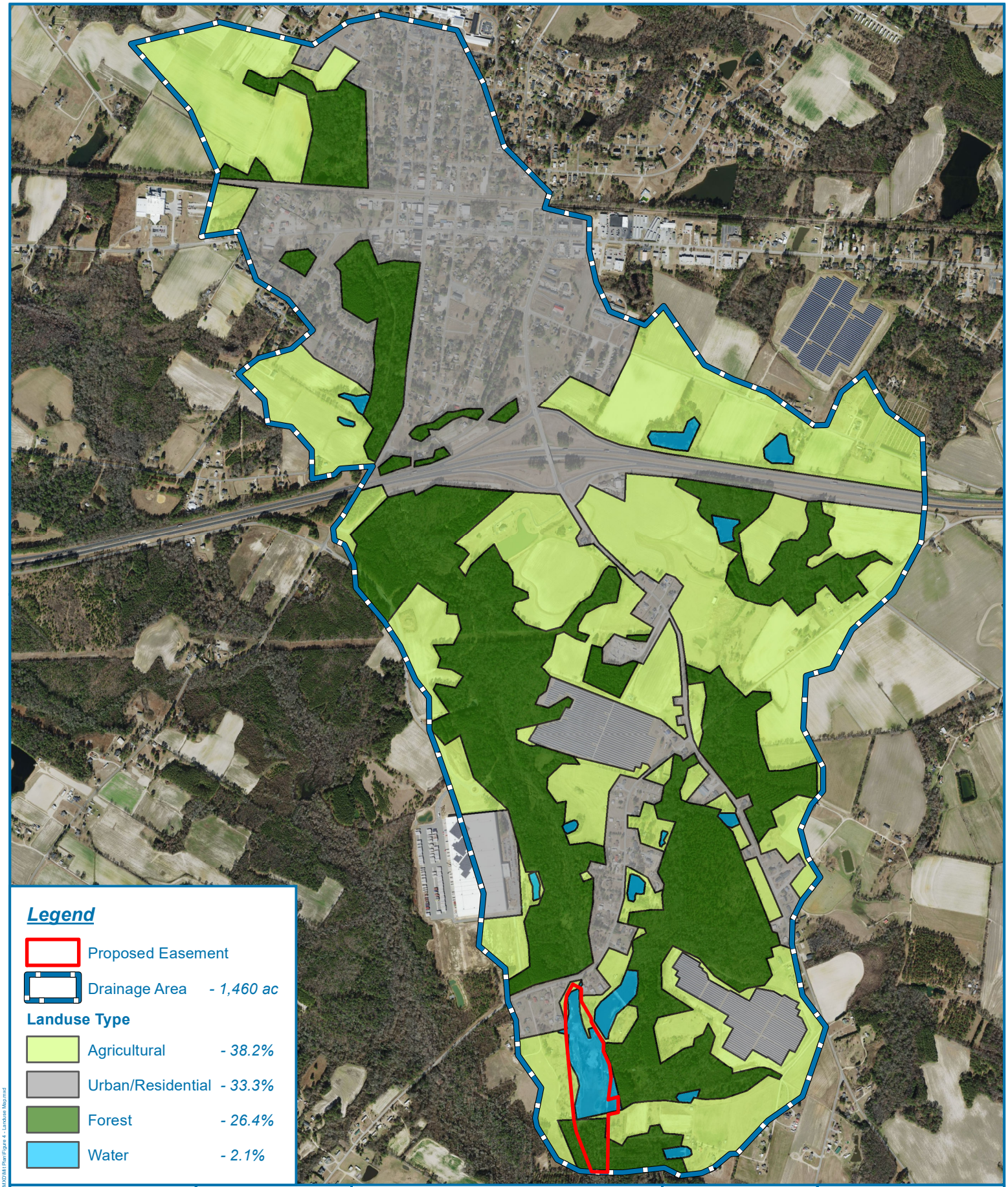


Figure 4 - Landuse Map

Matthew Mitigation Site

Johnston County, North Carolina

Date:	4/3/2019
Drawn by:	MDD
Checked by:	BPB
	1 inch = 1,500 feet

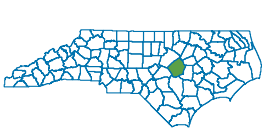
res

Document Path: S:\@RES GIS\Projects\NC\Matthew\MXD\M1 Plan\Figure 4 - Landuse Map.mxd

Legend

- Proposed Easement
- Hydric (100%)
- Predominantly Hydric (66-99%)
- Partially Hydric (33-65%)
- Predominantly Nonhydric (1-32%)
- Nonhydric (0%)

Map Unit Symbol	Map Unit Name	Percent Hydric	Drainage Class	Hydrologic Soil Group	Landscape Setting
Bb	Bibb sandy loam, 0 to 2 percent slope, frequently flooded	90%	Poorly Drained	A/D	Floodplains
GeB	Gilead sandy loam, 2 to 8 percent slopes	0%	Moderately Well Drained	C	Ridges on marine terraces
UcB	Uchee loamy coarse sand, 2 to 6 percent slopes	0%	Well Drained	C	Ridges and broad interstream divides on marine terraces



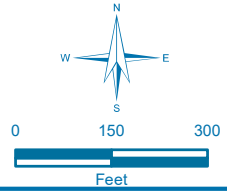


Figure 5 - Soils Map

Matthew Mitigation Site

Johnston County, North Carolina

Date: 4/3/2019

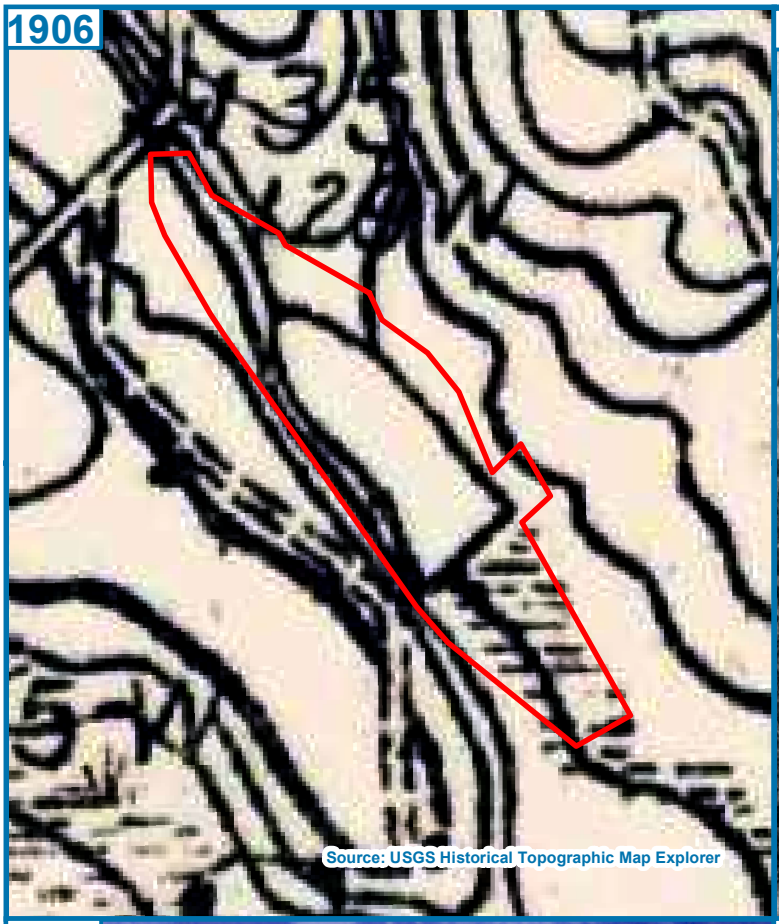
Drawn by: MDD

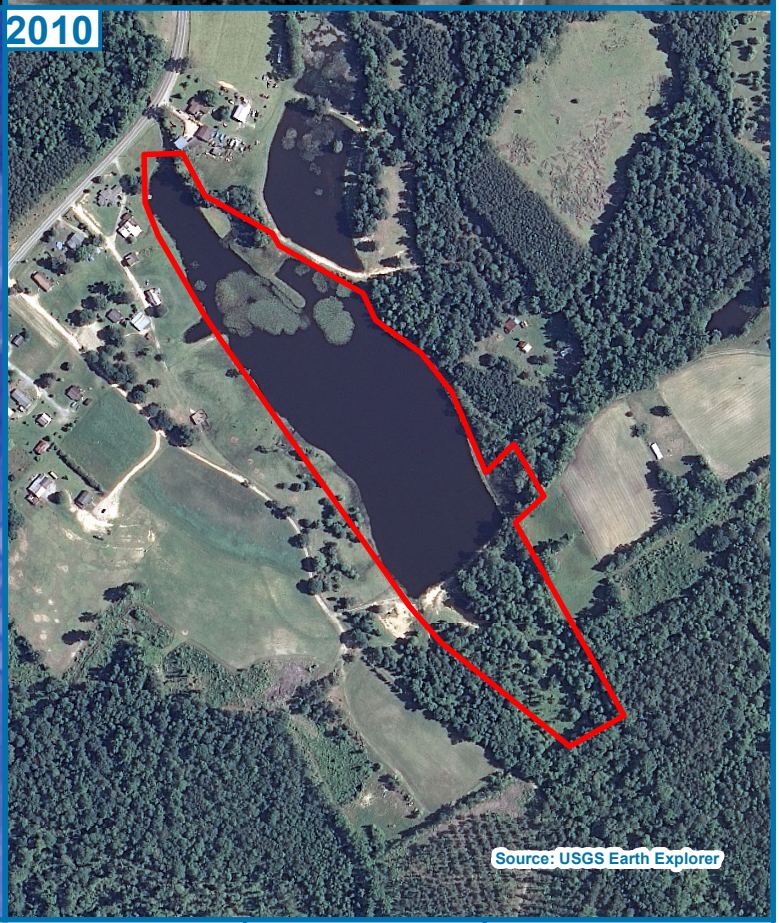
Checked by: BPB

1 inch = 300 feet

res

Document Path: S:\@RES GIS\Projects\NC\Matthew\MXD\M1 Plan\Figure 5 - Soils Map.mxd





Legend

Proposed Easement

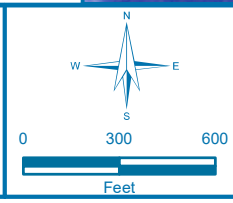


Figure 6 - Historical Mapping

Matthew Mitigation Site

Johnston County, North Carolina

Date: 4/3/2019

Drawn by: MDD

Checked by: BPB

1 inch = 600 feet

res

Document Path: S:\@RES GIS\Projects\NC\Matthew\MXD\M1Plan\Figure 6 - Historical Mapping.mxd

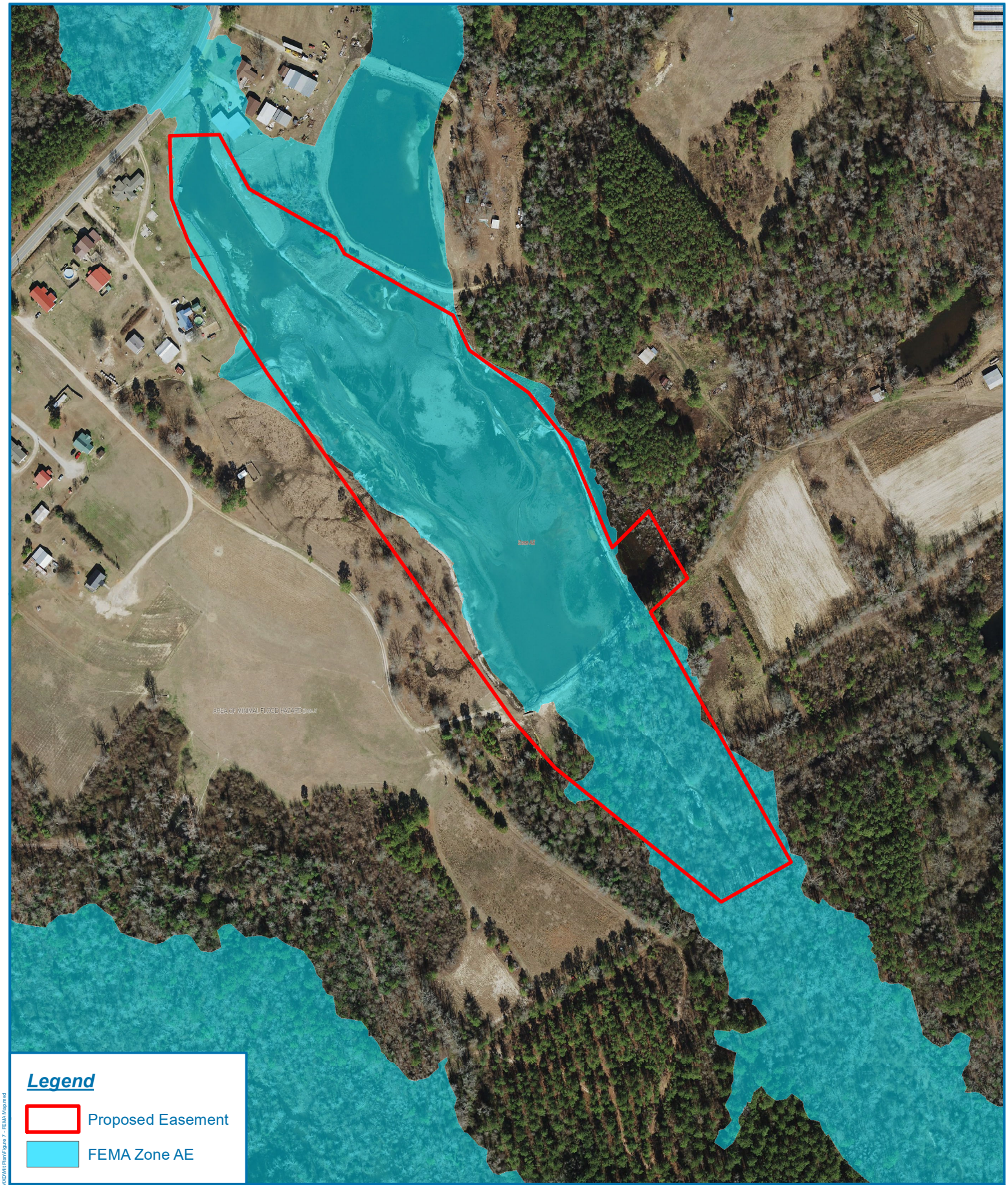


Figure 7 - FEMA Map

Panel: 3720166000K eff: 6/20/2018

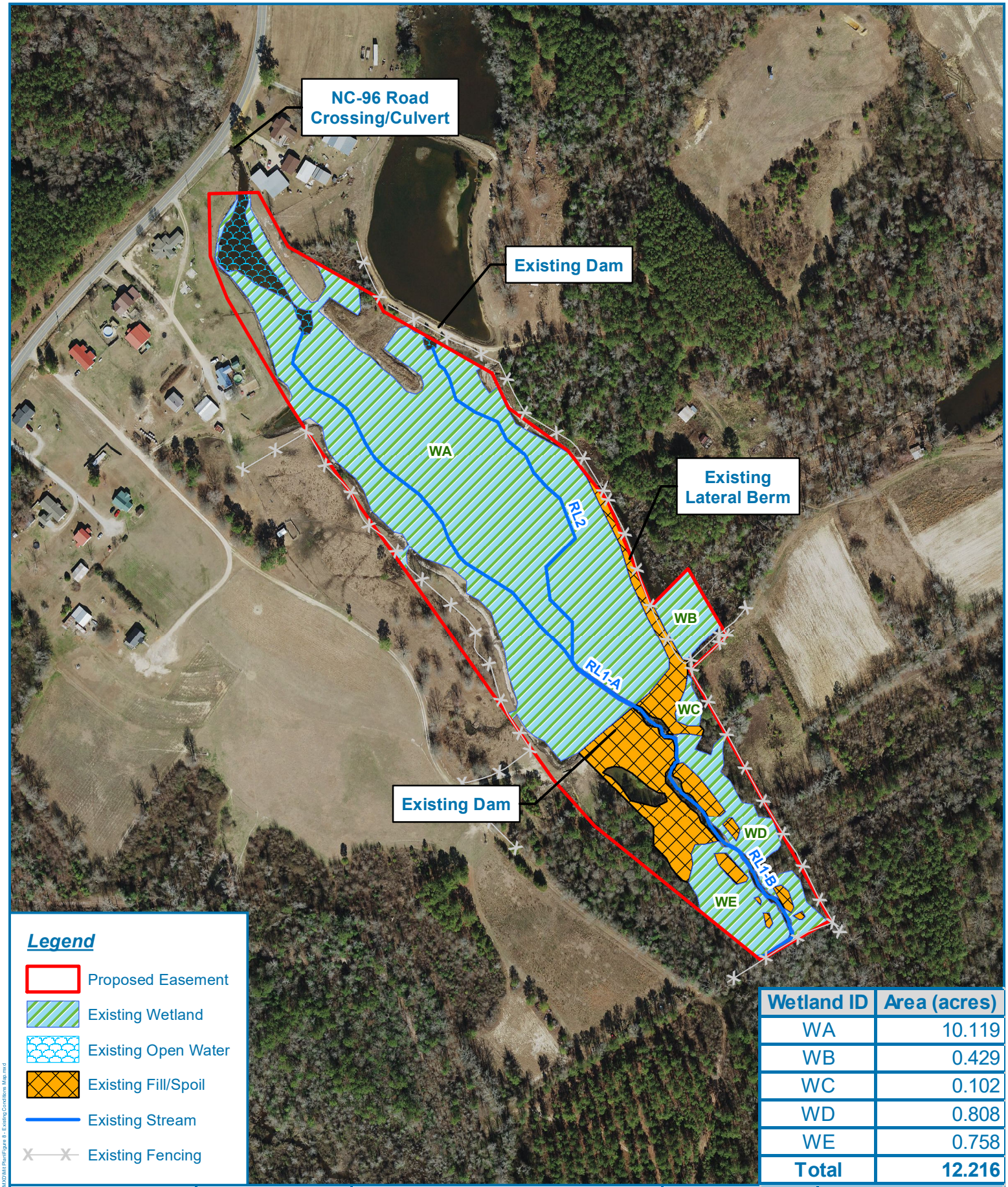
Matthew Mitigation Site

Johnston County, North Carolina

Date:	4/3/2019
Drawn by:	MDD
Checked by:	BPB
	1 inch = 300 feet

res

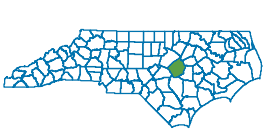
Document Path: S:\@RES GIS\Projects\NC\Matthew\MXD\M1 Plan\Figure 7 - FEMA Map.mxd



Legend

- Proposed Easement
- Existing Wetland
- Existing Open Water
- Existing Fill/Spoil
- Existing Stream
- Existing Fencing

Wetland ID	Area (acres)
WA	10.119
WB	0.429
WC	0.102
WD	0.808
WE	0.758
Total	**12.216**



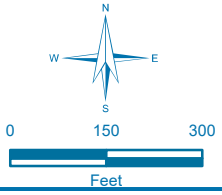


Figure 8 - Existing Conditions Map

Matthew Mitigation Site

Johnston County, North Carolina

Date: 8/22/2019

Drawn by: MDD

Checked by: BPB

1 inch = 300 feet

res

Document Path: S:\@RES GIS\Projects\NC\Matthew\MXD\Mit Plan\Figure 8 - Existing Conditions Map.mxd

Legend

- Proposed Easement
- NWI Wetlands (2018)

N
W E
S

0 150 300

Feet

Figure 9 - NWI Map

Matthew Mitigation Site

Johnston County, North Carolina

Date: 4/3/2019

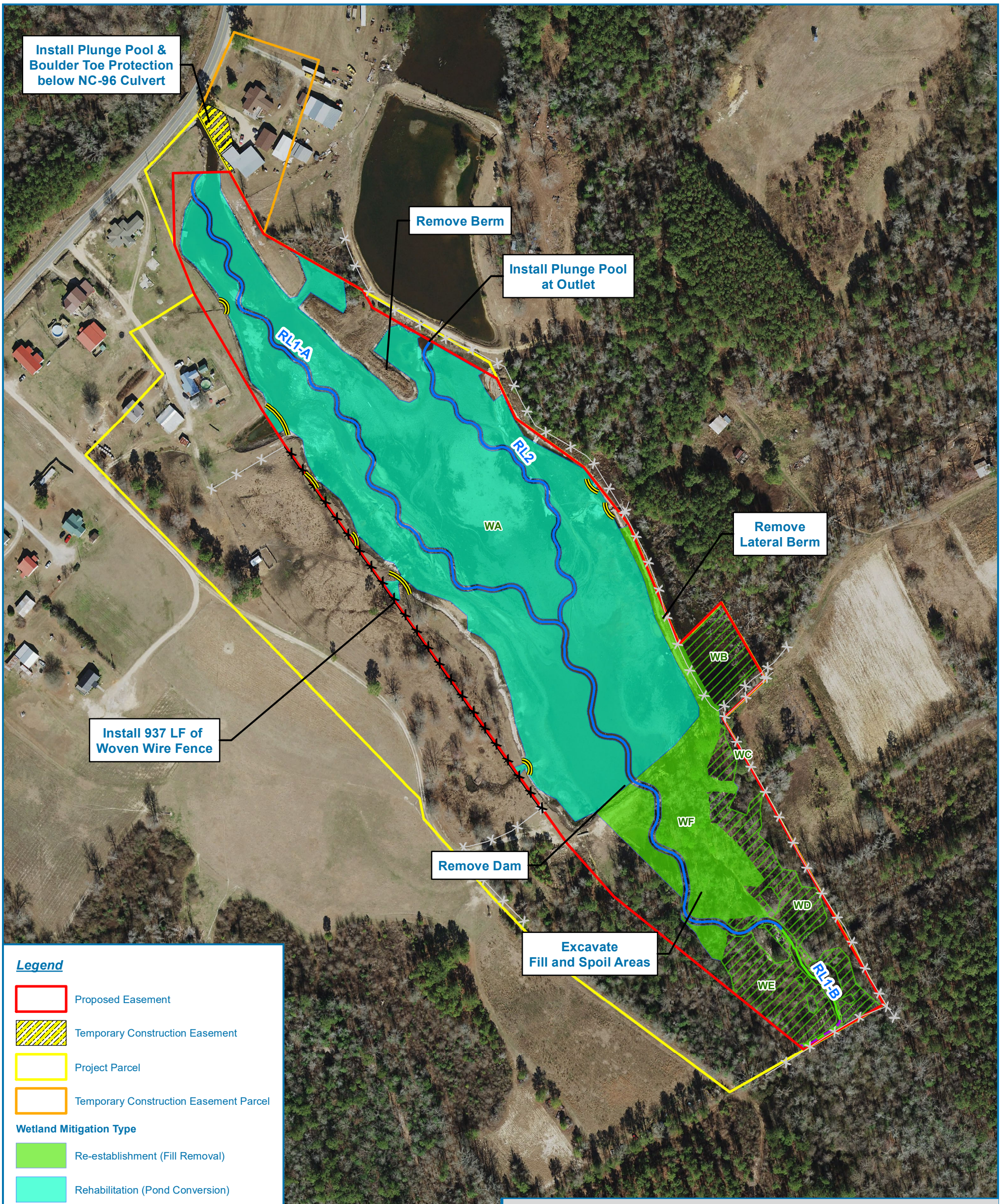
Drawn by: MDD

Checked by: BPB

1 inch = 300 feet

res

Document Path: S:\@RES GIS\Projects\NC\Matthew\MXD\M1 Plan\Figure 9 - NWI Map.mxd



Legend

- Proposed Easement
- Temporary Construction Easement
- Project Parcel
- Temporary Construction Easement Parcel

Wetland Mitigation Type

- Re-establishment (Fill Removal)
- Rehabilitation (Pond Conversion)
- Preservation

Stream Mitigation Type

- Restoration
- Preservation
- Preservation (No credit)
- Proposed Fence
- Existing Fencing
- Engineered Sediment Pack

Matthew Mitigation Site Credits

Stream Mitigation

Reach	Mitigation Type	Proposed Length (LF)	Mitigation Ratio	Warm SMUs
RL1-A	Restoration	2438	1:1	2438.000
RL1-B	Preservation	234	10:1	23.400
RL1-B	Preservation (no credit)	108	N/A	0.000
RL2	Restoration	792	1:1	792.000
Total		**3,572**		**3,253.400**

Wetland Mitigation

Wetland ID	Mitigation Type	Proposed Area (ac)	Mitigation Ratio	WMUs
WA	Rehabilitation (Pond Conversion)	10.202	2:1	5.101
WF	Re-establishment (Fill Removal)	1.900	1:1	1.900
WB,WC,WD,WE	Preservation	2.063	10:1	0.206
Total		**14.165**		**7.207**

0 100 200
Feet

Figure 10 - Conceptual Plan Map

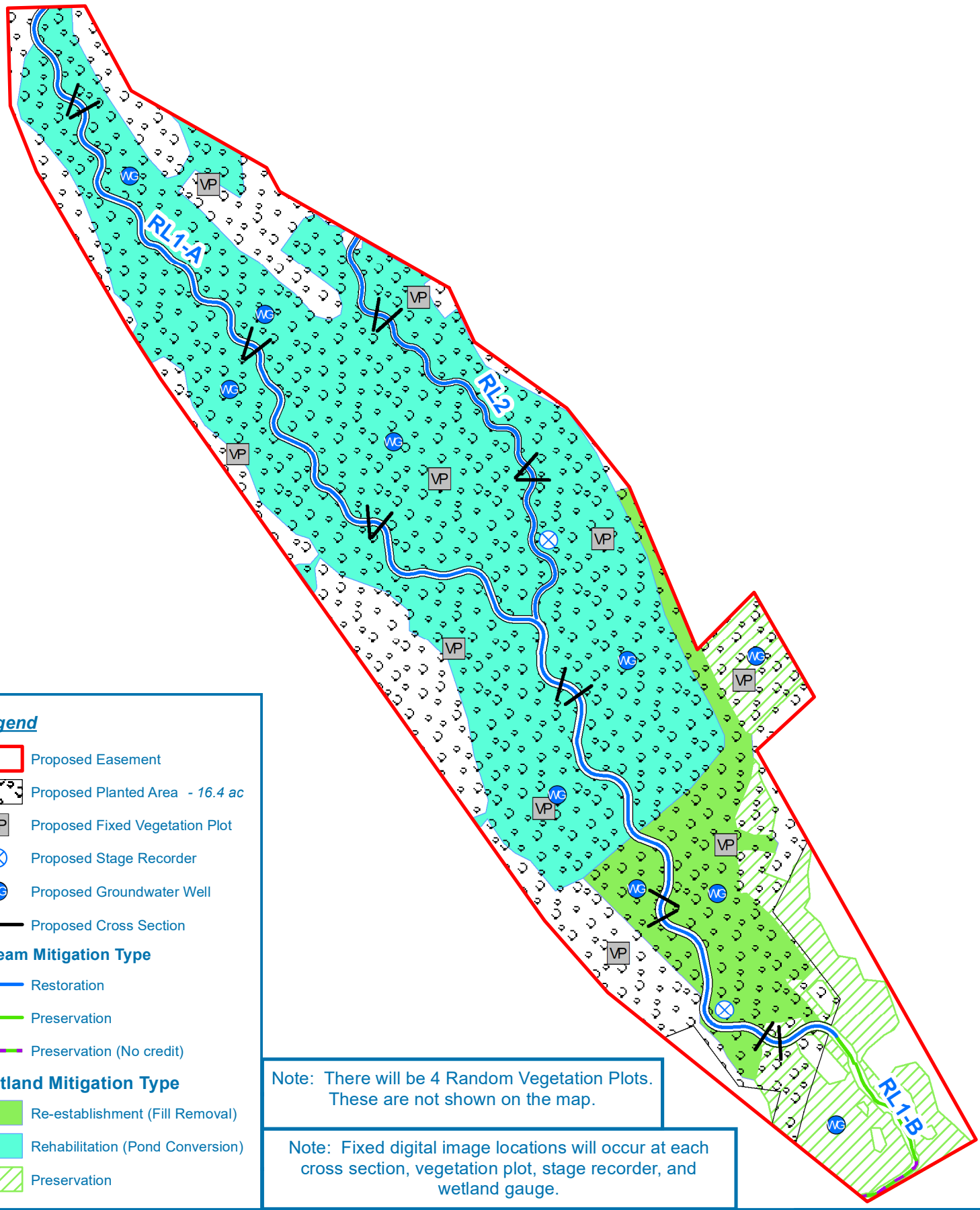
Matthew Mitigation Site

Johnston County, North Carolina

Date: 9/6/2019
Drawn by: MDD
Checked by: BPB
1 inch = 200 feet

res

Document Path: S:\@RES GIS\Projects\NCMatthew\MXD\Mit Plan\Figure 10 - Conceptual Plan Map.mxd



Legend

- Proposed Easement
- Proposed Planted Area - *16.4 ac*
- VP — Proposed Fixed Vegetation Plot
- Proposed Stage Recorder
- WG — Proposed Groundwater Well
- Proposed Cross Section

Stream Mitigation Type

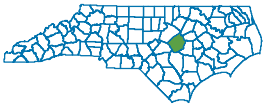
- Restoration
- Preservation
- Preservation (No credit)

Wetland Mitigation Type

- Re-establishment (Fill Removal)
- Rehabilitation (Pond Conversion)
- Preservation

Note: There will be 4 Random Vegetation Plots. These are not shown on the map.

Note: Fixed digital image locations will occur at each cross section, vegetation plot, stage recorder, and wetland gauge.



N W E S

0 100 200

Feet

Figure 11 - Monitoring Plan Map

Matthew Mitigation Site

Johnston County, North Carolina

Date: 8/15/2019

Drawn by: MDD

Checked by: BPB

1 inch = 200 feet

res

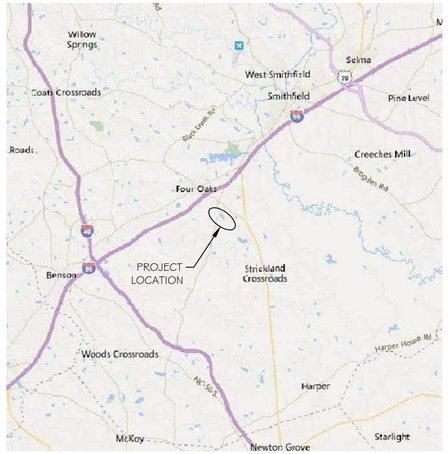
Document Path: S:\@RES GIS\Projects\NC\Matthew\MXD\Mit Plan\Figure 11 - Monitoring Plan Map.mxd

Appendix A - Plan Sheets

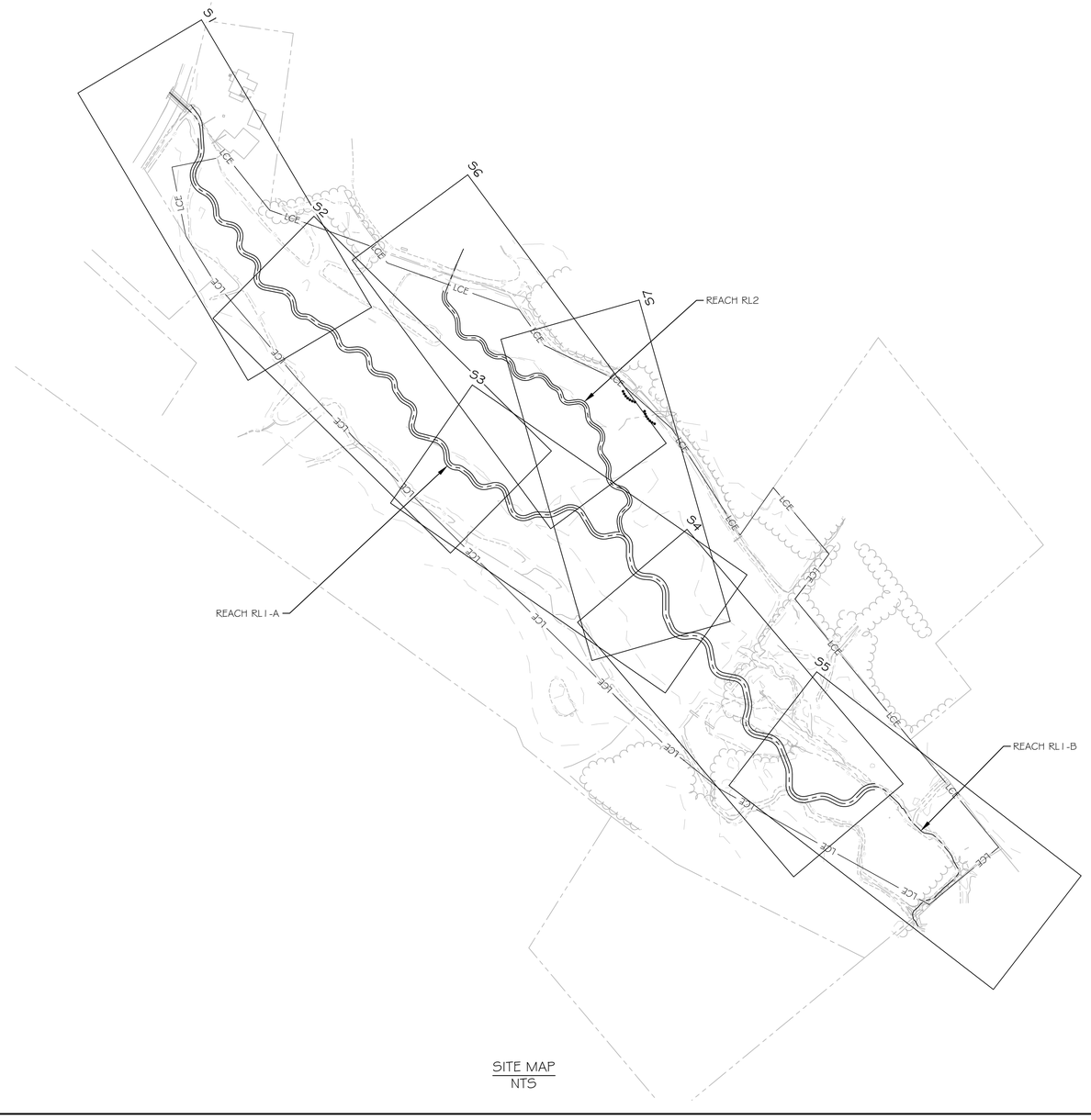
MATTHEW MITIGATION SITE

JOHNSTON COUNTY, NORTH CAROLINA

NEUSE RIVER BASIN: HUC 03020201
SEPTEMBER 2019



VICINITY MAP
NTS



SITE MAP
NTS

Sheet List Table	
Sheet Number	Sheet Title
-	COVER
A1	OVERALL AERIAL
E1	NOTES
E2	EXISTING CONDITIONS
S1	REACH RL1
S2	REACH RL1
S3	REACH RL1
S4	REACH RL1
S5	REACH RL1
S6	REACH RL2
S7	REACH RL2
W1	WETLAND PLAN
F1	FENCING PLAN
P1	PLANTING PLAN
D1	DETAILS
D2	DETAILS
D3	DETAILS
D4	DETAILS
D5	DETAILS
D6	DETAILS

PROJECT DIRECTORY

DESIGNED BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON ST., SUITE 110
RALEIGH, NC 27605

DESIGNED FOR:
LINDSAY CROCKER
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
217 WEST JONES ST., SUITE 300A
RALEIGH, NC 27603

SURVEYED BY:
MATRIX EAST, PLLC
906 N. QUEEN ST., SUITE A
KINSTON, NC 28501

DMS PROJECT #: 100043
CONTRACT #: 7419
USACE ACTION ID #: SAW-2018-01256
RFP #: 16-007279

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SEAL

MARK	DATE	DESCRIPTION
REVISIONS:		
RELEASED FOR:		PRELIMINARY - NOT FOR CONSTRUCTION

PLOT DATE: 9/3/2019

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:

-

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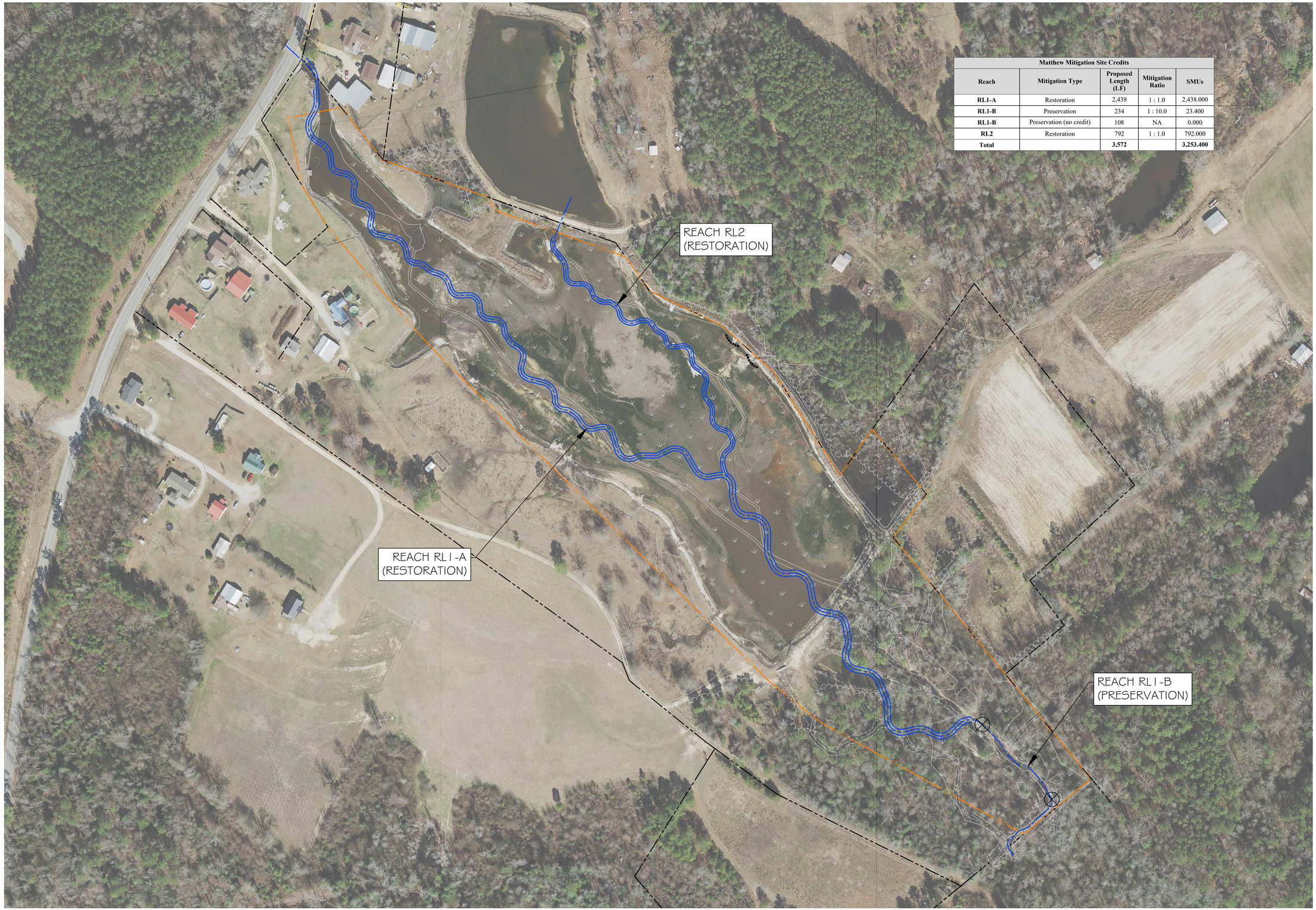

Matthew Mitigation Site Credits

Reach	Mitigation Type	Proposed Length (LF)	Mitigation Ratio	SMUs
RL1-A	Restoration	2,438	1 : 1.0	2,438.000
RL1-B	Preservation	234	1 : 10.0	23.400
RL1-B	Preservation (no credit)	108	NA	0.000
RL2	Restoration	792	1 : 1.0	792.000
Total		**3,572**		**3,253.400**

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SEAL

FULL SCALE: 1"= 100

0 100 200

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 09/03/2019

MARK	DATE	DESCRIPTION

REVISIONS:

RELEASED FOR:
PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME:
MATTHEW MITIGATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
OVERALL AERIAL

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:
A1

FILE NAME:S:\@RES GIS\Projects\NC\Matthew\CAD\DWG\0535_SHT_COVER.dwg SAVED BY: Tswartzfager

STREAM CONSTRUCTION NOTES:

1. ALL PROPOSED CHANNELS AND TEMPORARY AND PERMANENT CROSSINGS SHALL BE CONSTRUCTED IN A DRY CONDITION VIA OFFLINE CONSTRUCTION WHERE POSSIBLE. PUMP AROUND OPERATIONS SHOULD BE LIMITED TO AREAS WHERE THE EXISTING AND PROPOSED CHANNEL ALIGNMENTS OVERLAP.
2. ALL IMPERVIOUS DIKES AND PUMPING APPARATUS SHALL BE REMOVED FROM THE STREAM AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL UNLESS OTHERWISE APPROVED BY THE ENGINEER. WITH APPROVAL, A PUMP AROUND MAY BE ALLOWED TO RUN CONTINUOUSLY IF THERE IS NO FORECAST FOR RAIN OVERNIGHT, AND/OR THE PUMP APPARATUS IS MAINTAINED AND MONITORED CONTINUOUSLY.
3. CONSTRUCT UPSTREAM PORTION OF THE CHANNEL FIRST, WORKING IN AN UPSTREAM TO DOWNSTREAM DIRECTION, UNLESS OTHERWISE APPROVED BY THE ENGINEER.
4. REMOVE AND STOCKPILE TOPSOIL WITHIN AREAS THAT ARE TO BE CUT 9" OR MORE BELOW EXISTING GRADE. STOCKPILED TOPSOIL IS TO BE PLACED ALONG THE FLOODPLAIN BENCHES.
5. STRUCTURES ARE TO BE INSTALLED IN LOCATIONS SHOWN ON PLAN SHEETS (AS INDICATED ON THE STRUCTURE TABLES) USING METHODS DESCRIBED IN THE DETAIL SHEETS. PRIOR TO FINE GRADING, OBTAIN APPROVAL OF THE ENGINEER ON INSTALLATION OF STRUCTURES.
6. ALL PROPOSED SHALLOW/RIFFLE SECTIONS SHALL BE CONSTRUCTED ACCORDING TO TYPICAL WOODY RIFFLE DETAILS. SEE SHEET D5 FOR SPECIFICATIONS.
7. UPON COMPLETION OF FINE GRADING, INSTALL STREAM BANK STABILIZATION MEASURES INCLUDING EROSION CONTROL MATTING OR SOD MATS ALONG CHANNEL BANKS.
8. FILL AND STABILIZE ABANDONED SEGMENTS OF THE EXISTING CHANNEL PER DIRECTION OF THE ENGINEER.

LEGEND

- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR
- EXISTING WETLAND
- EXISTING STREAM
- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING OVERHEAD ELECTRIC UTILITY LINE
- PROPERTY LINE
- EXISTING FENCELINE
- EXISTING TREELINE
- EXISTING TREE
- PROPOSED TOP OF BANK
- PROPOSED CENTERLINE OF CHANNEL
- LIMITS OF PROPOSED CONSERVATION EASEMENT
- PROPOSED CHANNEL PLUG (SEE DETAIL D2)
- BRUSH TOE PROTECTION (SEE DETAIL D3)
- ENGINEERED SEDIMENT PACK (SEE DETAIL D7)
- LOG SILL (SEE DETAIL D4)
- ROCK CROSS VANE (SEE DETAIL D6)
- LOG CROSS VANE (SEE DETAIL D6)
- LOG VANE (SEE DETAIL D3)
- STONE RIFFLE (SEE DETAIL D5)
- RIFFLE GRADE CONTROL (SEE DETAIL D6)
- LOG STRUCTURE (PROFILE)
- ROCK STRUCTURE (PROFILE)

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SEAL

SCALE: AS SHOWN

PLOT DATE: 9/3/2019

MARK	DATE	DESCRIPTION

REVISIONS:

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME:
MATTHEW MITIGATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
NOTES

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:
E1

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SEAL

FULL SCALE: 1"=100

0 100 200

2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION
REVISIONS:		

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PLOT DATE: 09/03/2019

PROJECT NAME:
MATTHEW MITIGATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
EXISTING CONDITIONS

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:

E2

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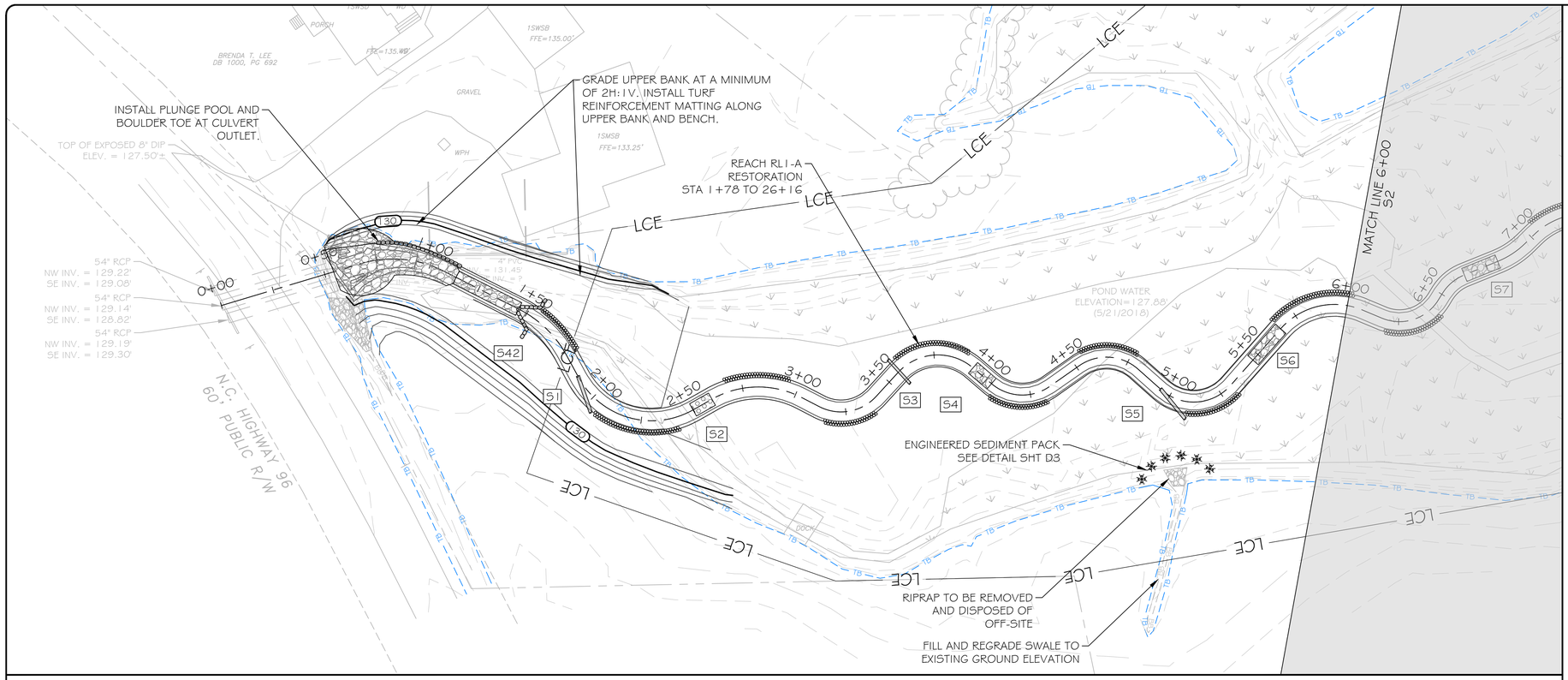

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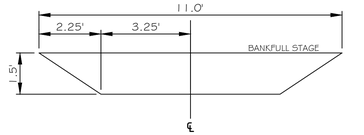
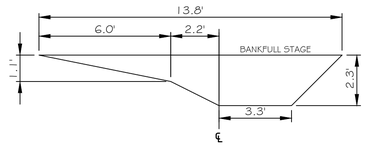
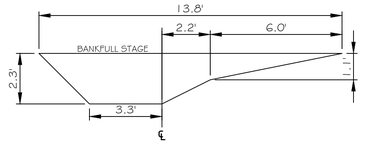


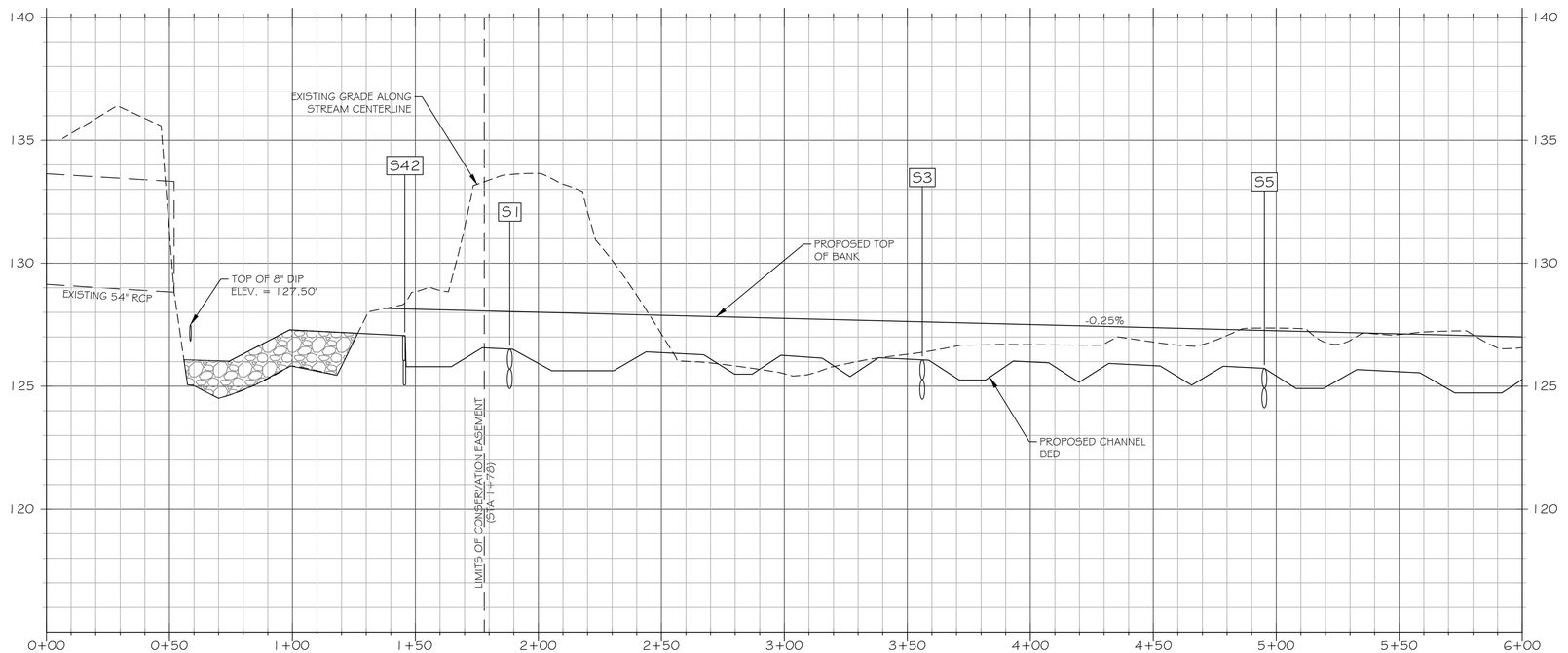
TYPICAL RIFFLE CROSS SECTION



TYPICAL RIGHT MEANDER CROSS SECTION



TYPICAL LEFT MEANDER CROSS SECTION



SCALE: HOR 1"=30'; VERT 1"=3'

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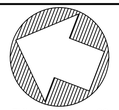
SEAL



FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION
REVISIONS:		

RELEASED FOR:
PRELIMINARY - NOT FOR CONSTRUCTION

PLOT DATE: 09/03/2019

PROJECT NAME:
MATTHEW MITIGATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH RL1

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:
S1

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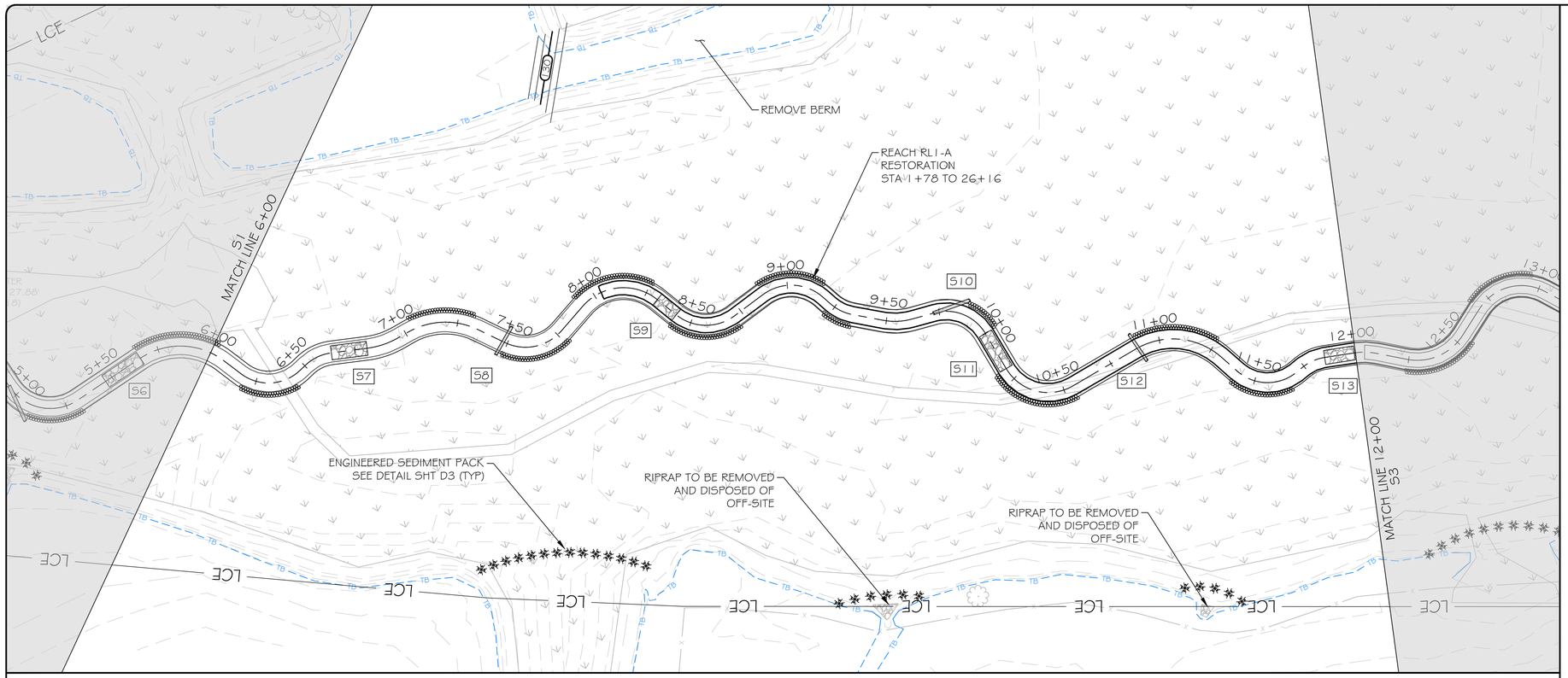

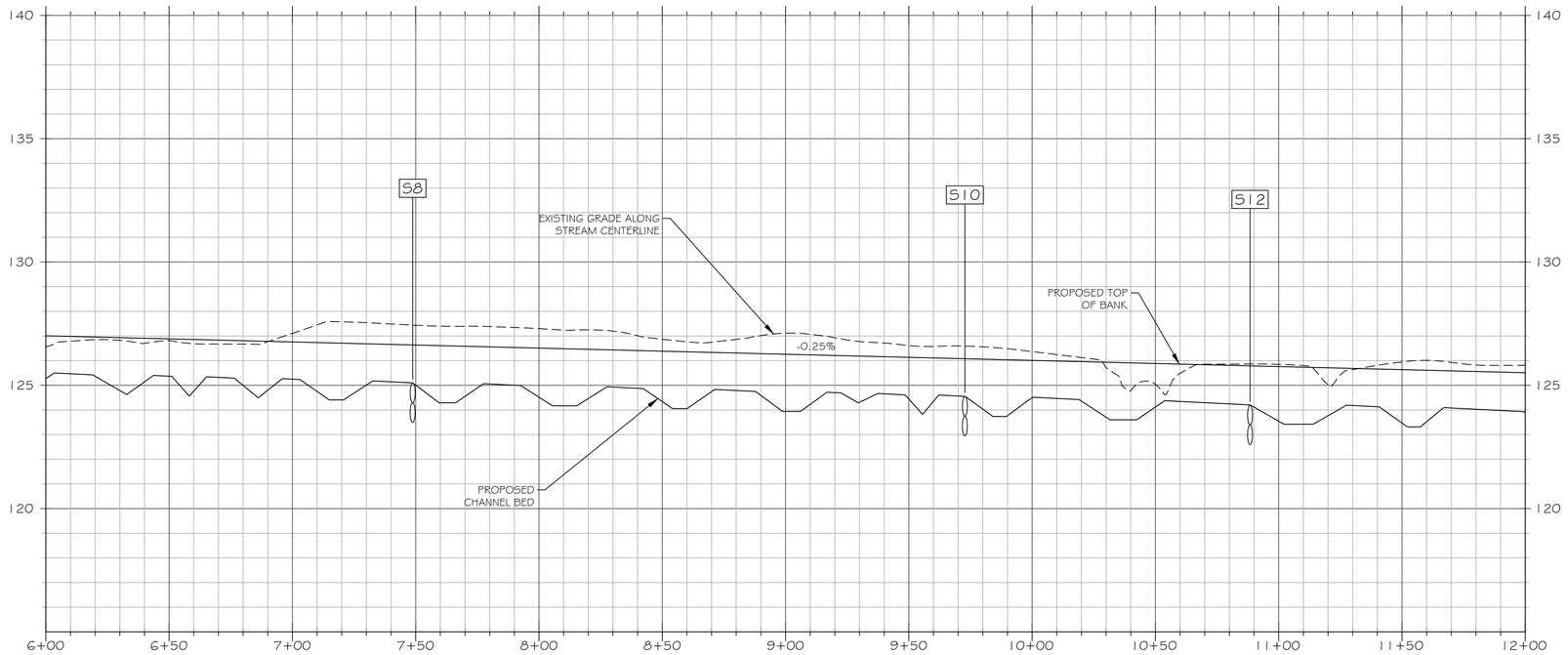

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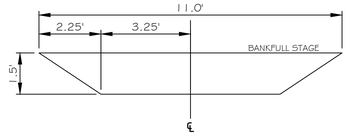
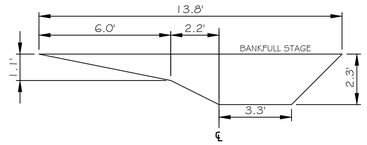
REACH RL1-A STA 0+47 TO STA 16+34



TYPICAL RIFFLE CROSS SECTION



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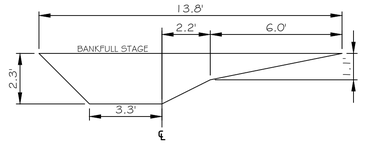

TYPICAL LEFT MEANDER CROSS SECTION

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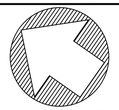
SEAL



FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION
REVISIONS:		

RELEASED FOR:
PRELIMINARY - NOT FOR CONSTRUCTION

PLOT DATE:
09/03/2019

PROJECT NAME:
MATTHEW MITIGATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH RL1

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:
S2

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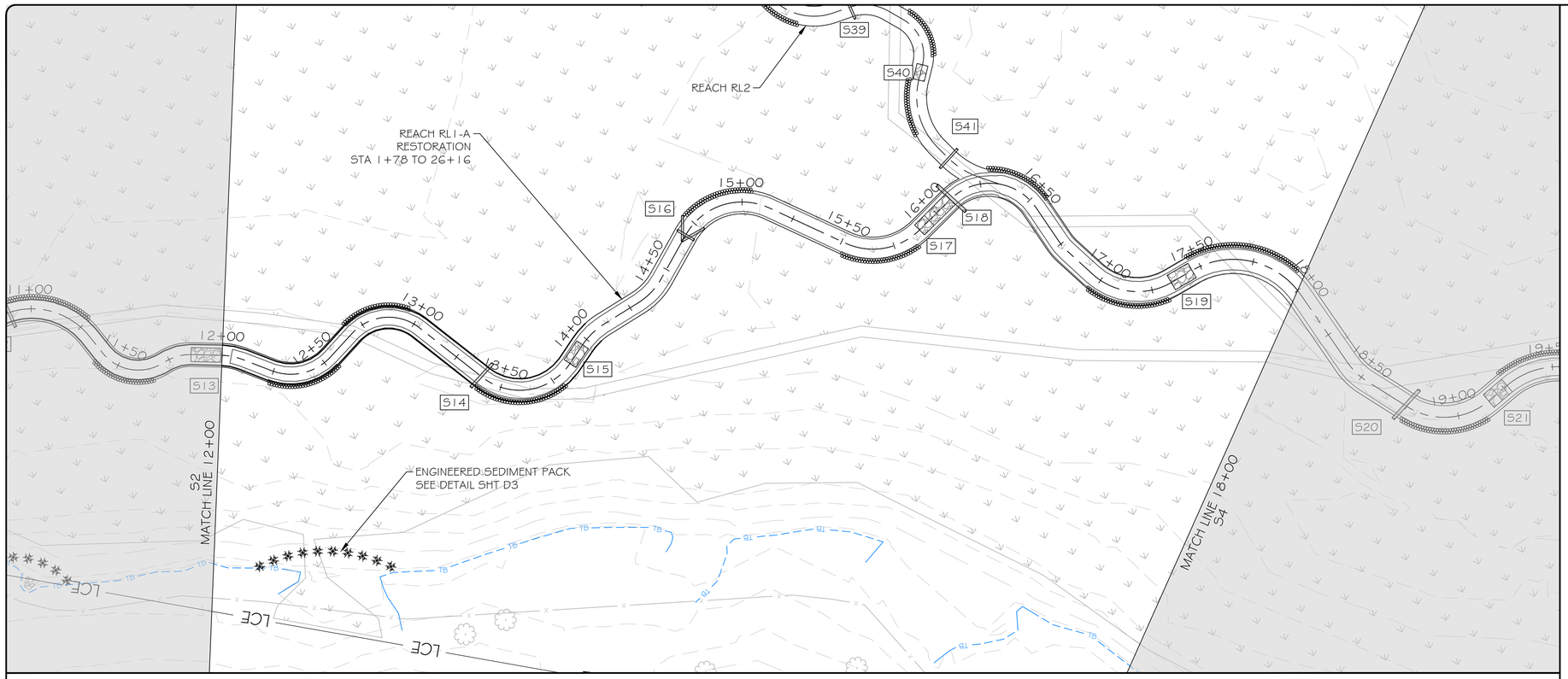

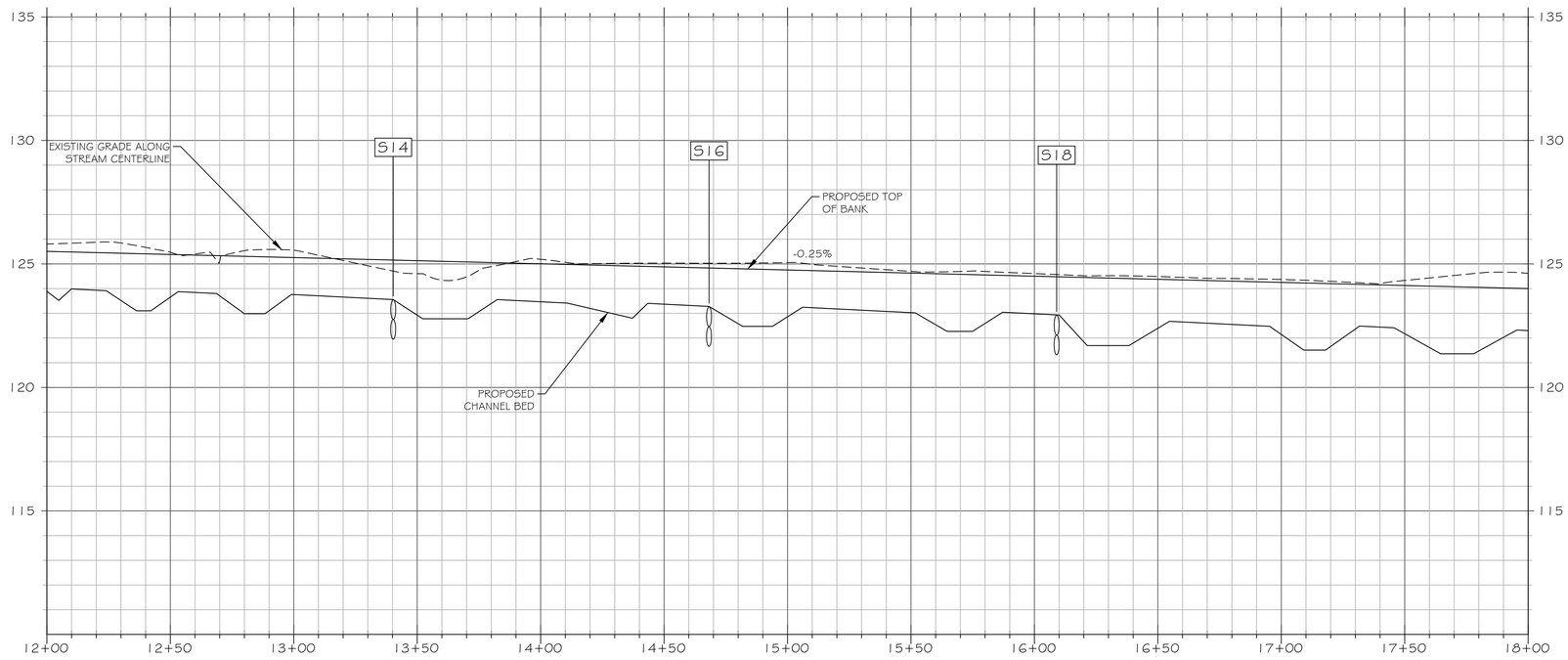

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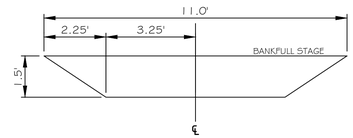
REACH RL1-A STA 0+47 TO STA 16+34



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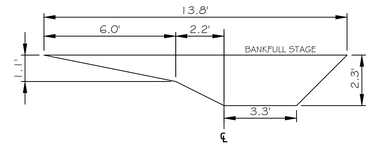

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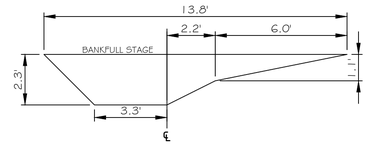
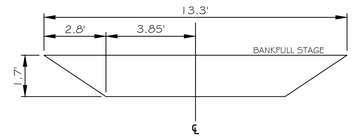


TYPICAL LEFT MEANDER CROSS SECTION

REACH RL1-A STA 16+34 TO STA 26+16



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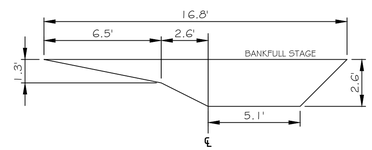

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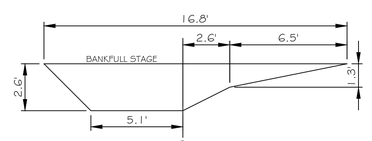

TYPICAL LEFT MEANDER CROSS SECTION

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FULL SCALE: 1"=30

0 30 60

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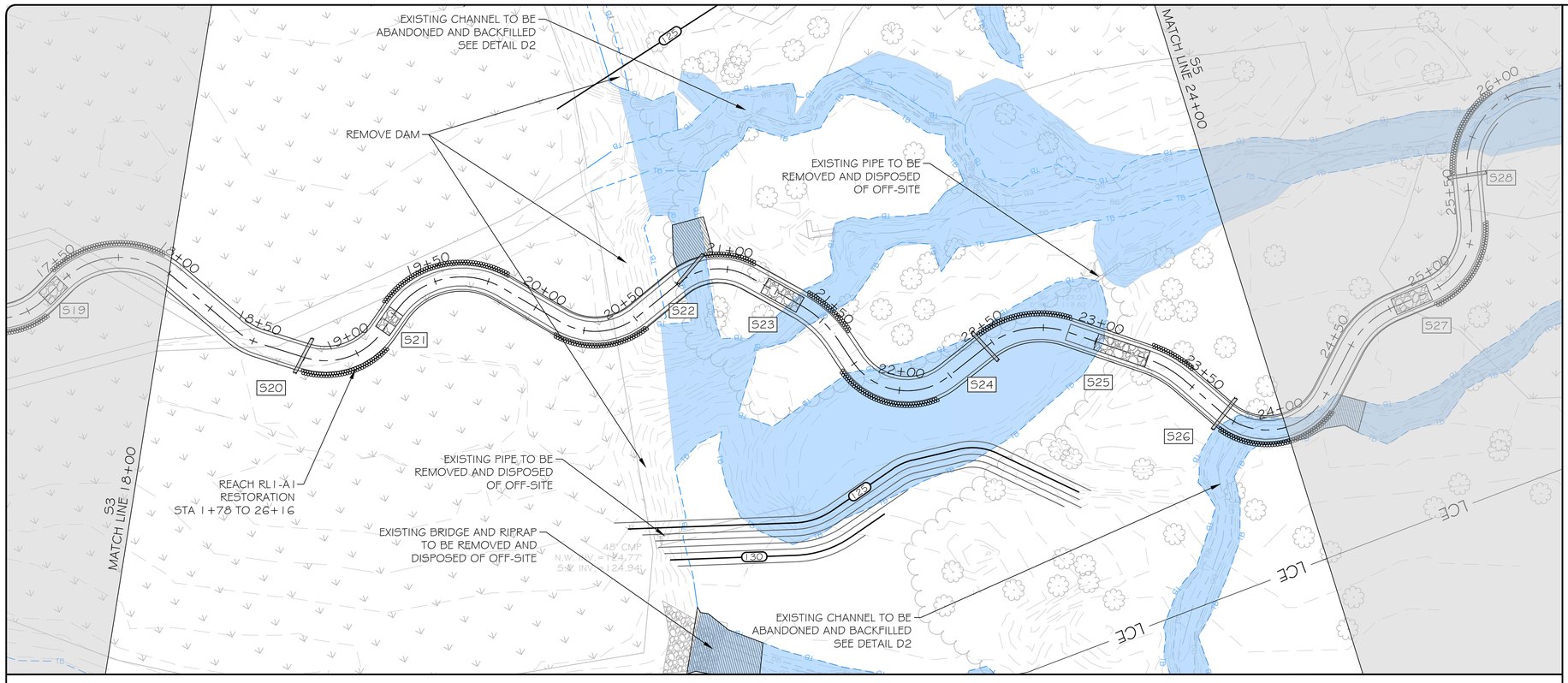
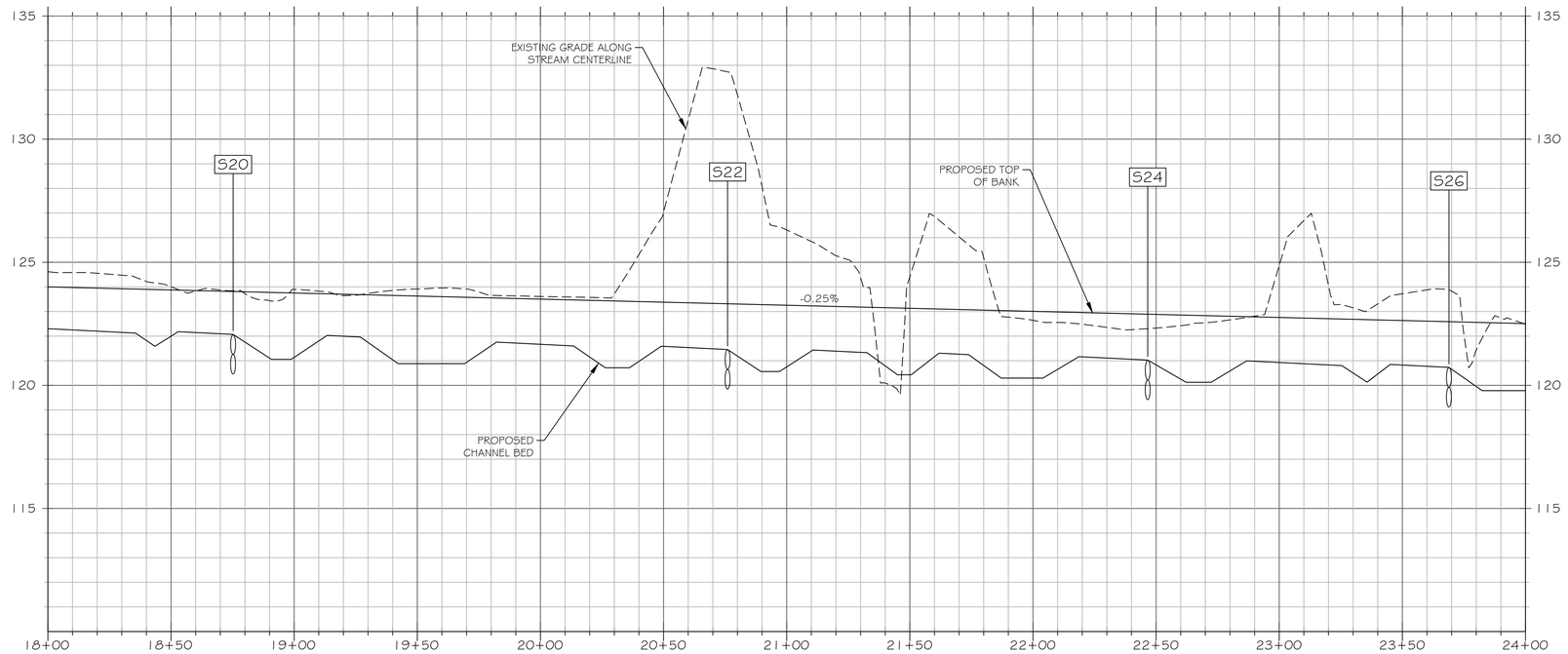
SHEET NUMBER:
S3

FILE NAME:S:\@RES GIS\Projects\NC\Matthew\CAD\DWG\0535_SHT_RL1.dwg SAVED BY: Fmullen





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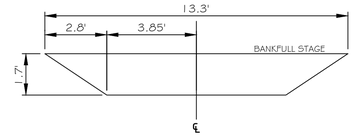
REACH RL1-A STA 16+34 TO STA 26+16



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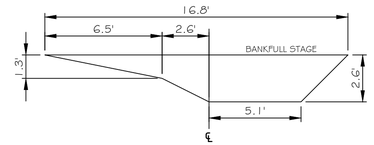

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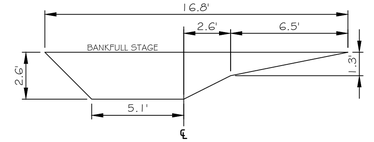

TYPICAL LEFT MEANDER CROSS SECTION

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CHECKED:	AFM

SHEET NUMBER:
S4

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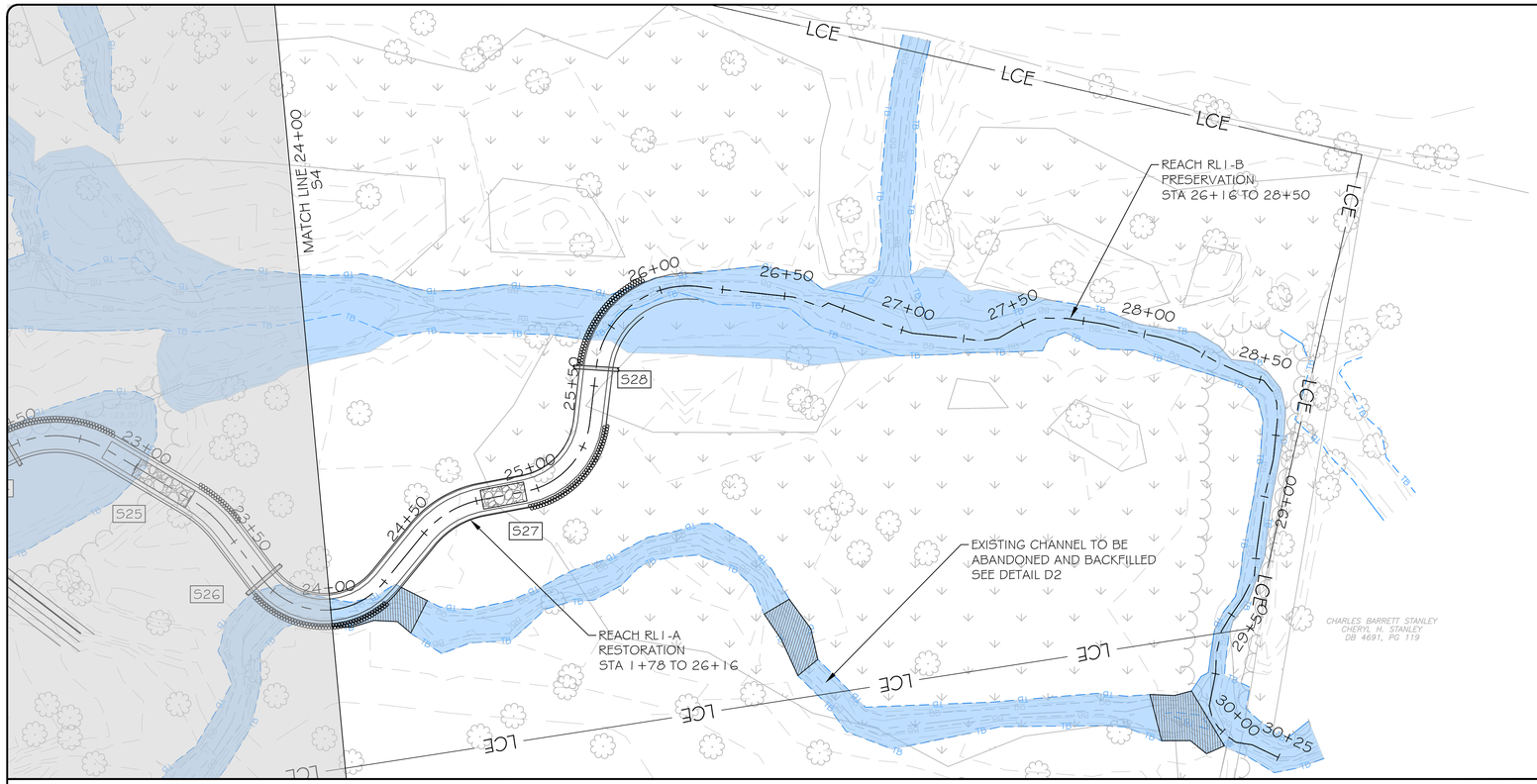
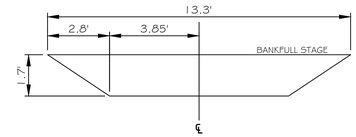


REACH RL1-A STA 16+34 TO STA 26+16



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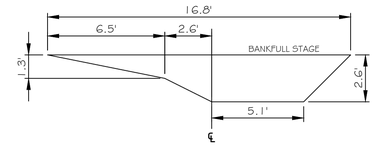

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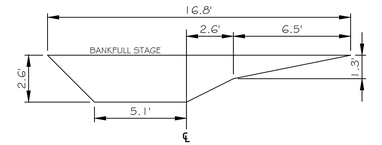

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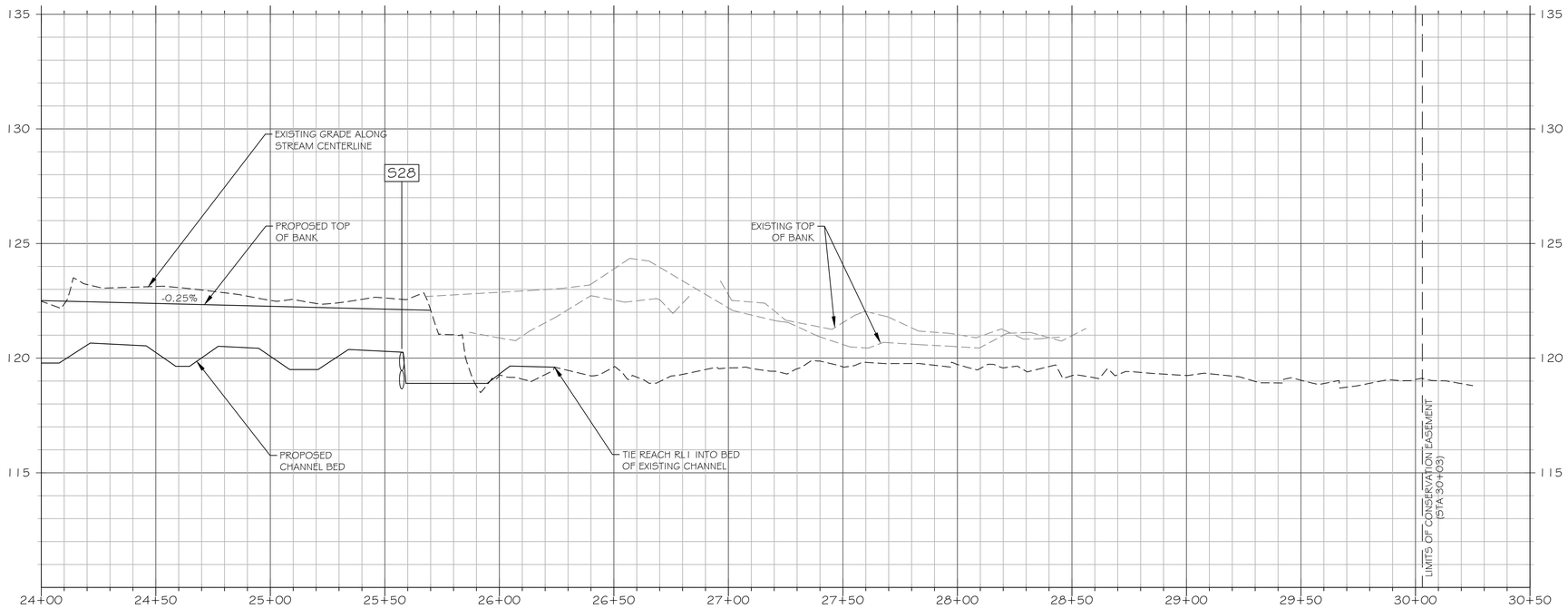

SCALE: HOR 1"=30'; VERT 1"=3'

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SEAL

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0 30 60

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MARK	DATE	DESCRIPTION

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JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH RL1

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:
S5

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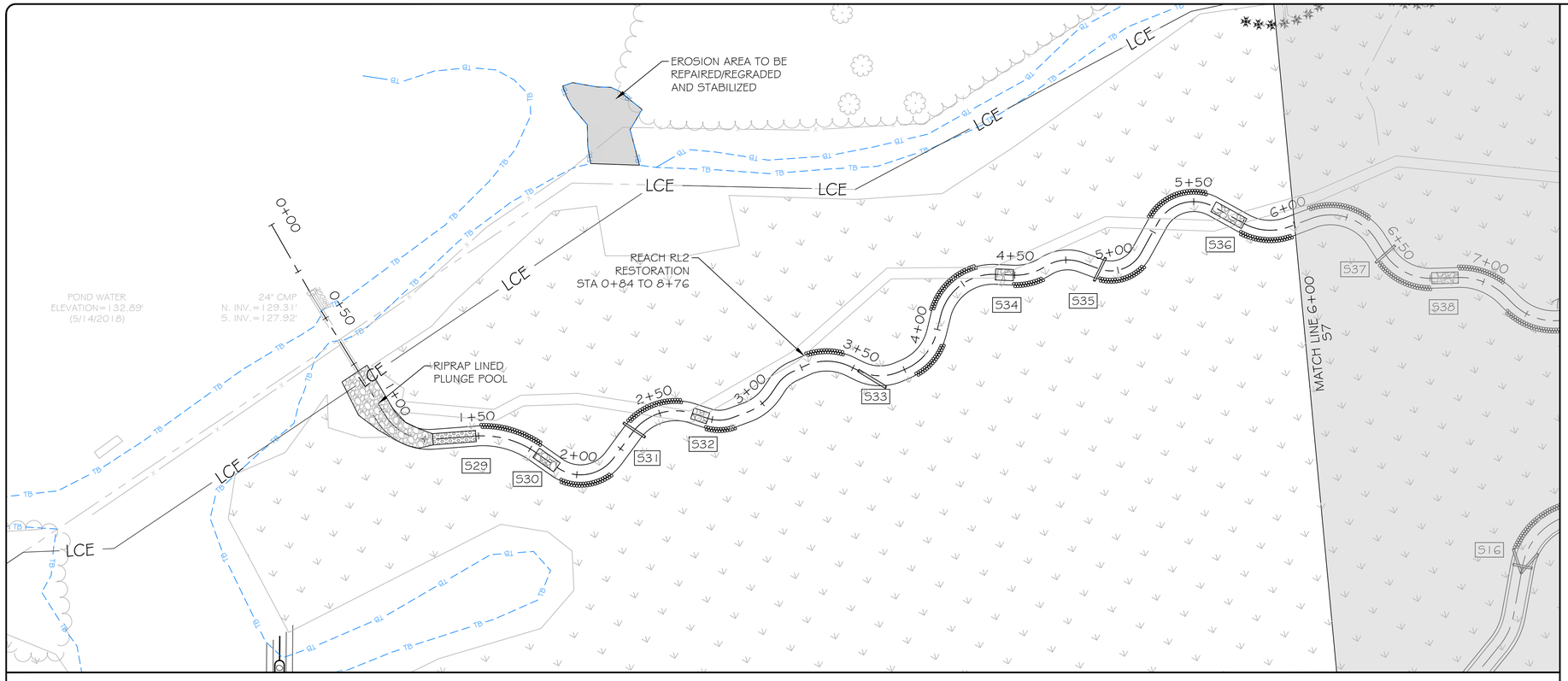
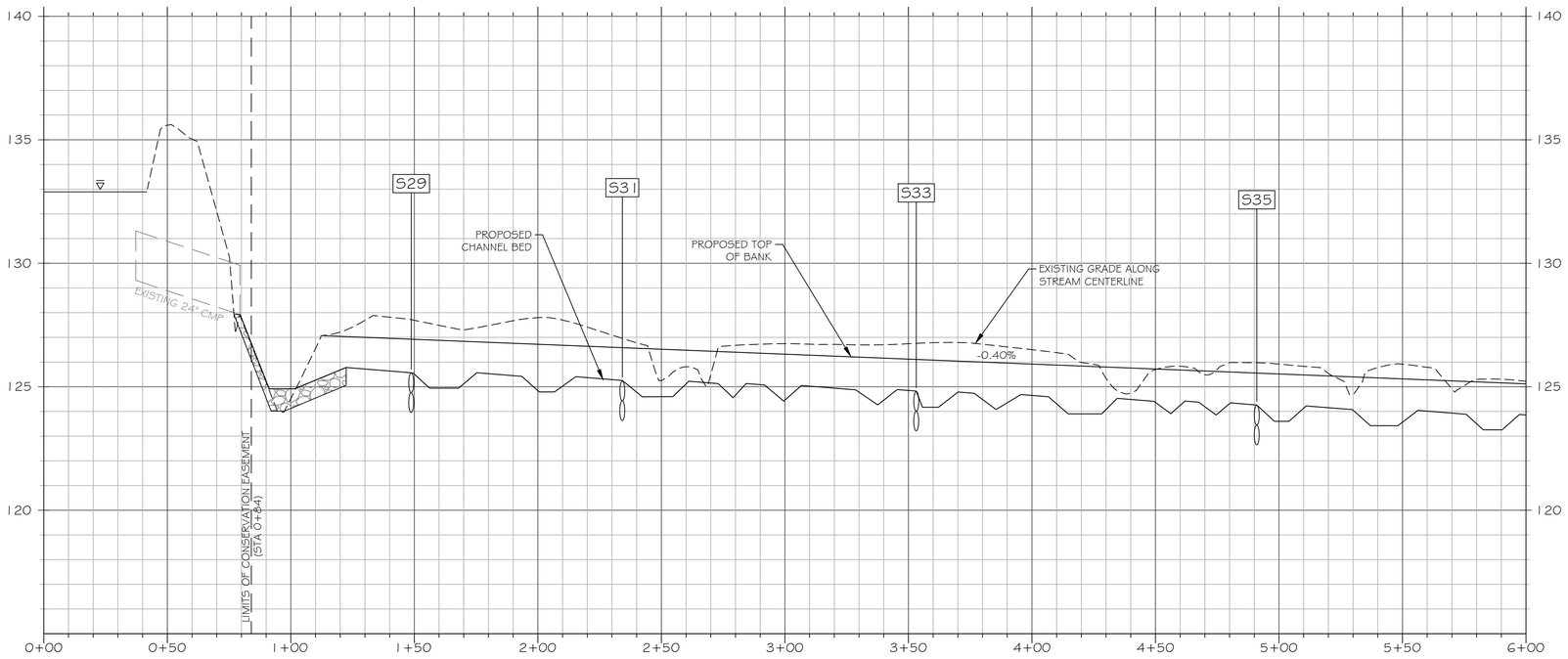
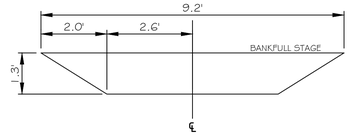




SCALE: HOR 1"=30'; VERT 1"=3'

REACH RL2 STA 0+79 TO STA 8+76



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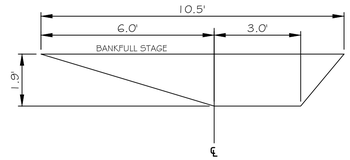

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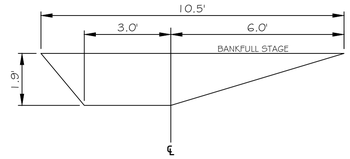

TYPICAL LEFT MEANDER CROSS SECTION

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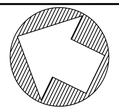

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
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MARK	DATE	DESCRIPTION

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09/03/2019

PROJECT NAME:
MATTHEW MITIGATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH RL2

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:
S6

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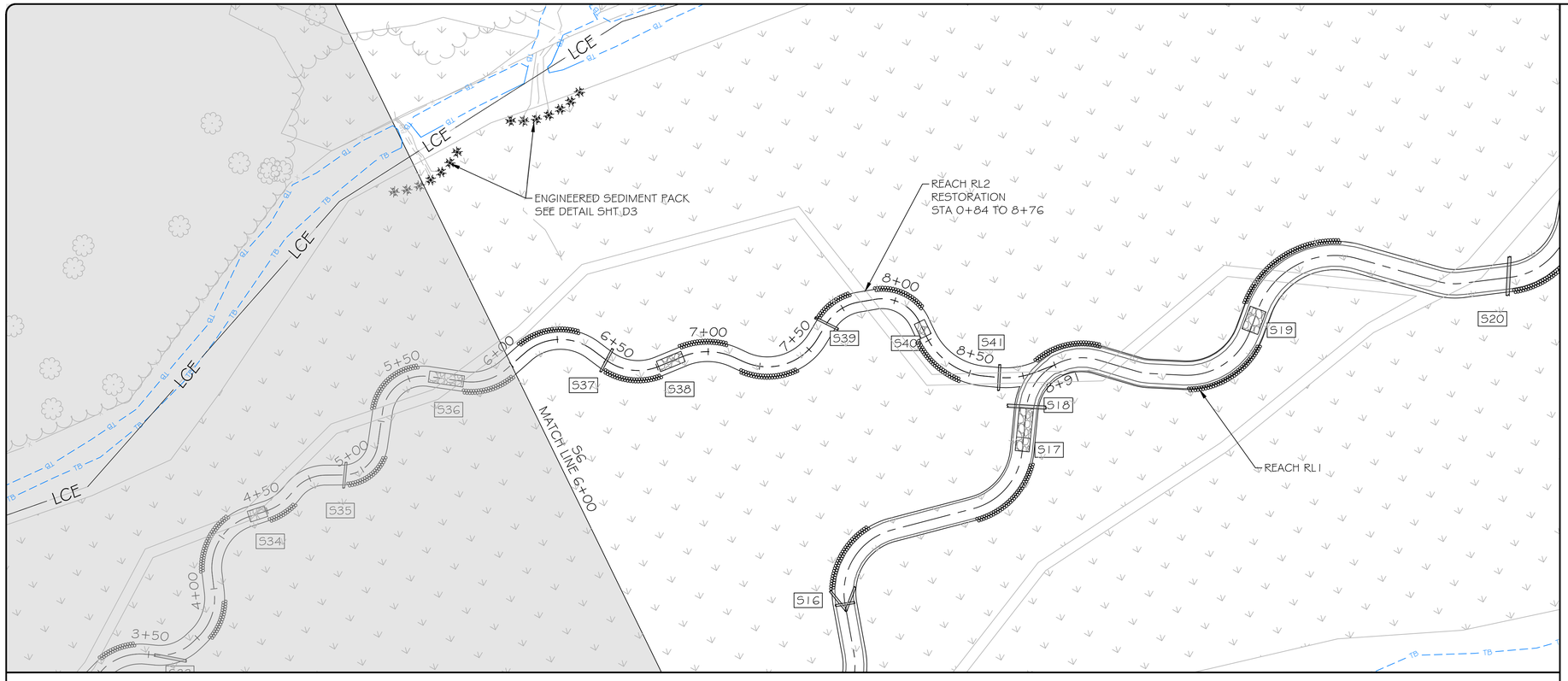
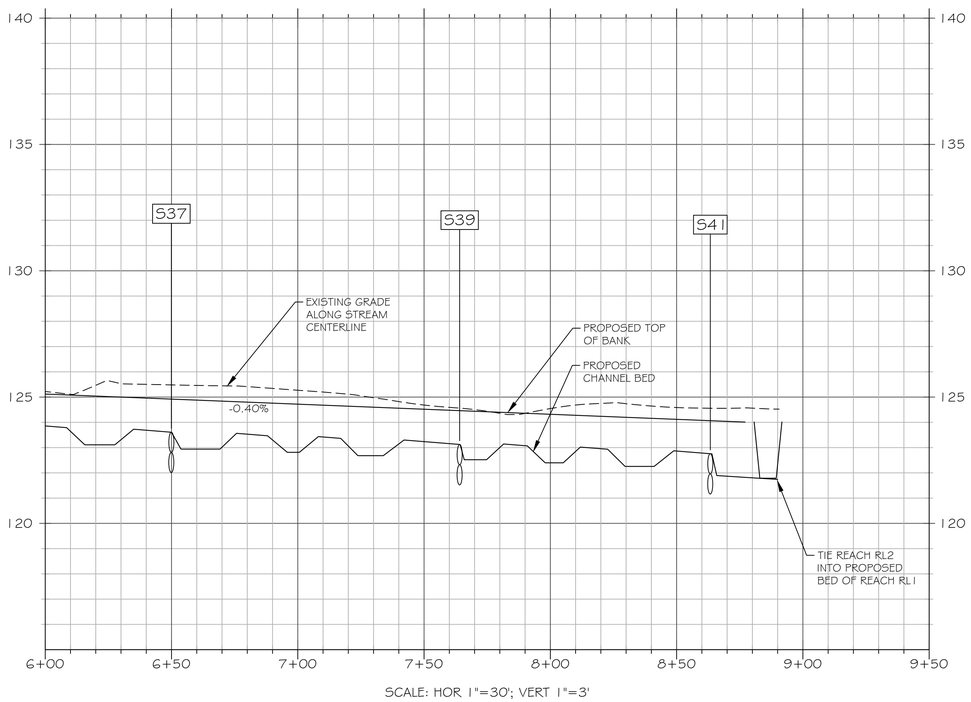
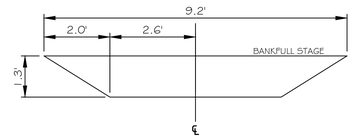




SCALE: HOR 1"=30'; VERT 1"=3'

REACH RL2 STA 0+79 TO STA 8+76



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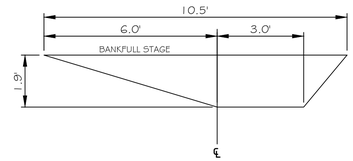

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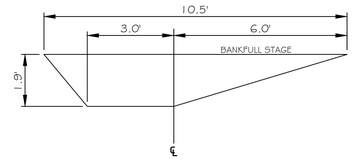

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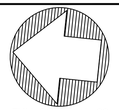

FULL SCALE: 1"=30

0 30 60

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PROJECT NUMBER:	0535
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DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:
S7

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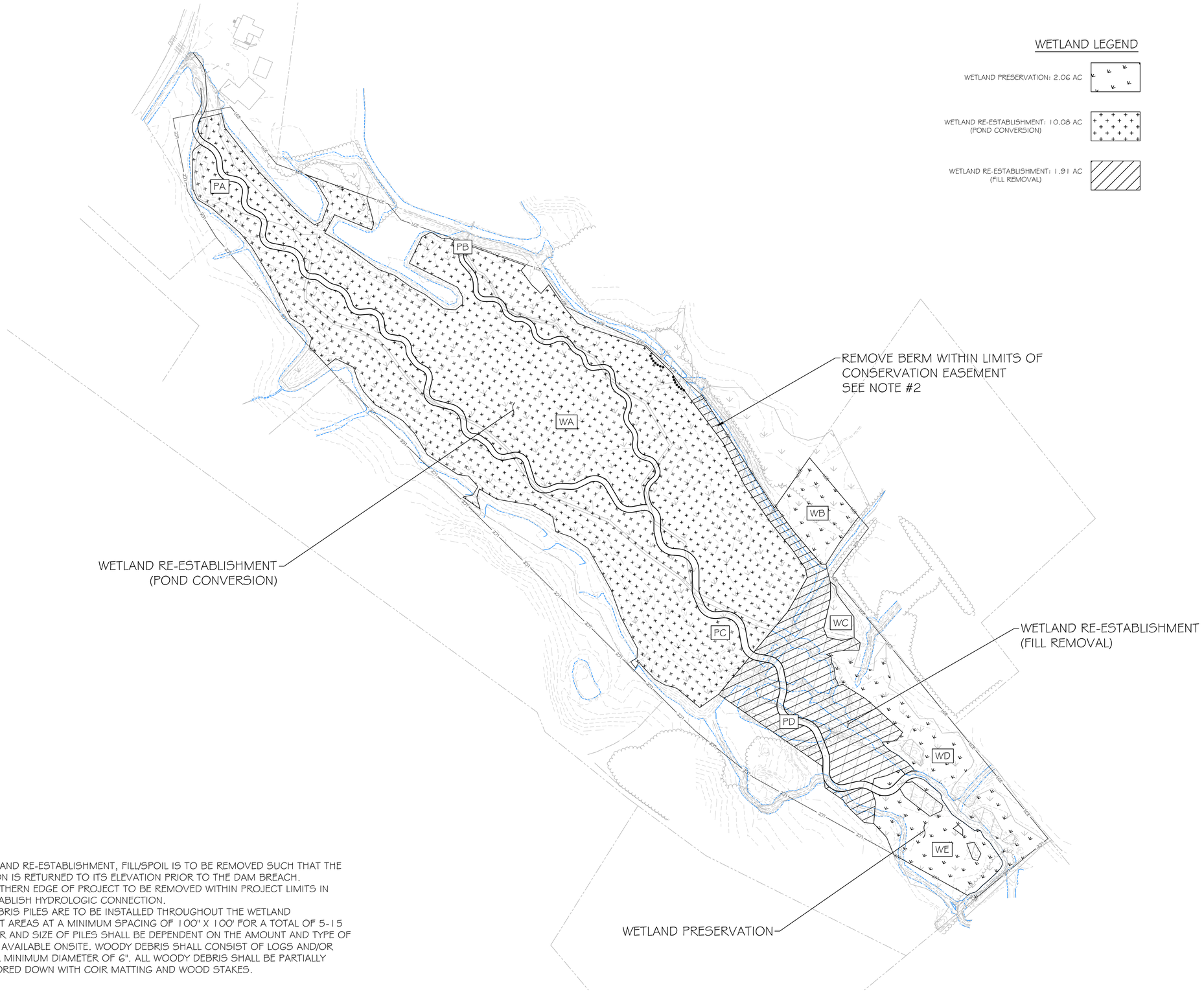

NOTES:

1. IN AREAS OF WETLAND RE-ESTABLISHMENT, FILL/SPOIL IS TO BE REMOVED SUCH THAT THE GROUND ELEVATION IS RETURNED TO ITS ELEVATION PRIOR TO THE DAM BREACH.
2. BERM ALONG NORTHERN EDGE OF PROJECT TO BE REMOVED WITHIN PROJECT LIMITS IN ORDER TO RE-ESTABLISH HYDROLOGIC CONNECTION.
3. LARGE WOODY DEBRIS PILES ARE TO BE INSTALLED THROUGHOUT THE WETLAND RE-ESTABLISHMENT AREAS AT A MINIMUM SPACING OF 100' X 100' FOR A TOTAL OF 5-15 PILES. THE NUMBER AND SIZE OF PILES SHALL BE DEPENDENT ON THE AMOUNT AND TYPE OF WOODY MATERIAL AVAILABLE ONSITE. WOODY DEBRIS SHALL CONSIST OF LOGS AND/OR BRANCHES WITH A MINIMUM DIAMETER OF 6". ALL WOODY DEBRIS SHALL BE PARTIALLY BURIED OR ANCHORED DOWN WITH COIR MATTING AND WOOD STAKES.

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SEAL

FULL SCALE: 1"=100

0 100 200

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MATTHEW MITIGATION SITE
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DRAWING TITLE:
WETLAND PLAN

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
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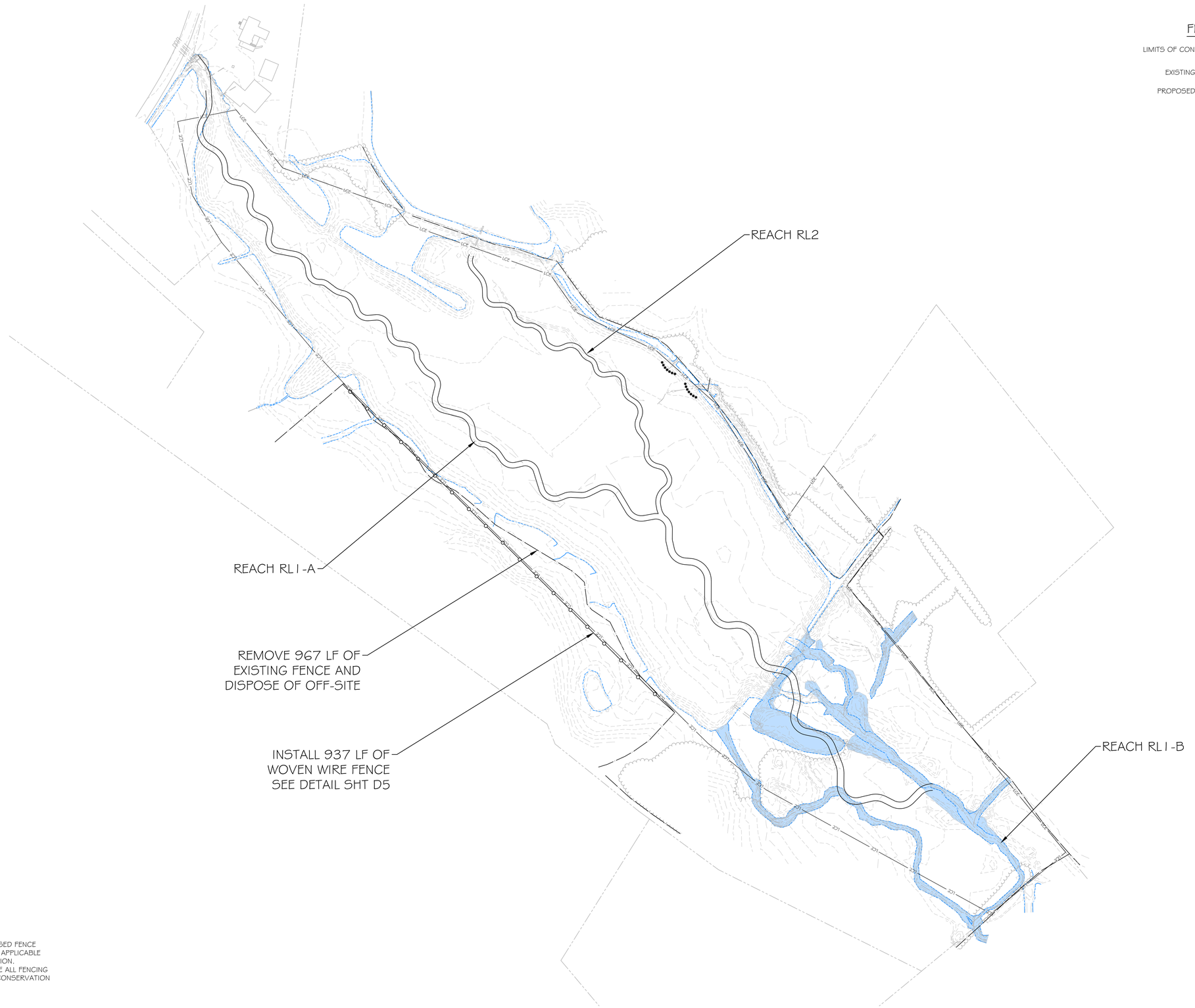
CHECKED:	AFM

SHEET NUMBER:
W1

FILE NAME:S:\@RES GIS\Projects\NC\Matthew\CAD\DWG\0535_SHT_SITE.dwg SAVED BY: Fmullen



FENCING LEGEND

LIMITS OF CONSERVATION EASEMENT — LCE

EXISTING FENCELINE

PROPOSED FENCELINE

FENCING NOTES:

1. CONTRACTOR TO TIE PROPOSED FENCE INTO EXISTING FENCE WHERE APPLICABLE TO MAINTAIN CATTLE EXCLUSION.
2. CONTRACTOR SHALL REMOVE ALL FENCING LOCATED WITHIN LIMITS OF CONSERVATION EASEMENT.

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SHEET NUMBER:

F1

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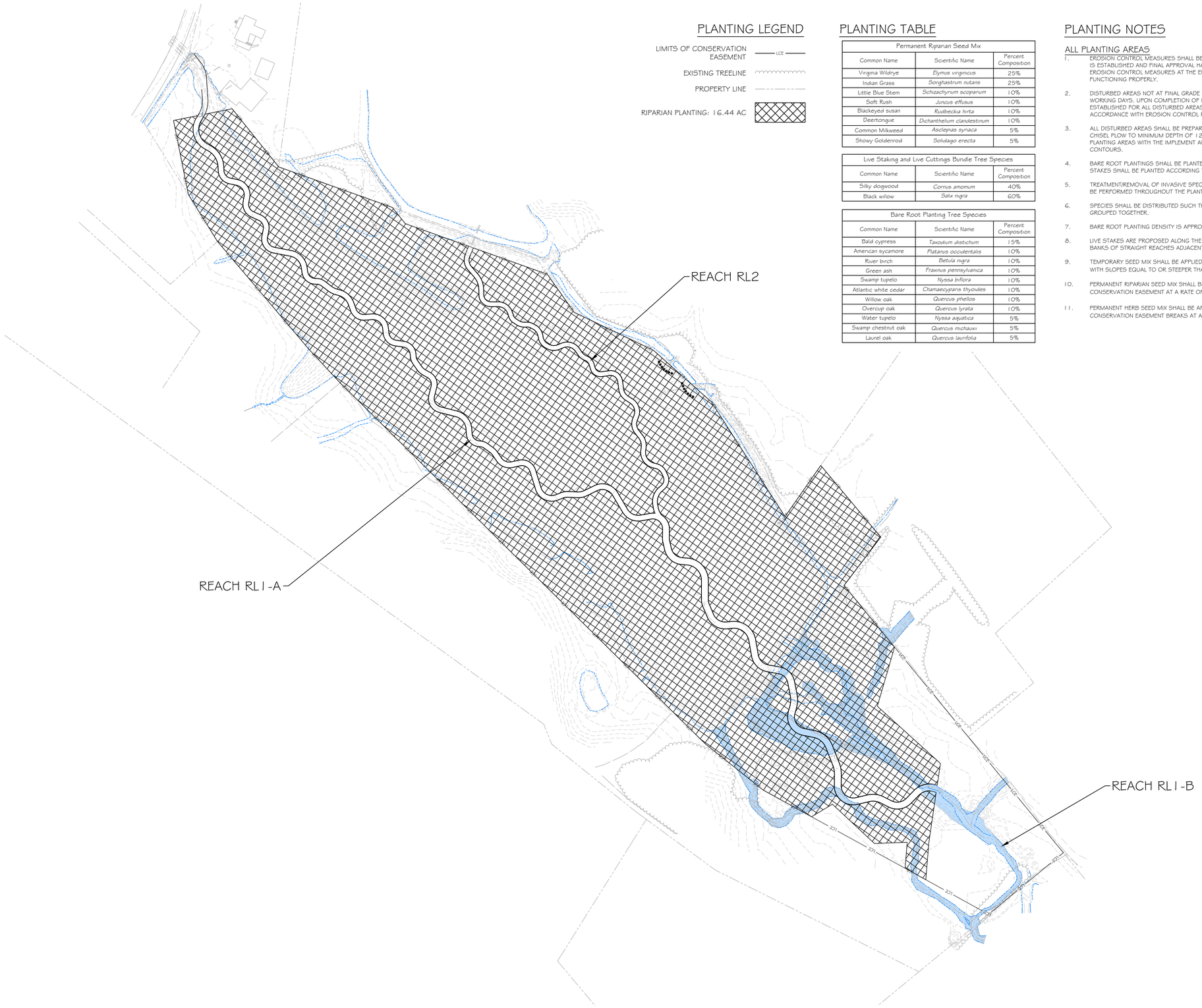

PLANTING LEGEND

LIMITS OF CONSERVATION EASEMENT — LCE —

EXISTING TREELINE

PROPERTY LINE

RIPARIAN PLANTING: 16.44 AC

PLANTING TABLE

Permanent Riparian Seed Mix		
Common Name	Scientific Name	Percent Composition
Virginia Wildrye	*Elymus virginicus*	25%
Indian Grass	*Sorghastrum nutans*	25%
Little Blue Stem	*Schizachyrum scoparium*	10%
Soft Rush	*Juncus effusus*	10%
Blackeyed susan	*Rudbeckia hirta*	10%
Deertongue	*Dichanthelium clandestinum*	10%
Common Milkweed	*Asclepias synaca*	5%
Showy Goldenrod	*Solidago erecta*	5%

Live Staking and Live Cuttings Bundle Tree Species		
Common Name	Scientific Name	Percent Composition
Silky dogwood	*Cornus amomum*	40%
Black willow	*Salix nigra*	60%

Bare Root Planting Tree Species		
Common Name	Scientific Name	Percent Composition
Bald cypress	*Taxodium distichum*	15%
Amercan sycamore	*Platanus occidentalis*	10%
River birch	*Betula nigra*	10%
Green ash	*Fraxinus pennsylvanica*	10%
Swamp tupelo	*Nyssa biflora*	10%
Atlantic white cedar	*Chamaecyparis thyoides*	10%
Willow oak	*Quercus phellos*	10%
Overcup oak	*Quercus lyrata*	10%
Water tupelo	*Nyssa aquatica*	5%
Swamp chestnut oak	*Quercus michauxii*	5%
Laurel oak	*Quercus laurifolia*	5%

PLANTING NOTES

ALL PLANTING AREAS

1. EROSION CONTROL MEASURES SHALL BE PROPERLY MAINTAINED UNTIL PERMANENT VEGETATION IS ESTABLISHED AND FINAL APPROVAL HAS BEEN ISSUED. THE CONTRACTOR SHALL INSPECT EROSION CONTROL MEASURES AT THE END OF EACH WORKING DAY TO ENSURE MEASURES ARE FUNCTIONING PROPERLY.
2. DISTURBED AREAS NOT AT FINAL GRADE SHALL BE TEMPORARILY VEGETATED WITHIN 10 WORKING DAYS. UPON COMPLETION OF FINAL GRADING, PERMANENT VEGETATION SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 10 WORKING DAYS. SEEDING SHALL BE IN ACCORDANCE WITH EROSION CONTROL PLAN.
3. ALL DISTURBED AREAS SHALL BE PREPARED PRIOR TO PLANTING BY DISC OR SPRING-TOOTH CHISEL PLOW TO MINIMUM DEPTH OF 12 INCHES. MULTIPLE PASSES SHALL BE MADE ACROSS PLANTING AREAS WITH THE IMPLEMENT AND THE FINAL PASS SHALL FOLLOW TOPOGRAPHIC CONTOURS.
4. BARE ROOT PLANTINGS SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET D2. LIVE STAKES SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET D2.
5. TREATMENT/REMOVAL OF INVASIVE SPECIES, PINES AND SWEET GUMS LESS THAN 6" DBH SHALL BE PERFORMED THROUGHOUT THE PLANTED AREA.
6. SPECIES SHALL BE DISTRIBUTED SUCH THAT 3 TO 6 PLANTS OF THE SAME SPECIES ARE GROUPED TOGETHER.
7. BARE ROOT PLANTING DENSITY IS APPROXIMATELY 800 STEMS PER ACRE.
8. LIVE STAKES ARE PROPOSED ALONG THE OUTSIDE OF MEANDER BENDS AND ALONG BOTH BANKS OF STRAIGHT REACHES ADJACENT TO POOLS.
9. TEMPORARY SEED MIX SHALL BE APPLIED AT A RATE OF 150 LBS/ACRE TO ALL DISTURBED AREAS WITH SLOPES EQUAL TO OR STEEPER THAN 3:1.
10. PERMANENT RIPARIAN SEED MIX SHALL BE APPLIED TO ALL DISTURBED AREAS WITHIN THE CONSERVATION EASEMENT AT A RATE OF 15 LBS/ACRE.
11. PERMANENT HERB SEED MIX SHALL BE APPLIED TO ALL DISTURBED AREAS WITHIN THE CONSERVATION EASEMENT BREAKS AT A RATE OF 15 LBS/ACRE.

res
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SEAL

FULL SCALE: 1"=100

0 100 200

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 09/03/2019

MARK	DATE	DESCRIPTION

REVISIONS:

RELEASED FOR:

PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME:
MATTHEW MITIGATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
PLANTING PLAN

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:

P1

FILE NAME:S:\@RES GIS\Projects\NC\Matthew\CAD\DWG\0535_SHT_SITE.dwg SAVED BY: Fmullen

WHEN AND WHERE TO USE IT
SILT FENCE IS APPLICABLE IN AREAS:

WHERE THE MAXIMUM SHEET OR OVERLAND FLOW PATH LENGTH TO THE FENCE IS 100-FEET.
WHERE THE MAXIMUM SLOPE STEEPNESS (NORMAL [PERPENDICULAR] TO FENCE LINE) IS 2H:1V.
THAT DO NOT RECEIVE CONCENTRATED FLOWS GREATER THAN 0.5 CFS.

DO NOT PLACE SILT FENCE ACROSS CHANNELS OR USE IT AS A VELOCITY CONTROL BMP.

CONSTRUCTION SPECIFICATIONS:

1. USE A SYNTHETIC FILTER FABRIC OF AT LEAST 95% BY WEIGHT OF POLYOLEFINS OR POLYESTER, WHICH IS CERTIFIED BY THE MANUFACTURER OR SUPPLIER AS CONFORMING TO THE REQUIREMENTS IN ASTM D 6461. SYNTHETIC FILTER FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABILIZERS TO PROVIDE A MINIMUM OF 6 MONTHS OF EXPECTED USABLE CONSTRUCTION LIFE AT A TEMPERATURE RANGE OF 0° TO 120° F.
2. ENSURE THAT POSTS FOR SEDIMENT FENCES ARE 1.33 LB/LINEAR FT STEEL WITH A MINIMUM LENGTH OF 5 FEET. MAKE SURE THAT STEEL POSTS HAVE PROJECTIONS TO FACILITATE FASTENING THE FABRIC.

CONSTRUCTION:

1. CONSTRUCT THE SEDIMENT BARRIER OF EXTRA STRENGTH SYNTHETIC FILTER FABRICS.
2. ENSURE THAT THE HEIGHT OF THE SEDIMENT FENCE DOES NOT EXCEED 24 INCHES ABOVE THE GROUND SURFACE. (HIGHER FENCES MAY IMPOUND VOLUMES OF WATER SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE.)
3. CONSTRUCT THE FILTER FABRIC FROM A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID JOINTS. WHEN JOINTS ARE NECESSARY, SECURELY FASTEN THE FILTER CLOTH ONLY AT A SUPPORT POST WITH 4 FEET MINIMUM OVERLAP TO THE NEXT POST.
4. EXTRA STRENGTH FILTER FABRIC WITH 6 FEET POST SPACING DOES NOT REQUIRE WIRE MESH SUPPORT FENCE. SECURELY FASTEN THE FILTER FABRIC DIRECTLY TO POSTS. WIRE OR PLASTIC ZIP TIES SHOULD HAVE MINIMUM 50 POUND TENSILE STRENGTH.
5. EXCAVATE A TRENCH APPROXIMATELY 4 INCHES WIDE AND 8 INCHES DEEP ALONG THE PROPOSED LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
6. PLACE 12 INCHES OF THE FABRIC ALONG THE BOTTOM AND SIDE OF THE TRENCH.
7. BACKFILL THE TRENCH WITH SOIL PLACED OVER THE FILTER FABRIC AND COMPACT. THOROUGH COMPACTION OF THE BACKFILL IS CRITICAL TO SILT FENCE PERFORMANCE.
8. DO NOT ATTACH FILTER FABRIC TO EXISTING TREES.

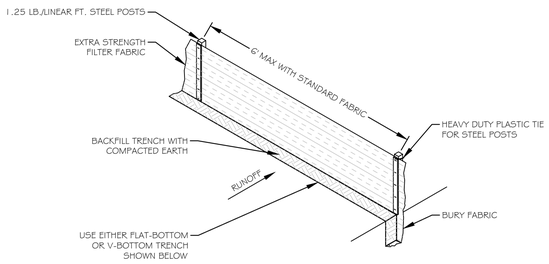
MAINTENANCE:

INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.

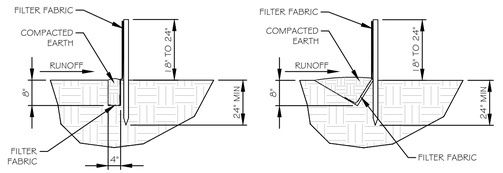
SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.

REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.

REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.



SILT FENCE INSTALLATION

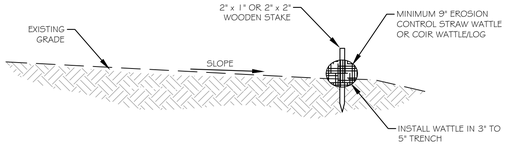


FLAT-BOTTOM TRENCH DETAIL

V-SHAPED TRENCH DETAIL

TEMPORARY SILT FENCE

NTS



NOTE:
EROSION CONTROL WATTLES OR COIR LOGS/WATTLES MAY BE USED IN PLACE OF SILT FENCE.

EROSION CONTROL WATTLE

NTS

INSTALLATION NOTES:

SITE PREPARATION

1. GRADE AND COMPACT AREA.
2. REMOVE ALL ROCKS, CLODS, VEGETATION, AND OBSTRUCTIONS SO THAT MATTING WILL HAVE DIRECT CONTACT WITH THE SOIL.
3. PREPARE SEEDBED BY LOOSENING 3 TO 4 INCHES OF TOPSOIL ABOVE FINAL GRADE.
4. TEST SOILS FOR ANY NUTRIENT DEFICIENCIES AND SUBMIT SOIL TEST RESULTS TO THE ENGINEER. APPLY ANY TREATMENT SUCH AS LIME OR FERTILIZERS TO THE SOIL IF NEEDED.

SEEDING

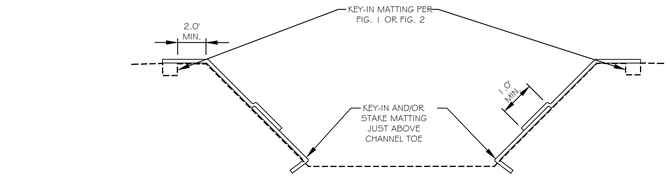
1. SEE PLANTING SHEETS FOR SEEDING REQUIREMENTS.
2. APPLY SEED TO SOIL BEFORE PLACING MATTING.

INSTALLATION - STREAM BANK

1. SEE GRADING NOTES ON PLAN AND PROFILE SHEETS AND DETAIL SHEETS FOR INFORMATION REGARDING WHAT AREAS ARE TO RECEIVE COIR MATTING.
2. OVERLAP ADJACENT MATS 3" (IN DIRECTION PARALLEL TO FLOW) AND ANCHOR EVERY 12" ACROSS THE OVERLAP. THE UPSTREAM MAT SHOULD BE PLACED OVER THE DOWNSTREAM MAT.
3. EDGES SHOULD BE SHINGLED AWAY FROM THE FLOW OF WATER.
4. LAY MAT LOOSE TO ALLOW CONTACT WITH SOIL. DO NOT STRETCH TIGHT.
5. ANCHOR MAT USING BIODEGRADABLE STAKES OR PINS.
6. CUT 8" x 8" TRENCH ALONG TOP OF BANK FOR MAT TERMINATION AS SHOWN IN FIGURES 1 & 2. EXTEND MAT 2 TO 3 FEET PAST TOP OF BANK.
7. PLACE ADJACENT ROLLS IN THE ANCHOR TRENCH WITH A MINIMUM OF 4" OVERLAP. SECURE WITH BIODEGRADABLE STAKES OR PINES, BACKFILL ANCHOR TRENCH, AND COMPACT SOIL.
8. STAPLE AT 12' INTERVALS ALONG OVERLAP.
9. STREAM BANK MATTING TO BE INSTALLED FROM TOE OF BANK TO A MINIMUM OF 2.0' PAST TOP OF BANK. SEE FIGURE 3 FOR TERMINATION AT TOP OF BANK.
10. IF MORE THAN ROLL IS REQUIRED TO COVER THE CHANNEL FROM THE TOP OF BANK DOWN TO THE TOE, THEN OVERLAP MATTING BY A MINIMUM OF 1'.

EROSION CONTROL MATTING MUST MEET OR EXCEED THE FOLLOWING REQUIREMENTS:

- 100 % COCONUT FIBER (COIR) TWINE WOVEN INTO A HIGH STRENGTH MATRIX.
- THICKNESS - 0.35 IN. MINIMUM.
- SHEAR STRESS – 5 LBS/SQFT
- FLOW VELOCITY- OBSERVED 16 FT/SEC
- WEIGHT - 29 OZ/SY
- OPEN AREA - 38%
- SLOPES – UP TO A MAXIMUM OF 1:1



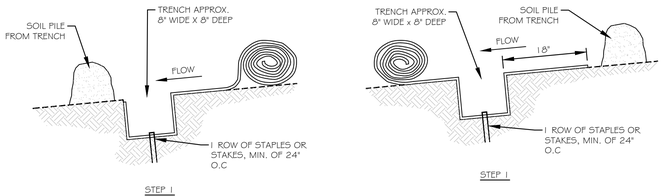


FIGURE 1

FIGURE 2

COIR MATTING

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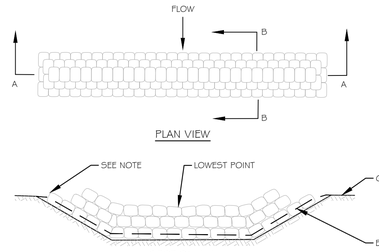
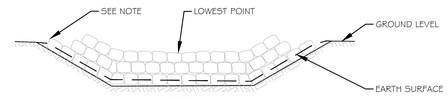
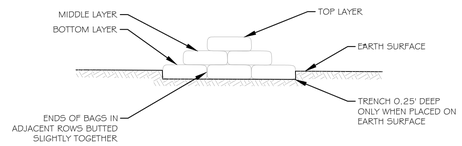


PLAN VIEW



SECTION A-A

NOTE: END OF DIKE AT GROUND LEVEL TO BE HIGHER THAN THE LOWEST POINT OF FLOW CHECK. SUFFICIENT SANDBAGS ARE TO BE PLACED TO PREVENT SCOURING.

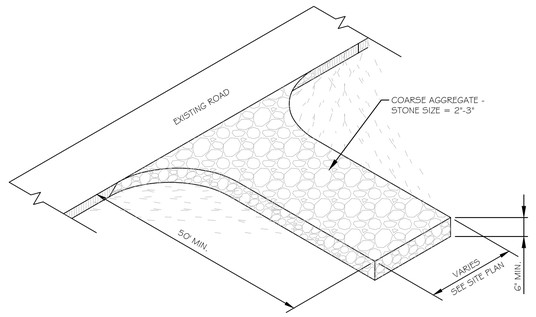


SECTION B-B

SANDBAG BARRIERS SHALL BE CONSTRUCTED OF THREE LAYERS OF SANDBAGS. THE BOTTOM LAYER SHALL CONSIST OF 3 ROWS OF BAGS, THE MIDDLE LAYER SHALL CONSIST OF 2 ROWS OF BAGS AND THE TOP LAYER SHALL CONSIST OF 1 ROW OF BAGS. THE RECOMMENDED DIMENSION OF A FILLED SANDBAG SHALL BE APPROXIMATELY 0.5 FT X 0.5 FT X 1.5 FT.

SANDBAG IMPERVIOUS DIKE

NTS



PURPOSE:

STABILIZED CONSTRUCTION ENTRANCES SHOULD BE USED AT ALL POINTS WHERE TRAFFIC WILL BE LEAVING A CONSTRUCTION SITE AND MOVING DIRECTLY ONTO A PUBLIC ROAD.

CONSTRUCTION SPECIFICATIONS:

1. CLEAR THE ENTRANCE AND EXIT AREA OF ALL VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL AND PROPERLY GRADE IT.
2. PLACE THE GRAVEL TO THE SPECIFIC GRADE AND DIMENSIONS SHOWN ON THE DETAIL, AND SMOOTH IT.
3. PROVIDE DRAINAGE TO CARRY WATER TO A SEDIMENT TRAP OR OTHER SUITABLE OUTLET.
4. USE GEOTEXTILE FABRICS BECAUSE THEY IMPROVE STABILITY OF THE FOUNDATION IN LOCATIONS SUBJECT TO SEEPAGE OR HIGH WATER TABLE.

MAINTENANCE:

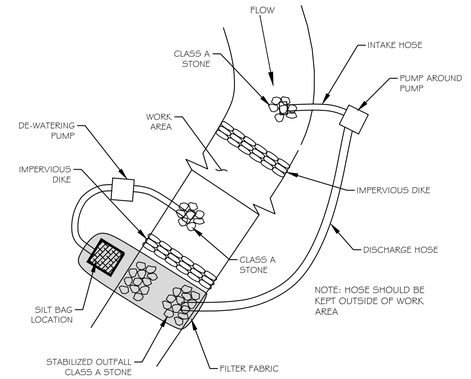
MAINTAIN THE GRAVEL PAD IN A CONDITION TO PREVENT MUD OR SEDIMENT FROM LEAVING THE CONSTRUCTION SITE. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH 2-INCH STONE. AFTER EACH RAINFALL, INSPECT ANY STRUCTURE USED TO TRAP SEDIMENT AND CLEAN IT OUT AS NECESSARY. IMMEDIATELY REMOVE ALL OBJECTIONABLE MATERIALS SPILLED, WASHED, OR TRACKED ONTO PUBLIC ROADWAYS, OR AIRFIELD PAVEMENTS.

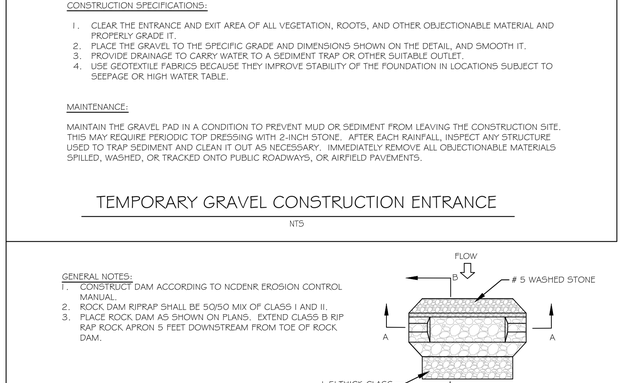
TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

NTS

NOTES:
1. EXCAVATION SHALL BE PERFORMED ONLY IN DRY AND/OR ISOLATED SECTIONS OF CHANNEL.
2. IMPERVIOUS DIKES SHOULD BE USED TO ISOLATE WORK AREAS FROM STREAM FLOW.
3. THE CONTRACTOR SHALL NOT DISTURB MORE AREA THAN CAN BE STABILIZED IN ONE WORKING DAY. A MAXIMUM OF 200 FEET MAY BE DISTURBED AT ANY ONE TIME.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING PUMP SIZE SUFFICIENT TO PUMP BASE FLOW.
5. DIKE MUST BE CONSTRUCTED OF NON-ERODIBLE MATERIALS SUCH AS SANDBAGS.

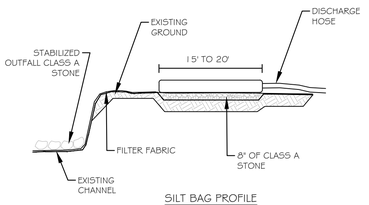
SEQUENCE OF CONSTRUCTION:
1. INSTALL STILLING BASIN AND STABILIZED OUTFALL USING CLASS A RIP RAP AT THE DOWNSTREAM END OF THE DESIGNATED PROJECT WORKING AREA.
2. THE CONTRACTOR SHALL INSTALL THE PUMP AROUND PUMP AND THE TEMPORARY PIPING THAT WILL CONVEY THE BASE FLOW FROM UPSTREAM OF THE WORK AREA TO THE STABILIZED OUTFALL.
3. INSTALL UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. INSTALL THE DOWNSTREAM IMPERVIOUS DIKE AND DEWATERING PUMPING APPARATUS IF NEEDED TO DEWATER THE ENTRAPPED AREA. THE PUMP AND HOSE FOR THIS PURPOSE SHALL BE OF SUFFICIENT SIZE TO DEWATER THE WORK AREA. THIS WATER WILL ALSO BE PUMPED TO AN OUTFALL STABILIZED WITH CLASS A RIP RAP.
5. THE CONTRACTOR SHALL EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF THE IMPERVIOUS DIKE. WHEN DEWATERING AREA, ALL DIRTY WATER MUST BE PUMPED THROUGH A SILT BAG. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE/PIPING STARTING WITH THE DOWNSTREAM DIKE FIRST.
6. ONCE THE WORKING AREA IS COMPLETED, REMOVE ALL RIP RAP AND IMPERVIOUS DIKES AND STABILIZE DISTURBED AREAS WITH SEED AND MULCH.
7. ALL WORK IN CHANNEL MUST BE COMPLETED BEFORE REMOVING IMPERVIOUS DIKE.





TEMPORARY ROCK CHECK DAM

NTS



SILT BAG PROFILE

PUMP AROUND & DEWATERING DETAIL

NTS

302 Jefferson Street, Suite 110
Raleigh, NC 27605
Main: 919.829.9909
Fax: 919.829.9913
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SEAL

SCALE: AS SHOWN

MARK	DATE	REVISIONS: DESCRIPTION
		RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
		PLOT DATE: 9/3/2019

PROJECT NAME:
MATTHEW MITIGATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

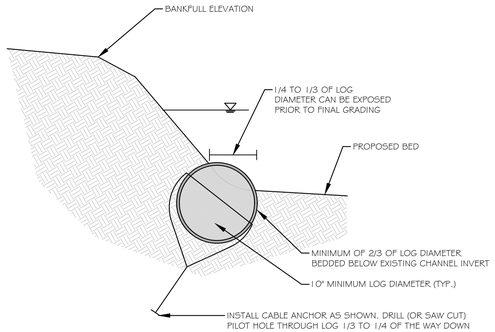
DRAWING TITLE:
DETAILS

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

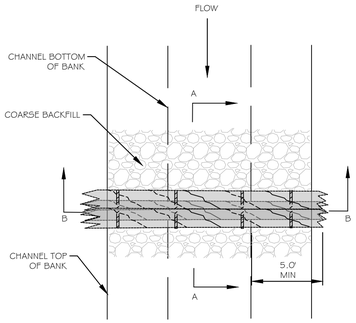
SHEET NUMBER:
D1

FILE NAME:S:\@RES GIS\Projects\NC\Matthew\CAD\DWG\0535_SHT_DETAILS.dwg SAVED BY: Tswartzfager

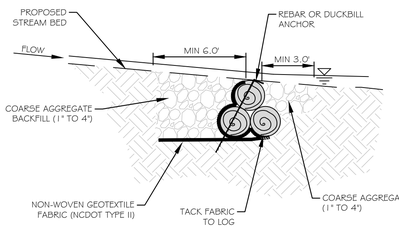
NOTES:
1. LOGS SHOULD BE AT LEAST 10 INCHES IN DIAMETER, 5-8 FEET LONG, RELATIVELY STRAIGHT, AND HARDWOOD.
2. CABLE ANCHORS SHOULD BE PLACED 1' TO 3' FROM EACH END OF LOG. REBAR (5/8" MINIMUM DIAMETER 3' MIN. LENGTH TYPICAL) MAY BE USED AS A SUBSTITUTION FOR CABLE ANCHORS PER DIRECTION OF ENGINEER.
3. IF REBAR IS USED, PRE-DRILL HOLES WITH 5/8" DRILL BIT.



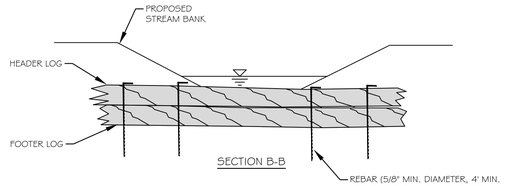
LOG TOE PROTECTION
NTS



TYPICAL PLAN VIEW



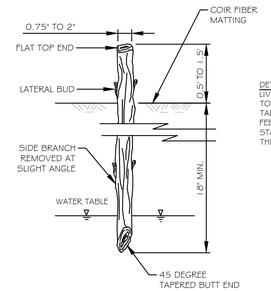
SECTION A-A



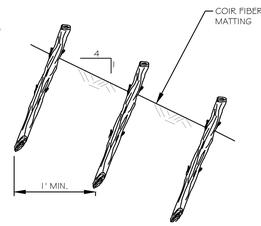
SECTION B-B

NOTES:
1. LOGS SHOULD BE RELATIVELY STRAIGHT HARDWOOD AND RECENTLY HARVESTED.
2. LOG DIMENSIONS:
   MIN DIAM. = 10", MIN LENGTH = 15'
3. NAIL FILTER FABRIC USING 3" 10D GALVANIZED COMMON NAIL EVERY 1.5' ALONG THE LOG
4. DUCKBILL ANCHORS MAY BE USED IN PLACE OF REBAR.

LOG GRADE CONTROL
NTS

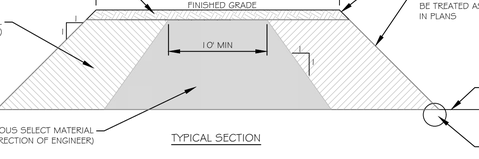


DETAIL
LIVE STAKES SHOULD BE LONG ENOUGH TO REACH BELOW THE GROUNDWATER TABLE. (GENERALLY, A LENGTH OF 2 TO 3 FEET IS SUFFICIENT.) ADDITIONALLY, THE STAKES SHOULD HAVE A DIAMETER IN THE RANGE OF 0.75 TO 2 INCHES.



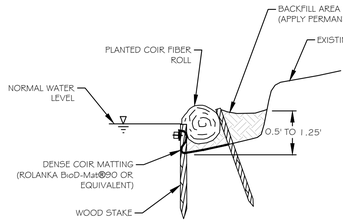
NOTE:
1. ACCEPTABLE SPECIES INCLUDE BLACK WILLOW (SALIX NIGRA), SILKY WILLOW (SALIX SERICEA) AND SILKY DOGWOOD (CORNUS AMMOMUM).
2. LIVE STAKES SHALL BE PLANTED IN AN AREA EXTENDING 3 FEET OUT FROM TOP OF BANK TO JUST BELOW BANKFULL.
3. LIVE STAKES SHALL BE SPACED 3 FEET APART, ALTERNATE SPACING.

LIVE STAKE
NTS

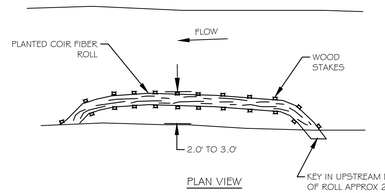


NOTES:
1. INSTALL STAKES ON 3' CENTERS ON EACH SIDE OF ROLL. TOP OF STAKE SHOULD NOT EXTEND ABOVE ROLL.
2. EXCAVATE A SMALL TRENCH (DEPTH APPROX 1/2 TO 2/3 OF LOG DIAM) FOR PLACEMENT OF ROLL.
3. COIR LOGS SHALL BE 10 FT LONG AND HAVE A DIAMETER OF 12 IN.

COIR LOG (TOE PROTECTION)
NTS



SECTION VIEW



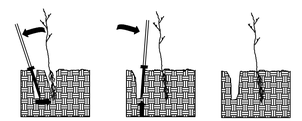
PLAN VIEW

NOTES:
1. DESIGNER TO MARK LOCATIONS AND DIMENSIONS OF SILLS IN THE FIELD PRIOR TO CONSTRUCTION.
2. INSTALL STAKES ON 3' CENTERS ON EACH SIDE OF ROLL. TOP OF STAKE SHOULD NOT EXTEND ABOVE ROLL.
3. EXCAVATE A SMALL TRENCH (APPROX 2" DEEP) FOR PLACEMENT OF ROLL.

VEGETATED SILL DEFLECTOR
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:

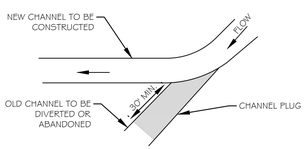
PLANTING BAG
DURING PLANTING, SEEDLINGS SHALL BE KEPT IN A MOIST CANVAS BAG OR SIMILAR CONTAINER TO PREVENT THE ROOT SYSTEMS FROM DRYING.

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.

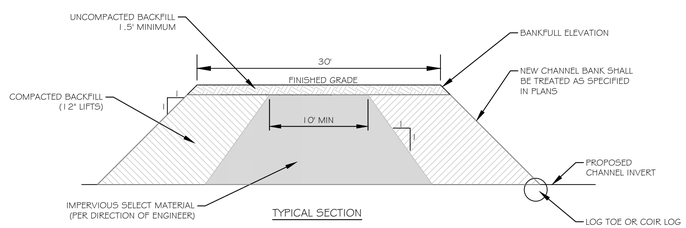
ROOT PRUNING
ALL SEEDLINGS SHALL BE ROOT PRUNED, IF NECESSARY, SO THAT NO ROOTS EXTEND MORE THAN 10 INCHES BELOW THE ROOT COLLAR.

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

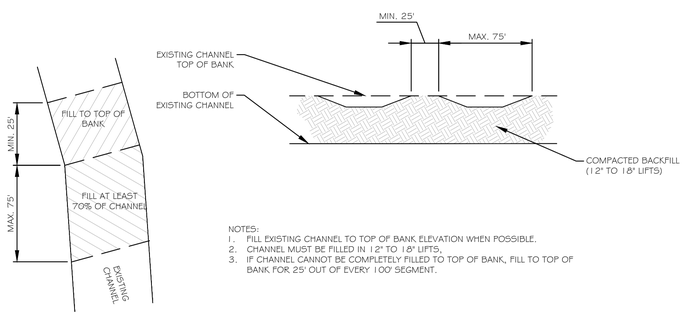


PLAN VIEW



TYPICAL SECTION

CHANNEL PLUG
NTS



NOTES:
1. FILL EXISTING CHANNEL TO TOP OF BANK ELEVATION WHEN POSSIBLE.
2. CHANNEL MUST BE FILLED IN 12" TO 18" LIFTS.
3. IF CHANNEL CANNOT BE COMPLETELY FILLED TO TOP OF BANK, FILL TO TOP OF BANK FOR 25' OUT OF EVERY 100' SEGMENT.

CHANNEL BACKFILL
NTS

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SEAL

SCALE: AS SHOWN

MARK	DATE	DESCRIPTION
REVISIONS:		
RELEASED FOR:		PRELIMINARY - NOT FOR CONSTRUCTION

PLOT DATE: 9/3/2019

PROJECT NAME:
MATTHEW MITIGATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
DETAILS

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:
D2

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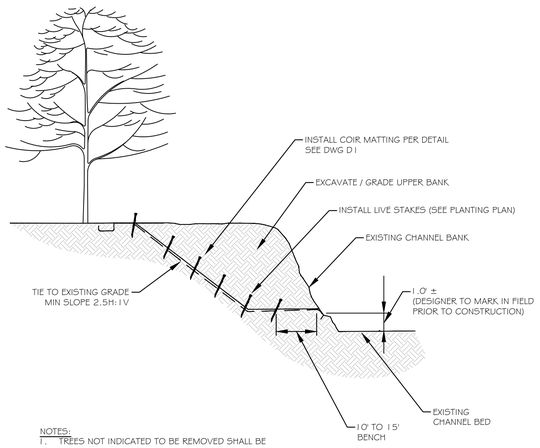
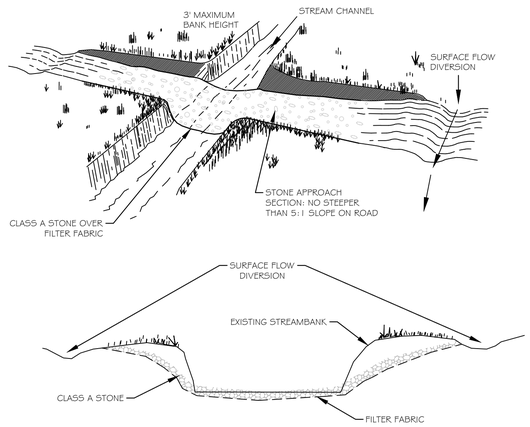


NOTES:
1. TREES NOT INDICATED TO BE REMOVED SHALL BE PROTECTED DURING CONSTRUCTION IN ACCORDANCE WITH PLANS.
2. SEED AND MULCH ALL BANKS PRIOR TO INSTALLING COIR MATTING.

TYPICAL BANK GRADING

NTS



NOTES:
1. CONSTRUCT STREAM CROSSING WHEN FLOW IS LOW.
2. HAVE ALL NECESSARY MATERIALS AND EQUIPMENT ON-SITE BEFORE WORK BEGINS.
3. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM. COMPLETE ONE SIDE BEFORE STARTING ON THE OTHER SIDE.
4. INSTALL STREAM CROSSING PERPENDICULAR TO FLOW.
5. GRADE SLOPES NO STEEPER THAN 5:1
6. MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL.
7. A STABILIZED PAD OF NATURAL CLASS A STONE, 6 TO 9 INCHES THICK, LINED WITH FILTER FABRIC SHALL BE USED OVER THE BERM AND ACCESS SLOPES.
8. FILTER FABRIC USED SHALL BE NCDOT TYPE 2 ENGINEERING FABRIC OR EQUIVALENT.
9. WIDTH OF THE CROSSING SHALL BE SUFFICIENT (8' MIN.) TO ACCOMMODATE THE LARGEST VEHICLE CROSSING THE CHANNEL.
10. CONTRACTOR SHALL DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT UTILIZED.
11. TEMPORARY CROSSINGS ARE TO BE ABANDONED IN PLACE.

FORD CROSSING

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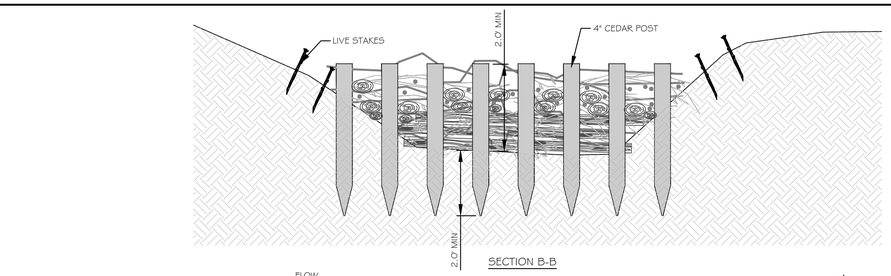
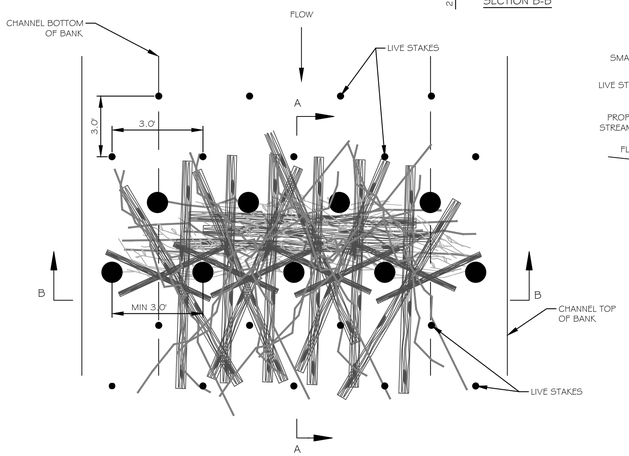
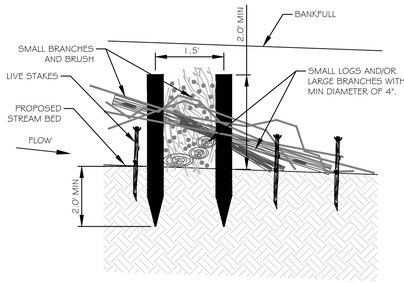


SECTION B-B



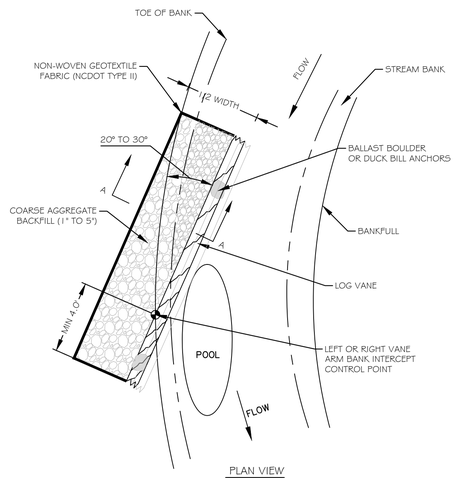


SECTION A-A

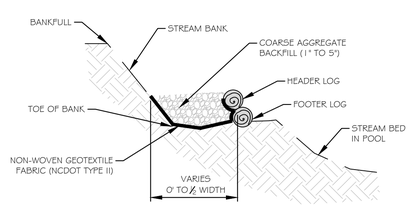
NOTES:
1. DRIVE 2 ROWS OF 4" CEDAR POSTS ON MINIMUN 3' CENTERS PAST MINIMUM DEPTH AS SHOWN.
2. FILL THE VOID BETWEEN POST ROWS W/ AN EVEN MIX OF HARDWOOD LOGS, LIMBS, AND BRUSH AS SHOWN.
3. REDUCE POST SPACING AS NEEDED TO IMPROVE STRUCTURE STABILITY.

ENGINEERED SEDIMENT PACK (ESP)

NTS



PLAN VIEW



SECTION A-A

NOTES:

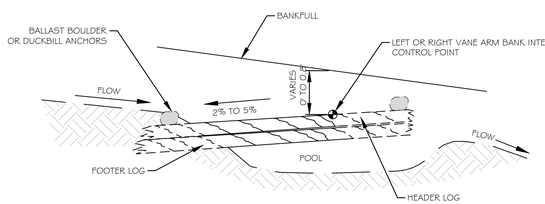
1. LOG VANES SHALL BE CONSTRUCTED OF ONE OR MORE LOGS HELD IN PLACE BY EITHER BALLAST BOULDERS, DUCKBILL ANCHORS, OR REBAR. LOGS SHALL BE A MINIMUM OF 22' IN LENGTH AND A MINIMUM OF 10" IN DIAMTER AND BE RELATIVELY STRAIGHT HARDWOOD, RECENTLY HARVESTED. THE LENGTH SHALL BE SUCH THAT THE LOG IS BURIED INTO THE SOIL OF THE STREAM BANK (ON ONE END) AND STREAM BED (ON THE OTHER END) A MINIMUM DISTANCE OF 4.0'. FLAT-SIDED BALLAST BOULDERS SHALL BE OF SIZE 2' X 1.5 X 1.5' OR AS SPECIFIED BY THE DESIGNER.

2. THE VANE SHALL INTERCEPT THE STREAM BANK AT A HEIGHT EQUAL TO BETWEEN ½ BANKFULL STAGE AND BANKFULL STAGE. AN ELEVATION CONTROL POINT MAY BE ESTABLISHED AT THE LEFT OR RIGHT STREAM BANK/VANE INTERCEPT POINT. THE VANE INTERCEPT LOCATION MAY BE OTHERWISE DESCRIBED BY ITS RELATIONSHIP TO BANKFULL STAGE OR BY THE LENGTH AND SLOPE OF THE VANE ARM. BANKFULL IS NOT NECESSARILY THE TOP OF THE STREAM BANK SLOPE.

3. FILTER FABRIC SHALL BE USED TO SEAL THE GAPS BETWEEN THE LOGS AND UNDER THE COARSE BACKFILL MATERIAL OF THE VANE. THERE SHALL BE NO FILTER FABRIC VISIBLE IN THE FINISHED WORK; EDGES SHALL BE FOLDED TUCKED, OR TRIMMED AS NEEDED.

4. LOG VANES SHALL BE BUILT TYPICALLY AS FOLLOWS:
   A. OVER-EXCAVATE STREAM BED TO A DEPTH EQUAL TO THE TOTAL THICKNESS OF THE HEADER (AND FOOTER IF SPECIFIED) LOGS.
   B. PLACE FOOTER LOG OF THE VANE ARM IF SPECIFIED. THE SLOPE OF THE VANE ARM IS MEASURED ALONG THE VANE ARM WHICH IS INSTALLED AT AN ANGLE TO THE STREAM BANK AND PROFILE.
   C. INSTALL HEADER LOG OF THE VANE ARM ON TOP OF AND SLIGHTLY FORWARD OR BACK FROM THE FOOTER LOG.
   D. NAIL FILTER FABRIC TO THE HEADER LOG USING A GALVANIZED NAIL WITH A PLASTIC CAP. THE SIZE AND GAGE OF NAIL AND NAIL SPACING SHALL BE SPECIFIED BY THE DESIGNER.
   E. PLACE BALLAST BOULDERS OR DUCKBILL ANCHOR ON THE VANE.
   F. PLACE COARSE BACKFILL BEHIND LOGS ENSURING THAT ANY VOIDS BETWEEN THE LOGS ARE FILLED.
   G. BACKFILL REMAINDER OF VANE WITH PREVIOUSLY EXCAVATED MATERIAL.

5. IF ANY EROSION CONTROL MATTING IS SPECIFIED FOR USE IN THE VICINITY OF THE STREAM BANK/VANE INTERCEPT POINT THE MATTING EDGES SHALL BE NEATLY SECURED AROUND THE LOGS.



PROFILE VIEW

LOG VANE

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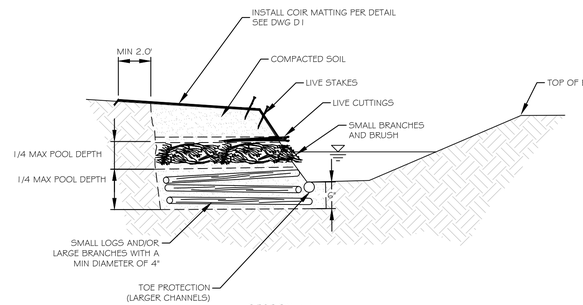
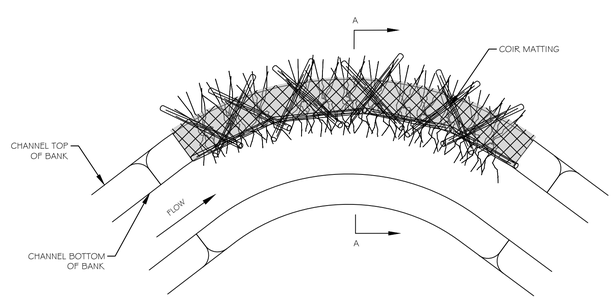


SECTION A-A

NOTES:

1. OVER EXCAVATE THE OUTSIDE BEND OF THE CHANNEL. PLACE LARGER BRANCHES AND LOGS IN A CRISS-CROSS PATTERN, LOCK IN PLACE WITH FILL COVERING 6 IN TO 18 IN OF THE LARGER BRANCHES/SMALL LOGS.
2. PLACE SMALLER BRANCHES AND BRUSH OVER THE LARGER BRANCHES/SMALL LOGS (HARDWOOD SPECIES ONLY) AND COMPACT LIGHTLY TOGETHER. BACKFILL AND COMPACT TO LOCK IN PLACE.
3. ACCEPTABLE LIVE CUTTINGS SPECIES INCLUDE BLACK WILLOW (SALIX NIGRA) AND SILKY WILLOW (SALIX SERICEA). WILLOW CUTTINGS SHOULD BE RINSED AT CUTTING POINT TO ALLOW BETTER ROOTING.
4. INSTALL EROSION CONTROL (COIR) MATTING OVER COMPACTED SOIL PER DIRECTION OF ENGINEER.
5. INSTALL 1 TO 3 ROWS OF LIVE STAKES ABOVE THE LIVE CUTTINGS LAYER PER DIRECTION OF ENGINEER.



TYPICAL PLAN VIEW

BRUSH TOE

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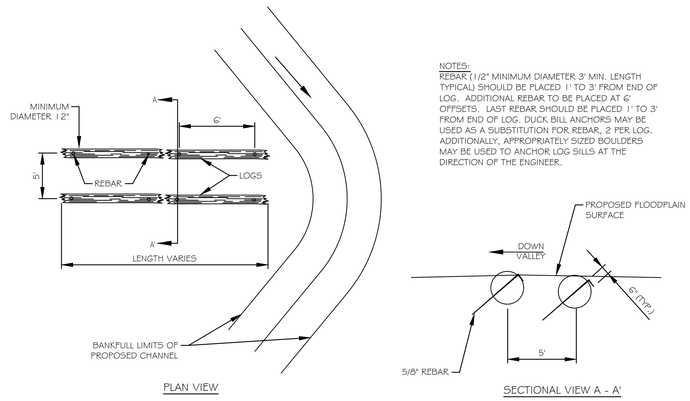

PLAN VIEW

NOTES:
REBAR (1/2" MINIMUM DIAMETER 3' MIN. LENGTH TYPICAL) SHOULD BE PLACED 1' TO 3' FROM END OF LOG. ADDITIONAL REBAR TO BE PLACED AT 6' OFFSETS. LAST REBAR SHOULD BE PLACED 1' TO 3' FROM END OF LOG. DUCK BILL ANCHORS MAY BE USED AS A SUBSTITUTION FOR REBAR, 2 PER LOG. ADDITIONALLY, APPROPRIATELY SIZED BOULDERS MAY BE USED TO ANCHOR LOG SILLS AT THE DIRECTION OF THE ENGINEER.

SECTIONAL VIEW A - A'

FLOODPLAIN SILL

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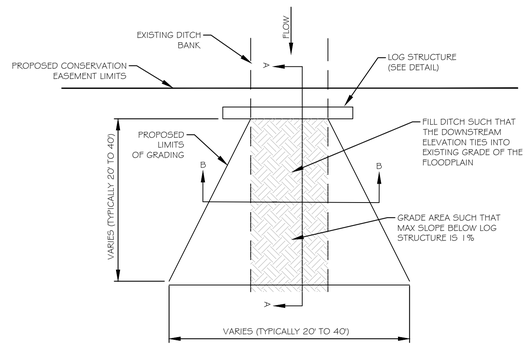
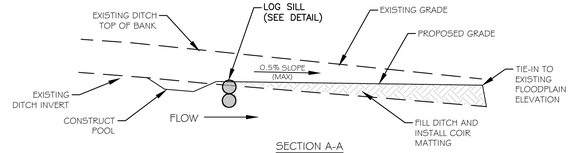
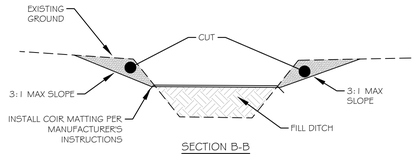


PLAN VIEW



SECTION A-A

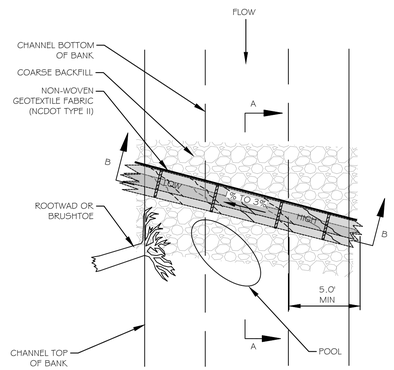


SECTION B-B

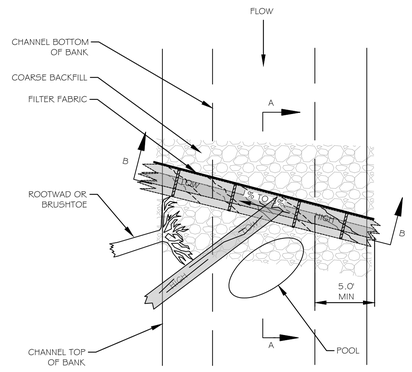
NOTES:
1. NO FLOODPLAIN GRADING IS ALLOWED WITHIN 10 FT OF THE PROPOSED CHANNEL TOP OF BANK.
2. LOGS SHOULD BE AT LEAST 10-20' LONG AND AT LEAST 8 INCHES IN DIAMETER, AND HARDWOOD.

DIFFUSE FLOW STRUCTURE

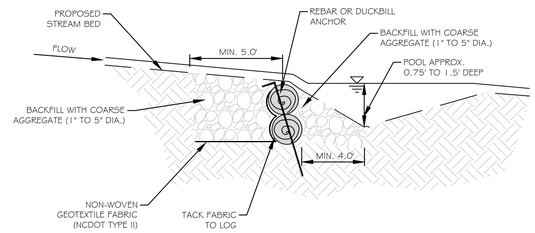
NTS



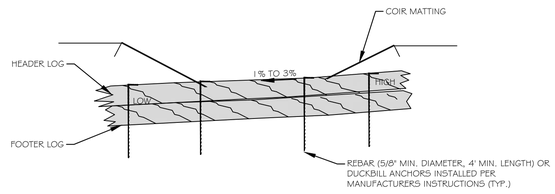
TYPICAL PLAN VIEW (OPT 1)



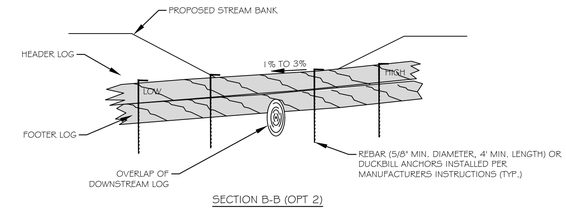
TYPICAL PLAN VIEW (OPT 2)



SECTION A-A



SECTION B-B (OPT 1)



SECTION B-B (OPT 2)

NOTES:
1. LOGS SHOULD BE RELATIVELY STRAIGHT HARDWOOD AND RECENTLY HARVESTED.
2. LOG DIMENSIONS:
   MIN DIAM. = 12", MIN LENGTH = 18'
   NAIL FILTER FABRIC USING 3" 10D GALVANIZED COMMON NAIL EVERY 1.5' ALONG THE LOG
3. DUCKBILL ANCHORS MAY BE USED IN PLACE OF REBAR.

LOG SILL

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SEAL

SCALE: AS SHOWN

PLOT DATE: 9/32/2019

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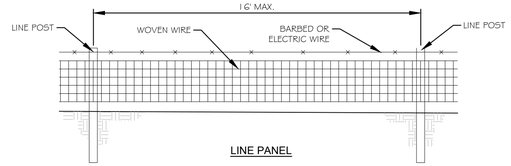
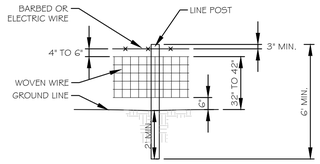


LINE PANEL



WOVEN WIRE:
ASTM CLASS 3 GALVANIZED.
TOP AND BOTTOM WIRES MIN. 12 GAUGE.
INTERMEDIATE AND STAY WIRES MIN.
12 1/2 GAUGE.

WOVEN WIRE WITH ONE BARB DETAIL

NOTES:
1. LINE POSTS (WOODEN): MIN. 4 IN. DIAM. OR 4 IN. SQUARE.
2. LINE POSTS (STEEL): STUDDED OR PUNCHED T, U, OR Y SHAPED, WITH ANCHOR PLATES.
3. MIN. WEIGHT 1.3 LBS./FT. (EXCLUDING ANCHOR PLATE). POSTS SHALL BE DRIVEN A MINIMUM OF 1.6' DEEP AND MUST BE AT LEAST 5.5 FT IN LENGTH
4. SPECIES AND TREATMENT FOR ALL WOOD: USE UNTREATED DURABLE POSTS OF SPECIES SUCH AS RED CEDAR, BLACK LOCUST OR OSAGE-ORANGE WITH BARK REMOVED, OR NON-DURABLE WOOD THAT IS PRESERVATIVE PRESSURE TREATED (0.40 LBS./CUBIC FOOT CCA, OR EQUIVALENT NON-CCA TREATMENT). DO NOT USE RED PINE.

WOVEN WIRE FENCE (NRCS DETAIL 382A)

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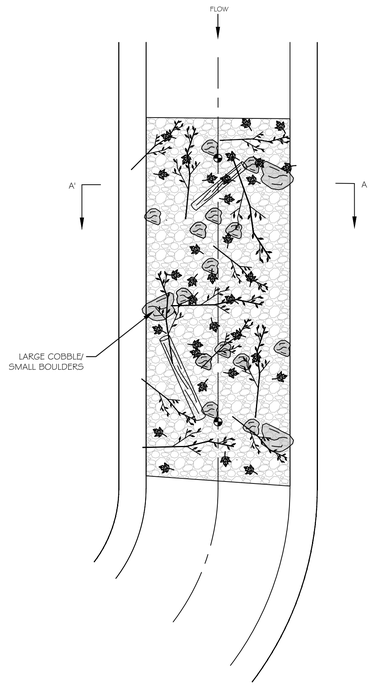
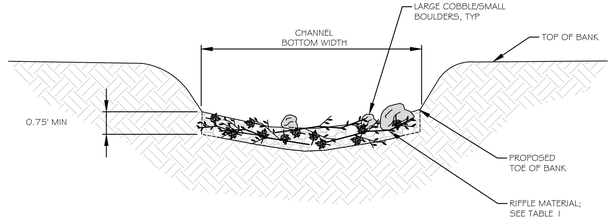
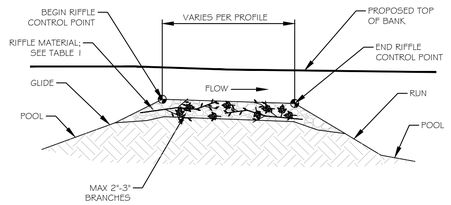




CROSS SECTION A-A'



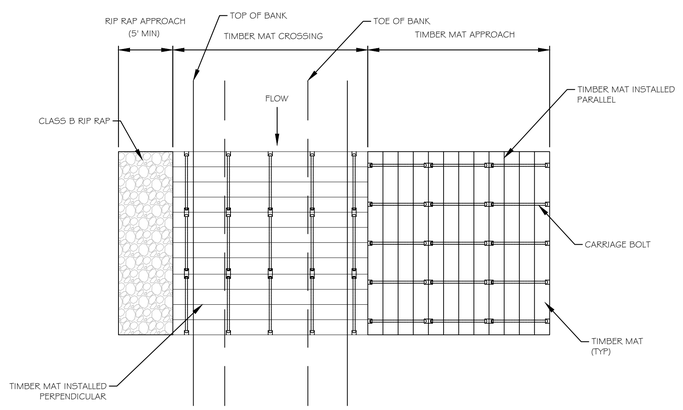
PROFILE

NOTES:
1. STONE RIFFLES SHALL BE INSTALLED IN NEWLY GRADED CHANNEL SECTIONS, AS SPECIFIED ON THE PLAN SHEETS.
2. ELEVATION CONTROL POINTS SHALL BE DESIGNATED AT THE BEGINNING AND END OF RIFFLE POINTS TO ESTABLISH PART OF THE PROFILE OF THE CHANNEL. SURVEY OF CONTROL POINTS SHALL BE REQUIRED TO ESTABLISH ACCURATE RIFFLE INSTALLATION WITHIN A TOLERANCE OF ±0.2'.
3. RIFFLE MATERIAL SHALL BE COMPRISED OF 75% ROCKS AND 25% WOODY MATERIAL. WOODY MATERIAL SHALL CONSIST OF LOGS, BRANCHES, AND BRUSH NO GREATER THAN 3" IN DIAMETER. THE ROCK MATERIAL SHALL CONSIST OF NATIVE SUBSTRATE MATERIAL WHEN POSSIBLE. NATIVE MATERIAL SHALL BE EXCAVATED, STOCKPILED, AND RE-USED FROM ABANDONED CHANNEL SECTIONS. IF A SUITABLE QUANTITY OF NATIVE SUBSTRATE MATERIAL CANNOT BE HARVESTED, CONTRACTOR MAY SUBSTITUTE THE RIFFLE MATERIAL WITH ROCK MATCHING THE COMPOSITION IN TABLE 1.
4. THE PLACEMENT OF RIFFLE MATERIAL SHALL BE DONE IN A MANNER TO CREATE A SMOOTH PROFILE, WITH NO ABRUPT "JUMP" (TRANSITION) BETWEEN THE UPSTREAM POOL-GLIDE AND THE RIFFLE, AND LIKEWISE NO ABRUPT "DROP" (TRANSITION) BETWEEN THE RIFFLE AND THE DOWNSTREAM RUN-POOL. THE FINISHED CROSS SECTION OF THE RIFFLE MATERIAL SHALL GENERALLY MATCH THE SHAPE AND DIMENSIONS SHOWN ON THE RIFFLE TYPICAL SECTION WITH SOME VARIABILITY OF THE THALWEG LOCATION AS A RESULT OF THE SMALL POOLS AND LOGS.
5. THE END OF RIFFLE CONTROL POINT MAY TIE IN TO ANOTHER IN-STREAM STRUCTURE (LOG SILL, J-HOOK, ETC.). NO LOGS SHOULD BE INCLUDED WITHIN THE FOOTPRINT OF THE PROPOSED STRUCTURE.
6. THE CONSTRUCTED RIFFLE SHALL BE KEYED IN TO THE STREAM BANKS AND/OR BED AS DESIGNATED BY THE DESIGNER. THE "KEY" SHALL EXTEND BEYOND THE TOP OF BANK AT THE BEGINNING (CREST) AND END OF THE RIFFLE. WHERE PRESERVATION OF EXISTING STREAM BANK VEGETATION IS A PRIORITY A "KEY" MAY NOT BE USED (OR THE DIMENSIONS MAY BE ADJUSTED) TO LIMIT DISTURBANCE.

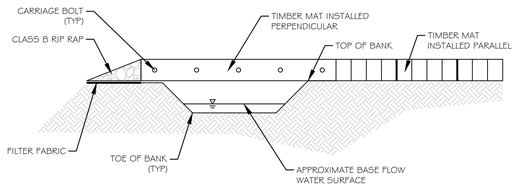
TABLE 1 - STONE COMPOSITION		
REACH	STONE SIZE	%
R1.1 & R1.2	NATIVE	25
	#5	50
	SURGE	25

STONE RIFFLE

NTS



PLAN VIEW

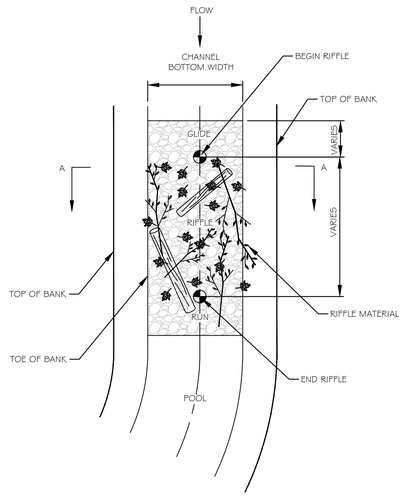


SECTION VIEW

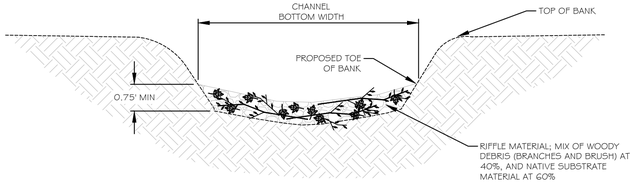
NOTES:
1. TIMBER MATS SHALL BE USED FOR TEMPORARY CONSTRUCTION ACCESS TO TRAVERSE WET AND/OR MUDDY ARES ADJACENT TO THE STREAM AND TO CROSS THE STREAM AND OTHER CONCENTRATED FLOW AREAS.
2. THE STREAM CROSSING SHALL BE INSTALLED WHEN FLOW IS LOW. THERE SHALL BE MINIMAL TO NO DISTURBANCE OF THE CHANNEL BED AND BANKS AS A RESULT OF INSTALLING THE APPROACHES OR CROSSING.
3. THE LENGTH OF TIMBER MAT REQUIRED TO CROSS THE STREAM OR CONCENTRATED FLOW AREAS SHALL BE SUCH THAT THE TIMBER MAT EXTENDS PAST THE TOP OF BANK ON EACH SIDE OF THE CROSSING A SUFFICIENT DISTANCE TO SUPPORT THE MAXIMUM EQUIPMENT SIZE USING THE CROSSING.
4. STREAM CROSSINGS SHALL BE INSTALLED WITH THE TIMBER MAT LENGTHS ORIENTED PERPENDICULAR TO THE TOPS OF THE STREAM BANKS. TIMBER MAT STREAM APPROACHES SHALL BE INSTALLED WITH THE TIMBER MAT LENGTHS ORIENTED PARALLEL TO THE TOPS OF THE STREAM BANKS.
5. STREAM CROSSING APPROACHES FROM DRY AREAS SHALL BE CONSTRUCTED USING CLASS B RIP RAP PLACED OVER FILTER FABRIC.
6. ALL TIMBER MATS, FILTER FABRIC, AND RIP RAP SHALL BE COMPLETELY REMOVED FROM THE SITE WHEN THE CROSSING IS REMOVED.

TIMBER MAT TEMPORARY CROSSING

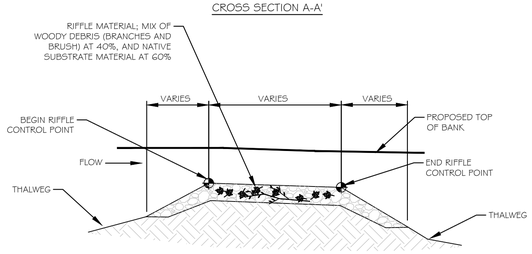
NTS



PLAN VIEW



CROSS SECTION A-A'



PROFILE

NOTES:
1. WOODY RIFFLES SHALL BE INSTALLED IN ALL NEWLY GRADED CHANNEL SECTIONS THROUGHOUT THE PROJECT UNLESS OTHERWISE SPECIFIED ON THE PLAN SHEETS.
2. ELEVATION CONTROL POINTS SHALL BE DESIGNATED AT THE BEGINNING AND END OF RIFFLE POINTS TO ESTABLISH PART OF THE PROFILE OF THE CHANNEL. SURVEY OF CONTROL POINTS SHALL BE REQUIRED TO ESTABLISH ACCURATE RIFFLE INSTALLATION WITHIN A TOLERANCE OF ±0.2'.
3. RIFFLE MATERIAL SHALL BE COMPRISED OF A 40/60 MIX OF WOODY MATERIAL AND ROCKS. WOODY MATERIAL SHALL CONSIST OF LOGS, BRANCHES, AND BRUSH NO GREATER THAN 4" IN DIAMETER. THE ROCK MATERIAL SHALL CONSIST OF NATIVE SUBSTRATE MATERIAL WHEN POSSIBLE. NATIVE MATERIAL SHALL BE EXCAVATED, STOCKPILED, AND RE-USED FROM ABANDONED CHANNEL SECTIONS. IF A SUITABLE QUANTITY OF NATIVE SUBSTRATE MATERIAL CANNOT BE HARVESTED, CONTRACTOR MAY SUBSTITUTE THE RIFFLE MATERIAL WITH ROCK MATCHING THE COMPOSITION IN TABLE 1.
4. THE PLACEMENT OF RIFFLE MATERIAL SHALL BE DONE IN A MANNER TO CREATE A SMOOTH PROFILE, WITH NO ABRUPT "JUMP" (TRANSITION) BETWEEN THE UPSTREAM POOL-GLIDE AND THE RIFFLE, AND LIKEWISE NO ABRUPT "DROP" (TRANSITION) BETWEEN THE RIFFLE AND THE DOWNSTREAM RUN-POOL. THE FINISHED CROSS SECTION OF THE RIFFLE MATERIAL SHALL GENERALLY MATCH THE SHAPE AND DIMENSIONS SHOWN ON THE RIFFLE TYPICAL SECTION.
5. THE END OF RIFFLE CONTROL POINT MAY TIE IN TO ANOTHER IN-STREAM STRUCTURE (LOG SILL OR J-HOOK).
6. THE CONSTRUCTED RIFFLE SHALL BE KEYED IN TO THE STREAM BANKS AND/OR BED AS DESIGNATED BY THE DESIGNER. THE "KEY" SHALL EXTEND BEYOND THE TOP OF BANK AT THE BEGINNING (CREST) OF THE RIFFLE. WHERE PRESERVATION OF EXISTING STREAM BANK VEGETATION IS A PRIORITY A "KEY" MAY NOT BE USED (OR THE DIMENSIONS MAY BE ADJUSTED) TO LIMIT DISTURBANCE.

TABLE 1 - STONE COMPOSITION		
REACH	STONE SIZE	%
X1	NATIVE	25
	#5	50
	SURGE	25

WOODY RIFFLE

NTS

res
302 Jefferson Street, Suite 110
Raleigh, NC 27605
Main: 919.829.9909
Fax: 919.829.9913
www.res.us

SEAL

SCALE: AS SHOWN

PLOT DATE: 9/3/2019

MARK	DATE	DESCRIPTION
REVISIONS:		
RELEASED FOR:		PRELIMINARY - NOT FOR CONSTRUCTION

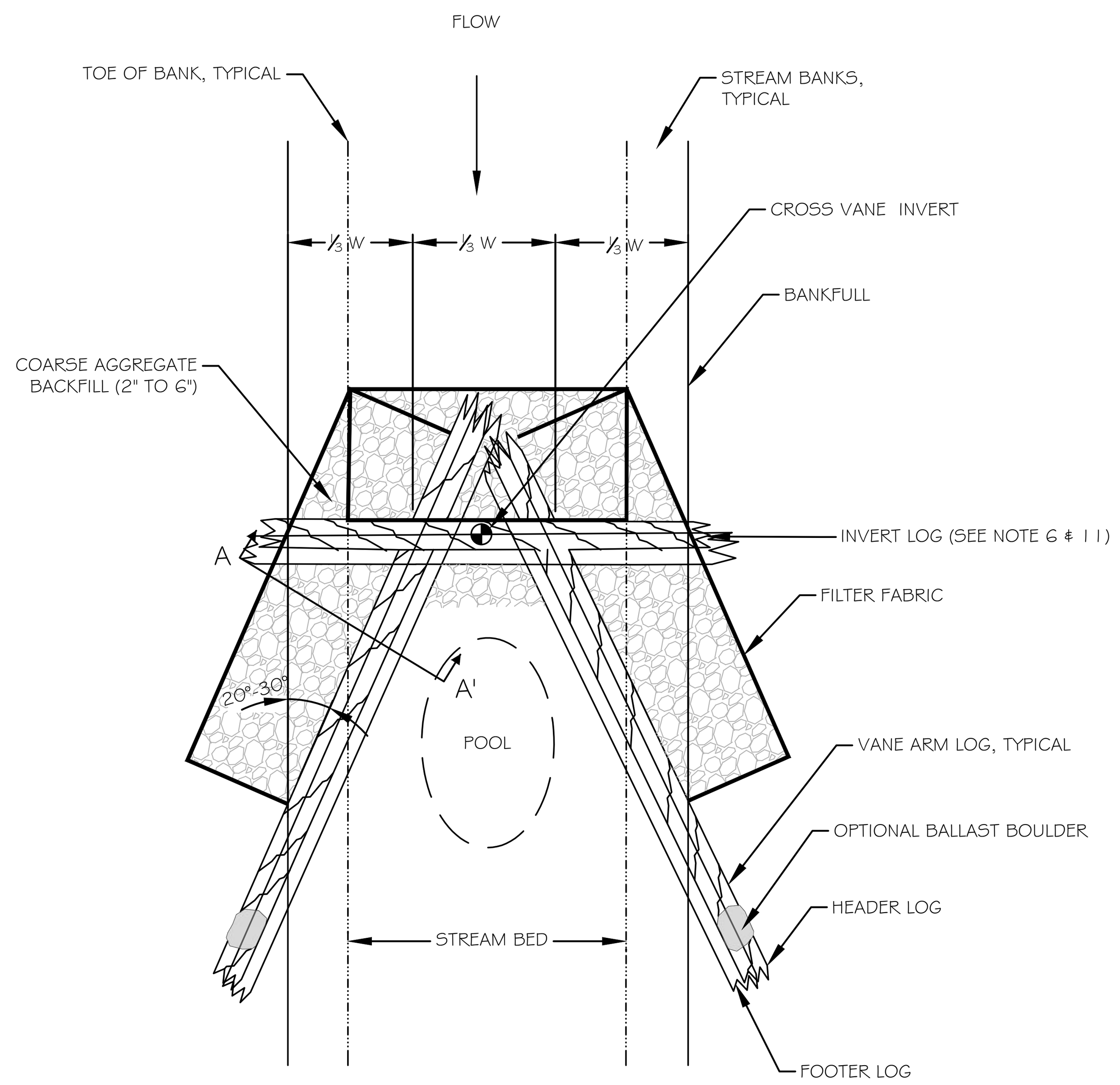
PROJECT NAME:
MATTHEW MITIGATION SITE
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
DETAILS

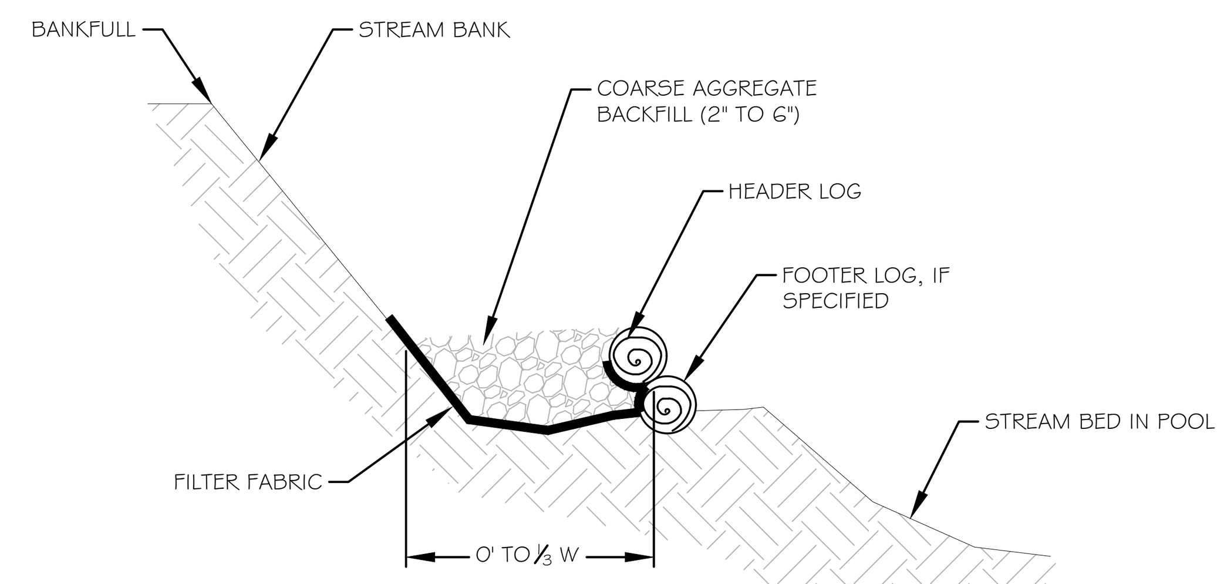
PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:
D5

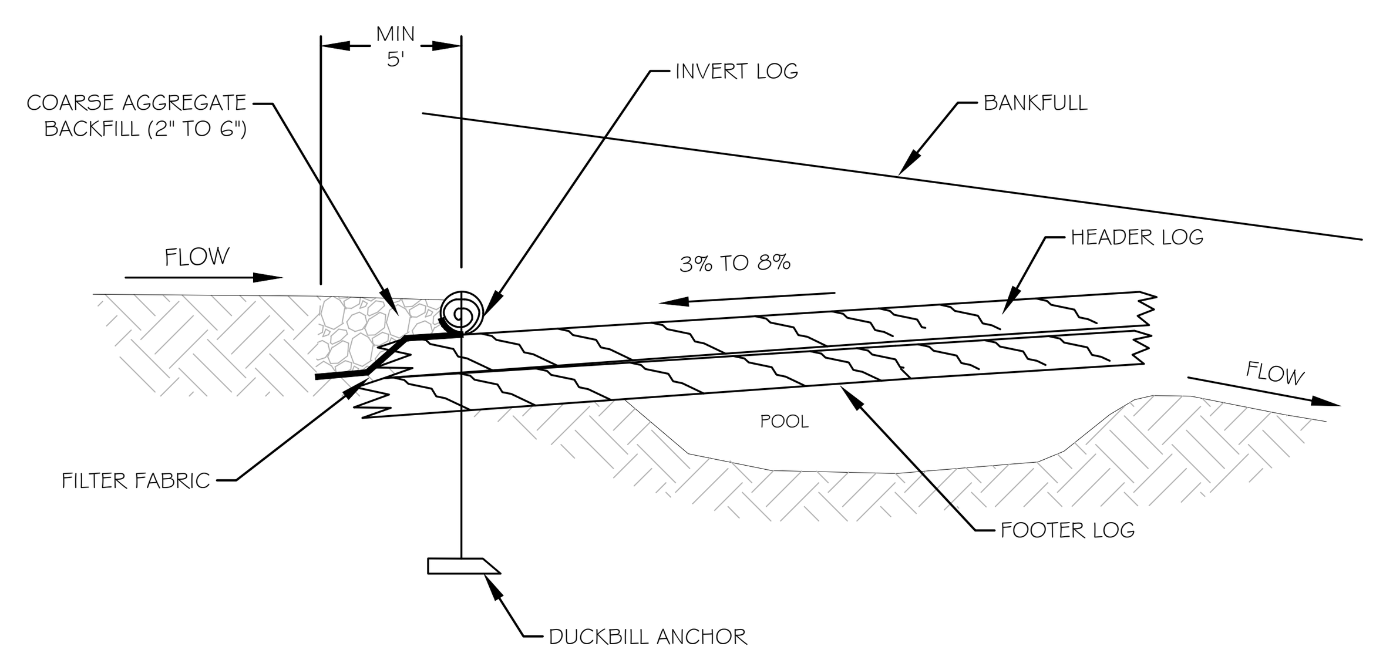
FILE NAME:S:\@RES GIS\Projects\NC\Matthew\CAD\DWG\0535_SHT_DETAILS.dwg SAVED BY: Tswartzfager



PLAN VIEW



SECTION A-A'

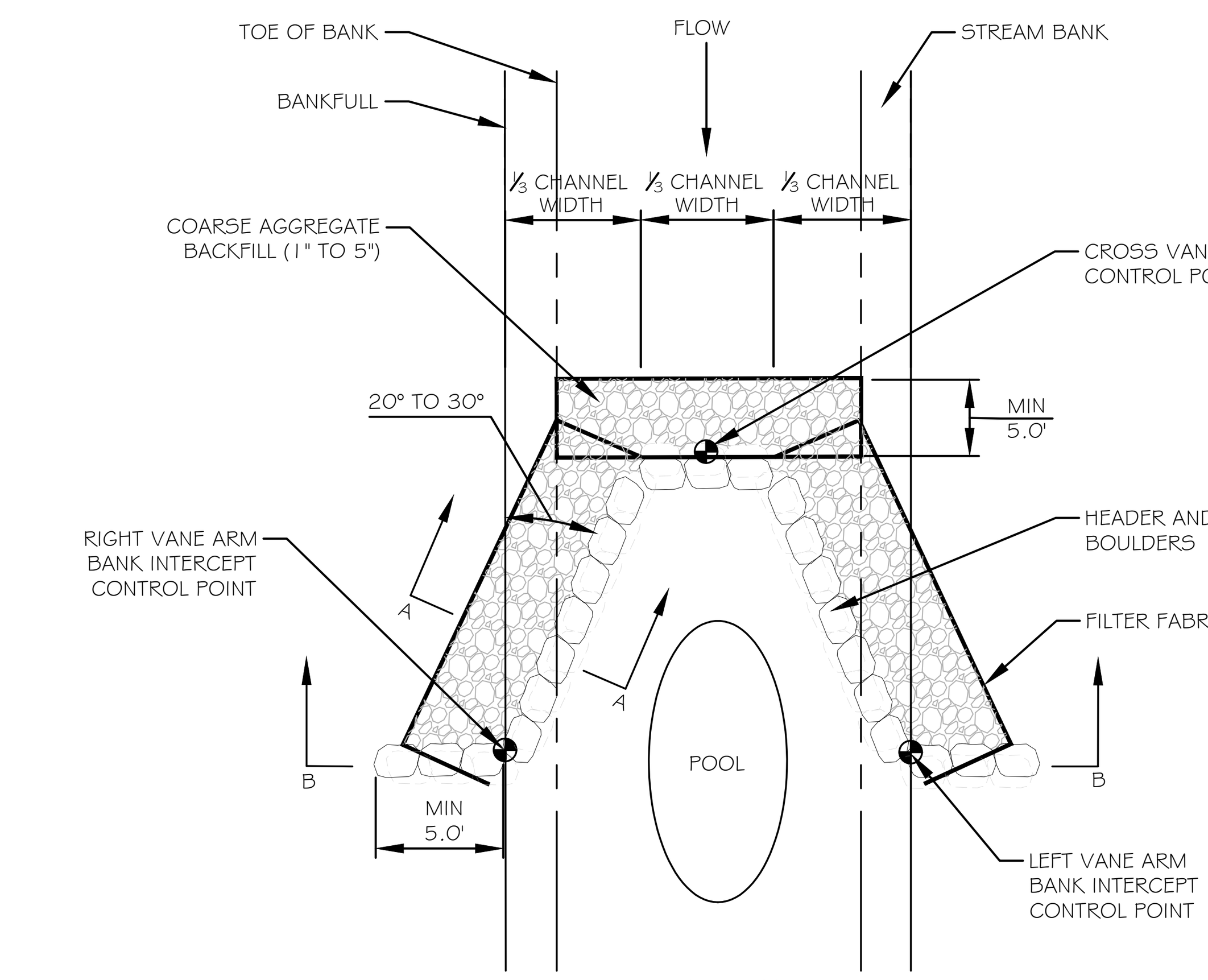


PROFILE VIEW

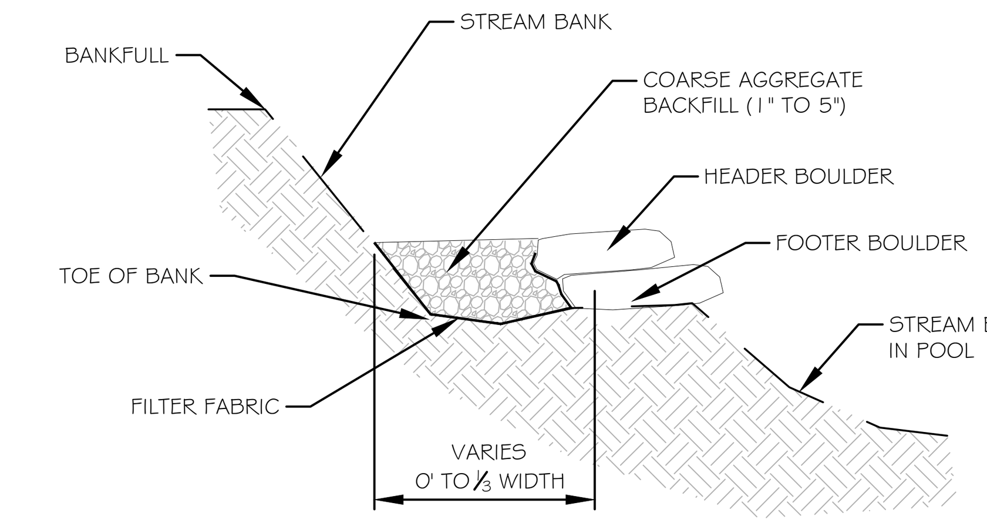
NOTES:
1. LOGS SHALL BE OF A MINIMUM OF 16' IN LENGTH AND 10" IN DIAMETER AND RELATIVELY STRAIGHT HARDWOOD, RECENTLY HARVESTED.
2. A SINGLE LOG MAY BE USED IN LIEU OF A HEADER/FOOTER LOG COMBINATION, PER DIRECTION OF DESIGNER.
3. FILTER FABRIC SHALL BE USED TO SEAL THE GAPS BETWEEN THE LOG(S) AND THE STREAM BED, UNDER THE COARSE BACKFILL MATERIAL. THERE SHALL BE NO FILTER FABRIC VISIBLE IN THE FINISHED WORK; EDGES SHALL BE FOLDED, TUCKED, OR TRIMMED AS NEEDED.
4. COARSE BACKFILL SHALL BE PLACED TO A THICKNESS EQUAL TO THE DEPTH OF THE HEADER (AND ANY FOOTER) LOGS AND SHALL EXTEND OUT FROM THE VANE ARMS TO THE STREAM BANK AND UPSTREAM.
5. AS AN OPTION, FLAT-SIDED BOULDERS MAY BE PLACED AS BALLAST ON TOP OF THE STREAM BANK SIDE OF THE EMBEDDED VANE ARMS. DUCK BILL ANCHORS MAY BE USED IN LIEU OF BALLAST BOULDERS.
6. DUCKBILL ANCHORS WITH GALVANIZED CABLE ATTACHED MAY BE USED TO SECURE LOGS INTO THE STREAM BED AND/OR BANKS. FLAT SIDED BOULDERS CAN BE USED IN LIEU OF THE LOG INVERT/DUCKBILL ANCHOR SYSTEM.

LOG CROSS VANE

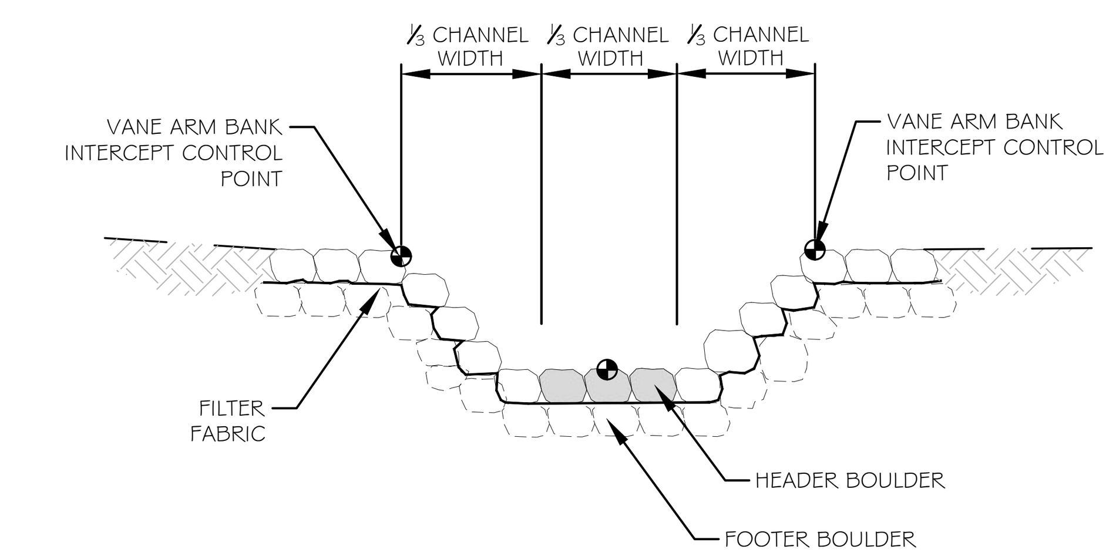
NTS



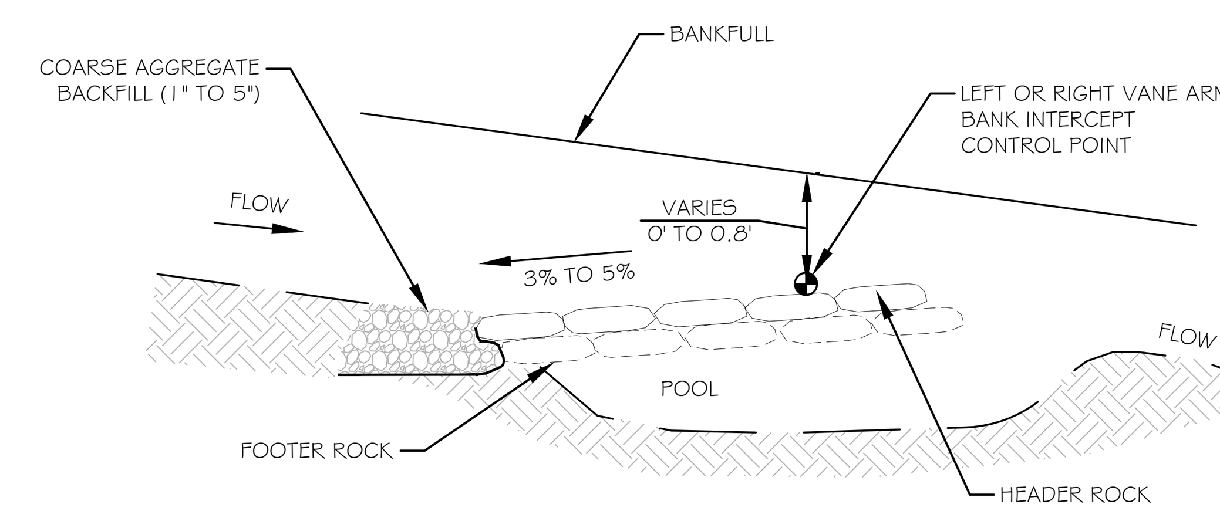
PLAN VIEW



SECTION A-A'



SECTION B-B'

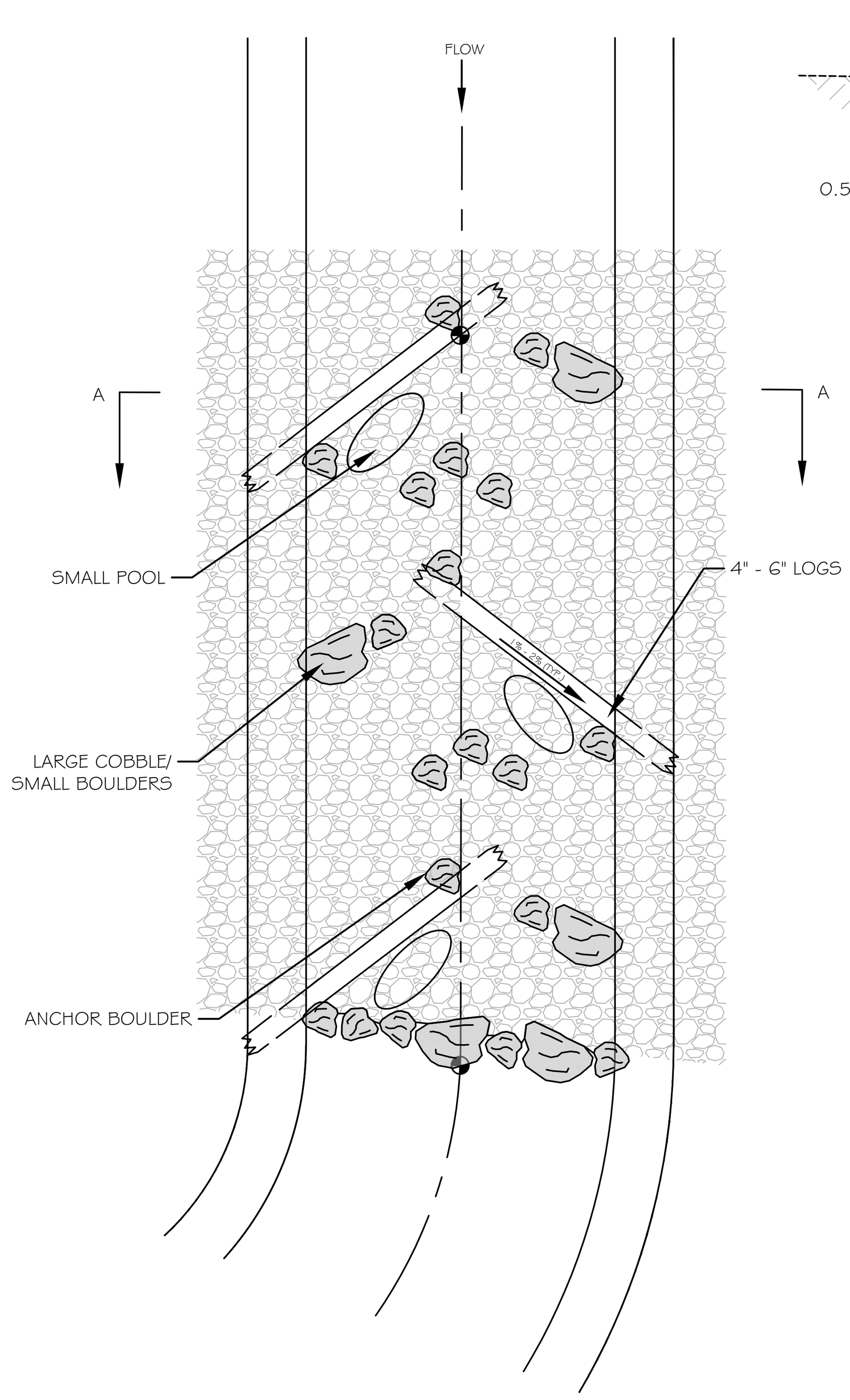


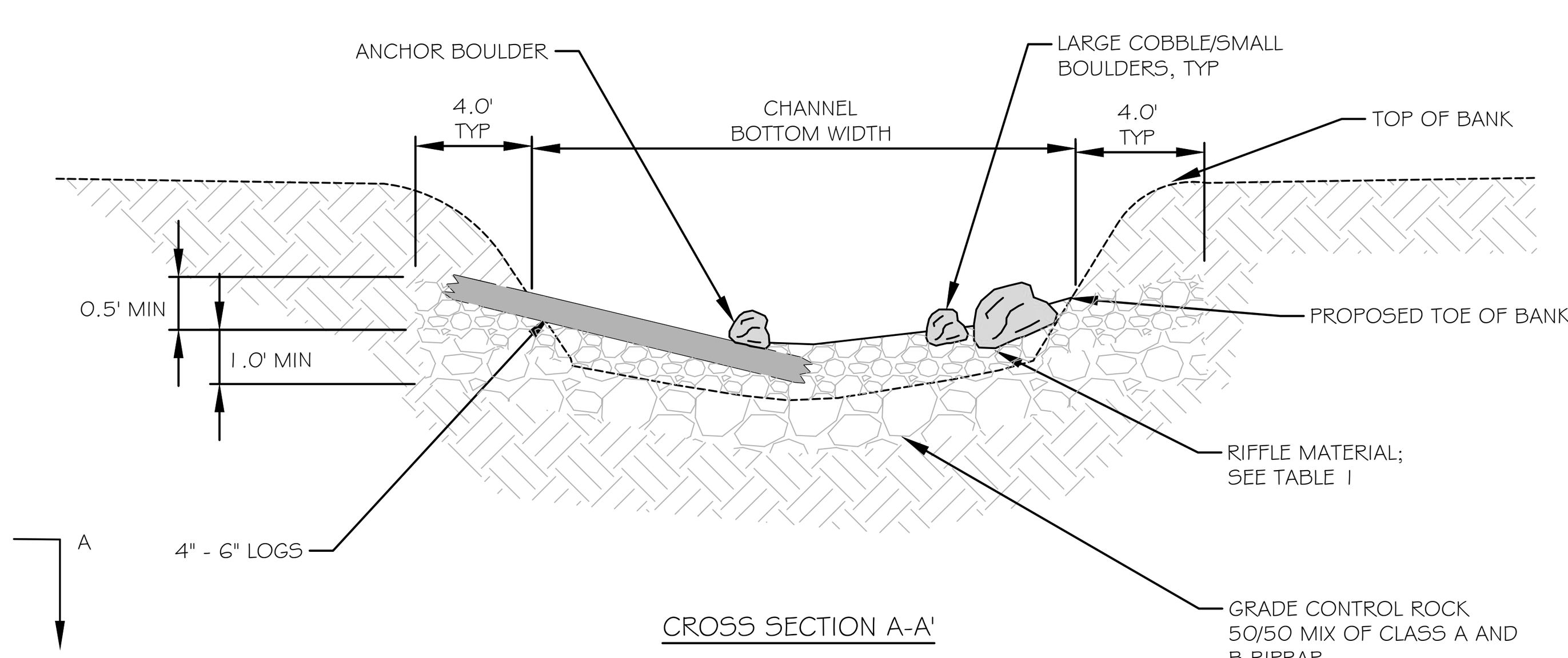
PROFILE VIEW

ROCK CROSS VANE

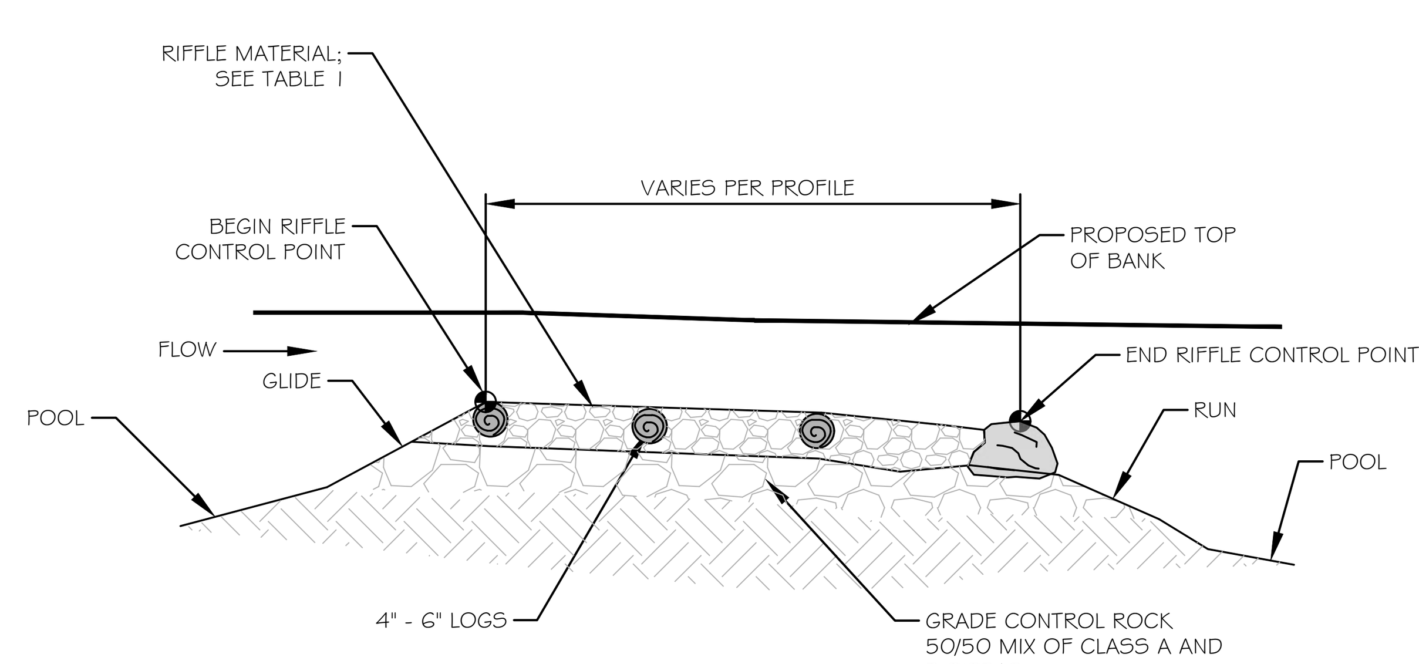
NTS

NOTES:
1. SEE STRUCTURE BOULDER SIZE TABLE FOR APPROXIMATE DIMENSIONS OF BOULDERS. THE UPPER LIMIT FOR BOULDERS SHALL BE APPROVED BY THE ENGINEER PRIOR TO INSTALLATION OF THE STRUCTURE.
2. CROSS VANES SHALL BE CONSTRUCTED SO THAT ADJOINING BOULDERS TAPER IN AN UPSTREAM DIRECTION, FROM THE BANKFULL ELEVATION TO THE STREAM INVERT. THE UPSTREAM END OF THE CROSS VANE IS SET AT AN ANGLE OF 20 TO 30 DEGREES TANGENT TO THE PROJECTED STREAM BANK DIRECTION. THE TOP ELEVATION OF BOTH VANES WILL DECREASE TOWARD THE CENTER OF THE CHANNEL.
3. THE DOWNSTREAM END OF THE CROSS VANE SHALL BE KEYED INTO THE STREAMBANK AT THE BANKFULL ELEVATION. THE CROSS VANE SHALL BE KEYED A MINIMUM OF FIVE FEET INTO THE STREAMBANK. THE UPSTREAM END OF CROSS VANE SHALL BE KEYED INTO THE STREAMBANK AT THE DESIGNED STREAMBED INVERT ELEVATION.
4. VANE BOULDERS SHALL BE PLACED IN A LINEAR FASHION SO AS TO PRODUCE THE SLOPING CROSS VANE, AND SHALL BE PLACED WITH TIGHT, CONTINUOUS SURFACE CONTACT BETWEEN ADJOINING BOULDER. BOULDER SHALL BE PLACE SO AS TO HAVE NO SIGNIFICANT GAPS BETWEEN ADJOINING BOULDER.
5. VANE BOULDERS SHALL BE PLACED SO AS TO HAVE A FINAL SMOOTH SURFACE ALONG THE TOP PLANE OF THE CROSS VANE. NO VANE BOULDER SHALL PROTRUDE HIGHER THAN THE OTHER BOULDER IN THE BOULDER VANE. A COMPLETED CROSS VANE HAS A SMOOTH, CONTINUOUS FINISH GRADE FROM THE BANKFULL ELEVATION TO THE STREAMBED.
6. AS THE CROSS VANE IS CONSTRUCTED, THE CONTRACTOR SHALL CHINK ALL VOIDS BETWEEN THE FOOTER BOULDERS, AND BETWEEN THE FOOTER BOULDERS AND VANE BOULDERS. VOIDS SHALL BE CHINKED WITH SMALLER ROCK SUCH THAT NO VOIDS GREATER THAN FOUR INCHES IN SIZE WILL BE PRESENT.





CROSS SECTION A-A'



PROFILE

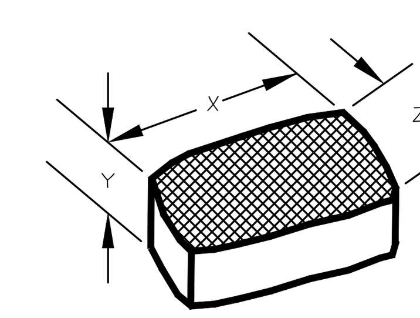
RIFFLE GRADE CONTROL

NTS

NOTES:
1. RIFFLE GRADE CONTROL STRUCTURES SHALL BE INSTALLED IN NEWLY GRADED CHANNEL SECTIONS, AS SPECIFIED BY THE DESIGNER.
2. ELEVATION CONTROL POINTS SHALL BE DESIGNATED AT THE BEGINNING AND END OF RIFFLE POINTS TO ESTABLISH PART OF THE PROFILE OF THE CHANNEL. SURVEY OF CONTROL POINTS SHALL BE REQUIRED TO ESTABLISH ACCURATE RIFFLE INSTALLATION WITHIN A TOLERANCE OF ±0.2'.
3. GRADE CONTROL ROCK SHALL BE COMPRISED OF A 50/50 MIX OF CLASS A AND B RIPRAP. GRADE CONTROL ROCK SHALL BE PLACED SUCH THAT THE ADDITION OF THE SPECIFIED THICKNESS OF RIFFLE MATERIAL SHALL ACHIEVE THE DESIGNATED GRADES.
4. RIFFLE MATERIAL SHALL BE COMPRISED OF ROCKS AND LOGS. THE ROCK MATERIAL COMPOSITION SHALL MATCH TABLE 1. RIFFLE MATERIAL SHALL BE EXCAVATED, STOCKPILED, AND RE-USED FROM ABANDONED CHANNEL SECTIONS. ROCK RIFFLE MATERIAL OBTAINED OFFSITE SHALL BE SLIGHTLY ROUNDED, “RIVER-TYPE” ROCK, UNLESS OTHER ROCK CHARACTERISTICS ARE APPROPRIATE FOR THE CHANNEL.
5. SPACING AND NUMBER OF LOGS SHOULD BE BASED ON RIFFLE LENGTH AND MAY VARY BASED ON LOG AVAILABILITY. LOGS SHOULD BE SPACED EQUALLY AND ANCHORED TO THE CHANNEL BED WITH BOULDERS.
6. THE PLACEMENT OF GRADE CONTROL ROCK AND/OR RIFFLE MATERIAL SHALL BE DONE IN A MANNER TO CREATE A SMOOTH PROFILE, WITH NO ABRUPT “JUMP” (TRANSITION) BETWEEN THE UPSTREAM POOL-GLIDE AND THE RIFFLE, AND LIKEWISE NO ABRUPT “DROP” (TRANSITION) BETWEEN THE RIFFLE AND THE DOWNSTREAM RUN-POOL. THE FINISHED CROSS SECTION OF THE RIFFLE MATERIAL SHALL GENERALLY MATCH THE SHAPE AND DIMENSIONS SHOWN ON THE RIFFLE TYPICAL SECTION WITH SOME VARIABILITY OF THE THALWEG LOCATION AS A RESULT OF THE SMALL POOLS AND LOGS.
7. THE END OF RIFFLE CONTROL POINT MAY TIE IN TO ANOTHER IN-STREAM STRUCTURE (LOG SILL , J-HOOK, ETC.). NO LOGS SHOULD BE INCLUDED WITHIN THE FOOTPRINT OF THE PROPOSED STRUCTURE.
8. THE CONSTRUCTED RIFFLE SHALL BE KEYED IN TO THE STREAM BANKS AND/OR BED AS DESIGNATED BY THE DESIGNER. THE "KEY" SHALL EXTEND BEYOND THE TOP OF BANK FOR THE LENGTH OF THE RIFFLE. WHERE PRESERVATION OF EXISTING STREAM BANK VEGETATION IS A PRIORITY A "KEY" MAY NOT BE USED (OR THE DIMENSIONS MAY BE ADJUSTED) TO LIMIT DISTURBANCE.

TABLE 1

REACH	STONE SIZE	%
RL1	#5	20
	#3	60
	NATIVE	20
RL2	#5	25
	#3	50
	NATIVE	25



3 PRIMARY ROCK DIMENSIONS:

X. LONGEST DIMENSION
Y. SHORTEST DIMENSION
Z. INTERMEDIATE DIMENSION

STRUCTURE BOULDER SIZE

REACH	DIMENSION	LENGTH (IN.)
X1	X	18
	Y	12
	Z	18
X2	X	24
	Y	18
	Z	18

res
302 Jefferson Street, Suite 110
Raleigh, NC 27605
Main: 919.829.9909
Fax: 919.829.9913
www.res.us

SEAL

SCALE: AS SHOWN

PLOT DATE: 9/3/2019

MARK	DATE	DESCRIPTION

REVISIONS:

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME: MATTHEW MITIGATION SITE JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: DETAILS

PROJECT NUMBER:	0535
PROJECT MANAGER:	BPB
DESIGNED:	AFM
DRAWN:	TRS
CHECKED:	AFM

SHEET NUMBER:

D6

FILE NAME:S:\@RES GIS\Projects\NC\Matthew\CAD\DWG\0535_SHT_DETAILS.dwg SAVED BY: Tswartzfager

Appendix B –
Data/Analysis/Supplementary Information

IRT Meeting Notes

M E M O R A N D U M

302 Jefferson Street, Suite 110 Raleigh, North Carolina 27605 919.209.1052 tel. 919.829.9913 fax

TO: **NC IRT, NC DMS**

FROM: **Bob White, RES**

DATE: **02-22-18**

RE: **RES Matthew Full Delivery Wetland and Stream Mitigation Site**
IRT Site Visits, February 20, 2018

Attendees: Mac Haupt (NC DWR), Henry Wicker (USACE), Travis Wilson (NCWRC), Jeff Schaffer (NC DMS), Tim Baumgartner (NCDMS) Bob White (RES), Daniel Ingram (RES), Burt Rudolph (RES), Frasier Mullen (RES), George Lankford (George K. Lankford, LLC)

Site Visit Date: February 20, 2018

Matthew Site

The Mathew site is located on the east side of NC Highway 96, south of Highway 95, approximately two miles southeast of Four Oaks in Johnston County, North Carolina. The Matthew Site is a proposed stream and riparian wetland mitigation project within a former farm pond basin. The farm pond dam was breached during Hurricane Matthew and significant amounts of sediment and concrete debris was deposited downstream of the pond during the storm flow. Juniper Swamp Branch is located approximately 0.35 miles below the breached dam.

Field meeting comments:

- NC DRW stated that the Division considers each stream restoration proposal within a drained pond on a case-by-case basis.

- NC DWR and NC WRC stated that all the remaining constructed dam must be removed to prevent ponding in the lower section of RL1-A. RES stated that the entire dam would be removed a horizontal distance sufficient to allow grading that exhibits the pre-ponding valley condition and matching the existing landscape adjacent to the project area.

- NC DWR stated that the debris (concrete and sediment, other materials) below the dam adjacent to channel RL1-B, can be removed to allow the stream to access the floodplain and this reach and floodplain wetlands are likely suitable for restoration. Furthermore, downstream spoil removal and establishment of flood plain connectivity would be wetland restoration and stream enhancement if functional lift is documented. NC WRC agreed that the side channel hummocks and debris deposition could be removed to allow stream

connectivity with the floodplain and acknowledged that trees would be removed during the process.

- All discussed and understood that the pond berm to the east side of the former pond would be entirely removed to the existing pond in the north side of the site (the origin of RL-2).

- NC DWR, NC DMS and RES discussed the ability to modify the elevation of the outfall of the northern farm pond (outside of the easement) to allow appropriate profile design of RL-2 to the confluence of RL1-A

- All discussed the engineering challenge of the NC DOT maintained culverts, road and easement on the north side of the project (the origin of PL1-A). The orientation of flow in the direction of existing structures, sizing of culverts and utility line were discussed. RES described this as an ongoing engineering discussion and that some bank "hardening" would be required to protect the channel and upland areas, and to move the channel to the right to align with the valley-centered designed channel. RES does not propose credit-generating work in this upper reach of RL1-A. Hardening methods may include large rock (boulders), sheet piling, or both, or other suitable engineered design. RES explained that upland areas adjacent to the upper part of reach RL1-A are comprised of fill and this material will be used for elevation control throughout the site.

- NC DWR and NC WRC commented on the necessity of full evaluation of stream RL3 to determine its flow condition and floodplain connectivity, and alignment to the confluence of constructed RL1-A.

- NC DWR commented on the necessity to kill and control the *Juncus spp.* that has grown into a dense stand throughout the former pond bottom through application of herbicide and/or burning. Further, the NC WRC commented on the likely allelopathic properties of decomposing *Juncus spp.* and potential challenges with establishing planted woody vegetation. RES is researching this condition related to seedling growth, and *Juncus spp.* control and removal.

- All discussed that the restoration reach within the drained pond would require constructed channel rather than a passive "channel forming" approach.

- Overall, the IRT members agree that the Matthew Site is suitable to provide non-riparian compensatory mitigation. Final credit approach will be determined in the approved mitigation plan.

Morphological Parameters

Matthew Morphological Parameters

	Existing[1]						Design					
	Reference Reach											
	Hannah Bridge		RL1-A		RL1-B		RL1-A US		RL1-A DS		RL2	
Feature	Riffle	Pool	Pool	Riffle	Riffle		Riffle	Pool	Riffle	Pool	Riffle	Pool
Drainage Area (ac)	752		1426		1460		853		1426		490	
Drainage Area (mi^2)	1.18		2.23		2.28		1.33		2.23		0.77	
NC Regional Curve Discharge ($cfs)^2$	18.6		29.5		30.0		20.4		29.5		13.7	
NC Regional Curve Discharge ($cfs)^3$	9.9		16.2		16.5		10.9		16.2		7.2	
Design/Calculated Discharge (cfs)	**29-31**		31.4		14.2		**20**		**30-33**		**16**	
Dimension												
BKF Cross Sectional Area (ft^2)	15.2	16.5	12.0	13.2	8.5		13.1	17.7	17.9	25.9	9.0	12.2
BKF Width (ft)	11.5	11.4	9.4	8.4	8.0		11	13.8	13.3	16.8	9.2	10.5
BKF Mean Depth (ft)	1.3	1.4	1.3	1.6	1.1		1.2	1.3	1.3	1.5	1.0	1.2
BKF Max Depth (ft)	1.9	2.5	2.0	2.9	1.4		1.5	2.3	1.7	2.6	1.3	1.8
Wetted Perimeter (ft)	12.8	13.5	11.0	11.5	9.4		11.9	15.1	14.2	18.3	9.9	11.6
Hydraulic Radius (ft)	1.2	1.2	1.1	1.2	0.9		1.1	1.2	1.3	1.4	0.9	1.0
Width/Depth Ratio	8.7	7.9	7.4	5.4	7.6		9.2	10.8	9.8	10.9	9.4	9.1
Floodprone Width (ft)	>30	>30	9	>30	0		>30	>30	>30	>30	>30	>30
Entrenchment Ratio	>2.2	>2.2	1.0	>2.2	>2.2		>2.2	>2.2	>2.2	>2.2	>2.2	>2.2
Bank/Height Ratio	1.1	1.1	1.1	---	1.1		1.0	1.0	1.0	1.0	1.0	1.0
Substrate												
Description (D50)	Fine Gravel		Coarse Sand		Fine Gravel		Coarse Sand/Fine Gravel		Coarse Sand/Fine Gravel		Coarse Sand/Fine Gravel	
D16 (mm)	0.55		0.59		0.062		-		-		-	
D50 (mm)	4.4		0.82		2.3		-		-		-	
D84 (mm)	11		4		8.8		-		-		-	
Pattern												
	Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Channel Beltwidth (ft)	20	59	-	-	-	-	18	54	22	66	15	46
Radius of Curvature (ft)	11	26	-	-	-	-	10	23	12	28	8	20
Radius of Curvature Ratio	0.9	2.1	-	-	-	-	0.9	2.1	0.9	2.1	0.9	2.1
Meander Wavelength (ft)	155	177	-	-	-	-	284	325	172	196	120	137
Meander Width Ratio	13.0	14.8	-	-	-	-	13.0	14.8	13.0	14.8	13.0	14.8
Profile												
	Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Riffle Length (ft)	5	35	-	-	-	-	5	21	6	25	4	18
Run Length (ft)	3	19	-	-	-	-	10	17	12	20	8	14
Pool Length (ft)	3	12	-	-	-	-	5	16	6	20	4	14
Pool -to-Pool Spacing (ft)	11	35	-	-	-	-	35	54	43	65	30	45
Additional Reach Parameters												
Valley Length (ft)	842		327		260		1240		785		655	
Channel Length (ft)	995		382		342		1456		982		792	
Sinuosity	1.18		1.17		1.32		1.17		1.25		1.21	
Water Surface Slope (ft/ft)	0.0025		-		-		-		-		-	
Channel Slope (ft/ft)	0.0027		0.0020		0.0020		0.0025		0.0025		0.0040	
Rosgen Classification	E4/5		E5		E4		E4/5		E4/5		E4/5	

[1] Bankfull stage was estimated using NC Regional Curve equations and existing conditions data

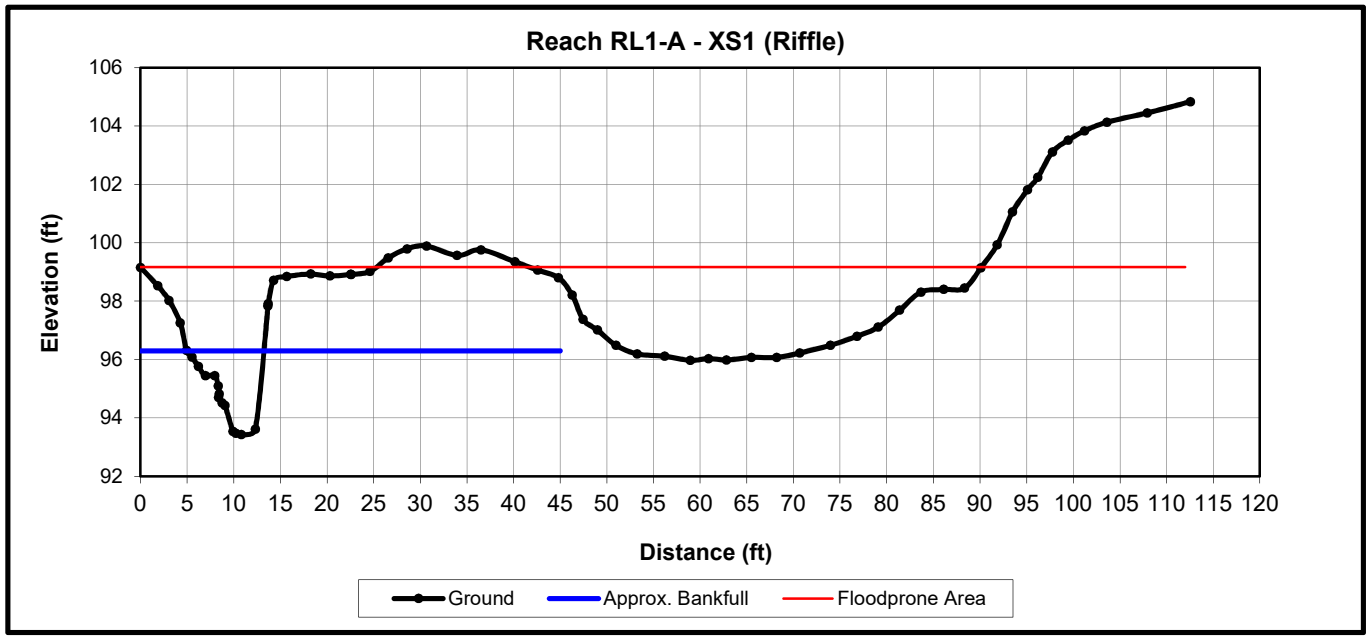
[2] NC Regional Curve equations source: Doll et al. (2003)

[3] NC Regional Curve equations source: Sweet and Geratz (2003)

Cross Sections of Current Conditions & Reference Reaches

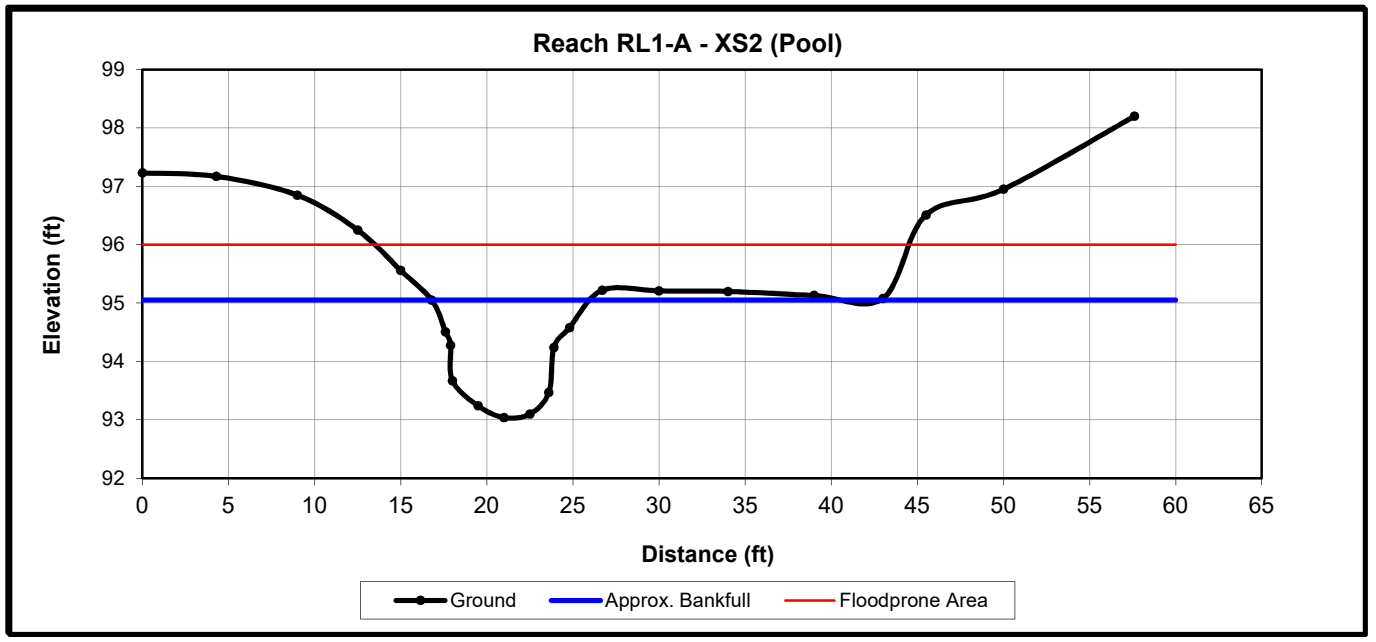
Upstream

Downstream



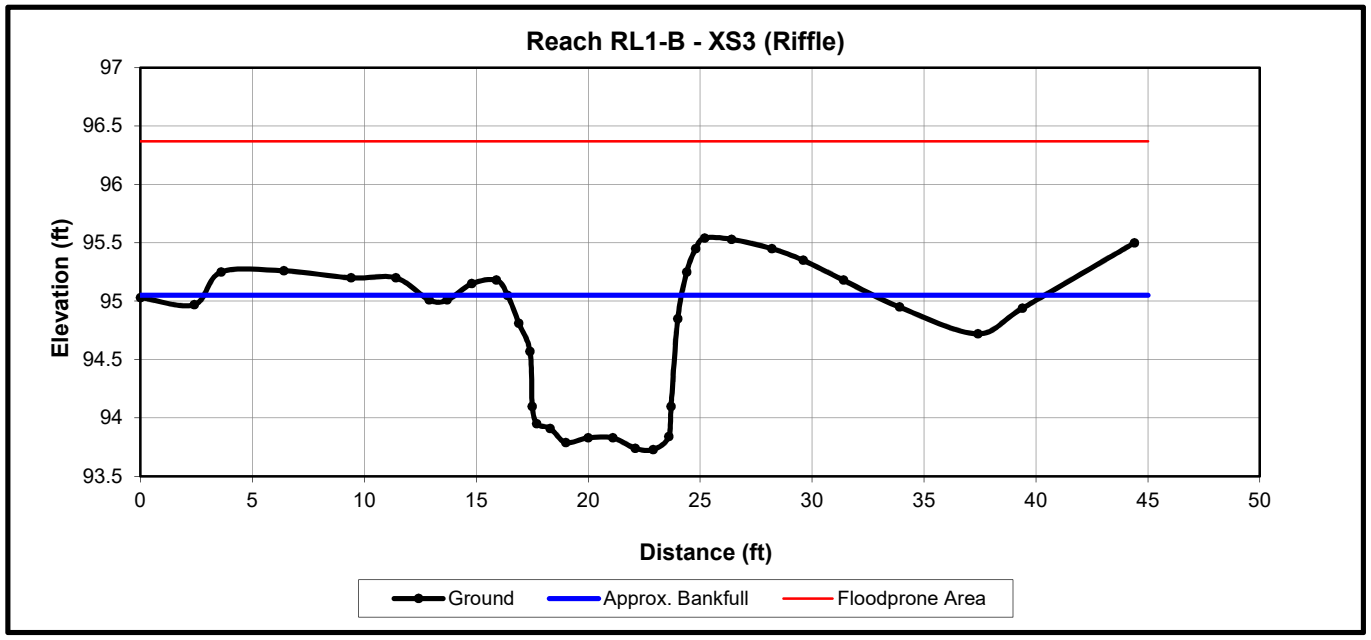
Upstream

Downstream



Upstream

Downstream



Channel Stability Assessment

Stream: UT to Juniper Swamp
Reach: RL1-B
Date: 10/9/2018
Weather:
Location:

Observers: MDO, MDE, OLP
Project: Matthew Site
Drainage Area:
Stream Type:

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	10
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	7
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	4
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	2
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	7
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y <12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	5
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	3

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	7
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	4
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	8
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	2
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	2
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	NA

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score 61

Stream: UT to Juniper Swamp
Reach: RL1-A (Below Dam)
Date: 10/9/2018
Weather:
Location:

Observers: MDD, MDE, DLP
Project: Matthew Site
Drainage Area:
Stream Type:

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	10
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	8
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	11
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	9
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	10
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y <12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	10
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	11

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
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9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	10
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	5
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	7
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	9
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	NA

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score 108

Background Attribute Table

Project Background Information					
Project Name	Matthew Site				
County	Johnston				
Project Area (acres)	19.19				
Project Coordinates (latitude and longitude)	35.42503, -78.40849				
Planted Acreage (Acres of Woody Stems Planted)	16.4				
Project Watershed Summary Information					
Physiographic Province	65m – Rolling Coastal Plain				
River Basin	Neuse				
USGS Hydrologic Unit 8-digit	3020201	USGS Hydrologic Unit 14-digit	3020201150020		
DWR Sub-basin	03-04-04				
Project Drainage Area (Acres and Square Miles)	1460				
Project Drainage Area Percentage of Impervious Area	7%				
CGIA Land Use Classification	Water, Bottomland Forest/Hardwood Swamp, Southern Yellow Pine				
Reach Summary Information					
Parameters	**Reach RL1-A**	**Reach RL1-B**	**Reach RL2**		
Length of reach (linear feet)	1,767	342	949		
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Unconfined	Unconfined		
Drainage area (Acres and Square Miles)	853 (1.33)	1460 (2.28)	490 (0.77)		
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial		
NCDWR Water Quality Classification	C; NSW	C; NSW	C; NSW		
Stream Classification (existing)	E5	E4	NA		
Stream Classification (proposed)	E4/5	E4/5	E4/5		
Evolutionary trend (Simon)	III	IV/V	III		
FEMA classification	Zone AE	Zone AE	Zone AE		
Wetland Summary Information					
Parameters	**WA**	**WB**	**WC**	**WD**	**WE**
Size of Wetland (acres)	10.20	0.429	0.10	0.808	0.758
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian riverine	Riparian riverine	Riparian riverine	Riparian riverine	Riparian riverine
Mapped Soil Series	Water	Bibb sandy loam	Bibb sandy loam	Bibb sandy loam	Bibb sandy loam
Drainage class	N/A	Poorly drained	Poorly drained	Poorly drained	Poorly drained
Soil Hydric Status	N/A	Predominantly hydric	Predominantly hydric	Predominantly hydric	Predominantly hydric
Source of Hydrology	Groundwater, overland	Groundwater, overland	Groundwater, overland	Groundwater, overland	Groundwater, overland
Restoration or enhancement method (hydrologic, vegetative etc.)	Hydrologic, vegetative	Vegetative	Vegetative	Vegetative	Vegetative
Regulatory Considerations					
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**		
Water of the United States - Section 404	Yes	No	Appendix K		
Water of the United States - Section 401	Yes	No	Appendix K		
Endangered Species Act	Yes	Yes	Appendix K		
Historic Preservation Act	Yes	Yes	Appendix K		
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A		
FEMA Floodplain Compliance	Yes	No	Appendix L		
Essential Fisheries Habitat	No	N/A	N/A		
DOT Right-of-way Permit	Yes	No	N/A		

Appendix C – Site Protection Instrument

SITE PROTECTION INSTRUMENT

Site Protection Instrument(s) Summary Information

The land required for the construction, management, and stewardship of this mitigation project includes portions of the parcels listed below in Table C1. EBX-Neuse I, LLC (an entity of RES) has obtained a conservation easement from the current landowners for the project area. The easement deed and survey plat will be submitted to DMS and State Property Office (SPO) for approval and will be held by the State of North Carolina. The easement deed will follow the NCDMS Full Delivery Conservation Easement Template dated May 5, 2017 and included in this appendix. Once recorded, the secured easement will allow EBX-Neuse I, LLC to proceed with the project development and protect the mitigation assets in perpetuity. Once finalized, a copy of the land protection instrument(s) will be included in **Appendix C**.

Table C1. Project Parcel and Landowner Information

Owner of Record	Tax Parcel ID #	County	Site Protection Instrument	Deed Book and Page Numbers	Acreage Protected
Ronnie L. Lawhorn and Sara A. Lawhorn	167000-69-8017 (Johnston County)	Johnston	Conservation Easement	--	19.19 ac

STATE OF NORTH CAROLINA

DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

_____ COUNTY

SPO File Number:
DMS Project Number:

Prepared by: Office of the Attorney General
Property Control Section
Return to: NC Department of Administration
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

THIS DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS, made this _____day of _____, 20__, by _____ *Landowner name goes here* , ("**Grantor**"), whose mailing address is _____ *Landowner address goes here* _____, to the State of North Carolina, ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Division of Mitigation Services (formerly known as the Ecosystem Enhancement Program and Wetlands Restoration Program) within the Department of Environment and Natural Resources for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the

protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between *(insert name and address of full delivery contract provider)* and the North Carolina Department of Environmental Quality, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environmental Quality Purchase and Services Contract Number _____.

WHEREAS, The State of North Carolina is qualified to be the Grantee of a Conservation Easement pursuant to N.C. Gen. Stat. § 121-35; and

WHEREAS, the Department of Environment and Natural Resources and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Understanding, (MOU) duly executed by all parties on November 4, 1998. This MOU recognized that the Wetlands Restoration Program was to provide effective compensatory mitigation for authorized impacts to wetlands, streams and other aquatic resources by restoring, enhancing and preserving the wetland and riparian areas of the State; and

WHEREAS, the Department of Environment and Natural Resources, the North Carolina Department of Transportation and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Agreement, (MOA) duly executed by all parties in Greensboro, NC on July 22, 2003, which recognizes that the Division of Mitigation Services (formerly Ecosystem Enhancement Program) is to provide for compensatory mitigation by effective protection of the land, water and natural resources of the State by restoring, enhancing and preserving ecosystem functions; and

WHEREAS, the Department of Environment and Natural Resources, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the North Carolina Wildlife Resources Commission, the North Carolina Division of Water Quality, the North Carolina Division of Coastal Management, and the National Marine Fisheries Service entered into an agreement to continue the In-Lieu Fee operations of the North Carolina Department of Natural Resources' Division of Mitigation Services (formerly Ecosystem Enhancement Program) with an effective date of 28 July, 2010, which supersedes and replaces the previously effective MOA and MOU referenced above; and

WHEREAS, the acceptance of this instrument for and on behalf of the State of North Carolina was granted to the Department of Administration by resolution as approved by the Governor and Council of State adopted at a meeting held in the City of Raleigh, North Carolina, on the 8th day of February 2000; and

WHEREAS, the Division of Mitigation Services in the Department of Environmental Quality, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in _____ Township, _____ County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately _____ acres and being conveyed to the Grantor by deed as recorded in **Deed Book _____ at Page ____** of the _____ County Registry, North Carolina; and

WHEREAS, Grantor is willing to grant a Conservation Easement and Right of Access over the herein described areas of the Property, thereby restricting and limiting the use of the areas of the Property subject to the Conservation Easement to the terms and conditions and purposes hereinafter set forth, and Grantee is willing to accept said Easement and Access Rights. The Conservation Easement shall be for the protection and benefit of the waters of ***if known, insert name of stream, branch, river or waterway here***.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement along with a general Right of Access.

The Conservation Easement Area consists of the following:

Tracts Number _____ containing a total of _____ **acres** as shown on the plats of survey entitled "Final Plat, Conservation Easement for North Carolina Division of Mitigation Services, Project Name: _____, SPO File No._____, EEP Site No. _____, Property of _____," dated _____, 20__ by *name of surveyor*, PLS Number _____ and recorded in the _____ County, North Carolina Register of Deeds at **Plat Book _____ Pages _____.**

See attached "**Exhibit A**", Legal Description of area of the Property hereinafter referred to as the "Conservation Easement Area"

The purposes of this Conservation Easement are to maintain, restore, enhance, construct, create and preserve wetland and/or riparian resources in the Conservation Easement Area that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; to maintain permanently the Conservation Easement Area in its natural condition, consistent with these purposes; and to prevent any use of the Easement Area that will significantly impair or interfere with these purposes. To achieve these purposes, the following conditions and restrictions are set forth:

I. DURATION OF EASEMENT

Pursuant to law, including the above referenced statutes, this Conservation Easement and Right of Access shall be perpetual and it shall run with, and be a continuing restriction upon the use of, the Property, and it shall be enforceable by the Grantee against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

The Conservation Easement Area shall be restricted from any development or usage that would impair or interfere with the purposes of this Conservation Easement. Unless expressly reserved as a compatible use herein, any activity in, or use of, the Conservation Easement Area by the Grantor is prohibited as inconsistent with the purposes of this Conservation Easement. Any rights not expressly reserved hereunder by the Grantor have been acquired by the Grantee. Any rights not expressly reserved hereunder by the Grantor, including the rights to all mitigation credits, including, but not limited to, stream, wetland, and riparian buffer mitigation units, derived from each site within the area of the Conservation Easement, are conveyed to and belong to the Grantee. Without limiting the generality of the foregoing, the following specific uses are prohibited, restricted, or reserved as indicated:

A. Recreational Uses. Grantor expressly reserves the right to undeveloped recreational uses, including hiking, bird watching, hunting and fishing, and access to the Conservation Easement Area for the purposes thereof.

B. Motorized Vehicle Use. Motorized vehicle use in the Conservation Easement Area is prohibited except within a Crossing Area(s) or Road or Trail as shown on the recorded survey plat**.**

C. Educational Uses. The Grantor reserves the right to engage in and permit others to engage in educational uses in the Conservation Easement Area not inconsistent with this Conservation Easement, and the right of access to the Conservation Easement Area for such purposes including organized educational activities such as site visits and observations. Educational uses of the property shall not alter vegetation, hydrology or topography of the site.

D. **Damage to Vegetation.** Except within Crossing Area(s) as shown on the recorded survey plat and as related to the removal of non-native plants, diseased or damaged trees, or vegetation that destabilizes or renders unsafe the Conservation Easement Area to persons or natural habitat, all cutting, removal, mowing, harming, or destruction of any trees and vegetation in the Conservation Easement Area is prohibited.

E. Industrial, Residential and Commercial Uses. All industrial, residential and commercial uses are prohibited in the Conservation Easement Area.

F. Agricultural Use. All agricultural uses are prohibited within the Conservation Easement Area including any use for cropland, waste lagoons, or pastureland.

G. New Construction. There shall be no building, facility, mobile home, antenna, utility pole, tower, or other structure constructed or placed in the Conservation Easement Area.

H. **Roads and Trails.** There shall be no construction or maintenance of new roads, trails, walkways, or paving in the Conservation Easement.

All existing roads, trails and crossings within the Conservation Easement Area shall be shown on the recorded survey plat.

I. Signs. No signs shall be permitted in the Conservation Easement Area except interpretive signs describing restoration activities and the conservation values of the Conservation Easement Area, signs identifying the owner of the Property and the holder of the Conservation Easement, signs giving directions, or signs prescribing rules and regulations for the use of the Conservation Easement Area.

J. Dumping or Storing. Dumping or storage of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances, machinery, or any other material in the Conservation Easement Area is prohibited.

K. Grading, Mineral Use, Excavation, Dredging. There shall be no grading, filling, excavation, dredging, mining, drilling, hydraulic fracturing; removal of topsoil, sand, gravel, rock, peat, minerals, or other materials.

L. Water Quality and Drainage Patterns. There shall be no diking, draining, dredging, channeling, filling, leveling, pumping, impounding or diverting, causing, allowing or permitting the diversion of surface or underground water in the Conservation Easement Area. No altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns is allowed. All removal of wetlands, polluting or discharging into waters, springs, seeps, or wetlands, or use of pesticide or biocides in the Conservation Easement Area is prohibited. In the event of an emergency interruption or shortage of all other water sources, water from within the Conservation Easement Area may temporarily be withdrawn for good cause shown as needed for the survival of livestock on the Property.

M. Subdivision and Conveyance. Grantor voluntarily agrees that no further subdivision, partitioning, or dividing of the Conservation Easement Area portion of the Property owned by the Grantor in fee simple ("fee") that is subject to this Conservation Easement is allowed. Any future transfer of the Property shall be subject to this Conservation Easement and Right of Access and to the Grantee's right of unlimited and repeated ingress and egress over and across the Property to the Conservation Easement Area for the purposes set forth herein.

N. Development Rights. All development rights are permanently removed from the Conservation Easement Area and are non-transferrable.

O. Disturbance of Natural Features. Any change, disturbance, alteration or impairment of the natural features of the Conservation Easement Area or any intentional introduction of non-native plants, trees and/or animal species by Grantor is prohibited.

The Grantor may request permission to vary from the above restrictions for good cause shown, provided that any such request is not inconsistent with the purposes of this Conservation Easement, and the Grantor obtains advance written approval from the Division of Mitigation Services, 1652 Mail Services Center, Raleigh, NC 27699-1652.

III. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees and agents, successors and assigns, receive a perpetual Right of Access to the Conservation Easement Area over the Property at reasonable times to undertake any activities on the property to restore, construct, manage, maintain, enhance, protect, and monitor the stream, wetland and any other riparian resources in the Conservation Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights.

B. Restoration Activities. These activities include planting of trees, shrubs and herbaceous vegetation, installation of monitoring wells, utilization of heavy equipment to grade, fill, and prepare the soil, modification of the hydrology of the site, and installation of natural and manmade materials as needed to direct in-stream, above ground, and subterraneous water flow.

C. Signs. The Grantee, its employees and agents, successors or assigns, shall be permitted to place signs and witness posts on the Property to include any or all of the following: describe the project, prohibited activities within the Conservation Easement, or identify the project boundaries and the holder of the Conservation Easement.

D. Fences. Conservation Easements are purchased to protect the investments by the State (Grantee) in natural resources. Livestock within conservations easements damages the investment and can result in reductions in natural resource value and mitigation credits which would cause financial harm to the State. Therefore, Landowners (Grantor) with livestock are required to restrict livestock access to the Conservation Easement area. Repeated failure to do so may result in the State (Grantee) repairing or installing livestock exclusion devices (fences) within the conservation area for the purpose of restricting livestock access. In such cases, the landowner (Grantor) must provide access to the State (Grantee) to make repairs.

E. Crossing Area(s). The Grantee is not responsible for maintenance of crossing area(s), however, the Grantee, its employees and agents, successors or assigns, reserve the right to repair crossing area(s), at its sole discretion and to recover the cost of such repairs from the Grantor if such repairs are needed as a result of activities of the Grantor, his successors or assigns.

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the

power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

B. Inspection. The Grantee, its employees and agents, successors and assigns, have the right, with reasonable notice, to enter the Conservation Easement Area over the Property at reasonable times for the purpose of inspection to determine whether the Grantor is complying with the terms, conditions and restrictions of this Conservation Easement.

C. Acts Beyond Grantor's Control. Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury or change in the Conservation Easement Area caused by third parties, resulting from causes beyond the Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken in good faith by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to life or damage to the Property resulting from such causes.

D. Costs of Enforcement. Beyond regular and typical monitoring expenses, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor, including, without limitation, any costs of restoration necessitated by Grantor's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantor.

E. No Waiver. Enforcement of this Easement shall be at the discretion of the Grantee and any forbearance, delay or omission by Grantee to exercise its rights hereunder in the event of any breach of any term set forth herein shall not be construed to be a waiver by Grantee.

V. MISCELLANEOUS

A. This instrument sets forth the entire agreement of the parties with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings or agreements relating to the Conservation Easement. If any provision is found to be invalid, the remainder of the provisions of the Conservation Easement, and the application of such provision to persons or circumstances other than those as to which it is found to be invalid, shall not be affected thereby.

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the

obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

C. Any notices shall be sent by registered or certified mail, return receipt requested to the parties at their addresses shown herein or to other addresses as either party establishes in writing upon notification to the other.

D. Grantor shall notify Grantee in writing of the name and address and any party to whom the Property or any part thereof is to be transferred at or prior to the time said transfer is made. Grantor further agrees that any subsequent lease, deed, or other legal instrument by which any interest in the Property is conveyed is subject to the Conservation Easement herein created.

E. The Grantor and Grantee agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property or any portion thereof.

F. This Conservation Easement and Right of Access may be amended, but only in writing signed by all parties hereto, or their successors or assigns, if such amendment does not affect the qualification of this Conservation Easement or the status of the Grantee under any applicable laws, and is consistent with the purposes of the Conservation Easement. The owner of the Property shall notify the State Property Office and the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any transfer of all or any part of the Property or of any request to void or modify this Conservation Easement. Such notifications and modification requests shall be addressed to:

Division of Mitigation Services Program Manager
NC State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

and

General Counsel
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403

G. The parties recognize and agree that the benefits of this Conservation Easement are in gross and assignable provided, however, that the Grantee hereby covenants and agrees, that in the event it transfers or assigns this Conservation Easement, the organization receiving the interest will be a qualified holder under N.C. Gen. Stat. § 121-34 et seq. and § 170(h) of the Internal Revenue Code, and the Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be required to continue in perpetuity the conservation purposes described in this document.

VI. QUIET ENJOYMENT

Grantor reserves all remaining rights accruing from ownership of the Property, including the right to engage in or permit or invite others to engage in only those uses of the Conservation Easement Area that are expressly reserved herein, not prohibited or restricted herein, and are not inconsistent with the purposes of this Conservation Easement. Without limiting the generality of the foregoing, the Grantor expressly reserves to the Grantor, and the Grantor's invitees and licensees, the right of access to the Conservation Easement Area, and the right of quiet enjoyment of the Conservation Easement Area,

TO HAVE AND TO HOLD, the said rights and easements perpetually unto the State of North Carolina for the aforesaid purposes,

AND Grantor covenants that Grantor is seized of said premises in fee and has the right to convey the permanent Conservation Easement herein granted; that the same is free from encumbrances and that Grantor will warrant and defend title to the same against the claims of all persons whomsoever.

IN TESTIMONY WHEREOF, the Grantor has hereunto set his hand and seal, the day and year first above written.

_____ (SEAL)

NORTH CAROLINA
COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that _____, Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the _____ day of _____, 20__.

_____
Notary Public

My commission expires:

_____

Exhibit A

[INSERT LEGAL DESCRIPTION]

Appendix D – Credit Release Schedule

CREDIT RELEASE SCHEDULE

All credit releases will be based on the total credit generated as reported in the approved final mitigation plan, unless there are major discrepancies and then a mitigation plan addendum will be submitted. Under no circumstances shall any mitigation project be debited until the necessary Department of the Army (DA) authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the IRT, will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to be restarted or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described as follows in **Tables D1** & **D2**.

Table D1. Stream Credit Release Schedule

Credit Release Milestone	Release Activity	Interim Release	Total Release
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50%
3	Third year monitoring report demonstrates performance standards are being met	10%	60%
4	Fourth year monitoring report demonstrates performance standards are being met	5%	65% (75%**)
5	Fifth year monitoring report demonstrates performance standards are being met	10%	75% (85%**)
6*	Sixth year monitoring report demonstrates performance standards are being met	5%	80% (90%**)
7	Seventh year monitoring report demonstrates performance standards are being met and project has received closeout approval	10%	90% (100%**)

**Please note that vegetation data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the IRT.*

***10% reserve of credits to be held back until the bankfull event performance standard has been met.*

Table D2. Wetland Credit Release Schedule

Credit Release Milestone	Release Activity	Interim Release	Total Release
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50%
3	Third year monitoring report demonstrates performance standards are being met	15%	65%
4*	Fourth year monitoring report demonstrates performance standards are being met	5%	70%
5	Fifth year monitoring report demonstrates performance standards are being met	15%	85%
6*	Sixth year monitoring report demonstrates performance standards are being met	5%	90%
7	Seventh year monitoring report demonstrates performance standards are being met and project has received closeout approval	10%	100%

**Please note that vegetation data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the IRT.*

Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan, can be released by DMS without prior written approval of the DE upon satisfactory completion of the following activities:

1) Approval of the final Mitigation Plan.
2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property.
3) Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; per the DMS Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.
4) Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 10% of a site's total stream credits shall be released after four bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than four bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, DMS will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

Appendix E – Financial Assurance

FINANCIAL ASSURANCE

Pursuant to Section IV H and Appendix III of the NCDEQ DMS (formerly Ecosystem Enhancement Program) In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environmental Quality (NCDEQ) has provided the USACE-Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by NCDEQ DMS. This commitment provides financial assurance for all mitigation projects implemented by the program.

Appendix F – Maintenance Plan

MAINTENANCE PLAN

The site will be monitored on a regular basis and a physical inspection will be conducted a minimum of once per year throughout the post construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following:

F1. Maintenance Plan

Component/Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where stormwater and floodplain flows intercept the channel may also require maintenance to prevent bank failures and head-cutting. Stream maintenance activities will be documented and reported in annual monitoring reports. Stream maintenance will continue through the monitoring period.
Wetland	Routine wetland maintenance and repair activities may include securing of loose coir matting, channel plug maintenance, and supplemental installations of live stakes and other target vegetation within the wetland.
Vegetation	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.
Site Boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries will be marked with signs identifying the property as a mitigation site, 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 site 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.
Road Crossing	N/A
Livestock Fencing	Livestock fencing is to be placed outside the easement limits. Maintenance of fencing is the responsibility of the landowner.
Beaver	Routine site visits and monitoring will be used to determine if beaver management is needed. If beaver activity poses a threat to project stability or vegetative success, RES will trap beavers and remove impoundments as needed. All beaver management activities will be documented and included in annual monitoring reports. Beaver monitoring and management will continue through the monitoring period.

Appendix G – DWR Stream ID Forms

NC DWQ Stream Identification Form Version 4.11

Date: 10/9/2018	**Project/Site:** Matthew	**Latitude:**
Evaluator: M. DeAngelo	**County:** Johnston	**Longitude:**
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 41.5	**Stream Determination (circle one)** Ephemeral Intermittent (Perennial)	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 23.5)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	1	(2)	3
5. Active/relict floodplain	0	1	2	(3)
6. Depositional bars or benches	0	1	2	(3)
7. Recent alluvial deposits	0	1	2	(3)
8. Headcuts	0	(1)	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		(Yes = 3)	

[a] artificial ditches are not rated; see discussions in manual

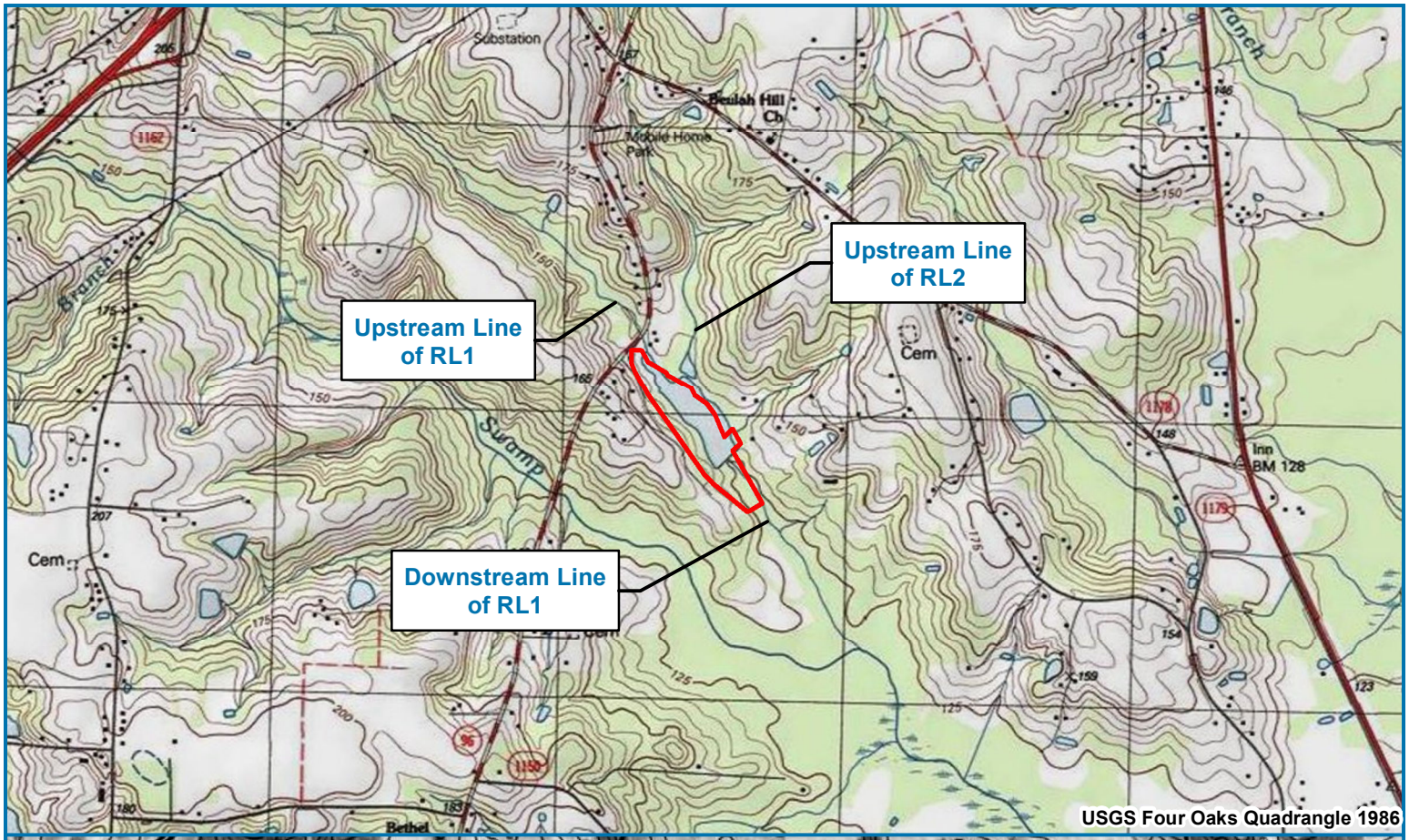
B. Hydrology (Subtotal = 12)				
12. Presence of Baseflow	0	1	2	(3)
13. Iron oxidizing bacteria	0	1	(2)	3
14. Leaf litter	(1.5)	1	0.5	0
15. Sediment on plants or debris	0	0.5	(1)	1.5
16. Organic debris lines or piles	0	0.5	1	(1.5)
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

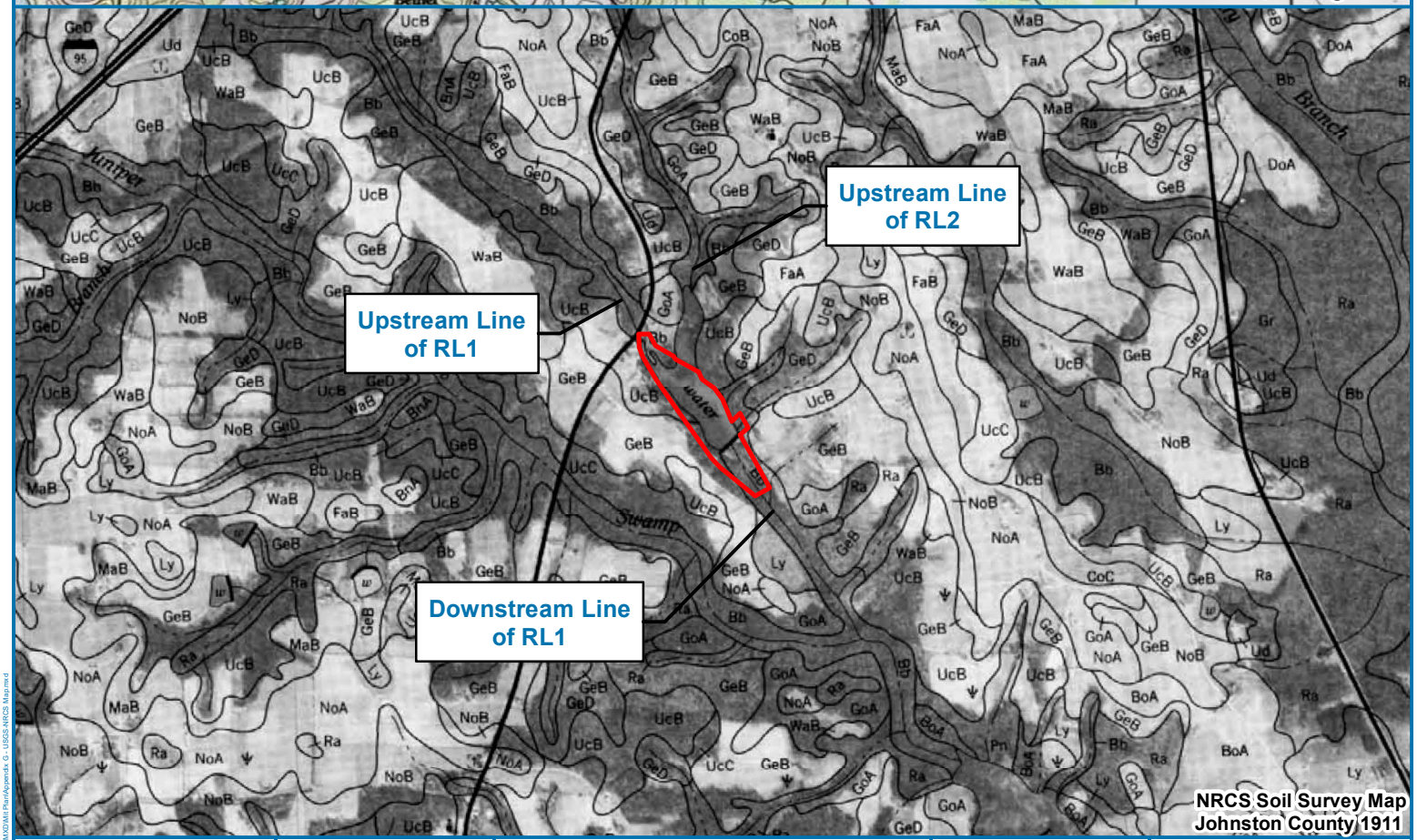
C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	(3)	2	1	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

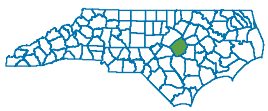
*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:







0 1,000 2,000
Feet

Stream Identification Map

Matthew Mitigation Site

Johnston County, North Carolina

Date:	5/31/2019
Drawn by:	MDD
Checked by:	BPB
	1 inch = 2,000 feet

res

Document Path: S:\@RES GIS\Projects\NC\Matthew\MXD\MM PlanAppendix G - USGS-NRCS Maps.mxd

Appendix H – USACE District Assessment Forms

Reach RL1-A (Below Dam)

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	3
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	5
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	3
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	1
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	5
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	3
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	0
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	NA
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	0
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	1
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture, livestock, or timber production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	1
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	5
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	NA
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	3
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						42

* These characteristics are not assessed in coastal streams.

RL1-B

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	1
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	5
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	5
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	3
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	3
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	5
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	5
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	3
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	1
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	NA
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	4
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	5
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	1
	15	**Impact by agriculture, livestock, or timber production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	2
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	2
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	3
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	5
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	NA
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	5
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						64

* These characteristics are not assessed in coastal streams.

Appendix I – Wetland JD Forms and Maps

Original PJD Submittal

June 21, 2018

June 21, 2018

Ms. Samantha Dailey
U.S. Army Corps Of Engineers
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587

Dear Ms. Samantha Dailey,

Resource Environmental Solutions (RES) is pleased to present this Request for a Preliminary Jurisdictional Determination for Matthew Mitigation Site located in Four Oaks, Johnston County, North Carolina. As part of this scope of work, RES is submitting this request to the U.S. Army Corps of Engineers (Corps) for a confirmation of the limits of Waters of the U.S. on the subject site.

The Project is located in the Neuse River Basin within Cataloging Unit 03020201, TLW 03020201150020, and NC Division of Water Resources (DWR) subbasin 03-04-04. The Project is within the Juniper Swamp watershed which is primarily forested and mixed agricultural land, and has historically served this purpose. Specifically, current land use within the project area consists of old pond bed, residential, and disturbed forest. This proposed site will result in significant ecological improvements including water quality improvement, habitat restoration, and a decrease in non-point source pollution.

The Site will include Priority Level I stream restoration and stream preservation. Priority Level I stream restoration will incorporate the design of a single-thread meandering channel within the old pond footprint. Restoration of the main project reach will tie into a preservation reach identified below the existing dam footprint.

The Project also provides an excellent opportunity for the re-establishment of a Bottomland Hardwood Forest wetland community. The majority of the restoration is proposed along a central corridor centered on the proposed stream alignment within the old pond bed. While it is expected that a larger area of the pond will revert to a bottomland wetland, the re-establishment corridor is based on existing wetland conditions above and below the footprint of the existing pond. The pond conversion area, and fill removal area will directly abut an existing high quality bottomland hardwood wetland preservation area. The resulting wetland will function as a contiguous bottomland hardwood wetland community situated on a stable coastal plain swamp stream Hydric soils within the proposed wetlands were confirmed in preliminary site visits and have been verified by George Lankford, LSS.

Attachments for Reference

- Jurisdictional Determination Request Form
- Preliminary Jurisdictional Determination Form
- Landowner Authorization Form
- Project Vicinity Map
- Project Location Map (with topography)
- Aerial Imagery
- Wetland Delineation Data Sheets
- Waters of the U.S. Delineation Map

RES respectfully requests that the Corps confirm this delineation of Waters of the U.S. on this property. I will contact you in the coming days to arrange a site visit for this purpose. Please contact me at (919) 345-3034 if you have any additional questions regarding this matter.

Sincerely,

Jeremy Schmid, PWS
Senior Ecologist

Attachments

Mathew Mitigation Site
Potential Wetland Area Description

Project Information and Background

The site location is approximately 1.5 miles southeast of Four Oaks and east of Highway 96 along two unnamed tributaries to Juniper Swamp (Figure 1). The central unnamed tributary is a 3rd order stream with its headwaters originating in the Town of Four Oaks. The second tributary enters the site below a farm pond, directly onto the exposed floodplain. The site drains both to the southeast into Juniper Swamp, a tributary to the Neuse River. This project area is approximately 20 acres, the majority of which is located within the floodplain. The surrounding land use is undeveloped land, farms, and single-family homes.

The site encompasses two wetland communities, upstream is the bed a pond breached and downstream wooded wetland. The wetland are separated a breached dam structure. The breach occurred during Hurricane Mathew in September of 2016, draining the pond and exposing the pond bed. The dam was constructed across the floodplain with downstream areas of fill, spoil from construction of the dam, and sediment deposited from the dam breach. Spoil berms are present along the tributary from historic excavation. Immediately below the dam the surface is littered with construction debris of bricks, blocks, and concrete slabs, some of which appear to have been used to stabilize the dam. Earthwork is visible along the northeast edge of the old pond where a berm was constructed. Part of the berm separates a small wetland below two small drainages. The exposed pond bed exposed past excavation of barrow pits.

Soils

The NRCS Soil Survey for Johnston County show the study area soils mapped as Bibb sandy loam upstream and downstream of the pond or water within the pond footprint. Across the site soils fall within the range of characteristics for the Bibb series. The NRCS Soil Survey for Johnston County indicates Bibb is. Within the pond bed, soils exhibit a dark sandy loam surface underlain by a sandy, silty, or clayey black or gray subsoil. This soil appears to be within the range of the Bibb series that would have been present prior to construction of the pond.

Hydric soil indicators predominately meet *A11-Depleted Below a Dark Surface*, *F3-Depleted Matrix*, *F6-Redox Dark Surface*, and F8-Redox Depressions hydric soil indicators. Other indicators present include *A12-Thick Dark Surface* and *F1-Loamy Mucky Mineral*. The soil and hydric indicators are typical of the floodplain landscape in the area. Soils within the pond have characteristics that are within the range of the Bibb soil, indicating a Bibb soil was most likely present before pond construction. Within the pond, a number of shallow excavations were exposed and remain as "Water" for soil mapping and aquatic resource classification purposes.

Site Modifications

This site exhibits a number of past impacts such as the dam construction, earthwork along the shoreline, channelization, and barrow areas revealed in the drain pond footprint.

Drainages from the northeast have been altered by construction of an adjacent pond and placement of berms that are partially impounding two small drainages features consisting of narrow, linear wetlands. The shoreline displays evidence of enhancement of the shelf for fishing/shore access. The central stream RL1-A has formed a shallow channel through the pond bottom and the RL2 tributary is flowing within what appears to be a previously constructed ditch.

Below the dam, the RL1-B stream channel is relatively straight with spoil berms to either side of the channel. Below the stand-pipe outlet is a settling pond connected to a channel representing the old flow path. To the west below the overflow outlet, a small ditch/channel along the slope captures upland runoff and toe of slope seepage. To the east below the dam is small depressional area is separated from the

floodplain by a low berm. A small channelized unnamed tributary from the northeast enter the floodplain near the southern portion of the reach.

Hydrology

The site hydrology at or within 12 inches of the surface throughout the wetland areas. The ditches below the dam drain portions of the fill and hydric soil immediately below the fill. The channel, RL1B, shows signs of historic excavation with adjacent spoil.

Natural Communities

Two general wetland communities were identified; 1), an early successional herbaceous community within the exposed pond bed, and 2) a mature forested wetland community typical of the landscape.

Exposed Pond Bed

The exposed pond bed is beginning to recover and consists of herbaceous species. Vegetation is primarily common rush *(Juncus effusus*), a few sedges, and water herbs with areas having early successional species such as dog fennel (*Eupatorium capillifolium*).

Forested Wetland

The forested wetland is on the floodplain of the main tributary. It has a mostly closed canopy consisting of red maple (*Acer rubrum*), and water oak (*Quercus nigra*). Along the channel and wetter areas, swamp tupelo (*Nyssa biflora*), and black willow (*Salix nigra*) are dominant. Shrubs consists of swamp titi (*Cyrilla racemiflora*), highbush blueberry (*Vaccinium corymbosum*), tag alder (*Alnus serrulata*), American holly (*Ilex opaca*), Chinese privet (*Ligustrum sinense*), and coastal doghobble (*Leucothoe axillaris*). The herbaceous strata was sparse to the moderately dense canopy and shrub cover. Species include Nepalese browntop (*Microstegium vimineum*), wartremoving herb (*Murdannia keisak*), and jewelweed (*Impatiens capensis*). Woody vines laurel greenbrier (*Smilax laurifolia*) and Japanese honeysuckle (*Lonicera japonica*) are locally common.

Jurisdictional Determination Request

US Army Corps of Engineers
Wilmington District

This form is intended for use by anyone requesting a jurisdictional determination (JD) from the U.S. Army Corps of Engineers, Wilmington District (Corps). Please include all supporting information, as described within each category, with your request. You may submit your request via mail, electronic mail, or facsimile. Requests should be sent to the appropriate project manager of the county in which the property is located. A current list of project managers by assigned counties can be found on-line at: http://www.saw.usace.army.mil/Missions/RegulatoryPermitProgram/Contact/CountyLocator.aspx, by calling 910-251-4633, or by contacting any of the field offices listed below. Once your request is received you will be contacted by a Corps project manager.

ASHEVILLE & CHARLOTTE REGULATORY FIELD OFFICES
US Army Corps of Engineers
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006
General Number: (828) 271-7980
Fax Number: (828) 281-8120

RALEIGH REGULATORY FIELD OFFICE
US Army Corps of Engineers
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587
General Number: (919) 554-4884
Fax Number: (919) 562-0421

WASHINGTON REGULATORY FIELD OFFICE
US Army Corps of Engineers
2407 West Fifth Street
Washington, North Carolina 27889
General Number: (910) 251-4610
Fax Number: (252) 975-1399

WILMINGTON REGULATORY FIELD OFFICE
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, North Carolina 28403
General Number: 910-251-4633
Fax Number: (910) 251-4025

INSTRUCTIONS:

All requestors must complete Parts A, B, C, D, E, F and G.

NOTE TO CONSULTANTS AND AGENCIES: If you are requesting a JD on behalf of a paying client or your agency, please note the specific submittal requirements in **Part H**.

NOTE ON PART D – PROPERTY OWNER AUTHORIZATION: Please be aware that all JD requests must include the current property owner authorization for the Corps to proceed with the determination, which may include inspection of the property when necessary. This form must be signed by the current property owner(s) or the owner(s) authorized agent to be considered a complete request.

NOTE ON PART D - NCDOT REQUESTS: Property owner authorization/notification for JD requests associated with North Carolina Department of Transportation (NCDOT) projects will be conducted according to the current NCDOT/USACE protocols.

NOTE TO USDA PROGRAM PARTICIPANTS: A Corps approved or preliminary JD may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should also request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

A. PARCEL INFORMATION

Street Address: 2241 NC HWY 96

City, State: FOUR OAKS, NC 27524

County: JOHNSTON

Parcel Index Number(s) (PIN): 167000-69-8017

B. REQUESTOR INFORMATION

Name: Resource Environmental Solutions

Mailing Address: 302 Jefferson Street, Suite 110

Raleigh, NC 27605

Telephone Number: 239-233-7570

Electronic Mail Address: jschmid@res.us

Select one:

- ☐ I am the current property owner.
- ☑ I am an Authorized Agent or Environmental Consultant[1]
- ☐ Interested Buyer or Under Contract to Purchase
- ☐ Other, please explain. _____

_____

C. PROPERTY OWNER INFORMATION[2]

Name: LAWHORN, RONNIE LYNN and SARA

Mailing Address: 2245 NC 96 S

FOUR OAKS, NC 27524

Telephone Number: _____

Electronic Mail Address: _____

[1] Must provide completed Agent Authorization Form/Letter.

[2] Documentation of ownership also needs to be provided with request (copy of Deed, County GIS/Parcel/Tax Record).

D. PROPERTY ACCESS CERTIFICATION[3,4]

By signing below, I authorize representatives of the Wilmington District, U.S. Army Corps of Engineers (Corps) to enter upon the property herein described for the purpose of conducting on-site investigations, if necessary, and issuing a jurisdictional determination pursuant to Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899. I, the undersigned, am either a duly authorized owner of record of the property identified herein, or acting as the duly authorized agent of the owner of record of the property.

Jeremy Schmid
Print Name

Capacity: ☐ Owner ☑ Authorized Agent[5]

6-21-18
Date

Signature

E. REASON FOR JD REQUEST: (Check as many as applicable)

☐ I intend to construct/develop a project or perform activities on this parcel which would be designed to avoid all aquatic resources.
☐ I intend to construct/develop a project or perform activities on this parcel which would be designed to avoid all jurisdictional aquatic resources under Corps authority.
☑ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps, and the JD would be used to avoid and minimize impacts to jurisdictional aquatic resources and as an initial step in a future permitting process.
☐ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps; this request is accompanied by my permit application and the JD is to be used in the permitting process.
☐ I intend to construct/develop a project or perform activities in a navigable water of the U.S. which is included on the district Section 10 list and/or is subject to the ebb and flow of the tide.
☑ A Corps JD is required in order obtain my local/state authorization.
☐ I intend to contest jurisdiction over a particular aquatic resource and request the Corps confirm that jurisdiction does/does not exist over the aquatic resource on the parcel.
☐ I believe that the site may be comprised entirely of dry land.
☑ Other: Site will be developed as a wetland mitigation bank.

[3] For NCDOT requests following the current NCDOT/USACE protocols, skip to Part E.
[4] If there are multiple parcels owned by different parties, please provide the following for each additional parcel on a continuation sheet.
[5] Must provide agent authorization form/letter signed by owner(s).

Exhibit C

LANDOWNER AUTHORIZATION FORM

Site: Lawhorn Site

PROPERTY LEGAL DESCRITION:

Deed Book	Page	County
00674	0235	Johnston

Parcel ID Number: A portion of Tax ID 4370656 in Johnston County North Carolina as shown on **Exhibit A.**

Street Address: A portion of 2241 NC HWY 96, Four Oaks, NC shown on Exhibit A.

Property Owner (please print): Ronnie Lynn Lawhorn and Sara Ann Lawhorn

The undersigned, registered property owner(s) of the above property, do hereby authorize

EBX, Neuse I, LLC, Resource Environmental Solutions ("RES"), the NC Department of Environment and Natural Resources, and the US Army Corps of Engineers, their employees, agents or assigns to have reasonable access to the above referenced property for the evaluation of the property as a potential stream, wetland and/or riparian buffer mitigation project, including conducting stream and/or wetland determinations and delineations.

Property Owners(s) Address: 2245 NC HWY 96 S
Four Oaks, NC 27524

Property Owner Telephone Number: 919-963-2093

I/We hereby certify the above information to be true and accurate to the best of my/our knowledge.

By: Ronnie Lawhorn 12-7-16
(Property Owner Authorized Signature) **(Date)**

F. JURISDICTIONAL DETERMINATION (JD) TYPE (Select One)

☑ I am requesting that the Corps provide a preliminary JD for the property identified herein.

A Preliminary Jurisdictional Determination (PJD) provides an indication that there may be "waters of the United States" or "navigable waters of the United States"on a property. PJDs are sufficient as the basis for permit decisions. For the purposes of permitting, all waters and wetlands on the property will be treated as if they are jurisdictional "waters of the United States". PJDs cannot be appealed (33 C.F.R. 331.2); however, a PJD is "preliminary" in the sense that an approved JD can be requested at any time. PJDs do not expire.

☐ I am requesting that the Corps provide an approved JD for the property identified herein.

An Approved Jurisdictional Determination (AJD) is a determination that jurisdictional "waters of the United States" or "navigable waters of the United States" are either present or absent on a site. An approved JD identifies the limits of waters on a site determined to be jurisdictional under the Clean Water Act and/or Rivers and Harbors Act. Approved JDs are sufficient as the basis for permit decisions. AJDs are appealable (33 C.F.R. 331.2). The results of the AJD will be posted on the Corps website. A landowner, permit applicant, or other "affected party" (33 C.F.R. 331.2) who receives an AJD may rely upon the AJD for five years (subject to certain limited exceptions explained in Regulatory Guidance Letter 05-02).

☐ I am unclear as to which JD I would like to request and require additional information to inform my decision.

G. ALL REQUESTS

☑ Map of Property or Project Area. This Map must clearly depict the boundaries of the review area.

☑ Size of Property or Review Area ~20 acres.

☑ The property boundary (or review area boundary) is clearly physically marked on the site.

H. REQUESTS FROM CONSULTANTS

☑ Project Coordinates (Decimal Degrees): Latitude: 35.420897°
Longitude: -78.405843°

☑ A legible delineation map depicting the aquatic resources and the property/review area. Delineation maps must be no larger than 11x17 and should contain the following: (Corps signature of submitted survey plats will occur after the submitted delineation map has been reviewed and approved).[6]

- North Arrow
- Graphical Scale
- Boundary of Review Area
- Date
- Location of data points for each Wetland Determination Data Form or tributary assessment reach.

For Approved Jurisdictional Determinations:

- Jurisdictional wetland features should be labeled as Wetland Waters of the US, 404 wetlands, etc. Please include the acreage of these features.
- Jurisdictional non-wetland features (i.e. tidal/navigable waters, tributaries, impoundments) should be labeled as Non-Wetland Waters of the US, stream, tributary, open water, relatively permanent water, pond, etc. Please include the acreage or linear length of each of these features as appropriate.
- Isolated waters, waters that lack a significant nexus to navigable waters, or non-jurisdictional upland features should be identified as Non-Jurisdictional. Please include a justification in the label regarding why the feature is non-jurisdictional (i.e. "Isolated", "No Significant Nexus", or "Upland Feature"). Please include the acreage or linear length of these features as appropriate.

For Preliminary Jurisdictional Determinations:

- Wetland and non-wetland features should not be identified as Jurisdictional, 404, Waters of the United States, or anything that implies jurisdiction. These features can be identified as Potential Waters of the United States, Potential Non-wetland Waters of the United States, wetland, stream, open water, etc. Please include the acreage and linear length of these features as appropriate.

☑ Completed Wetland Determination Data Forms for appropriate region
(at least one wetland and one upland form needs to be completed for each wetland type)

[6] Please refer to the guidance document titled "Survey Standards for Jurisdictional Determinations" to ensure that the supplied map meets the necessary mapping standards. http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Jurisdiction/

- [x] Completed appropriate Jurisdictional Determination form
  - **PJDs,** please complete a Preliminary Jurisdictional Determination Form[7] and include the Aquatic Resource Table
  - **AJDs**, please complete an Approved Jurisdictional Determination Form[8]
- [x] Vicinity Map
- [x] Aerial Photograph
- [x] USGS Topographic Map
- [x] Soil Survey Map
- [ ] Other Maps, as appropriate (e.g. National Wetland Inventory Map, Proposed Site Plan, previous delineation maps, LIDAR maps, FEMA floodplain maps)
- [ ] Landscape Photos (if taken)
- [ ] NCSAM and/or NCWAM Assessment Forms and Rating Sheets
- [ ] NC Division of Water Resources Stream Identification Forms
- [ ] Other Assessment Forms

[7] www.saw.usace.army.mil/Portals/59/docs/regulatory/regdocs/JD/RGL_08-02_App_A_Prelim_JD_Form_fillable.pdf
[8] Please see http://www.saw.usace.army.mil/Missions/Regulatory-Permit-Program/Jurisdiction/

Principal Purpose: The information that you provide will be used in evaluating your request to determine whether there are any aquatic resources within the project area subject to federal jurisdiction under the regulatory authorities referenced above.
Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public, and may be made available as part of a public notice as required by federal law. Your name and property location where federal jurisdiction is to be determined will be included in the approved jurisdictional determination (AJD), which will be made available to the public on the District's website and on the Headquarters USAGE website.
Disclosure: Submission of requested information is voluntary; however, if information is not provided, the request for an AJD cannot be evaluated nor can an AJD be issued.

Appendix 2 - PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD:

B. NAME AND ADDRESS OF PERSON REQUESTING PJD: Jeremy Schmid, RES,302 Jefferson Street, Suite 110, Raleigh, NC 27605

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: NC County/parish/borough: Johnston City: Four Oaks

Center coordinates of site (lat/long in degree decimal format):

Lat.: 35.420897° Long.: -78.405843°

Universal Transverse Mercator:

Name of nearest waterbody: Juniper Swamp

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:

☐ Field Determination. Date(s):

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resource in review area (acreage and linear feet, if applicable)	Type of aquatic resource (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
			see attachment		

Mathew Mitigation Site
Johnston County NC

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH MAY BE SUBJECT TO REGULATORY JURISDICTION Jurisdiction Mathew Mitigation Site					
Site Number	**Latitude**	**Longitude**	**Est. Amount of aquatic resources in review area**	**Type of aquatic resource (i.e., wetland vs. non-wetland waters)**	**Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)**
WA			8.76 ac	Wetland	Section 404
WB			0.56 ac	Wetland	Section 404
WC			0.10 ac	Wetland	Section 404
WD			0.81 ac	Wetland	Section 404
WE			0.76 ac	Wetland	Section 404
RL1-A			909 lf	Stream	Section 404
RL1-B			831 lf	Stream	Section 404
RL2			771 lf	Stream	Section 404
PA			0.78 ac	Open Water	Section 404
PB			0.12 ac	Open Water	Section 404
PC			1.24 ac	Open Water	Section 404
PD			0.14 ac	Open Water	Section 404

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

- [x] Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
  Map: _____.
- [x] Data sheets prepared/submitted by or on behalf of the PJD requestor.
  - [ ] Office concurs with data sheets/delineation report.
  - [ ] Office does not concur with data sheets/delineation report. Rationale: _____.
- [ ] Data sheets prepared by the Corps: _____.
- [ ] Corps navigable waters' study: _____.
- [ ] U.S. Geological Survey Hydrologic Atlas: _____.
  - [ ] USGS NHD data.
  - [ ] USGS 8 and 12 digit HUC maps.
- [x] U.S. Geological Survey map(s). Cite scale & quad name: _____.
- [x] Natural Resources Conservation Service Soil Survey. Citation: _____.
- [ ] National wetlands inventory map(s). Cite name: _____.
- [ ] State/local wetland inventory map(s): _____.
- [ ] FEMA/FIRM maps: _____.
- [ ] 100-year Floodplain Elevation is: _____.(National Geodetic Vertical Datum of 1929)
- [x] Photographs: [x] Aerial (Name & Date): _____.
  or [ ] Other (Name & Date): _____.
- [ ] Previous determination(s). File no. and date of response letter: _____.
- [ ] Other information (please specify): _____.

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

_____	George K Lankford Digitally signed by George K Lankford Date: 2017.07.03 14:38:54 -04'00'
Signature and date of Regulatory staff member completing PJD	Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

[1] Districts may establish timeframes for requestor to return signed PJD forms. If the requestor does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

*** DISCLAIMER ***

Johnston County assumes no legal responsibility for the information represented here.

Result 1

id:	08I12038
Tag:	08I12038
NCPin:	167000-69-8017
Mapsheet No:	1670
Owner Name 1:	LAWHORN, RONNIE LYNN
Owner Name 2:	LAWHORN, SARA ANN
Mail Address 1:	2245 NC 96 S
Mail Address 2:	
Mail Address 3:	FOUR OAKS, NC 27524-0000
Site Address 1:	2241 NC HWY 96
Site Address 2:	FOUR OAKS, NC 27524-
Book:	00674
Page:	0235
Market Value:	175080
Assessed Acreage:	28.32
Calc. Acreage:	30.92
Sales Price:	0
Sale Date:	1989-03-27

Scale: 1:7850 - 1 in. = 654.18 feet

(The scale is only accurate when printed landscape on a 8 1/2 x 11 size sheet with no page scaling.)

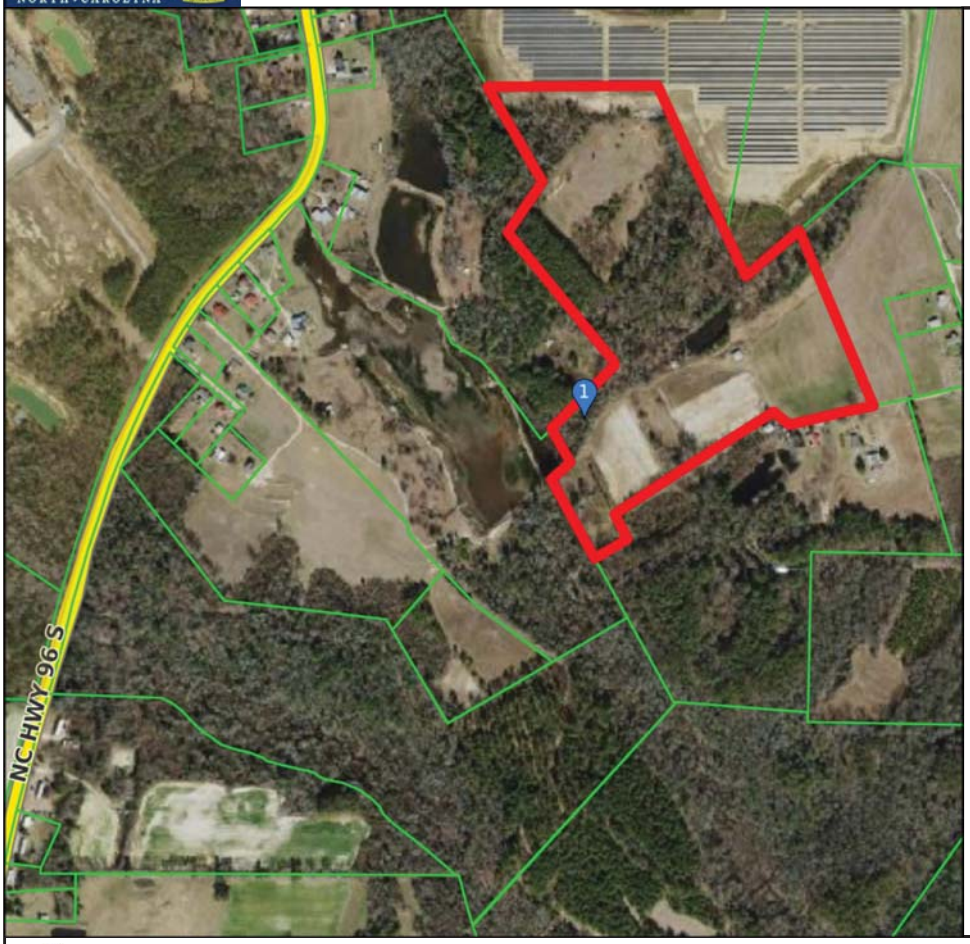
Johnston County GIS
May 9, 2018

Result 2

id: 08I12038
Tag: 08I12038
NCPin: 167000-69-8017
Mapsheet No: 1670
Owner Name 1: LAWHORN, RONNIE LYNN
Owner Name 2: LAWHORN, SARA ANN
Mail Address 1: 2245 NC 96 S
Mail Address 2:
Mail Address 3: FOUR OAKS, NC 27524-0000
Site Address 1: 2233 NC HWY 96
Site Address 2: FOUR OAKS, NC 27524-
Book: 00674
Page: 0235
Market Value: 175080
Assessed Acreage: 28.32
Calc. Acreage: 30.92
Sales Price: 0
Sale Date: 1989-03-27

*** DISCLAIMER ***

Johnston County assumes no legal responsibility for the information represented here.



Result 1

id:	08I12034
Tag:	08I12034
NCPin:	167000-79-9606
Mapsheet No:	1670
Owner Name 1:	LEE, ANTHONY GERALD
Owner Name 2:	LEE, RHONDA STANLEY
Mail Address 1:	
Mail Address 2:	PO BOX 3
Mail Address 3:	FOUR OAKS, NC 27524-0003
Site Address 1:	
Site Address 2:	
Book:	04393
Page:	0431
Market Value:	116840
Assessed Acreage:	37.66
Calc. Acreage:	39.31
Sales Price:	45000
Sale Date:	2013-12-18

Scale: 1:7850 - 1 in. = 654.18 feet

(The scale is only accurate when printed landscape on a 8 1/2 x 11 size sheet with no page scaling.)

Johnston County GIS
May 9, 2018

*** DISCLAIMER ***

Johnston County assumes no legal responsibility for the information represented here.

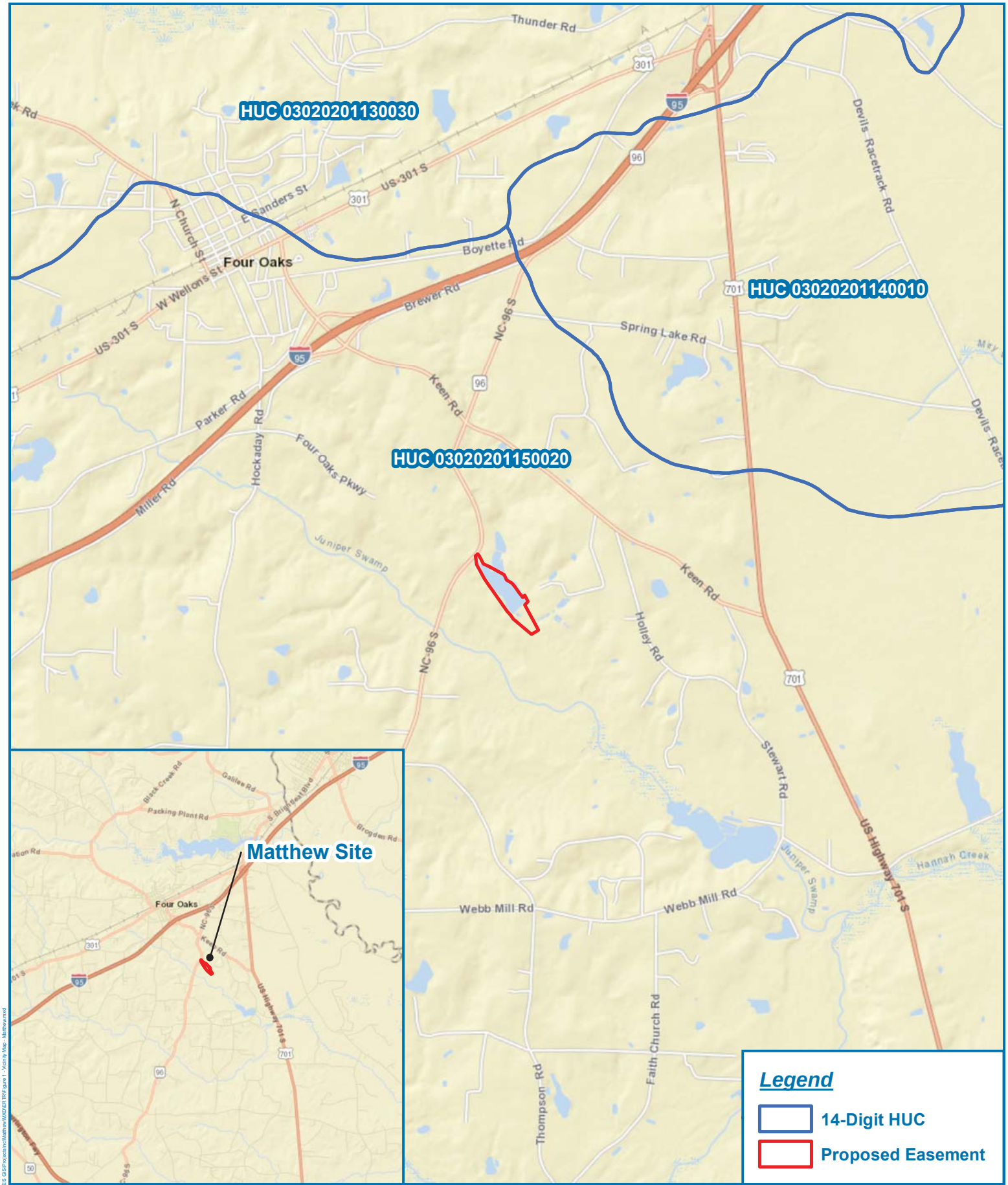
Result 1

id:	08I12197P
Tag:	08I12197P
NCPin:	167100-60-9151
Mapsheet No:	1671
Owner Name 1:	LEE, ANTHONY GERALD
Owner Name 2:	LEE, BRENDA T
Mail Address 1:	2159 NC HIGHWAY 96 S
Mail Address 2:	
Mail Address 3:	FOUR OAKS, NC 27524-8561
Site Address 1:	2159 NC HWY 96
Site Address 2:	FOUR OAKS, NC 27524-
Book:	04384
Page:	0937
Market Value:	87360
Assessed Acreage:	26.76
Calc. Acreage:	26.51
Sales Price:	0
Sale Date:	2013-11-25

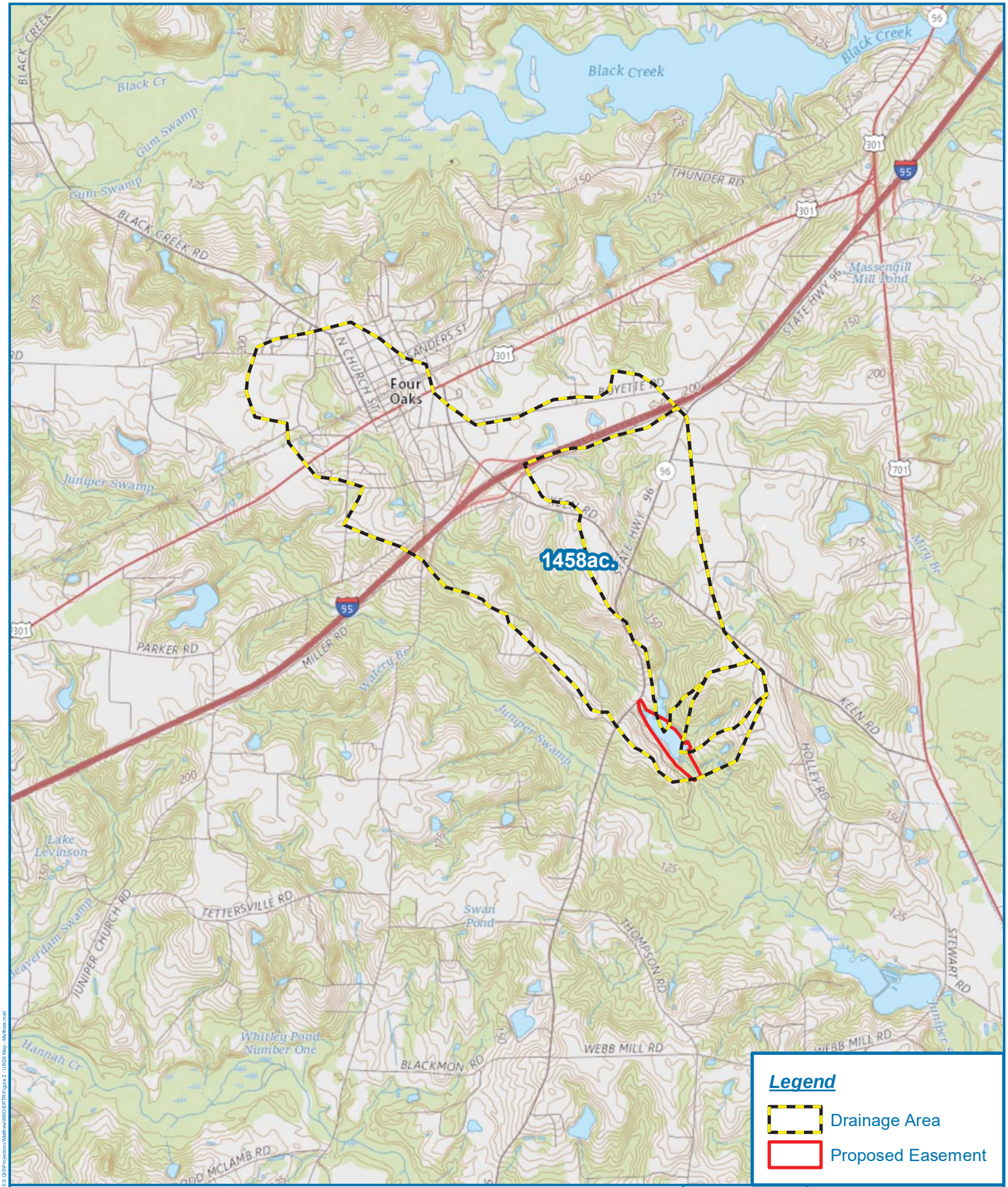
Scale: 1:7850 - 1 in. = 654.18 feet

(The scale is only accurate when printed landscape on a 8 1/2 x 11 size sheet with no page scaling.)

Johnston County GIS
May 9, 2018



Document Path: C:\Users\mmegal\Dropbox (RES)\@RES GIS\Projects\Matthew\MXD\ERT\Figure 1 - Vicinity Map - Matthew.mxd



0 1,500 3,000

Feet

Figure 2 - USGS Map

Matthew Mitigation Site

Johnston County, North Carolina

Date: 2/27/2018

Drawn by: EWT

Document Path: C:\Users\mregal\Dropbox (RES)\@RES GIS\Projects\Matthew\MXD\ERTR\Figure 2 - USGS Map - Matthew.mxd

Legend

- Study Area
- Potential Non-Wetland Waters of the US
- Potential Wetland Waters of the US
- Open Water
- Spoil
- Data Points

res

Potential Wetland or Non-Wetland Waters of the U.S. Map

Matthew Mitigation Site

Johnston County, North Carolina

N E S W

0 75 150

Feet

Date: 6/11/2018

Drawn By: MDD

Checked By: GL

Revisions: NONE

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 09/20/2017

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 02

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.42084 Long: -78.404605 Datum: WGS 84

Soil Map Unit Name: Bibb sandy loam. NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☑ Sparsely Vegetated Concave Surface (B8)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): -23
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): -3

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

water table slowly rising and did not reach equilibrium.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 02

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	20	Yes	OBL
2. Liriodendron tulopifera	10	Yes	FACU
3. Liquidambar styricflua	5	No	FAC
4.			
5.			
6.			
7.			
8.			
	35	= Total Cover	

50% of total cover: 17 20% of total cover: 7

Sapling/Shrub Stratum (Plot size: 30' radius)			
1. Ligustrum sinense	15	Yes	FACU
2. Ilex opaca	5	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
	20	= Total Cover	

50% of total cover: 10 20% of total cover: 4

Herb Stratum (Plot size: 30' radius)			
1. Murdannia keisak	20	Yes	OBL
2. Impatiens capensis	2	No	FACW
3. Onoclea sensibilis	2	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	24	= Total Cover	

50% of total cover: 12 20% of total cover: 5

Woody Vine Stratum (Plot size: 30' radius)			
1. Smilax laurifolia	2	NA	OBL
2.			
3.			
4.			
5.			
	2	= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	42	x 1 =	42
FACW species	4	x 2 =	8
FAC species	5	x 3 =	15
FACU species	30	x 4 =	120
UPL species		x 5 =	
Column Totals:	81 (A)		185 (B)

Prevalence Index = B/A = 2.28

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No _____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: 02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5 YR 2/2	100					LS	
2-14	7.5 YR 2/2	95	10 YR 3/6	5	C	PL	CL	
14-36	10 YR 2/1	90	10 YR 3/1	7	C	PL	SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☑ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 09/20/2017

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 03

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.421716 Long: -78.405303 Datum: WGS 84

Soil Map Unit Name: water (currently comparable to Bibb sandy loam) NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

Point is old pond bed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☑ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): -15
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): -15

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 03

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30' radius)			
1. Juncus effusus	100	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [ ] 2 - Dominance Test is >50%
- [ ] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (If observed, list morphological adaptations below).

Exposed pond bed.

SOIL

Sampling Point: 03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-9	10 YR 3/1	85	10 YR 3/6	15	C	PL	CL	
9-29	10 YR 4/1	80	10 YR 3/6	10	C	PL	SL	few oxidized rhizospheres
--	--	--	10 YR 4/2	10	D	PL	--	
29-36	N 2.5/-	100					SiL	
36-40	10 YR 4/1	60	10 YR 2/2	40	C	PL	SC	~10% gravel and small pebbles

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☑ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

Soil are exposed pond bed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 09/20/2017

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 04

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.422796 Long: -78.406415 Datum: WGS 84

Soil Map Unit Name: water (currently comparable to Bibb sandy loam) NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

Point is old pond bed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): -28
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): -18

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Water table rising-not equalized during data collection. May still be jurisdictional. Vegetation is disturbed from long-term inundation and vegetative community dominated by early successional species.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 04

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30' radius)			
1. Eupatorium capillifolium	100	Yes	FACU
2. Polygonum sagittatum	2	No	OBL
3. Carex sp.	2	NO	--
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover			

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (If observed, list morphological adaptations below).

Exposed pond bed. Vegetation exhibiting early successional community.

SOIL

Sampling Point: 04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 2/2	85	10 YR 3/4	5	C	PL	SL	
6-18	N 2.5/-	90	10 YR 3/1	2	C	PL	SL	
18-34	10 YR 5/1	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☑ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

Soil are exposed pond bed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 04/26/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 107

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.420548 Long: -78.404825 Datum: WGS 84

Soil Map Unit Name: Bibb sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): -17
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): -17

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

On floodplain with upland surface runoff from and slope seepage collected in ditch at toe of slope. Valley flow is constricted by dam structure.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 107

Tree Stratum (Plot size: 20' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Liriodendron tulipifera	40	Yes	FACU
2. Liquidambar styraciflua	10	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 20' radius)			
1. Ligustrum sinense	35	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	40 = Total Cover		

50% of total cover: 20 20% of total cover: 8

Herb Stratum (Plot size: 20' radius)			
1. Microstegium vimineum	10	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60 = Total Cover		

50% of total cover: 30 20% of total cover: 12

Woody Vine Stratum (Plot size: 20' radius)			
1. Lonicera japonica	15	Yes	FACU
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: 107

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5 YR 5/4	100					S	
3-16	7.5 YR 3/2	95	7.5 YR 3/4	5	C	M	SL	mottle have sharp boundaries
16-26	7.5 YR 2.5/1	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Upper 16 inches appears to be fill or deposition from dam construction.
At -16 inches a dark buried horizon. Likely the original hydric surface before dam construction.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 04/26/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 108B

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.422363 Long: -78.406891 Datum: WGS 84

Soil Map Unit Name: water (currently comparable to Bibb sandy loam) NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

Point is old pond bed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☑ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): -1
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): -1

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 108B

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30' radius)			
1. Juncus effusus	100	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover			

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☑ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (If observed, list morphological adaptations below).

Exposed pond bed.

SOIL

Sampling Point: 108B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-17	10 YR 2/2	90	10 YR 3/6	10	C	PL	fSL	few oxidized rhizospheres
17-28	N 2.5/-	100					fSL	~5% gravel and small pebbles

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

Soil are exposed pond bed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 04/26/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 109B upland

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): foot slope Local relief (concave, convex, none): none Slope (%): <2%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.422212 Long: -78.406991 Datum: WGS 84

Soil Map Unit Name: Uchee loamy coarse sand NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 109B upland

Tree Stratum (Plot size: 20' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	30	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	30 = Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 20' radius)			
1. Schedonorus arundinaceus	75	Yes	FACU
2. Solidago canadensis	5	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		

50% of total cover: 40 20% of total cover: 16

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals:	(A)	(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: 109B upland

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 2/1	75	10 YR 6/2	25	D		LS	25% uncoated sand grains
6-10	10 YR 3/2	100					LS	
10-17	10 YR 3/6	85	10 YR 4/4	15	C		cLS	~15% gravel and small pebbles

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 05/3/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 114B

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.423297 Long: -78.407125 Datum: WGS 84

Soil Map Unit Name: water (currently comparable to Bibb sandy loam) NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

Point is old pond bed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): -12
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): -12

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Water table rising-not equalized during data collection. Vegetation is disturbed from long-term inundation and vegetative community dominated by early successional species.

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 114B

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 20' radius)			
1. Juncus effusus	80	Yes	FACW
2. Eupatorium capillifolium	15	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	95 = Total Cover		

50% of total cover: 48 20% of total cover: 19

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☑ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: 114B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 2/2	100					SiL	
6-30	10 YR 2/2	92	10 YR 3/3	8	C	PL	SiL	
30-36	10 YR 5/1	100					S	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☑ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

Upper 6 inches are likely sediment.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 04/06/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 116

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.421334 Long: -78.404783 Datum: WGS 84

Soil Map Unit Name: Bibb sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes X No _____ Depth (inches): -2

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): -2

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 116

Tree Stratum (Plot size: 20' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	5	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	5 = Total Cover		
50% of total cover: 17	20% of total cover: 7		
Sapling/Shrub Stratum (Plot size: 20' radius)			
1. Alnus serrulata	10	Yes	OBL
2. Vaccinium corymbosum	2	No	FACW
3. Magnolia virginiana	1	No	FACW
4.			
5.			
6.			
7.			
8.			
	13 = Total Cover		
50% of total cover: 7	20% of total cover: 3		
Herb Stratum (Plot size: 20' radius)			
1. Impatiens capensis	7	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	24 = Total Cover		
50% of total cover: 12	20% of total cover: 5		
Woody Vine Stratum (Plot size: 20' radius)			
1. Lonicera japonica	5	Yes	FACU
2. Smilax rotundifolia	2	Yes	FAC
3.			
4.			
5.			
	7 = Total Cover		
50% of total cover: 4	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [ ] 2 - Dominance Test is >50%
- [ ] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: 116

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	7.5 YR 2.5/3	100					mucky SL	
4-10	7.5 YR 4/2	86	7.5 YR 3/3	10	C	PL	SL	
--	--	-	7.5 YR 5/1	4	D	M	--	
10-20	7.5 YR 4/1	95	7.5 YR 3/4	5	C	PL	SL	
20-23	7.5 YR 5/1	98	7.5 YR 4/2	2	C	PL	SCL	massive and restrictive

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☑ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: structureless clayey horizon

Depth (inches): 20

Hydric Soil Present? **Yes** X **No** ____

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 04/06/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 117

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): toe of slope Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.421277 Long: -78.404722 Datum: WGS 84

Soil Map Unit Name: Bibb sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 117

Tree Stratum (Plot size: 20' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus taeda	50	Yes	FAC
2. Quercus nigra	10	No	FAC
3. Acer rubrum	4	No	FAC
4.			
5.			
6.			
7.			
8.			
	64	= Total Cover	
50% of total cover: 32	20% of total cover: 13		

Sapling/Shrub Stratum (Plot size: 20' radius)			
1. Ilex opaca	10	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	10	= Total Cover	
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	24	= Total Cover	
50% of total cover: 12	20% of total cover: 5		

Woody Vine Stratum (Plot size: 20' radius)			
1. Lonicera japonica	5	Yes	FACU
2. Gelsemiium sempervirens	2	Yes	FAC
3.			
4.			
5.			
	7	= Total Cover	
50% of total cover: 4	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	66	x 3 =	198
FACU species	15	x 4 =	60
UPL species		x 5 =	
Column Totals:	81 (A)		258 (B)

Prevalence Index = B/A = 3.19

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: 117

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-9	10 YR 2/1	100					SL	
9-12	10 YR 3/2	92	10 YR 4/3	8	C	PL	SL	
12-20	7.5 YR 4/4	90	7.5 YR 5/4	10	C	PL	SC	
20-23	10 YR 5/4	100					S	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 04/06/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 118

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.420535 Long: -78.404359 Datum: WGS 84

Soil Map Unit Name: Bibb sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☑ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): -3
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): -1

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: 118

Tree Stratum (Plot size: 20' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	25	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	25 = Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 20' radius)			
1. Ligustrum sinense	15	Yes	FACU
2. Leucothoe axillaris	5	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	35 = Total Cover		
50% of total cover: 18	20% of total cover: 7		
Herb Stratum (Plot size: 20' radius)			
1. Murdannia keisak	45	Yes	OBL
2. Juncus effusus	5	No	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50 = Total Cover		
50% of total cover: 25	20% of total cover: 10		
Woody Vine Stratum (Plot size: 20' radius)			
1. Gelsemium sempervirens	10	Yes	FAC
2. Lonicera japonica	5	Yes	FACU
3. Smilax laurifolia	2	No	OBL
4.			
5.			
	17 = Total Cover		
50% of total cover: 9	20% of total cover: 3		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	52	x 1 =	52
FACW species	5	x 2 =	10
FAC species	35	x 3 =	105
FACU species	20	x 4 =	80
UPL species		x 5 =	
Column Totals:	112 (A)		247 (B)

Prevalence Index = B/A = 2.21

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: 118

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10 YR 2/1	98	10 YR 3/3	2		PL	SL	
9-17	10 YR 4/1	98	10 YR 3/6	2	C	PL	S	
17-24	10 YR 5/2	98	10 YR 4/4	2	D	PL	S	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☑ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 04/06/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 118B

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): toe of slope Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.421726 Long: -78.404927 Datum: WGS 84

Soil Map Unit Name: Bibb sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Pt is on berm between wetlands. Soil is disturbed and variable.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 118B

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size:)			
1. Ilex			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: ~20' radius)			
1. Panicum anceps	30	Yes	FAC
2. Eupatorium capillifolium	15	Yes	FACU
3. Juncus effusus	5	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	45 = Total Cover		

50% of total cover: 23 20% of total cover: 9

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species		x 2 =	
FAC species	30	x 3 =	90
FACU species	15	x 4 =	60
UPL species		x 5 =	
Column Totals:	50 (A)		155 (B)

Prevalence Index = B/A = 3.10

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: 118B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 4/6	55	5 YR 3/4	25	C	M	SCL	
-	-	-	10 YR 3/2	20	C	PL	-	
6-12	10 YR 3/2	90	7.5 YR 3/4	10	C	PL	SL	
12-29	10 YR 2/1	75	7.5 YR 3/3	10	C	-	SL	
-	-	-	10 YR 5/1	10	D	-	-	
-	-	-	10 YR 4/6	5	C	-	-	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Soils are highly disturbed and mixed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 04/06/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 119

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.419859 Long: -78.404287 Datum: WGS 84

Soil Map Unit Name: Bibb sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☑ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): -13
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): -13

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 119

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: 20% of total cover:

Sapling/Shrub Stratum (Plot size: 20' radius)			
1. Cyrilla racemiflora	30	Yes	FACW
2. Ligustrum sinense	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
	40 = Total Cover		

50% of total cover: 20 20% of total cover: 8

Herb Stratum (Plot size: 20' radius)			
1. Impatiens capensis	55	Yes	FACW
2. Rubus argutus	5	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60 = Total Cover		

50% of total cover: 30 20% of total cover: 12

Woody Vine Stratum (Plot size: 20' radius)			
1. Lonicera japonica	3	NA	FACU
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: 20% of total cover:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☑ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No**

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: 119

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-5	10 YR 2/2	96	10 YR 3/6	4			SiL	
5-11	10 YR 2/1	90	10 YR 3/4	10	C	M	SiL	Fe masses
11-20	10 YR 4/2	100					S	
20-28	10 YR 2/1	100					S	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☑ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☑ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: structureless clayey horizon

Depth (inches): 20

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Mathew Mitigation Site City/County: Johnston Sampling Date: 05/3/2018

Applicant/Owner: Resource Environmental Solutions State: NC Sampling Point: 119B

Investigator(s): G Lankford Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): <1%

Subregion (LRR or MLRA): LRR P and MLRA 133A Lat: 35.421015 Long: -78.40497 Datum: WGS 84

Soil Map Unit Name: Bibb sandy loam NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____ No X	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

Point is below dam where fill was place during dam construction and sediment was deposited from breach. Contains construction debris visible on surface.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☑ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☑ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): -4
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): -4

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: 119B

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Nyssa biflora	40	Yes	FACW
2. Liquidambar styraciflua	30	No	FAC
3. Acer rubrum	5	No	FAC
4.			
5.			
6.			
7.			
8.			
	75	= Total Cover	

50% of total cover: 38 20% of total cover: 23

Sapling/Shrub Stratum (Plot size: 30' radius)			
1. Cyrilla racemiflora	5	Yes	FACW
2. Ilex opaca	2	Yes	FACU
3. Vaccinium corymbosum	2	Yes	FACW
4.			
5.			
6.			
7.			
8.			
	9	= Total Cover	

50% of total cover: 5 20% of total cover: 2

Herb Stratum (Plot size: 30' radius)			
1. Murdannia keisak	5	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	5	= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____	= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	_____	x 1 =	_____
FACW species	_____	x 2 =	_____
FAC species	_____	x 3 =	_____
FACU species	_____	x 4 =	_____
UPL species	_____	x 5 =	_____
Column Totals:	_____ (A)		_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☑ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: 119B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10 YR 4/3	100					S	fill and sediment
16-22	10 YR 2/1	100					fSL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Upper 16 inches is fill from construction of dam and sediment from breach. Channel is now relocated nearby and supports the water table. Buried surface would have most likely met A11 or A12 indicator

Updated PJD Submittal Materials

November 30, 2018

Mathew Mitigation Site
Johnston County NC

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH MAY BE SUBJECT TO REGULATORY JURISDICTION Jurisdiction Mathew Mitigation Site					
Site Number	**Latitude**	**Longitude**	**Est. Amount of aquatic resources in review area**	**Type of aquatic resource (i.e., wetland vs. non-wetland waters)**	**Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)**
WA			10.00 ac	Wetland	Section 404
WB			0.56 ac	Wetland	Section 404
WC			0.10 ac	Wetland	Section 404
WD			0.81 ac	Wetland	Section 404
WE			0.76 ac	Wetland	Section 404
RL1-A			1088 lf	Stream	Section 404
RL1-B			831 lf	Stream	Section 404
RL2			918 lf	Stream	Section 404
PA			0.43 ac	Open Water	Section 404
PB			0.03 ac	Open Water	Section 404
PC			0.43 ac	Open Water	Section 404
PD			0.14 ac	Open Water	Section 404

Legend

- Study Area
- Potential Non-Wetland Waters of the US
- Potential Wetland Waters of the US
- Open Water
- Spoil
- Data Points

res

Potential Wetland or Non-Wetland Waters of the U.S. Map

Matthew Mitigation Site

Johnston County, North Carolina

N E S W

0 75 150

Feet

Date: 11/30/2018

Drawn By: MDD

Checked By: GL

Revisions: NONE

Confirmation Emails from USACE

February 13, 2019

March 21, 2019

From: Dailey, Samantha J CIV USARMY CESAW (USA)
To: Bob White
Cc: Brad Breslow
Subject: [EXTERNAL] SAW-2018-01256 Matthews Mitigation Site
Date: Wednesday, February 13, 2019 2:26:11 PM

Bob/Brad,

On July 24, 2018, an on-site field verification was conducted for the above referenced mitigation site. Revisions were requested at the conclusion of the site and received by our office on November 30, 2018. The map titled Potential Wetland or Non-Wetland Waters of the U.S. Map, dated 11/30/2018, along with the "Table of Aquatic Resources in Review Area Which May Be Subject to Regulatory Jurisdiction" accurately delineates waters on-site. A preliminary JD is forthcoming within the next 30-45 days.

Thank you,
Sam

Samantha Dailey
Regulatory Project Manager
U.S. Army Corps of Engineers
Regulatory Division
3331 Heritage Trade Drive, Suite 105
Wake Forest, NC 27587
(919) 554-4884, Ext. 22
Samantha.j.dailey@usace.army.mil

Matthew Deangelo

From: Baumgartner, Tim <tim.baumgartner@ncdenr.gov>
Sent: Thursday, March 21, 2019 4:49 PM
To: Tugwell, Todd J CIV USARMY CESAW (US); Schaffer, Jeff; Wiesner, Paul
Cc: Kim Browning
Subject: RE: [External] JDs for DMS sites

Thanks Todd,

Interestingly enough, that has been a topic of conversation within the last week. DMS has been holding mit plans for review until the PJD or JD was completed and documented. However, we are running into a lot of timing issues in doing that.

We'll instruct Providers to at least get an email from the PM and hope to have that before mit plan submittal to IRT for review. However, we will need to post these mit plans to begin IRT review in the meantime. We just won't finalize until the documentation, i.e. sufficient PJD/JD forms obtained or emails to confirm. However, we want to make sure any emails provide sufficient enough documentation that the IRT agrees with proceeding to final.

Thanks
Tim

==========

Tim Baumgartner
Director
Division of Mitigation Services
Department of Environmental Quality

Office - 919-707-8543
Cell - 919-218-2557

1652 Mail Service Center
217 W. Jones Street
Raleigh, NC 27699-1652

-----Original Message-----
From: Tugwell, Todd J CIV USARMY CESAW (US) [mailto:Todd.J.Tugwell@usace.army.mil]
Sent: Thursday, March 21, 2019 4:20 PM
To: Baumgartner, Tim <tim.baumgartner@ncdenr.gov>; Schaffer, Jeff <jeff.schaffer@ncdenr.gov>; Wiesner, Paul <paul.wiesner@ncdenr.gov>
Cc: Kim Browning <Kimberly.D.Browning@usace.army.mil>
Subject: [External] JDs for DMS sites

Just wanted to give you a heads-up that many of our PMs are overloaded with permits, and JDs will always have a lower priority, so it is likely that you may not see issued JDs for projects. That said, I know you need to have some verification of the limits of jurisdiction (if an area is currently a jurisdictional wetland, stream origin points, etc.) to proceed with projects. As an alternative to an issued JD, our PMs may be able to send emails stating that they concur with a delineation, which is way less work to do that than to go through the process of actually getting an official JD prepared, even a preliminary JD. For the purposes of banks and ILF sites, we will treat an email from the PM stating that they concur with a JD map just the same as an official issued JD. Hopefully this will suffice for your needs.

Thanks,

Todd Tugwell
Mitigation Project Manager
Wilmington District, US Army Corps of Engineers
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587
(919) 554-4884 ext. 58

Appendix J – Invasive Species Plan

INVASIVE SPECIES PLAN

Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. These site inspections may identify the presence of invasive vegetation. RES will treat invasive species vegetation within the project area and provide remedial action on a case by- case basis. Common invasive species vegetation, such as Chinese privet (*Ligustrum sinense*), multiflora rose (*Rosa multiflora*), tree-of-heaven (*Ailanthus altissima*), and Japanese honeysuckle (*Lonicera japonica*), will be treated to allow native plants to become established within the conservation easement. Invasive species vegetation will be treated by approved mechanical and/or chemical methods such that the percent composition of exotic/invasive species is less than 5% of the total riparian buffer area. Specifically, at the Matthew Site, the old pond bed may need to be treated for alligatorweed (*Alternanthera philoxeroides*) and/or common rush, depending whether or not these species are dominant prior to construction. Though common rush is not an exotic invasive species, it can be a nuisance species and it is possible that allelopathic properties upon its decomposition can potentially inhibit tree growth. The primary method of control will be either herbicide application or burning. Any control methods requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations. If areas of invasive species exist within the easement, they will be monitored yearly as part of the monitoring protocol and treated if necessary. If required, problem areas will continue to be treated until the project easement shows overall trending towards meeting all monitoring requirements.

Appendix K – Approved FHWA Categorical Exclusion Form

Categorical Exclusion Form for Division of Mitigation Services Projects
Version 1.4

Part 1: General Project Information	
Project Name:	Matthew
County Name:	Johnston
DMS ID Number:	100043
Project Sponsor:	Resource Environmental Solutions LLC
Project Contact Name:	Bob White
Project Contact Address:	302 Jefferson Street Suite 110, Raleigh, NC 27605
Project Contact E-mail:	bwhite@res.us
DMS Project Manager:	Lindsay Crocker

Project Description

The Matthew site is located in the Neuse River Basin within Cataloging Unit 03020201 and TLW 03020201150020. The Project will include Priority I stream restoration and stream preservation on three stream reaches (RL1-RL1, RL2, RL3) and wetland re-establishment and preservation on three wetlands. Stream Restoration activities will include constructing an E/C type stream with appropriate dimensions and pattern, reconnecting the channel to the floodplain. The majority of the restoration is proposed along a central corridor centered on the proposed stream alignment within the old pond bed. The wetland establishment will include damn removal and stabilization, dike fill removal, trash and construction debris removal, removal of accumulated sediments as needed, planting of native Bottomland Hardwood native species, and restoration of stream/wetland complex.

For Official Use Only

Reviewed By:

10/10/2018

Date

LHCrocker.

DMS Project Manager

Conditional Approved By:

Date

For Division Administrator FHWA

☐ **Check this box if there are outstanding issues**

Final Approval By:

10-10-18

Date

For Division Administrator FHWA

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☑ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☑ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☑ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☑ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☑ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☑ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☑ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☑ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☑ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☑ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☑ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☑ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Does the project require the acquisition of real estate?	☑ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☑ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☑ Yes ☐ No ☐ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	☐ Yes ☑ No
2. Is the site of religious importance to American Indians?	☐ Yes ☐ No ☑ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☑ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☑ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☑ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☑ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☑ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☑ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☑ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☑ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☑ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☑ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☑ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☐ Yes ☑ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☐ No ☑ N/A
4. Is the project "likely to adversely affect" the species and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☑ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination?	☐ Yes ☑ No ☐ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☑ N/A

Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI?	☐ Yes ☑ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☑ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☑ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☑ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	☑ Yes ☐ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☑ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☑ Yes ☐ No
2. Have the USFWS and the NCWRC been consulted?	☑ Yes ☐ No ☐ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☑ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☑ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☑ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☑ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☑ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☑ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☑ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☑ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☑ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☑ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☑ N/A

Letters to and From Agencies

302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

January 16, 2018

Renee Gledhill-Earley
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh NC 27699-4617

Subject: Project Scoping for Matthew Mitigation Project in Johnston County

Dear Ms. Gledhill-Earley,

The Matthew Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable wetland impacts. The proposed project involves the restoration and preservation of approximately 2,944 linear feet of stream and restoration (re-establishment) and preservation of approximately 13.94 acres of wetland.

RES requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream and wetland mitigation project on the Matthew Site (a USGS site map with approximate limits of conservation easement is attached).

A review of the N.C. State Historic Preservation Office (SHPO) HPOWEB GIS Service database (http://gis.ncdcr.gov/hpoweb/; accessed January 9, 2018) was performed as part of the site due diligence evaluation. The database did not reveal any listed or potentially eligible historic or archeological resources on the proposed properties. In addition, the majority of the Site was historically contained within a large impoundment but has been drained due to a dam breach from Hurricane Matthew in October 2016. Other land use around the project is pasture, residential land, and some bottomland hardwood forest.

We ask that you review this site based on the attached information to determine the presence of any historic properties. We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below, or via email. Please feel free to contact me at mdeangelo@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Matt DeAngelo | Ecologist

North Carolina Department of Natural and Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary Susi H. Hamilton

Office of Archives and History
Deputy Secretary Kevin Cherry

February 16, 2018

Matt DeAngelo
RES
302 Jefferson Street, Suite 110
Raleigh, NC 27605

Re: Matthew Mitigation Site, Johnston County, ER 18-0127

Dear Mr. DeAngelo:

Thank you for your letter of January 16, 2018, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or environmental.review@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

January 16, 2018

Mr. Vann Stancil
Habitat Conservation Biologist
North Carolina Wildlife Resources Commission
215 Jerusalem Church Road
Kenly, NC 27542

Subject: Project Scoping for Matthew Mitigation Project in Johnston County

Dear Mr. Stancil,

The purpose of this letter is to request review and comment on any possible issues that might emerge with respect to fish and wildlife associated with a potential stream and wetland restoration project on the attached site (USGS site map with approximate property lines and areas of potential ground disturbance are enclosed). The Matthew Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable wetland impacts The proposed project involves the restoration and preservation of approximately 2,944 linear feet of stream and restoration (re-establishment) and preservation of approximately 13.94 acres of wetland. The majority of the Site was historically contained within a large impoundment but has been drained due to a dam breach from Hurricane Matthew in October 2016. Other land use around the project is pasture, residential land, and some bottomland hardwood forest.

We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below. Please feel free to contact me at mdeangelo@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Matt DeAngelo | Ecologist

From: Stancil, Vann F
To: Matthew DeAngelo
Subject: RE: [External] Project Scoping for Barefoot Mitigation Project in Sampson County
Date: Tuesday, March 6, 2018 4:18:34 PM

Matt,

I've reviewed the Barefoot Wetland Mitigation Site. It's located in northern Sampson County, west of Newton Grove, in the Mill Creek watershed. The site consists of cleared agricultural land and forested land. There are no records of any state or federally listed species at the site nor any in the immediate vicinity of the site.

The Matthew Stream and Wetland Mitigation Site is located in Johnston County, southeast of Four Oaks. The site formerly impounded an unnamed tributary to Juniper Swamp before the dam was breached during Hurricane Matthew in 2016. There are no records of any state or federally listed species at the site nor any in the immediate vicinity of the site.

Regarding terrestrial species, the U.S. Fish and Wildlife Service (USFWS) recently listed the northern long-eared bat (*Myotis septentrionalis*) as threatened under the Endangered Species Act. Johnston & Sampson counties are within the range (https://www.fws.gov/midwest/endangered/mammals/nleb/pdf/WNSZone.pdf) of the northern long-eared bat and may be present or in the vicinity of the project site. As such, consultation with the USFWS may be required. For more information, please see https://www.fws.gov/midwest/endangered/mammals/nleb/ or https://www.fws.gov/raleigh/NLEB_RFO.html or contact the Raleigh office of the USFWS to ensure that potential issues related to this species are addressed.

Looking back at your emails after I typed up this response, I see that you said to disregard the Barefoot Site. I thought I deleted your email about it but apparently I did not. If there are any other outstanding projects that you need me to review, please let me know and let me know if I can assist further with the Matthew project.

Thanks,
Vann

From: Matthew DeAngelo [mailto:mdeangelo@res.us]
Sent: Monday, January 15, 2018 1:20 PM
To: Stancil, Vann F <vann.stancil@ncwildlife.org>
Subject: [External] Project Scoping for Barefoot Mitigation Project in Sampson County

Dear Mr. Stancil,

The Barefoot Wetland Mitigation Site has been identified by Resource Environmental Solutions, LLC (RES) to provide compensatory mitigation for unavoidable wetland impacts in Sampson County, North Carolina through the North Carolina Division of Mitigation Services.

The purpose of this letter is to request, review, and comment on any possible issues that might emerge with respect to fish and wildlife associated with a potential wetland restoration project on the attached site (A USGS site map with approximate property lines and areas of potential ground disturbance are enclosed along with a KMZ file).

We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address listed in the attached letter or via email. Please feel free to contact me at mdeangelo@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Matt DeAngelo
Ecologist

RES | res.us
Direct: 984.255.9133 | Mobile: 757.202.4471

---

302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

January 11, 2018

Milton Cortes
Natural Resources Conservation Service
4407 Bland Rd, Suite 117
Raleigh, NC 27609

Subject: AD-1006 Request for the Matthew Mitigation Site in Johnston County

Dear Mr. Cortes,

Resource Enviornmental Solutions (RES) requests review and comment from the Natural Resources Conservation Service on any possible concerns that may emerge with respect to farmland resources including prime, unique, statewide or local important farmland associated with the Matthew stream mitigation project. This project is being developed for the North Carolina Division of Mitigation Services. Please note that this request is in support of the development of the Categorical Exclusion (CE) and an Environmental Resource Technical Report for the referenced project.

The Matthew Site has been identified for the purposes of providing mitigation for unavoidable stream and wetland impacts in the Neuse River Basin. RES has been awarded the contract to design and implement the Matthew project. A requirement of the project is to prepare an Environmental Resource Technical Document that describes resources present on the project site.

The Project is located in the Hannah Creek watershed (14-digit HUC 03020201150020), a Targeted Local Watershed (TLW). The Project supports many of the Neuse River Basin Restoration Priorities (RBRP) goals and presents an opportunity to restore and preserve 2,944 linear feet of stream and riparian corridor and 13.94 acres of riparian wetlands. The Project will provide numerous ecological and water quality benefits within the Neuse River Basin. These benefits are not limited to the project area, but have more far-reaching effects throughout the Neuse River Basin. The Project will provide improvements to water quality, hydrologic function, and habitat. Coordinates for the site are as follows: 35.422109 N, -78.406105 W.

An inventory of soils data was completed by RES utilizing Web Soil Survey to determine prime farmland classifications for the 19.27 acre project area. One soil map unit in the project are is classified as prime farmland, making up approximately 4.9% of the site (Gilead sandy loam). One soil map unit in the project is classified as farmland of state importance, making up approximately 2.5% of the site (Uchee loamy coarse sand). One soil map unit in the project area is classified as not prime farmland, making up 39.0% of the site (Bibb sandy loam). The remaining 53.5% of the easement is mapped as water and is rated as not prime farmland.

Encolosed is Form AD-1006 with Parts I and III Completed and maps of the Matthew Site. We ask that you review the site information and complete Parts II, IV, and V as required by NRCS. Please email (mengel@res.us), or mail your reply to the office at 302 Jeffferson Street, Suite 100, Raleigh, NC 27605.

USDA
United States Department of Agriculture

Natural Resources
Conservation Service

North Carolina
State Office

4407 Bland Road
Suite 117
Raleigh, NC 27609
Voice 919-873-2171
Fax (844) 325-2156

January 25, 2018

Megan D. Engel
Field Ecologist
RES
302 Jefferson Street, Suite 110
Raleigh, NC 27605

Dear Ms. Engel:

Thank you for your letter dated January 11, 2018, Subject: Proposed Matthew Mitigation Site, Conservation Easement, Johnston Co., NC. The following guidance is provided for your information.

Projects are subject to the Farmland Protection Policy Act (FPPA) requirements if they may irreversibly convert farmland (directly or indirectly) to non-agricultural use and are completed by a federal agency or with assistance from a federal agency. Farmland means prime or unique farmlands as defined in section 1540(c)(1) of the FPPA or farmland that is determined by the appropriate state or unit of local government agency or agencies with concurrence of the Secretary of Agriculture to be farmland of statewide local importance.

For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forestland, pastureland, cropland, or other land, but not water or urban built-up land.

Farmland does not include land already in or committed to urban development or water storage. Farmland *already in* urban development or water storage includes all such land with a density of 30 structures per 40-acre area. Farmland already in urban development also includes lands identified as *urbanized area* (UA) on the Census Bureau Map, or as urban area mapped with a *tint overprint* on the United States Geological Survey (USGS) topographical maps, or as *urban-built-up* on the United States Department of Agriculture (USDA) Important Farmland Maps.

The area in question meets one or more of the above criteria for Farmland. Farmland area will be affected or converted. Enclosed is the Farmland Conversion Impact Rating form AD1006 with PARTS II, IV and V completed by NRCS. The corresponding agency will need to complete the evaluation, according to the Code of Federal Regulation 7CFR 658, Farmland Protection Policy Act.

If you have any questions, please contact Milton Cortes, Assistant State Soil Scientist at 919-873-2171 or by email: milton.cortes@nc.usda.gov.

Again, thank you for inquiry. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

Milton Cortes
Assistant State Soil Scientist

cc:
Kent Clary, State Soil Scientist, NRCS, Raleigh, NC

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 1/11/2018
Name of Project Matthew Mitigation Site	Federal Agency Involved Federal Highway Admin (FHWA)
Proposed Land Use Conservation Easement	County and State Johnston County, NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 1/11/2018 / Person Completing Form: Milton Cortes, NRCS NC

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☑ NO ☐	Acres Irrigated: none	Average Farm Size: 166 acres
Major Crop(s): CORN	Farmable Land In Govt. Jurisdiction — Acres: 76 % 390,735 acres	Amount of Farmland As Defined in FPPA — Acres: 74 % 379,107 acres	
Name of Land Evaluation System Used: Johnston Co. NC LESA	Name of State or Local Site Assessment System: N/A	Date Land Evaluation Returned by NRCS: January 25, 2018 by eMail	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating: Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	19.27			
B. Total Acres To Be Converted Indirectly	0			
C. Total Acres In Site	19.27			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	1			
B. Total Acres Statewide Important or Local Important Farmland	0.5			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted	0.0004			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value	76.8%			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)	10			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)	10			
2. Perimeter In Non-urban Use	(10)	10			
3. Percent Of Site Being Farmed	(20)	0			
4. Protection Provided By State and Local Government	(20)	0			
5. Distance From Urban Built-up Area	(15)	5			
6. Distance To Urban Support Services	(15)	15			
7. Size Of Present Farm Unit Compared To Average	(10)	0			
8. Creation Of Non-farmable Farmland	(10)	0			
9. Availability Of Farm Support Services	(5)	0			
10. On-Farm Investments	(20)	0			
11. Effects Of Conversion On Farm Support Services	(10)	0			
12. Compatibility With Existing Agricultural Use	(10)	10			
TOTAL SITE ASSESSMENT POINTS	160	50	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	10	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	50	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	60	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 - Federal agencies (or Federally funded projects) involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form. For Corridor type projects, the Federal agency shall use form NRCS-CPA-106 in place of form AD-1006. The Land Evaluation and Site Assessment (LESA) process may also be accessed by visiting the FPPA website, http://fppa.nrcs.usda.gov/lesa/.

Step 2 - Originator (Federal Agency) will send one original copy of the form together with appropriate scaled maps indicating location(s)of project site(s), to the Natural Resources Conservation Service (NRCS) local Field Office or USDA Service Center and retain a copy for their files. (NRCS has offices in most counties in the U.S. The USDA Office Information Locator may be found at http://offices.usda.gov/scripts/ndISAPI.dll/oip_public/USA_map**,** or the offices can usually be found in the Phone Book under U.S. Government, Department of Agriculture. A list of field offices is available from the NRCS State Conservationist and State Office in each State.)

Step 3 - NRCS will, within 10 working days after receipt of the completed form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland. (When a site visit or land evaluation system design is needed, NRCS will respond within 30 working days.

Step 4 - For sites where farmland covered by the FPPA will be converted by the proposed project, NRCS will complete Parts II, IV and V of the form.

Step 5 - NRCS will return the original copy of the form to the Federal agency involved in the project, and retain a file copy for NRCS records.

Step 6 - The Federal agency involved in the proposed project will complete Parts VI and VII of the form and return the form with the final selected site to the servicing NRCS office.

Step 7 - The Federal agency providing financial or technical assistance to the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

(For Federal Agency)

Part I: When completing the "County and State" questions, list all the local governments that are responsible for local land use controls where site(s) are to be evaluated.

Part III: When completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them or other major change in the ability to use the land for agriculture.
2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities planned build out capacity) that will cause a direct conversion.

Part VI: Do not complete Part VI using the standard format if a State or Local site assessment is used. With local and NRCS assistance, use the local Land Evaluation and Site Assessment (LESA).

1. Assign the maximum points for each site assessment criterion as shown in § 658.5(b) of CFR. In cases of corridor-type project such as transportation, power line and flood control, criteria #5 and #6 will not apply and will, be weighted zero, however, criterion #8 will be weighed a maximum of 25 points and criterion #11 a maximum of 25 points.

2. Federal agencies may assign relative weights among the 12 site assessment criteria other than those shown on the FPPA rule after submitting individual agency FPPA policy for review and comment to NRCS. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total points at 160. For project sites where the total points equal or exceed 160, consider alternative actions, as appropriate, that could reduce adverse impacts (e.g. Alternative Sites, Modifications or Mitigation).

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, convert the site assessment points to a base of 160.
Example: if the Site Assessment maximum is 200 points, and the alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \text{ X } 160 = 144 \text{ points for Site A}$$

For assistance in completing this form or FPPA process, contact the local NRCS Field Office or USDA Service Center.

NRCS employees, consult the FPPA Manual and/or policy for additional instructions to complete the AD-1006 form.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Raleigh Field Office
P.O. Box 33726
Raleigh, NC 27636-3726

Date: 10/4/2018

Self-Certification Letter

Project Name Matthew

Dear Applicant:

Thank you for using the U.S. Fish and Wildlife Service (Service) Raleigh Ecological Services online project review process. By printing this letter in conjunction with your project review package, you are certifying that you have completed the online project review process for the project named above in accordance with all instructions provided, using the best available information to reach your conclusions. This letter, and the enclosed project review package, completes the review of your project in accordance with the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA), and the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c, 54 Stat. 250), as amended (Eagle Act). This letter also provides information for your project review under the National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C. 4321-4347, 83 Stat. 852), as amended. A copy of this letter and the project review package must be submitted to this office for this certification to be valid. This letter and the project review package will be maintained in our records.

The species conclusions table in the enclosed project review package summarizes your ESA and Eagle Act conclusions. Based on your analysis, mark all the determinations that apply:

- [x] "no effect" determinations for proposed/listed species and/or proposed/designated critical habitat; and/or
- [ ] "may affect, not likely to adversely affect" determinations for proposed/listed species and/or proposed/designated critical habitat; and/or
- [ ] "may affect, likely to adversely affect" determination for the Northern long-eared bat (Myotis septentrionalis) and relying on the findings of the January 5, 2016, Programmatic Biological Opinion for the Final 4(d) Rule on the Northern long-eared bat;
- [x] "no Eagle Act permit required" determinations for eagles.

We certify that use of the online project review process in strict accordance with the instructions provided as documented in the enclosed project review package results in reaching the appropriate determinations. Therefore, we concur with the “no effect” or “not likely to adversely affect” determinations for proposed and listed species and proposed and designated critical habitat; the “may affect” determination for Northern long-eared bat; and/or the “no Eagle Act permit required” determinations for eagles. Additional coordination with this office is not needed. Candidate species are not legally protected pursuant to the ESA. However, the Service encourages consideration of these species by avoiding adverse impacts to them. Please contact this office for additional coordination if your project action area contains candidate species. Should project plans change or if additional information on the distribution of proposed or listed species, proposed or designated critical habitat, or bald eagles becomes available, this determination may be reconsidered. This certification letter is valid for 1 year. Information about the online project review process including instructions, species information, and other information regarding project reviews within North Carolina is available at our website http://www.fws.gov/raleigh/pp.html. If you have any questions, you can write to us at Raleigh@fws.gov or please contact Leigh Mann of this office at 919-856-4520, ext. 10.

Sincerely,

/s/Pete Benjamin

Pete Benjamin
Field Supervisor
Raleigh Ecological Services

Enclosures - project review package

Megan Engel

From: Wells, Emily <emily_wells@fws.gov>
Sent: Thursday, October 4, 2018 12:08 PM
To: Megan Engel
Cc: Raleigh, FW4; Mann, Leigh
Subject: Re: [EXTERNAL] Online project review certification letter: Matthew Mitigation Site

Thanks! We would agree with the updated determination.

Thank you,
Emily

On Thu, Oct 4, 2018 at 11:53 AM Megan Engel <mengel@res.us> wrote:

> Emily,
>
> Here is the updated letter. My apologies.
>
> Thanks,
>
> **Megan D Engel**
>
> Field Ecologist
>
> **RES** | res.us
>
> Direct: 919.521.8215 | Mobile: 909.844.7122
>
> **From:** Wells, Emily <emily_wells@fws.gov>
> **Sent:** Thursday, October 4, 2018 11:49 AM
> **To:** Raleigh, FW4 <raleigh@fws.gov>; Mann, Leigh <leigh_mann@fws.gov>; Megan Engel <mengel@res.us>
> **Subject:** Re: [EXTERNAL] Online project review certification letter: Matthew Mitigation Site
>
> Hi Megan,
>
> Just check the no eagle act permit box on the letter and you will be good to go. Sorry I didn't see that part previously.

~Emily

On Thu, Oct 4, 2018 at 11:44 AM Raleigh, FW4 <raleigh@fws.gov> wrote:

> This is additional information being sent for the original that we received and have October 18th due date on currently.
>
> ---------- Forwarded message ---------
> From: **Megan Engel** <mengel@res.us>
> Date: Thu, Oct 4, 2018 at 10:06 AM
> Subject: [EXTERNAL] Online project review certification letter: Matthew Mitigation Site
> To: Raleigh@fws.gov <Raleigh@fws.gov>
>
> To the Reviewer,
>
> My name is Megan Engel from RES, and I am submitting an online project review package for your records for the Matthew Stream and Wetland Mitigation Site located in Johnston County, NC. RES has determined "No Effect" determinations for three of the listed species associated with the project area. I had sent the originally request on Monday 9/24/2018, and had not included determinations for Critical Habitat and the Bald Eagle; these are included with this request.
>
> Please feel free to contact me with any questions or comments.
>
> Thanks,
>
> **Megan D Engel**
>
> Field Ecologist
>
> **RES** | res.us
>
> Direct: 919.521.8215 | Mobile: 909.844.7122

--

Emily Wells

USFWS Fish and Wildlife Biologist

Raleigh Ecological Services Field Office

551-F Pylon Drive

Raleigh, North Carolina 27606

Office # 919-856-4520 x25

Fax # 919-856-4556

Mailing Address:

P.O. Box 33726

Raleigh, North Carolina 27636-3726

--

Emily Wells
USFWS Fish and Wildlife Biologist
Raleigh Ecological Services Field Office
551-F Pylon Drive
Raleigh, North Carolina 27606
Office # 919-856-4520 x25
Fax # 919-856-4556

Mailing Address:
P.O. Box 33726
Raleigh, North Carolina 27636-3726

NOTE: This email correspondence and any attachments to and from this sender is subject to the Freedom of Information Act (FOIA) and may be disclosed to third parties.

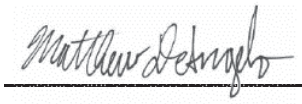
Species Conclusions Table

Project Name: Matthew Mitigation Site

Date: 09/21/2018

Species / Resource Name	Conclusion	ESA Section 7 / Eagle Act Determination	Notes / Documentation
Red-cockaded Woodpecker (*Picoides borealis)*	No suitable habitat present	No Effect	
Yellow Lance (*Elliptio lanceolate)*	No suitable habitat present	No Effect	
Michaux's Sumac (*Rhus michauxii)*	No suitable habitat present	No Effect	
Bald Eagle (Haliaeetus leucocephalus)	Unlikely to disturb nesting bald eagles	No Eagle Act Permit Required	
Critcal Habitat	No critical habitat present		

Acknowledgement: I agree that the above information about my proposed project is true. I used all of the provided resources to make an informed decision about impacts in the immediate and surrounding areas.



Matthew DeAngelo (Ecologist) — 10/4/2018

Signature /Title — Date

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
Phone: (919) 856-4520 Fax: (919) 856-4556

In Reply Refer To:
Consultation Code: 04EN2000-2018-SLI-1315
Event Code: 04EN2000-2018-E-02724
Project Name: Matthew

September 21, 2018

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The species list generated pursuant to the information you provided identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Section 7 of the Act requires that all federal agencies (or their designated non-federal representative), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species. A biological assessment or evaluation may be prepared to fulfill that requirement and in determining whether additional consultation with the Service is necessary. In addition to the federally-protected species list, information on the species' life histories and habitats and information on completing a biological assessment or

evaluation and can be found on our web page at http://www.fws.gov/raleigh. Please check the web site often for updated information or changes

If your project contains suitable habitat for any of the federally-listed species known to be present within the county where your project occurs, the proposed action has the potential to adversely affect those species. As such, we recommend that surveys be conducted to determine the species' presence or absence within the project area. The use of North Carolina Natural Heritage program data should not be substituted for actual field surveys.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a federally-protected species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared). However, you should maintain a complete record of the assessment, including steps leading to your determination of effect, the qualified personnel conducting the assessment, habitat conditions, site photographs, and any other related articles.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

Not all Threatened and Endangered Species that occur in North Carolina are subject to section 7 consultation with the U.S Fish and Wildlife Service. Atlantic and shortnose sturgeon, sea turtles,when in the water, and certain marine mammals are under purview of the National Marine Fisheries Service. If your project occurs in marine, estuarine, or coastal river systems you should also contact the National Marine Fisheries Service, http://www.nmfs.noaa.gov/

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office. If you have any questions or comments, please contact John Ellis of this office at john_ellis@fws.gov.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
(919) 856-4520

Project Summary

Consultation Code: 04EN2000-2018-SLI-1315

Event Code: 04EN2000-2018-E-02724

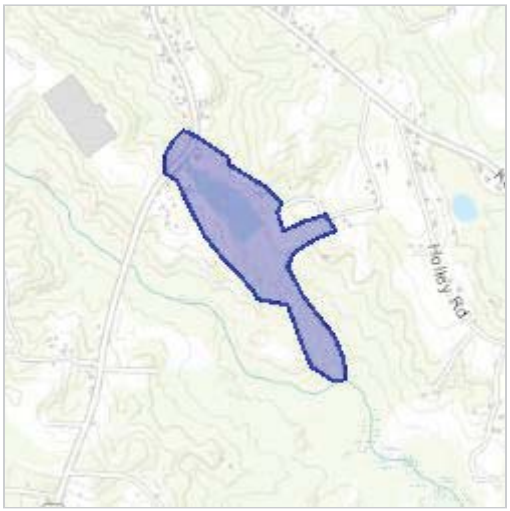
Project Name: Matthew

Project Type: LAND - RESTORATION / ENHANCEMENT

Project Description: Stream and Wetland Restoration Project

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/35.42047494441445N78.4049540678659W



Counties: Johnston, NC

Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Red-cockaded Woodpecker *Picoides borealis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7614	Endangered

Clams

NAME	STATUS
Yellow Lance *Elliptio lanceolata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4511	Threatened

Flowering Plants

NAME	STATUS
Michaux's Sumac *Rhus michauxii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5217	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

January 16, 2018

Mr. Pete Benjamin
US Fish and Wildlife Service
Raleigh Field Office
Raleigh, NC 27636-3726

Subject: Project Scoping for Matthew Mitigation Project in Johnston County

Dear Mr. Pete Benjamin,

Resource Environmetal Solutions (RES) requests review and comment from the United States Fish and Wildlife Service (USFWS) on any possible concerns they may have with regards to the implementation of the Matthew Mitigation Project. Please note that this request is in support of the development of the Categorical Exclusion (CE) for the referenced project. The proposed project involves the restoration and preservation of approximately 2,944 linear feet of stream and restoration (re-establishment) and preservation of approximately 13.94 acres of wetland. The majority of the Site was historically contained within a large impoundment but has been drained due to a dam breach from Hurricane Matthew in October 2016. Other land use around the project is pasture, residential land, and some bottomland hardwood forest.

The USFWS database (updated 13 November 2017) lists four endangered species for Johnston County, North Carolina: Red-cockaded woodpecker (*Picoides borealis*), Dwarf wedgemussel (*Alasmidonta heterodon*), Tar River spinymussel (*Parvaspina steinstansana*), and Michaux's sumac (*Rhus michauxii*). No protected species or potential habitat for protected species was observed during preliminary site evaluations. Also, a review of the NC Natural Heritage Program (NHP) GIS database was consulted to determine whether previously cataloged occurrences of protected species were mapped within one mile of the project site. Results from NHP on January 16, 2018, indicated that there were no known occurrences of protected species within a one-mile radius of the project area. Based on initial site investigations, no impacts to federally protected species are anticipated as a result of the proposed project.

Please provide comments on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources from the earthwork and planting of a wetland restoration project on the subject property. A USGS map showing the location and approximate limits of the conservation easement is enclosed.

We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below. Please feel free to contact me at mdeangelo@res.us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Matt DeAngelo | Ecologist

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Raleigh ES Field Office
Post Office Box 33726
Raleigh, North Carolina 27636-3726

February 8, 2018

Matt DeAngelo
RES
302 Jefferson Street, Suite 110
Raleigh, NC 27605

Re: Matthew Mitigation Project – Johnston County, NC

Dear Mr. DeAngelo:

This letter is to inform you that the Service has established an on-line project planning and consultation process which assists developers and consultants in determining whether a federally-listed species or designated critical habitat may be affected by a proposed project. For future projects, please visit the Raleigh Field Office's project planning website at https://www.fws.gov/raleigh/pp.html. If you are only searching for a list of species that may be present in the project's Action Area, then you may use the Service's Information, Planning, and Consultation System (IPaC) website to determine if any listed, proposed, or candidate species may be present in the Action Area and generate a species list. The IPaC website may be viewed at https://ecos.fws.gov/ipac/. The IPaC web site contains a complete and frequently updated list of all endangered and threatened species protected by the provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)(Act), a list of federal species of concern[1] that are known to occur in each county in North Carolina, and other resources.

Section 7 of the Act requires that all federal agencies (or their designated non-federal representative), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species. A biological assessment or evaluation may be prepared to fulfill that requirement and in determining whether additional consultation with the Service is necessary. In addition to the federally-protected species list, information on the species' life histories and habitats and information on completing a biological assessment or

[1] The term "federal species of concern" refers to those species which the Service believes might be in need of concentrated conservation actions. Federal species of concern receive no legal protection and their designation does not necessarily imply that the species will eventually be proposed for listing as a federally endangered or threatened species. However, we recommend that all practicable measures be taken to avoid or minimize adverse impacts to federal species of concern.

evaluation and can be found on our web page at http://www.fws.gov/raleigh. Please check the web site often for updated information or changes.

If your project contains suitable habitat for any of the federally-listed species known to be present within the county where your project occurs, the proposed action has the potential to adversely affect those species. As such, we recommend that surveys be conducted to determine the species' presence or absence within the project area. The use of North Carolina Natural Heritage program data should not be substituted for actual field surveys.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a federally-protected species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared). However, you should maintain a complete record of the assessment, including steps leading to your determination of effect, the qualified personnel conducting the assessment, habitat conditions, site photographs, and any other related articles.

With regard to the above-referenced project, we offer the following remarks. Our comments are submitted pursuant to, and in accordance with, provisions of the Endangered Species Act.

Based on the information provided and other information available, it appears that the proposed action is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act at these sites. We believe that the requirements of section 7(a)(2) of the Act have been satisfied for your project. Please remember that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or, (3) a new species is listed or critical habitat determined that may be affected by the identified action.

However, the Service is concerned about the potential impacts the proposed action might have on aquatic species. Aquatic resources are highly susceptible to sedimentation. Therefore, we recommend that all practicable measures be taken to avoid adverse impacts to aquatic species, including implementing directional boring methods and stringent sediment and erosion control measures. An erosion and sedimentation control plan should be submitted to and approved by the North Carolina Division of Land Resources, Land Quality Section prior to construction. Erosion and sedimentation controls should be installed and maintained between the construction site and any nearby down-gradient surface waters. In addition, we recommend maintaining natural, vegetated buffers on all streams and creeks adjacent to the project site.

The North Carolina Wildlife Resources Commission has developed a Guidance Memorandum (a copy can be found on our website at (http://www.fws.gov/raleigh) to address and mitigate secondary and cumulative impacts to aquatic and terrestrial wildlife resources and water quality.

We recommend that you consider this document in the development of your projects and in completing an initiation package for consultation (if necessary).
We hope you find our web page useful and informative and that following the process described above will reduce the time required, and eliminate the need, for general correspondence for species' lists. If you have any questions or comments, please contact Emily Wells of this office at (919) 856-4520 ext. 25.

Sincerely,

for

Pete Benjamin
Field Supervisor

Appendix L – DMS Floodplain Requirements Checklist

EEP Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and Ecosystem Enhancement Program to be filled for all EEP projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. State NFIP Engineer), NC Floodplain Mapping Unit (attn. State NFIP Coordinator) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Matthew Site
Name if stream or feature:	Unnamed Tributary to Juniper Swamp
County:	Johnston County
Name of river basin:	Neuse River Basin
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Johnston County (Town of Four Oaks ETJ)
DFIRM panel number for entire site:	1660 (map number 3720166000K, effective date June 20, 2018)
Consultant name:	Resource Environmental Solutions
Phone number:	(919) 209-1052
Address:	302 Jefferson Street, Suite 110 Raleigh, NC 27605

Design Information

The Matthew Mitigation Site is located within a rural watershed in Johnston County, North Carolina within the Neuse River Basin and USGS 14-digit HUC 03020201150020. The Project proposes to restore 3,230 linear feet (LF) and preserve 234 LF of streams as well as restore 11.99 acres and preserve 2.06 acres of wetland that will provide water quality benefit for 1,460 acres of drainage area. The purpose of the Project is to meet water quality improvements addressed in the River Basin Restoration Priorities and improve overall stream and wetland health.

Reach	Length (LF)	Mitigation Type
RL1-A	2,438	Restoration
RL1-B	234	Preservation
RL1-B	108	Preservation (No credit)
RL2	792	Restoration

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

☑ Yes ☐ No

If project is located in a SFHA, check how it was determined:

☐ Redelineation

☐ Detailed Study

☑ Limited Detail Study

☐ Approximate Study

☐ Don't know

List flood zone designation: Zone X (outside 0.2% floodplain)

Check if applies:

☑ AE Zone

- ☐ Floodway
- ☑ Non-Encroachment
- ☐ None

☐ A Zone

- ☐ Local Setbacks Required
- ☐ No Local Setbacks Required

If local setbacks are required, list how many feet:

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

☐ Yes ☑ No

Land Acquisition (Check)

☐ State owned (fee simple)

☐ Conservation easment (Design Bid Build)

☑ Conservation Easement (Full Delivery Project)

Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)

Is community/county participating in the NFIP program? ☐ Yes ☒ No Note: if community is not participating, then all requirements should be addressed to NFIP (attn: State NFIP Engineer, (919) 715-8000)
Name of Local Floodplain Administrator:

Floodplain Requirements

This section to be filled by designer/applicant following verification with the LFPA

- ☐ No Action
- ☑ No Rise
- ☑ Letter of Map Revision
- ☐ Conditional Letter of Map Revision
- ☐ Other Requirements

List other requirements:

Comments:

Name: FRASIER MULLEN Signature: [signature]

Title: ENGINEER Date: 4/5/19

Appendix M – Final Hydric Soils Detailed Study

FINAL-Site Hydric Soils Detailed Study
Mathew Mitigation Site
Johnston County NC

Prepared for:

Mr. Bob White
Resource Environmental Solutions, LLC
302 Jefferson Street, Suite 110
Raleigh, North Carolina 27605

Prepared by:

George K Lankford Soil Scientist, LSS #1223
George K Lankford, LLC
238 Shady Grove Rd
Pittsboro, NC 27312

January 2019

Soil Scientist Seal

This report describes the results of the soil evaluation performed at the Mathew Mitigation Site in Johnston County, NC. Any subsequent transfer of the report by the user shall be made by transferring the complete report, including figures, maps, appendices, all attachments and disclaimers.

Study Objectives and Scope

The purpose of the study was to describe and delineate the extent of hydric soils that are potentially suitable for hydrologic restoration, rehabilitation, and reestablishment for mitigation. Potential for hydrologic restoration of soils in this study is evaluated considering the existing land use and conditions with the sites potential for creating a hydroperiod suitable for the landscape and soils. Practical modifications that utilize the available natural hydrology may include, but are not limited to surface drainage modifications, plugging drainage ditches, removal of fill materials, and microtopographic alteration such as surface roughening or enhancing existing floodplain depressions. Removal of fill material is typically limited due to cost and environmental impacts if an extensive area is involved. Restoration potential assumes a successful design and ability to construct site modifications necessary to restore adequate hydrology to hydric soil areas. Because of the unique history of the site, much of the hydric soil is currently jurisdictional with large areas suitable for rehabilitation and enhancement.

This report presents an evaluation of the subject property based upon a detailed field evaluation the purpose of confirming the presence and extent of hydric soil and assess the suitability for wetland restoration/mitigation at the site. The soil delineation and all boundaries shown are based on the detailed field evaluation. A delineation of Jurisdictional wetlands was also performed.

The observations and opinions stated in this report reflect conditions apparent on the subject property at the time of the site evaluation. My findings, opinions, conclusions, and recommendations are based on the locations and boundaries of the property as evident in the field and professional experience.

Project Information and Background

The site location is approximately 1.5 miles southeast of Four Oaks and east of Highway 96 located in Johnston County, North Carolina (Figure 1). The project site is along an unnamed tributary to Juniper Swamp and is within the Neuse River basin. This project area encompasses approximately 20 acres on the flood plain of these unnamed tributaries to Juniper Swamp (Figure 2). The project consist of a breached dam, the drained pond bed behind the dam, and two unnamed tributaries within the pond bed (RL1 and RL2). The RL1 channel is divided into two reaches, RL1-A above the dam and RL1-B below the dam. The RL2 stream is also ponded just above the project. This evaluation focused upon areas of hydric soil with and without jurisdictional hydrology. Restoration or enhancement of the drained and impacted hydric soils was evaluated and areas suitable for wetland mitigation are discussed.

NRCS Soil Mapping

The project is within the general soil map unit of Gilead-Uchee-Bibb where the soils formed in sediments deposited by oceans and streams. The area landscape ranges from moderately steep, moderately well drained to nearly level, poorly drained soils of the drainage way. The landscape of the project area is a moderate sized floodplain in the upper coastal plain with topography that is nearly level to slightly concave with minor depressions and shallow elevated areas typical of the local area.

The Natural Resource Conservation Service (NRCS 1994) Johnston County Soil Survey indicate a poorly drained Bibb sandy loam mapped within the floodplain of the Unnamed Tributary to Juniper Swamp at the project site. The surrounding upland slopes are mapped as Gilead and Uchee. General soil properties of local map units are shown in Table 1. The pond was mapped as ‘water’ prior to the breach. Upstream of RL1-A and RL2 are Bibb soils leading to the conclusion that prior to construction the pond and dam would have been Bibb soils.

Bibb sandy loam soils formed in sandy and loamy alluvium on floodplains of narrow drainage ways throughout the Coastal Plain.” (NRCS- Soil Survey of Johnston County 1994). The frequently flooded Bibb soils are poorly drained with slow runoff, moderate permeability, and moderate available water

capacity. The depth to the seasonal high water table is within 8 inches between 6 and 11 months of the year.

Table 1. Mathew NRCS Mapped Soil Mapping Units

Mapping Unit/Series	**Johnston mucky loam**	**Bibb sandy loam frequently flooded**	**Gilead sandy loam**	**Uchee loamy sand**
	Wetter ← ---------- → Drier			
Taxonomic Classification	*Cumulic Humaquepts*	*Typic Fluvaquents*	*Aquic Hapludults*	*Arenic Kanhapludult*
Parent Material	sandy and loamy alluvium	sandy and loamy alluvium	clayey marine deposits	loamy and sandy marine deposits
Topographic Slope Setting (down/across)	concave-linear-	concave-linear-	convex -convex	convex -convex
Drainage Class	very poorly	poorly	moderately well	well
Seasonal High Water	0 to 12 ponded	0 to 12 (6-11 months)	18 to 30	42 to 60
Flooding/Ponding Frequency	frequent/frequent	frequent/none	none/none	none/none
Permeability	moderately rapid	moderately	moderately slow or slow	rapid
Runoff Class	ponded	low	medium	slow
Ksat (most limiting layer)	high	high	very low	mod high
	1.98 to 5.95 in/hr	1.98 to 5.95 in/hr	0.00 to 0.57 in/hr	0.20 to 0.57 in/hr
Available Water Capacity (water storage in profile)	high (~9.4 in)	mod (~7.2 in)	mod (~7.5 in)	mod (~6.5 in)
Hydroperiod Range *	12-16%	12-16%	NA	NA

**Hydroperiod follows US Army Corps of Engineers. 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update. North Carolina Interagency Review Team - October 24, 2016.*

A Bibb soil typically has a thin dark sandy textured surface layer underlain by a sandy or loamy textured subsoil. The inclusions of Johnston have a deep organic surface. The Bibb series does not include sandy clay loam or other clayey textured horizons within its textural range. Johnston soils have an organic surface.

The surrounding upland soils are moderately well drained Gilead sandy loam and well drained Uchee loamy sand that formed in marine deposits. Both upland soils are found on convex-convex landforms of the shoulders and summits of ridges. Gilead has a clayey subsoil and Uchee has loamy textures throughout. Runoff for all these soils is low or medium. The Bibb soil is classified as hydric by the NRCS. The Gilead and Uchee soils are not classified as hydric. Bibb soils may contain inclusion of very poorly drained Johnston soil that has a thick, dark, mucky loam surface horizon.

The upland Gilead and Uchee soil have a sandy textured surface underlain by a yellowish brown to brownish yellow, clayey textured subsoil on the uplands ranging from 0 to 25 percent slopes.

The evaluation focused upon areas within the floodplain having a high potential for containing hydric soil and where adequate hydrology would be expected. Slope and landscape position have the largest effect on natural drainage of these soils. The Bibb series is classified as hydric by the NRCS. The Gilead and Uchee soils are not classified as hydric or expected to contain hydric inclusions. Gilead soils are considered prime farmland and Uchee soils are farmland of statewide importance.

Methodology

A detailed hydric soil and wetland delineation was completed in April and May of 2018. A series of soil borings were performed across the site to delineate the boundary between hydric soil and upland soil. Soil borings were used to described current soil characteristics and evaluate the extent of hydric soil suitable for restoration. Soils were evaluated using morphologic characteristics to determine hydric indicators and evaluate current hydrology using criteria based on "*Field Indicators of Hydric Soils in the United States*" (USDA, NRCS, 2016, Version 8.1). The boring observations do not contain adequate detail to classify these soils to a series. The site is located in Major Land Resource Area (MLRA) 133A- Southern Coastal Plain and Land Resource Region (LRR) P-South Atlantic and Gulf Slope Cash Crops, Forest, and Livestock Region.

Soil boundaries were delineated based on soil borings information, landscape position, and topographic relief. The hydric soil boundary points from field observations were collected with a sub-meter GPS system by RES staff to locate the soil boundaries shown on the figures and calculate acreage. Boring locations were approximately located using the Trimble Outdoor Navigator smart phone application and exported to Google Earth. Hydric soils delineated represent areas with potential for hydrologic restoration but soils having hydric indicators may extend beyond the delineated boundary in some locations.

Wetland delineation guidance conforms to the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region* (Version 2.0), and Land Resource Region P (133A Southern Coastal Plain) (U.S. Army Corps of Engineers. 2010). Technical guidance and procedures for identifying and delineating wetlands follows the Regional Guidance manual. This technique uses a multi-parameter approach, which requires positive evidence of three (3) criteria:

- Hydrophytic vegetation
- Hydric soils
- Wetland hydrology

Areas exhibiting the above three wetland characteristics, as well as surface waters, are considered jurisdictional waters of the U.S.

At the Mathew site, more than 35 shallow borings from 12 to 30 inches were evaluated to delineate and characterize the soils (Figure 3). Representative profiles were described to document the range of soil characteristics at this site (Appendix A). Characteristics assessed include texture, color, mottling, and saturation-water table where present with other important features and characteristics noted as observed.

Results and Discussion

Landscape setting

The area landscape is within the upper part of the Southern Coastal Plain with the project on the floodplain and toe slope of an unnamed tributary to Juniper Swamp. The surrounding land use is undeveloped land, farms, and single-family homes. The project generally has a natural low relief with a concave-linear geomorphic position that slopes upward to the upland areas. Although the site has two distinct vegetative communities, the general landscape and soils are similar. The dam structure and berms exhibit disturbed soil materials typical of earth work dam associated with the construction. The drained pond bed exposed past excavation and borrow pits. Soils within the borrow pits were not evaluated.

The primary stream is an unnamed large 2nd order stream tributary, RL1, with its headwaters originating in the Town of Four Oaks (Figure 1). Below the dam, this channel is incised for a short distance. A second unnamed tributary, RL2, enters the site from the northeast below an existing pond and currently has a less developed watershed. This channel appears to have been channelized prior to construction of the dam.

The site encompasses two wetland community types based upon historic land use. Upstream is the breached pond bed having an herbaceous community. The downstream community is a forested wetland. The wetlands are separated a breached dam structure. The breach occurred during Hurricane Mathew in September of 2016. Downstream of the dam are areas of fill and spoil from construction of the dam and sediment deposited from the dam breach and spoil berms from historic excavation are found along the relatively straight channel within the forest. Immediately below the dam the soil surface is littered with construction debris of bricks, blocks, and concrete slabs, some of which appear to have been used to stabilize the dam and stop erosion. Earthwork is visible in the northeast portion of the old pond where berms were constructed to facilitate access around the pond. One of the berms separates from the pond two small drainages and a small wetland. Culverts are present within the berm, but a gully currently collects drainage into a small ditch near RL2. The vegetative community is beginning to recover where vegetation is primarily common rush (*Juncus effuse*) and dog fennel (*Eupatorium capillifolium*).

Soils description

Based upon field observation across the site, the NRCS mapping units show a moderately good relationship to actual site conditions in areas of the site and it appears represent the range of soil at the site. Hydric soil indicators at the site are typical of the landscape setting, occurring within 12 inches of the soil surface with most of the area having jurisdictional hydrology. Representative profile are found in Appendix A.

Throughout the project area, surface soils are loamy or sandy textured and underlain by a sandy, loamy or silty textured subsoil. These textures fall within the expected range for a Bibb soil. A few borings exhibited a light clayey textured subsoil below 20 inches, and is within the range of characteristics of expected soil inclusions. This clayey horizon also appears to have weak to massive structure and where present would be restrictive to vertical infiltration or discharge. A number of borings exhibited a deeper layer with small gravel. In some of the shallow depressional features within the forested community soils exhibited a higher organic content and mucky mineral textures were observed.

Surrounding the project site, the upland soils are sandy textures having a dark yellowish brown subsoil, indicating they are well drained. The disturbed soils have variable colors and textures due to the mixing during earth work. Soils along the dam structure have visible construction debris on the surface and was buried as part of the fill. As the disturbed soil extends downstream away from the dam, it becomes thinner above a natural soil horizon, grading into a soil having a natural profile from the surface. The disturbed

soil also appears to lack hydrology due to the incised channel, a toe slope ditch, and the blocking of lateral flow by the dam structure. The spoil berms along RL1-B were not evaluated.

Hydric Soil Indicators

Within the pond bed, indicators are usually at the surface. The typical soil surface consists of very dark gray or brown to black sandy loam surface usually with brown or dark brown mottles from 12 inches to greater than 30 inches. This dark surface is underlain by a gray to dark grey horizon with mottles. The mottles are concentrations of iron, manganese, and organic matter. Some areas with silty soils are also present in the floodplain.

The hydric soil indicators found include the *A11-Thick Dark Surface, A12-Thick Dark Surface, F1-Loamy Mucky Minera*l, *F3-Depleted Matrix, F6-Redox Dark Surface, F8-Redox Depressions*, and *F7-Depleted Dark Surface*. These indicators show a thicker dark surface than typical of the Bibb series and are more like a Johnston inclusion.

Existing hydrology

A large portion of the hydric soil identified at the Mathew site is currently jurisdictional wetlands (Figure 2). A site visit by the US Army Corps of Engineers to provide a Jurisdictional Determination call was done on July 24, 2018. The JD boundaries were verbally agreed upon during the site visit, but a final written confirmation has not been received.

Hydrology at the Mathew Site is the result of a high water table of the lower landscape position and from numerous seepages along the base of the upland slopes. Overbank events add to surface hydrology of surrounding floodplain. Farther from the streams at the upland-wetland interface, subsurface lateral flow through the soils maintains wetland hydrology. At the dam, the subsoil flow path parallel to the stream is restricted or blocked by the structure and fill material. The dam also creates a constriction of flow, inhibiting normal flow volumes parallel to the stream. On the south side of the floodplain below the dam, a ditch from the old pond outlet intercepts the slope seepage. The channel constriction and loss of seepage has resulted in an area of drained hydric soils below the dam.

Based upon the site evaluation, it was assumed that hydric soil is present beneath the current dam structure and the narrow berm to the northeast of the pond bed. Because of the presence of hydric soil upstream and downstream of the dam structure, it can be predicted that hydric soil was present beneath the dam structure prior to pond construction and flooding of the pond. This hydric soil material likely still exists beneath much of the fill. Once the dam structure and fill material have been removed, and the old outlet ditch has been plugged, the natural hydrology of the floodplain will be restored.

Removal of the fill materials will expose the hydric soil and due to location and elevation, a wetland hydrology will return to these areas. The hydric soils currently lacking hydrology are downstream of the fill materials exhibit hydric indicators, but currently lack hydrology due to a ditch along the edge of the floodplain and the obstruction of natural flow patterns of the floodplain. Removal of these material will restore the natural flow through the floodplain. Areas upstream of the fill may experience altered hydrology once this material is removed, resulting in a reduced the hydroperiod to a more natural length. This will occur because of reduced ponding up stream while soils immediately downstream will receive natural flows down the flood plain..

Potential Hydroperiod for Restored Soils

Mitigation guidance for soils in the Coastal Plain suggests a growing season hydroperiod during which the water table is within 12 inches of the surface for a Bib soil (*Typic Fluvaquents*) of 10-16 percent (US Army Corps of Engineers 2016). Because of natural variation found in natural system, the potential

inclusions and depressional areas my exhibit a hydroperiod of greater than 16 percent and area with slightly higher elevations may be expected to have a 9 to 12 percent hydroperiod.

Summary Conclusions and Recommendations

Based upon this detailed study of site soils, surface disturbance appears to be related primarily to the fill from the man-made earthwork related to construction of the dam. Soils upstream of the dam appear to exhibit characteristics of a Bibb soil that is mapped upstream and downstream of the pond. The soil beneath the dam structure likely exhibited Bibb soil prior to construction. The current fill spans the width of the floodplain and constricts normal floodplain flows. Immediately downstream, hydric soil appear to lack jurisdictional hydrology because of the constricted natural flow path.

After the breaching of the pond lowed water elevation, alterations to the pond bottom were exposed and include ditches and barrow pits. A berm was constructed along the eastern edge of the pond that constricts flow from a small wetland system. Below the dam, construction debris is present. The channel through the forest appears to have been historically dredged and straightened as indicated by spoil along its current banks. Jurisdictional wetlands are now present above and below the dam and fill materials.

The site soils are representative of alluvial systems in the upper coastal plain with soils similar to Bibb series. Within the pond bed and likely below fill material, the Bibb soils were most likely the natural soil prior to pond construction. Hydrologic success following mitigation guidance for this soil type should be expected to range from 12 to 16 percent saturation during the growing season. Due to natural variability, hydrology may be less than 12 percent in areas of higher relief and near the upland-wetland boundary or higher than 16 percent in depressional areas.

Wetland rehabilitation can be achieved through removal of fill materials and plugging some of the ditches to restore the natural flow patterns and hydrology in this floodplain system. Where the dam and debris materials are removed, surface roughening and creation of shallow depressions throughout the area will mimic natural conditions and provide an appropriate landscape for diverse habitat. Removal of the structure and fill material will allow natural floodplain flow and hydrology to return to the site.

The wetland found in the old pond bed can be stabilized and enhanced by planting a forest community typical of the area floodplains. With removal of the dam structure and construction debris, successful hydrologic restoration at this site can restored and will provide numerous soils related functional uplifts. These include, trapping of sediments, nutrients, and pollutants, increased infiltration of runoff, reestablishment of natural oxidation-reduction cycling, improved nutrient and chemical transformations, increased organic carbon accumulation, improved soil structure (surface primarily), and increases in microbial and fungal populations and diversity important for soil health. Large scale benefits may include diverse wildlife habitat and community connectivity.

The project area is located within a landscape suitable for wetlands and contains soil exhibiting hydric indicators with natural hydrology across most of the project. The area appears to contain typical soil and microtopography for floodplains of this area. The observed soils at the site appear to have taxonomy similar to a local soil map unit that is known to be hydric. For areas suitable for rehabilitation, an available hydrology source will be available after removal of fill materials and the natural flows are restored to the site. Rehabilitation will restore the natural functions and community to the pond bed and provide greater connectivity to the large drainage corridor downstream.

Given the observed soil characteristics, a favorable landscape position, the presence of existing wetlands at the site, and the potential source for reconnecting existing hydrologic inputs, this site appears suitable for wetland rehabilitation and enhancement through hydrologic restoration.

This report describes the results of the soil evaluation performed at the Mathew Mitigation Site in Johnston County, NC. Any subsequent transfer of the report by the user shall be made by transferring the complete report, including figures, maps, appendices, all attachments and disclaimers.

References

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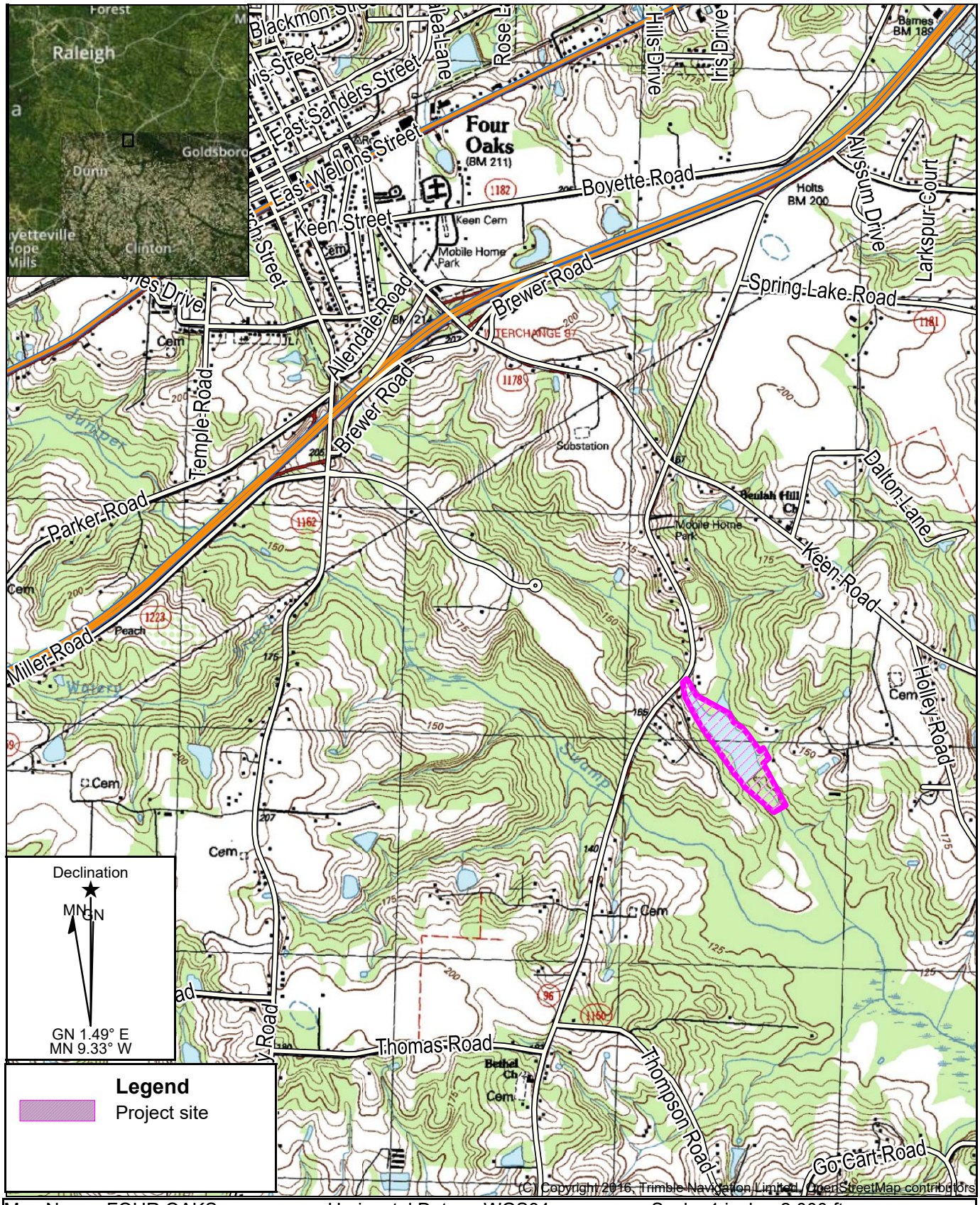
Figures

APPENDICE

Appendix A Soil Boring Log
Appendix B Photos
Appendix C NRCS Web Soil Survey Report



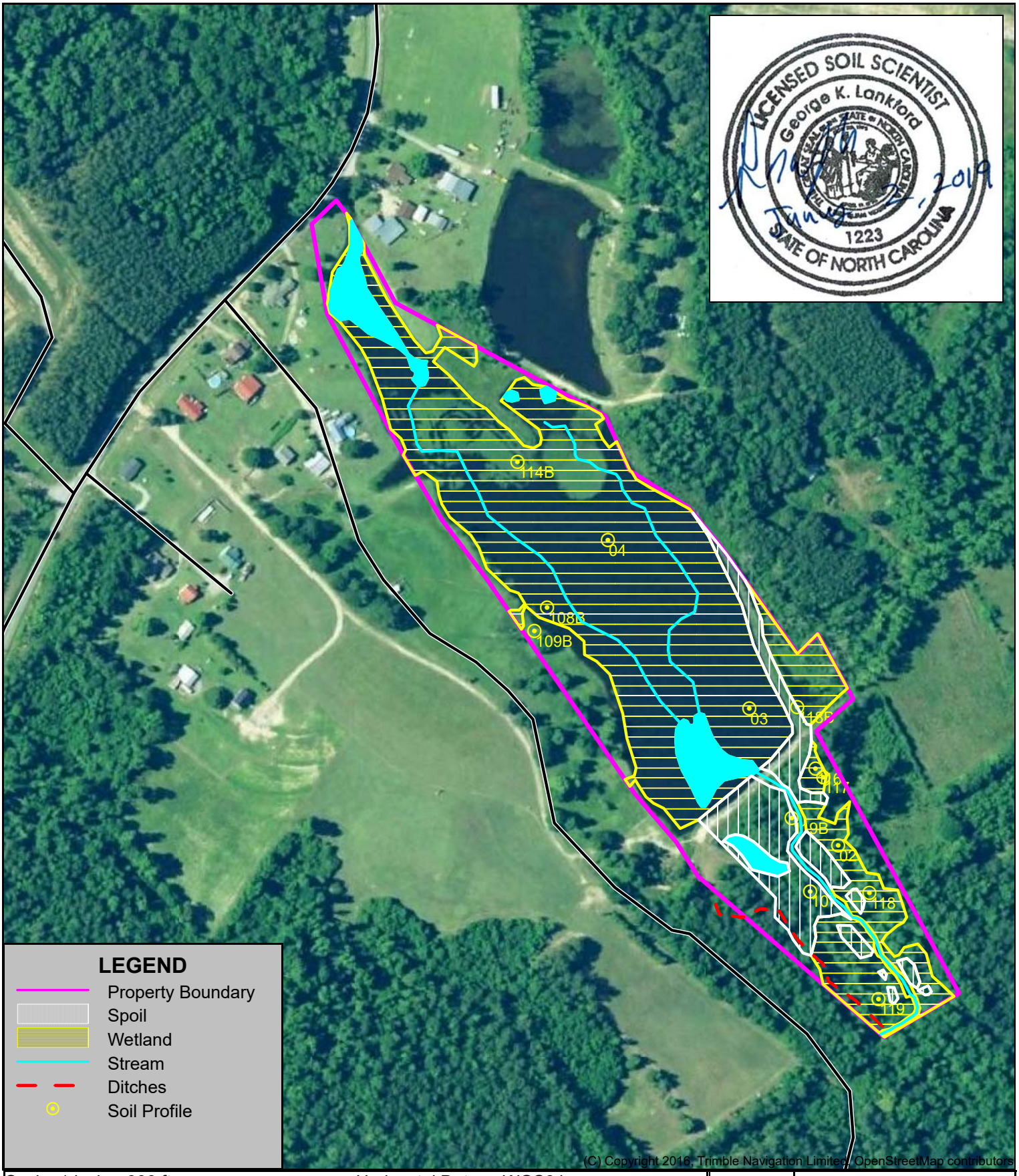
Map Name: FOUR OAKS | Horizontal Datum: WGS84 | Scale: 1 inch = 2,000 ft.

Mathew Mitigation Site
Figure 1. Vicinity Map-USGS

SCALE 1:24000

0 1000 2000 3000 4000 5000
Feet

0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9
Miles



Scale: 1 inch = 300 ft.

Horizontal Datum: WGS84

SCALE 1:3600

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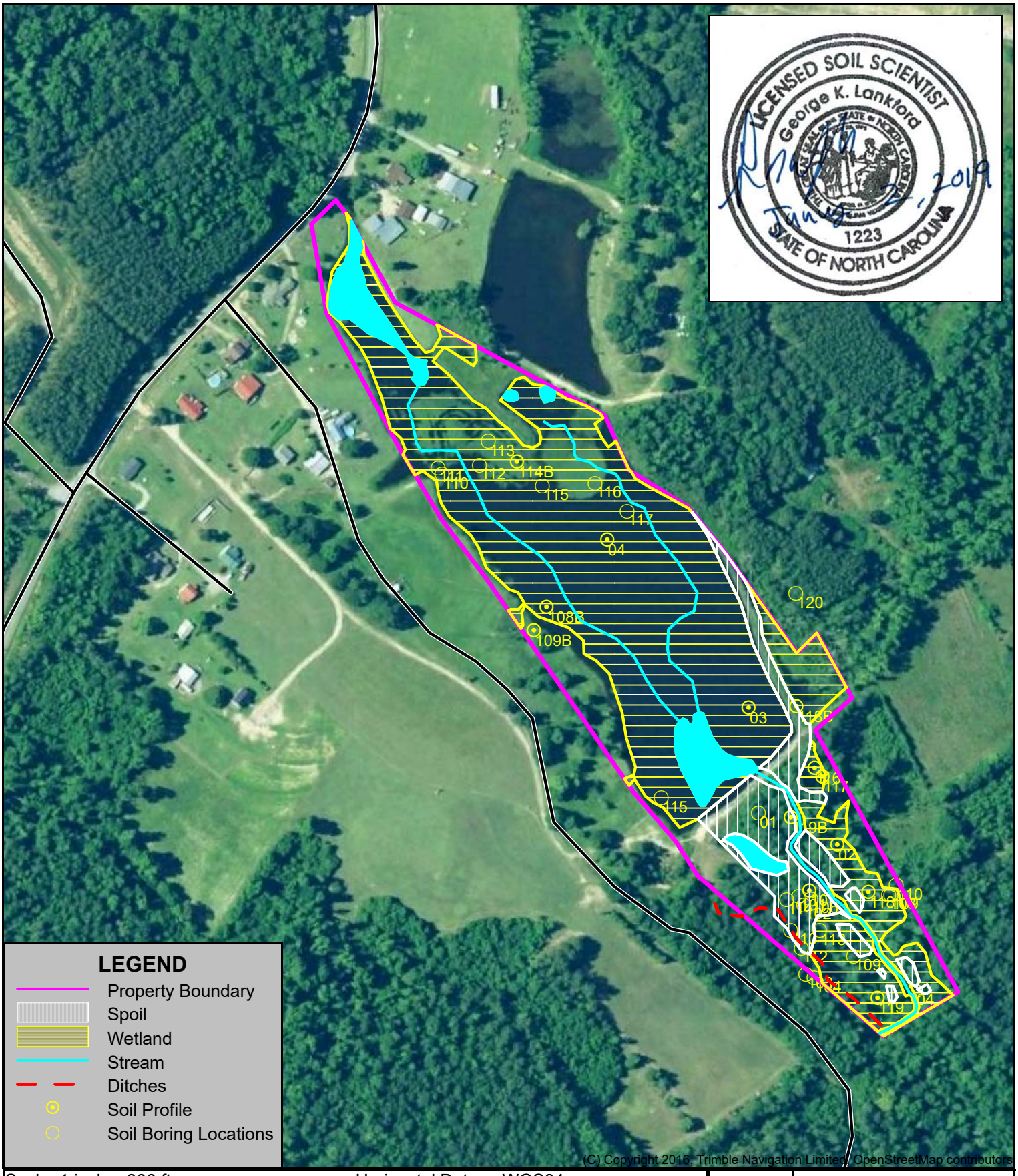
Feet

Mathew Mitigation Site
Figure 2. Aerial View - Hydric Soils



Scale: 1 inch = 300 ft.

Horizontal Datum: WGS84

SCALE 1:3600

0 100 200 300 400

Feet

Mathew Mitigation Site

Figure 3. Aerial View - Soil Boirng Locations

Appendix A
Mathew Site-Johnston County NC
Soil Boring Descriptions

Table. Representative Soil Profiles at Mathew Mitigation Site

Depth (inches)	Color		Mottle Percentage (Location*)	Texture**	Notes
	Matrix	Mottle			
SB 3 (Sept 20, 2017) Wetland WA			Hydric Indicators A11-Depleted Below a Dark Surface F3-Depleted Matrix	WT at -15	
0-9	10 YR 3/1	10 YR 3/6	15% (PL)	CL	
9-29	10 YR 4/1	10 YR 3/6 10 YR 4/2	10% (PL) 10% (PL)	SL	oxidized rhizospheres present
29-36	N 2.5/-			SiL	
36-40	10 YR 4/1	10 YR 2/2	40% (PL)	SC	10% gravel and small pebbles
SB 4 (Sept 20, 2017) Wetland WA			Hydric Indicators A12-Thick Dark Surface F6-Redox Dark Surface	WT at -28	
0-6	10 YR 2/2	10 YR 3/4	5% (PL)	SL	
6-18	N 2.5/-	10 YR 3/1	2% (PL)	SL	
18-34	10 YR 5/1			SL	
SB 108B (April 26, 2018) Wetland WA			Hydric Indicators F6-Redox Dark Surface	WT at -1	
0-17	10 YR 2/2	10 YR 3/6	10% (PL)	fSL	oxidized rhizospheres present
17-28	N 2.5/-			fSL	5% gravel and small pebbles
SB 109B (April 26, 2018) upland profile			Hydric Indicators no indicators	WT not observed	
0-6	10 YR 2/1	10 YR 3/2	25% (PL)	LS	25% = uncoated sand grains
6-10	10 YR 3/2			LS	
10-17	10 YR 3/6	10 YR 4/4	15% (PL)	cLS	15% gravel and small pebbles
SB 114B (May 3, 2018) Wetland WA			Hydric Indicators F6-Redox Dark Surface	WT at -12	
0-6	10 YR 2/2			SiL	
6-30	10 YR 2/2	10 YR 3/3	8% (PL)	SiL	
30-36	10 YR 5/1			S	
SB 118B (May 3, 2018) Spoil-highly disturbed			Hydric Indicators no indicators	WT not observed	
0-6	10 YR 4/6	5 YR 3/4 10 YR 3/2	25% (M) 20% (PL)	SCL	
6-12	10 YR 3/2	7.5 YR 3/4	10% (PL)	SL	

Appendix A
Mathew Site-Johnston County NC
Soil Boring Descriptions

Table. Representative Soil Profiles at Mathew Mitigation Site

Depth (inches)	Color		Mottle Percentage (Location*)	Texture**	Notes
	Matrix	Mottle			
12-29	10 YR 2/1	10 YR 3/3 10 YR 5/1 10 YR 4/6	10% 10% 5%	SL	
SB 116 (April 6, 2018) Wetland WC			Hydric Indicators WT at -2 F1-Loamy Mucky Mineral F3-Depleted Matrix		
0-4	7.5 YR 2.5/3			mucky SL	
4-10	7.5 YR 4/2	7.5 YR 3/3 7.5 YR 5/1	10% (PL) 4% (PL)	SL	
10-20	7.5 YR 4/1	7.5 YR 3/4	5% (PL)	SL	
20-23	7.5 YR 5/1	7.5 YR 4/2	2% (PL)	SCL	massive and restrictive
SB 117 (April 6, 2018) upland profile			Hydric Indicators WT not observed No indicators		
0-9	10 YR 2/1			SL	
9-12	10 YR 3/2	10 YR 4/3	8% (PL)	SL	
12-20	7.5 YR 4/4	7.5 YR 5/4	10% (PL)	SC	
20-23	10 YR 5/4			S	
SB 2 (Sept 20, 2017) Wetland WD			Hydric Indicators WT at -23 F6-Redox Dark Surface F8-Redox Depressions		
0-2	7.5 YR 2/2			LS	
2-14	7.5 YR 2/2	7.5 YR 3/6	5% (PL)	CL	
14-36	7.5 YR 5/2	7.5 YR 3/1	7% (PL)	SL	
SB 118 (April 6, 2018) Wetland WD			Hydric Indicators WT at -3 A11-Depleted Below Dark Surface		
0-9	10 YR 2/1	10 YR 3/3	2% (PL)	SL	
9-17	10 YR 4/1	10 YR 3/6	2% (PL)	S	
17-24	10 YR 5/2	10 YR 4/4	2% (PL)	S	
SB 119 (April 6, 2018) Wetland WE			Hydric Indicators WT at -13 F6-Redox Dark Surface F8-Redox Depressions		
0-5	10 YR 2/1	10 YR 3/6	4% (PL)	SiL	
5-11	10 YR 2/2	10 YR 3/4	10% (M)	SiL	Fe masses
11-20	10 YR 4/2			S	
20-28	10 YR 2/1			S	

Appendix A
Mathew Site-Johnston County NC
Soil Boring Descriptions

Table. Representative Soil Profiles at Mathew Mitigation Site

Depth (inches)	Color		Mottle Percentage (Location*)	Texture**	Notes
	Matrix	Mottle			
SB 107 (April 26, 2018) **Spoil**			Hydric Indicators (may be buried A11 or A12 indicator)	WT at -17	
0-3	7.5 YR 5/4			S	
3-16	7.5 YR 3/2	7.5 YR 3/4	5% (C)	SL	mottles w/sharp boundaries
16-26	7.5 YR 2.5/1			SL	
SB 119B (May 3, 2018) **Spoil-disturbed-fill**			Hydric Indicators None	WT at -4	
0-16	10 YR 4/3			S	
16-22	10 YR 2/1			fSL	

WT = observed apparent water table
*PL =pore lining, M = matrix
**Texture (follows USDA textural classification)
S = sand, L = loam, Si = silt, C = clay
f = fine, c = coarse (textural modifiers for sand)

Soil Scientist Seal

Appendix B
Mathew Site
Photo Log

June 2018

1. Herbaceous community in drained pond bed.

2 A11-Depleted Below a Dark Surface and F3-Depleted Matrix. Typical Bibb type soil in pond bed. (Profile # 3).

Appendix B
Mathew Site
Photo Log

June 2018

3. Open water areas at upstream portion of project.

4. Depressional wetland in forest community.

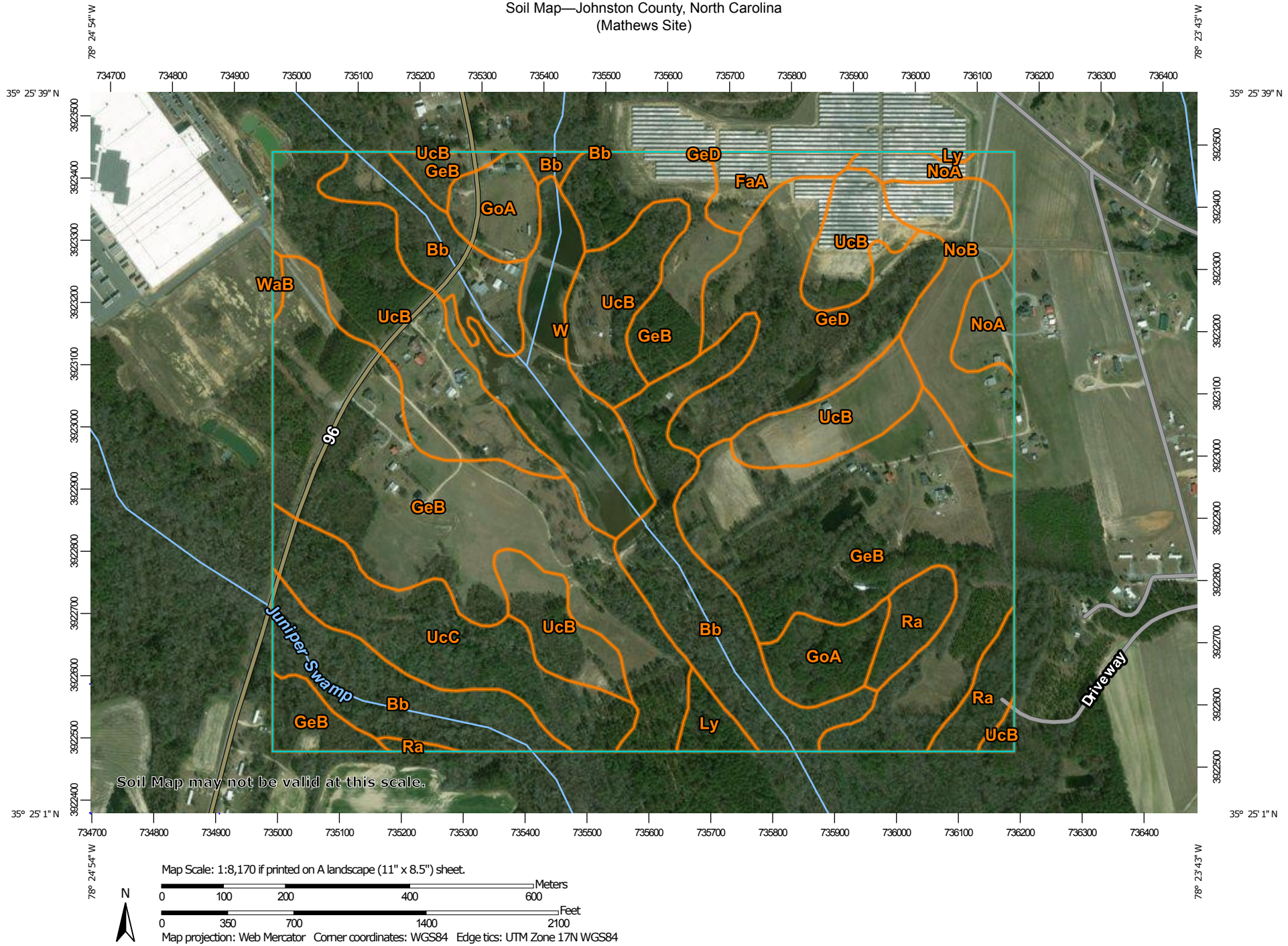
Appendix B
Mathew Site
Photo Log

June 2018

5. F1-Loamy Mucky Mineral and F3-Depleted Matrix in forested depression (Profile # 116).

6. Debris below dam structure.

Soil Map—Johnston County, North Carolina
(Mathews Site)



Map Scale: 1:8,170 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Johnston County, North Carolina
Survey Area Data: Version 20, Sep 19, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 25, 2014—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Johnston County, North Carolina (NC101)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Bb	Bibb sandy loam, 0 to 2 percent slopes, frequently flooded	41.3	14.4%
FaA	Faceville sandy loam, 0 to 2 percent slopes	4.0	1.4%
GeB	Gilead sandy loam, 2 to 8 percent slopes	99.5	34.7%
GeD	Gilead sandy loam, 8 to 15 percent slopes	21.2	7.4%
GoA	Goldsboro sandy loam, 0 to 2 percent slopes	10.3	3.6%
Ly	Lynchburg sandy loam, 0 to 2 percent slopes	2.4	0.8%
NoA	Norfolk loamy sand, 0 to 2 percent slopes	6.2	2.2%
NoB	Norfolk loamy sand, 2 to 6 percent slopes	12.9	4.5%
Ra	Rains sandy loam, 0 to 2 percent slopes	7.4	2.6%
UcB	Uchee loamy coarse sand, 2 to 6 percent slopes	47.8	16.7%
UcC	Uchee loamy coarse sand, 6 to 12 percent slopes	17.5	6.1%
W	Water	15.5	5.4%
WaB	Wagram loamy sand, 0 to 6 percent slopes	0.4	0.1%
Totals for Area of Interest		**286.4**	**100.0%**