PROSPECTUS

Rough Horn Swamp Mitigation Bank
Columbus County, North Carolina

Lumber River Basin
HUC 03040203

Prepared for:

USACE, Wilmington District

Wilmington Regulatory Field Office
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403

DRAFT
September 2016

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Prepared by:

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DRAFT
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1.0 Mitigation Bank Introduction and Objectives

1.1 Introduction

KCI is submitting the following prospectus to develop the Rough Horn Swamp Mitigation Bank (RHSMB), located in the Lumber 03040203 in Columbus County, North Carolina. This prospectus presents an overview of the potential for the proposed RHSMB that would serve as a stream and wetland mitigation bank providing effective and ecological mitigation utilized by private and public projects, where unavoidable losses of riparian and non-riparian wetlands and streams take place from activities authorized by the U.S. Corps of Engineers (USACE) under Section 404 of the Clean Water Act. The purpose of this prospectus is to provide regulatory agencies with sufficient information on the establishment and operation of the bank and to initiate regulatory review by the Interagency Review Team (IRT).

RHSMB is located near the Town of Evergreen in the west-central portion of Columbus County, North Carolina. Specifically, the site is located just southwest of the intersection of Old Boardman Road and CCC Road with a centroid of approximately 34.448056 N, 78.935094 W (Figure 1). The total proposed protected acreage within the bank is 31.7 acres. The site exists along a second-order tributary that originates in Long Bay, a drained Carolina Bay, located approximately one mile to the southeast of the RHSMB. For the purpose of this prospectus, the unnamed tributary will be referred to as Long Bay Creek. The site is also located within the 500-year floodplain of the Lumber River, located approximately 1,700 linear feet from the western edge of the RHSMB. The site topography is generally flat with only five feet of elevation change across the site. RHSMB has undergone significant modifications that have altered the site hydrology and vegetation since at least 1938.

This bank offers the opportunity to greatly improve the ecological conditions within the project watershed. The RHSMB will provide improved and sustainable ecological and hydrologic functions for the proposed mitigation bank service area. It will be effectively managed in perpetuity and will not impact or degrade any areas with high ecological value. Due to the degraded existing conditions, the site has a very high probability of meeting the prescribed success criteria, while also meeting the requirements of all other applicable federal and state laws.

1.2 Goals and Objectives

The project goals for the RHSMB are as follows:

- Restore a Coastal Plain stream valley
- Create a diverse wetland system with Bottomland Hardwood Forest and Wet Hardwood Flat communities

The following objectives will be implemented to achieve these goals:

- Relocate a channelized stream to its historic landscape position adjacent to riparian wetlands
- Redevelop a stream valley at existing floodplain elevation
- Install stream bedform variation and habitat features
- Plant the site with native trees and shrubs and a herbaceous seed mix that supports the development of the two community types.
- Fill field ditches and redevelop wetland microtopography to slow the flow of surface and subsurface drainage.

Table 1. Mitigation Goals, Objectives, and Functional Parameters

Goal	Objective	Functional Level	Function-Based Parameter Effects	Monitoring Measurement Tool
Restore a Coastal Plain stream valley	Relocate a channelized stream to its historic landscape position adjacent to riparian wetlands	Hydraulics	Floodplain Connectivity	Flood Frequency
	Redevelop a stream valley at existing floodplain elevation	Geomorphology	Lateral Stability and Channel Form	Visual Inspection
	Install bedform variation and habitat features	Geomorphology	Bed Form Diversity	Visual Inspection
Create a diverse wetland system with Bottomland Hardwood Forest and Hardwood Flat communities	Plant the site with native trees and shrubs and a herbaceous seed mix that supports the development of the two community types.	Geomorphology/ Wetland Species Composition	Vegetation	Density
				Species Composition/Diversity
	Fill field ditches and redevelop wetland microtopography to slow the flow of surface and subsurface drainage	Wetland Hydrology	Groundwater Saturation/ Surface Ponding	Percent Saturation Within 12 inches

Table adapted from Harman et al. 2012

2.0 MITIGATION BANK ESTABLISHMENT AND OPERATION

2.1 Establishment and Operation

The purpose of the Bank is to provide stream and wetland mitigation for unavoidable impacts to waters of the US, which result from development related activities authorized under Section 401 and Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act of 1899, and all applicable state statutes, provided such use has met those requirements. The Bank's objective is to provide ecologically sustainable and economically efficient off-site compensatory mitigation opportunities for the North Carolina Division of Mitigation Services (NCDMS) and/or other public and private permittees requiring mitigation credits for unavoidable impacts to regulated streams and/or wetlands. The Bank will be established to compensate for wetland and other aquatic resource losses anticipated by such authorized development within the bank service area in a manner that contributes to the long-term ecological functioning of the Lumber Basin, with an immediate goal of no-net loss and a long-term goal of a net gain of stream and wetland functions and services. The bank will include the restoration of approximately 2,642 linear feet of coastal stream valley, 12.7 acres of riparian wetlands and 11.3 acres of non-riparian wetlands.

It is expected that this Prospectus will be the basis of a formal Mitigation Banking Instrument (MBI). The MBI will be developed by KCI to establish the bank operations. The MBI will contain the Site Development Plan and will include location maps, summary of existing conditions and reference sites, hydrologic

analysis, design criteria, success criteria, long-term real estate instrument, and plans and specifications for construction, operation, monitoring and maintenance of the RHSMB.

The RHSMB will be managed and operated by KCI Technologies, Inc. and its team members as outlined in Section 6.0. The bank will operate as a single-site, private commercial bank.

2.2 Determination of Credits

Below are the anticipated stream and wetland credits that will be produced from the bank.

Table 2. Mitigation Summary for Rough Horn Swamp Mitigation Bank

Project Component -or- Reach ID	Existing Footage/ Acreage	Mitigation Type	Restoration Footage or Acreage	Mitigation Ratio	Stream or Wetland Mitigation Credits
Coastal Plain Stream Restoration (Warm)	2,707 lf (ditched stream)	Restoration	2,642 lf (valley centerline)	1:1	2,642 SMCs
Rip. Wetland Restoration (Re-establishment)	11.2 ac	Restoration (Re-establishment)	11.2 ac	1:1	11.2 WMCs
Rip. Wetland Restoration (Rehabilitation)	1.5 ac	Restoration (Rehabilitation)	1.5 ac	1.5:1	1.0 WMCs
Non-Rip. Wetland Restoration (Re-establishment)	11.3 ac	Restoration (Re-establishment)	11.3 ac	1:1	11.3 WMCs
SUMMARY					
Stream SMCs	2,642 SMCs				
Riparian WMCs	12.2 WMCs				
Non-Riparian WMCs	11.3 WMCs				

2.3 Credit Release Schedule

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary 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 Interagency Review Team (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 restart 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:

Table 3. Stream Credit Release Schedule

Stream Credits 7-year Timeframe			
Monitoring Year	**Credit Release Activity**	**Interim Release**	**Total Released**
0	Initial Allocation – see requirements below	15%	15%
0	Completion of all initial physical and biological improvements described in Mitigation Plan	15%	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% (60%*)
3	Third year monitoring report demonstrates performance standards are being met	10%	60% (70%*)
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 close-out approval from IRT	10%	90% (100%*)

**see Subsequent Release below*

Table 4. Wetland Credit Release Schedule

Forested Wetlands Credits 7-year Timeframe			
Monitoring Year	**Credit Release Activity**	**Interim Release**	**Total Released**
0	Initial Allocation – see requirements below	15%	15%
0	Completion of all initial physical and biological improvements described in Mitigation Plan	15%	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	10%	70%
5	Fifth year monitoring report demonstrates performance standards are being met; provided that all performance standards are met, the project may be closed out contingent on IRT approval. If so, the remainder of the credits will be released at this stage.	10%	80%
6	Sixth year monitoring report demonstrates performance standards are being met	10%	90%
7	Seventh year monitoring report demonstrates performance standards are being met, and project has received close-out approval from IRT	10%	100%

Initial Allocation of Released Credits
If deemed appropriate by the IRT, fifteen percent (15%) of the Bank's total stream credits shall be available for sale immediately upon completion of all of the following:

- Execution of the MBI by KCI, the DE, and other agencies eligible for membership in the IRT who choose to execute this agreement;
- Approval of the final Mitigation Plan;
- Mitigation bank site has been secured;
- Delivery of the financial assurances; and
- Recordation of the long-term protection mechanism, as well as a title opinion covering the property acceptable to the DE.

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 project with a 7-year monitoring period, a reserve of 10% of a site's total stream credits shall be released after two bank-full events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than two bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT.

Accounting
KCI shall maintain accurate records of debits made from the RHSMB. All ledger reports shall identify credits debited and remaining by type of credit and shall include for each reported debit the Corps ORM ID number for the permit for which the credits were utilized and the permitted impacts for each resource type.

KCI will notify the USACE every time an approved credit transaction occurs within 30 days of the transaction with a summary of the transaction and a full ledger report showing the changes made. Signed copies of the Transfer of Mitigation Responsibility form shall also be submitted to the USACE permit Project Manager and the USACE Bank Manager.

In addition to notification of credit transactions, KCI will also prepare an annual ledger report showing all credits used, any changes in credit availability (e.g., additional credits released, credit sales suspended), and the beginning and ending balance of credits remaining. We will submit the annual report until all of the credits have been utilized.

3.0 PROPOSED GEOGRAPHIC SERVICE AREA

RHSMB is situated within the 03040203 hydrologic unit (HU), which contains the Lumber River and its tributaries until reaching the South Carolina border. The proposed geographic service area (GSA) for the RHSMB, as seen in Figure 2, includes 03040203 as the primary GSA. In addition, the Sponsor would like consideration to include 03040201 and 03040204 within North Carolina as a secondary GSA at a reduced credit ratio. These HU's are truncated by the North/South Carolina boarder, reducing the in-state area to a level that would make establishment of other banks within these areas economically unfeasible. The justification for including this secondary service area was established based on adjacent HU's that contained more than 50% of the Level III Ecoregion as the project site (65 - Southeastern Plains). The 03040201 HU contains 66% of the same Level III Ecoregion as the project site and include headwaters of the Lower Pee Dee River such as Hitchcock Creek and Jones Creek in the vicinity of Rockingham, NC. The

03040204 HU contains 99% of the same Level III Ecoregion as the project site, and includes the upstream tributaries that form the Little Pee Dee River just past the South Carolina border. These HUs are all part of the Lower Pee Dee River Basin.

4.0 NEED AND FEASIBILITY OF MITIGATION BANK

4.1 Mitigation Need

Recent NCDMS full-delivery solicitations in this HUC have specifically asked for substantial stream and wetland mitigation sites, demonstrating current and future needs for mitigation in this HUC. Currently, there are no private mitigation banks directly in the Lumber 03 sub-basin, although the area is served by two adjacent private banks, the Lower Cape Fear Umbrella Bank (Sneeden & White Springs Tracts – stream and riparian wetland credits) and the Barra Farms II Mitigation Bank (non-riparian wetland credits)

The past 9 years of DOT Impact projections were analyzed to determine future projected needs in the Lumber River Basin. The following needs were identified.

Table 5. NCDOT Projected Mitigation Needs

DOT Project ID	STIP Year	County	Stream Mitigation Credits	Non-Riparian Credits	Riparian Credits
B-3680	2007	Moore	0	0.32	0.18
B-3680	2011	Moore	238		1.58
B-3693	2007	Robeson	291	0.02	0.75
B-3693	2009	Robeson			0.18
B-3897	2006	Robeson	0	0.01	0.24
B-3898	2008	Robeson	0	0	0.13
B-4249	2010	Robeson			0.17
B-4250	2006	Robeson	0	0.02	0.23
B-4251	2008	Robeson	0		0.12
B-4477	2011	Columbus			0.13
B-4583	2008	Moore	0	0.1	0.24
B-4614	2009	Richmond			0.21
B-4614	2010	Richmond			0.09
B-4616	2015	Robeson			
B-4617	2011	Robeson			0.28
B-4619	2008	Robeson	0	0.06	0.62
B-4620	2015	Robeson		0.186	0.36
B-4711	2012	Bladen			0.034
B-4801	2011	Robeson			0.16
B-4952	2011	Robeson		0.28	0
B-4967	2009	Hoke		0.11	0.36
B-4967	2009	Scotland		0.03	0.13
B-4967	2015	Hoke			0.22
B-4967	2015	Scotland			1.1
B-5127	2013	Hoke	70		0.73
B-5132	2013	Hoke			0.143
B-5333	2015	Robeson		0.0032	0.1989
B-5334	2015	Robeson		0.0012	0.0724
B-5337	2011	Robeson			0.1574

B-5362	2015	Montgomery			
B-5511	2015	Robeson		0.1717	0.4915
B-5529	2015	Robeson		0.15	0.4
B-5693	2015	Robeson		0.101	0.344
B-5696	2015	Robeson			0.089
B-5702	2015	Robeson		0.017	0.281
B-5707	2015	Bladen			0.007
Division06_13_03040203	2007		10	0.1	0.1
Division08_13_03040203	2007		25	0.05	0.02
EB-5741	2015	Moore			
I-4413	2011	Robeson	80		
POC-5	2010	Robeson	50		0.1
R-2502B	2007	Moore	0	1.2	
R-2502B	2007	Richmond	0		2.8
R-2593A	2009	Robeson	3800	13	5.1
R-2593B	2009	Robeson	2640	3.7	3
R-4900	2009	Columbus	366	2.1	7.2
R-5752	2015	Robeson			
U-2519AA	2015	Robeson	687	1.3	4.3
U-2519AB	2015	Cumberland	3737		2.2
U-3816	2007	Hoke		0.64	
U-5814	2015	Moore			
U-5815	2015	Moore			
W -4704	2008	Robeson	0	0.5	
Totals			11994	24.1701	35.2482
Impact Projections/Year			**1332.67**	**2.69**	**3.92**

The above table indicates that there are supportive needs identified by NCDOT in the Lumber 03 sub-basin and a lack of available credits. The impacts include approximately 12,000 feet of stream, 24 acres of NR wetlands and 35 acres of riparian wetlands. Three significant TIP projects are included in these projections. They include the Red Springs Bypass, the Fayetteville Outer Loop and the Replacement of the Lumber River Bridge over SR 1203. No significant private impacts are known to be coming in the basin over the next 5 years, although private impacts have accounted for approximately 1.4 credits per year since 2003. Improvements to US-74 completed recently have spurred some private development along the associated interchanges. We would expect these investments to continue or expand over the coming years. The Columbus Swamp Site, a full-delivery project for NCDMS located in the same 8-digit HU as the RHSMB and offering approximately 35 riparian wetland credits, has been sold out since March 7, 2016.

4.2 Site Selection

The RHSMB was selected due to its potential to provide integrated stream and wetland mitigation in a heavily drained and manipulated riparian corridor that flows from Long Bay directly to the Lumber River. The site was identified during site evaluations associated with the development of a NCDMS full-delivery mitigation site known as the Rough Horn Swamp Wetland Restoration Project. The NCDMS project, currently under contract to KCI, will provide approximately 30 riparian and non-riparian wetland mitigation credits to NCDMS. The RHSMB project would expand upon the NCDMS project to restore additional stream and wetland function to the system.

Within the Lumber 03, agriculture dominates much of the land use in this hydrologic unit (HU) at just over 30 percent; however, the headwaters of many streams have remained heavily forested. Close to a quarter

of this forested area is comprised of wooded wetlands found mainly in the floodplains of the braided river systems (NCDENR, DWQ 2010). The site is located within the 03040203190010 Local Watershed Unit (14-digit HUC). This watershed was selected by a Targeted Local Watershed by NCDMS (then NCEEP) in 2003. It contains the town of Boardman and a portion of Fair Bluff. It has a significant amount of Significant Natural Heritage Area and Natural Heritage Elements of Occurrence, primarily related to the Lumber River, which borders this HU. These include Net Hole/Buck Landing Swamp approximately 2,000 feet to the west, Big Swamp/Old Whiteville Road approximately 2 miles to the northeast, Flowers Swamp approximately 2 miles to the west, and Bluff Swamp/Princess Ann Swamp, approximately 1.5 miles to the southwest. The project site stream drains directly to Net Hole/Buck Landing Swamp and in combination with the adjacent NCDMS site, this project would connect a forested corridor fragmented only by one two-lane roadway from Long Bay to Net Hole/Buck Landing Swamp.

5.0 SITE OWNERSHIP AND LONG-TERM MANAGEMENT

The land required for the construction, management, and stewardship of this mitigation project includes portions of the parcels listed below. The conservation easement documents for RHSMB are currently in progress and should be completed before the final mitigation banking instrument is submitted.

The Point of Contact for the bank sponsor is:

Joe Pfeiffer
KCI Technologies, Inc.
4601 Six Forks Rd, Suite 220
Raleigh, NC 27609
Phone (919) 614-3615 / Fax (919) 783-9244 / joe.pfeiffer@kci.com

Starting October 14, 2016, KCI is moving to a new office location. Any correspondence after this date should be sent to:

KCI Technologies, Inc.
4505 Falls of Neuse Road, Suite 400
Raleigh, NC 27609

Table 6. Site Ownership

Landowners	PIN	County	Site Protection Instrument	Deed Book Page Number	Parcel Acreage	Acreage protected
George Sanderson	0215.00-94-9519.000	Columbus	Conservation Easement	DB PB 100 PG 11-11	45.00	9.17
KCI Technologies, Inc.	0215.00-93-1613.000	Columbus	Fee Simple Purchase; Conservation Easement in progress	In progress	43.03	22.57

George Allen Sanderson
3001 Old Boardman Road
Evergreen, NC 28438
Phone (910) 739-6844

Applicable real estate options and landowner authorizations are included in Appendix A.

5.1 Long-Term Management

KCI will institute a long-term management plan to assess the on-going condition and implement any maintenance provisions to maintain performance of the site. The conservation easements will ensure that only IRT-allowable activities take place.

To monitor the project's continued success, the long-term management plan will be implemented following the completed monitoring period. All components of the mitigation bank will be inspected annually or less frequently as needed to ensure that the project remains stable in perpetuity. Sources of instability or other deficiencies will be addressed. Invasive species will be managed annually or less frequently as needed to ensure the long-term survivability of the planned native vegetation community. All reporting will be documented and kept on file for future reference.

This easement will be transferred to Atlantic Coast Conservancy (ACC) once monitoring success criteria have been achieved and upon approval for close-out by the Interagency Review Team (IRT). The ACC shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party.

6.0 QUALIFICATIONS OF BANK SPONSOR

The team assembled for this project is led by KCI Technologies, Inc. and includes KCI Associates of North Carolina, P.A. and KCI Environmental Technologies and Construction, Inc. (ETC). Both member entities are corporate subsidiaries of KCI Technologies, Inc., and as such are submitting as co-ventures on this prospectus in order to provide ecological services, engineering, land acquisition, and turn-key design-build implementation of the RHSMB. KCI Associates of North Carolina, P.A. is a full-service engineering, planning and environmental consulting firm registered with the Office of the Secretary of State, as well as the North Carolina Board of Professional Engineers and Land Surveyors (C-0764). ETC is an environmental construction firm specializing in the implementation of environmental restoration and management projects, and is registered with the Office of the Secretary of State and is a North Carolina Licensed General Contractor (#41336). The team has the capacity to form the necessary legal and financial entities for the proposed work and hereinafter is referred to jointly as KCI.

KCI Technologies, Inc. is an employee-owned company headquartered in Sparks, Maryland, with division offices located throughout the Mid-Atlantic and southeastern United States. The local staff in the Natural Resources Practice in the Raleigh, NC office will be responsible for work derived from this contract. With a staff of more than 1,100 professional engineers, planners, architects, scientists, and construction support personnel, KCI is considered to have one of largest staffs trained in wetland and stream restoration design and construction, watershed management, geomorphology, and hydrologic/hydraulic engineering on the East Coast. KCI has made a concerted effort to foster the best technical expertise available in the design, implementation and construction of stream and wetland restoration projects.

KCI's team has been established to provide successful implementation of wetland and steam mitigation projects by providing turnkey services including site identification, land acquisition, planning and assessment, design, permitting, construction, construction management, performance monitoring,

remedial action and financial planning in one entity. KCI has been involved in the location, design, development and management of over 1,600 acres of wetland and 50 miles of stream mitigation throughout the eastern seaboard and has extensive experience in North Carolina. Our approach to successfully meeting our client's needs utilizes the collaborative expertise of environmental, engineering, and construction professions, as well as quality support personnel. Please see past project experience and personnel resumes in Appendix B.

7.0 ECOLOGICAL SUITABILITY AND EXISTING CONDITIONS

RHSMB has undergone significant modifications that have altered the site hydrology and vegetation since at least 1938. Historic aerial photographs (see Figures 3a and 3b) indicate that the site was already partially ditched by this time. The ditches, combined with contour manipulation (crowning), have severely altered the site's historic hydrologic regime. Even with the addition of many drainage ditches, the site is still periodically flooded during storm events. Flooding occurs both from overbank events from Long Bay Creek and its surrounding drainages as well as from backwater flooding from the Lumber River and Big Swamp during extreme events. Rack lines within forested portions of the site and adjacent sites are evident and verbal communications with the landowner are additional testimony to the site's flood potential. The extent of historic modifications of the drainage features in this watershed is not fully captured on the most recent USGS 7.5 minute quadrangle. Specifically, the routing of stream flow through the subject site has been moved south of the location shown on the USGS quadrangle. Soils investigations and interviews with local residents have confirmed that the historic location of the channel was consistent with that shown on the USGS quadrangle and soil survey mapping.

7.1 Historic Site Geology/Geomorphic Setting

The site lies within the Mid-Atlantic Floodplains and Low Terraces (Level IV 63n) ecoregion of the Coastal Plain physiographic province. These areas are characterized by large, sluggish rivers, deep-water swamps, oxbow lakes, and alluvial deposits with abrupt textural changes characterize. Cypress-gum swamps are common, along with bottomland hardwoods of wetland oaks, green ash, red maple, and hickories. The geology at the site is described as Yorktown Formation and Duplin Formation, Undivided Yorktown Formation (Tpy). The Yorktown Formation is described as having fossiliferous clay with varying amounts of fine-grained sand, bluish gray, shell material commonly concentrated in lenses. The Duplin Formation is described as being shelly with medium- to coarse-grained sand, sandy marl, and limestone, bluish gray.

According to the Columbus County Soil Survey, the soils within the project site are mapped as Torhunta fine sandy loam, Johnston loam, Wakulla course sand and Leon sand (see Figure 4). The mitigation efforts will be conducted within the areas mapped as Torhunta and Johnston. Torhunta series soils are very poorly drained soils located on upland bays and stream terraces. Torhunta series soils typically have a high water table (0.5' to 1.5' from the surface) from December to May but are listed as having a flood frequency of "none" in the Columbus County Soil Survey. Given these characteristics, this soil type was determined to be an indicator for non-riparian wetland areas. Johnston soils are also very poorly drained soils that are located along major drainageways and floodplains. Similar to Torhunta series soils, Johnston soils have a seasonally high water table, but unlike Torhunta soils they are frequently flooded. Given these characteristics, this soil type was determined to be an indicator for riparian wetland areas. The mapped soils were evaluated by a licensed soil scientist and small changes to the boundaries of these two soil series were discovered, including a small area of Stallings sandy loam (Figure 5). Both the mapped soils and the field-verified soils are described in detail in Appendix C.

7.2 Chronology of Historic Aerials

Historic aerial photographs were examined for any information pertaining to historic land use and site hydrology. The reviewed aerials are seen in Figures 3A and 3B. Historic aerials were obtained from the Columbus County Soil and Water Conservation District from 1938, 1951, 1955, 1966, 1972, and 1979 and 1993 and 2000 from the USGS via NC OneMap. From this photographic record, it is apparent that the area surrounding the project site has been a mix of agricultural and forested land for many years. In the 1938 aerial, the site is predominantly forested, although there are agricultural areas in close vicinity. By 1955, drainage ditches are visible in the northern portion of the site, and the land has been cleared in this area. In the 1966 aerial, additional land has been cleared to the south of the site, and the site remains relatively unchanged in the 1972 photo. By 1979, the southwestern corner of the site has been cleared entirely. Evidence of smaller drainage features are also seen in the 1979 photo. The site remains in a similar condition up until the present, where the majority of the site is ditched and drained except for a forested area in the eastern portion of the site. There are, however, ditches present in the forested land that are not visible on the aerials. The date of their installation is unknown.

Based on the pattern of development shown by the historic aerials and on adjacent properties, the development pressure for the site is low.

7.3 Watershed Summary Information

RHSMB is situated within the 03040203 (Lumber 03) Watershed Cataloging Unit (8-digit HUC) and more specifically in the 03040203190010 14-digit HUC. The drainage area to the downstream end of the site is approximately 1,735 acres (2.71 square miles) (see Figure 6). The hydrologic features within the drainage area are comprised of a second-order tributary that drains two Carolina Bays. These bays (Long Bay and Big Bay) have been substantially modified to facilitate drainage. The drainage for both bays enters the RHSMB site from the east and is called Long Bay Creek (LBC) for this project. Another smaller first-order tributary enters the site from the northern section, called UT to Long Bay Creek (UTLBC).

The project site is bounded by interspersed agricultural and forested land to the east, agricultural land and Old Boardman Road to the north, and agricultural and forested land south. Waters leaving the site flow approximately 0.5 mile to the Lumber River. The section of the Lumber River along the site is DWQ 14-(13), which is classified for surface water as C; Sw (Secondary Recreation; Swamp Waters). This reach of the Lumber River was not listed as impaired under the 2014 303(d) list.

7.4 Existing Site Conditions

The project has experienced significant hydrologic and vegetative modifications to allow for agricultural development. The current or previous landowners have installed a series of drainage ditches to optimize crop production. This activity has drained substantial acreage of riparian and non-riparian wetlands. The two existing project streams have also been straightened, channelized, and often relocated. Project photos are included in Appendix C, and Figure 7 provides an overview of the site conditions.

7.5.1 Streams

There are two streams that currently run through the RHSMB. Long Bay Creek is a modified (ditched) stream channel that originates in Long Bay and flows in a northwesterly direction to the RHSMB. The stream enters the site in the wooded section on the eastern end of the project. Spoil piles remain in the wooded area along the Long Bay Creek attesting to the historical impact. Remnant portions of the natural

Long Bay channel are evident within the wooded area to the south and west of the existing ditched channel. This is evidenced by soil survey data, on-site soils evaluations and information gathered during landowner and local resident interviews. LIDAR imagery of the site also shows this natural drainage pattern (low point) entering the RHS site from the northeast (see Figure 8). The relic channel of Long Bay Creek is not channelized and follows a more natural stream morphology. This channel was historically part of an existing wetland/stream complex with lower banks and high width/depth ratios. Valley cross-sections were taken of this remnant stream channel and are included in Appendix C. The second existing project stream is a first-order, unnamed tributary to Long Bay Creek (UTLBC) that enters from the northern section of the watershed. This stream has also been straightened and ditched and flows through an existing farm field.

The confluence of the two project streams occurs off-site of the RHSMB on the adjacent NCDMS project; the restoration of these two streams will continue on this project as well. After leaving the NCDMS project boundary, Long Branch Creek continues to flow in a westerly direction to its confluence with the Lumber River approximately 3000 feet to the west of the project site.

7.5.2 Wetlands

Wetlands historically formed at RHSMB due to surface inputs, with additional inputs coming from overbank stream events. Based on field topographic survey data and LIDAR elevation data, the contours at RHSMB range from 79 to 87 feet. The topography of the site begins with the highest elevations at the northeastern edge of the site. The elevation decreases as one moves from northeast to west. Water on the site exits the western boundary of the bank into the NCDMS project site.

The site has been impacted by a history of channelization and agricultural practices. These efforts to drain wetlands on the property were largely successful. However, two wetlands of marginal quality exist in the wooded areas on the eastern portion of the site. These wetlands are located within or near Long Bay Creek's historic landscape position. Wetland 1 is 2.77 acres and Wetland 2 is 1.19 acres as shown in the jurisdictional determination (See Appendix C).

7.5.3 Vegetation

The project includes a mature wooded area to the east. This forested area is partially ditched, but also contains the relic channel for Long Bay Creek. There are a variety of tree species, including black gum (*Nyssa sylvatica*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), swamp bay (*Persea palustris*), American holly (*Ilex opaca*), and tulip poplar (*Liriodendron tulipifera*). The remaining land on the project is currently being used for row crops.

7.5 Site Constraints

7.6.1 Jurisdictional Features

A jurisdictional determination was submitted to the US Army Corps of Engineers on October 9, 2015 and was approved January 22, 2016 (see Appendix C). Following the completion of the mitigation plan, a pre-construction notification (PCN) will be completed to apply for a Nationwide 27 Permit (NWP) to comply with Sections 401 and 404 of the Clean Water Act with the Wilmington District of the US Army Corps of Engineers and the NCDEQ Division of Water Resources.

7.6.2 Cultural Resources

There are no registered historic places within a five-mile radius of the subject property. Should historic or archeological resource issues arise during the permit process for the RHS site, KCI will address these issues using historians and archaeologists.

7.6.3 Endangered and Threatened Species

The US Fish and Wildlife Service's list of endangered and threatened species for Columbus County was reviewed and the following species are considered as having the potential to exist on the project site.

Table 7. Selected USWFS Endangered and Threated Species in Columbus County

Group	Common Name	Scientific Name	Status
Birds	Red-cockaded woodpecker	*Picoides borealis*	Endangered
Birds	Wood stork	*Mycteria americana*	Threatened
Flowering Plants	Cooley's meadowrue	*Thalictrum cooleyi*	Endangered
Flowering Plants	Rough-leaved loosestrife	*Lysimachia asperulaefolia*	Endangered

Below are the habitat descriptions adapted from the Raleigh Ecological Services Field Office descriptions (USFWS, 2016).

Habitat for Red-cockaded woodpecker: Red-cockaded woodpecker habitat includes forests with trees old enough for roosting, generally at least 60-120 years old, depending on species of pine. The most prominent adaptation of RCWs is their use of living pines for cavity excavation.

For nesting and roosting habitat, red-cockaded woodpeckers need open stands of pine containing trees 60 years old and older. RCWs need live, large older pines in which to excavate their cavities. Longleaf pines (*Pinus palustris*) are preferred, but other species of southern pine are also acceptable. Dense stands (stands that are primarily hardwoods, or that have a dense hardwood understory) are avoided. Foraging habitat is provided in pine and pine hardwood stands 30 years old or older with foraging preference for pine trees 10 inches or larger in diameter. In good, moderately-stocked, pine habitat, sufficient foraging substrate can be provided on 80 to 125 acres. Hardwood midstory encroachment results in cluster abandonment; therefore, it is critical that hardwood midstory be controlled. Prescribed burning is the most efficient and ecologically beneficial method to accomplish hardwood midstory control.

Given that these types of pine stands do not exist at the project site, no effect on RCWs is anticipated from this project.

Habitat for Wood Stork (*Mycteria americana)*: Wood storks use freshwater and estuarine wetlands for nesting, feeding and roosting. They feed in wide variety of tidal and freshwater ecosystems: freshwater marshes, ponds, hardwood and cypress swamps, narrow tidal creeks or shallow tidal pools, and artificial wetlands such as seasonally flooded roadside and agricultural ditches, impoundments and large reservoirs. Particularly attractive feeding sites are depressions in marshes or swamps where fish become concentrated during periods of falling water levels. They nest in patches of medium to tall trees, either in standing water or on islands surrounded by expanses of open water.

The type of standing water habitat does not currently exist at the site, and as such, no effect on the wood stork is anticipated from this project.

Habitat for Cooley's meadowrue (*Thalictrum cooleyi):* Cooley's meadowrue occurs on circumneutral soils in grass-sedge bogs and wet pine savannahs and savannah-like areas. It may also grow along fire plow lines, in roadside ditches, woodland clearings, and powerline rights-of-way, and needs some type of disturbance such as fire or mowing to maintain its open habitat. Plants often found growing with Cooley's meadowrue include tulip poplar growing with bald cypress and/or Atlantic white cedar.

This type of habitat is not currently found at the project site, and no effect is anticipated on this plant.

Habitat for Rough-leaved loosestrife *Lysimachia asperulaefolia:* This species generally occurs in the ecotones or edges between longleaf pine uplands and pond pine pocosins (areas of dense shrub and vine growth usually on a wet, peaty, poorly drained soil) on moist to seasonally saturated sands and on shallow organic soils overlaying sand. Rough-leaf loosestrife has also been found on deep peat in the low shrub community of large Carolina bays (shallow, elliptical, poorly drained depressions of unknown origin). The grass-shrub ecotone, where rough-leaf loosestrife is found, is fire-maintained, as are the adjacent plant communities (longleaf pine - scrub oak, savanna, flatwoods, and pocosin). Suppression of naturally-occurring fire in these ecotones results in shrubs increasing in density and height and expanding to eliminate the open edges required by this plant. Several populations are known from roadsides and power line rights of way where regular maintenance mimics fire and maintains vegetation so that herbaceous species are open to sunlight.

Given the lack of pocosin or bay habitat at the site, no effect is anticipated on this plant.

Based on these descriptions of suitable habitat for the selected species, we believe there will be no adverse effects following the implementation of this project. A consultation with the USFWS will be completed prior to the development of the Mitigation Banking Instrument.

8.0 MITIGATION WORK PLAN

8.1 Design Features

The mitigation approach for RHSMB will aim to restore an integrated stream/wetland ecosystem that will support the Long Bay Creek/Lumber River corridor. Stream restoration actions will focus on relocating surface water inputs from the unnamed tributary from Big Bay and from Long Bay Creek to their historic flowpaths. The RHSMB maximizes the restoration potential by providing 12.7 acres of riparian wetland restoration (re-establishment and rehabilitation), 11.3 acres of non-riparian wetland restoration (re-establishment), and 2,642 lf of stream restoration. This approach is shown in Figure 9.

While the credit type and ratio for this project generally follow the framework of the restoration mitigation type, these mitigation types have been further refined to be considered either re-establishment or rehabilitation, which are both forms of restoration. Re-establishment occurs where the functions are returned to the site in a location where an aquatic resource previously existed. Rehabilitation results in an improvement in most, if not all, aquatic resource functions at a degraded, existing wetland site (40 CFR Part 230). The USACE has approved restoration credits for both “re-establishment” and “rehabilitation” through the 2008 mitigation rules and subsequently on other DMS projects. The outcome from these discussions has been different ratios for rehabilitation and re-establishment, although they are both considered forms of restoration credit.

Stream Restoration (Priority I) 2,642 lf (valley length)
Mitigation actions will focus on filling the dredged channels and creating a shallow braided headwater stream/wetland complex. The restoration reach will have valley widths of approximately 100-feet wide and will be approached in a manner consistent with the guidance document *Information Regarding Stream Restoration with Emphasis on the Coastal Plain* (USACE 2007). This design aims to restore the function of these systems, applying the guidance as described in that document for restoring riparian headwater systems.

Coastal Plain stream restoration will take place on Long Bay Creek (LBC - 1,192 lf proposed valley length) as well as two additional unnamed tributaries to Long Bay Creek. Reach 1 (UTLBC1 – 493 lf proposed valley length), will flow from the northeastern corner of the site for 493 linear feet; currently this flow is disrupted by the main ditched channel of LBC cutting diagonal across this area. Reach 2 (UTLBC2 – 957 lf proposed valley length), currently a ditched stream, travels from the northern top of the site until the confluence with LBC off-site on the NCDMS project. The restored streams will not be a single-thread channel systems, but instead stream/wetland valleys with multiple flowpaths that will meander through variations in streambed topography created by roots and woody debris. In the case of LBC, the stream will be removed from its ditched channel that runs along the northern edge and be returned to its prior position in forested valley bottom. These existing valley cross-sections are shown in Appendix C and the approximate area where the flow will be returned is highlighted in blue. UTLBC1 will flow out of the northeast and be placed in the former stream valley shared by LBC. For UTLBC2, the proposed stream valley will run along the extent of the top of the existing ditched stream and then turn to the northwest near its end.

The stream valleys for the project streams will be morphologically highly variable and the conditions in the wooded section will be used as a guide to develop what the headwater stream/wetland restoration should look like. Observations from similar stream systems will be incorporated into the design, such as the dominant flowpath is not always centered in the valley or even the lowest part of the valley; that numerous side channels can be almost the same size as the primary flowpath; that sometimes side channels are nonexistent and the flowpath conveys a greater concentrated flow; that the size and dimensions of the primary flowpath vary depending on governing valley morphology; and that the profiles have some areas of high variability and other areas with little grade change. These qualities, and the morphological parameters of the relic channel, will contribute to the design plan for the restoration of the ditched streams on-site. The restored streams will also contribute to the restoration or improvement of the groundwater hydrology to the adjacent drained riparian wetlands.

Once the restored streams enter the NCDMS project, the stream and wetland restoration will be continued for another 1,600 lf before reaching an existing treeline.

Riparian Wetland Restoration (Rehabilitation and Re-establishment) – 12.7 acres
The drained hydric soils (11.2 acres) adjacent to the relic stream/wetland valleys will be restored to riparian wetland as part of the restoration of Long Bay Creek and its tributaries. There are also existing riparian wetlands (1.5 ac) that will be rehabilitated by increasing the groundwater hydroperiod and enhancing vegetation. The mitigation area would be restored by filling approximately 1,700 linear feet of ditches, relocating sidecast spoil, and completing minor surface contouring to offset existing man-made drainage enhancements (primarily field crowning in the existing field areas). The stream will be the main hydrologic source to the riparian components of the wetland system but will be augmented by a shallow groundwater table, overland flow, and seepage from the adjacent uplands. Wetland hydrology will be restored to the drained hydric soils once the restored streams are redirected to the existing relic channels,

raising the groundwater elevations and providing overbank flow. The functional uplift will be significant in this wetland system, because there is already a mature canopy of appropriate tree species. Following the completion of site grading, the riparian wetland will be planted as Bottomland Hardwood Forest as described in the section below.

Non-Riparian Wetland Restoration – 11.3 acres
In addition to the riparian features at the site, there will also be 11.3 acres of non-riparian restoration (re-establishment) that will take place. The drained Torhunta non-riparian hydric soils are found adjacent to the riparian soils in the fields to the southwest and northwest. Ditches have been installed in this fields to remove ponding and saturation from surface water inputs, which are the primary hydrologic source for the non-riparian wetlands. The mitigation area will be restored by filling approximately 1,900 linear feet of additional ditches, removing remnant spoil piles, and grading the site with minor variations to restore natural wetland topography. Following the completion of site grading, the non-riparian wetland will be planted as a Hardwood Flat Forest community as described in the section below.

8.2 Target Plant Communities

The target NCWAM types for the site will be a Bottomland Hardwood Forest, which will encompass the riparian wetlands and Coastal Plain stream restoration, and a Hardwood Flat Forest for the non-riparian wetlands. The planting plan proposed for the site considers the species identified in this community type as well as other similar species that have been observed in the adjacent wetland areas. In the lower part of the site (riparian area) where the restored Coastal Plain stream pattern will flow, it is anticipated that significant numbers of bald cypress, swamp tupelo, cherrybark oak, and overcup oak will be planted in the riparian zone due to the anticipated periods of prolonged saturation and inundation. The second area (non-riparian zone) would be at an elevation slightly above the stream area transitioning to the adjacent uplands. The two planting areas will have many of the same species, differing only slightly based on the tolerance to the wetness regime. Trees and shrubs will be planted at a density of 968 stems per acre (9 feet x 5 feet spacing) to achieve a mature survivability of two hundred ten (210) stems per acre after seven years. Plantings in the existing forested areas will be reduced as necessary to those open or disturbed areas that may support plantings. Woody vegetation planting will be conducted during dormancy. Species to be planted may consist of the following and any substitutions from the planting plan will be taken from this list:

Table 8. Bottomland Hardwood Forest Proposed Species

Common Name	Scientific Name	Wetland Status (Atlantic & Gulf Coast Plain)
American Hornbeam	*Carpinus caroliniana*	FAC
Silky Dogwood	*Cornus amomum*	FACW
Green Ash	*Fraxinus pennsylvanica*	FACW
Tulip Poplar	*Liriodendron tulipifera*	FACU
Sweet Bay	*Magnolia virginiana*	FACW
Swamp Tupelo	*Nyssa biflora*	OBL
Laurel Oak	*Quercus laurifolia*	FACW
Overcup Oak	*Quercus lyrata*	OBL
Swamp Chestnut Oak	*Quercus michauxii*	FACW
Water Oak	*Quercus nigra*	FAC
Willow Oak	*Quercus phellos*	FACW

Bald Cypress	*Taxodium distichum*	OBL
American Elm	*Ulmus americana*	FACW

Table 9. Hardwood Flat Proposed Species

Common Name	Scientific Name	Wetland Status (Atlantic & Gulf Coast Plain)
River Birch	*Betula nigra*	FACW
Silky Dogwood	*Cornus amomum*	FACW
Green Ash	*Fraxinus pennsylvanica*	FACW
Tulip Poplar	*Liriodendron tulipifera*	FACU
Sweet Bay	*Magnolia virginiana*	FACW
Swamp Tupelo	*Nyssa biflora*	OBL
Laurel Oak	*Quercus laurifolia*	FACW
Overcup Oak	*Quercus lyrata*	OBL
Swamp Chestnut Oak	*Quercus michauxii*	FACW
Water Oak	*Quercus nigra*	FAC
Cherrybark Oak	*Quercus pagoda*	FACW
Willow Oak	*Quercus phellos*	FACW
American Elm	*Ulmus americana*	FACW

An herbaceous seed mix composed of appropriate native species will also be developed and used to further stabilize and restore the wetland.

9.0 MAINTENANCE PLAN

The site will be monitored on a regular basis, with a physical inspection of the site 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:

Table 10. Project Maintenance Plan

Component/Feature	Maintenance Through Project Close-Out
Stream and Wetland	Routine maintenance and repair activities may include securing of loose coir matting and supplemental installations of live stakes and other target vegetation within the mitigation area. Areas where stormwater and floodplain flows intercept the wetland may also require maintenance to prevent scour.
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 controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Site Boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. 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.

10.0 PERFORMANCE STANDARDS

The RHSMB will be monitored to determine if the stream and wetland features on-site meet the standards for mitigation credit production. The credits will be validated upon confirmation that the success criteria described below are met. Monitoring of the RHSMB shall occur for a minimum of seven years. The table at the end of this section expands on the functional improvements anticipated for this site and how these improvements are linked to the monitoring of the performance standards.

Headwater Stream Performance
Stream hydrology monitoring will be conducted to determine if the restored headwater streams meet the proposed performance criteria for headwater stream hydrology and form. The stream will have continuous surface water flow within the valley, every year, for at least 30 consecutive days. Additionally, the stream must show signs of supporting the restored channel form as documented with photos. These indicators may include evidence of: scour, sediment deposition and sorting, multiple flow events, wrack lines and flow over vegetation, leaf litter, or water staining.

Vegetation Performance
The site must achieve a woody stem density of 320 stems/acre after three years, 260 stems/acre after five years and 210 stems/acre after seven years to be considered successful. Plot data with individual species lists will be provided. If monitoring indicates that the specified survival rate is not being met, appropriate corrective actions will take place, which may include invasive species control, and replanting.

Wetland Hydrologic Performance
Wetland hydrology monitoring will be conducted to determine if the restored wetland areas meet the proposed performance criteria for wetland hydrology. The site must present continuous saturated or inundated hydrologic conditions for at least 10% of the growing season for the riparian wetlands and at least 7.5% of the growing season for the non-riparian wetlands during normal weather conditions based on a conservative estimate. A “normal” year will be based on NRCS climatological data for Columbus County, and using the 30th to 70th percentile thresholds as the range of normal, as documented in the USACE Technical Report “Accessing and Using Meteorological Data to Evaluate Wetland Hydrology, April 2000.” The USDA WETS table for Whiteville 7 NW estimates that the growing season begins March 12th and ends November 15th (247 days) for a 50% probability of a freeze of 28 degrees F or lower (USDA 2016).

Wetland hydrologic performance will be determined through evaluation of automatic recording gauge data supplemented by documentation of wetland hydrology indicators as defined in the 1987 USACE Wetland Delineation Manual. Daily data will be collected\automatic wells over the monitoring period following implementation. These data will determine if the wetland meets the hydrology success criterion of the water table being within 12 inches of the ground surface continuously for the proposed extent of the growing season.

Below is a summary of how anticipated functional outcomes of the project are linked to the performance standards.

Table 11. Project Functional Outcomes and Monitoring

Goals	Objective	Functional Level	Function-Based Parameter Effects	Monitoring Measurement Tool	Performance Standard
Restore a Coastal Plain stream valley	Relocate a channelized stream to its historic landscape position adjacent to riparian wetlands	Hydraulics	Floodplain Connectivity	Flood Frequency	Continuous surface flow for at least 30 consecutive days
	Redevelop a stream valley at existing floodplain elevation	Geomorphology	Lateral Stability and Channel Form	Visual Inspection	Evidence of scour, sediment deposition and sorting, multiple flow events, wrack lines, leaf litter, or water staining
	Install bedform variation and habitat features	Geomorphology	Bed Form Diversity	Visual Inspection of Features	Presence of logs or other habitat indicators providing bed diversity
Create a diverse wetland system with Bottomland Hardwood Forest and Hardwood Flat communities	Plant the site with native trees and shrubs and a herbaceous seed mix that supports the development of the two community types.	Geomorphology/ Wetland Species Composition	Vegetation	Density	260 stems/acre after 5 years or 210 stems/acre after 7 years
				Species Composition/ Diversity	Percentage of species types
	Fill field ditches and redevelop wetland microtopography to slow the flow of surface and subsurface drainage	Wetland Hydrology	Groundwater Saturation/ Surface Ponding	Percent Saturation Within 12 inches	10% of growing season for Bottomland Hardwood Forest (riparian) / 7.5% for Hardwood Flat (non-riparian)

Table adapted from Harman et al. 2012

11.0 MONITORING REQUIREMENTS

Monitoring of the RHSMB shall consist of the collection and analysis of stream and wetland hydrology, stability, and vegetation survivability data to support the evaluation of the project in meeting established performance standards described above.

Vegetation Monitoring

The success of the riparian buffer and wetland plantings will be evaluated using ten-by-ten meter or equivalently-sized vegetative sampling plots within the planted area. Trees and shrubs will be grouped into height classifications and the species notated. Volunteers will be recorded in the same manner, but counted separately from planted trees. The corners of each monitoring plot will be permanently marked in the field and the coordinates of the plot corners will be recorded using conventional survey or GPS. Additionally, a photograph will be taken of each plot that will be replicated each monitoring year. Beginning at the end of the first growing season, KCI will monitor the planted vegetation in monitoring years 1, 2, 3, 5, and 7 at a minimum.

Wetland Hydrologic Monitoring

Hydrologic performance will be determined through evaluation of automatic recording gauge data supplemented by documentation of wetland hydrology indicators as defined in the 1987 USACE Wetland Delineation Manual. Daily data will be collected from seven automatic wells over the 7-year monitoring period following implementation.

Stream Hydrologic Monitoring

In the stream restoration areas of RHSMB, automatic recording gauges will also be installed to document the presence of surface water. In addition to the presence of surface water, other physical flow indicators will also be documented to demonstrate that there are surface flows through the stream/wetland valley.

Visual Assessment

An annual site walk will be conducted at the end of each monitoring period to document any problem areas. Specific problem areas that could arise include excessive bank erosion, bed deposition or aggradation, problems with the installed structures, or sparse vegetative cover. The findings of the visual assessment as well as any recommended corrective actions for problem areas will be summarized in the monitoring reports by way of a Current Conditions Plan View (CCPV) figure.

Photograph reference points (PRPs) will be established to assist in characterizing the site and to allow qualitative evaluation of the site conditions. The location of each photo point will be marked in the monitoring plan and the bearing/orientation of the photograph will be documented to allow for repeated use.

The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends and assist in decision making regarding project close-out. The report will document the monitored components and include all collected data, analyses, and photographs. The first scheduled monitoring will be conducted during the first full growing season following project completion. The site will be monitored for performance standards for a minimum of for seven years after completion of construction. Full monitoring reports will be completed in Years 1, 2, 3, 5, and 7. Limited monitoring reports (CCPV, photos, stream and wetland gauge data, and site narrative) will be submitted in Years 4 and 6.

Table 12. Monitoring Methodology

Required	Parameter	Method	Frequency	Notes
Yes	Groundwater Hydrology	Gauges will be distributed in the wetland re-establishment areas and rehabilitation area	Annual	Groundwater monitoring gauges with data recording devices will be installed on-site; the data will be downloaded on a monthly basis during the growing season
Yes	Stream Hydrology	A least one gauge will be installed throughout the stream valley to document surface water flow	Annual	In addition to the gauge data, physical indicators of flow will be documented and reported in the annual monitoring reports.
Yes	Vegetation	Permanent vegetation monitoring plots	Monitoring Years 1, 2, 3, 5, and 7	
Yes	Project boundary		Semi-annual	Locations of vegetation damage, boundary encroachments, etc. will be mapped

12.0 ADAPTIVE MANAGEMENT PLAN

Upon completion of site construction KCI will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described previously in this document. If, during the course of annual monitoring it is determined that the site's ability to achieve site performance standards are jeopardized, KCI will notify the USACE of the need to develop a Plan of Corrective Action. The Plan of Corrective Action may be prepared using in-house technical staff or may require engineering and consulting services. Once the Corrective Action Plan is prepared and finalized KCI will:

1. Notify USACE as required by the Nationwide 27 permit general conditions.
2. Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the USACE.
3. Obtain other permits as necessary.
4. Implement the Corrective Action Plan.
5. Provide the USACE a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

13.0 FINANCIAL ASSURANCES

Prior to any debiting the sponsor shall provide financial assurances, as acceptable by the Corps, in consultation with the IRT, to ensure a high level of confidence that the Bank will be successfully completed and maintained in perpetuity. The details of these financial assurances will be provided in the MBI.

14.0 REFERENCES

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Figures

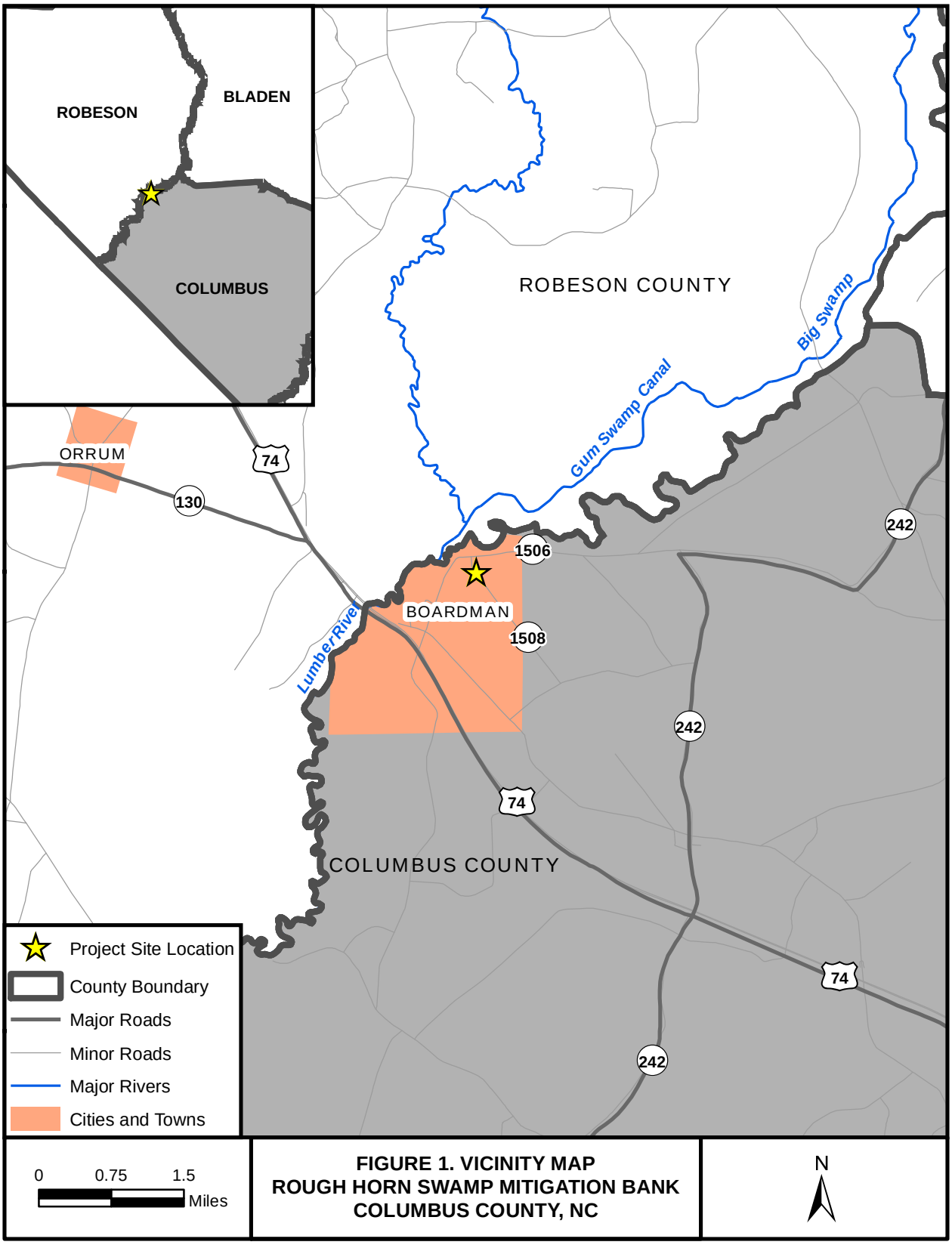


FIGURE 1. VICINITY MAP
ROUGH HORN SWAMP MITIGATION BANK
COLUMBUS COUNTY, NC

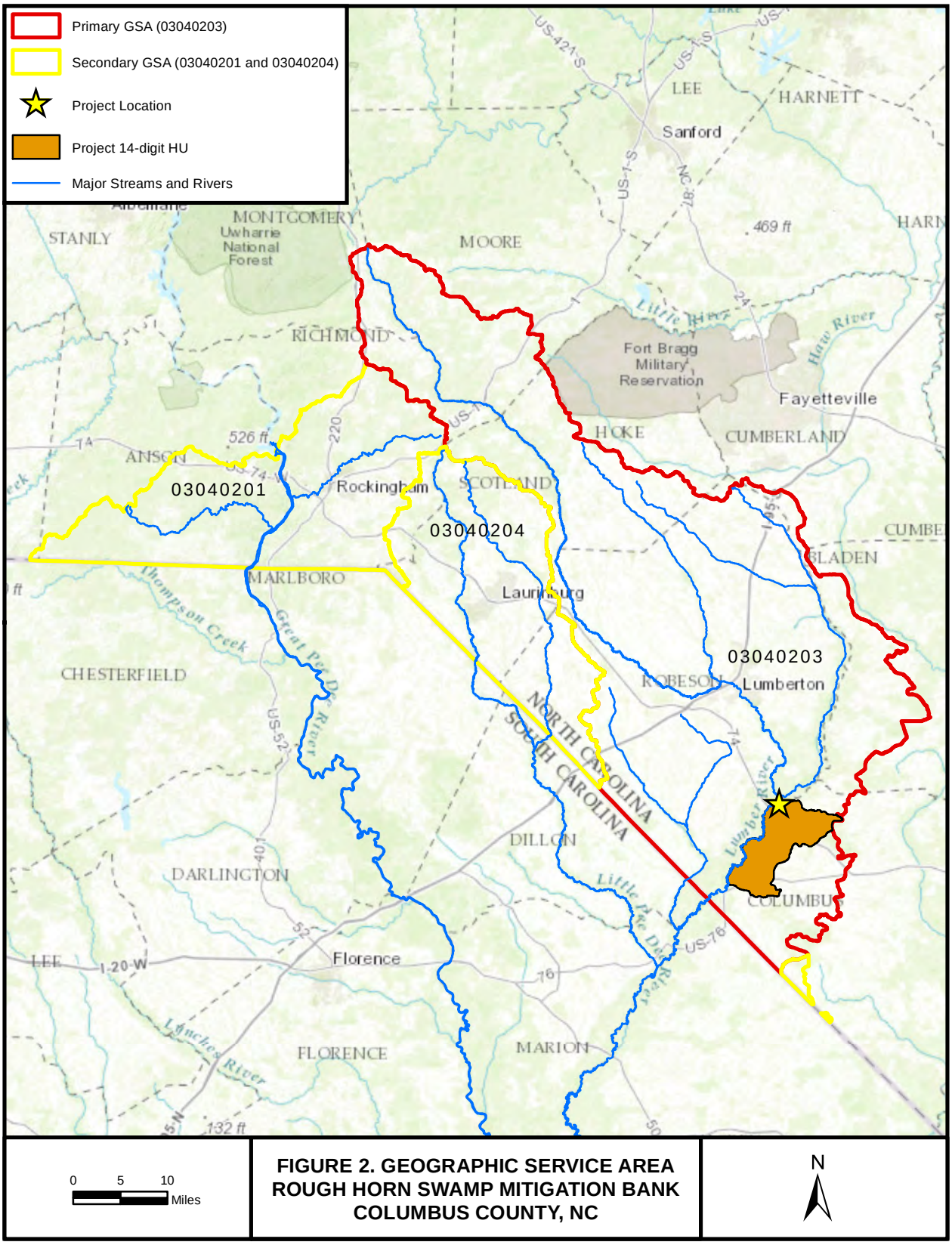


FIGURE 2. GEOGRAPHIC SERVICE AREA ROUGH HORN SWAMP MITIGATION BANK COLUMBUS COUNTY, NC

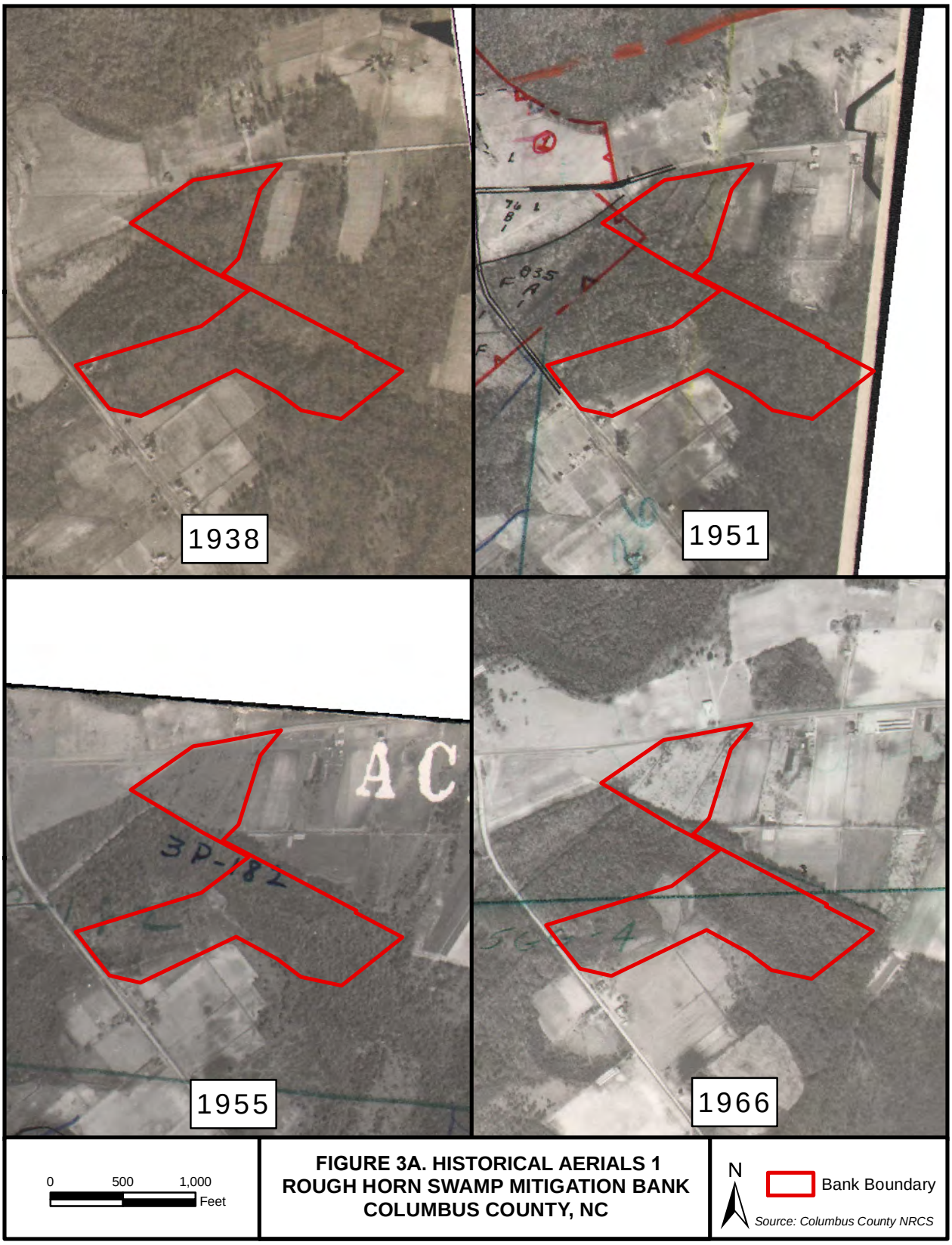


FIGURE 3A. HISTORICAL AERIALS 1
ROUGH HORN SWAMP MITIGATION BANK
COLUMBUS COUNTY, NC

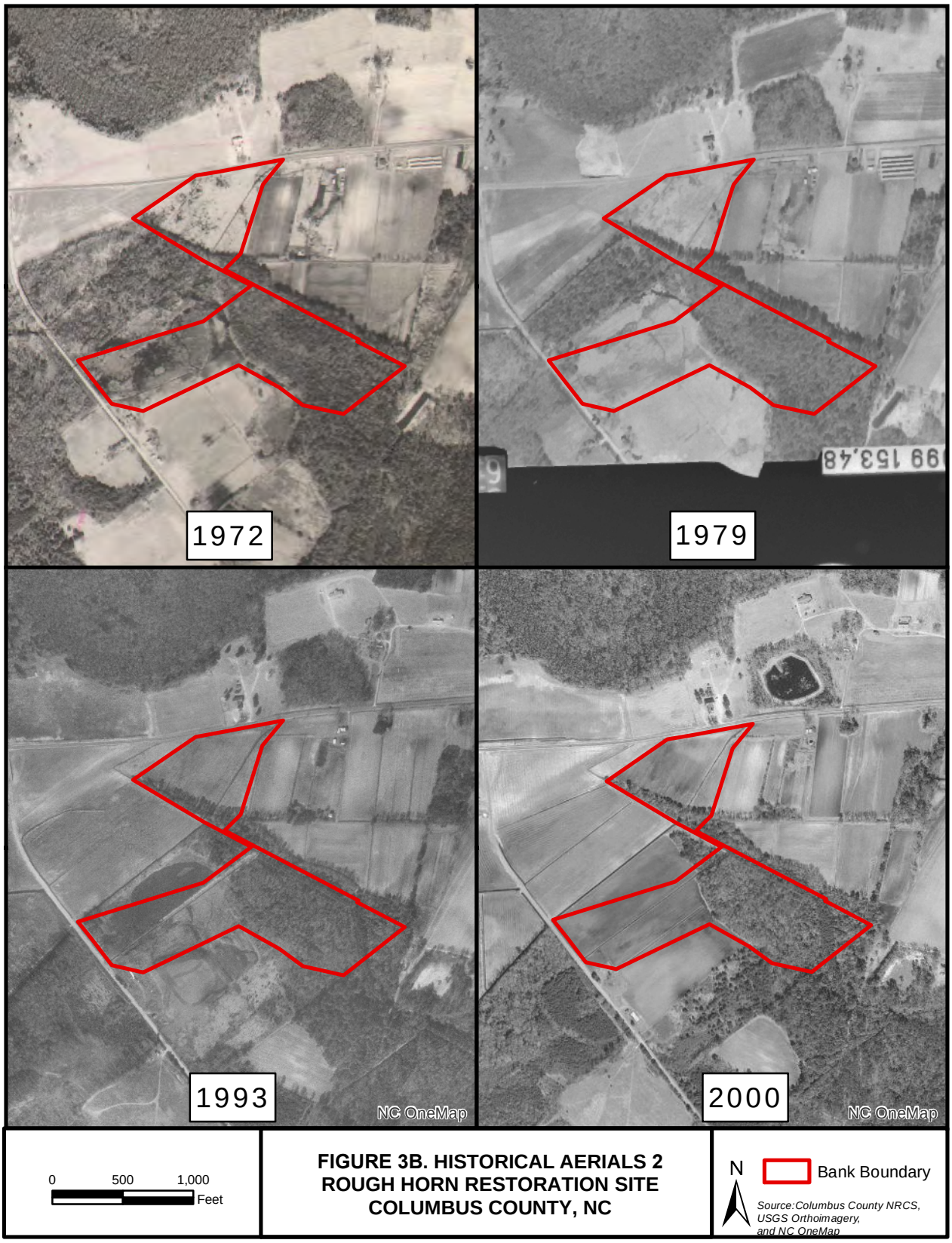


FIGURE 3B. HISTORICAL AERIALS 2
ROUGH HORN RESTORATION SITE
COLUMBUS COUNTY, NC

FIGURE 4. NRCS SOIL SURVEY
ROUGH HORN SWAMP MITIGATION BANK
COLUMBUS COUNTY, NC

Source: NRCS SSURGO Data, Columbus County
NC OneMap Imagery, 2013

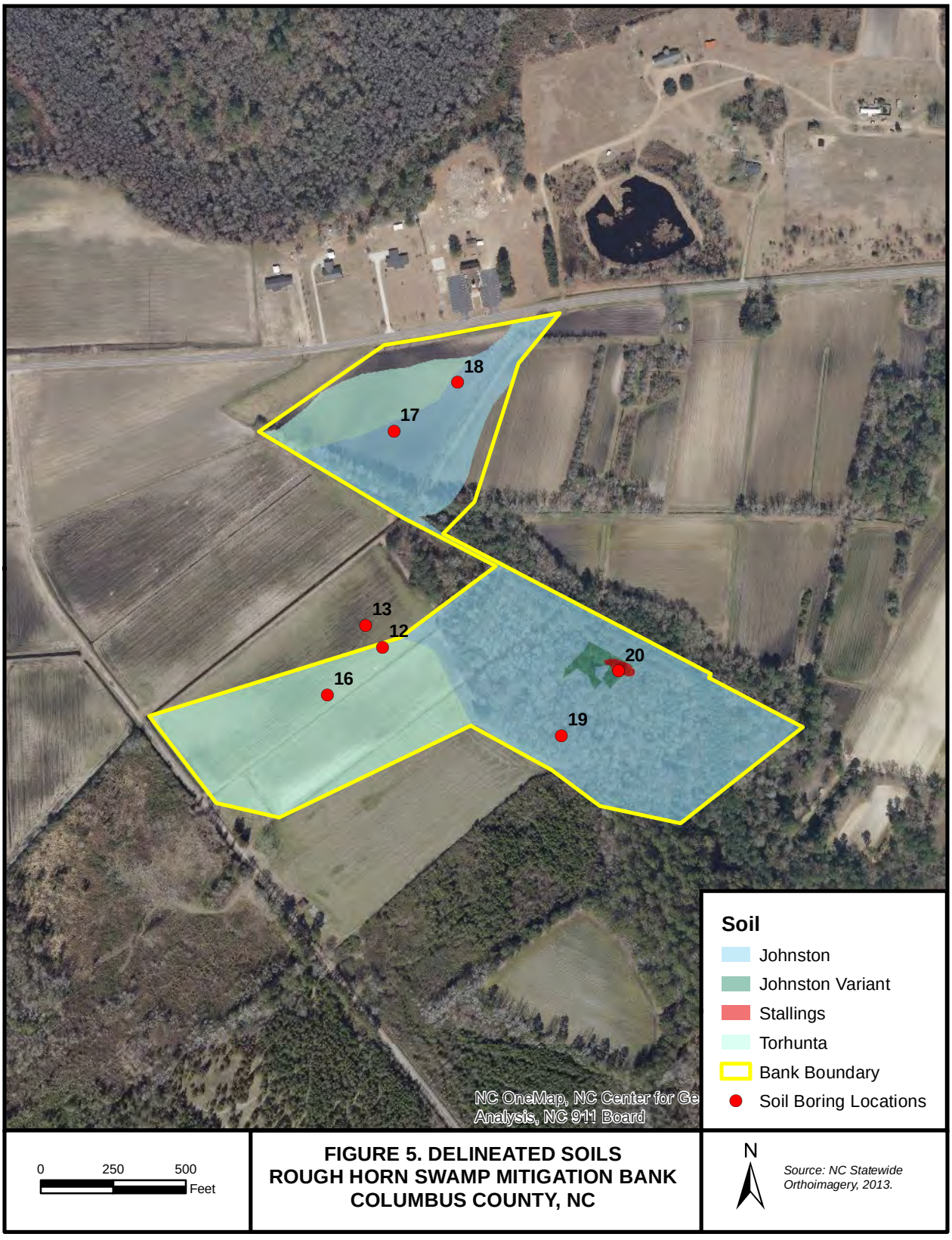


FIGURE 5. DELINEATED SOILS
ROUGH HORN SWAMP MITIGATION BANK
COLUMBUS COUNTY, NC

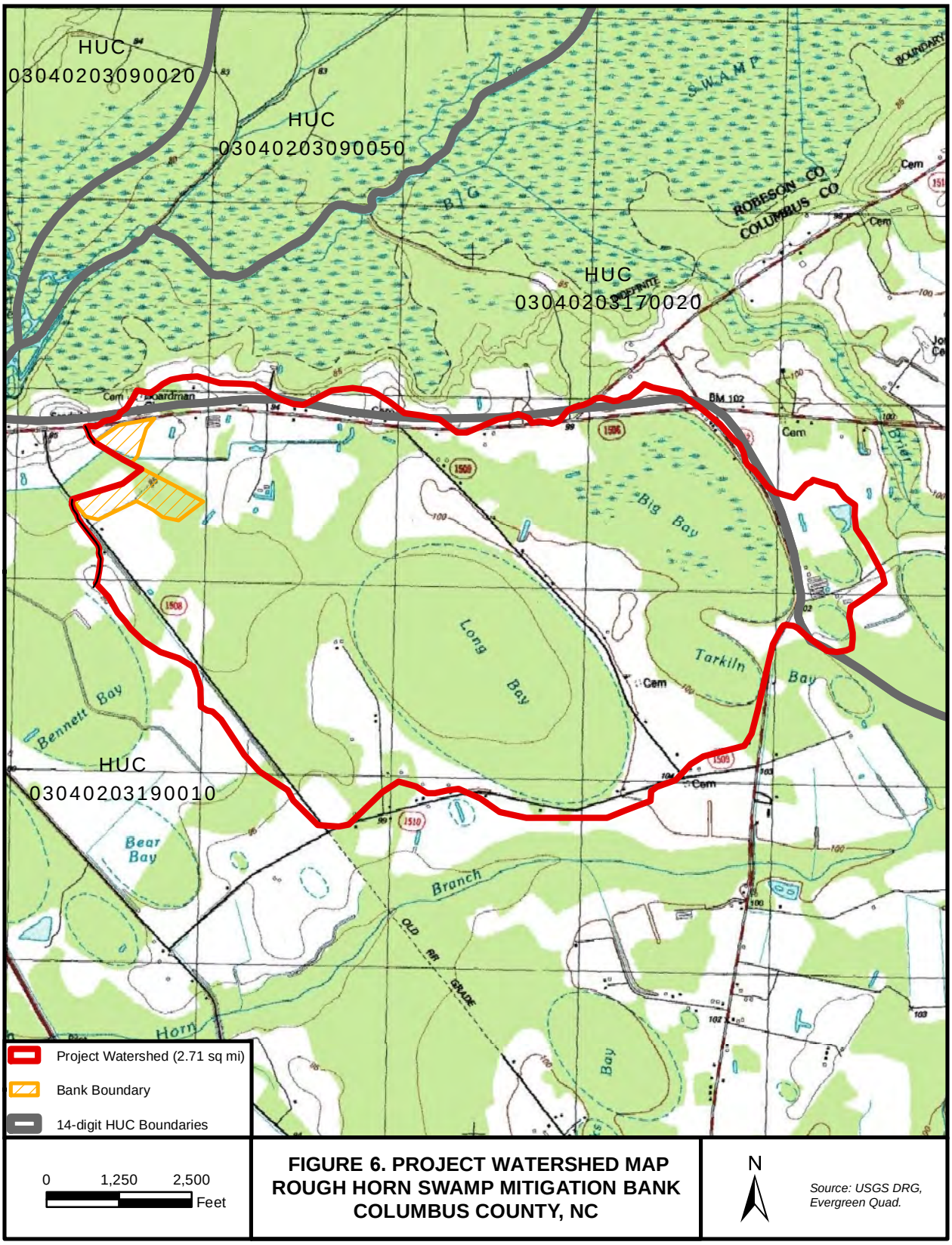


FIGURE 6. PROJECT WATERSHED MAP
ROUGH HORN SWAMP MITIGATION BANK
COLUMBUS COUNTY, NC

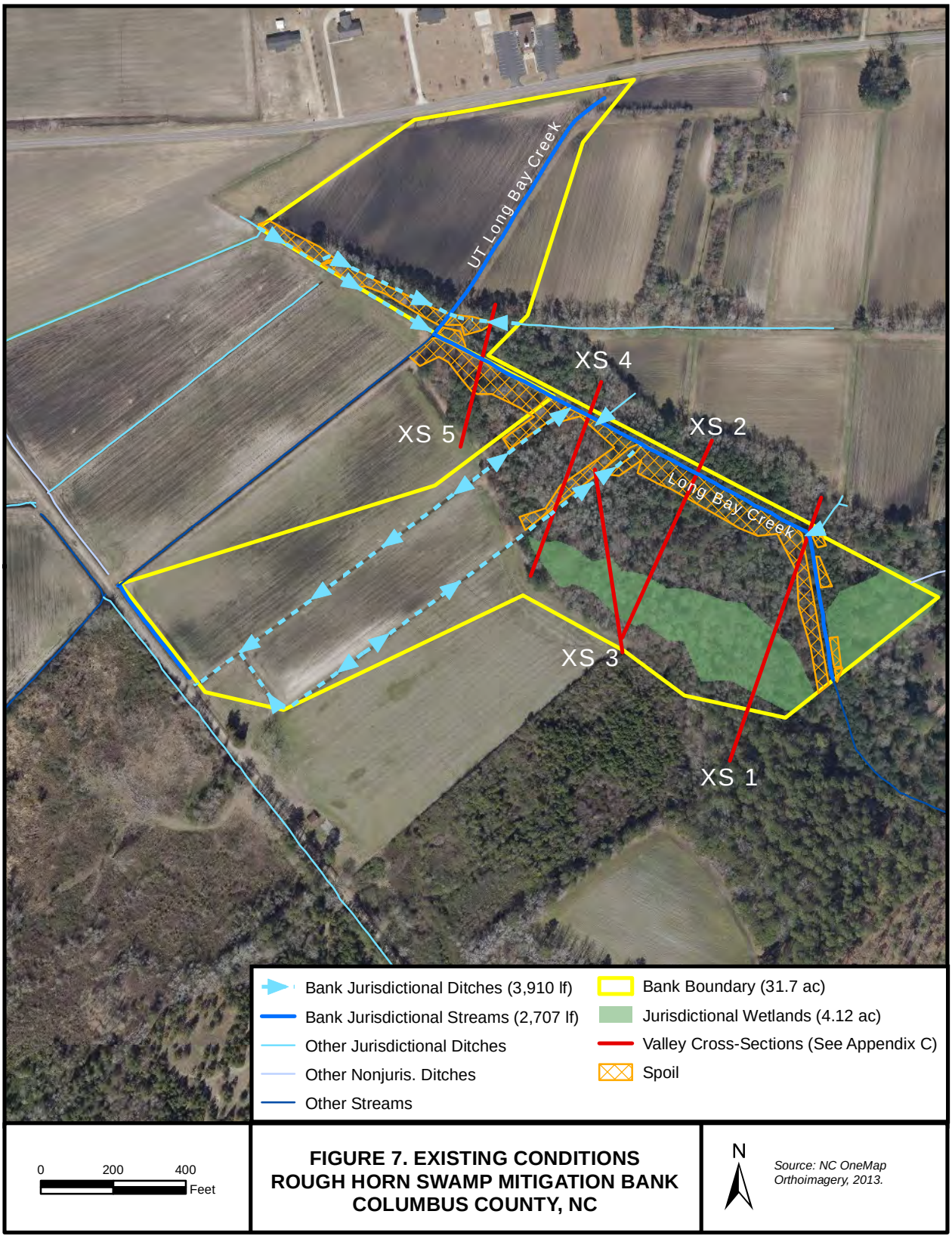


FIGURE 7. EXISTING CONDITIONS
ROUGH HORN SWAMP MITIGATION BANK
COLUMBUS COUNTY, NC

Source: NC OneMap Orthoimagery, 2013.

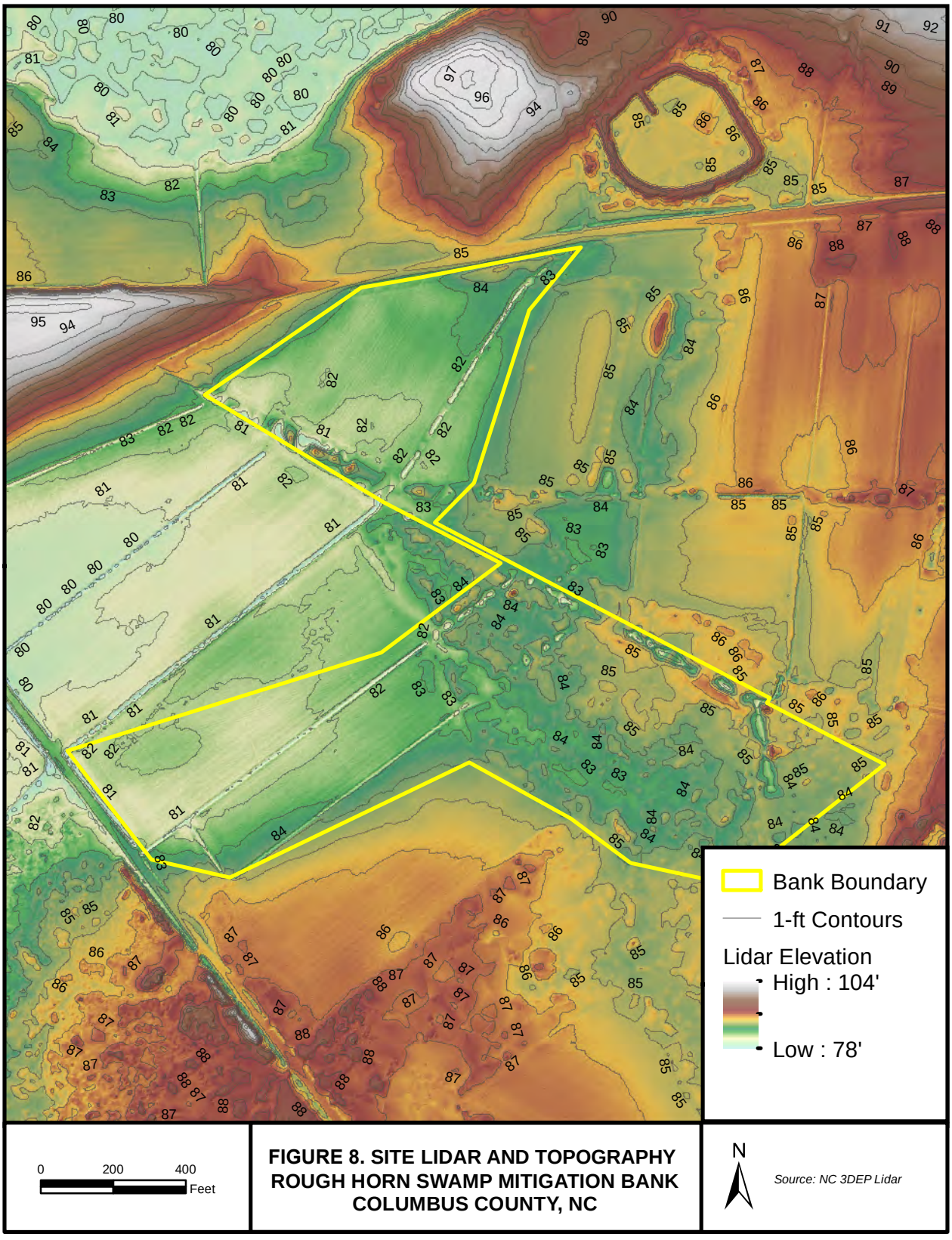


FIGURE 8. SITE LIDAR AND TOPOGRAPHY
ROUGH HORN SWAMP MITIGATION BANK
COLUMBUS COUNTY, NC

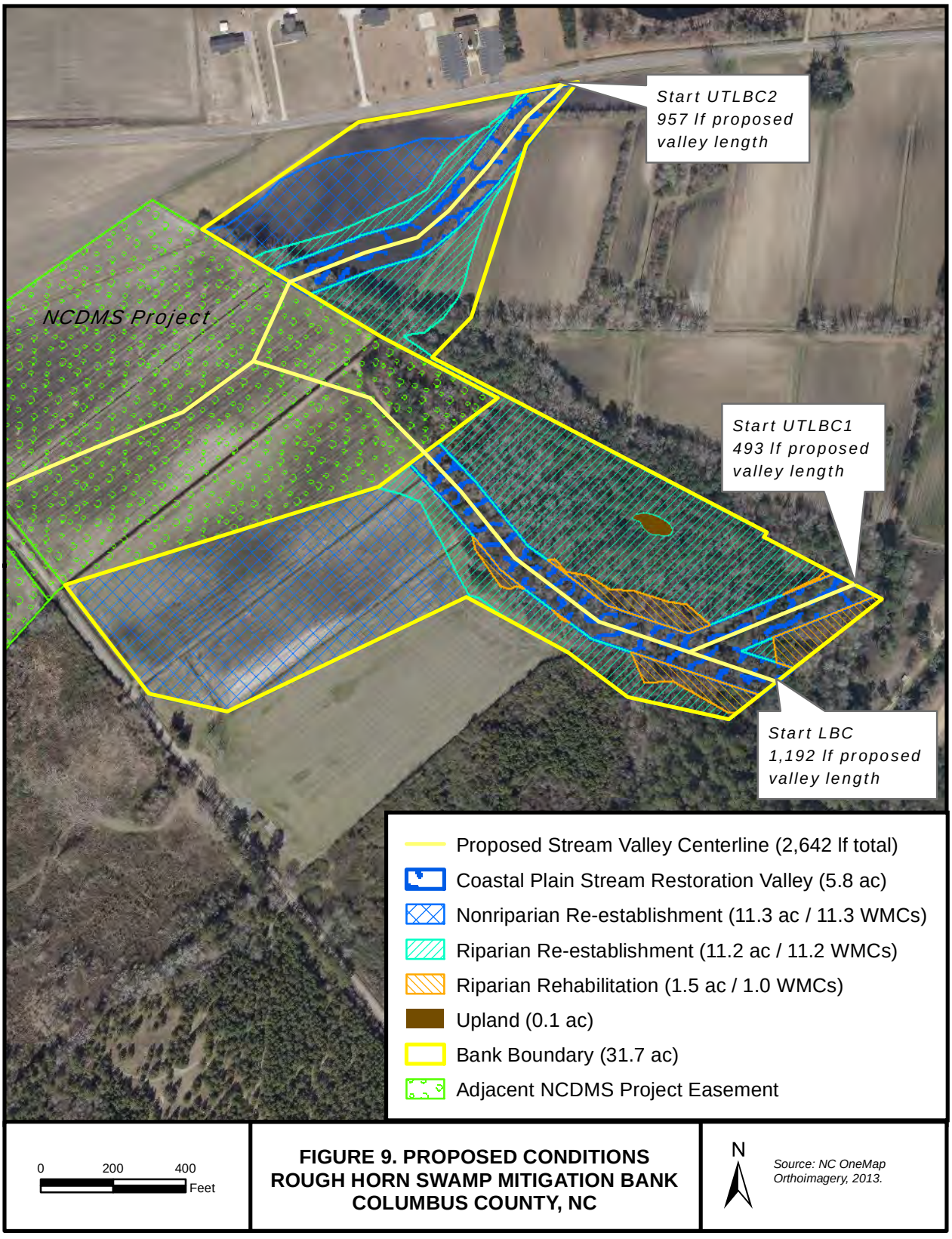


FIGURE 9. PROPOSED CONDITIONS
ROUGH HORN SWAMP MITIGATION BANK
COLUMBUS COUNTY, NC

Appendix A. Site Protection Instrument

NOTES:

1. THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARENT TRACTS. THE PARENT TRACT BOUNDARIES ADJACENT TO THIS EASEMENT ARE NOT CHANGED BY THIS PLAT. BOUNDARY INFORMATION SHOWN HEREON WAS DERIVED FROM DEEDS AND MAPS OF RECORD IN COLUMBUS COUNTY AND MONUMENTATION FOUND IN THE FIELD.
2. DISTANCES SHOWN ARE HORIZONTAL GROUND DISTANCES IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.
3. AREA COMPUTED BY COORDINATE METHOD.
4. THE BASIS OF THE MERIDIANS AND COORDINATES FOR THIS PLAT IS THE NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83), BASED ON DIFFERENTIAL GPS OBSERVATIONS PERFORMED IN JUNE 2015.
5. DEED REFERENCES: AS SHOWN HEREON.
6. SUBJECT PROPERTIES KNOWN AS TAX NUMBER: AS SHOWN HEREON.
7. SUBJECT EASEMENT LIES WITHIN THE AREA DESIGNATED AS ZONE "X", BASED ON FEDERAL FLOOD INSURANCE RATE MAP 3720021500K AND 3720021400K, EFFECTIVE JUNE 2, 2006.
8. NO UNDERGROUND UTILITY LOCATING PERFORMED DURING THE COURSE OF THIS SURVEY.
9. THE STATE PLANE COORDINATES FOR THIS PROJECT WERE PRODUCED WITH RTK GPS OBSERVATIONS. THE NETWORK POSITIONAL ACCURACY OF THE RTK DERIVED POSITIONAL INFORMATION IS 0.02 METER. HORIZONTAL POSITIONS ARE REFERENCED TO NAD 83 (2011). COMBINED SCALE FACTOR = 0.99997060

OWNER CERTIFICATION

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH IS LOCATED IN THE SUBDIVISION JURISDICTION OF THE COUNTY OF CLUMBUS AND THAT I HEREBY ADOPT THIS PLAN OF SUBDIVISION WITH MY FREE CONSENT AND ESTABLISH MINIMUM SETBACK LINES AS NOTED.

George A. Sanderson 5-12-16
GEORGE ALLEN SANDERSON DATE

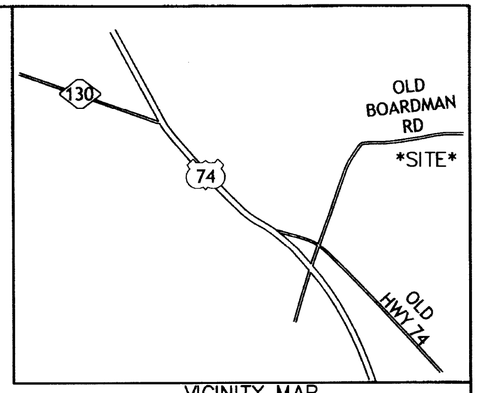
Certification of Approval
Columbus County Planning Board
Date 5/12/16 Signature Tanya A Lanier

STATE OF NORTH CAROLINA
COLUMBUS COUNTY
I, Dan Meares, REVIEW OFFICER OF COLUMBUS COUNTY, CERTIFY THAT THE MAP OR PLAT WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

Dan Meares 5-12-2016
REVIEW OFFICER DATE

LEGEND

- ● EXISTING PK NAIL
- ◉ EXISTING IRON
- ○ 5/8" REBAR SET W/ 3.25" ALUMINUM CAP WITH STATE SEAL
- △ CALCULATED POINT
- ⊡ EXISTING MONUMENT
- ▭ NEW CONSERVATION EASEMENT
- P.O.B. POINT OF BEGINNING
- P.O.C. POINT OF COMMENCEMENT



VICINITY MAP
(NOT TO SCALE)

OLD BOARDMAN ROAD
S.R. 1506
(60' RIGHT OF WAY)

N79°48'18"E 73.18'
N79°18'32"E 375.85'
N80°18'13"E 166.98'
FOUND CONC MON
FOUND CONC. MON
FOUND IRON PIPE
FOUND PK
FOUND IRON BAR
1027'± TO S.R. 1508
#10 #11 #12 #13 #14 #15 #16 #17 #18 #19 #4

S62°01'07"W 369.27'
381.22'(to pipe)
N55°26'38"E 523.54'
N59°04'28"W 735.39'
574.52'
S17°39'13"W 500.12'
S39°22'10"W 224.10'
S44°44'22"W 154.81'
S62°22'18"E 1042.86'
N62°22'18"W 1194.11'
S27°37'42"W 15.00'
N62°22'18"W 365.94'(TIE)
N59°33'07"E 6673.95'(grid)

CONSERVATION EASEMENT
399,331 SF
9.17 ACRES

P.O.B. CONSERVATION EASEMENT
P.O.C. CONSERVATION EASEMENT

N/F
GEORGE ALLEN SANDERSON
PROPERTY #: 22394
DB 373 PG 560
45.0 ACRES

N/F
GEORGE ALLEN SANDERSON
PROPERTY #: 22398
DB 205 PG 398

N/F
HORACE G FIELD, JR.
JANET GAIL FIELDS
PROPERTY #: 21056
PIN 0215.00-84-3286.000
DB 354 PG 85

N/F
KCI ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION INC.
PROPERTY #: 77799
PIN: 0215.00-93-1613.000
DB 1124 PG 934-936

N/F
TEDDY BRITT & ALEXANDER CAIN
PROPERTY #: 20694
DB 500 PG 293

NCGS MON
BOARD (EA1676)
N: 250,210.96
E: 2,014,801.68
CSF: 0.99997394

NC GRID NORTH (NAD 83)

POINT TABLE		
#	NORTHING	EASTING
10	253762.72	2020231.01
11	254611.72	2018680.22
12	254908.68	2019111.39
13	254936.71	2019275.47
14	255006.44	2019644.79
15	255019.39	2019716.81
16	254846.15	2019574.66
17	254369.58	2019422.99
18	254259.61	2019314.02
19	253776.01	2020237.97
4	254316.47	2019173.06

2016002143
COLUMBUS CO, NC FEE $21.00
PRESENTED & RECORDED:
05-12-2016 01:52:21 PM
KANDANCE H. BULLOCK
REGISTER OF DEEDS
BY: REGINA MARCELLINO
DEPUTY

BK: PB 100
PG: 11-11

I, JAMES M. GELLENTHIN, CERTIFY THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN DEED BOOR 373 PAGE 560), THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK AND PAGE AS SHOWN, THAT THE RATIO OF PRECISION AS CALCULATED IS GREATER THAN [illegible], THAT THIS MAP DOES REPRESENT AN OFFICIAL BOUNDARY SURVEY AND HAS BEEN PREPARED IN ACCORDANCE WITH G.S. 47-30. I WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 22ND DAY OF MARCH, 2016.

NORTH CAROLINA REGISTRATION NUMBER
JAMES M. GELLENTHIN

I, JAMES M. GELLENTHIN, PROFESSIONAL LAND SURVEYOR, CERTIFY TO THE FOLLOWING AS REQUIRED IN G.S. 47-30 (F)(11)(c):

THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS RECOMBINATION OF EXISTING PARCELS, A COURT ORDERED SURVEY OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION.

NORTH CAROLINA REGISTRATION NUMBER
JAMES M. GELLENTHIN

GRAPHIC SCALE
150 0 75 150 300
1 INCH = 150 FEET

EASEMENT PLAT
FOR
KCI ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION INC.
PROPERTY OF GEORGE ALLEN SANDERSON (OWNER)
TATUM TOWNSHIP, COLUMBUS COUNTY
NORTH CAROLINA

DATE:	SCALE:	SHEET:
NOV 13, 2015	1" = 150'	1 OF 1

KCI ASSOCIATES OF NORTH CAROLINA C-0764

KCI ASSOCIATES OF N.C.
ENGINEERS, SURVEYORS AND PLANNERS
4601 SIX FORKS ROAD, SUITE 220
RALEIGH, NC 27609
PHONE (919) 783-9214 * FAX (919) 783-9266

PB 100 PG 11

NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM
LANDOWNER AUTHORIZATION FORM

PROPERTY LEGAL DESCRITION:

Deed Book: 373 **Page:** 560 **County:** Columbus

Parcel ID Number: 0215-94-9519

Street Address: Old Boardman Road, Evergreen NC

Property Owner (please print: George Sanderson

Property Owner (please print): _____

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

Tim Morris **of** KCI Technologies, Inc.

(Contractor/Agent/Project Manager)[1] **(Name of Contractor/Agent Firm/Agency)[2]**

to take all actions necessary 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, as well as issuance and acceptance of any required permit(s) or certification(s). I agree to allow regulatory agencies, including the US Army Corps of Engineers, to visit the property as part of these environmental reviews.

Property Owners(s) Address: (if different from above) 3001 Old Boardman Road

Evergreen NC, 28438

Property Owner Telephone Number: 910-739-6844

Property Owner Telephone Number: _____

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

George Sanderson 4-1-15

(Property Owner Authorized Signature) **(Date)**

_____

(Property Owner Authorized Signature) **(Date)**

[1]Name of full delivery staff member (full-deliveries) or EEP project manager (design-bid-build).
[2]Name of company (full-deliveries) or Ecosystem Enhancement Program (design-bid-build).

Appendix B. Example Projects and Resumes

Bowl Basin Restoration Site

Onslow County, North Carolina

The Bowl Basin Wetland Restoration Site (BBWRS) is a full-delivery mitigation project being developed for the North Carolina Department of Environment and Natural Resources, Division of Mitigation Services (DMS). The BBWRS is a former non-riparian wetland system in the White Oak River Basin (03020106 8-digit HUC) in northeastern Onslow County, North Carolina that had been substantially modified to maximize agricultural production. The site offered the opportunity to restore impacted agricultural lands to non-riparian wetland habitat.

The project will provide the restoration of approximately 11.7 acres of non-riparian wetland. Project goals identified in White Oak River Basin Restoration Priorities (WORBRP) were incorporated into the goals of the BBWRS. These goals include:

- Slow and treat the runoff of up-slope agricultural drainage
- Restore a hardwood flats community
- Create additional valuable wetland habitat in the Upper White Oak drainage basin

The project goals were addressed through the implementation of the following project objectives:

- Filled field ditches to restore surface flow retention and elevate local groundwater levels
- Alleviated surface compaction and furrow drainage by surface roughening throughout the site
- Redeveloped longer wetland flow patterns to increase surface flow retention time
- Restored a native forested hardwood wetland community using native trees and seed mixes

Construction was completed in the Fall of 2014. The site is currently being monitored.

OWNER REFERENCE: NC DMS, Kristin Miguez, 919-796-7475

ENGINEER REFERENCE: Gary Mryncza 615-377-2499

TEAM MEMBERS:
Principal in Charge: Joe Pfeiffer
Project Manager: Tim Morris
Design: Alex French, Adam Spiller
Construction: Kevin O'Briant
Monitoring: Tommy Seelinger, Alex French

PROJECT VALUE: $529,000

DELIVERY METHOD: Full Delivery

KCI

www.kci.com

Twin Bays Wetland Restoration Site

Duplin County, North Carolina

The Twin Bays Wetland Restoration Site (TBWRS) is located northwest of Wallace, North Carolina. TBWRS is a full-delivery mitigation site developed for the North Carolina Department of Environment and Natural Resources, Division of Mitigation Services (DMS). The site is located within the Cape Fear River Basin (03030007 8-digit HUC) and the Rock Fish Creek Local Watershed (03030007090040 14-digit HUC) which has been identified as a Target Local Watershed (TLW).

The project will provide the restoration of approximately 10.6 acres of non-riparian wetland and 0.4 acre of upland habitat. The primary restoration actions were the filling of existing ditches and roughening of the compacted ground surface, but also included the modification of an existing pond and the redevelopment of active seepage areas. Project goals addressed stressors identified in the watershed. Goals included:

- Slow and treat the runoff of upslope agricultural drainage.
- Restore a Hardwood Flats Community.
- Develop valuable wetland habitat niches within a drained agricultural landscape.

The project goals were addressed through the implementation of the following project objectives:

- Filled field ditches to restore surface flow retention and elevate local groundwater levels.
- Redeveloped longer wetland flow patterns to increase surface flow retention time.
- Modified an existing pond to its natural seep condition to feed the downslope wetland.
- Restored a forested hardwood wetland community using native trees and seed mixes.

Construction was completed in the winter of 2014. The site is currently being monitored.

OWNER REFERENCE: NC DMS, Kristin Miguez, 919-796-7475

ENGINEER REFERENCE: Gary Mryncza 615-377-2499

TEAM MEMBERS:

Principal in Charge: Joe Pfeiffer
Project Manager: Tim Morris
Design: Alex French, Adam Spiller
Construction: Kevin O'Briant
Monitoring: Tommy Seelinger, Alex French

PROJECT VALUE: $735,000

DELIVERY METHOD: Full Delivery

KCI

www.kci.com

Jacob's Ladder and Jacob's Landing Stream Restoration

Rowan County, North Carolina

The Jacob's Ladder and Jacob's Landing stream restoration sites (JLS) are two full-delivery mitigation projects being developed for the North Carolina Ecosystem Enhancement Program (EEP). The sites offer the opportunity to restore two first-order stream systems draining to Irish Buffalo Creek in the Lower Yadkin-Pee Dee River Basin (HUC 03040105). The streams had been impacted by decades of unrestricted cattle access and related agricultural activity. Now completed, the two sites will restore, enhance and preserve approximately 10,000 linear feet of stream channel. The projects are located in the Irish Buffalo Creek Local Watershed Unit (HUC 03040105020040), which the EEP has identified as a Targeted Local Watershed (TLW). Project goals address stressors identified in the watershed and include:

- Reduce sediment supply entering Irish Buffalo Creek.
- Restore a diverse riparian corridor that connects to forested stream systems both upstream and downstream of each project.

The following activities will be implemented to achieve these goals:

- Restore stable channel planform to streams that have been straightened and modified.
- Reshape and stabilize eroding stream banks.
- Protect and stabilize incoming seepage flow into the site's tributaries.
- Plant site with native trees to help reestablish a diverse riparian corridor.
- Install exclusion fencing to keep livestock out of the project streams.

The two sites encompass a series of tributaries that make up a portion of the Irish Buffalo Creek headwaters in southwestern Rowan County near China Grove. The sites are located in a water supply watershed; Irish Buffalo Creek flows into Kannapolis Lake, the primary water source for the City of Kannapolis. Downstream of Kannapolis Lake, Irish Buffalo Creek is listed as impaired on the 2010 North Carolina 303(d) list for turbidity and copper.

Construction is completed and the site will be monitored for five years.

OWNER REFERENCE:

NCEEP, Tim Baumgartner 919-707-8543

ENGINEER REFERENCE:

Gary Mryncza 615-377-2499

TEAM MEMBERS:

Principal in Charge: Joe Pfeiffer
Project Manager:Tim Morris
Design: Adam Spiller
Construction Inspector: Kevin O'Briant
Quality Control, Deliverables: Kristin Knight Meng

PROJECT VALUE: $2.8 Million

DELIVERY METHOD:

Full Delivery

KCI

www.kci.com

Stanley's Slough /II Stream and Wetland Restoration Projects

Northampton County, North Carolina

Stanley's Slough and Stanley's II stream and wetland restoration project involved the restoration of coastal plain wetlands, streams and riparian buffers. The project will restore approximately 4,274 LF of stream and 10 acres of riparian wetlands that have been impacted by anthropogenic processes, including grazing, crop production, land clearing and stream channel modification. The project goals developed in the project's mitigation plan addressed stressors identified in local watershed planning documents including the need to:

•Restore streams and riparian buffers to provide shade and temperature control and increase in stream woody debris for habitat.

•Restore and protect sensitive aquatic resources to improve habitat and species diversity through the restoration of wetlands, streams, and riparian buffers.

•Implement wetland and stream restoration projects that reduce sources of nutrient pollution and surface runoff by restoring hydrology and vegetation, stabilizing banks, and restoring natural geomorphology where appropriate.

All of these goal were accomplished through careful planning, design and project implementation. KCI restored a diverse headwater stream and wetland community through the design and implementation of stream and wetland grading plans designed to restore the impacted channel and ancillary drainage network to its historic condition. All of the drainage modifications were implemented to increase the elevation of the local groundwater table through the elimination of lateral drainage ditches and modification of existing channelized streams which allowed the designers to reconnect the site hydrology to historic flow paths. Project construction and planting were completed in March 2014. The site is currently in its first year of monitoring and will be monitored for a total of seven years.

REFERENCE:
NCEEP, Lindsay Crocker 919-707-8944
ENGINEER REFERENCE:
Gary Mryncza 615-377-2499
TEAM MEMBERS:
Principal in Charge: Joe Pfeiffer
Project Manager: Tim Morris
Design: Alex French; Adam Spiller
Construction Inspection: Kevin O'Briant
VALUE:
$2 Million
DELIVERY METHOD:
Full Delivery

KCI

www.kci.com

The Nature Conservancy - Johnson and Waddle Sites

Smyth County, Virginia

With funding provided by the Virginia Aquatic Resources Trust Fund (VARTF), KCI has contracted with The Nature Conservancy of Virginia to provide 21 acres of forested wetland mitigation on two sites in Smyth County, Virginia. These sites, known as the Johnson and Waddle Sites (JWS), will provide wetland mitigation credit along the North Fork Holston River in southwestern Virginia. Following the implementation of the proposed mitigation design, the JWS will provide 10.0 acres of wetland restoration, 8.3 acres of wetland creation, 6.6 acres of wetland enhancement, and 11.3 acres of upland buffer restoration. Together these areas will offer 21.0 units of forested wetland mitigation.

The restoration of the Johnson and Waddle Sites offers an opportunity to provide functional wetland uplift to the Tennessee River Basin. The project goals include the following:

- Expand forested wetland habitat for migratory birds, amphibians, and other wildlife.
- Increase nutrient uptake from surrounding pasture and agricultural lands.

The project goals were addressed through implementation of the following objectives:

- Filled field ditches and install ditch plugs to slow the outflow of groundwater from the JWS.
- Redeveloped surface roughness to capture and retain precipitation on the site.
- Planted the sites with species native to Mountain Alluvial Forest and Mountain Swamp Seep communities.
- Restored an upland buffer to protect wetland resources.

The proposed mitigation actions at the JWS restored the hydrology and vegetation that had been altered or entirely removed from the project sites. At the Johnson Site, the mitigation approach focused on increasing hydrologic retention through targeted grading in the creation areas and restoring surface roughness in restoration areas. Targeted locations in the creation areas had 1-2 feet of sub-soil removed to reach soils with a slower hydraulic conductivity. In compacted areas, surface roughness was restored by tilling the soil to form microtopography +/- 0.5 foot. Mitigation actions at the Waddle Site focused on filling the ditch that drains the entire length of the project. A spring that is at the top of the main ditch was developed to allow a natural seepage pattern through the wetland. Also, two smaller ditches were filled to lengthen the hydroperiod throughout the site.

Construction was completed in the fall of 2012. The site is currently being monitored.

CLIENT: The Nature Conservancy of Virginia

PROJECT VALUE: $800K

COMPLETED: Preliminary Assessment, Conceptual Design

SERVICES:

Easement Acquisition
Site Identification
Categorical Exclusion
Site Assessment, Design
Construction
Monitoring

KCI

www.kci.com

Farrar Dairy Wetland and Stream Restoration FDP

Lillington, Harnett County, North Carolina

The Farrar Dairy Site is located southwest of Lillington, in Harnett County. KCI found the site, assessed existing conditions, developed the appropriate stream and wetland design, and completed the construction. The project will provide mitigation credit for stream and wetland impacts by restoring, enhancing, and preserving 13,044 linear feet of stream and 112 acres of wetland. The project aimed to restore the streams, riparian buffers and forested wetlands along the North Prong of Anderson Creek (NPAC), the main stream through the site, in order to reestablish an interconnected floodplain corridor. The project streams and wetlands at the site had become degraded through poor grazing management and vegetation removal. The NPAC was channelized to maximize use of agricultural fields, but this modification also disconnected NPAC from its floodplain. Ditches had been installed to drain wetlands, and incoming tributaries to the NPAC were straightened to convey water straight through the property. Impoundments and berms were built to attract migratory waterfowl, but these features disrupted the natural hydrologic regime of the site.

The Farrar Dairy Site was an ideal opportunity to return a highly altered system to a contiguous stream and wetland complex. KCI performed an existing conditions site analysis and developed a design to raise the bed elevation of the NPAC and restore a natural meander pattern to reconnect the stream to its historic floodplain. The restoration plan also called for filling and plugging ditches in the drained hydric soils to restore saturated hydrologic conditions, planting a functional Coastal Plain Small Swamp Stream community to create an effective riparian buffer and wetland complex, and grading former agricultural fields to redevelop wetland microtopography. Incoming tributaries to the NPAC were returned to natural channel forms. Existing wetlands of marginal quality were enhanced by removing berms, treating invasive species, and partially filling in open water impoundments. The project also included connecting the restored areas to a stream and wetland preservation area along the downstream end of the NPAC.

KCI completed monitoring the site in December 2013. Closeout of the site with the Interagency Review Team occurred in May 2014. All contracted credits are anticipated to be delivered to NCEEP as a result of the closeout meeting.

OWNER REFERENCE:

NCEEP, Tim Baumgartner, 919-707-8543

DESIGNER REFERENCE:

Gary Mryncza, 615-377-2499

TEAM MEMBERS:

Principal in Charge: Joe Pfeiffer
Project Manager: Tim Morris
Design: Adam Spiller
Construction Manager: Tim Morris

VALUE:

$6 Million

DELIVERY METHOD:

Full Delivery

KCI

www.kci.com

Collins Creek Stream Restoration

Chapel Hill, North Carolina

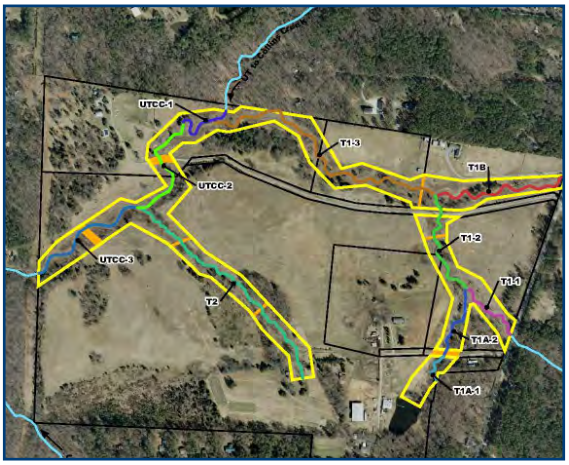
The Collins Creek Site (CCS) was full-delivery project developed for the NCEEP. This site was successfully closed out in 2013. The site restored a heavily impacted stream system in order to improve water quality and aquatic and terrestrial habitat. The project restored and enhanced 2,310 existing linear feet of an unnamed tributary to Collins Creek (UTCC) and 6,879 existing linear feet along four of its tributaries (T1, T1A, T1B, and T2).

The project streams had become degraded primarily through poor grazing management and vegetation removal. The streams had all experienced bank erosion. Bed degradation and aggradation were also evident throughout the different project reaches. All of the reaches exhibited areas of incision and vertical instability. There were few stable riffle and pool sequences to provide bed diversity. As a result, the ecological diversity and water quality values of the site had been affected adversely.

The streams at the CCS were restored using a combination of C, Bc, and B Rosgen stream types. In order to restore the different stream systems on the CCS, a natural channel design approach was employed using stable reference reaches. Six different reference reach sites were identified for use in the project design.

Following the completion of the stream enhancement and restoration, all floodplain areas surrounding the project streams were planted with species consistent with Piedmont Alluvial Forest. The slopes leading up from the floodplain areas and the valleys directly along the channels were planted as Mesic Mixed Hardwood Forest. The planted areas were fenced to ensure that livestock no longer have access to project streams or riparian buffers.

KCI Environmental Technologies and Construction (ETC) completed the site restoration and planting in March 2008. Monitoring was completed in December 2012 and a project closeout meeting was completed in June 2013. The project generated 8,884 stream mitigation units for the NCEEP.



VALUE:

$1.9 Million

DELIVERY METHOD:

Full Delivery

OWNER REFERENCE:

NCEEP, Tim Baumgartner, 919-707-8543

ENGINEER REFERENCE:

Gary Mryncza, 615-377-2499

TEAM MEMBERS:

Principal in Charge: Joe Pfeiffer
Project Manager: Tim Morris
Construction Inspection: Kevin O'Briant
Design: Adam Spiller, Kristin Knight-Meng, Alex French

KCI

www.kci.com

Harrell Stream and Wetland Restoration

Edgecombe County, North Carolina

The Harrell Stream and Wetland Restoration Site is located in the Coastal Plain in Edgecombe County. The project will mitigate stream and wetland impacts within the Tar-Pamlico River Basin by restoring 6,808 linear feet on an unnamed tributary to Swift Creek and 15 acres of wetlands.

Project goals included protecting aquatic resources from excess nutrients, sediment, and other pollutants coming from the agricultural watershed; reestablishing terrestrial and aquatic habitat, and connecting the site to the existing floodplain corridor along Swift Creek. Project objectives included restoring a stable stream channel with the appropriate pattern, profile, and dimension that can support a sand transport system; connecting the stream to a functioning floodplain; filling and plugging ditches in the drained hydric soils to restore a wetland hydroperiod, and planting tree species typical of a Coastal Plain Small Swamp Stream along the stream riparian corridor and floodplain.

The stream restoration included four separate reaches that were restored based on a combination of Priority Levels 2 and 3. Log drop structures were used to control grade throughout the profile. The stream was restored to a B5c and C5 stream types.

The wetland design was completed in August 2006, construction began in October 2006 and the wetland was planted in February 2007. The stream design and restoration plan were completed in April 2007, construction began in July 2007 and the stream was planted in January 2008. The site was monitored through 2012. The site was closed out by the Interagency Review Team (IRT) in the spring 2013. The site received the full credit requested at closeout by the NCEEP.

OWNER REFERENCE:

NCEEP, Tim Baumgartner, 919-707-8543

ENGINEER REFERENCE:

Gary Mryncza 615-377-2499

TEAM MEMBERS:

Principal in Charge: Joe Pfeiffer
Project Manager: Tim Morris
Design: Adam Spiller; Alex French
Quality Assurance/Quality Control: Kristin Knight Meng

VALUE:

$2 Million

DELIVERY METHOD:

Full Delivery

KCI

www.kci.com

Cane Creek Stream Restoration FDP

Person County, North Carolina

KCI is developing the Cane Creek Tributary Site as a full-delivery stream mitigation project for the NCEEP. The site is located in northwestern Person County, North Carolina within the upper portion of the Roanoke Basin and drains into Hyco Lake.

The site is uniquely situated in the piedmont of North Carolina with a large number of groundwater seeps feeding small headwater tributaries that drain into Cane Creek. Across the site, there are ten separate tributaries that make up over 18,000 linear feet of completed stream mitigation.

KCI developed a restoration plan for the site that involved a combination of stream restoration and enhancement of B and Bc channel types. The project reaches were designed as restoration or enhancement based on the level of departure from a stable stream system. On the steeper tributaries with severe headcuts, log structures were installed to stabilize bed elevations and to recreate pool habitat. Other streams at the CCTS required less intensive work and bank stabilization techniques were incorporated among existing mature trees and bedrock. A riparian planting plan at the CCTS site was developed using Piedmont Alluvial Forest species in flood prone areas and Mesic Mixed Hardwood Forest species in slopes leading away from lower lying areas. Livestock exclusion fencing was also installed along all of the streams in order to prevent any future impacts from cattle.

Construction was initiated in May 2008 and completed in December 2008. The first year of post-construction monitoring was completed during the summer of 2009. Monitoring was concluded in December 2013. Project closeout will occur in June 2014.

OWNER REFERENCE:

NCEEP, Tim Baumgartner, 919-707-8543

ENGINEER REFERENCE:

Gary Mryncza, 410-316-7862

TEAM MEMBERS:

Project Director: Joe Pfeiffer
Project Manager: Tim Morris
Superintendent: Kevin O'Briant
Cost Estimator: Tim Morris

VALUE:

$3.2 Million

DELIVERY METHOD:

Full Delivery

KCI

www.kci.com

Norman's Pasture Wetland Restoration

Sampson County, North Carolina

Norman's Pasture and Norman's Pasture II Restoration Site is a headwater stream and wetland system in Sampson County that has been substantially modified to maximize grazing and agriculture. The site, with approximately 25 acres of wetland restoration and 750 linear feet of stream restoration potential consists of a collection of tributaries that drain down moderately-sloped valleys onto the floodplain of Stewarts Creek, a large fourth-order blackwater stream. The streams have been moved and straightened and the wetlands have been ditched in order to clear and drain the land for anthropogenic uses. Despite these modifications, there are areas with high-quality wetlands that remain on the property. The site offers the potential to restore and protect a range of unique aquatic resources in one setting – existing riparian wetlands, a steep forested tributary, lower gradient seep-fed headwaters, and artesian springs.

In the Cape Fear River Basin Restoration Priorities (NCEEP 2009), the goals for the 8-digit hydrologic unit include focusing on water quality improvements and protecting Outstanding Resource Waters. Project goals will support these larger aims and include:

- Reconnect a continuous stream and wetland headwater system to Stewarts Creek
- Improve and expand riparian habitat along Stewarts Creek
- Buffer nutrient inputs from adjacent agricultural and grazing practices

The following objectives will be implemented to achieve the goals:

- Redevelop headwater stream-wetland complexes that have previously been impacted by ditching
- Protect and integrate existing riparian wetlands into the project design
- Plant any unvegetated riparian areas with native plant communities
- Fence all easement areas to protect the site's resources from grazing

The site is currently in the construction stage and is anticipated to be completed in summer of 2015.

REFERENCE:

NCEEP, Kristin Miguez, 910-796-7475

ENGINEER REFERENCE:

Gary Mryncza 615-377-2499

TEAM MEMBERS:

Project Director: Joe Pfeiffer
Project Manager: Tim Morris
Lead Designer: Adam Spiller
Quality Assurance/Quality Control:
Kristin Knight Meng

VALUE:

$1.8 Million

DELIVERY METHOD:

Full Delivery

KCI

www.kci.com

JOSEPH J. PFEIFFER, JR., PWS
Principal-in-Charge

Education
MA in Physical Geography and Environmental Planning
BS in Natural Science
AA in Wildlife/Fisheries Management

Registration
Professional Wetland Scientist (#927)
Rosgen Levels I, II, III, IV

29 Years Experience

Mr. Pfeiffer is the Practice Leader for Ecosystem Dynamics and is responsible for all mitigation acquisition and construction. Since joining KCI in 1988, Mr. Pfeiffer has been responsible for coordinating all aspects of environmental/engineering projects for both public and private clients. Mr. Pfeiffer utilizes his diverse background to integrate engineering and environmental planning to develop a comprehensive project approach that facilitates effective working relationships among his design teams. This management style aids his abilities to coordinate design requirements with permitting, minimizing unnecessary comments from the regulatory agencies and providing seamless participation between all parties involved. During his tenure at KCI, Mr. Pfeiffer has been responsible for wetland/stream restoration, bioengineering design, shoreline stabilization, wildlife/fisheries habitat assessment and design, recreation planning, GIS database development and analysis, water quality analysis, wetland delineation, mitigation and permitting, NPDES permit processing, image processing, and biological inventories.

- Farrar Dairy Full Delivery Project, Lillington, North Carolina, NCEEP. Project Principal. Directed the location, acquisition, design development, and permitting of more than 110 acres of wetland and over 12,500 linear feet of stream restoration, enhancement, and preservation.
- Collins Creek Full Delivery Project, Orange County, North Carolina, NCEEP. Project Principal. Directed the location, acquisition, design development, permitting and construction of a 9,200 linear feet stream restoration project.
- Harrell Full Delivery Project, Edgecombe County, North Carolina, NCEEP. Project Principal. Directed the location, acquistion, design development, permitting and construction for the development of 15 acres of wetland restoration and 6,800 linear feet of stream restoration.

TIMOTHY MORRIS
Project Manager

Education
MEM in Water Resource Management
BS in Natural Resource Management

Registration
Rosgen Level I, II

19 Years Experience

Mr. Morris has worked as an environmental consultant for 19 years since graduating with a Master of Environmental Management degree from Duke University. He has worked on a variety of natural resource based planning and construction projects for both private and public sector clients. His expertise is in the water resource management field, and his specific experience includes wetland delineation, wetland permitting, wetland mitigation design and construction management, pond and lake management, environmental construction inspection and watershed planning.

Notable projects included the US 113 Dualization project on the Eastern Shore of Maryland and the Woodrow Wilson Bridge Project, a $2.5 billion transportation venture between Maryland, Virginia and the District of Columbia. For this project, Mr. Morris managed the design and construction of 17 successful environmental mitigation contracts valued at approximately $20 million.

- Farrar Dairy Full Delivery Project, Lillington, North Carolina, NCEEP. Lead Scientist/Wetland Designer. Supervised the design of more than 110 acres of wetland mitigation and over 12,500 linear feet of stream restoration, enhancement, and preservation on a large integrated wetland-stream complex in the Sand Hills. Coordinated preparation of construction drawings and facilitated the implementation of property improvements coincident to the restoration project.
- Windy Cove Farm Wetland Mitigation Project, Millboro Springs, Virginia, TNC. Project Manager. Responsible for the design and construction of approximately four acres of created and restored wetlands for the Virginia Aquatic Resources Trust Fund, a mitigation fund managed by the Nature Conservancy of Virginia. The project restored a wetland located within an active cattle pasture by altering the current hydrologic regime through targeted grading intended to mitigate channelization on the site.
- US Route 113 Environmental Monitoring, Eastern Shore, Maryland, MSHA. Environmental Inspector. Supervised the construction of five wetland mitigation sites, four nutrient sites, four stream restoration sites, two floodplain restoration projects, two fish passage projects and more than 50 acres of reforestation.

STEVEN F. STOKES, LSS

Senior Environmental Scientist

Education
BS in Wildlife Biology

Registration
Licensed Soil Scientist #1087
USDA-SCS; Soil Correlation & Water Quality
OSHA 40-Hour Safety Training/8-Hour Supervisor Course
Rosgen Levels I, II, III

34 Years Experience

Mr. Stokes is responsible for natural resource investigations including soil classification and interpretation, soil and floodplain mapping, hydric soil classification and mapping based on NRCS criteria, and water table analysis for wetland mitigation and delineation. Mr. Stokes is also responsible for providing technical quality control reviews and oversees project progression, investigations, analyses, contract documents, and field related activities for projects.

- Full Delivery Projects, NC Ecosystem Enhancement Program. Lead Scientist. Responsible for site location/identification, acquisition, landowner contracts, assessment and technical reports to provide stream, wetland and/or buffer mitigation in the Tar-Pamlico, Cape Fear, French Broad, and Roanoke River Basins.
- Brown Farm Full Delivery Project, Durham/Orange Counties, North Carolina, NCEEP. Project Scientist. Responsible for site location/identification, acquisition and contracts, wetlands and soils assessments, permitting, and post-construction management of the 25-acre restoration site in the Cape Fear River Basin.
- Daniels Farm Full Delivery Project, Louisburg, North Carolina, NCWRP. Project Scientist. Responsible for site location/identification, acquisition and contracts, assessment, restoration plan development, permitting, construction, reforestation and monitoring of the 30-acre restoration site in the Tar-Pam River Basin.
- Rich Fork Full Delivery Project, Thomasville, North Carolina, NCDOT. Licensed Soil Scientist. Conducted a detailed soils investigation to determine if the soils had been buried by alluvial deposition or as a result of overburden from spoil excavated from Rich Fork Creek during channelization. The results provided data to support the concept of restoration rather than creation in spite of one-foot of topsoil removal.

GARY M. MRYNCZA, PE, PH

Project Engineer

Education
MS in Water Resources
MS in Civil Engineering
BS in Natural Science
BSET in Civil Engineering Technology

Registration
Hey-River Mechanics and Restoration
Rosgen Levels I, II, III, IV
Professional Hydrologist (H-1605)
Professional Engineer (NC #32733)
Certified Professional in Erosion & Sediment Control (#4314)

18 Years Experience

Mr. Mryncza is the company-wide Discipline Head for Resource Management and specializes in hydrology and streams. His experience includes watershed and site-specific hydrologic analysis, stream assessment, feasibility study and restoration design, water quality assessment/stream monitoring, and water resources management. Mr. Mryncza is versed in the use of hydrologic/hydraulic models and has experience applying natural channel design principles. He has been responsible for the development of design plans for over 50,000 linear feet of channel in North Carolina for NCWRP / NCEEP and NCDOT.

- Dog Bite Full Delivery Project, Bakersville, North Carolina, NCEEP. Project Engineer. Supervised the design of over 3,000 feet of degraded stream (trout waters) and associated riparian area. Led the design team in existing conditions assessments and development of design criteria. Analyzed sediment transport and hydrology and hydraulics. Performed quality assurance/control for various design elements.
- Pavilion Branch Stream Restoration Project, Nashville, Tennessee, TSMP. Project Manager/Design Engineer. Provided assessment and design services for the restoration of over 5,000 feet of urban stream channel. The assessment included surveying channel morphology, sediment transport and H&H analyses, and evaluating urban constraints. Developed the design criteria and final design drawings and specifications. Conducted a study of the federally-endangered Nashville Crayfish and incorporated habitat features into the design.
- Glen Raven Full Delivery Project, Burlington, North Carolina, NCEEP. Design Engineer. Supervised design of over 3,000 feet of impaired stream and associated riparian area. Led the design team in existing condition assessments, reference reach surveys, and development of design criteria. Performed sediment transport and hydraulic analyses. Developed construction drawings and performed quality assurance/control for various design elements.

ZACH MYRNCZA

Site Restoration

Education
Graduate / 2012 / MCM - Construction Management / Western Carolina University
BA / 2007 / Psychology / St. Andrews Presbyterian College

Registration
TDOT Asphalt Roadway
TDEC EPSC Level I
CPESC
OSHA Construction Safety and Health Course 10-Hour
Rosgen Level I
TDOT Concrete Field Technician
TDOT Soils and Aggregate Technician

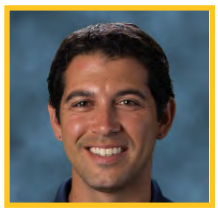
9 Years Experience

Zach Mryncza is an environmental scientist that has been involved in stream restoration for more than ten years. His responsibilities include stream assessment and monitoring, construction oversight and management, erosion prevention and sediment control inspection, and CADD support during plan preparation.

- Cane Creek Tributary Restoration Site, North Carolina Department of Environment & Natural Resources, Person County, NC. Environmental Scientist KCI developed a restoration plan of approximately 17,000 LF of headwater tributaries that involved a combination of stream restoration and enhancement of B and Bc channel types. The project reaches were designed as restoration or enhancement based on the level of departure from a stable stream system.
- Harrell Stream and Wetland Restoration, North Carolina Department of Environment & Natural Resources, Wake County, NC. Environmental Scientist Project involved main stream restoration for 8,238 LF of channelized and extensively disturbed agricultural land. Work included Priority 2 restoration to modify plan form, profile and cross section including any required in-stream structures to provide stability and habitat. Channel was meandered within 150 feet of approximate belt width. Grading was conducted to establish a floodplain and appropriate cross sectional area. A total of three stream crossings were provided to allow access across easement to the agricultural land to north of the channel. A 75-foot riparian buffer was planted. The wetland preservation included 16 acres of riverine.
- 2008-9 NCEEP Monitoring, Statewide, NC. Environmental Scientist. Stream monitoring services for multiple sites for the North Carolina Ecosystem Enhancement Program.

ADAM SPILLER

Environmental Scientist



Education
MEM in Ecosystem Science and Management
BS in Biology-Environmental Science

Registration
Rosgen Level I, II, III, IV
CPESC # 6515

10 Years Experience

Mr. Spiller is experienced in performing stream and wetland assessments and restoration design. His educational background in biology and environmental management aid him in understanding the functional implications of stream restoration. He has applied these skills in numerous contexts, including assessment, design, and monitoring.

- Dog Bite Full Delivery Project, Bakersville, North Carolina, NCEEP. Natural Channel Designer. Prepared the design of over 3,000 feet of degraded stream (trout waters) and associated riparian area. Processed necessary permits and participated in the existing conditions assessments and client/landowner coordination. Developed watershed hydrology model to evaluate design discharges for the three drainages contributing to the site.
- Collins Creek Full Delivery Project, Orange County, North Carolina, NCEEP. Natural Channel Designer. Prepared the design for the primary tributary and contributing drainages to the UT to Collins Creek. Conducted existing conditions and reference reach assessments, developed design criteria, and prepared construction drawings. Participated in the oversight of construction activities and will be responsible for preparation of annual monitoring reports.
- 2006-2011 NCEEP Mitigation Monitoring, North Carolina NCEEP. Project Manager/Monitoring Specialist. Led monitoring efforts on numerous EEP stream/wetland restoration projects. Monitoring included vegetation assessments and stream morphology assessments. All aspects of monitoring process were conducted from the field survey to final report preparation.
- Johnson Site Stream Restoration Project, Hamptonville, North Carolina, NCEEP. Natural Channel Designer. Prepared design drawings (30% through final) for over 2,000 feet of stream restoration. This included designing typical channel cross-sections, horizontal and vertical alignments, and the riparian planting plan. Tasks also included preparing project reports for permitting.

KRISTIN KNIGHT-MENG, PE

Senior Project Engineer

Education
MEM in Ecosystem Science and Management
BA in Biology-Environmental Studies

Registration
NC PE # 040899
Rosgen Level I, II

9 Years Experience

Ms. Knight-Meng is an Environmental Engineer who specializes in stream and wetland assessment and design. Ms. Knight-Meng has worked on all aspects of stream and wetland restoration, including site assessment, design, GIS analysis, permitting, hydrologic modeling, and monitoring. Prior to joining KCI, Ms. Knight-Meng had previous experience in watershed management and conservation planning.

- Cane Creek Tributary Site Stream Restoration, Person County, North Carolina, NCEEP. Stream Designer/ Environmental Scientist. Prepared restoration design of approximately 17,000 linear feet of streams and headwater tributaries. Completed restoration plan and acquired necessary permits.
- Antioch Fluvial and Riparian Assessment and Conceptual Plan, Nashville, Tennessee, USACOE. Technical Manager. Completed inventory of stream and riparian problem areas along an urban stream corridor. Developed a report describing prioritized enhancement actions aimed at improving water quality and riparian habitat.
- Six Points Stream Monitoring, Indianapolis, Indiana, INDOT. Environmental Scientist. Performed as-built survey on the relocated reaches at the I-70 Six Points Interchange. Completed macroinvertebrate and fish sampling for annual monitoring.
- Collins Creek Full Delivery Project, Orange County, North Carolina, NCEEP. Environmental Scientist. Performed site assessment work. Developed project restoration plan and acquired permits for construction.
- Harrell Full Delivery Project, Edgecombe County, North Carolina, NCEEP. Environmental Scientist. Used geospatial analysis to analyze land use and hydrologic features of the project watershed. Incorporated watershed and gauge data to create a HEC-HMS model to analyze hydrologic inputs and outputs in the project watershed.

ALEX FRENCH

Environmental Scientist

Education
BS in Natural Resources

Registration
Rosgen Level I, II, III, IV

15 Years Experience

Mr. French is experienced in performing existing stream condition data collection and reference reach assessments using the Rosgen Classification System. His educational background in biology and natural resource management provide an excellent understanding of the functional implications of stream restoration. He has applied these skills in numerous contexts including assessment, design, and monitoring.

- Bold Run Stream Restoration Project, Wake Forest, North Carolina, NCEEP. Stream Designer. Assisted with design of over 1,600 linear feet of impaired stream and associated riparian area. Performed existing conditions assessment, reference reach surveys, and development of design criteria. Prepared construction drawings.
- Little Troublesome Stream Restoration Project, Reidsville, North Carolina, NCEEP. Stream Designer. Assisted in the design of over 2,100 feet of impaired stream and associated riparian and wetland area. Performed existing conditions assessment, reference reach surveys, and development of design criteria. Prepared construction drawings.
- Glen Raven Stream Restoration Project (FDP), Burlington, North Carolina, NCEEP. Stream Designer. Assisted with the design of over 3,700 feet of impaired stream and associated riparian area. Performed existing conditions assessment, reference reach surveys, and development of design criteria. Prepared construction drawings.
- Collins Stream Restoration Project (FDP), Orange County, North Carolina, NCEEP. Stream Designer. Aided in design of over 9,200 feet of impaired stream and associated riparian area. Performed existing conditions assessment, reference reach surveys, and development of design criteria. Developed construction drawings.
- Farrar Dairy Stream and Wetland Restoration Project (FDP), Lillington, North Carolina, NCEEP. Stream Designer. Assisted in the design of over 12,000 feet of impaired stream and associated riparian and wetland area. Performed existing conditions assessment, reference reach surveys, and development of design criteria. Prepared construction drawings.

KEVIN O'BRIANT

Site Restoration

Education
BS in Environmental Science

Registration
Water Pollution Control System Operator (#989400)

15 Years Experience

Mr. O'Briant is an environmental scientist with 15 years of experience on projects involving the assessment and remediation of sites impacted with petroleum, chlorinated solvents, pesticides and metals. His experience includes Phase I and II environmental site assessments applying all state, federal, and EPA guidelines. Mr. O'Briant's field experience includes soil, groundwater, and stormwater sampling and installation of groundwater monitoring wells. He has provided oversight for removal of underground storage tanks and soil excavations.

- McCain Site Stream Restoration Project Sophia, North Carolina. Construction Supervisor. Managed the restoration of over 2,500 linear feet of stream channel. This project restored a cattle impacted stream, utilizing a new stream planform, in-stream structures, livestock exclusion fencing, and a planted riparian buffer of native trees and shrubs.
- Briles Site Stream Restoration Project Trinity, North Carolina. Construction Supervisor. Managed the restoration and enhancement of over 2,600 linear feet of stream channel. The project goals included restoring stable channel morphology, improving water quality, and enhancing aquatic and terrestrial habitat. The project objectives included building an appropriate C4/B4c channel with stable dimensions, excluding livestock from the project area, installing in-stream, and planting a riparian buffer of native trees and shrubs.
- Windy Cove Farm Wetland Restoration Project, The Nature Conservancy, Millboro Springs, Virginia. Project Scientist/Equipment Operator. Assisted with the creation, restoration, enhancement and preservation of wetlands and buffer in the Upper James River watershed in Bath County, Virginia. Shallow berms were installed to divert surface runoff to feed other portions of the created wetland. In addition, shallow depressions were created to retain surface and shallow subsurface flow to support wetland plants and promote amphibian habitat. Major tasks included the installation of an infiltration structure to allow the surface runoff to exit the site at a slower rate promoting wetland habitat creation.

JOE SULLIVAN

Environmental Scientist

Education
BS in Biology and BA Environmental Studies
MS in Natural Resources

4 Years Experience

Mr. Sullivan is an environmental scientist with four years of experience on projects involving the planning, assessment, permitting, and compliance of infrastructure and development projects. He has experience with stream and wetland delineations, 404/401 permitting, buffer authorizations, natural resource studies, endangered species surveys, and invasive species management. His experience includes field assessments & delineation, species surveys, GPS data collection, GIS analysis and mapping, and report preparation. He has used these skills in a variety of private developments as well as municipal and NCDOT projects.

- NCDOT I-4400: Widening of I-26, Buncombe and Henderson Counties, NC. Environmental specialist for wetland/stream delineation, threatened/endangered species surveys, and Natural Resources Technical Report. Project involved the assessment and delineation of approximately 24 miles road.
- NCDOT R-2561: Riegelwood Bypass, Columbus County, NC. Environmental specialist for wetland/stream delineation, threatened/endangered species surveys, and Natural Resources Technical Report. Project involved the assessment and delineation of approximately 300 acres of forested lands. Complied with safety and security guidelines were necessary working on International Paper property.
- NCDOT R-2593: Red Springs Bypass, Robeson and Hoke Counties, NC. Environmental specialist for wetland/stream delineation, threatened/endangered species surveys, and Jurisdictional Determinations. Project involved the re-verification, assessment and delineation of approximately 1500 acres of forested and agricultural lands.
- NCDOT U-2525C: Greensboro Eastern Loop, Guilford County, NC. Environmental specialist for wetland/stream delineation, threatened/endangered species surveys, and Jurisdictional Determinations. Project involved the re-verification, assessment and delineation of approximately 300 acres of forested and developed lands.
- NCDOT R-2250: Greenville Southwest Bypass, Pitt County, NC. Environmental specialist for wetland/stream delineation, threatened/endangered species surveys, Jurisdictional Determinations, and Buffer Authorizations. involved the re-verification, assessment and delineation of approximately 850 of forest and agricultural lands.

TOMMY SEELINGER
Environmental Scientist

Education
BS in Biology

3 Years Experience

Mr. Seelinger is an environmental scientist with three years of experience on projects in KCI's resource management division.

- 2008-9 NCEEP Monitoring, Statewide, NC. Environmental Scientist. KCI has provided stream monitoring services for the North Carolina Ecosystem Enhancement Program. For this project, the firm performed assessment and documentation for multiple streams restoration sites.
- Pond Creek Monitoring, Pegram, TN. Environmental Scientist. KCI provided professional stream monitoring and adaptive management planning services in accordance with the TSMP Monitoring Protocol for nine project sites in Middle and West Tennessee as part of an on-call contract. The Pond Creek task order included: QVA, two cross-sections, Wolman counts at each riffle cross-section, the Pfankuch Channel Stability Evaluation, survey of twelve rectangular vegetation plots, and photograph reference documentation.
- Full Delivery Monitoring. Mr. Seelinger assists in the monitoring of 12 active full delivery projects for KCI. Conducts stream cross section and profile surveys, pebble counts, vegetation surveys and groundwater monitoring.
- Design-Bid-Build assessments and monitoring. Mr. Seelinger conducts stream and wetland assessments and monitoring for EEP design-bid-build projects throughout NC.

MICHAEL UNDERWOOD, EIT
Environmental Scientist

Education
BS / Biological and Agricultural Engineering

Registration
TDEC EPSC Level I, OSHA 10-Hour, NCSU Rivercourses

2 Years Experience

Mr. Underwood is an environmental scientist with two years of experience on projects in KCI's resource management division.

- TDOT Mitigation Site Remediation, Statewide, Tennessee. EIT. These task orders involve the assessment of 30 different TDOT mitigation sites covering all 4 TDOT Regions that were found to have deficiencies during monitoring. These sites include stream and wetland restoration projects. After the assessment a repair strategy is devised and upon approval by TDOT, KCI implements the repairs. These services have been provided to TDOT for three consecutive years and span two stream design contracts.
- May Prairie Stream Restoration Site, Manchester, TN. EIT. Work included assessment, stream design, planting plan design, construction drawings, report preparation, and construction contracting. The final design includes over 4,500 linear feet of stream restoration through one of the state's most floristically diverse natural areas. Construction is underway and construction oversight is ongoing.
- SR 99 Stream Restoration Project, Murfreesboro, TN. EIT. Due to widening of SR-99 it is necessary to relocate an adjacent stream for the project's onsite mitigation requirements. KCI conducted a stream assessment and conceptual design for UT Spence Creek. Currently final plans are being prepared to support resubmittal of permit documents.
- Stream Mitigation Monitoring Contract, Middle and West TN. Monitoring Specialist. Involved with data collection and analysis for annual monitoring at multiple stream restoration sites throughout Tennessee for two years that includes collection of morphologic and vegetation data, and photo-documentation and qualitative visual assessments.
- Richland Creek Dam Removal Feasibility Study, Nashville, Davidson County, TN. EIT. Assisted with field survey and data collection to study feasibility of removing a 5' high run-of-the-river concrete dam that is impounding Richland Creek. Performed sediment collection under standard sampling protocol and summarized laboratory results from upstream, at dam, and downstream locations.

Appendix C. Baseline Conditions

Soil Data Forms

KCI ASSOCIATES OF NORTH CAROLINA, PA

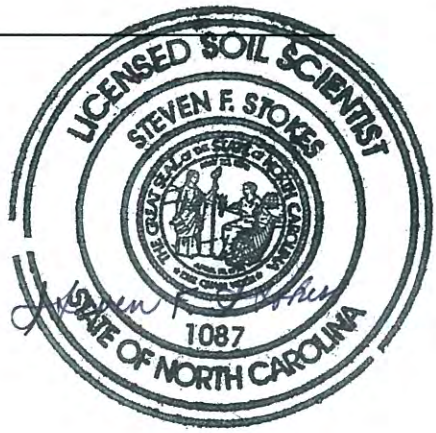
SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring#12
Soil Series: Torhunta
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 20" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Corn
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-9	10YR 2/1		fsl	1fgr	mfr	aw	
A1	9-20	10YR 2/1		fsl	1fgr	mfr	gw	
Bg	20-36	10YR 4/2		sl	1fsbk	mfr	gw	
BC	36-51	10YR 4/2		ls	1msbk	mfr	dw	diffuse boundary, sandy loam (sl) lenses
Cg	51-60	10YR 5/2		s	massive			

COMMENTS:
Torhunta is a drained hydric soil
The Torhunta series is a very poorly drained soil found on nearly level stream terraces and upland bay areas of Coastal Plain.
This Torhunta soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS DATE: 4/8/2015



KCI
ASSOCIATES OF
NORTH CAROLINA, PA

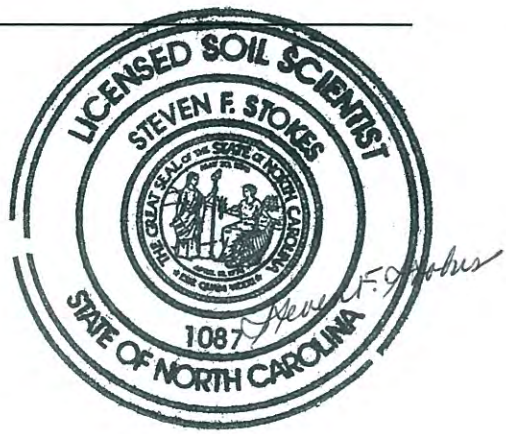
SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring#13
Soil Series: Johnston
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: 24" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately rapid
Vegetation: Corn
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-6	10YR 2/1		ls	massive	mfr	as	massive breaking to 1fgr
A1	6-11	10YR 3/1		fsl	massive	mfr	as	massive breaking to 1msbk
A2	11-42	10YR 3/2		sl	massive	mfr	as	massive breaking to 1f&msbk
Cg1	42-50	10YR 5/2		cos sl	sg	mfr	as	
Cg2	50-60	10YR 5/2		cos s	massive			

COMMENTS:
Johnston is a drained hydric soil
The Johnston series is a very poorly drained soil found on nearly level floodplains and swamps of the Coastal Plain.
This Johnston soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS DATE: 4/8/2015



KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 16
Soil Series: Torhunta
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 24" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Corn
Borings terminated at 52 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-12	10YR 2/1		ls	1fgr	mfr	as	Compacted surface
A1	12-16	10YR 2/1		fsl	1fsbk	mfr	cs	
A2	16-19	10YR 3/1		sl	1fsbk	mfr	cs	
Bg	19-44	10YR 4/2		sl-scl	1msbk	mfr	gw	
Cg	44-52	10YR 4/1		ls	massive	mfr		

COMMENTS:
Torhunta is a drained hydric soil
The Torhunta series is a very poorly drained soil found on nearly level stream terraces and upland bay areas of Coastal Plain.
This Torhunta soil has very slow runoff and moderately rapid permeability.
Boring is 36' from ditch. Water table in ditch is 29" below top of bank.

DESCRIBED BY: SFS DATE: 4/8/2015

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
1087
STATE OF NORTH CAROLINA

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 17
Soil Series: Torhunta Variant
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 20" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Soybeans
Borings terminated at 56 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-12	10YR 2/1		ls	1fgr	mfr	cs	
Bg1	12-36	10YR 4/1		sl	1fsbk	mfr	gw	
Bg2	36-44	10YR 4/1		ls	1fsbk	mfr	gw	
Cg	44-56	10YR 4/1		scl	massive	mfr		

COMMENTS:
Torhunta is a drained hydric soil
The Torhunta series is a very poorly drained soil found on nearly level stream terraces and upland bay areas of Coastal Plain.
This Torhunta soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS DATE: 4/8/2015

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** April 8, 2015
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 18
Soil Series: Torhunta
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Typic Humaquepts
AWT: 22" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Soybeans
Borings terminated at 54 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-8	10YR 2/1		fsl	1fgr	mfr	as	
A1	8-11	10YR 3/1		fsl	1fsbk	mfr	cs	
Bg1	11-26	10YR 4/2		sl	1msbk	mfr	gw	
Bg2	26-36	10YR 3/2		ls	1fsbk	mfr	gw	
BC	36-54	10YR 4/2		ls	1fsbk	mfr		
Cg	54							Soil, probably sand, slid from auger.

COMMENTS:
Torhunta is a drained hydric soil
The Torhunta series is a very poorly drained soil found on nearly level stream terraces and upland bay areas of Coastal Plain.
This Torhunta soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS DATE: 4/8/2015

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
1087
STATE OF NORTH CAROLINA

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** September 19, 2016
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 20
Soil Series: Stallings
Soil Classification: Coarse-loamy, siliceous, semiactive, thermic Aeric Paleaquults
AWT: 54" **SHWT:** 12"-18" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Somewhat poorly drained **Permeability:** Moderately Rapid
Vegetation: Forest-Loblolly Pine, Saplings of Red Maple, Sweetgum and Smilax
Borings terminated at 61 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
A	0-8	10YR 2/1		fsl	1fgr	mfr	cs	
Bt1	8-11	10YR 4/3	10YR 5/4c2d	sl	1fsbk	mfr	cw	
Bt2	11-29	10YR 4/3	10YR 4/2c2d	sl	1fsbk	mfr	gw	
Bt3	29-37	10YR 5/3		sl	2msbk	mfr	gw	
Bt4	37-48	10YR 4/2		fsl	1fsbk	mfr	gw	
BCg	48-61	10YR 5/2		ls	1mgr	mfr	cw	
BCg2	59-61	10YR 5/1	10YR 4/2c2f	ls	1mgr	mfr		

COMMENTS:
Stallings series is a non-hydric soil.
The Stallings series is a somewhat poorly drained soil found on nearly level interstream divides of the Coastal Plain.
This Stallings soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS, JS DATE: 9/19/2016

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** September 19, 2016
Project: Rough Horn Swamp Wetland Restoration Site **Project #:** 20153280P
County: Columbus **State:** NC
Location: 2076 Old Boardman Road Evergreen, NC 28438 **Site/Lot:** Boring # 19
Soil Series: Johnson
Soil Classification: Coarse-loamy, siliceous, active, acid, thermic Cumulic Humaquepts
AWT: 19" **SHWT:** 0-12" **Slope:** 0-2% **Aspect:**
Elevation: **Drainage:** Very Poorly Drained; slow runoff **Permeability:** Moderately Rapid
Vegetation: Forest-Red Maple, Black Gum, Red Bay, Cinnamon Fern, Chain Fern
Borings terminated at 60 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Oa	0-2	10YR 2/1		muck	massive	mfr	as	massive breaking to 1fgr
A	2-30	10YR 2/1		muck	massive	mfr	as	massive breaking to 1fsbk
Cg1	30-52	10YR 3/1		s	sg	mfr	as	massive breaking to 1fsbk
Cg2	52-60	10YR2/1		fsl-ls	massive	mfr	as	

COMMENTS:
Johnston is in a jurisdictional wetland unit at this location.
The Johnston series is a very poorly drained soil found on nearly level floodplains and swamps of the Coastal Plain.
This Johnston soil has very slow runoff and moderately rapid permeability.

DESCRIBED BY: SFS, JS DATE: 9/19/2016

Site Photographs

Site Photographs

Looking downstream on Long Bay Creek as it enters the project boundary. 7/5/16

Former stream valley for Long Bay Creek that will be restored. 7/5/16

Existing forested wetland. 7/5/16

Intersection of ditch flowing south to north and Long Bay Creek flowing west. 7/5/16

Ditch flowing south to north that currently drains part of the proposed stream valley to be restored. 7/5/16

Looking south along furthest ditch to east in non-riparian project area. 7/5/16

Looking south along second field ditch from the east in non-riparian area. 7/5/16

Looking west at current confluence of Long Bay Creek and UTLBC2. 7/5/16

Looking upstream (north) on existing UTLBC2 channel. 7/5/16

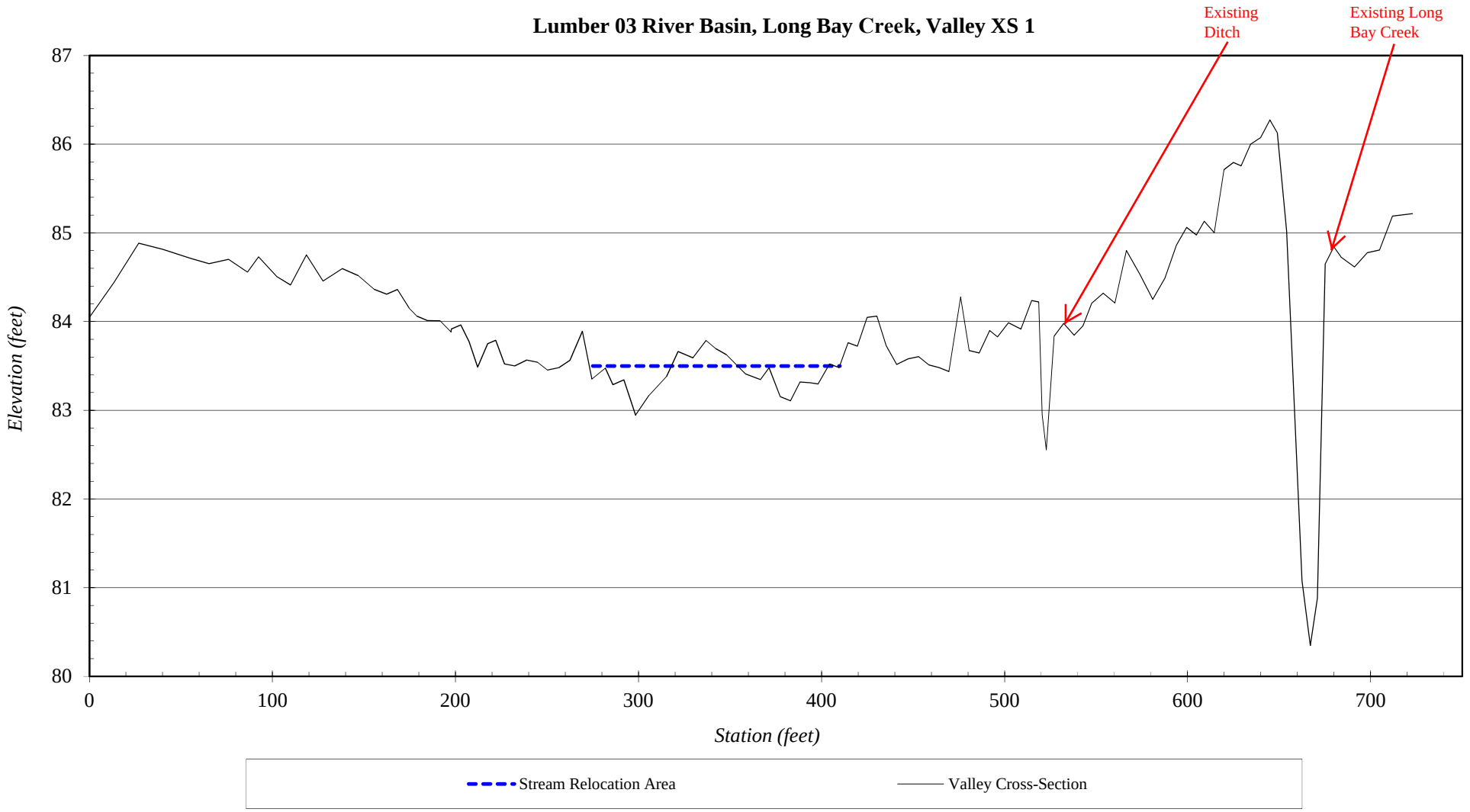
Near the top of the northern end of project, looking at Old Boardman Rd to the west. 7/5/16

Looking toward southeast at treeline at western edge. 7/5/16

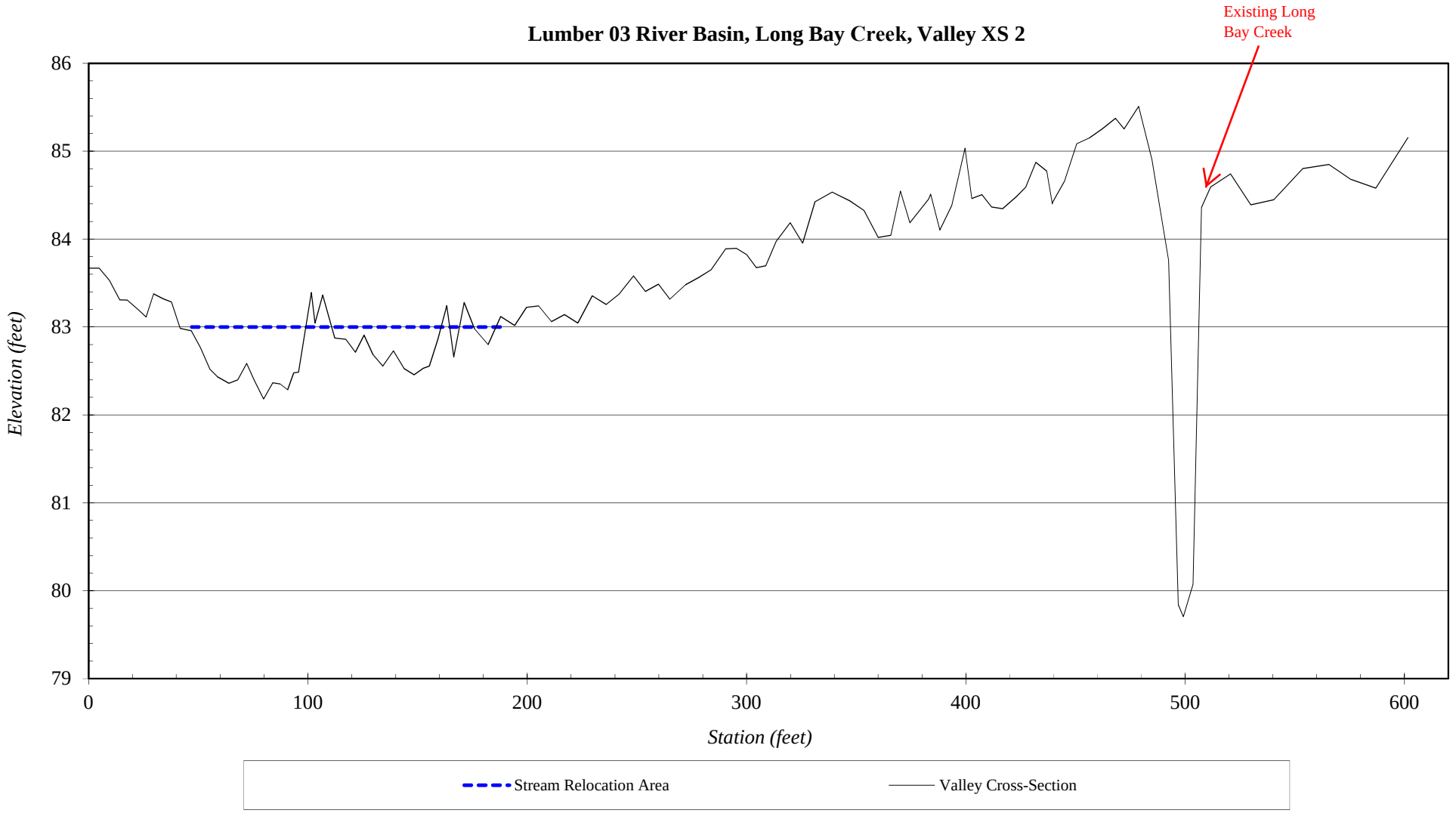
Looking east at ditch flowing along western edge of project along the treeline. 7/5/16

Existing Valley Cross-Sections

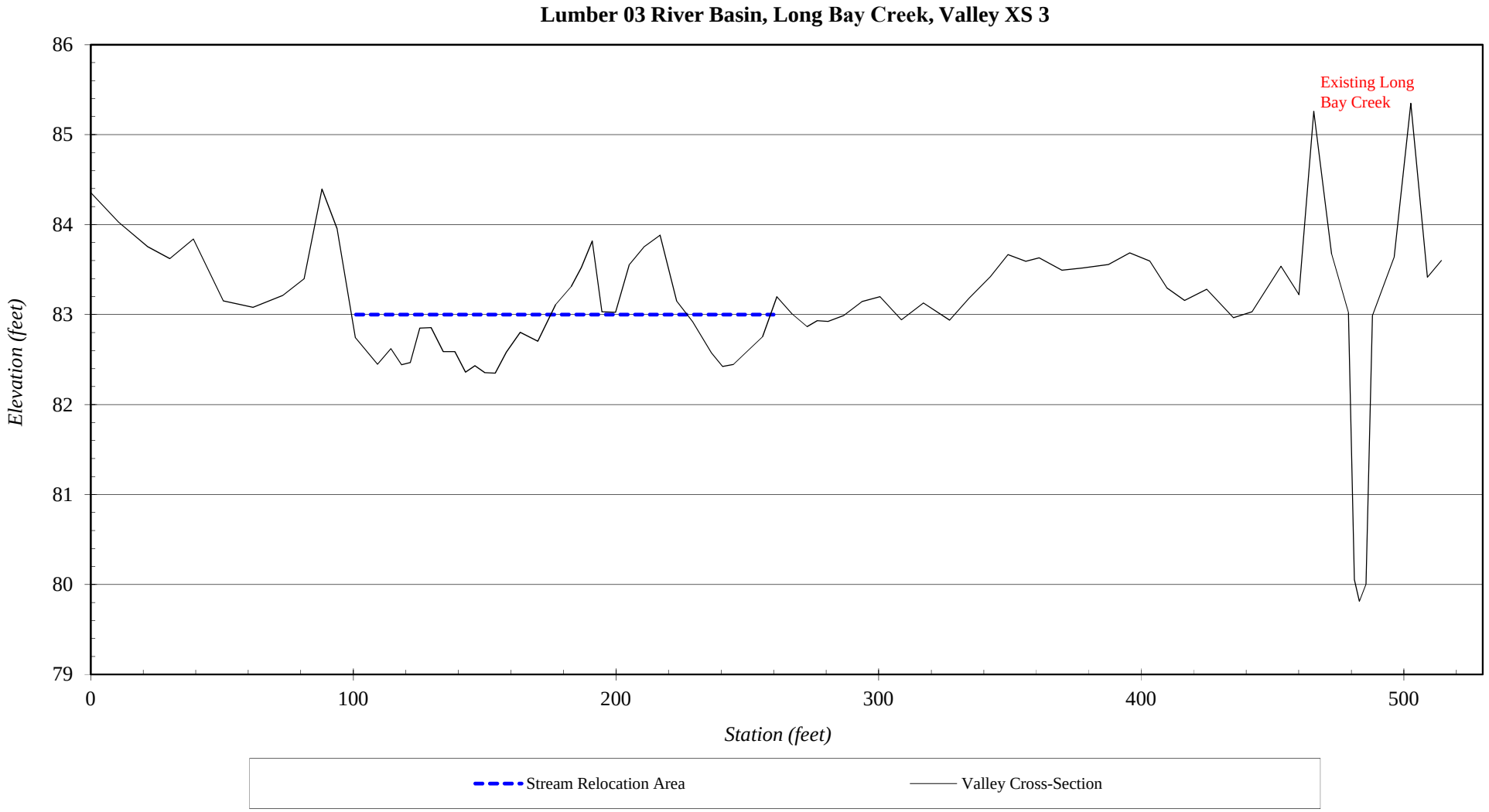
River Basin:	Lumber 03
Watershed:	Long Bay Creek
XS ID	Valley XS 1
Drainage Area (sq mi):	2.71 square miles
Date:	March 2016
Field Crew:	KCI



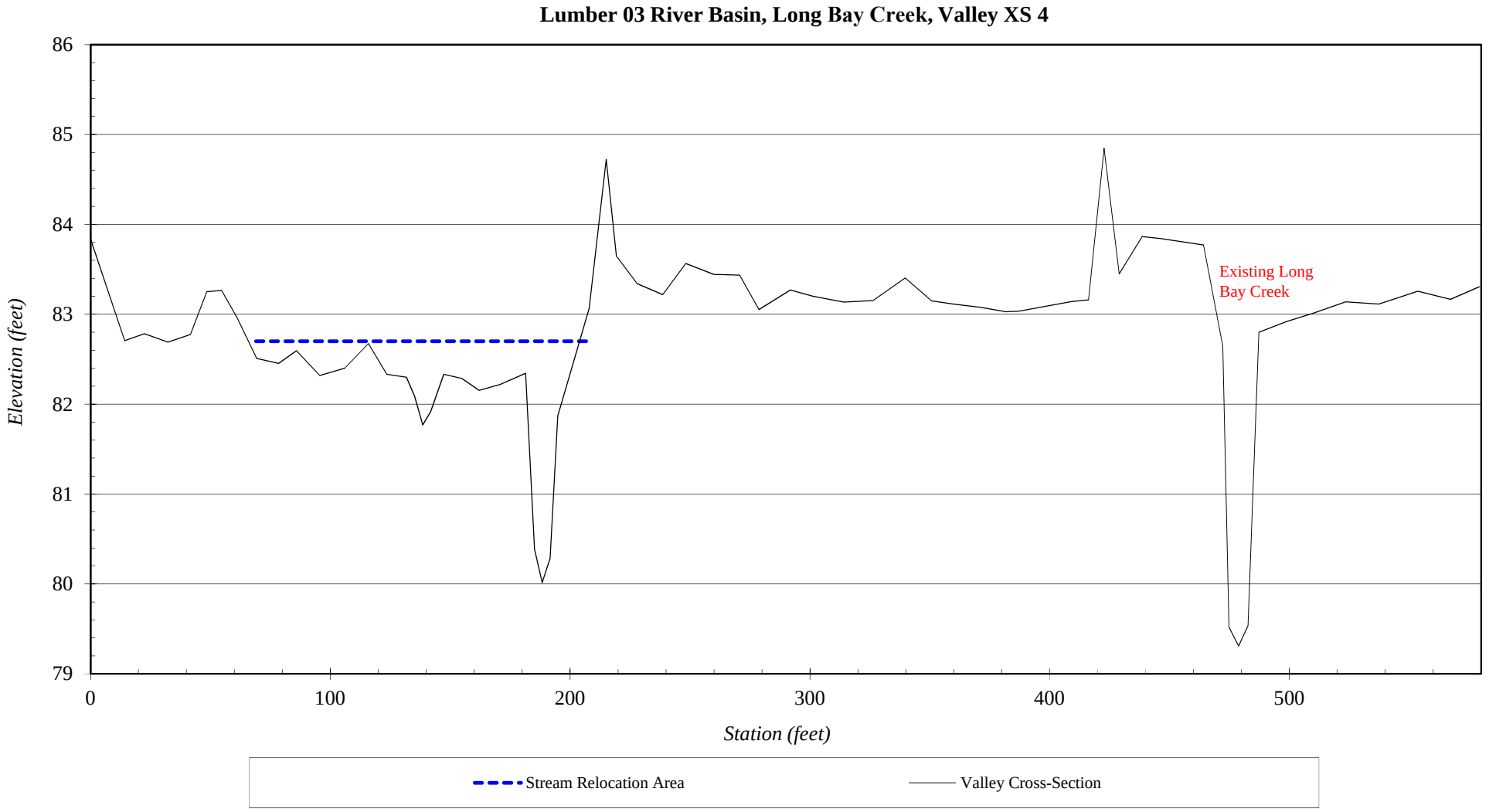
River Basin:	Lumber 03
Watershed:	Long Bay Creek
XS ID	Valley XS 2
Drainage Area (sq mi):	2.71 square miles
Date:	March 2016
Field Crew:	KCI



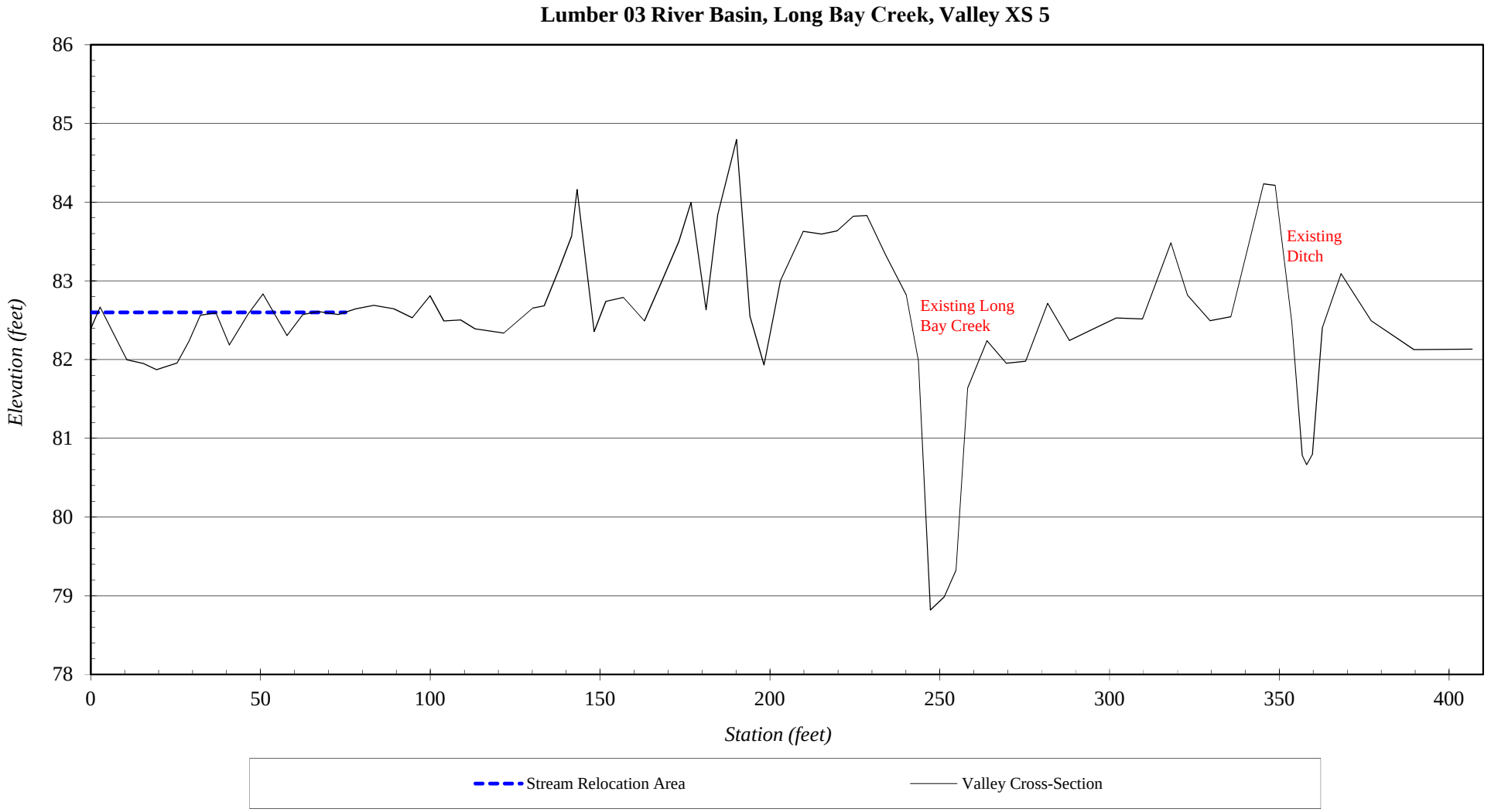
River Basin:	Lumber 03
Watershed:	Long Bay Creek
XS ID	Valley XS 3
Drainage Area (sq mi):	2.71 square miles
Date:	March 2016
Field Crew:	KCI



River Basin:	Lumber 03
Watershed:	Long Bay Creek
XS ID	Valley XS 4
Drainage Area (sq mi):	2.71 square miles
Date:	March 2016
Field Crew:	KCI



River Basin:	Lumber 03
Watershed:	Long Bay Creek
XS ID	Valley XS 5
Drainage Area (sq mi):	2.71 square miles
Date:	March 2016
Field Crew:	KCI



USACE Wetland Determination Forms

W1 - wet

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Restoration Site City/County: Columbus Sampling Date: 9/1/15

Applicant/Owner: KCI State: NC Sampling Point: W1 - wet

Investigator(s): J. Sullivan & T. Seplinger Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): _____ Slope (%): 0-1

Subregion (LRR or MLRA): P-133A Lat: 34.44666 Long: -78.93446 Datum: NAD83

Soil Map Unit Name: Johnston NWI classification: PFO

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? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (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 _____	No X	Depth (inches): >36
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): –

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: W1-wd

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Nyssa sylvatica	20	Y	FAC
2. Persea palustris	30	Y	FACW
3. Acer rubrum	20	Y	FAC
4. Liquidambar styraciflua	10		FAC
5.			
6.			
7.			
8.			
	80	= Total Cover	
50% of total cover: 40	20% of total cover: 16		
Sapling/Shrub Stratum (Plot size: 15)			
1. Acer rubrum	16	Y	FAC
2. Ilex opaca	10	Y	FAC
3. Liquidambar styraciflua	20	Y	FAC
4.			
5.			
6.			
7.			
8.			
	40	= Total Cover	
50% of total cover: 20	20% of total cover: 8		
Herb Stratum (Plot size: 5)			
1. Woodwardia aerolata	80	X	OBL
2. Osmunda cinnamomea	10		FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90	= Total Cover	
50% of total cover: 45	20% of total cover: 18		
Woody Vine Stratum (Plot size: 30)			
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: 7 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 % (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
- X 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: W1 - wet

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	10YR2/1	100			MS	M	SL	>0.5 in mucky surface
6-18	10YR2/1	100					SL	
18-22	10YR 3/1	100					SL	
22-26	10YR 4/2	100					SL	
26-30	10YR 3/1	100					SL	
30-36	10YR 3/2	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:

Hydric Soil 2

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Swamp Restoration Site City/County: Columbus Sampling Date: 9/1/15

Applicant/Owner: KCT State: NC Sampling Point: Hydric Soil 2

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range: _____

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): _____ Slope (%): 1-2

Subregion (LRR or MLRA): P-133A Lat: 34.447113 Long: -78.934343 Datum: NAD83

Soil Map Unit Name: Johnston 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? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (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 X No _____	
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): >20
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: Hydric Soil 2

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Persea Palustris	30	X	FACW
2. Liquidambar Styraciflua	30	X	FAC
3. Acer rubrum	30	X	FAC
4. Pinus taeda	10		FAC
5.			
6.			
7.			
8.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Sapling/Shrub Stratum (Plot size: 15)			
1. Persea Palustris	20	X	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		

Herb Stratum (Plot size: 5)			
1. Woodwardia areolata	20	X	OBL
2. Smilax bona nox	20	X	FAC
3. Vitis rotundifolia	20	X	FAC
4. Lyonia lucida	5		FACW
5. Osmunda Cinnamonea	5		FACW
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	70 = Total Cover		
50% of total cover: 35	20% of total cover: 14		

Woody Vine Stratum (Plot size: 30)			
1. Vitis rotundifolia	20	X	FAC
2.			
3.			
4.			
5.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 9 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 % (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
- X 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: Hydric Soil 2

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 - 10	10YR 2/1	100			MS	M	SL	
10 - 13	10YR 3/1	100			MS	M	SL	
13 - 20+	10YR 4/1	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:

Hydric Soil 3

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Rough Horn Swamp Restoration Site City/County: Columbus Sampling Date: 9/1/15

Applicant/Owner: KCI State: NC Sampling Point: Hydric Soil 3

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range:

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): Slope (%): 1-2

Subregion (LRR or MLRA): P-133A Lat: 34.447795 Long: -78.935629 Datum: NAD 83

Soil Map Unit Name: Johnston 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? No Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (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 X No	
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): >24
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: Hydric Soil 3

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Persea Palustris	45	X	FACW
2. Liquidambar styraciflua	45	X	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Sapling/Shrub Stratum (Plot size: 15 ft)			
1. Lyonia lucida	15	X	FACW
2. Clethra alnifolia	10	X	FACW
3. Persea Palustris	10	X	FAC
4.			
5.			
6.			
7.			
8.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		

Herb Stratum (Plot size: 5 ft)			
1. Osmunda cinnamomea	10		FACW
2. Leucothoe axillaris	50	X	FACW
3. Smilax bona-nox	10		FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	70 = Total Cover		
50% of total cover: 35	20% of total cover: 14		

Woody Vine Stratum (Plot size: 30 ft.)			
1. Smilax bona-nox	10	X	FAC
2. Smilax rotundifolia	10	X	FAC
3.			
4.			
5.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 % (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
- X 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: Hydric Soil 3

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
0-12	10YR 2/1	100					SL	few uncoated
12-17	10YR 3/1	100					SL	few uncoated
17-18	10YR 3/1	100					SL	many uncoated
18-24+	10YR 4/1							

[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:

Upland
Non-Hydric Soil

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Pough Horn Swamp Restoration Site City/County: Columbus Sampling Date: 9/1/15

Applicant/Owner: KCI State: NC Sampling Point: Upland

Investigator(s): J. Sullivan & T. Seelinger Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): 0-3%

Subregion (LRR or MLRA): P-133A Lat: 34.447279 Long: -78.933914 Datum: NAD83

Soil Map Unit Name: Stallings 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? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? Nr (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 _____ 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): >18
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: Upland Non-hydric Soil

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus taeda	50	X	FAC
2. Liquidambar styraciflua	20	X	FAC
3. Quercus nigra	20	X	FAC
4.			
5.			
6.			
7.			
8.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Sapling/Shrub Stratum (Plot size: 30 ft.)			
1. Vaccinium corymbosum	10	X	FACW
2. Morella cerifera	20	X	FAC
3. Persea palustris	10	X	FACW
4.			
5.			
6.			
7.			
8.			
	40 = Total Cover		
50% of total cover: 20	20% of total cover: 8		

Herb Stratum (Plot size: 1 m)			
1. Leucothoe axillaris	40	X	FACW
2. Vitis rotundifolia	10	X	FAC
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: 30 ft.)			
1. Vitis rotundifolia	20	X	FAC
2.			
3.			
4.			
5.			
	20 = Total Cover		
50% of total cover: 10	20% of total cover: 4		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 9 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (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
- X 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: upland Non-hydric Soil

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
0-1	10YR 7/1	100					SL	weathered grains
1-9	10YR 4/2	100					SL	
9-18+	2.5Y 4/2	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:

Jurisdictional Determination

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2015-02410** County: **Columbus** U.S.G.S. Quad: **Evergreen**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owners: **Horace and Janet Fields**
2076 Old Boardman Road
Evergreen, North Carolina 28438

George Sanderson
3001 Old Boardman Road
Evergreen, North Carolina 28438

William Stephens
P.O. Box 100
Orrum, North Carolina 28369

Teddy Britt
19096 Highway 242 South
Evergreen, North Carolina 28438

Agent: **Steven F. Stokes**
KCI Associates of North Carolina, P.A.
4601 Six Forks Road, Landmark Center II
Suite 220
Raleigh, North Carolina 27609

Size (acres)	**66.2-acres**	Nearest Town	**Evergreen**
Nearest Waterway	**UNT to Lumber River**	River Basin	**Lumber**
USGS HUC	**03040203**	Coordinates	Latitude: **34.4482 N**
			Longitude: **-78.9379 W**

Location description: **The property is located at 2076 Old Boardman Road (Property Nos. 21,056; 22,394; 77,799; 21,273; 21,705; and 20,694) in Evergreen, Columbus County, North Carolina. The project site consists of 66.2-acres of active agricultural land and undeveloped, forested land. A large ditch runs through the central part of the project site. This ditch was a former stream that had been relocated within the property for agricultural purposes. There are also several smaller farm ditches throughout the property. The project area is bordered by Old Boardman Road to the north, forested tracts to the west and south, and agricultural lands to the east.**

Indicate Which of the Following Apply:

A. Preliminary Determination

X There appear to be waters, including wetlands, on the above described property, as depicted on the attached exhibit, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344). This preliminary jurisdictional determination may be used in the permit evaluation process, including determining compensatory mitigation. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). However, you may request an approved JD, which is an appealable action, by contacting the Corps district for further instruction.

B. Approved Determination

_ There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are waters of the U.S. including wetlands on the above described property subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We strongly suggest you have the waters of the U.S. including wetlands on your project area delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

_ The waters of the U.S. including wetlands on your project area have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat identified below. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described property which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Wilmington, NC, at (910) 796-7215 to determine their requirements.

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **John N. Policarpo at 910-251-4487 or John.N.Policarpo@usace.army.mil**.

C. Basis for Determination: Portions of this site may exhibit wetland criteria as described in the 1987 Corps Wetland Delineation Manual and the Atlantic and Gulf Coastal Plain Regional Supplement. Two separate non-tidal wetlands on-site are considered abutting a Relatively Permanent Water (RPW), an unnamed tributary (UNT) to the Lumber River, while a third wetland is located in a linear ditch connected to an RPW. The UNT to the Lumber River is an RPW relocated from a natural stream that previously flowed through the project site, but was relocated for agricultural purposes. This RPW is a perennial stream with bed and bank and an ordinary high water mark. There are seven jurisdictional ditches located throughout the project site that are considered RPWs; these ditches exhibit bed and bank and an ordinary high water mark. This determination is based on a site visit conducted by John N. Policarpo of the Corps on October 29, 2015. The enclosed figure titled "Figure 3. Jurisdictional Features Map, Rough Horn Swamp Restoration Site, Columbus County, NC", undated, accurately depicts the approximate extent of on-site waters of the U.S., including wetlands, that may be jurisdictional under Section 404 of the Clean Water Act.

D. Remarks:

E. Attention USDA Program Participants

This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination 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 request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

F. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above)

This correspondence constitutes an approved jurisdictional determination for the above described site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

US Army Corps of Engineers
South Atlantic Division
Attn: Jason Steele, Review Officer
60 Forsyth Street SW, Room 10M15
Atlanta, Georgia 30303-8801

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by **March 22, 2016**.

It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: 

Date: **January 22, 2016** Expiration Date: **January 22, 2021**

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete our Customer Satisfaction Survey, located online at http://regulatory.usacesurvey.com/.

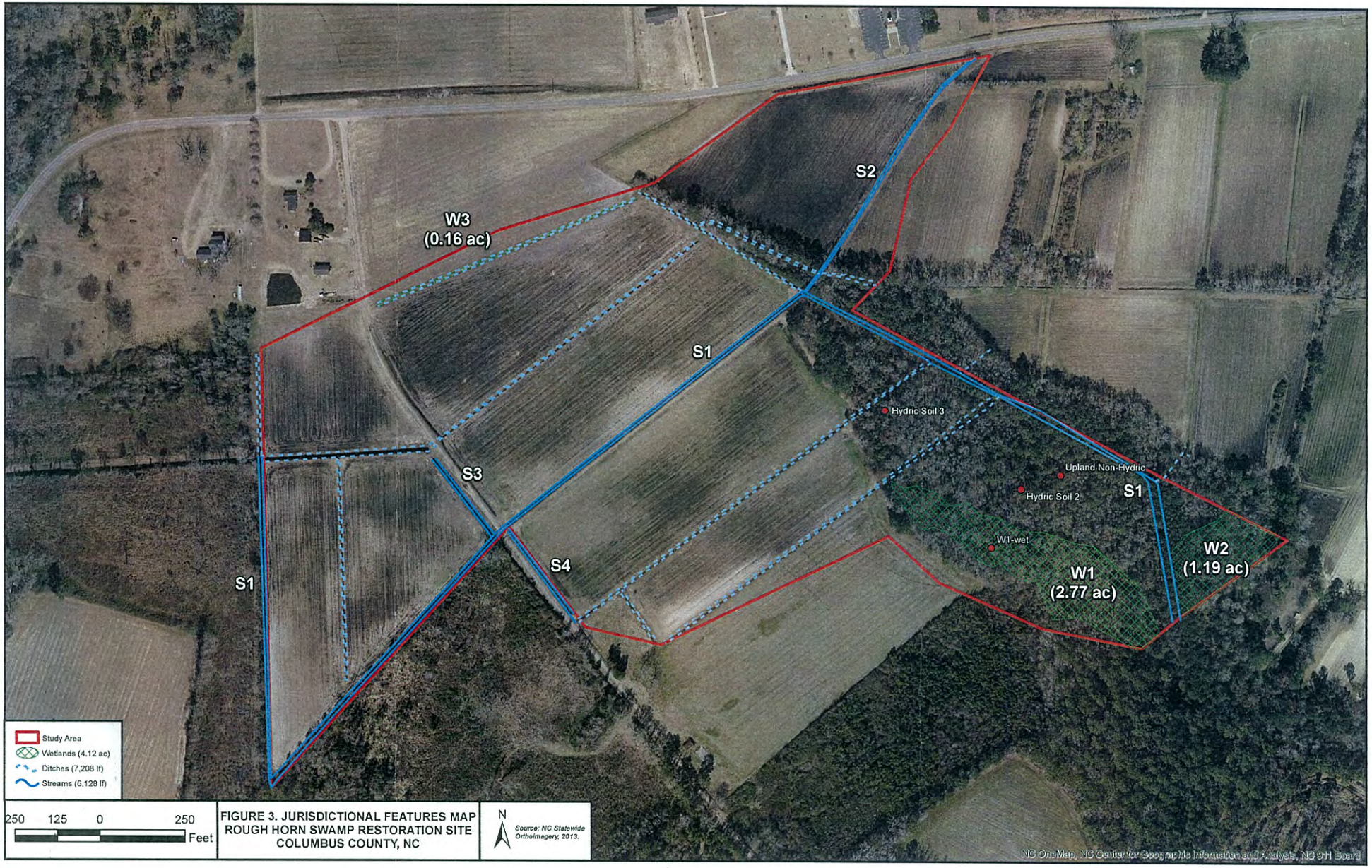


FIGURE 3. JURISDICTIONAL FEATURES MAP
ROUGH HORN SWAMP RESTORATION SITE
COLUMBUS COUNTY, NC