RUDOLPH BUFFER/NUTRIENT OFFSET SITE

JOHNSTON COUNTY, NORTH CAROLINA

BANK PARCEL DEVELOPMENT PLAN

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TABLE OF CONTENTS

List of Figures

List of Tables

Appendices

I. EXISTING CONDITIONS

LOCATION

The Rudolph Buffer/Nutrient Offset Site is located in southeast Johnston County, NC on the boundary with Wayne County (**Figure 1**). It is located approximately eight miles west of Goldsboro, NC. Specifically, the site is located at Latitude 35.3845900, Longitude -78.151378, and is located on the Princeton, NC USGS Quadrangle (**Figure 2**). The Rudolph Site is located in the Upper Neuse River Basin within the USGS HUC 03020201 and North Carolina Division of Water Quality (DWQ) sub-basin 03-04-02. The site drains into Moccasin Creek, a tributary to the Neuse River. The site is comprised of two parcels, the Worley Tract and the Kornegay Tract, totaling 116.9 acres. The proposed easement, including proposed buffer mitigation and nutrient uptake, encompasses 54.3 acres. This site will be included in the EBX Neuse Riparian Buffer Umbrella Mitigation Bank.

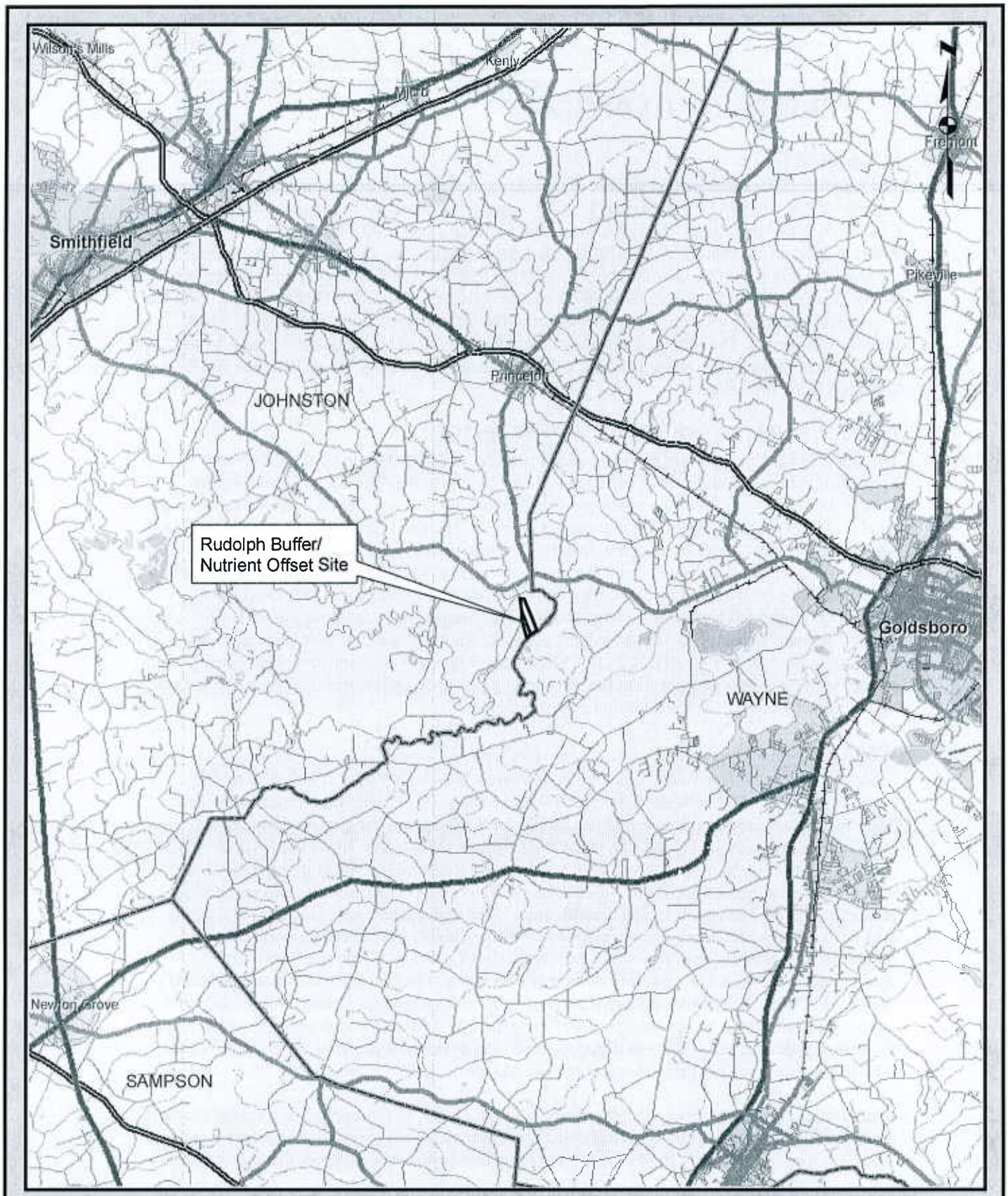
PHYSIOGRAPHY, TOPOGRAPHY, AND DRAINAGE

The site is in the Coastal Plain Physiographic Province, and is underlain by the Cape Fear Formation, which is comprised of sandstone and sandy mudstone. The site is located on the floodplain and has relatively flat topography. Elevations range from 75 to 85 feet above mean sea level (NAD 27) based upon USGS mapping (**Figure 2**). The site is on an old floodplain terrace between Moccasin Creek and Raccoon Swamp. The site drains into Moccasin Creek before flowing approximately 2.25 miles into the Neuse River. Natural drainage patterns throughout the watershed have been altered by cultivation and dredging of the channels. Martin Richmond (NCDWQ) conducted a site visit in May 2010 and determined there are three Neuse Buffer Rule subject channels present and one not-subject channel. The watersheds of these drainages are bisected by Buckleberry Road (SR 2541). Within the proposed mitigation area, the channels drain surface water and groundwater from the surrounding row crop agriculture. The primary land use in the project vicinity is woodlands and corn production.

WATER QUALITY

Moccasin Creek and Raccoon Swamp are classified as WS-IV; NSW by DWQ. The primary classification "WS-IV" indicates waters as a Water Supply IV - Highly Developed watershed. These waters are used as sources of water supply for drinking, culinary, or food processing purposes where a less developed watershed classification (WS-I, II or III) is not feasible. WS-IV waters are generally in moderately to highly developed watersheds or Protected Areas. These waters are also protected for Class C uses. Class C waters support aquatic life and secondary recreational uses. The supplemental classification NSW denotes nutrient sensitive waters that may need additional nutrient management due to being subject to excessive growth of microscopic or macroscopic vegetation. Moccasin Creek discharges into the Neuse River approximately 2.3 miles downstream of the mitigation site. The Neuse River is listed as Water Supply IV, Nutrient Sensitive Waters at its confluence with Moccasin Creek. Water Supply IV waters are protected as water supplies which are generally upstream and draining to Water Supply IV waters, waters used by industry to supply their employees with drinking water, or as waters formerly used as water supply. These waters are also protected for Class C uses.

Waters used as sources of water supply for drinking, culinary, or food processing purposes where a WS-I, II or III classification is not feasible. These waters are also protected for Class C uses. WS-IV waters are generally in moderately to highly developed watersheds or Protected Areas.



EBX

Figure 1
Vicinity Map
Rudolph Buffer/Nutrient Offset Site

0 1.5 3 6 Miles

1 inch = 3 miles

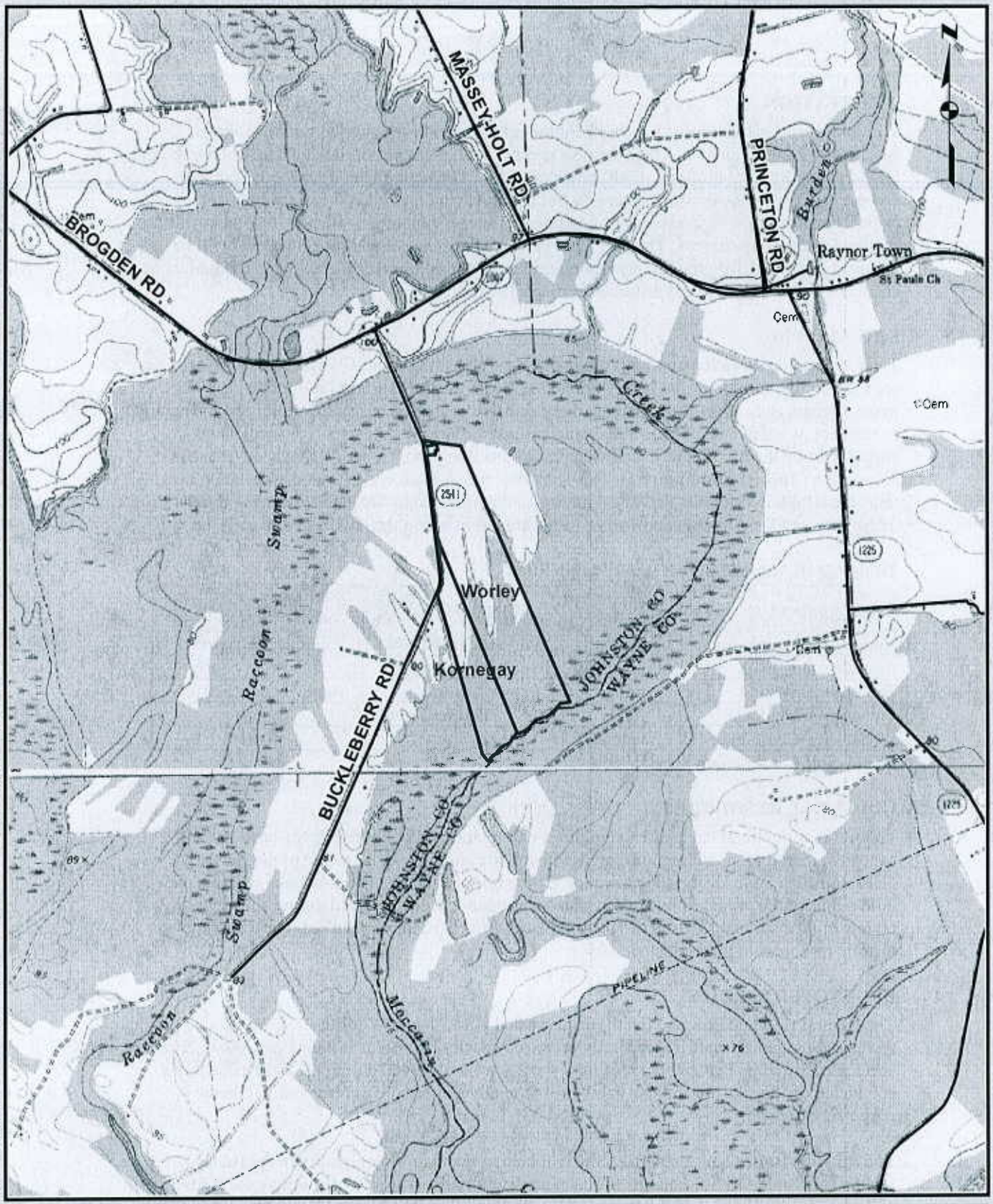


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Figure 2
USGS Quad Map
Rudolph Buffer/Nutrient Offset Site

0 1,000 2,000 4,000 Feet

1 inch = 2,000 feet

VEGETATION

Within the proposed conservation easement the primary land use is agricultural row crops; specifically corn production. There are also several small areas of bottomland hardwood trees and Conservation Reserve Program (CRP) pine plantation. The bottomland hardwoods abut the downstream end of the drainage channels, but do not extend the full 200 feet from the top of bank. These areas are an assemblage of mature and successional trees. Beaver impoundments are flooding some of these areas. The CRP land is planted in successional pine trees, and will be removed from the CRP program prior to placement of the conservation easement. The maintained channel banks contain typical disturbed herbaceous species.

SOIL MAPPING

The proposed preservation area soils are mapped as Wehadkee-Bibb-Chewacla association. These soils are poorly and somewhat poorly drained soil with a loamy surface on floodplains along major streams and creeks. Areas having these soils are characterized by low relief and the natural occurrence of hardwoods. The soil mapping units at the site are Altavista fine sandy loam, Augusta sandy loam, Tomotley sandy loam, Tarboro loamy sand, , and Wehadkeee-Chastain association (**Table 1 and Figure 3**). The Tomotley and Wehadkeee-Chastain association map units are NRCS hydric soils list. The Altavista and Augusta soils are listed as having hydric inclusions, and the Altavista and Tarboro soils are not listed on the NRCS hydric soils list.

Table 1. Soil Mapped across the Rudolph Site

Mapping Units	Flooding Frequency	Hydric Status	Drainage Class
Altavista fine sandy loam	occasionally	hydric inclusion (9%)	moderately well
Augusta sandy loam	occasionally	hydric inclusion (7%)	somewhat poorly
Tarboro loamy sand	rarely	not hydric	somewhat excessively
Tomotley sandy loam	rarely	hydric	poorly
Wehadkeee-Chastain	frequently	hydric	poorly

USDA-Soil Conservation Service 1994

CULTURAL RESOURCES

The site is agricultural land, and no buildings or structures were observed. No earth moving is expected; therefore, no cultural resources impacts are anticipated. A review of the files at the North Carolina State Historic Preservation Office revealed no historic structures within a one-mile radius of the proposed mitigation site. No structures were observed during site visits. A review of the National Register of Historic Places (NRHP) database did not reveal any known historic resources in the project vicinity.

PROTECTED SPECIES

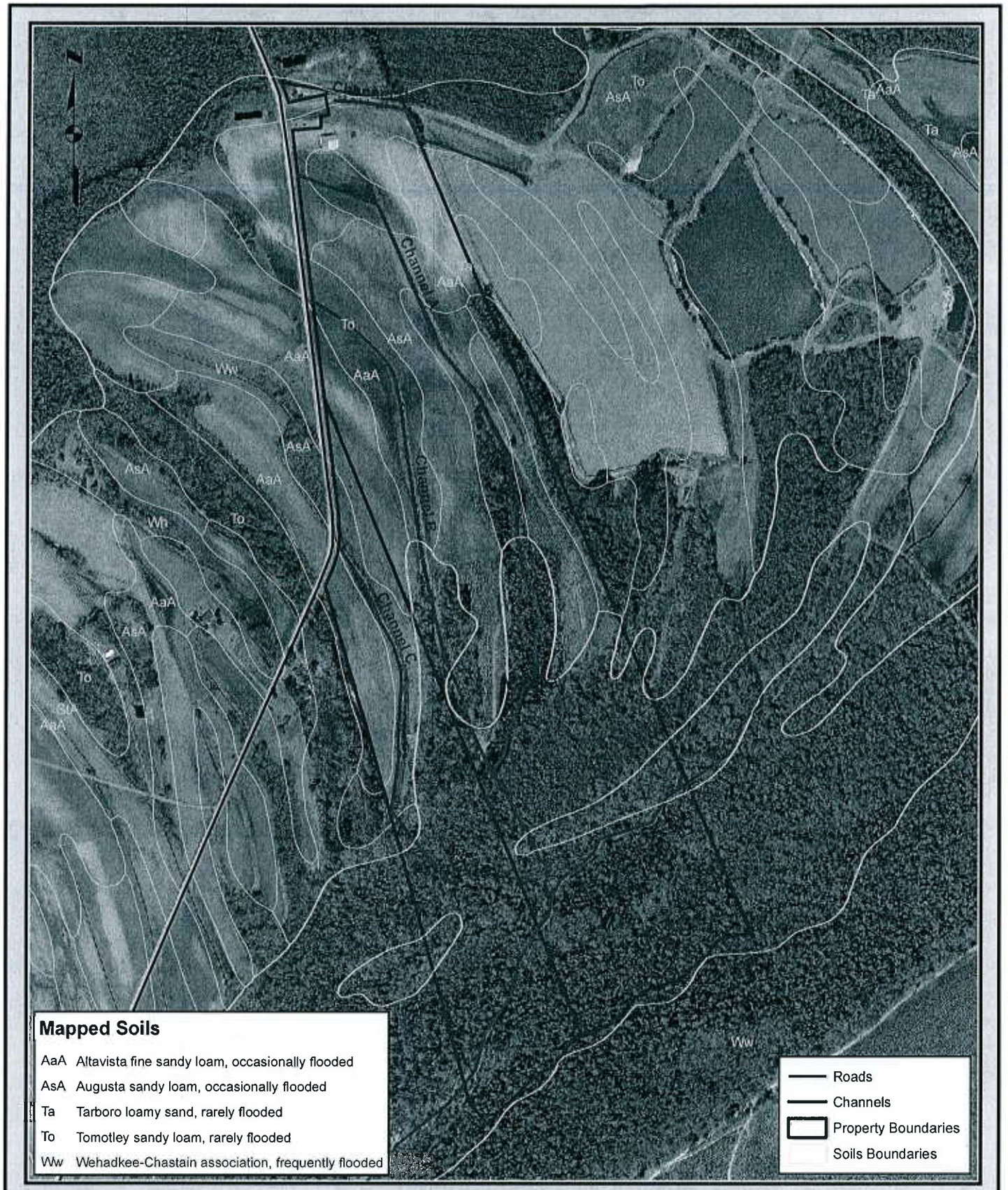
The Natural Heritage Program (NHP) database and US Fish and Wildlife (USFWS) county listing were used to identify state and federally protected species that occur in Johnston County. These species are listed in **Table 2**. No protected species were observed during the field evaluations conducted on the site. No suitable habitat for federally protected was observed within the proposed easement.

The Rudolph Buffer/Nutrient Offset Site will help to maintain water quality in the Neuse River Basin. This could provide benefits to state and federally listed species that utilize the Neuse River and other riverine habitats downstream of the Rudolph Site. The Natural Heritage Program database does not list any element occurrences or significant natural heritage areas within the

Rudolph Site. There are no element occurrences within one mile of the site. The Moccasin Swamp significant natural heritage area lies approximately 0.6 miles northwest of the Rudolph Site.

Table 2. Protected Species in Johnston County

Common Name	Scientific Name	State	Federal	Status
Invertebrate Animals:				
Atlantic Pigtoe	*Fusconaia masoni*	E	FSC	Current
Cape Fear Spike	*Elliptio marsupiobesa*	SC		Current
Creeper	*Strophitus undulatus*	T		Current
Dwarf Wedgemussel	*Alasmidonta heterodon*	E	E	Current
Eastern Lampmussel	*Lampsilis radiata*	T		Current
Green Floater	*Lasmigona subviridis*	E	FSC	Current
North Carolina Spiny Crayfish	*Orconectes carolinensis*	SC		Current
Notched Rainbow	*Villosa constricta*	SC		Current
Roanoke Slabshell	*Elliptio roanokensis*	T		Current
Tar River Spinymussel	*Elliptio steinstansana*	E	E	Current
Triangle Floater	*Alasmidonta undulata*	T		Current
Yellow Lampmussel	*Lampsilis cariosa*	E	FSC	Current
Yellow Lance	*Elliptio lanceolata*	E	FSC	Current
Vascular Plants:				
Bog Spicebush	*Lindera subcoriacea*	T	FSC	Current
Carolina Bogmint	*Macbridea caroliniana*	T	FSC	Current
Michaux's Sumac	*Rhus michauxii*	E-SC	E	Historical
Spring-flowering Goldenrod	*Solidago verna*	T	FSC	Current
Virginia Least Trillium	*Trillium pusillum* var. *virginianum*	E	FSC	Historical
Vertebrate Animals:				
Bald Eagle	*Haliaeetus leucocephalus*	T		Current
Carolina Madtom	*Noturus furiosus*	T	FSC	Current
Cerulean Warbler	*Dendroica cerulea*	SC	FSC	Current
Least Brook Lamprey	*Lampetra aepyptera*	T		Current
Loggerhead Shrike	*Lanius ludovicianus*	SC		Current
Neuse River Waterdog	*Necturus lewisi*	SC		Current
Red-cockaded Woodpecker	*Picoides borealis*	E	E	Current
Roanoke Bass	*Ambloplites cavifrons*	SR	FSC	Historical



EBX

Figure 3
Soils Map
Rudolph Buffer/Nutrient Offset Site

0 300 600 1,200 Feet
1 inch = 600 feet

EXISTING CHANNEL CONDITIONS

Table 3 summarizes the existing channel conditions on the Rudolph Site. All four of the channels are stable. Channels B, C, and D are non-jurisdictional. The only jurisdictional stream on the site is channel A. Typical bank species through the site include soft rush (*Juncus effuses*), Japanese honeysuckle (*Lonicera japonica*), narrowleaf cattail (*Typha angustifolia*), woolgrass (*Scirpus cyperinus*), sedges (*Carex* sp.), and fescue (*Festuca* sp.).

Table 3. Summary of Existing Channel Conditions

Channel	Length (ft.)	Width (ft.)	Depth (ft.)	Stable (Y/N)	Flow type	Bank Vegetation	Bed Material
A (upper)	168	4	2	Y	Ephemeral	Herbaceous, mowed	Sand/Detritus
A (lower)	3171	6	2	Y	Intermittent	Herbaceous, mowed	Sand
B	3,154	6	3	Y	Ephemeral	Herbaceous, mowed	Sand with some detritus
C	1,760	4	2	Y	Ephemeral	Herbaceous, mowed	Sand with some detritus
D	498	4	3	Y	Ephemeral	Sparsely vegetated, scattered mature trees	Sand

II. MITIGATION PLAN

The Rudolph Buffer/Nutrient Offset Site will be planted with appropriate native species within the protected buffer easement. The species selected consist of native species observed in the surrounding forest and species know to occur in similar environments. The current land use is row crop. The buffer area will be planted in bare root tree seedlings on an 8 by 8 foot spacing to achieve an initial density of 680 trees per acre. The buffered channels will provide water quality and habitat functions within the sensitive Neuse River watershed.

Some areas adjacent to the forested areas may require maintenance due to the rapid regeneration of some species. Rapidly regenerating species and invasive species may develop greater individual species density and create a less diverse mix. Minimal maintenance is anticipated due to the past cultivation history.

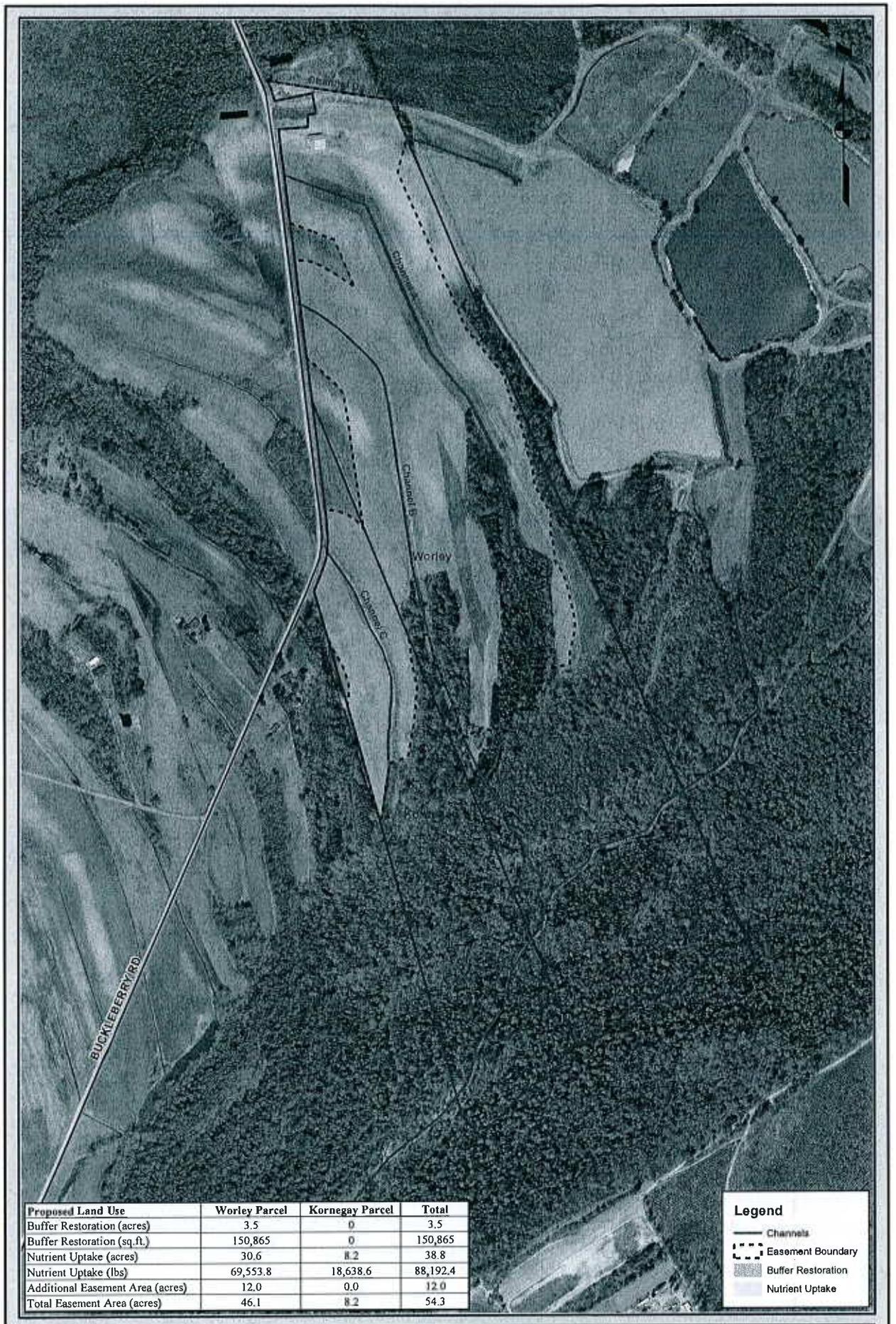
Figure 4 presents the proposed mitigation plan and easement location.

PLANTING PLAN

Revegetation of the site will include planting bare root trees and controlling invasive species growth. The target communities are Coastal Plain Small Stream Swamp (Blackwater Subtype) along the channels grading to Bottomland Hardwood Forest downstream, and Mesic Mixed Hardwood Forest on the drier upslope. The communities are as defined by Schafale and Weakely (1990). The planting plan will consist of two planting zones. Zone 1 occupies the wetter, lower landscape areas, and Zone 2 occupies the drier, higher landscape areas. Near-channel areas will be in the lower landscape areas. The initial planting of bare root trees will occur in late fall or early winter. Tree species specified for planting on the Rudolph Site are shown in **Table 4**.

Table 4. Rudolph Site Tree Planting List

Common Name	Scientific Name	Indicator	Planting Density	Growth Rate
Zone 1 (wet conditions)				
River Birch	*Betula nigra*	FACW		rapid
Green Ash	*Fraxinus pennsylvanica*	FACW		rapid
Cottonwood, Swamp	*Populus heterophylla*	OBL		moderate
Oak, Overcup	*Quercus lyrata*	OBL		moderate
Oak, Willow	*Quercus phellos*	FACW-		rapid
Coastal plain willow	*Salix caroliniana*	OBL		rapid
Bald Cypress	*Taxodium distichum*	OBL		rapid
Zone 2 (mesic conditions)				
American sycamore	*Platanus occidentalis*	FACW-		rapid
Oak, Laurel	*Quercus laurifolia*	FACW		rapid
Shumard's oak	*Quercus shumardii*	FACW-		moderate
Oak, Swamp Chestnut	*Quercus michauxii*	FACW-		moderate
Oak, Water	*Quercus nigra*	FAC		rapid
Oak, Cherrybark	*Quercus pagoda*	FAC+		moderate
Oak, Willow	*Quercus phellos*	FACW-		rapid
Green Ash	*Fraxinus pennsylvanica*	FACW		rapid



Proposed Land Use	Worley Parcel	Kornegay Parcel	Total
Buffer Restoration (acres)	3.5	0	3.5
Buffer Restoration (sq.ft.)	150,865	0	150,865
Nutrient Uptake (acres)	30.6	8.2	38.8
Nutrient Uptake (lbs)	69,553.8	18,638.6	88,192.4
Additional Easement Area (acres)	12.0	0.0	12.0
Total Easement Area (acres)	46.1	8.2	54.3

Figure 4
Conceptual Mitigation Plan
Rudolph Buffer/Nutrient Offset Site

0 200 400 800 Feet
1 inch = 400 feet

JOHNSTON COUNTY

Site Preparation

The majority of the site slated for buffer restoration has been maintained as cleared agricultural fields. These areas are relatively clear and will require little site preparation other than select herbicide treatments or limited mechanical clearing to remove undesirable underbrush prior to planting. The cultivated field will be ripped to at least 18 inch depth and disked, using standard farming equipment in an overlapping pattern. This will break up any plow layers and restrictive horizons present, increasing surface storage to promote nutrient uptake on this site. The microtopography will mimic natural conditions found in natural buffers. After the mechanical site preparation, all disturbed areas will be planted using an annual seed mix. The seed mix will hold the soil, reduce weed competition, and create a microclimate conducive to seedling growth. Species included in the annual seed mix are listed in **Table 5**.

Table 5. Annual Seed Mix Composition

Species	Common Name	Percent
Elymus virginicus	Virginia wild rye	20
Panicum virgatum	Switchgrass	20
Rudbeckia hirta	Black-eyed susan	10
Panicum clandestinum	Deer tongue	20
Andropogon gerardii	Big bluestem	10
Juncus effusus	Soft rush	10
Schizachyrium scoparium	Little bluestem	5
Sorghastrum nutans	Indian grass	5

Rate: 20 pounds per acre

EBX will manage nuisance vegetation growth by mowing in between planted trees as needed during the monitoring period. If necessary, selective application of a pre-emergent herbicide will be used to control weedy competition. This management has show in the past to provide the necessary advantage to planted seedling during their establishment. This release technique temporarily removes competition until the woody buffer vegetation has become well established.

SUCCESS CRITERIA

Buffer vegetative success criteria are based upon the density and growth of target tree species as shown in **Table 4**. Vegetative success criteria will be based upon guidelines set forth in the *Guidelines for Riparian Buffer Restoration* prepared by the North Carolina Ecosystem Enhancement Program and shall be defined as a success rate equivalent to 320 live stems per acre at the end of the 5-year monitoring period. Volunteer species not listed in the planting plan, such as loblolly and sweetgum, can only be counted to a maximum of 20 percent of the total trees counting toward the target criterion of 320 stems per acre after five years of monitoring.

If vegetative success criteria are not achieved based on acreage density calculation from combined monitoring plots over the entire restoration area, or if an inspection of the buffer restoration site indicate that portions of the site do not have sufficient stem densities or are otherwise deficient, supplemental planting shall be performed with tree species approved by NCDWQ. Supplemental planting shall be performed as needed until vegetative success criteria are met. No quantitative measurements of herbaceous vegetation performance will be required to meet the vegetative success criteria. The quantity of monitoring plots shall be determined in accordance with the Carolina Vegetation Sampling Protocol (levels I & II), such that no more than 2 percent of the parcel is encompassed in monitoring plots. Size will be standard 1/10

hectare plots and will be sampled according to the *Carolina Vegetative Sampling Protocol* (Lee et al., 2006).

MONITORING PLAN

EBX shall submit to NCDWQ an annual monitoring report, no later than December 31, for each year for five consecutive years after the first full growing season, describing the conditions of the parcel and relating those conditions to the success criteria detailed in the above sections. Each annual report shall contain the following:

1. USGS map;
2. Detailed narrative summarizing the condition of the bank and all regular maintenance activities;
3. Site map showing location of sampling plots;
4. Photo log of each sampling plot;
5. Monitoring data, including specific vegetation counts and photographs;
6. A copy of the nutrient offset credit ledger; and
7. A copy of the buffer credit ledger.

III. MITIGATION POTENTIAL

This Bank Parcel Development Package presents 54.3 acres of permanent conservation easement at the Rudolph Buffer/Nutrient Offset Site in Johnston County, North Carolina. There are currently 6.4 acres in the Conservation Reserve Program (CRP). The CRP areas within the proposed easement will be removed from the CRP program prior to planting with appropriate hardwood species and placement under a permanent conservation easement. The purpose of this project is to generate riparian buffer and nutrient mitigation credits for the EBX Neuse Riparian Buffer Umbrella Mitigation Bank. The site is consistent with applicable state guidance and the provisions of the EBX Neuse Riparian Buffer Umbrella Mitigation Banking Instrument (RBMBI). The legal limits of the mitigation site will be finalized when the conservation easement is recorded. The parcel boundaries and proposed easement limits displayed in the report are based on Johnston County GIS data and field collected GPS data. The final recorded conservation easement will be consistent with the RBMBI provisions.

Nutrient reduction offsets and riparian buffer credits may be used to offset payments authorized by state certifications required for compliance with wastewater discharge requirements, basinwide stormwater requirements, and nutrient offset payments. The Rudolph Site credits will be used in the hydrologic unit code (HUC) 03020201. All activities will be consistent with rules adopted by the Environmental Management Commission and all other applicable authorities.

BUFFER AND NUTRIENT MITIGATION CREDITS

The Rudolph Site will generate up to 150,865 buffer mitigation units from the restoration of a 50-foot wide buffer along the banks of Channel A. Re-planting of a 200-foot buffer along Channels A-D will generate up to 88,192.4 nitrogen credits at a rate of 2,273 credits per acre. Buffer mitigation credits generated in the 50-foot stream buffer may be used for either buffer mitigation or nutrient offset mitigation; not both. The buffer restoration areas could generate up to 7,955.5 additional nitrogen credits, if so used. The nutrient offset credit ledger and the buffer credit ledger, together, will account for all mitigation credits and debits. The legal limits of the mitigation site and final credit generation will be finalized when the conservation easement is recorded. The Rudolph Site will service impacts within the USGS 8-digit HUC 03020201 and North Carolina Division of Water Quality (DWQ) sub-basin 03-04-02. The anticipated buffer and nutrient mitigation credits that the Rudolph Site will generate are summarized in **Table 6**.

Table 6. Rudolph Buffer and Nutrient Mitigation Credit

Proposed Land Use	Rudolph Parcel	Kornegay Parcel	Total
Buffer Restoration (acres)	3.5	0.0	3.5
Buffer Restoration (sq.ft.)	150,865	0	150,865
Nutrient Uptake (acres)	30.6	8.2	38.8
Nutrient Uptake (lbs)	69,553.8	18,638.6	88,192.4
Additional Easement Area (acres)	12.0	0.0	12.0
Total Easement Area (acres)	46.1	8.2	54.3

IV. MONITORING AND MAINTENANCE

HUC SERVICE AREA

The Rudolph Site will serve impacts in HUC 03020201. This HUC encompasses the upper Neuse River drainage area and its major and minor tributaries. The use and application of the credits will be consistent with the Mitigation Banking Instrument of the EBX Neuse Riparian Buffer Umbrella Mitigation Bank. The mitigation credits may also be used in other authorized HUCs on a case-by-case basis, as approved by DWQ.

MONITORING

Successful restoration of the vegetation on the mitigation site is dependent upon active planting of preferred canopy species and volunteer regeneration of the native plant community. In order to determine if the criteria are achieved, EEP-CVS vegetation monitoring plots will be installed throughout the restoration site. The number of plots required will be based on the EEP-CVS plot area curve method. The cumulative size of installed plots will cover approximately 2% of the restoration site. The individual plots will be 0.01 hectare (100 square meters) in size and follow the Level I and Level II monitoring protocol.

Vegetation monitoring will occur in spring after leaf-out has occurred. Individual plot data will be provided and will include diameter, height, and density measurements. Relative values will be calculated and importance values will be determined. Individual seedlings will be marked such that they can be found in succeeding monitoring years. At the end of the first growing season, species composition, density, and survival will be evaluated. For each subsequent year, until the final success criteria are achieved, the restored site will be evaluated between July and November.

The monitoring will occur annually for five years. Monitoring reports will be submitted annually following monitoring. Future site visits by the easement holder will be conducted annually unless the easement holder is notified of unauthorized activities. Unauthorized activities will be investigated and reported immediately to DWQ. Remedial action will be taken if required by DWQ.

CREDIT RELEASE

The release of credits for the site will be as specified in the provisions of Mitigation Banking Instrument of the EBX Neuse Riparian Buffer Umbrella Mitigation Bank.

CONSERVATION EASEMENT

A permanent conservation easement will be placed over the mitigation areas in perpetuity. The easement will be recorded in the chain of title in the land records of Johnston County. The conservation easement will be held by an approved non-profit conservation organization. The conservation easement boundary will be marked with signs on yellow, metal poles spaced every 100 feet.

FINANCIAL ASSURANCES

Upon approval of the Rudolph Site Restoration Plan, the buffer sponsor will provide to DWQ financial assurances for the pre-construction release of credits in the form of performance bonds, letters of credit, or casualty insurance. Such financial assurances shall be in the amount of 20 percent of the credits anticipated to be generated multiplied by the current EEP price for riparian buffer mitigation in the Neuse River Basin. Such financial assurances shall be retired upon submittal of the As-Built report.

V. REFERENCES

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Appendix A

Photo Log

Channel A – upstream end and adjacent unbuffered agricultural field

Channel A – downstream end, adjacent farm road, and unbuffered agricultural field

Channel B – upstream end and adjacent unbuffered agricultural field

Channel B – downstream end in existing disturbed hardwoods

Channel C – upstream end and adjacent unbuffered agricultural field

Channel C – downstream end, adjacent unbuffered agricultural field and existing hardwood regeneration

Channel D – upstream end

Channel D – downstream end