Daniels Farm #2 Wetland Restoration Site
Franklin County, North Carolina

Wetland Restoration Plan

Contract No. D05025

North Carolina Ecosystem Enhancement Program

February 2006

Daniels Farm #2 Wetland Restoration Site

Franklin County, North Carolina

SCO Contract No. D05025
KCI Project No. 12054238

Wetland Restoration Plan

Prepared for:
NCDENR-EEP
1652 Mail Service Center
Raleigh, NC 27699-1652

Prepared by:
KCI Technologies, Inc.
4601 Six Forks Road, Suite 220
Raleigh, NC 27609

Joseph J. Pfeiffer, Project Manager
jpfeiffer@kci.com
919-783-9214

February 2006

EXECUTIVE SUMMARY

The Daniels Farm #2 wetland restoration project will restore, enhance, and preserve a Piedmont Bottomland Hardwood wetland community along the Tar River in central Franklin County. This project proposes to improve water quality and protect aquatic habitat in a predominantly agricultural area by restoring and enhancing 19.7 acres of wetland and preserving 10.4 acres of intact wetland. The proposed restoration sites have undergone severe degradation from unrestricted agricultural activities and human-induced disturbances.

The site is located southeast of Louisburg, North Carolina in Franklin County and is situated on an unnamed tributary to the Tar River within the United States Geologic Survey (USGS) 8-digit Hydrologic Unit Code (HUC) 03020101. The project watershed occupies 313.8 acres and drains directly to the Tar River. The area within the project watershed is in a rural section of Franklin County and consists primarily of forest and agriculture. The site is located within the Piedmont physiographic province and is part of the Northern Outer Piedmont Level IV Ecoregion.

The project site is contained in a small, shallow drainage leading to the Tar River. Much of the land has been selectively logged and ditches and berms have altered the site hydrology. A first-order, unnamed tributary to the Tar River (UTTR) bisects the site, flowing north shortly before turning east-southeast and flowing into the Tar River just below the project site boundary. The stream originates from a series of seeps and three ponds directly south of the project site and then gathers groundwater and additional drainage, which allows it to maintain a year-round perennial flow. In addition to the UTTR, there is a network of drainage ditches that have been constructed to drain the site for forestry and agriculture.

A soils investigation was conducted by a certified soil scientist from KCI to determine the extent and distribution of the soil types on the site. Based on these field results, the dominant soil type within the project site is Roanoke (fine, mixed, semiactive, thermic Typic Endoaquults) with occasional small inclusions of Altavista (fine-loamy, mixed, semiactive, thermic Aquic Hapludults) and Wahee (fine, mixed, semiactive, thermic Aeric Endoaquults). Roanoke consists of very deep, poorly drained, slowly permeable or very slowly permeable soils that have a moderate shrink-swell potential and is defined as hydric in Franklin County's soil survey.

During numerous field visits, KCI studied the factors governing the existing site wetlands. The hydrology for the site wetlands is driven primarily by surface water inputs: precipitation, overland flow from upstream slopes, overbank events from the UTTR, and periodic flooding from the Tar River, all of which are detailed in the site water budget. A wetland delineation was performed to establish the boundaries of the existing wetlands. KCI also conducted a hydrologic analysis to determine which of these wetlands are within the 5-year Tar River floodplain. The limits of the 5-year floodplain were converted into an approximate boundary separating riverine and nonriverine wetlands. Based on these analyses, there are currently 13.75 acres of drained hydric soils, 4.51 acres of modified wetlands, and 10.27 acres of existing high quality wetland within the 5-year floodplain of the Tar River.

The wetland restoration areas at the project site include two agricultural fields as well as a forested section along the UTTR. These sections have the necessary hydric soils, but do not contain adequate vegetation and hydrology for jurisdictional wetland status. Hydrologic restoration will focus on filling in ditches that were constructed to drain the historic wetlands. Wetland microtopography will be created to lengthen the path and slow the flow of water through the wetlands. Combined together, these actions will allow surface and floodwaters to have greater access to the wetlands. The restored sites will also be replanted with hardwood species typical of a Piedmont Bottomland Hardwood Community.

Forested land in the southwestern corner of the project site has jurisdictional wetland status, but will benefit from enhancement. This section is believed to have contained a DA stream system before berms and ditches changed the flow patterns through the wetland. KCI will aim to recreate a DA system, which consists of a stable, braided stream with three or more channels. Filling the ditches, removing the berms that alter flow, and allowing the stream to spread throughout the wetland will allow natural DA-type flow patterns to form. The enhancement area will also be planted with hardwood species to increase species diversity among the existing vegetation.

In addition to the restoration and enhancement portions of the project, there will also be 10.27 acres of riverine wetland preserved. This wetland is located in the southeastern section of the project site and contains a functioning Piedmont Bottomland Hardwood Community. Small inclusions of upland and nonriverine wetland will also be included in the project in order to restore fully the surrounding ecosystem.

A monitoring program will be implemented to observe the progress toward achieving mitigation goals and objectives within the restored wetland areas. Monitoring data will be collected annually for a period of five years or until vegetative and hydrologic success criteria are achieved.

DANIELS FARM #2 RESTORATION PLAN

TABLE OF CONTENTS

INTRODUCTION 1
1.0 PROJECT SITE IDENTIFICATION AND LOCATION 1
1.1 Directions to Project Site 1
1.2 USGS Hydrologic Code and NCDWQ River Basin Designations 1
2.0 WATERSHED CHARACTERIZATION 1
2.1 Drainage Area 1
2.2 Surface Water Classification / Water Quality 1
2.3 Physiography, Geology and Soils 4
2.4 Historical Land Use and Development Trends 4
2.5 Endangered / Threatened Species 6
2.6 Cultural Resources 7
2.7 Potential Constraints 7
3.0 PROJECT SITE WETLANDS 9
3.1 Jurisdictional Wetlands 9
3.2 Hydrological Characterization 9
3.3 Soil Characterization 14
3.4 Plant Community Characterization 15
4.0 REFERENCE WETLANDS 16
4.1 Hydrological Characterization 16
4.2 Soil Characterization 16
4.3 Plant Community Characterization 16
5.0 PROJECT SITE RESTORATION PLAN 17
5.1 Restoration Project Goals and Objectives 17
5.2 HEC-RAS Analysis 19
5.3 Hydrological Modifications 20
5.4 Natural Plant Community Restoration 22
6.0 PERFORMANCE CRITERIA 25
6.1 Hydrology 25
6.2 Vegetation 25
6.3 Schedule / Reporting 26

7.0 REFERENCES 27

FIGURES

Figure 1. Site Location 2
Figure 2. Project Watershed 3
Figure 3. Project Soils 5
Figure 4. Floodplain Map 8
Figure 5. Existing Hydrologic Features 10
Figure 6. Existing Wetlands 11
Figure 7. Project Site Plan 18
Figure 8. Proposed Restoration Activities 21
Figure 9. Planting Plan 23

TABLES

Table 1. Existing Land Use in Project Watershed (Anderson I Classification) 4
Table 2. Species in Franklin County, North Carolina Listed Under the Federal Endangered Species Act 6
Table 3. Constraints Within the Project Watershed 7
Table 4. Soil Properties for the Restoration Site. 15
Table 5. Mitigation Type and Extent 19

APPENDICES

Appendix 1. Historical Aerial Photographs
Appendix 2. Correspondence
Appendix 3. USACE Routine Wetland Determination Data Forms
Appendix 4. USACE Approved Wetland Boundary
Appendix 5. Gauge Data and Charts
Appendix 6. Water Budget
Appendix 7. Vegetative Sampling
Appendix 8. No-rise Certification
Appendix 9. Project Photographs

INTRODUCTION

This restoration plan outlines the existing conditions at the Daniels Farm #2 Site and describes the process that will be used to restore and protect a wetland system directly adjacent to the Tar River. Using results from field studies and a literature review, this document provides an overview of the planned restoration project. The hydrology, soils, and vegetative communities at a reference wetland area are described as a model and are used to shape the final restoration design.

This project proposes to improve water quality and protect aquatic habitat in an agricultural area by restoring and enhancing 19.7 acres of wetland and preserving 10.4 acres of intact wetland. The proposed restoration sites have undergone severe degradation from unrestricted agricultural activities and human-induced disturbances. As a result, the ecological diversity and water quality values of the site have been severely reduced. In order to restore a functioning wetland system, hydrologic alterations will be removed and the site will be replanted with native wetland species. Livestock will also be permanently excluded from the wetlands. These actions will reduce both point source and nonpoint source nutrient and sediment inputs into the system and improve aquatic and terrestrial habitat. The completed project is in a unique position to protect the entire local drainage by connecting an extensive wetland restoration project on an adjacent upgradient portion of the Daniels Farm with this site before the confluence with the Tar River directly downstream of the project site.

1.0 PROJECT SITE IDENTIFICATION AND LOCATION

1.1 Directions to Project Site

The Daniels Farm #2 Site is located one mile east of the intersection of Egypt Church Road (SR 1604) and NC Route 39 and is approximately 2.4 miles southeast of Louisburg, North Carolina in Franklin County. Figure 1 shows the location of the site within the region. The site is located in the east-central portion of the Louisburg USGS 7.5' Topographic Quadrangle (1984). The latitude and longitude coordinates at the center of the site are 36.061387, -78.274728 (WGS84).

1.2 USGS Hydrologic Code and NCDWQ River Basin Designations

The project site is situated on an unnamed tributary to the Tar River within the Tar-Pamlico River Basin within the North Carolina Division of Water Quality (DWQ) Sub-basin 03-03-01 and United States Geologic Survey (USGS) 8-digit Hydrologic Unit Code (HUC) 03020101. The restoration area is within the Local Watershed Unit 03020101040070 (14-digit HUC) and the North Carolina Ecosystem Enhancement Program (NCEEP) Tar-Pamlico River Basin Watershed Restoration Plan has identified this unit as a high-priority, Targeted Local Watershed.

2.0 WATERSHED CHARACTERIZATION

2.1 Drainage Area

The project watershed occupies 313.8 acres and drains directly to the Tar River as seen in Figure 2. The area comprising the watershed is in a rural section of Franklin County and is primarily made up of forest and agriculture.

2.2 Surface Water Classification / Water Quality

The NCDWQ assigns surface water classifications in order to help protect, maintain, and preserve water quality. The unnamed tributary to the Tar River (UTTR) within the project site has not been rated by the NCDWQ, but the Tar River [NCDWQ Stream Index 28-(24.7)] from the Louisburg water supply intake to a point 3.2 miles downstream of NC Route 581 is classified as WS-V and is also protected for Class C uses. WS-V Waters are generally upstream and draining to Class WS-IV waters, waters used by industry to supply their employees with drinking water, or waters formerly used as water supply. Class C Waters are protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival,

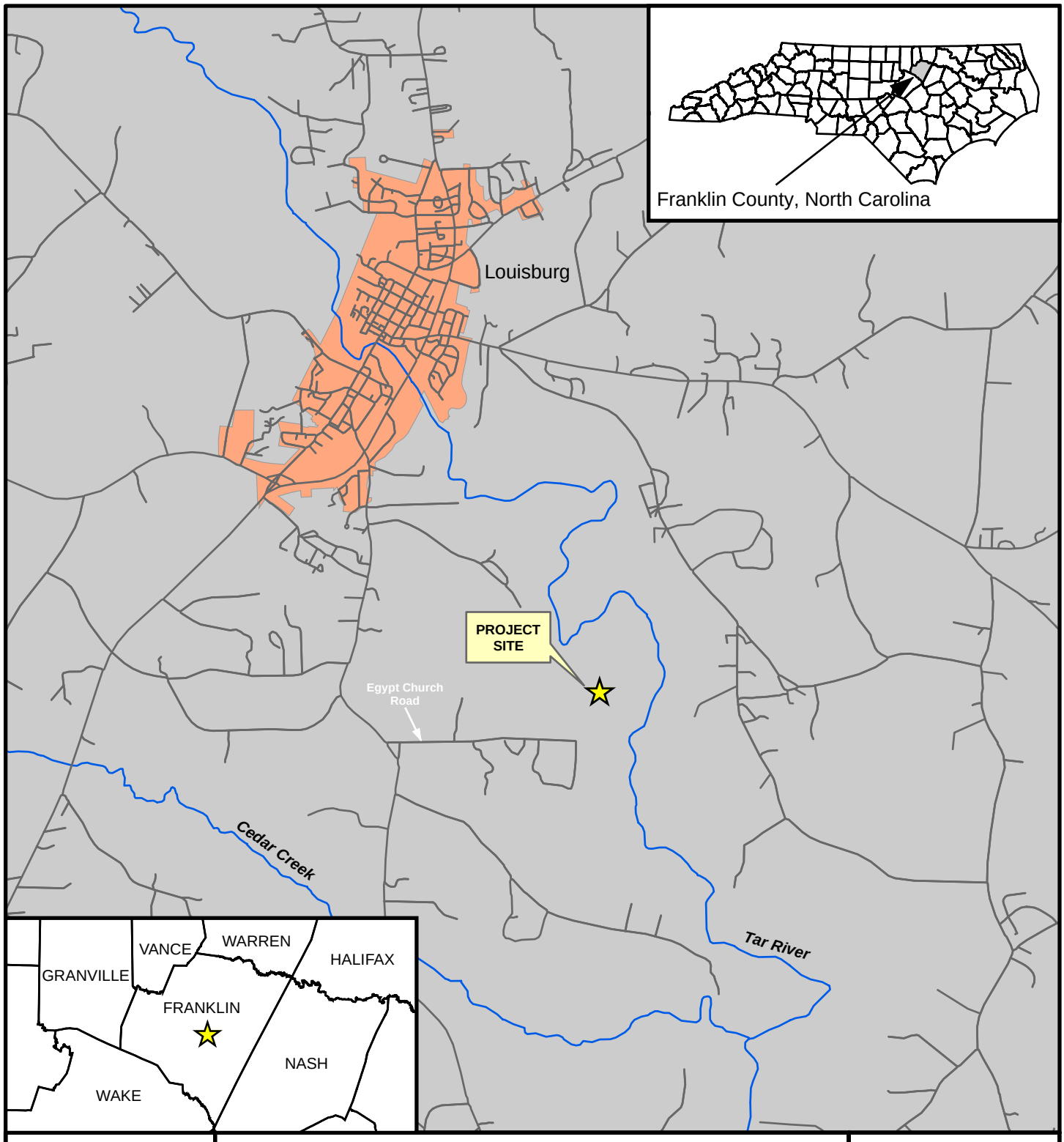


Figure 1. Site Location

- Project Site
- Roads
- Major Rivers
- Municipalities
- Counties

N
W E
S

1:63,360
1 inch equals 1 miles

1 0.5 0 1 Miles

KCI TECHNOLOGIES

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

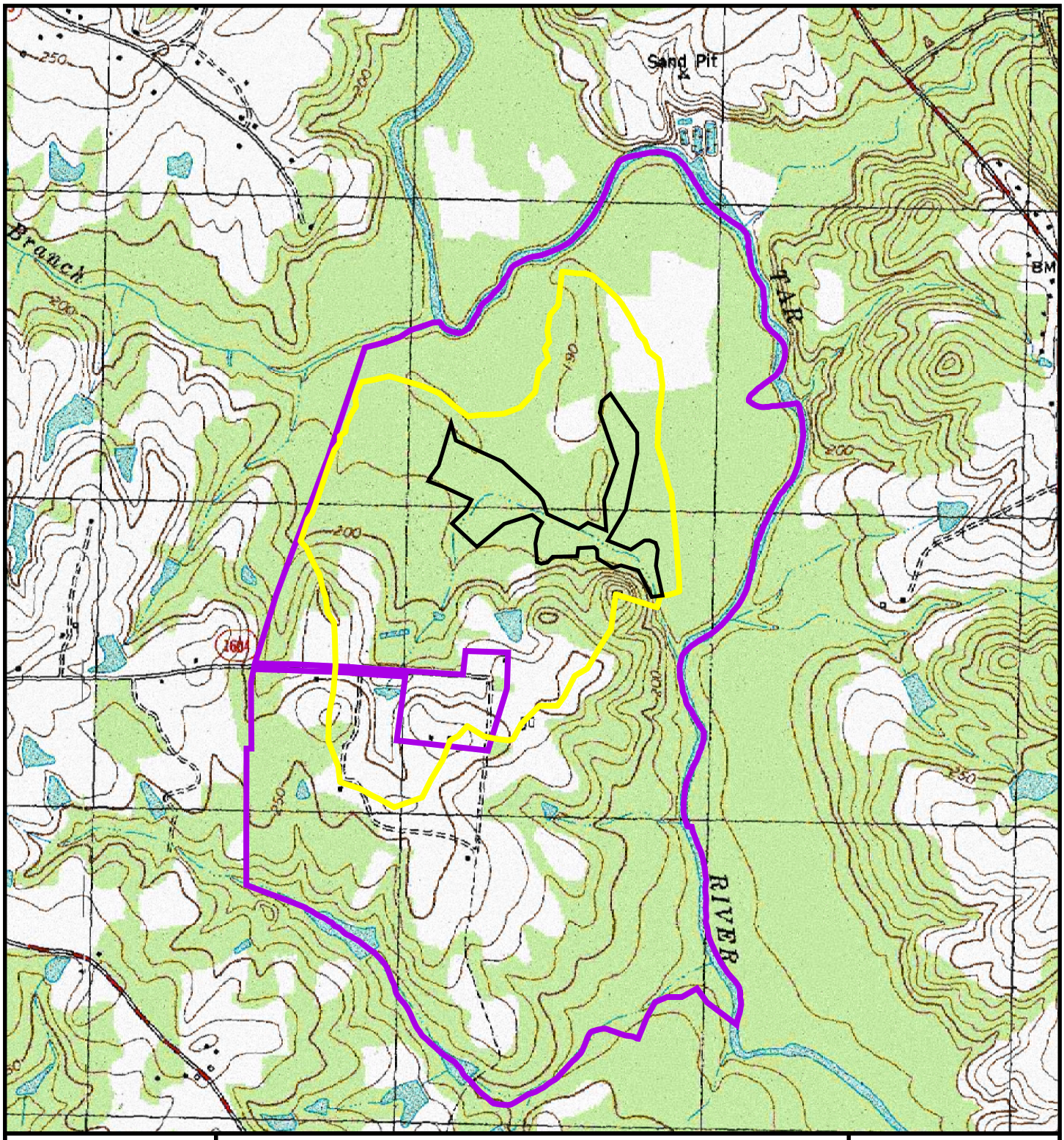


Figure 2. Project Watershed

Project Watershed

Approximate Parcel Boundary

Project Site Boundary

N
W E
S

1:18,000

1 inch equals 1,500 feet

1,500 750 0 1,500 Feet

Source: USGS Topographic Quadrangle Louisburg, 1984

KCI TECHNOLOGIES

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

agriculture, and other uses suitable for Class C. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner. There are no restrictions on watershed development or types of discharges. This portion of the Tar River and its tributaries are additionally designated as Nutrient Sensitive Waters (NSW), a supplemental classification intended for waters that require additional nutrient management, because they are susceptible to excessive growth of microscopic or macroscopic vegetation (NCDENR DWQ 2005).

There are no impaired waters within the project watershed or within the local 14-digit cataloging unit.

2.3 Physiography, Geology and Soils

The project watershed is located within the Piedmont physiographic province and is part of the Northern Outer Piedmont Level IV Ecoregion. The site is only about 12 miles west of the edge of the Rolling Coastal Plain Level IV Ecoregion, which is part of the Southeastern Plains physiographic region.

The geology of the site is comprised of foliated to massive granitic rock, an intrusive rock of the Raleigh Belt. This formation is megacrystic to equigranular with intrusions of the Rolesville suite, Wise, and possibly Lemon Springs (NCDENR Geologic Survey).

According to the county soil survey, the dominant soils within the project site are the Roanoke-Wahee Complex with minor inclusions of Altavista Sandy Loam. Roanoke-Wahee soils are low gradient, very deep, somewhat poorly to poorly drained soils found on floodplains and stream terraces. Altavista Sandy Loam is low gradient, very deep, moderately well drained soils found on low stream terraces. Additional soils within the project watershed include Appling Loamy Sand, Wedowee Sandy Loam, Vance Sandy Loam, State Loam, Wake-Saw-Wedowee Complex, and Cecil Sandy Loam (USDA, NRCS 1998). Figure 3 shows the soils in the project watershed, although a detailed soil investigation by KCI revealed several departures from the mapped soil units on the project site (see Section 3.3).

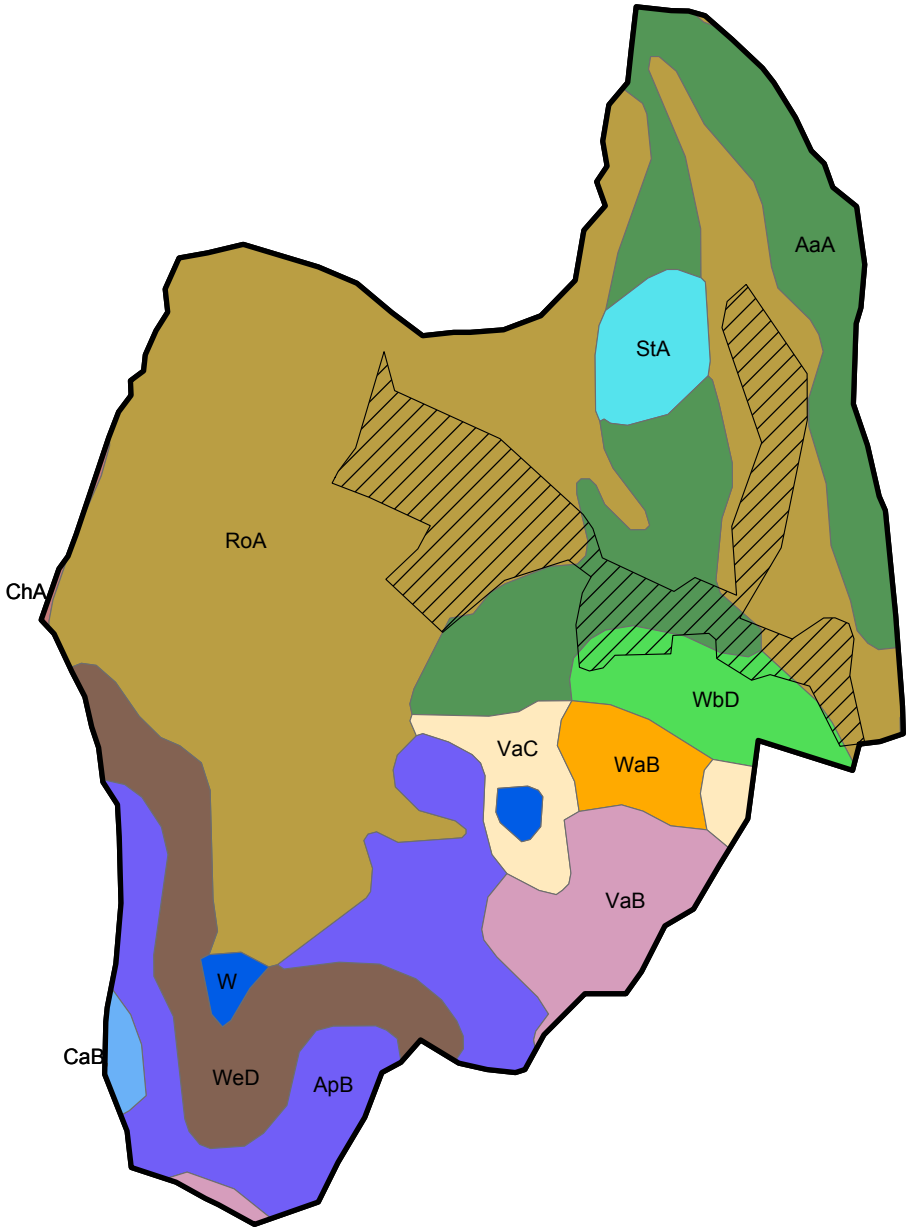
2.4 Historical Land Use and Development Trends

Due to the rural nature of the area, the development pressure is considered low in the watershed. There are no obvious signs of increasing development. Based on an Anderson Level I land use assessment using the North Carolina GAP land cover dataset, which used 1992/3 aerial photographs, the project watershed is approximately 40% forest, 35% rangeland, 20% agriculture, and 4% wetland (McKerrow 2003). Adjacent to the restoration site are 31.7 acres of former agricultural land that were restored to nonriverine wetland (Low Elevation Seeps and Nonriverine Wet Hardwood Forest communities) in 2003 by KCI Associates of North Carolina, which were not captured in the land use assessment. Table 1 shows the land uses in the project watershed.

Table 1. Existing Land Use in Project Watershed (Anderson I Classification)

Land Use	Acreage	Percentage
Forest land	126.3	40.3%
Rangeland	110.3	35.2%
Agricultural	63.4	20.2%
Wetland	12.0	3.8%
Water	1.8	0.6%
Total	**313.8 acres**	

*These values exclude the conversion of 31.7 acres of agriculture to nonriverine wetland in 2003 by KCI Associates of North Carolina.



Soil Series

- AaA - Altavista Sandy Loam, 0 To 3 Percent Slopes, Rarely Flooded
- ApB - Appling Loamy Sand, 2 To 6 Percent Slopes
- CaB - Cecil Sandy Loam, 2 To 6 Percent Slopes
- ChA - Chewacla And Wehadkee Soils, 0 To 3 Percent Slopes, Frequently Flooded
- RmA - Riverview And Buncombe Soils, 0 To 3 Percent Slopes, Frequently Flooded
- RoA - Roanoke-Wahee Complex, 0 To 3 Percent Slopes, Occasionally Flooded
- StA - State Loam, 0 To 3 Percent Slopes, Rarely Flooded
- VaB - Vance Sandy Loam, 2 To 6 Percent Slopes
- VaC - Vance Sandy Loam, 6 To 10 Percent Slopes
- WaB - Wake-Saw-Wedowee Complex, 2 To 8 Percent Slopes, Rocky
- WbD - Wake-Wateree-Wedowee complex, 8 to 15 Percent Slopes, Rocky
- WeD - Wedowee Sandy Loam, 10 To 15 Percent Slopes
- Water

KCI TECHNOLOGIES

Figure 3. Project Soils

Project Watershed

Project Site Boundary

N
W E
S

1:10,800

1 inch equals 900 feet

900 450 0 900 Feet

Source: Soil Survey of Franklin County, NC

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

Aerial photographs were examined to understand the historical conditions at the project site (Appendix 1). Images from 1938, 1955, 1973, 1982, and 2000 were reviewed in order to help determine the chronology of land use at the site and to assist in the development of an appropriate restoration strategy. Aerial photographs of the site were obtained from the USDA NRCS District Office in Franklin County.

- The 1938 aerial photograph shows the property covered primarily with forest. Drainage ditches are present in the northwest corner of the site, which indicates that this portion of land was likely under cultivation at the time. Much of the land in the general vicinity around the property had been cleared for agricultural production.
- As of the 1955 aerial photograph, the land within the project boundary remained predominantly forested. The land in the northwest corner that was cleared in the 1938 photograph had grown over by 1955.
- The land use at the project site remained unchanged in the 1973 image. Across the landscape, however, there were isolated areas, primarily along the Tar River, that were cleared for agriculture between 1955 and 1973.
- In the 1982 aerial photograph, the northeast corner of the project site had been cleared for agriculture and was apparently under cultivation. Additional land in the general vicinity of the site was cleared and ditched for agriculture between 1973 and 1982.
- By the 2000 aerial, the northwest portion of the project site had also been cleared of vegetation and drainage ditches are clearly evident. No other apparent changes took place between 1982 and 2000.

Based on the historical aerial photos reviewed for this site, the Daniels Farm #2 Site was primarily forested until sometime between 1973 and 1982, when portions of the site were cleared for agricultural production. There is no visible evidence of mass disturbance such as filling or mining on the property in any of the review photographs.

2.5 Endangered / Threatened Species

As part of the initial environmental documentation for this project, a Categorical Exclusion (CE) was completed for the site. A review of endangered species and a biological determination of no effect from proposed project are included in the CE. A summary of the information has been included below and more detailed information can be found in the CE.

A review of the United States Fish and Wildlife Service's (USFWS) listings of federally endangered or threatened species under the Endangered Species Act revealed three species in Franklin County. Table 2 details the findings of this search. There is no critical habitat designated in the county.

Table 2. Species in Franklin County, North Carolina Listed Under the Federal Endangered Species Act

Major Taxonomic Group	Scientific Name	Common Name	Federal Status
Mollusk	*Alasmidonta heterodon*	Dwarf Wedge Mussel	Endangered
Mollusk	*Elliptio steinstansana*	Tar River Spinymussel	Endangered
Vascular Plant	*Rhus michauxii*	Michaux's Sumac	Endangered

A formal request was submitted to the North Carolina Natural Heritage Program (NCNHP) for review of the restoration project's potential impacts on endangered or threatened species. The NCNHP found no records of protected species within the project site, but did recommend taking precautions to prevent

excess sedimentation from moving downstream during construction in order to protect downstream mussel populations (see Appendix 2).

2.6 Cultural Resources

A visit to the North Carolina State Historic Preservation Office revealed no historic properties or archaeological resources within a two-mile vicinity of the project area.

KCI submitted a formal request for review of the site to the North Carolina State Historic Preservation Office (SHPO). The SHPO office responded that they were not aware of any cultural resources that would be affected by the restoration project (see Appendix 2).

2.7 Potential Constraints

As part of the CE documentation process, a limited Phase I site assessment was conducted to verify whether the site was listed in any state or federal environmental databases such as hazardous waste sites or underground storage tanks. The site was not identified in any database, and a summary of the limited Phase I report is included in the CE report. In addition, the project site was examined for any potential hindrances to a successful restoration project. The evaluation focused on hazardous materials, utilities, restrictive easements, and the potential for hydrologic trespass. Table 3 summarizes the identified constraints related to the implementation of site restoration activities.

Table 3. Constraints Within the Project Watershed

Potential Constraint	Present on Project Site?	Proposed Resolution
Adjacent Property Land Use	Agriculture, Forest, and Wetland	N/A
Deed Restrictions/Easements	No	N/A
Limited Access	No	N/A
Utilities	No	N/A
Structures	No	N/A
Natural Feature Barriers	No	N/A
FEMA Regulated Area	Project area within Zone AE	No-Rise Certification

2.7.1 Property Ownership and Boundary

The project site is entirely under the ownership of the Daniels Farm Inc. (Franklin County Parcel # 2814-32-4173).

2.7.2 Site Access

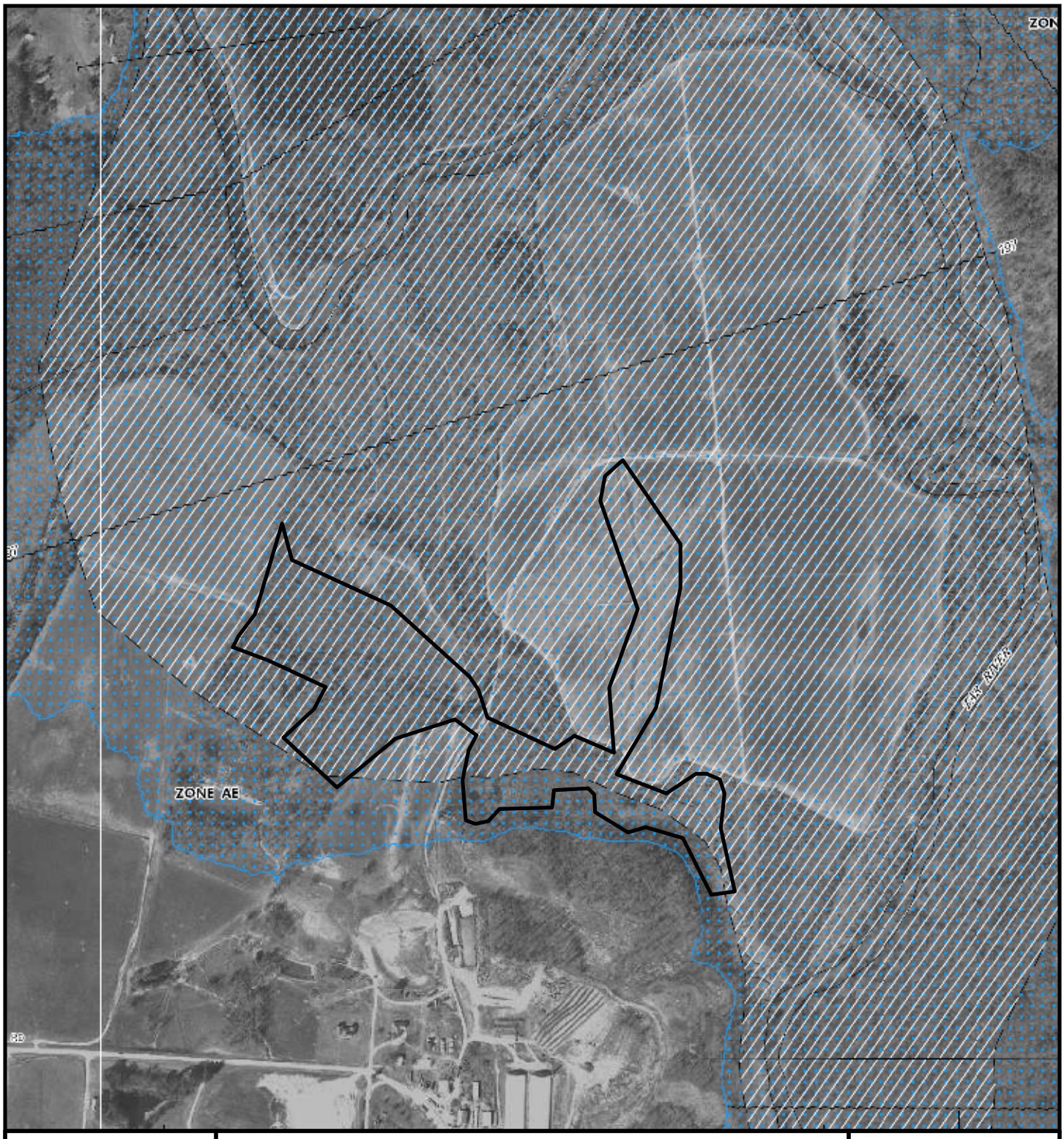
The site is reached from Egypt Church Road (SR 1604) as shown in Figure 1. From Egypt Church Road, legal access is guaranteed with an ingress/egress easement that enters the project site through the southwest corner. The landowners also allow passage through their property via a gravel road running through the center of the property.

2.7.3 Utilities

A search was completed to investigate any utilities within the project site and none were found.

2.7.4 FEMA / Hydrologic Trepass

The property is located within the 100-year floodplain of the Tar River as determined by the Federal Emergency Management Agency (FEMA). As shown in Figure 4, the entire project site is located in



KCI TECHNOLOGIES

Figure 4. Floodplain Map

Project Site Boundary

Floodway Areas in Zone AE

Special Flood Hazard Area
(Subject to inundation by the 1% annual chance flood)

Source: NC Floodplain Mapping Program, DFIRM Panel 2814

N
W E
S

1:8,400
1 inch equals 700 feet

700 350 0 700 Feet

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

Zone AE. The site is located within a small watershed that drains to the Tar River and the entire drainage is within the Daniels property. There will be no hydrologic trespass on any bordering properties.

3.0 PROJECT SITE WETLANDS

The project site is contained in a small, shallow drainage leading to the Tar River. The types of existing hydrologic features in the project area are shown in Figure 5. Much of the land within the project area has been selectively logged and ditches and berms have altered the site hydrology.

3.1 Jurisdictional Wetlands

Existing wetlands were delineated in August 2005 using the methods set out by the US Army Corps of Engineers (USACE) (1987). The delineation forms used for the project site are available in Appendix 3. The wetlands at the project site are shown in Figure 6 and were approved by the USACE as the existing jurisdictional wetlands (Appendix 4).

3.2 Hydrological Characterization

Project Streams and Ditches

A first-order, unnamed tributary to the Tar River (UTTR) bisects the site, flowing north shortly before turning east-southeast and flowing into the Tar River just below the project site boundary. The stream originates from a series of seeps and three ponds directly south of the project site and then gathers groundwater and additional drainage, which allows it to maintain a year-round perennial flow.

The upstream section of the UTTR within the project boundary flows northeast for approximately 220 feet. Wetland vegetation, including trees and shrubs, comprises the majority of the land use throughout this section. This forested area shows evidence of a multiple channel stream system before hydrologic modifications took place. There are many older, small channels that run down a gentle slope through this forested section, but a berm along the eastern side of the stream channel keeps water from extending into the forested wetland except during extreme events.

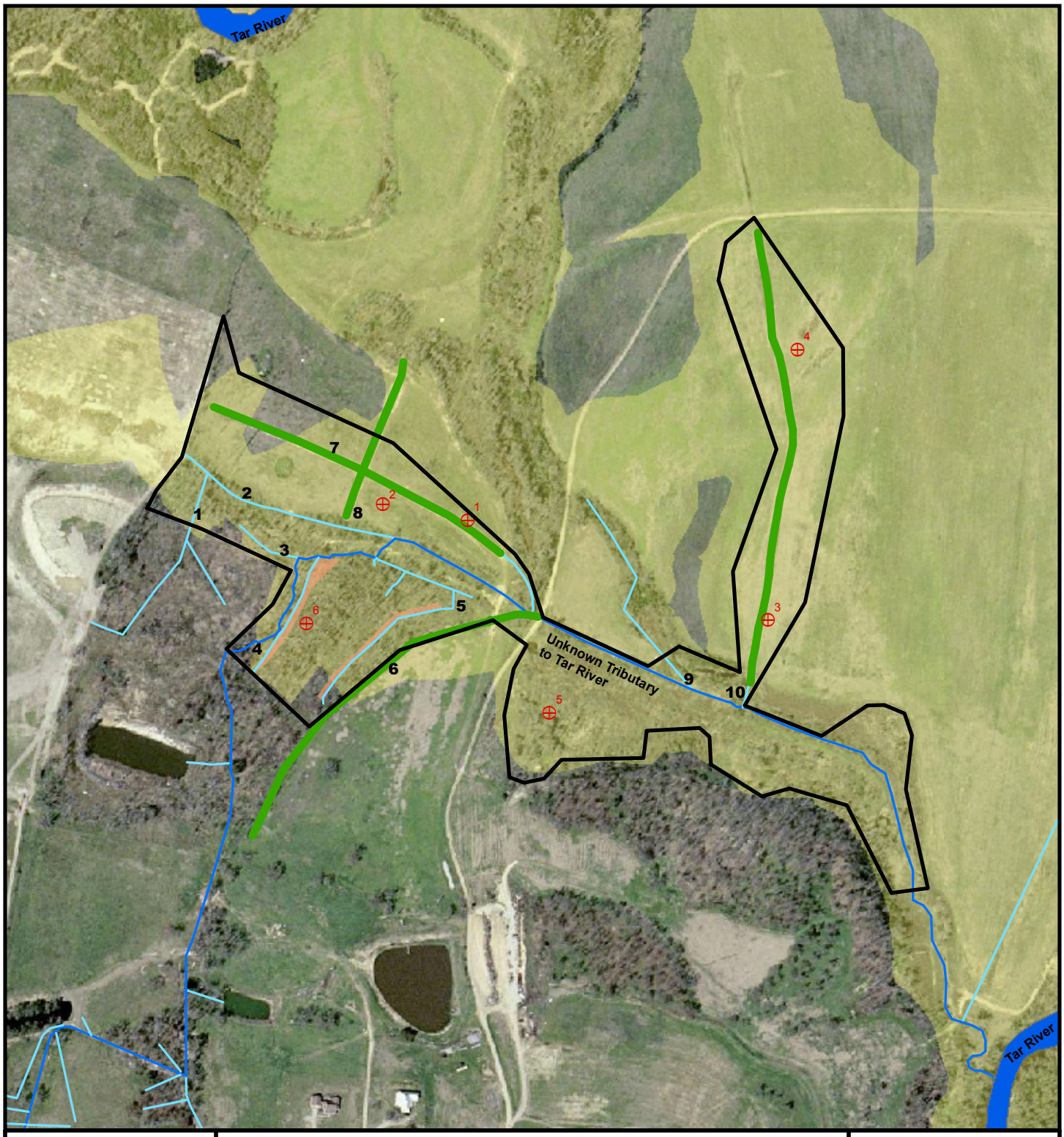
As the UTTR turns east-southeast, it enters a ditched channel that runs along an agricultural field to the north. This section has been altered significantly and drains a large amount of water from the project site. Once the UTTR crosses the existing roads via a culvert, the downstream reach within the project boundary consists of 1,750 feet of stream. This reach exhibits stable components and is functioning properly.

In addition to the UTTR, there is a network of drainage ditches that have been constructed to drain the site for forestry and agriculture. These ditches are shown in Figure 5 and consist of a combination of traditional ditches and more shallow grassed waterways.

Project Wetlands

The hydrology for the delineated wetlands is driven primarily by surface water inputs: precipitation, overland flow from upstream slopes, overbank events from the UTTR, and periodic flooding from the Tar River. These inputs provide the necessary hydrology to support the wetland system, although the existing ditches and berms prevent the wetland from experiencing the maximum amount of hydrologic inputs it could receive.

KCI also conducted a hydrologic analysis to determine which wetlands are within the 5-year Tar River floodplain. In order to complete this analysis, information was gathered from the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) Report for Franklin County, the annual maximum series of peak flood events for the Tar River Gauge in Louisburg (USGS Gauge 02081747),



KCI TECHNOLOGIES

Figure 5. Existing Hydrologic Features

- Project Site Boundary
- Groundwater Gauge
- Channelized Stream
- Drainage Ditch
- Grassed Waterways
- Tar River
- 5-year Floodplain
- Berm

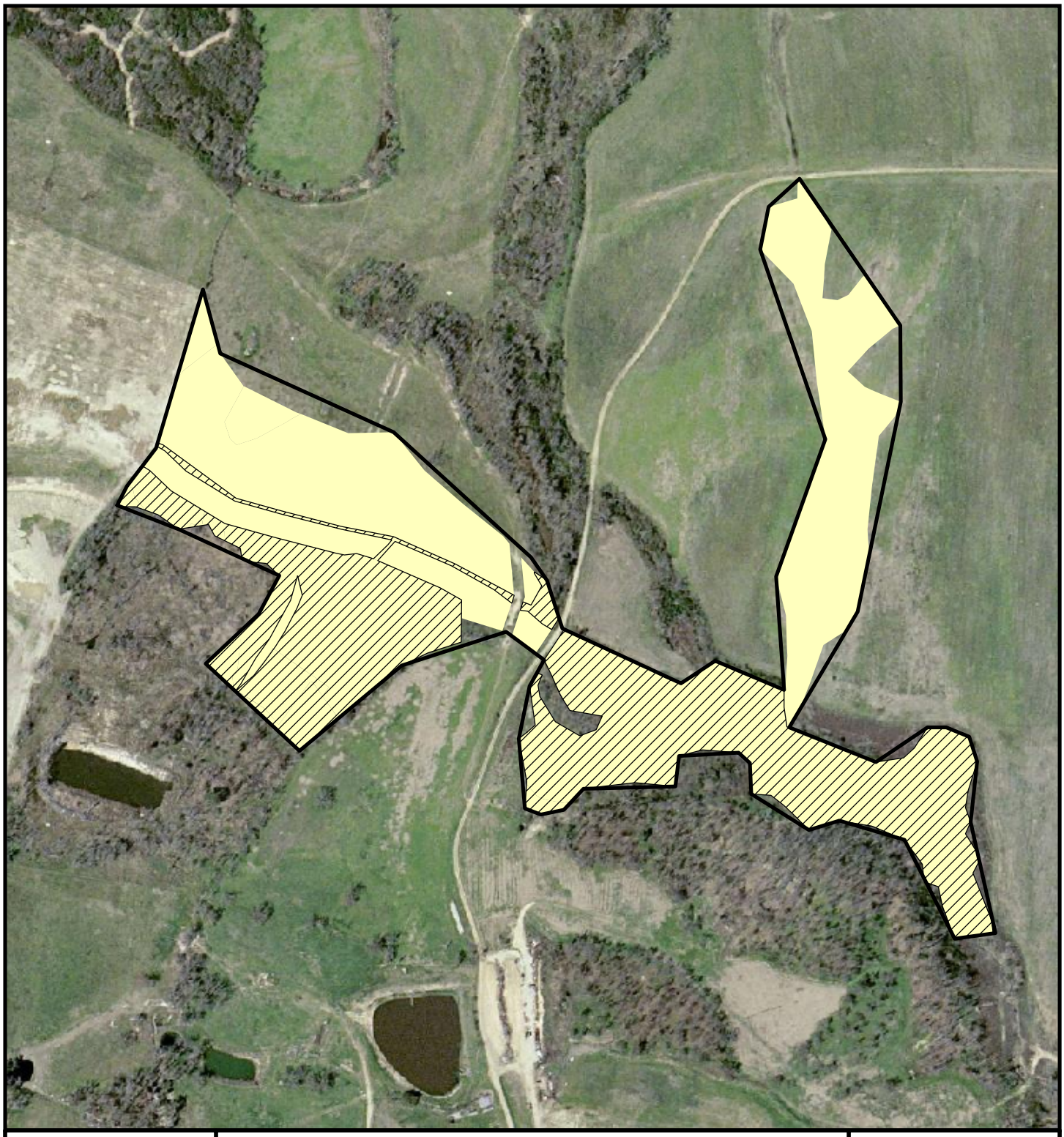
1:5,400
1 inch equals 450 feet

450 225 0 450 Feet

Image Source: AirPhotoUSA April 1, 2004

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.



KCI TECHNOLOGIES

Figure 6. Existing Wetlands

Project Site Boundary

Delineated Wetlands

Delineated Hydric Soils

1:4,800
1 inch equals 400 feet

400 200 0 400 Feet

Image Source: AirPhotoUSA April 1, 2004

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

and high-resolution LIDAR digital elevation models (DEM) from the North Carolina Floodplain Mapping Program.

A Log Pearson Type III flood frequency analysis was used to ascertain the discharge event associated with a 0.20 exceedance probability or 5-year return period. Based on an analysis of 40 years of peak data, it was determined that 9,975 cubic feet per second (cfs) represented this event at the Tar River Gauge Station. A 5-year flood event occurred on January 5, 1992 resulting in a stage of 21.57 feet (flood to elevation 197.32 feet). An evaluation of the flood profiles from the FIS report indicated that this correlated to a flood elevation of 187.52 feet in the vicinity of the Wolfpen Branch confluence (due north of the project site) and a flood elevation of 186.62 feet at the confluence of UTTR with the Tar River at the downstream project limits.

A bare-earth DEM of the subject flood panel was used to build a triangulated irregular network (TIN) of the surface on the Daniels Farm #2 Site and the surrounding areas. The flood elevations determined above were superimposed on this surface. Subsequently, the limits of the 5-year floodplain were converted into a boundary limit, which is presented in Figure 5.

Based on this analysis, there are currently 13.75 acres of drained hydric soils, 4.51 acres of modified wetlands, and 10.27 acres of existing high quality wetland within the 5-year floodplain of the Tar River. The drained hydric soils have been used for agriculture and currently do not qualify as jurisdictional wetlands. The 4.51-acre portion of modified wetland exists at the southwestern portion of the project site. This area has maintained its primary wetland vegetative communities, but ditches that drain the forested portion have altered its hydrology. The area still has adequate hydrology for jurisdictional status, but the hydrologic conditions could be improved by removing the ditches. Existing intact wetlands – primarily in the southeast portion of the project site along the UTTR - total 10.27 acres and contain Piedmont Bottomland Hardwood Wetlands in good condition.

There are also 0.68 acres of drained hydric soils, 0.72 acres of modified wetland, and 0.11 acres of intact wetland that are not within the 5-year floodplain and classified as nonriverine wetland.

3.2.1 Groundwater Gauges

High groundwater has been reported historically for the site and occurs seasonally at or near the surface in the surrounding natural areas. This elevated water condition is attributed to a relatively high water table and numerous groundwater seeps. The groundwater within the project site is being evaluated by monitoring the water level with six on-site HOBO recording pressure gauges. The gauges were installed across the site on August 28, 2005 and programmed to measure water levels twice daily at 12-hour intervals. The data were downloaded periodically and evaluated to determine the depth and duration of the groundwater levels on the site. Data have been collected and evaluated through November 23, 2005.

Data from each monitoring gauge were plotted to determine the hydroperiod (duration of saturation within 12 inches of the ground surface) for the site (Appendix 5).

Gauge #1 is located north of the lateral drainage feature (Ditch #7). South of the well, the ground slopes somewhat sharply into the drainage feature. At the time the gauge was installed, groundwater was not encountered to a depth of 62", although water was subsequently present in the well. Throughout the monitoring period, the groundwater level was approximately five feet below the ground surface. The deep groundwater level was primarily a factor of dry hydrologic conditions coupled with the influence of the lateral drainage feature.

Gauge #2 is found approximately 150 yards west of Gauge #1 and south of the lateral drainage feature (Ditch #7). The gauge is located southeast of the intersection of the two drainage features (Ditches #7

and #8). Groundwater was encountered at a depth of approximately 55" at the time of installation. Throughout the monitoring period, the groundwater level was between two and three and a half feet below the ground surface. The groundwater level is reduced by the influence of the drainage ditches, but drawdown is slow after precipitation events.

Gauge #3 was placed approximately 200 yards north of UTTR and just east of the grassed waterway drainage feature. Groundwater was not encountered at the time of installation, but was present later in the well. During the monitoring period, groundwater levels ranged from nearly five feet deep to the surface. There were significant spikes in the groundwater levels following precipitation events from October 7th through 10th and November 21st and 22nd. During these events, it is likely that backwater from the Tar River would have influenced the groundwater at this monitoring site.

Gauge #4 is located in the northeastern edge of the project site and is approximately 150 yards south of the farm access road and east of the grassed waterway drainage feature. Groundwater was not encountered at the time of installation, but was present later in the well. During the monitoring period, the groundwater level remained fairly deep at about four and a half feet below the surface. The only exception was at the end of the monitoring record when groundwater reached the surface. This was likely due to the influence of backwater from the Tar River that may have inundated this monitoring area.

Gauge #5 is in the southeastern portion of the project site and is approximately 150 yard east of the farm access road and approximately 100 yards south of the UTTR. Groundwater was encountered at the surface at the time of installation and remained near the surface during monitoring.

Gauge #6 is in the southwestern area of the project site and is approximately 25 yards east of the UTTR. Groundwater was not encountered at a depth of 50 inches at the time of installation, but water was present later in the well. At the beginning of the monitoring period, the groundwater level was approximately three and a half feet below the surface, but increased with each precipitation event. Water was ponded on the surface throughout the second half of the monitoring period after the precipitation event between October 7th and 10th.

3.2.2 Hydrologic Budget for Restoration Site

Existing Conditions
Existing site hydrology was modeled by developing an annual water budget that calculates water inputs and outputs in order to compare the change in storage on a monthly time step (Appendix 6). Two water budgets were developed – Budget #1 for the agricultural land in the northeastern portion of the project site and Budget #2 for the agricultural and forested area in the western portion. Both wetland budgets drain to the UTTR and then on to the Tar River.

Under existing conditions, precipitation (P) is the primary input to the sites. Historic precipitation data from the National Climatic Data Center (NCDC) were obtained from Earth Info, Inc. The nearest available data are for the City of Louisburg, North Carolina, located approximately 3.5 miles north-northeast of the Daniels Farm site. Total precipitation for the years of the period of record (1948-1997) was reviewed. Three years were selected to represent precipitation conditions for an average year (1973), dry year (1963) and wet year (1979).

Groundwater is a highly probable wetland input based on the low, flat location of the sites along a river terrace and the observation of several groundwater seep discharge zones upstream of the site. However, groundwater input was not calculated for the water budget, because the wetlands are assumed to be a riverine system dominated by surface water inputs. Surface water input was calculated using the Soil

Conservation Service (SCS) runoff curve number equation (1986). For Budget #2, surface water was assumed to be both an input and output and cancelled out as a result.

Additional water outputs from the site include potential evapotranspiration (PET) and groundwater infiltration. PET was calculated by the Thornthwaite method using mean monthly temperatures determined from 1971-2000 data from Louisburg and daytime hours. Groundwater infiltration represents groundwater losses from the site due to downward seepage through the soil profile. Soil permeability was assumed to be $2x10^{-6}$ ft/min (1.04 inches per month), which is typical of low permeability soils associated with wetlands.

Net monthly water inputs and outputs were calculated in inches and used to estimate a yearly wetland water budget. A maximum wetland water volume of 4.68 inches was calculated for both Budgets #1 and #2 based on the specific yield of 0.13 for 36 inches of the Roanoke Series. The resulting hydrographs for the average, dry, and wet years show a seasonal pattern. Recharge occurs during the late fall and winter months until a rapid drawdown occurs as PET rates increase in the summer. During the late summer, both Budgets #1 and #2 show that the existing conditions are unsaturated within the upper 12 inches of soil.

Proposed Conditions

The water budgets also look at the changes that will occur when the mitigation actions take place. For Budget #1, the surface water outlet will be blocked at the lowest point on the site. Therefore, the proposed budget assumes all incoming surface water is retained. Based on the proposed changes in microtopography, a rise of 0.2 feet of surface water retention is also predicted for Budget #1. For Budget #2, the proposed conditions also estimate a 0.2-foot increase in surface water capacity based on microtopography alterations. Using these assumptions, Budgets #1 and #2 show an increase in jurisdictional saturation by an average of one to two months, although both still predict a loss of wetland hydrology in the late summer months.

In addition to the inputs and outputs calculated in the water budget, the two sites are within the 5-year floodplain of the Tar River as described in Section 3.2. Based on calculations using gauges located up and downstream of the site, the downstream limit of the UTTR could experience an estimated annual flood stage of 177.1 feet. This input cannot be included with certainty in an annual water budget, but the flooding regime will play an important role in supporting these riverine wetlands.

3.3 Soil Characterization

A soils investigation was conducted by a certified soil scientist from KCI to determine the extent and distribution of the hydric soils on the site and to classify the predominate soils to the soil series level. The investigation consisted of delineating the hydric soil boundaries with pink flagging in accordance with the US Army Corps of Engineers (1987). Areas that were identified as possible hydric soil mapping units were surveyed at a higher intensity until the edge of the mapping unit was identified. The boundary of the hydric and non-hydric soil mapping units were then followed by continual sampling and observations as the boundary line was identified and delineated. In those areas where the boundary was found to be a broad gradient rather than a distinct break, microtopography, landscape position, soil textural changes, redoximorphic features, and depleted matrices were additionally considered to identify the extent of the hydric soils.

To develop a detailed soils map, several soil borings were advanced on the site in the general hydric soil areas identified by landscape position, vegetation and slope. Once the hydric soil borings were identified, the soil scientist marked the point and established a visual line to the next auger boring where again hydric soil conditions were confirmed by additional borings. The soil scientist moved along the edges of the mapping unit and marked each point along the line. To confirm the hydric soil mapping unit, soil

borings were advanced to a depth of 50 inches. The soil profile descriptions identified the individual horizons in the topsoil and upper subsoil as well as the depth, color, texture, structure, boundary, and evidence of restrictive horizons and redoximorphic features. The extent of the mapped hydric soils is shown in Figure 6. Once a final boundary showing the drained hydric soils was completed, it was presented to and approved by the USACE (Appendix 4).

Soils in the agricultural field in the northeastern section are classified as Prior Converted (PC) by the USDA Natural Resources Conservation Service (NRCS) (see Appendix 2). The agricultural field in the western portion of the project site has not been evaluated by the NRCS for a PC determination.

3.3.1 Taxonomic Classification

Soils mapped on the property were found to be typical of low Piedmont, Coastal Plain uplands and terraces that have formed in loamy and clayey marine and fluvial sediments. Based on field results, the dominant soil type within the project site is Roanoke (fine, mixed, semiactive, thermic Typic Endoaquults) with occasional small inclusions of Altavista (fine-loamy, mixed, semiactive, thermic Aquic Hapludults) and Wahee (fine, mixed, semiactive, thermic Aeric Endoaquults). The large swath of Altavista as shown in the county soil survey was not encountered during field investigations. Instead, Roanoke soils were found to be the primary soil type throughout the project site.

Roanoke is listed as a hydric soil in Franklin County, because it experiences saturation for a significant period during the growing season. The Franklin County Soil Survey indicates that these hydric soils cannot be farmed under natural conditions without removing woody vegetation or manipulating hydrology (USDA, NRCS 1998).

3.3.2 Profile Description

Roanoke is the dominant soil type on the site and consists of very deep, poorly drained, slowly permeable or very slowly permeable soils that have a moderate shrink-swell potential. The seasonally high water table is at a depth of one foot during wet periods. The soil is occasionally flooded in low areas for brief periods. Slopes are 0 to 2 percent. Individual areas are irregular in shape and generally range from 10 to 50 acres in size. Typically, the surface layer is five inches thick with a Munsell color of light brownish gray and ranges from fine sandy loam and loam to silt loam. The subsoil is typically 48 inches thick. The upper part of the subsoil is light gray sandy clay loam that has brownish yellow mottles. The lower part of the subsoil is gray silty clay or clay that has yellowish brown or brownish yellow mottles (USDA NRCS 2004).

3.3.3 Soil Properties

The physical properties for Roanoke are identified in Table 4.

Table 4. Soil Properties for the Restoration Site.

Soil Name	Description	Hydraulic Conductivity (in/hr)	Percent Organic Matter	Bulk Density (g/cc)
Roanoke	Poorly drained soil formed along flood plains and stream terraces. Surface layer is dark grayish brown silt loam; subsurface is dark gray clay loam to clay.	0.06-2.0	0.5-2.0%	1.20-1.65

(USDA, NRCS 1998)

3.4 Plant Community Characterization

A large portion of the project site is occupied by agricultural fields to the northeast and northwest. The land was most recently farmed with soybeans and does not contain any natural vegetation.

In the western portion of the project site, there is a large forested area along the UTTR. There are mature hardwood species here, but the stand has been logged selectively in the past. Vegetation in this section is dominated by green ash (*Fraxinus pennsylvanica*) and red maple (*Acer rubrum*). There are also small numbers of other hardwood species mixed throughout such as American elm (*Ulmus americana*), swamp chestnut oak (*Quercus michauxii*), sweetbay (*Magnolia virginiana)*, and sweetgum *(Liquidambar styraciflua)*. Herbaceous cover includes jewelweed (*Impatiens capensis*) and lizard's tail (*Saururus cernuus*). A few individuals of Chinese privet (*Ligustrum sinense)*, an invasive species, are also found in this forested area. Altogether, the plant community here resembles a Piedmont Bottomland Hardwood Forest, but does not contain as much diversity as typically found in this community type due to logging.

A vegetative sampling point was installed in the forested area and sampling was performed using the USACE protocol (1987). The only two species in the canopy were red maple (most dominant) and green ash (see Appendix 7). American elm (*Ulmus americana*) was the sole species in the sapling/shrub layer.

The southeastern area of the project site also contains Piedmont Bottomland Forest. The hardwood species consist of green ash (*Fraxinus pennsylvanica*) and red maple (*Acer rubrum*) with a few individuals of willow oak (*Quercus phellos*) and black gum (*Nyssa sylvatica)*. This area has been selectively logged in past decades and is not as dense as a typical Piedmont Bottomland Forest. However, there are several small bald cypress trees (*Taxodium distichum)* coming up along a variety of other young tree species. In September 2005, the dominant species in the herbaceous cover were jewelweed (*Impatiens capensis*), lizard's tail (*Saururus cernuus*), arrowhead (*Sagittaria latifolia)*, and *Hibiscus spp.*

4.0 REFERENCE WETLANDS

The reference wetland lies on the western edge of the project site and contains 0.41 acres. It contains a mature hardwood stand and resembles a Piedmont Bottomland Hardwood community type. The location of the reference wetland is denoted in Figure 7.

4.1 Hydrological Characterization

The reference wetland receives hydrologic inputs from the upslope drainages to the south and east as well as from flooding events from the Tar River.

4.1.1 Gauge Data Summary

The groundwater within the reference wetland will be evaluated by monitoring the water level with an on-site HOBO recording pressure gauge. Data from this gauge will be compared to gauges within the restoration areas. The gauge will be programmed to measure water levels twice daily at 12-hour intervals. The data will be downloaded periodically and evaluated to determine the depth and duration of the groundwater level on the reference site.

4.2 Soil Characterization

The soil at the reference wetland was included in the delineation for the entire project site as described in Section 3.3. Roanoke is the dominant soil type within the reference wetland.

4.3 Plant Community Characterization

The composition of plant species at the reference wetland is best described as a Piedmont Bottomland Hardwood Forest.

4.3.1 Community Description

The reference wetland contains intact hardwood species that resemble a Piedmont Bottomland Hardwood vegetative community as described by Schafale and Weakley (1990). This area contains the most diverse mixture of species on the project site. The dominant species are red maple (*Acer rubrum*) and green ash (*Fraxinus pennsylvanica*), but also include individuals of American elm (*Ulmus americana*), winged elm

(*Ulmus alata*), slippery elm (*Ulmus rubra*), swamp chestnut oak (*Quercus michauxii*), white oak (*Quercus alba*), sweetbay (*Magnolia virginiana)*, and sweetgum *(Liquidambar styraciflua)*. The herbaceous layer consists of species such as false nettle (*Boehmeria cylindrical*), jewelweed (*Impatiens capensis*), lizard's tail (*Saururus cernuus*), and arrowhead (*Sagittaria latifolia)*.

A vegetative sampling point was placed within the reference wetland. The results showed that sweetgum, swamp chestnut oak, and American elm, respectively, were the three most dominant species in tree layer using basal area as the metric (USACE 1987). The complete results are shown in Appendix 7.

5.0 PROJECT SITE RESTORATION PLAN

5.1 Restoration Project Goals and Objectives

The goal of the project is to reestablish a riverine wetland complex that will restore ecosystem processes, structure, and composition to mitigate for wetland functions and values that have been lost as a result of anthropogenic disturbances in this region of the Tar-Pamlico River Basin. The end result will be a functioning Piedmont Bottomland Hardwood community that will be reconnected to the Tar River. Small portions of nonriverine wetland and upland will also be included in the project as necessary to restore the entire surrounding ecosystem. The project plan is outlined in Figure 7.

The areas requiring wetland restoration at the project site include the two agricultural fields and a forested section along the UTTR. These sections have the necessary hydric soils, but do not contain adequate vegetation and hydrology for jurisdictional wetland status. The agricultural field in the northeastern portion of the project site contains 5.74 acres of drained hydric soils and will be considered Restoration Wetland #1. The agricultural field in the western area of the project site combined with a portion of forested land along Ditch #2 totals 8.01 acres and will be known as Restoration Wetland #2. For the areas to be restored, actions will focus on removing ditches and reestablishing wetland microtopography. The sites will also be replanted with hydrophytic vegetation. Restoration will also include 0.68 acres of nonriverine wetland and 2.81 acres of upland in order to recreate fully a functioning ecosystem.

The remaining forested land in the southwest corner of the project site is a jurisdictional wetland, but could benefit from removing hydrologic modifications that have altered the system. This 4.51-acre wetland area will be called Enhancement Wetland #3. This section is believed to have contained a DA system before hydrologic modifications changed the flow patterns. A DA system typically has a low but highly variable width/depth ratio and a channel slope of 0.005 or less. The stream is found in broad, gentle valleys shaped by alluvial or lacustrine deposits (Doll *et al*. 2003). KCI will aim to recreate a DA stream type, which consists of a stable, braided stream with three or more channels. Once these modifications to wetland hydrology are removed, unrestricted flow will be allowed to disperse across the landscape and establish interconnected channels. Removing the ditches and berms that alter flow will allow a DA system to form on the property once again. The enhancement area will also include 0.72 acres of nonriverine wetland and 0.34 acres of upland.

In addition to the restoration and enhancement portions of the project, there will also be 10.27 acres of riverine wetland preserved. The preservation area includes the forested southeastern section of the project site as well as the reference wetland, both of which are functioning Bottomland Hardwood ecosystems. There will also be 0.11 acres of nonriverine wetland and 0.84 acres of upland in the preservation area.

The project will involve a combination of wetland restoration, enhancement, and preservation of a Piedmont Bottomland Hardwood wetland community. The return of these sites to functioning wetland ecosystems will provide water quality benefits to water draining from neighboring agricultural fields. The wetlands will also reconnect a habitat corridor to the Tar River, which is directly downstream of the project site. Table 5 summarizes the mitigation that will take place at the project site.

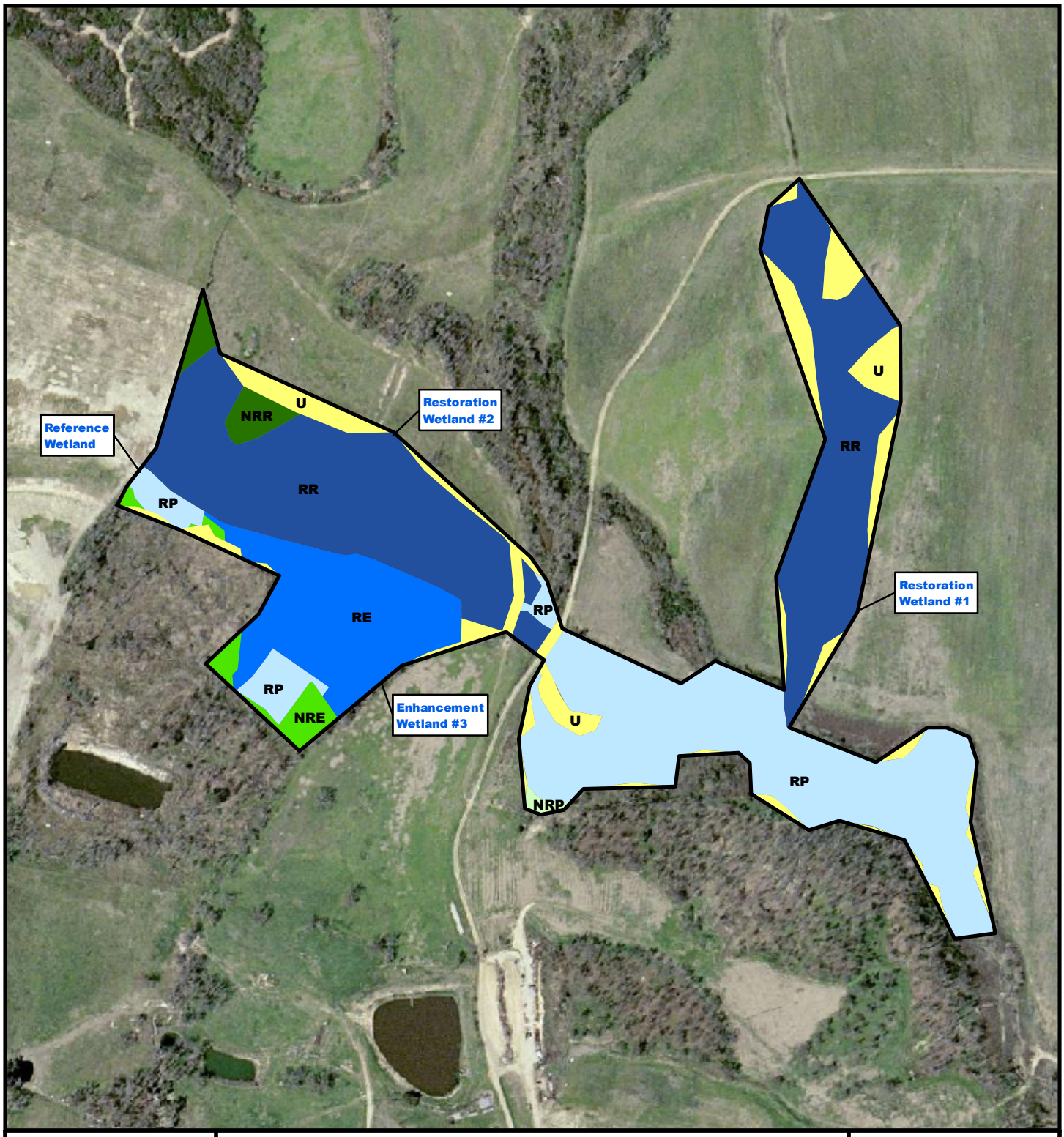


Figure 7. Project Site Plan

- Riverine Restoration (RR) - 13.75 acres
- Riverine Enhancement (RE) - 4.51 acres
- Riverine Preservation (RP) - 10.27 acres
- Upland Inclusions (U) - 3.99 acres
- Project Site Boundary
- Nonriverine Restoration (NRR) - 0.68 acres
- Nonriverine Enhancement (NRE) - 0.72 acres
- Nonriverine Preservation (NRP) - 0.11 acres

1:4,800
1 inch equals 400 feet
400 200 0 400 Feet

Image Source: AirPhotoUSA April 1, 2004

KCI TECHNOLOGIES

KCI ASSOCIATES OF NC
ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

Table 5. Mitigation Type and Extent

	Restoration	Enhancement	Preservation	TOTAL
Riverine Wetland Acreage	13.75	4.51	10.27	28.53
Nonriverine Wetland Acreage	0.68	0.72	0.11	1.51
Upland Inclusions	2.81	0.34	0.84	3.99
TOTAL	**17.24**	**5.57**	**11.22**	**34.03 acres**

Functions that will be restored as a result of the mitigation include:

- Aquatic/Terrestrial Wildlife Habitat
- Water Quality
- Groundwater Recharge
- Nutrient Cycling
- Bottomland Hardwood Communities

5.1.1 Designed Wetland Type

The restored wetlands will be designed as a riverine wetland system. The restoration areas are within the 5-year floodplain of the Tar River and will receive inputs from these flood events. Restoration will focus on filling existing ditches and creating microtopography to retain floodwaters and restore wetland hydrology. Wetland-specific hardwood and herbaceous species will be planted to establish hydrophytic vegetation in the restoration areas. A few portions of nonriverine wetland will also be restored and enhanced, which will help to connect the proposed project with the previously completed nonriverine wetland restoration upstream.

5.1.2 Target Wetland Communities

The target community for the entire project site is a Piedmont Bottomland Hardwood Forest as described by Schafale and Weakley (1990). This wetland type has a canopy dominated by tree species such as tulip poplar (*Liriodendron tulipifera)*, sweetgum (*Liquidambar styraciflua*), cherrybark oak (*Quercus pagoda* (*falcata var. pagodaefolia*)), swamp chestnut oak (*Quercus michauxii)*, American elm (*Ulmus Americana*), sugarberry (*Celtis laevigata*), green ash (*Fraxinus pennsylvanica*), loblolly pine (*Pinus taeda*), shagback hickory (*Carya ovata*), and bitternut hickory (*Carya cordiformis*). Typical understory trees include American hornbeam (*Carpinus caroliniana*), red maple (*Acer rubrum*), flowering dogwood (*Cornus florida*), American holly (*Ilex opaca*), and common pawpaw (*Asimina triloba*). Common shrubs are often species such as painted buckeye (*Aesculus sylvatica*) and American strawberry-bush (*Evonymus americana*). Invasive species such as Virginia dayflower (*Commelina virginica*), Japanese honeysuckle (*Lonicera japonica*), Japanese grass (*Microstegium vimineum*), and Asian spiderwort (*Murdannia keisak*) have the potential to invade this community type.

The typical Piedmont Bottomland Hardwood Community is flooded at least occasionally. Bottomland Forests are believed to form a stable climax forest with uneven-aged canopy with primarily gap phase regeneration (Schafale and Weakley 1990).

5.2 HEC-RAS Analysis

The Daniels Farm #2 Site is located within the 100-year floodplain of the Tar River (Zone AE). The North Carolina Floodplain Mapping Program has performed a HEC-RAS (River Analysis System) model.

The resulting cross-sections were reviewed to verify that the conditions represent a benchmark hydraulic condition that can be compared to post-restoration conditions.

5.2.1 No-rise, LOMR, or CLOMR

Any modifications that would result in the increase of the 100-year flood elevation would require a Letter of Map Revision (LOMR). This restoration design intends to maintain the 100-year flood elevation at the current level following project completion. A No-Rise Certification letter explains that an increase in the 100-year flood elevation is not anticipated (see Appendix 8).

5.2.2 Hydrologic Trepass

The drainage area for the proposed project is entirely contained within the Daniels Farm Inc. property and the eastern downstream border runs directly along the Tar River. There will be no hydrologic trespass to any landowners upstream or downstream of the project.

5.3 Hydrological Modifications

Hydrologic modifications will focus on restoring surface water retention to this wetland system. Currently, existing ditches and berms force water out of the system and prevent surface water from remaining on-site and recharging the groundwater. Hydrologic restoration and enhancement will focus on filling in these ditches that were constructed to drain the historic wetlands. The restoration will also involve removing or breaching berms that currently force water into the ditches. Combined together, these actions will allow surface and floodwaters to have greater access to the wetlands. Figure 8 outlines the modifications that will take place.

5.3.1 Narrative of Modifications

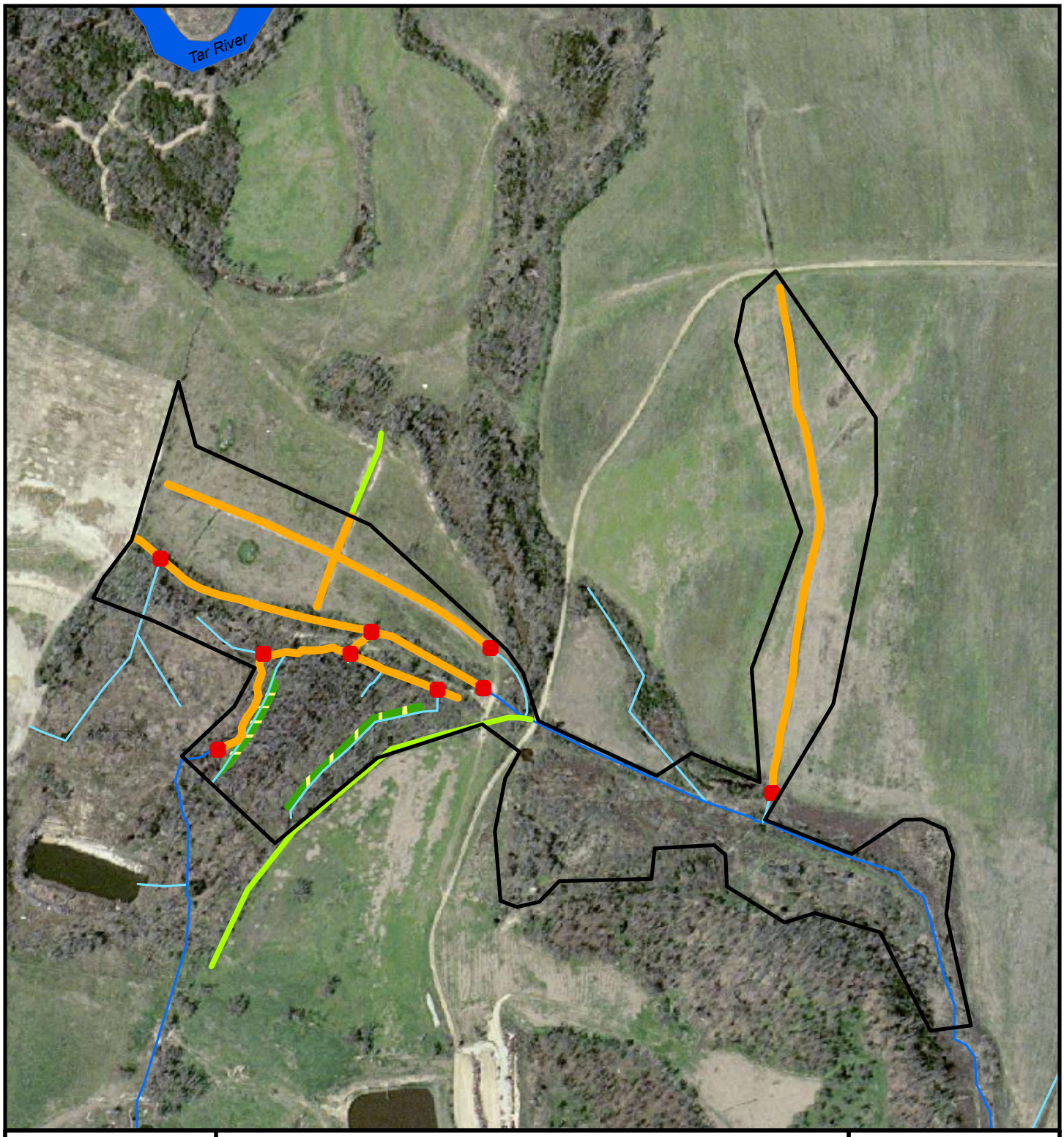
Restoration Wetland #1 – 5.74 riverine acres

The site is an agricultural field that has been drained for cultivation. A grassed waterway that runs north to south through this former soybean field provides the primary drainage route from this site. This waterway will be filled and a ditch plug will be installed at the southern end of the grassed waterway where the site drains into Ditch #10 and then into the UTTR. Interconnected microtopography will also be created to increase the retention of surface water within the wetland. This will involve ripping the soil and creating depressions and rises typical of a riverine wetland system. The changes in topography will be approximately six inches plus or minus the existing elevations. These restoration actions will allow precipitation and floodwaters to be held within the wetland and to recharge groundwater instead of draining directly to the UTTR.

Restoration Wetland #2 – 8.01 riverine acres

This restoration area is also currently an agricultural field. There are two grassed waterways that run directly through this site and are shown in Figure 5 as Grassed Waterways #7 and #8. These two drainage routes will be filled and microtopography will be restored to increase water retention in the wetland. Similar to Restoration Wetland #1, the soil will be ripped and shaped to create depressions and rises in the topography. The changes in topography will range from plus or minus six inches from base elevations and lengthen the flow path through the wetland. The outlet at the eastern edge of the site will be plugged to prevent water from draining from the site. A crossing at the eastern edge of the site will be maintained for the landowner. Any excess surface water will drain to the culvert that flows under the crossing and into the UTTR.

Ditch #2 will be filled in as it runs from the western edge of the project site until it reaches the end of Restoration Wetland #2. This channel has an average depth of approximately 40 inches and is draining a



KCI TECHNOLOGIES

Figure 8. Proposed Restoration Activities

Project Site Boundary
Fill Ditches
Berm Breaks
Ditch Plugs
Tar River
Existing Ditches
Existing Stream Channel
Existing Grassed Waterways

1:4,800
1 inch equals 400 feet
400 200 0 400 Feet

Image Source: AirPhotoUSA April 1, 2004

KCI ASSOCIATES OF NC
ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

large quantity of water from the wetland. After the ditch is filled, it will be covered with erosion-control matting and hydroseeded to prevent erosion. Three ditch plugs also will be placed along Ditch #2 to halt the flow of water down the channel.

Enhancement Wetland #3 – 4.51 riverine acres
Although this area has maintained its jurisdictional wetland status, it has been modified substantially with the creation of ditches and berms. Enhancement efforts will focus on increasing wetland hydrology by removing some of these modifications. The UTTR will be filled as it flows through this area and will be stabilized with matting and hydroseeding. Ditch #5 will be filled in a similar manner. Four ditch plugs will be installed in the enhancement area as shown in Figure 8. The two major berms within the enhancement area will be breached; cuts will be made in the berms to allow water to flow through these obstructions. The berms will not be removed in order to maintain as much of the mature vegetation in the wetland as possible. These combined enhancement actions will allow water to have complete access to the wetland and permit a DA channel system to redevelop.

Preservation Wetlands – 10.27 riverine acres
No hydrologic alterations will take place in the preservation wetlands.

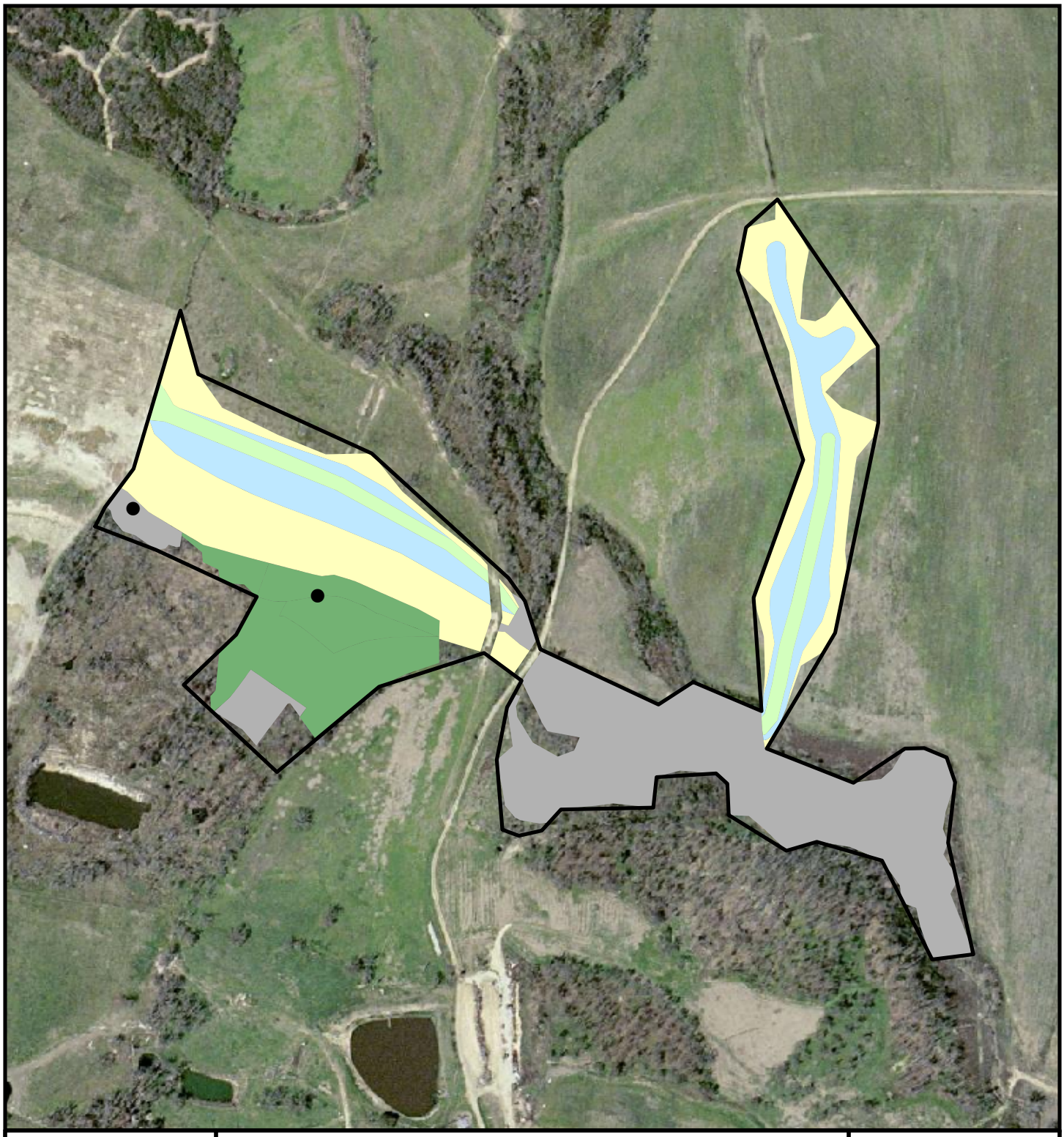
5.3.2 Scaled Schematic of Modifications
A diagram of the proposed restoration and enhancement actions is seen in Figure 8.

5.4 Natural Plant Community Restoration
Restoring natural vegetation will focus primarily on the riverine wetland restoration areas. These areas will receive species consistent with a Piedmont Bottomland Hardwood Forest Community. The Enhancement Wetland #3 will also receive targeted hardwood species to increase species diversity among the existing vegetation.

Restoration Plant Community
Plantings shall consist of the following native species as available. Woody vegetation planting will take place during the dormant season.

The planting plan in Figure 9 shows the different zones that will be used to target restoration vegetation. In general, these zones will consist of the following species groupings:

Zone A:		
Green Ash	*Fraxinus pennsylvanica*	FACW
Bald Cypress	*Taxodium distichum*	OBL
Zone B:		
Sugarberry	*Celtis laevigata*	FACW
Green Ash	*Fraxinus pennsylvanica*	FACW
Laurel Oak	*Quercus laurifolia*	FACW
Overcup Oak	*Quercus lyrata*	OBL
Swamp Chestnut Oak	*Quercus michauxii*	FACW-
Zone C:		
Tulip Poplar	*Liriodendron tulipfera*	FAC
Swamp Chestnut Oak	*Quercus michauxii*	FACW-
Cherrybark Oak	*Quercus pagoda*	FACW
Willow Oak	*Quercus phellos*	FACW-



KCI TECHNOLOGIES

Figure 9. Planting Plan

Restoration Zone A
Restoration Zone B
Restoration Zone C
Enhancement
Preservation (No modifications)

Project Site Boundary
Vegetative Sampling Points

1:4,800
1 inch equals 400 feet

400 200 0 400 Feet

Image Source: AirPhotoUSA April 1, 2004

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

The two restoration sites (Restoration Wetlands #1 and #2) are currently farmed as soybeans. No vegetation will remain in place once earth-moving activities are completed. A density of 680 trees/acre (approximately 8 x 8 feet spacing) will be planted to achieve a mature survivability of 320 trees/acre. As seen in Figure 9, *Taxodium distichum* and *Fraxinus pennsylvanica* will be planted only in the lowest and therefore the wettest points of the site. At the higher points, a mixture of the other hardwood species will be planted as described in Zones B and C.

Enhancement Plant Community
The actions in the enhancement area will focus on improving existing habitat and increasing species diversity. Tree removal and planting will strive to create a gap dynamic by creating openings where groupings of young trees can be planted. The plantings will be placed in groups with the center being formed by many individuals of the species and the irregular border comprised of various species.

Dominant species such as red maple (*Acer rubrum*), green ash (*Fraxinus pennsylvanica*), sweetgum (*Liquidambar styraciflua*), and American elm (*Ulmus americana*) will be thinned to provide adequate light (55-70% open canopy) for planted trees. The trees targeted for removal will be treated with herbicide in late summer when the trees have leafed out entirely or in the winter once the sap has stopped flowing. A glyphosate herbicide will be applied at this time. The trees will be left either downed or standing to provide habitat for terrestrial species. Invasive species management will also take place at this time (November being the ideal time) and will focus on removing Chinese privet (*Ligustrum sinense)*.

In conjunction with the thinning, the area will be planted with native tree stock to increase diversity to resemble a Piedmont Bottomland Hardwood Forest. These new trees will be planted at a density ranging from 100 to 200 trees/acre. Instead of distributing the trees evenly throughout as in the restoration area, the trees in the enhancement area will be grouped together where there is the greatest amount of sunlight and space. The stock will contain primarily mast-producing trees such as those listed below. These particular species have the necessary shade tolerance and wetland indicator status to survive in the enhancement area.

Water Hickory	*Carya aquatica*	OBL
Sugarberry	*Celtis laevigata*	FACW
Laurel Oak	*Quercus laurifolia*	FACW
Overcup Oak	*Quercus lyrata*	OBL
Bald Cypress	*Taxodium distichum*	OBL

Vegetative enhancement actions will be tailored to the existing stands in order to increased diversity and plant species specific to existing conditions.

The area along the existing channel of the UTTR and Ditch #2 is expected to maintain a level of high saturation due to its low elevation. Currently, there is a large spoils bank in the middle of the section, which will be used to fill in nearby ditches and created a lower area available for planting. This area will be planted primarily with bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*), which are ideally suited for the wet conditions this area will experience. There are already several mature cypress trees here. The area will be planted with other hardwood species as needed. No major thinning actions are anticipated here.

Directly south of the UTTR, the area contains mature hardwood stands, but red maple and green ash dominate. The focus of vegetative enhancement here will be to increase the number of mast-producing trees. A diversity of hardwood species as listed above for enhancement will be planted within this area.

Several large individuals of sweet gum, red maple, and green ash will be removed to create more space and light for the younger trees.

The southernmost portion of the enhancement area contains mature wetland vegetation and will not be planted with any new species. The planned modifications in this area will consist of inserting breaks in two major berms that prevent water from flooding into the enhancement area. Creating breaks in the berms instead of removing them entirely will allow existing mature hardwoods to remain in this section.

Preservation Wetlands
No plantings will occur at these sites.

6.0 PERFORMANCE CRITERIA

A monitoring program will be implemented to observe the progress toward achieving mitigation goals and objectives within the restored wetland areas. The site will be deemed successful once wetland hydrology is established and vegetation success criteria are met.

6.1 Hydrology

Groundwater elevations will be monitored to evaluate the attainment of jurisdictional wetland hydrology. The reference wetland will also be monitored using the same procedures for comparative analysis.

Monitoring Procedure
Verification of wetland hydrology will be determined by automatic recording well data collected within the project area and reference wetland. Automatic recording gauges will be established within restoration areas at a density of one automatic well per four acres. Daily data will be collected from the automatic gauges over the 5-year monitoring period following wetland construction.

Restoration Success Criteria
Wetland hydrology will be considered established if well data from the site indicates that the water table is within 12 inches of the soil surface for 5% of the growing season (NRCS published or locally calculated) during normal weather conditions. A "normal" year was based on NRCS climatological data for Franklin County and uses the 30^{th} to 70^{th} percentile thresholds as the range of normal as documented by the USACE (Sprecher and Warne 2000). According to the NRCS, the growing season is considered to be the period with a 50% probability that the daily minimum temperature is higher than 28°F (USDA, NRCS 2004). Using this basis, the growing season in Franklin County is considered to extend from March 20 to November 11 for a total of 235 days. Success will be achieved if the water table is within 12 inches of the soil surface for 12 days or more during the growing season.

6.2 Vegetation

The success criteria for the planted species in the restoration areas will be based on survival and growth. Beginning at the end of the first growing season, the project team will monitor vegetation for five years following the planting.

Monitoring Procedure
Permanent monitoring plots (10 x 10 meters) will be established in the wetland restoration areas at a density that will ensure 2% coverage of the total restoration acreage. Plots will be systematically located to ensure even placement. Data will be collected at each plot for: total number of stems, species, percent survival, height, estimated percent cover of all species, and evidence of insects, disease or browsing.

Restoration Success Criteria
Survival of planted species must be 320 stems/acre at the end of five years of monitoring. Non-target species must not constitute more than 20 percent of the woody vegetation based on permanent monitoring plots.

Enhancement Success Criteria
The success of the enhancement area vegetation will be measured differently than the restoration area, because many of the existing trees will remain standing. Using a baseline created from the existing vegetation sampling point in the enhancement area, each subsequent monitoring year will compare the change in basal area of undesirable species using the US Army Corps of Engineers criteria (1987). The enhancement area will be considered successful if the undesirable species (*Acer rubrum* and *Liquidambar styraciflua*) decrease in basal area proportional to desirable species.

6.3 Schedule / Reporting

Monitoring data will be collected annually for a period of five years or until success criteria are achieved. Annual reports will be submitted to NCEEP and will document the monitored components of the restoration plan (hydrology and vegetation) and include all collected data, analyses, and photographs.

Restoration of wetlands involves interpretation of collected information to devise a strategy that will ultimately lead to a functional ecosystem. Minor variations in the results can be anticipated due to unknown site conditions, inputs from outside the restoration site, regional climatic variations, or acts of God, etc. Nurturing the site with regular management activities is also considered necessary to ensure that the goals and objectives of the project are met. These activities will be conducted throughout the year and may include invasive species control or other management activities. If the monitoring identifies failures in the project site, a remedial action plan will be developed to investigate the causes of the failure and propose actions to rectify the problem.

7.0 REFERENCES

Doll, B.A., G.L. Grabow, K.R. Hall, J. Halley, W.A. Harman, G.D. Jennings and D.E. Wise. 2003. Stream restoration: a natural channel design handbook. North Carolina Stream Restoration Institute, North Carolina State University.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

McKerrow, A. 2003. North Carolina GAP Land Cover. Raleigh, North Carolina: North Carolina Gap Analysis Project Office.

NCDENR, Division of Water Quality. 2005. Surface water classification. Last accessed 7/12/2005 at: http://h2o.enr.state.nc.us/csu/swc.html.

NCDENR, Geologic Survey. North Carolina Geology. Last accessed 11/2/2005 at http://www.geology.enr.state.nc.us/usgs/geomap.htm.

NCDENR, Natural Heritage Program. 2005. County and Quad Species Listings. http://www.ncnhp.org/.

NCDENR, Wildlife Resources Commission. 2005. North Carolina atlas of freshwater mussels and endangered fish. http://www.ncwildlife.org/fs_index_07_conservation.htm.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the natural communities of North Carolina, Third Approximation. Raleigh, North Carolina: North Carolina Natural Heritage Program.

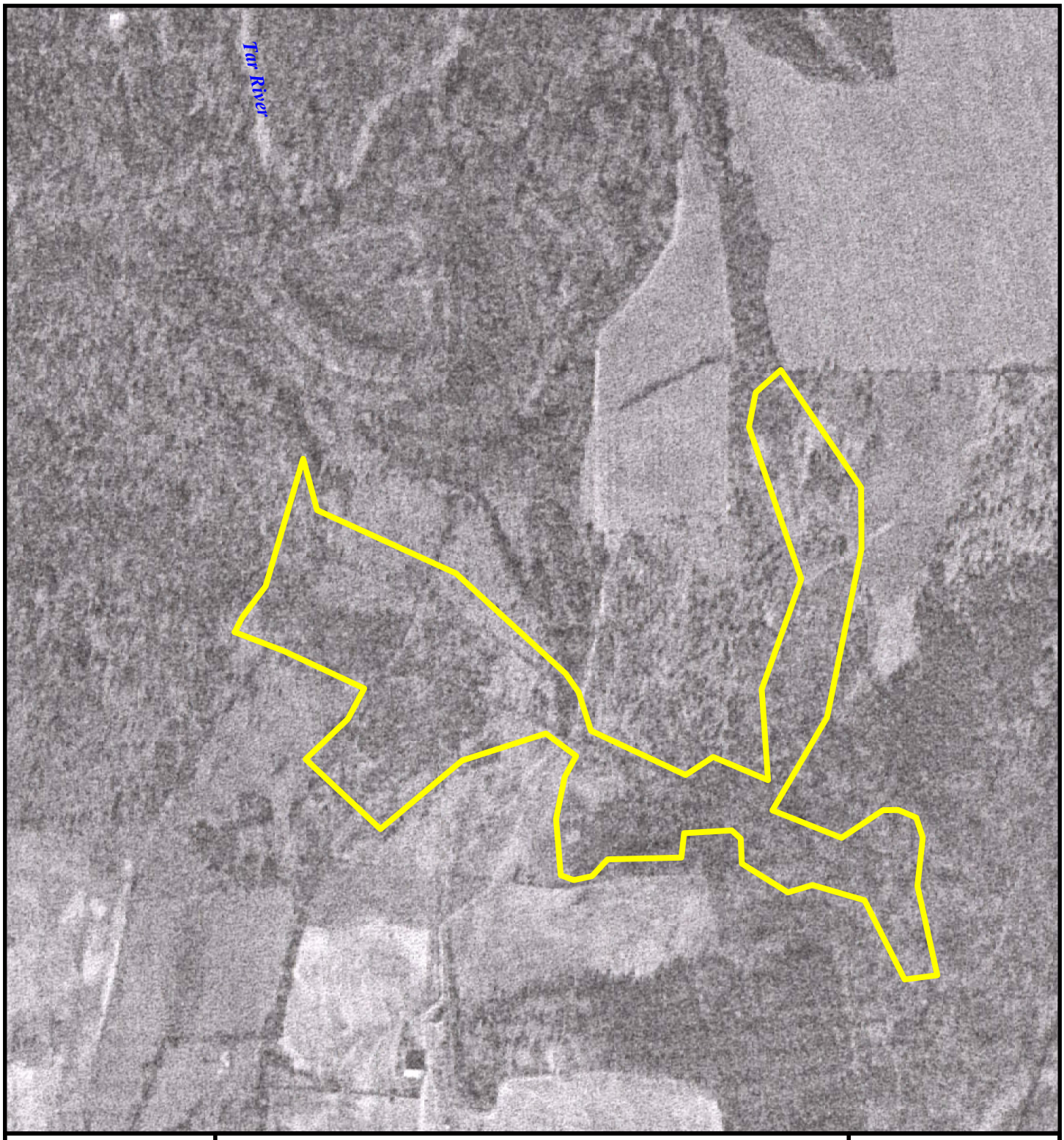
Sprecher, S. W. and A. G Warne. 2000. Accessing and using meteorological data to evaluate wetland hydrology, ERDC/EL TR-WRAP-00-01, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

United States Department of Agriculture, Natural Resources Conservation Service. Field indicators of hydric soils in the United States, Version 5.9. Last accessed November 8, 2005 at http://soils.usda.gov/use/hydric.

United States Department of Agriculture, Natural Resources Conservation Service. 1998. Soil survey of Franklin County, North Carolina. Raleigh, North Carolina.

United States Department of Agriculture, Soil Conservation Service. 1986. Urban hydrology for small watersheds. Technical Release 55.

Appendix 1. Historical Aerial Photographs



KCI TECHNOLOGIES

Daniels Farm #2 Site - 1938

Project Site Boundary

N
W E
S

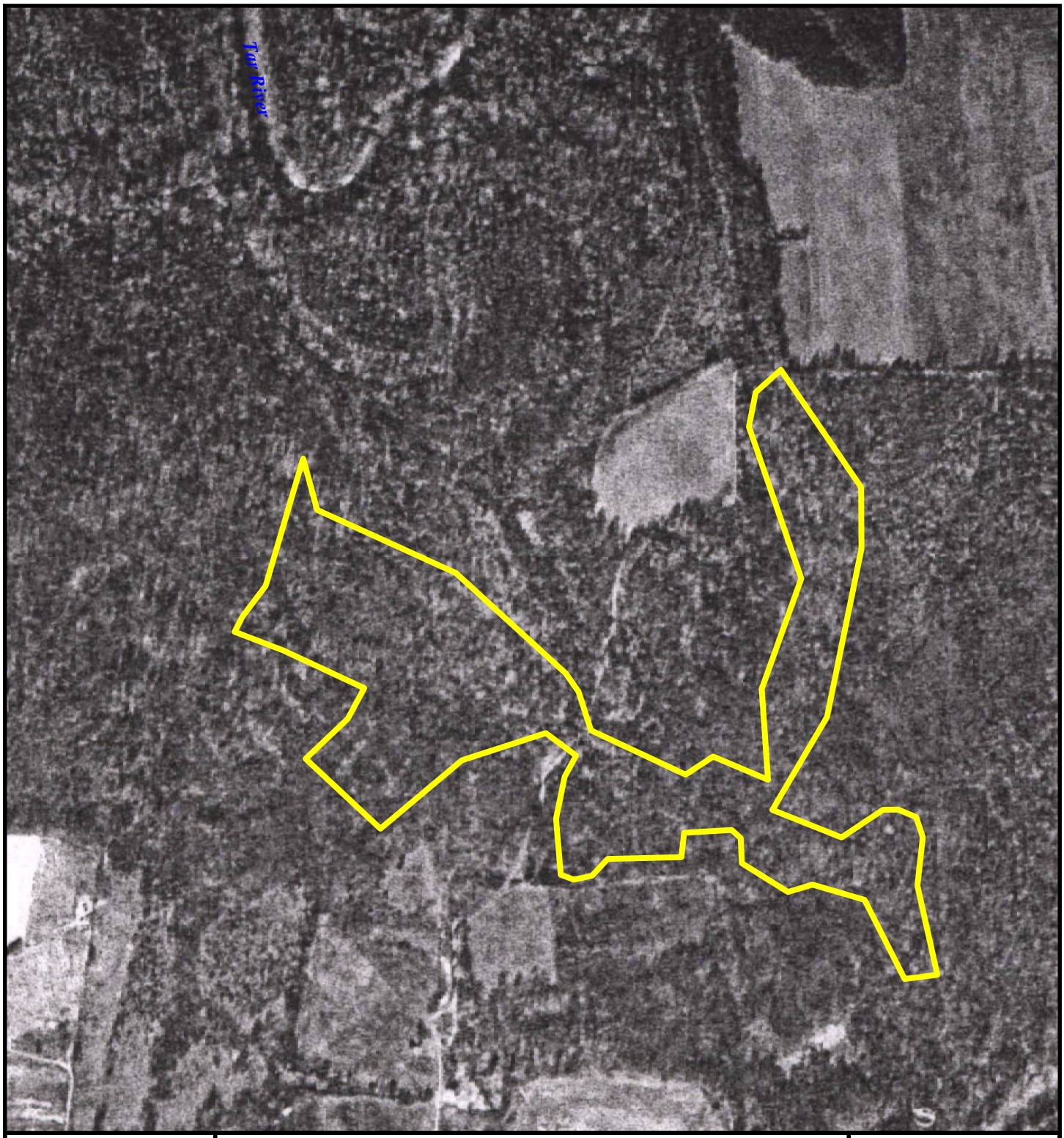
1:6,000
1 inch equals 500 feet

500 250 0 500
Feet

Source: USDA Aerial Photograph, 1938

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.



KCI TECHNOLOGIES

Daniels Farm #2 Site - 1955

Project Site Boundary

N
W E
S

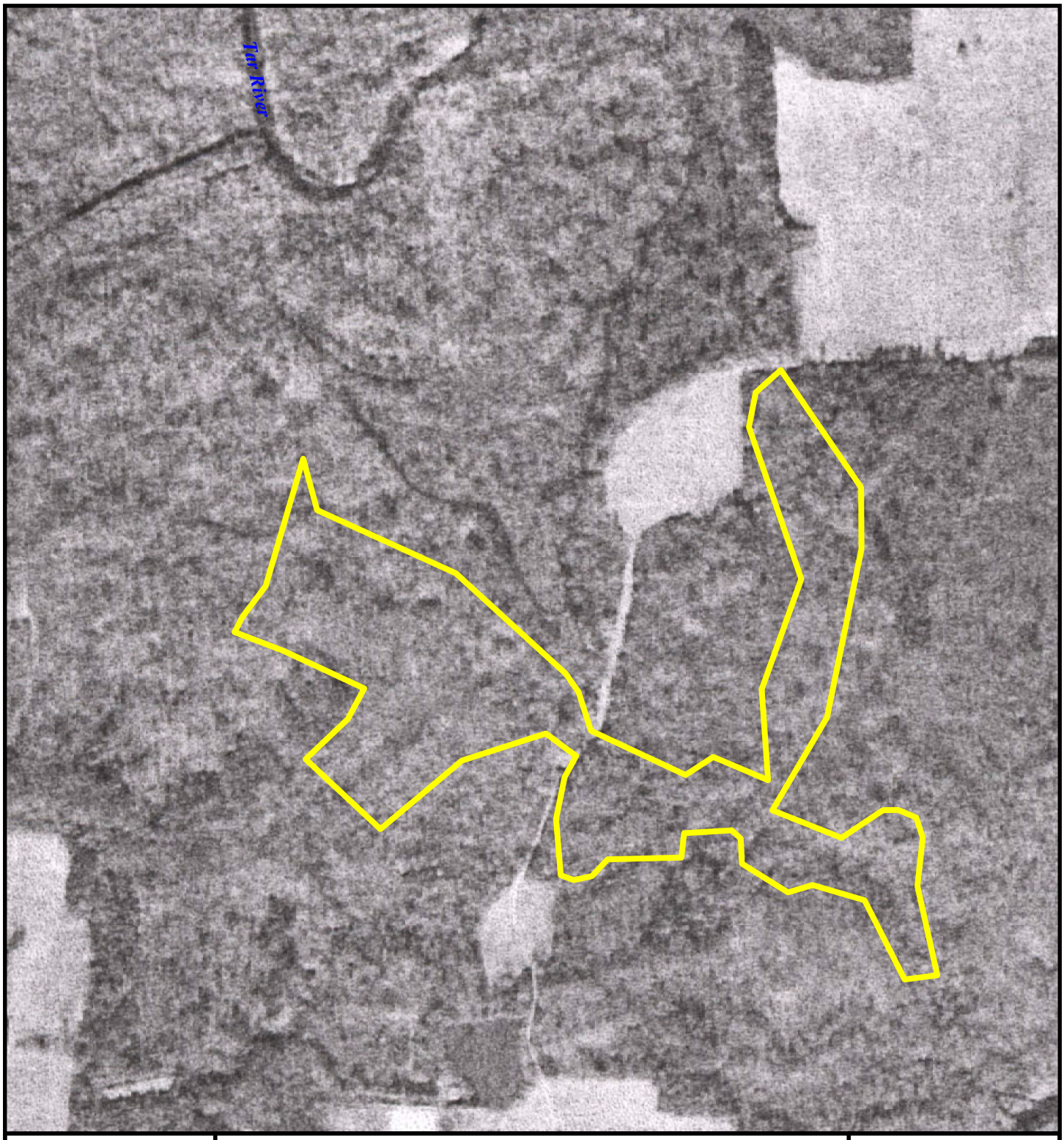
1:6,000
1 inch equals 500 feet

500 250 0 500 Feet

Source: USDA Aerial Photograph, 1955

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.



KCI TECHNOLOGIES

Daniels Farm #2 Site - 1973

Project Site Boundary

N
W E
S

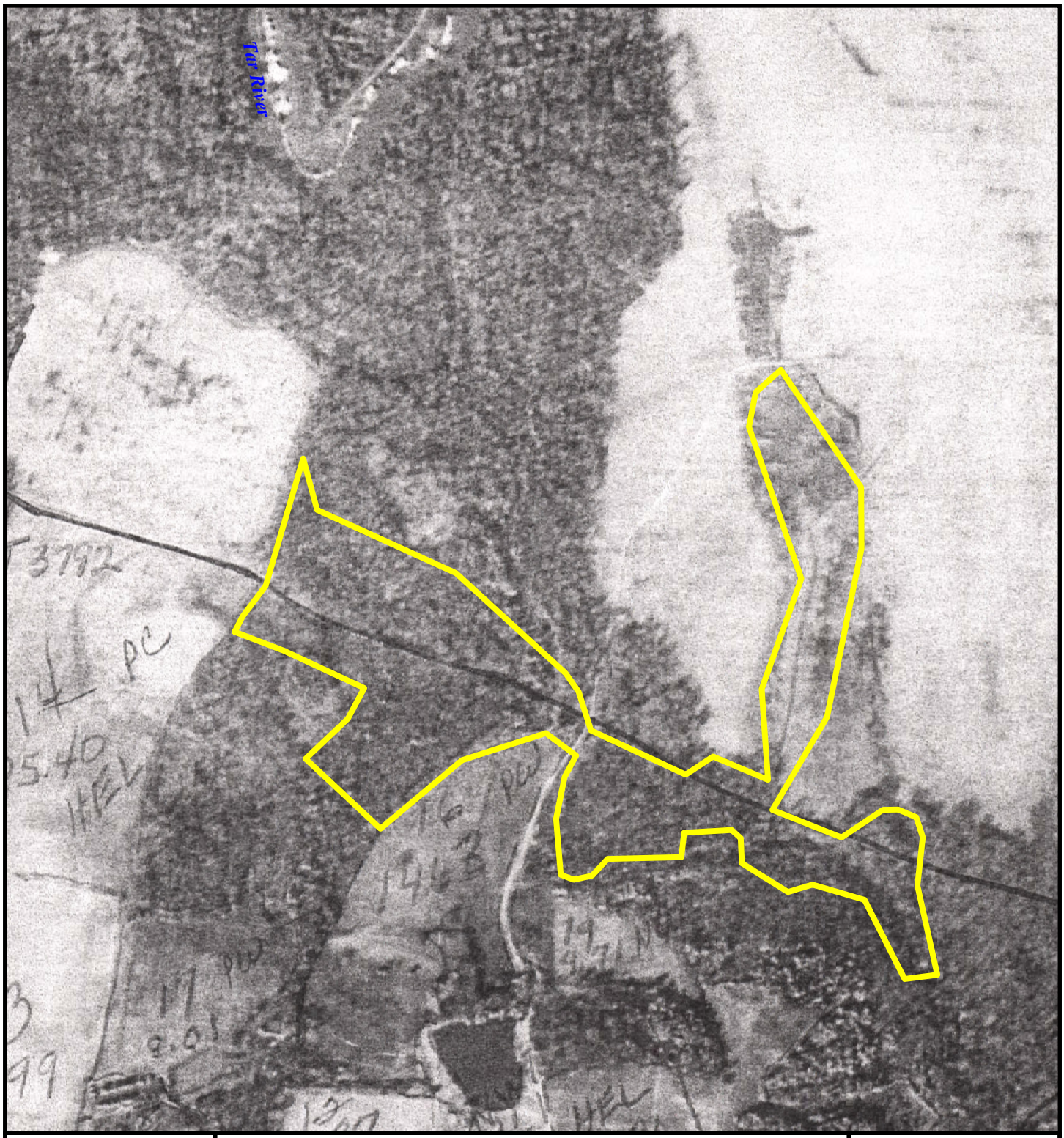
1:6,000
1 inch equals 500 feet

500 250 0 500
Feet

Source: USDA Aerial Photograph, 1973

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.



Daniels Farm #2 Site - 1982

Project Site Boundary

N
W E
S

1:6,000
1 inch equals 500 feet

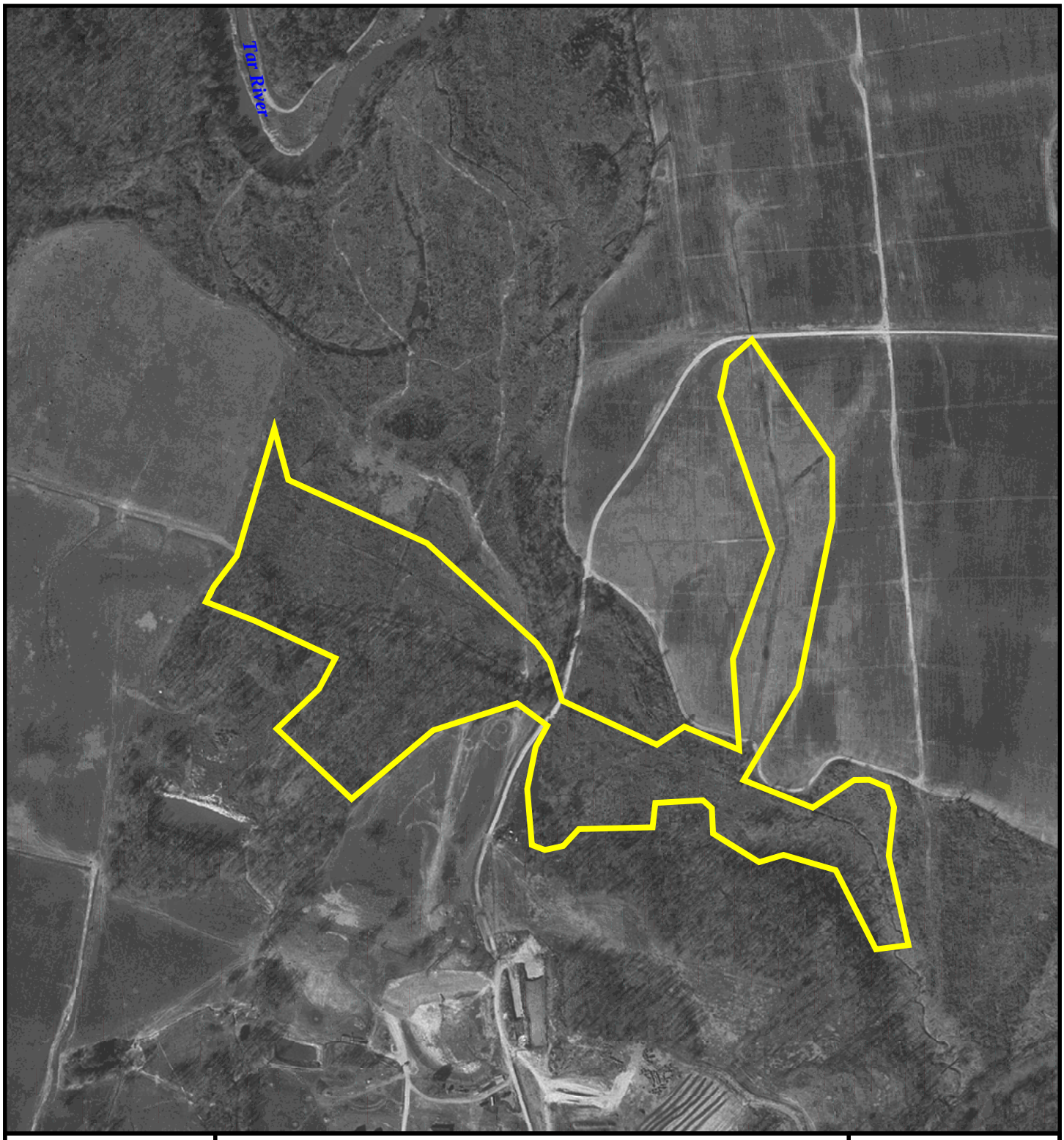
500 250 0 500
Feet

Source: USDA Aerial Photograph, 1982

KCI TECHNOLOGIES

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.



KCI TECHNOLOGIES

Daniels Farm #2 Site - 2000

Project Site Boundary

N
W E
S

1:6,000
1 inch equals 500 feet

500 250 0 500
Feet

Source: NC Floodplain Mapping Program, 2000

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

Appendix 2. Correspondence

KCI TECHNOLOGIES

ENGINEERS • SURVEYORS • SCIENTISTS • CONSTRUCTION MANAGERS

LANDMARK CENTER II • SUITE 220 • 4601 SIX FORKS ROAD • RALEIGH • NC 27609 • 919-783-9214 • (FAX) 919-783-9266

July 5, 2005

Ms. Renee Gledhill-Earley
Environmental Review Coordinator - SHPO
4617 Mail Service Center
Raleigh, NC 27699-4617

Attn: Juliana Hoekstra

Subject: Cultural Resources Review
Daniels Farm #2 Wetland Restoration Project
Project Number 12054238

Dear Ms. Hoekstra:

Please accept this information pertaining to the proposed Daniels Farm #2 Wetland Restoration Project, which is located off of Egypt Church Road approximately 2.4 miles southeast of Louisburg, North Carolina in Franklin County, as a submittal for cultural resources review by the State Historic Preservation Office.

A portion of this property (refer to attached layout) is currently under investigation as a stream and wetland restoration project for the North Carolina Ecosystem Enhancement Program. The current land use in the project area is predominantly Agricultural Crop Fields, Piedmont/Mountain Mixed Bottomland Hardwood Forests, Piedmont/Mountain Emergent Vegetation, and Dry Mesic Oak Pine Forests according to the 2003 NC GAP land cover dataset. The restoration would improve water quality and provide greater protection for aquatic ecosystems from surrounding agricultural lands. This type of work typically involves restoring wetland hydrology and reforestation. No impacts to structures on the subject property are anticipated.

Following the review of the included documentation, please provide a determination regarding any potential impacts to cultural resources associated with this project.

Please feel free to contact me at (919) 783-9214, ext. 141, should you have any questions or require any further information to process this request. Thank you in advance for your assistance and attention.

Sincerely,

Michael B. Schlegel
Project Manager

North Carolina Department of Cultural Resources

State Historic Preservation Office

Peter B. Sandbeck, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

July 19, 2005

Michael Schlegel
KCI Technologies
Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609

Re: Daniels Farm #2 Wetland Restoration, Louisburg, Franklin County, ER 05 1537

Dear Mr. Schlegel:

Thank you for your letter of July 5, 2005, concerning the above project.

We have conducted a review of the proposed undertaking and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the undertaking as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

Peter Sandbeck

	Location	Mailing Address	Telephone/Fax
ADMINISTRATION	507 N. Blount Street, Raleigh NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-4763/733-8653
RESTORATION	515 N. Blount Street, Raleigh NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-6547/715-4801
SURVEY & PLANNING	515 N. Blount Street, Raleigh, NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-6545/715-4801

KCI TECHNOLOGIES

ENGINEERS • SURVEYORS • SCIENTISTS • CONSTRUCTION MANAGERS

LANDMARK CENTER II • SUITE 220 • 4601 SIX FORKS ROAD • RALEIGH • NC 27609 • 919-783-9214 • (FAX) 919-783-9266

July 5, 2005

Linda Pearsall, Program Head
North Carolina Natural Heritage Program
1601 Mail Service Center
Raleigh, NC 27529

Subject: Natural Heritage Review
Daniels Farm #2 Wetland Restoration Site
Project Number 12054238

Dear Ms. Pearsall:

Please accept this information pertaining to the proposed Daniels Farm #2 Wetland Restoration Site, which is located off of Egypt Church Road approximately 2.4 miles southeast of Louisburg, North Carolina in Franklin County, as a submittal for natural communities and rare species review by the North Carolina Natural Heritage Program.

A portion of this property (refer to attached layout) is currently under investigation as a stream and wetland restoration project for the North Carolina Ecosystem Enhancement Program. The current land use in the project area is predominantly Agricultural Crop Fields, Piedmont/Mountain Mixed Bottomland Hardwood Forests, Piedmont/Mountain Emergent Vegetation, and Dry Mesic Oak Pine Forests according to the 2003 NC GAP land cover dataset. The restoration would improve water quality and provide greater protection for aquatic ecosystems from surrounding agricultural lands. This type of work typically involves restoring wetland hydrology and reforestation. No impacts to structures on the subject property are anticipated.

Following the review of the included documentation, please provide a determination regarding any potential impacts to rare species or natural areas associated with this project.

Please feel free to contact me at (919) 783-9214, ext. 141, should you have any questions or require any further information to process this request. Thank you in advance for your assistance and attention.

Sincerely,

Michael B. Schlegel
Project Manager

NCDENR

North Carolina Department of Environment and Natural Resources

Michael F. Easley, Governor

William G. Ross Jr., Secretary

July 11, 2005

Mr. Michael B. Schlegel
KCI Technologies
Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609

Subject: Daniels Farm #2 Wetland Restoration Site; Egypt Church Road, Louisburg, Franklin County
Project No. 12054238

Dear Mr. Schlegel:

The Natural Heritage Program has no record of rare species within a mile of the project area; however, just downstream of the site is the Nationally significant Middle Tar River Aquatic Habitat. Though we have no records of rare aquatic species within a mile of the site, a number of rare mussels and other aquatic animals are present in the river a few miles above and below the site. Thus, it is very important to keep sedimentation from the project from reaching the Tar River.

You may wish to check the Natural Heritage Program database website at <www.ncnhp.org> for a listing of rare plants and animals and significant natural communities in the county and on the topographic quad map. Please do not hesitate to contact me at 919-715-8697 if you have questions or need further information.

Sincerely,

Harry E. LeGrand, Jr., Zoologist
Natural Heritage Program

HEL/hel

1601 Mail Service Center, Raleigh, North Carolina 27699-1601
Phone: 919-733-4984 • FAX: 919-715-3060 • Internet: www.enr.state.nc.us

KCI TECHNOLOGIES

ENGINEERS • SURVEYORS • SCIENTISTS • CONSTRUCTION MANAGERS

LANDMARK CENTER II • SUITE 220 • 4601 SIX FORKS ROAD • RALEIGH • NC 27609 • 919-783-9214 • (FAX) 919-783-9266

July 13, 2005

Ms. Shannon Deaton
Habitat Conservation Program Manager
NC Wildlife Resources Commission
Division of Inland Fisheries
1721 Mail Service Center
Raleigh, NC 27699-1721

Subject: Fish and Wildlife Coordination Act
Daniels Farm #2 Wetland Restoration Site
Project Number 12054238

Dear Ms. Deaton:

Please accept this information pertaining to the proposed Daniels Farm #2 Wetland Restoration Site, which is located off of Egypt Church Road approximately 2.4 miles southeast of Louisburg, North Carolina in Franklin County, as a submittal for the Fish and Wildlife Coordination Act review by the NC Wildlife Resources Commission.

A portion of this property (refer to attached layout) is currently under investigation as a wetland restoration project for the North Carolina Ecosystem Enhancement Program. The current land use in the project area is piedmont bottomland forest and agricultural crop fields, currently in soybean production. The restoration would improve water quality and wildlife habitat and provide greater protection for aquatic ecosystems from surrounding agricultural lands. This type of work typically involves restoring wetland hydrology and reforestation. In particular, this project involves minor enhancement in the existing bottomland forest and restoration in the agricultural areas. The restoration will fill a field ditch and allow the adjacent depressional areas to become saturated or impounded. As part of the environmental documentation process (Categorical Exclusion), coordination with the NCWRC and the USFWS is requested for compliance with the Fish and Wildlife Coordination Act because a portion of the project will modify an existing ditch.

Following the review of the included documentation, please provide a determination of the potential effects to wildlife associated with this project.

Please feel free to contact me at (919) 783-9214, ext. 141, should you have any questions or require any further information to process this request. Thank you in advance for your assistance and attention.

Sincerely,

Michael B. Schlegel
Project Manager

North Carolina Wildlife Resources Commission

Richard B. Hamilton, Executive Director

8 August 2005

Mr. Michael Schlegel, Project Manager
KCI Associates of North Carolina
Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609

Subject: Fish and Wildlife Coordination Act, Daniels Farm #2 Wetland Restoration Site, Franklin County, North Carolina. Project Number 12054238

Dear Mr. Schlegel:

Biologists with the North Carolina Wildlife Resources Commission have reviewed the subject document. Our comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d), and North Carolina General Statutes (G.S. 113-131 et seq.).

The North Carolina Ecosystem Enhancement Program is currently investigating a wetland restoration site along Tar River in the Tar-Pamlico River basin. There are records for the federal and state endangered dwarf wedgemussel (*Alasmidonta heterodon*); the federal species of concern and state endangered yellow lance (*Elliptio lanceolata*), Atlantic pigtoe (*Fusconaia masoni*), and yellow lampmussel (*Lampsilis cariosa*); the federal species of concern and state special concern Carolina madtom (*Noturus furiosus*); and the state special concern notched rainbow (*Villosa constricta*) in the Tar River watershed. Current land use at the project site is agriculture and forest. The project would involve filling field ditches to restore wetland hydrology and minor enhancement in the existing bottomland forest.

The proposed restoration project should improve water quality and aquatic habitat. We do not anticipate significant adverse impacts to fish and wildlife resources from the proposed project.

Thank you for the opportunity to review this project. If you require further assistance, please contact our office at (336) 449-7625.

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 733-3633 • **Fax:** (919) 715-7643

8 August 2005
Daniels Farm #2 Wetland Restoration Site
Project No. 12054238

Sincerely,

Shari L. Bryant
Piedmont Region Coordinator
Habitat Conservation Program

ec: Dale Suiter, FWS
Sarah McRae, NHP
Angie Rodgers, WRC

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
101-B S. Bickett Blvd.
Louisburg, NC 27549
(919) 496-3137 ext. 3
www.franklinsoilandwaterconservation.com

August 2, 2005

Mr. Steve Stokes
KCI Associates
4601 Six Forks Rd.
Suite 220
Raleigh, NC 27609-5210

Dear Mr. Stokes:

This letter is to provide information relevant to the presence of Prior Converted (PC) and restorable wetland areas on the Daniels property in Franklin County, NC. FSA tract 3791, field 2 is currently shown as PC on official FSA aerial photography. This field was cleared for agricultural production prior to 1985 and does not meet the criteria for abandonment and thus can be called PC by NRCS. However, this does not indicate that any wetlands restoration activity would be compliant with the Clean Water Act and any necessary NC DWQ water quality certifications. As the NRCS PC determination suggests, wetlands conditions could likely be restored on this site when methods to restore hydrology are employed in accordance with a wetlands restoration plan prepared by a qualified planner. If you need further information on this tract, please contact me.

Sincerely,

Joshua Spencer
District Conservationist

Appendix 3. USACE Routine Wetland Determination Data Forms

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Daniels Farm #2 **Applicant / Owner:** KCI Technologies, Inc. **Investigator:** Steven F. Stokes	**Date:** 8-31-05 **County:** Franklin **State:** NC
Do normal circumstances exist on the site? Yes____ No X **Is the site significantly disturbed (Atypical situation)?** Yes____ No X **Is the area a potential problem area?** Yes____ No X **(explain on reverse if needed)**	**Community ID:**_____ **Transect ID:**_____ **Plot ID:** 1A Wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Fraxinus pennsylvanica*	1	FACW	9.		
2. *Acer rubrum*	1	FAC	10.		
3. *Nyssa sylvatica*	1	FAC	11.		
4. *Saururus cernuus*	3	OBL	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 100%

Remarks:

HYDROLOGY

___ **Recorded Data (Describe In Remarks):**
- ___ **Stream, Lake, or Tide Gauge**
- ___ **Aerial Photographs**
- ___ **Other**

X **No Recorded Data Available**

Field Observations:

Depth of Surface Water: _____ **(in.)**

Depth to Free Water in Pit: >60 **(in.)**

Depth to Saturated Soil: >60 **(in.)**

Wetland Hydrology Indicators

Primary Indicators:
- ___ **Inundated**
- ___ **Saturated in Upper 12"**
- ___ **Water Marks**
- ___ **Drift Lines**
- ___ **Sediment Deposits**
- ___ **Drainage Patterns in Wetlands**

Secondary Indicators:
- ___ **Oxidized Roots Channels in Upper 12"**
- ___ **Water-Stained Leaves**
- X **Local Soil Survey Data**
- X **FAC-Neutral Test**
- ___ **Other (Explain in Remarks)**

Remarks:

Site has been drained.

SOILS

1A Non-wetland

Map Unit Name
(Series and Phase): Roanoke silt loam **Drainage Class:** Poorly Drained

Taxonomy (Subgroup): Typic Endoaquults **Confirm Mapped Type? Yes** X **No** ___

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	A1	10YR 5/2			sil, 1fgr
2-10	Btg1	10YR 5/1	7.5YR 4/6	f1d	l, 1fsbk
10-18	Btg2	10YR 5/1	7.5YR 4/6	c2d	scl, 1msbk
18-30	Btg3	10YR 5/1	10YR 6/4	f1f	c, 2msbk
30-42	2Cg	10YR 5/1	2.5Y 6/4 c2d	2.5Y 6/6 c2d	sc, massive
42-50	2Cg1	2.5Y 7/2			sl, massive
50-60	2Cg2	2.5Y 7/2	10YR 6/1 c2d		sl, massive, lenses of clay

Hydric Soil Indicators:

___ Histosol	___ Concretions
___ Histic Epipedon	___ High Organic Content in Surface Layer in Sandy Soils
___ Sulfidic Odor	___ Organic Streaking in Sandy Soils
___ Aquic Moisture Regime	X Listed On Local Hydric Soils List
___ Reducing Conditions	X Listed on National Hydric Soils List
X Gleyed or Low-Chroma Colors	___ Other (Explain in Remarks)

Remarks:
Relic mottles evident.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **Yes** X **No** ___
Wetland Hydrology Present? **Yes** X **No** ___
Hydric Soils Present? **Yes** X **No** ___

Is the Sampling Point Within a Wetland? **Yes** X **No** ___

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Daniels Farm #2 **Applicant / Owner:** KCI Technologies Inc. **Investigator:** Steven F. Stokes	**Date:** 8-31-05 **County:** Franklin **State:** NC
Do normal circumstances exist on the site? Yes X No ____ **Is the site significantly disturbed (Atypical situation)?** Yes ____ No X **Is the area a potential problem area?** Yes ____ No X **(explain on reverse if needed)**	**Community ID:** ____ **Transect ID:** ____ **Plot ID:** 2A Non-wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Ulmus alata*	1	FACU+	9.		
2. *Ulmus alata*	2	FACU+	10.		
3. *Fraxinus pennsylvanica*	1	FACW	11.		
4. *Liquidambar styraciflua*	3	FAC+	12.		
5. *Boehmeria cylindrica*	3	FACW+	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 60%

Remarks:

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- **___ Stream, Lake, or Tide Gauge**
- **___ Aerial Photographs**
- **___ Other**

X No Recorded Data Available

Field Observations:

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: >18 **(in.)**

Depth to Saturated Soil: >18 **(in.)**

Wetland Hydrology Indicators

Primary Indicators:
- **___ Inundated**
- **___ Saturated in Upper 12"**
- **___ Water Marks**
- **___ Drift Lines**
- **___ Sediment Deposits**
- **___ Drainage Patterns in Wetlands**

Secondary Indicators:
- **___ Oxidized Roots Channels in Upper 12"**
- **___ Water-Stained Leaves**
- **___ Local Soil Survey Data**
- **___ FAC-Neutral Test**
- **___ Other (Explain in Remarks)**

Remarks:

SOILS

2A Non-wetland

Map Unit Name
(Series and Phase): Wake-Wateree-Wedowee Complex
Drainage Class: Well Drained

Taxonomy (Subgroup): Lithic Udipsamments **Confirm Mapped Type? Yes** ___ **No** X

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	A1	10YR 5/3			sand, 1fgr
6-15	Bw1	10YR 5/4			sand, 1fgr
15-18	Bw2	10YR 5/3			sl, 1fsbk

Hydric Soil Indicators:

___ **Histosol**
___ **Histic Epipedon**
___ **Sulfidic Odor**
___ **Aquic Moisture Regime**
___ **Reducing Conditions**
___ **Gleyed or Low-Chroma Colors**
___ **Concretions**
___ **High Organic Content in Surface Layer in Sandy Soils**
___ **Organic Streaking in Sandy Soils**
___ **Listed On Local Hydric Soils List**
___ **Listed on National Hydric Soils List**
___ **Other (Explain in Remarks)**

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **Yes** X **No** ___
Wetland Hydrology Present? **Yes** ___ **No** X
Hydric Soils Present? **Yes** ___ **No** X

Is the Sampling Point Within a Wetland? **Yes** ___ **No** X

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Daniels Farm #2 **Applicant / Owner:** KCI Technologies, Inc. **Investigator:** Steven F. Stokes	**Date:** 8-31-05 **County:** Franklin **State:** NC
Do normal circumstances exist on the site? Yes X No **Is the site significantly disturbed (Atypical situation)?** Yes No X **Is the area a potential problem area?** Yes No X **(explain on reverse if needed)**	**Community ID:** **Transect ID:** **Plot ID:** 2B Wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Acer rubrum*	1	FAC	9.		
2. *Impatiens capensis*	3	FACW	10.		
3. *Fraxinus pennsylvanica*	1	FACW	11.		
4. *Leersia oryzoides*	3	OBL	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 100%

Remarks:

HYDROLOGY

___ **Recorded Data (Describe In Remarks):**
- ___ **Stream, Lake, or Tide Gauge**
- ___ **Aerial Photographs**
- ___ **Other**

X **No Recorded Data Available**

Field Observations:

Depth of Surface Water: 2 **(in.)**

Depth to Free Water in Pit: **(in.)**

Depth to Saturated Soil: **(in.)**

Wetland Hydrology Indicators

Primary Indicators:
- X **Inundated**
- X **Saturated in Upper 12"**
- ___ **Water Marks**
- ___ **Drift Lines**
- ___ **Sediment Deposits**
- ___ **Drainage Patterns in Wetlands**

Secondary Indicators:
- ___ **Oxidized Roots Channels in Upper 12"**
- ___ **Water-Stained Leaves**
- ___ **Local Soil Survey Data**
- X **FAC-Neutral Test**
- ___ **Other (Explain in Remarks)**

Remarks:

SOILS

Map Unit Name
(Series and Phase): Roanoke silt loam **Drainage Class:** Poorly Drained

Taxonomy (Subgroup): Typic Endoaquults **Confirm Mapped Type? Yes** ___ **No** X

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	A1	10YR 5/1			sil
3-12	A2	10YR 6/1			l, 1msbk
12-18+	Btg1	10YR 4/2			sc, massive

Hydric Soil Indicators:

___ Histosol	___ Concretions
___ Histic Epipedon	___ High Organic Content in Surface Layer in Sandy Soils
___ Sulfidic Odor	___ Organic Streaking in Sandy Soils
___ Aquic Moisture Regime	X Listed On Local Hydric Soils List
___ Reducing Conditions	X Listed on National Hydric Soils List
X Gleyed or Low-Chroma Colors	___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

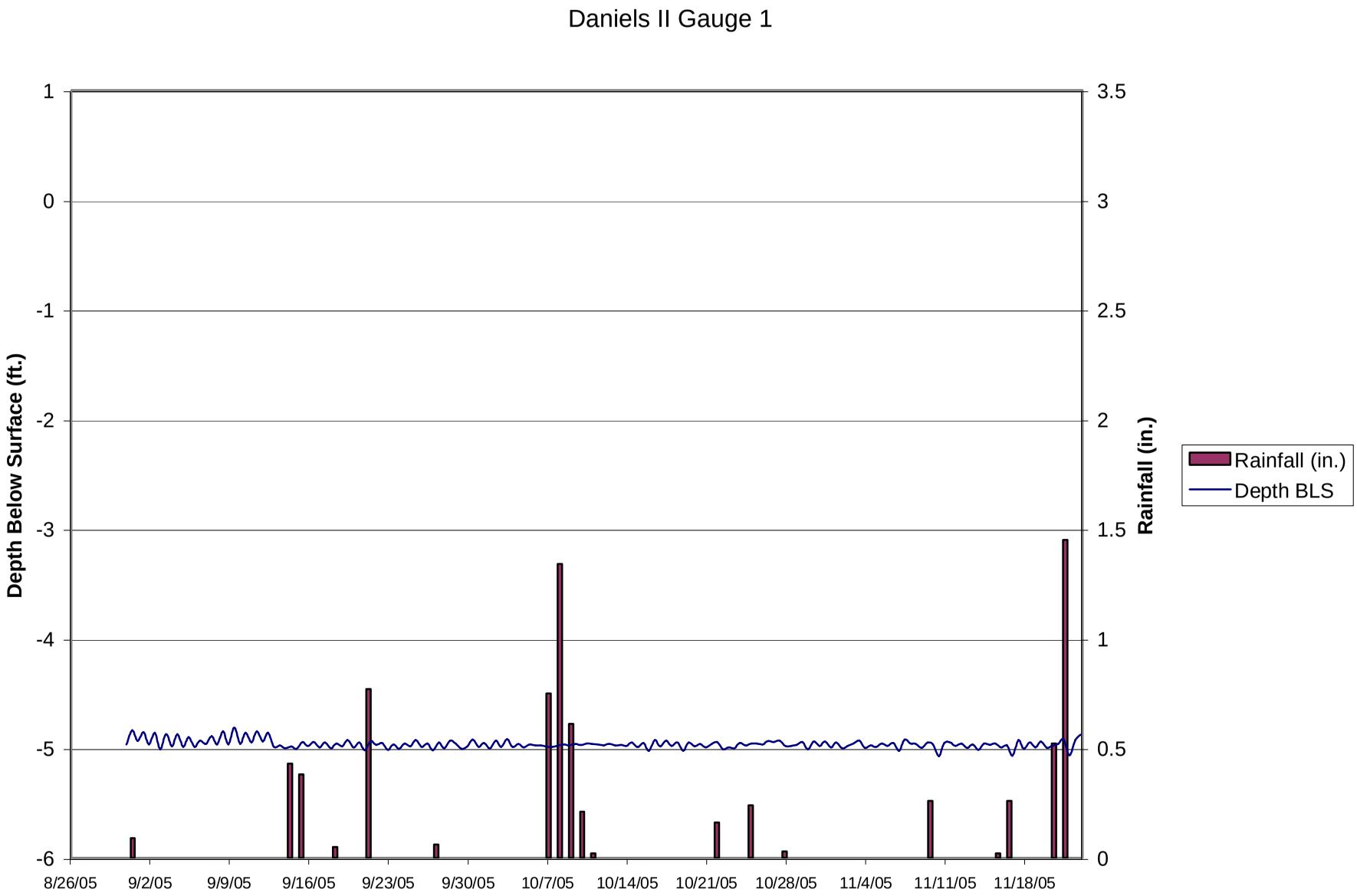
Hydrophytic Vegetation Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___
Hydric Soils Present? Yes X No ___

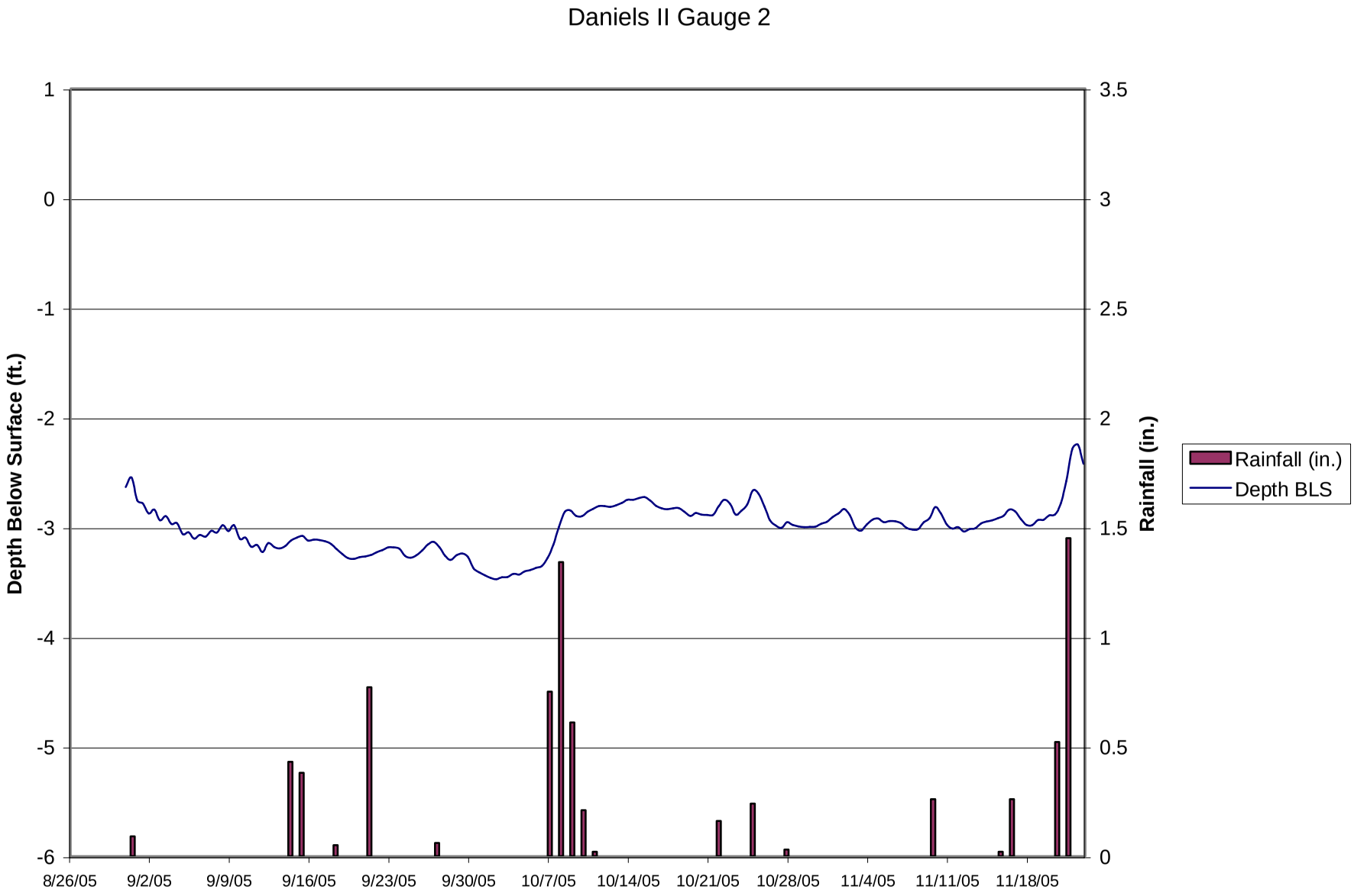
Is the Sampling Point Within a Wetland? Yes X No ___

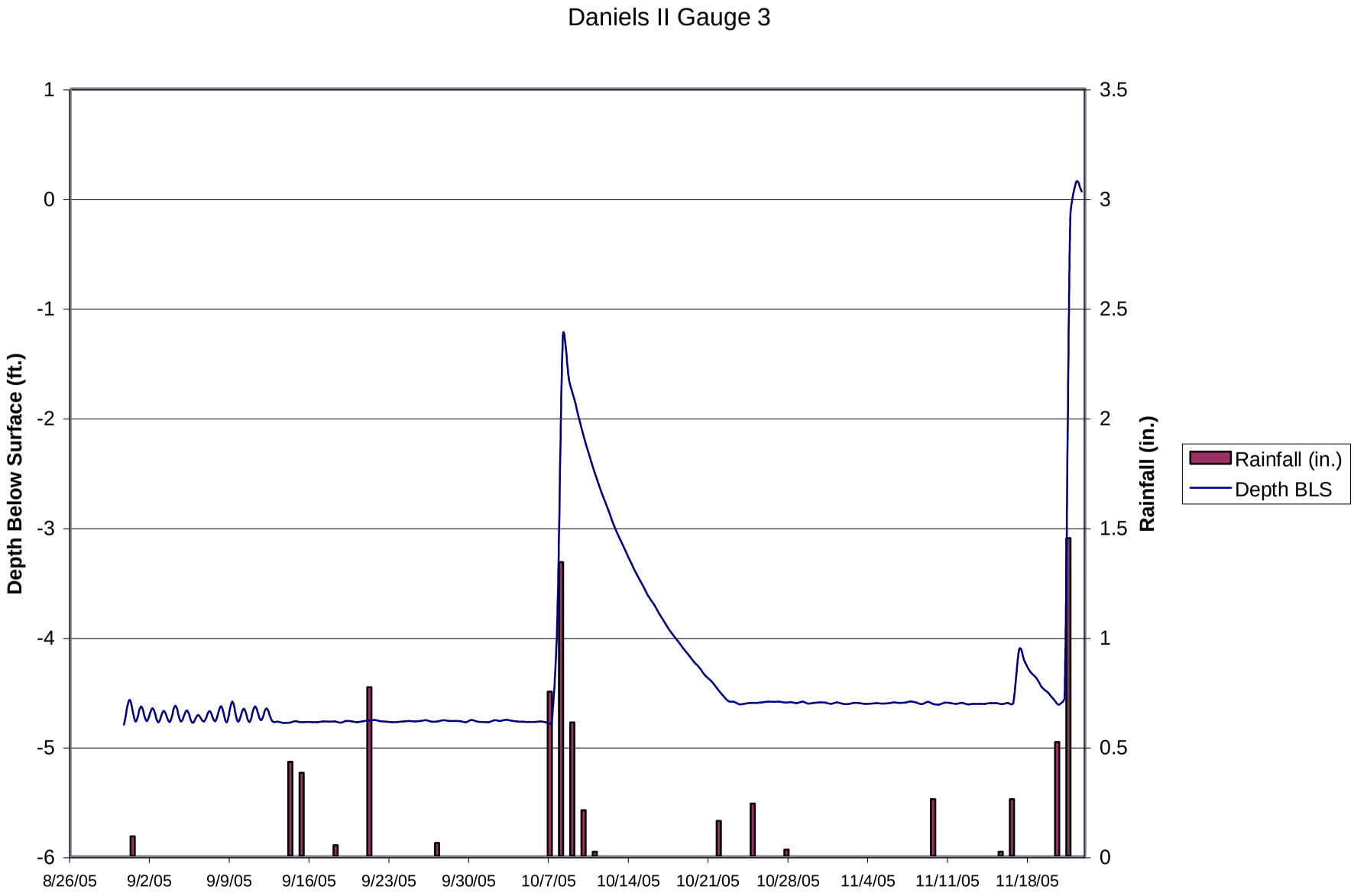
Remarks:

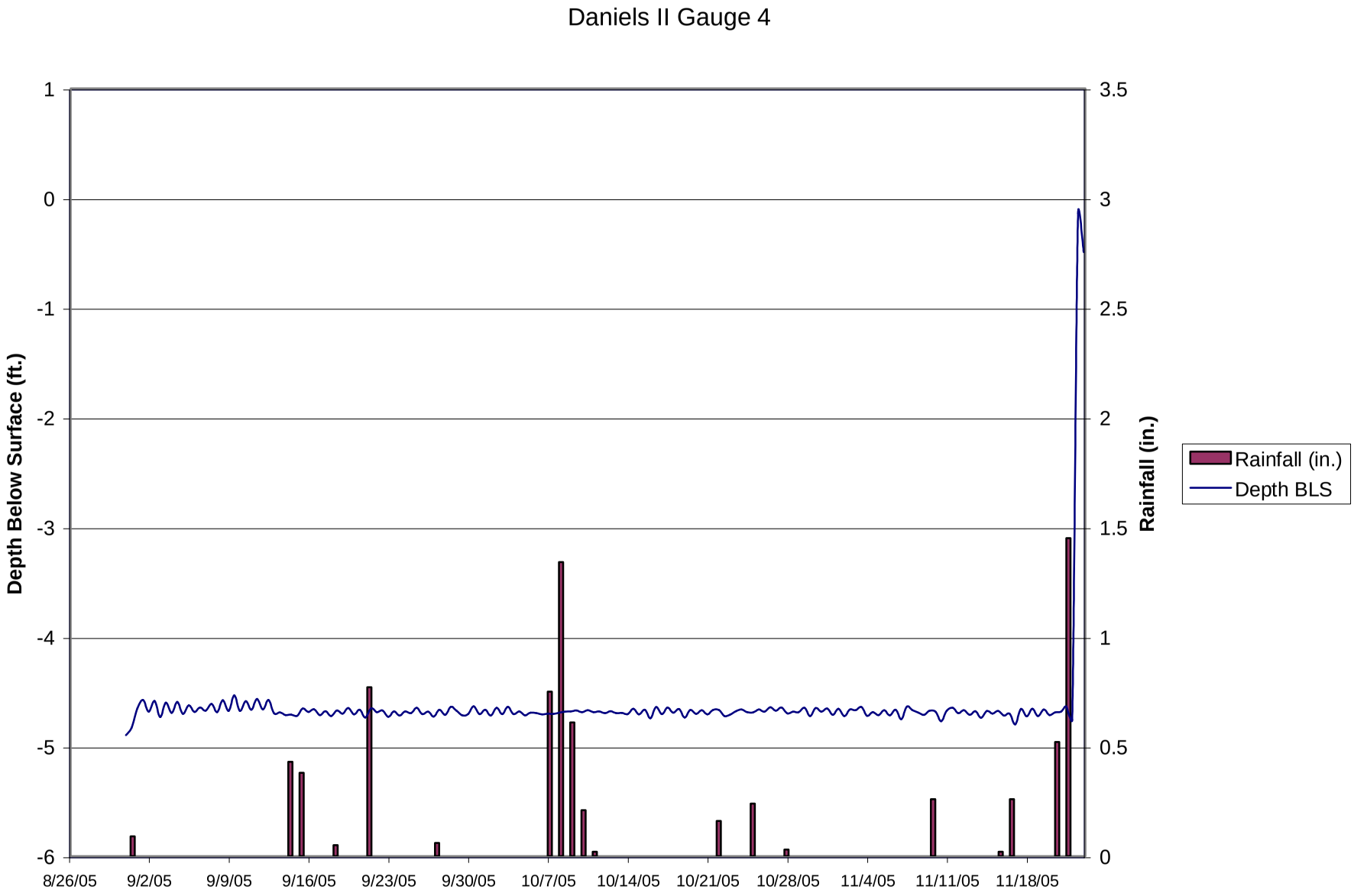
Appendix 4. USACE Approved Wetland Boundary

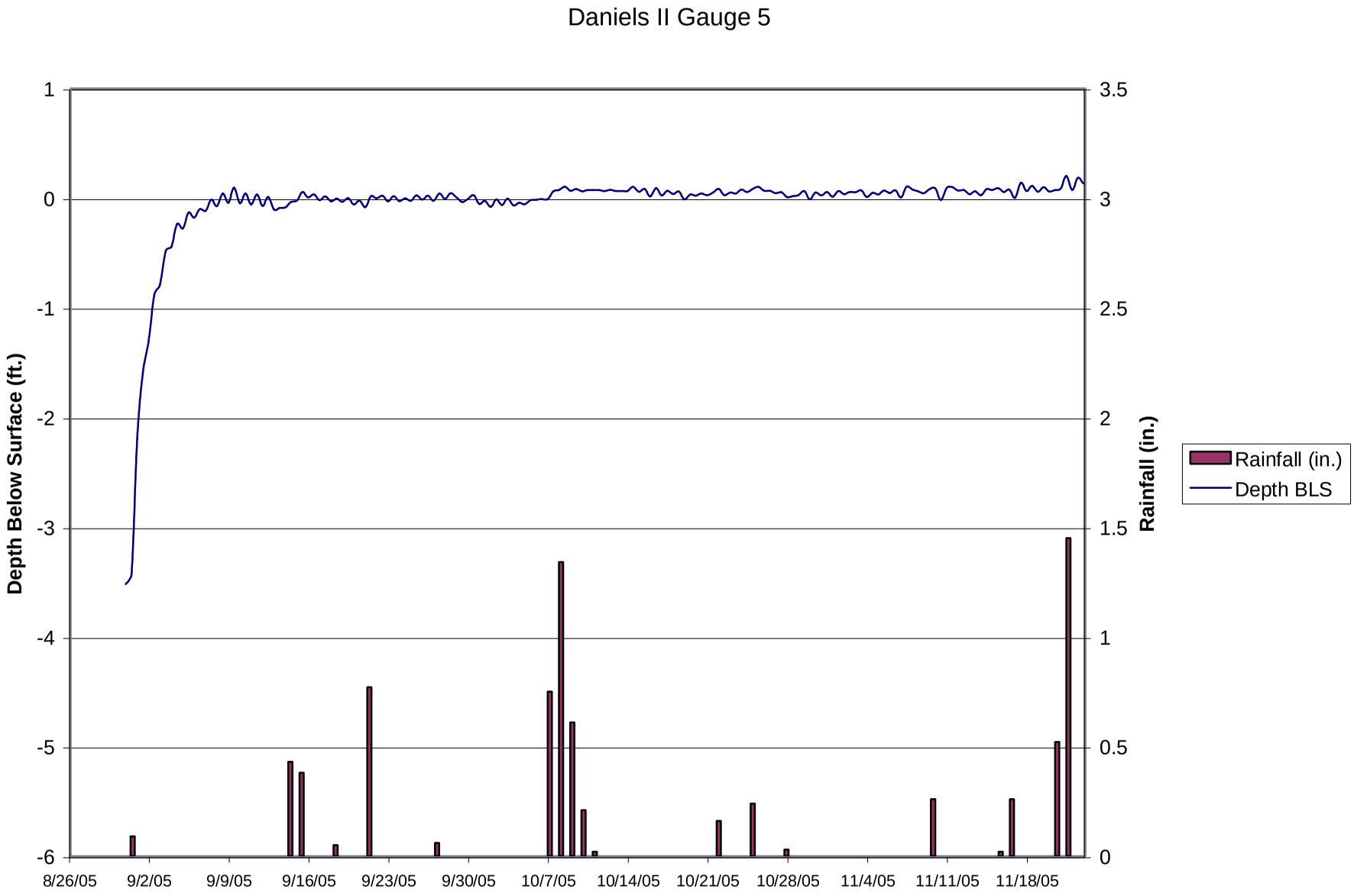
Appendix 5. Gauge Data and Charts

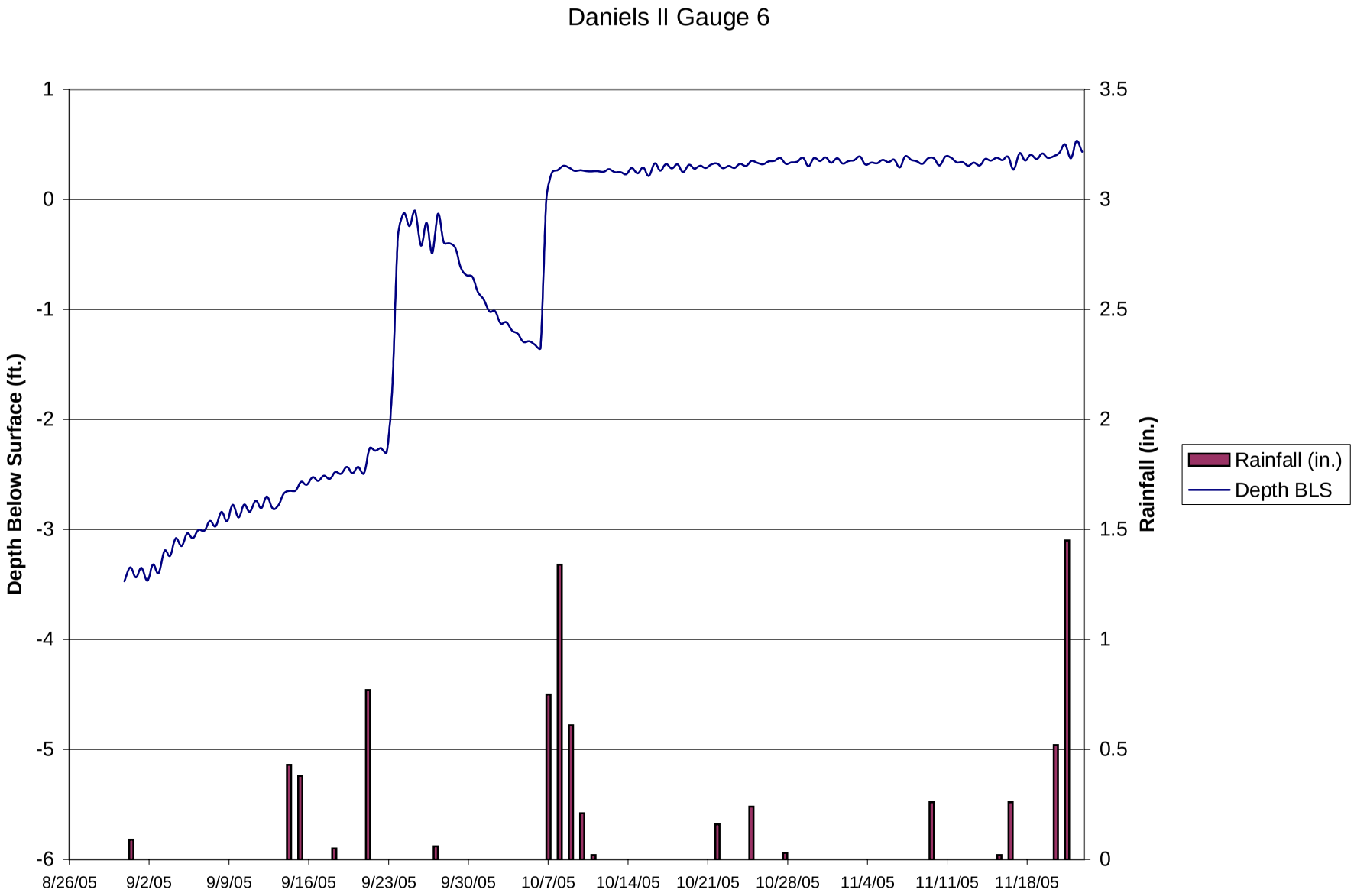

Daniels II Gauge 1
Depth Below Surface (ft.)
Rainfall (in.)
1
0
-1
-2
-3
-4
-5
-6
3.5
3
2.5
2
1.5
1
0.5
0
8/26/05
9/2/05
9/9/05
9/16/05
9/23/05
9/30/05
10/7/05
10/14/05
10/21/05
10/28/05
11/4/05
11/11/05
11/18/05
Rainfall (in.)
Depth BLS


Daniels II Gauge 2
Depth Below Surface (ft.)
Rainfall (in.)
1
0
-1
-2
-3
-4
-5
-6
3.5
3
2.5
2
1.5
1
0.5
0
8/26/05
9/2/05
9/9/05
9/16/05
9/23/05
9/30/05
10/7/05
10/14/05
10/21/05
10/28/05
11/4/05
11/11/05
11/18/05
Rainfall (in.)
Depth BLS


Daniels II Gauge 3
Depth Below Surface (ft.)
Rainfall (in.)
1
0
-1
-2
-3
-4
-5
-6
3.5
3
2.5
2
1.5
1
0.5
0
8/26/05
9/2/05
9/9/05
9/16/05
9/23/05
9/30/05
10/7/05
10/14/05
10/21/05
10/28/05
11/4/05
11/11/05
11/18/05
Rainfall (in.)
Depth BLS


Daniels II Gauge 4
Depth Below Surface (ft.)
Rainfall (in.)
1
0
-1
-2
-3
-4
-5
-6
3.5
3
2.5
2
1.5
1
0.5
0
8/26/05
9/2/05
9/9/05
9/16/05
9/23/05
9/30/05
10/7/05
10/14/05
10/21/05
10/28/05
11/4/05
11/11/05
11/18/05
Rainfall (in.)
Depth BLS


Daniels II Gauge 5
Depth Below Surface (ft.)
Rainfall (in.)
1
0
-1
-2
-3
-4
-5
-6
3.5
3
2.5
2
1.5
1
0.5
0
8/26/05
9/2/05
9/9/05
9/16/05
9/23/05
9/30/05
10/7/05
10/14/05
10/21/05
10/28/05
11/4/05
11/11/05
11/18/05
Rainfall (in.)
Depth BLS


Daniels II Gauge 6
Depth Below Surface (ft.)
Rainfall (in.)
1
0
-1
-2
-3
-4
-5
-6
3.5
3
2.5
2
1.5
1
0.5
0
8/26/05
9/2/05
9/9/05
9/16/05
9/23/05
9/30/05
10/7/05
10/14/05
10/21/05
10/28/05
11/4/05
11/11/05
11/18/05
Rainfall (in.)
Depth BLS

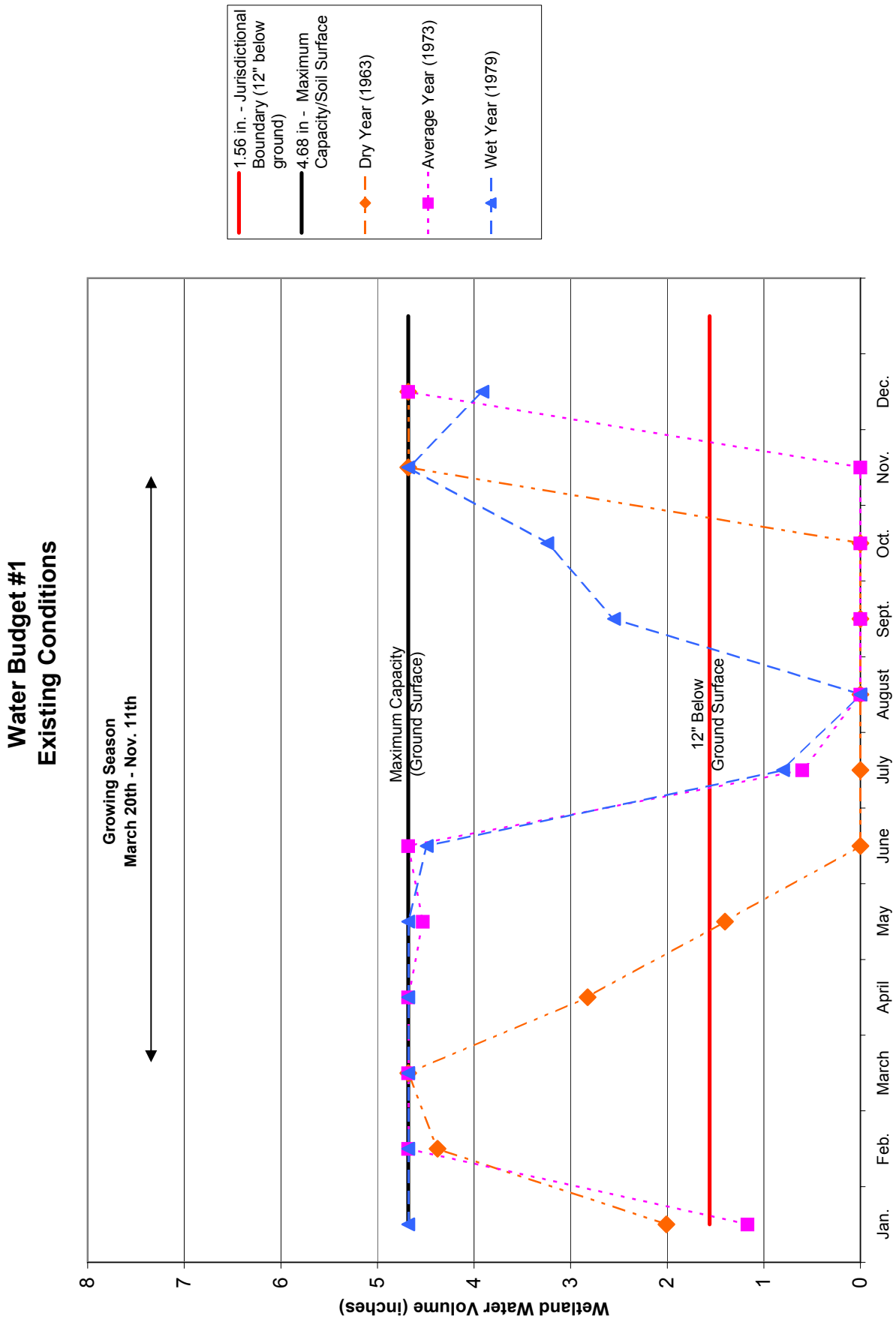
Appendix 6. Water Budget

Daniels Farm #2 - Existing Conditions for Water Budget #1

Dry Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1963	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-63	3.22	0.35	0.00	0.17	0.35	0.00	1.04	2.01	0.00	2.01
Feb-63	3.75	0.68	0.00	0.34	0.68	0.00	1.04	2.37	0.00	4.38
Mar-63	3.7	0.46	0.00	1.05	0.46	0.00	1.04	1.61	1.31	4.68
Apr-63	1.38	0.23	0.00	2.20	0.23	0.00	1.04	-1.86	0.00	2.82
May-63	3.24	0.71	0.00	3.62	0.71	0.00	1.04	-1.42	0.00	1.40
Jun-63	2.28	0.00	0.00	5.34	0.00	0.00	1.04	-4.10	0.00	0.00
Jul-63	2.56	0.30	0.00	6.10	0.30	0.00	1.04	-4.58	0.00	0.00
Aug-63	1.32	0.00	0.00	5.40	0.00	0.00	1.04	-5.12	0.00	0.00
Sep-63	4.35	1.78	0.00	3.89	1.78	0.00	1.04	-0.58	0.00	0.00
Oct-63	0.46	0.00	0.00	1.99	0.00	0.00	1.04	-2.57	0.00	0.00
Nov-63	7.85	3.58	0.00	0.92	3.58	0.00	1.04	5.89	1.21	4.68
Dec-63	3.85	0.64	0.00	0.31	0.64	0.00	1.04	2.50	2.50	4.68
Annual Totals	**37.96**	**8.74**	**0.00**	**31.32**	**8.74**	**0.00**	**1.04**			

Avg. Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1973	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-73	2.38	0.00	0.00	0.17	0.00	0.00	1.04	1.17	0.00	1.17
Feb-73	5.36	1.58	0.00	0.34	1.58	0.00	1.04	3.98	0.47	4.68
Mar-73	3.56	0.00	0.00	1.05	0.00	0.00	1.04	1.47	1.47	4.68
Apr-73	4.86	1.83	0.00	2.20	1.83	0.00	1.04	1.62	1.62	4.68
May-73	4.51	0.65	0.00	3.62	0.65	0.00	1.04	-0.15	0.00	4.53
Jun-73	8.57	4.09	0.00	5.34	4.09	0.00	1.04	2.19	2.04	4.68
Jul-73	3.06	0.32	0.00	6.10	0.32	0.00	1.04	-4.08	0.00	0.60
Aug-73	5.35	1.69	0.00	5.40	1.69	0.00	1.04	-1.09	0.00	0.00
Sep-73	2.47	0.32	0.00	3.89	0.32	0.00	1.04	-2.46	0.00	0.00
Oct-73	0.59	0.00	0.00	1.99	0.00	0.00	1.04	-2.44	0.00	0.00
Nov-73	0.74	0.00	0.00	0.92	0.00	0.00	1.04	-1.22	0.00	0.00
Dec-73	6.27	1.96	0.00	0.31	1.96	0.00	1.04	4.92	0.24	4.68
Annual Totals	**47.72**	**12.42**	**0.00**	**31.32**	**12.42**	**0.00**	**12.48**			

Wet Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1979	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-79	6.35	1.95	0.00	0.17	1.95	0.00	1.04	5.14	0.46	4.68
Feb-79	4.31	1.08	0.00	0.34	1.08	0.00	1.04	2.93	2.93	4.68
Mar-79	3.47	0.37	0.00	1.05	0.37	0.00	1.04	1.38	1.38	4.68
Apr-79	5.33	1.60	0.00	2.20	1.60	0.00	1.04	2.09	2.09	4.68
May-79	5.42	0.90	0.00	3.62	0.90	0.00	1.04	0.76	0.76	4.68
Jun-79	6.19	3.19	0.00	5.34	3.19	0.00	1.04	-0.19	0.00	4.49
Jul-79	3.45	0.48	0.00	6.10	0.48	0.00	1.04	-3.69	0.00	0.80
Aug-79	3.68	1.50	0.00	5.40	1.50	0.00	1.04	-2.76	0.00	0.00
Sep-79	7.48	2.40	0.00	3.89	2.40	0.00	1.04	2.55	0.00	2.55
Oct-79	3.72	0.54	0.00	1.99	0.54	0.00	1.04	0.69	0.00	3.24
Nov-79	6.76	2.88	0.00	0.92	2.88	0.00	1.04	4.80	3.36	4.68
Dec-79	0.58	0	0.00	0.31	0	0.00	1.04	-0.77	0.00	3.91
Annual Totals	**56.74**	**16.88**	**0.00**	**31.32**	**16.88**	**0.00**	**12.48**			


Water Budget #1
Existing Conditions
Growing Season
March 20th - Nov. 11th
Maximum Capacity
(Ground Surface)
12" Below
Ground Surface
Wetland Water Volume (inches)
0
1
2
3
4
5
6
7
8
Jan.
Feb.
March
April
May
June
July
August
Sept.
Oct.
Nov.
Dec.
1.56 in. - Jurisdictional Boundary (12" below ground)
4.68 in - Maximum Capacity/Soil Surface
Dry Year (1963)
Average Year (1973)
Wet Year (1979)

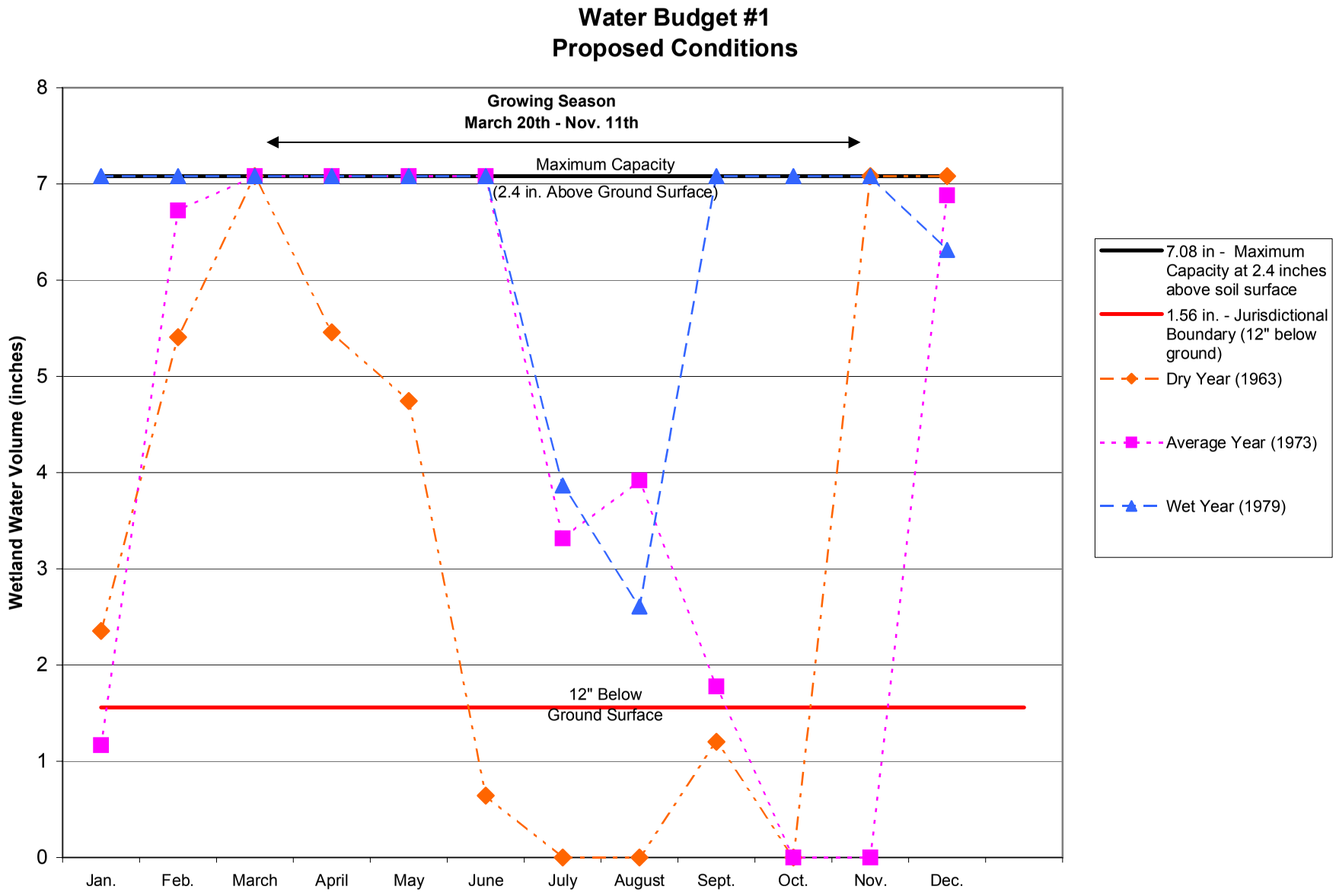
Daniels Farm #2 - Proposed Conditions for Water Budget #1

Dry Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1963	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-63	3.22	0.35	0.00	0.17	0.00	0.00	1.04	2.35	0.00	2.35
Feb-63	3.75	0.68	0.00	0.34	0.00	0.00	1.04	3.05	0.00	5.41
Mar-63	3.7	0.46	0.00	1.05	0.00	0.00	1.04	2.08	0.40	7.08
Apr-63	1.38	0.23	0.00	2.20	0.00	0.00	1.04	-1.62	0.00	5.46
May-63	3.24	0.71	0.00	3.62	0.00	0.00	1.04	-0.71	0.00	4.74
Jun-63	2.28	0.00	0.00	5.34	0.00	0.00	1.04	-4.10	0.00	0.64
Jul-63	2.56	0.30	0.00	6.10	0.00	0.00	1.04	-4.28	0.00	0.00
Aug-63	1.32	0.00	0.00	5.40	0.00	0.00	1.04	-5.12	0.00	0.00
Sep-63	4.35	1.78	0.00	3.89	0.00	0.00	1.04	1.20	0.00	1.20
Oct-63	0.46	0.00	0.00	1.99	0.00	0.00	1.04	-2.57	0.00	0.00
Nov-63	7.85	3.58	0.00	0.92	0.00	0.00	1.04	9.47	2.39	7.08
Dec-63	3.85	0.64	0.00	0.31	0.00	0.00	1.04	3.14	3.14	7.08
Annual Total	**37.96**	**8.74**	**0.00**	**31.32**	**0.00**	**0.00**	**1.04**			

Avg. Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1973	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-73	2.38	0.00	0.00	0.17	0.00	0.00	1.04	1.17	0.00	1.17
Feb-73	5.36	1.58	0.00	0.34	0.00	0.00	1.04	5.56	0.00	6.72
Mar-73	3.56	0.00	0.00	1.05	0.00	0.00	1.04	1.47	1.12	7.08
Apr-73	4.86	1.83	0.00	2.20	0.00	0.00	1.04	3.46	3.46	7.08
May-73	4.51	0.65	0.00	3.62	0.00	0.00	1.04	0.49	0.49	7.08
Jun-73	8.57	4.09	0.00	5.34	0.00	0.00	1.04	6.28	6.28	7.08
Jul-73	3.06	0.32	0.00	6.10	0.00	0.00	1.04	-3.76	0.00	3.32
Aug-73	5.35	1.69	0.00	5.40	0.00	0.00	1.04	0.60	0.00	3.92
Sep-73	2.47	0.32	0.00	3.89	0.00	0.00	1.04	-2.14	0.00	1.78
Oct-73	0.59	0.00	0.00	1.99	0.00	0.00	1.04	-2.44	0.00	0.00
Nov-73	0.74	0.00	0.00	0.92	0.00	0.00	1.04	-1.22	0.00	0.00
Dec-73	6.27	1.96	0.00	0.31	0.00	0.00	1.04	6.88	0.00	6.88
Annual Total	**47.72**	**12.42**	**0.00**	**31.32**	**0.00**	**0.00**	**12.48**			

Wet Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1979	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-79	6.35	1.95	0.00	0.17	0.00	0.00	1.04	7.09	0.01	7.08
Feb-79	4.31	1.08	0.00	0.34	0.00	0.00	1.04	4.01	4.01	7.08
Mar-79	3.47	0.37	0.00	1.05	0.00	0.00	1.04	1.76	1.76	7.08
Apr-79	5.33	1.60	0.00	2.20	0.00	0.00	1.04	3.69	3.69	7.08
May-79	5.42	0.90	0.00	3.62	0.00	0.00	1.04	1.66	1.66	7.08
Jun-79	6.19	3.19	0.00	5.34	0.00	0.00	1.04	3.00	3.00	7.08
Jul-79	3.45	0.48	0.00	6.10	0.00	0.00	1.04	-3.21	0.00	3.87
Aug-79	3.68	1.50	0.00	5.40	0.00	0.00	1.04	-1.26	0.00	2.61
Sep-79	7.48	2.40	0.00	3.89	0.00	0.00	1.04	4.95	0.47	7.08
Oct-79	3.72	0.54	0.00	1.99	0.00	0.00	1.04	1.24	1.24	7.08
Nov-79	6.76	2.88	0.00	0.92	0.00	0.00	1.04	7.68	7.68	7.08
Dec-79	0.58	0.00	0.00	0.31	0.00	0.00	1.04	-0.77	0.00	6.31
Annual Total	**56.74**	**16.88**	**0.00**	**31.32**	**0.00**	**0.00**	**12.48**			

Note: A retention of 0.2 feet (2.4 inches) of surface water is assumed based on the creation of microtopography during wetland restoration.

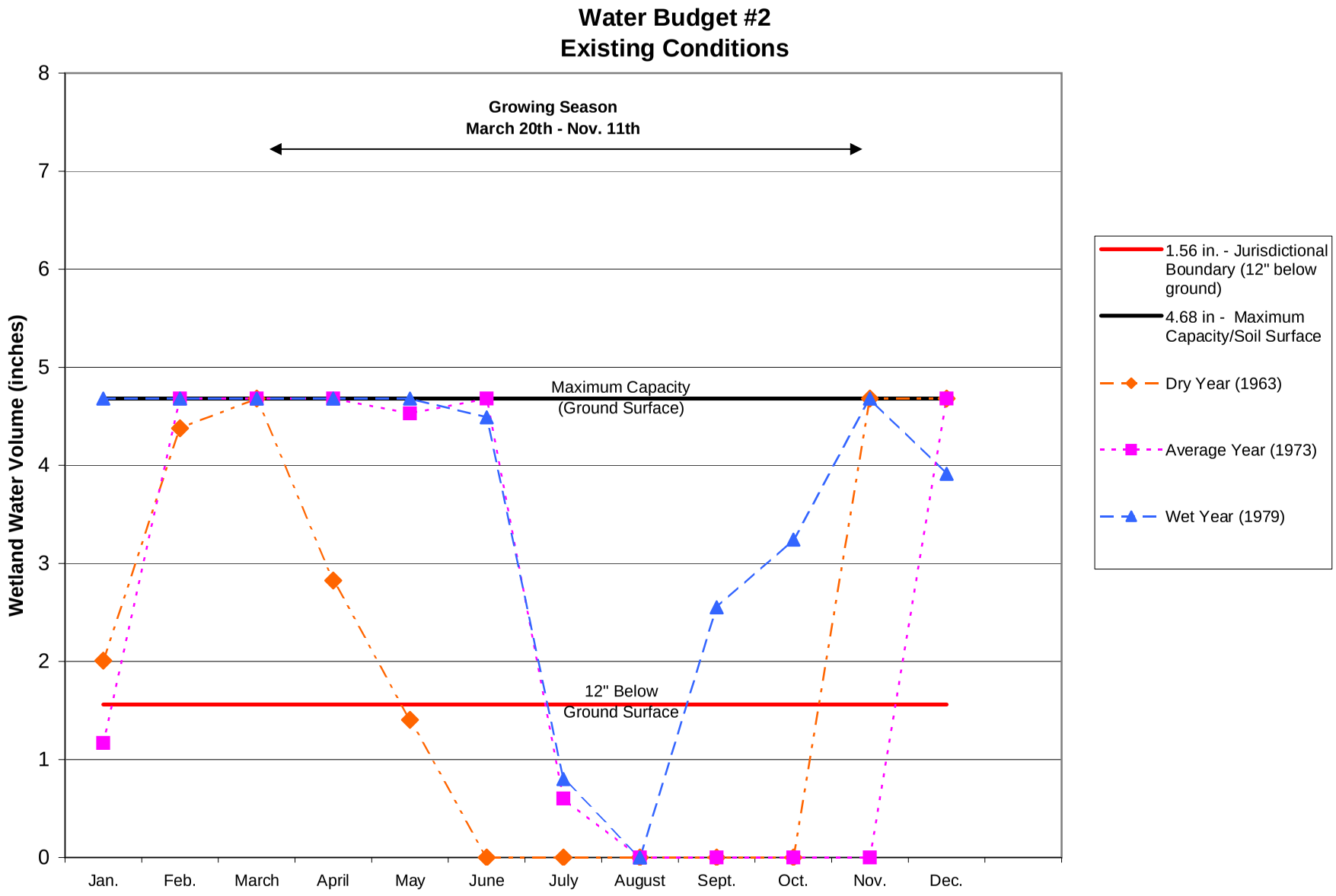

Water Budget #1
Proposed Conditions
Growing Season
March 20th - Nov. 11th
Maximum Capacity
(2.4 in. Above Ground Surface)
12" Below
Ground Surface
Wetland Water Volume (inches)
0
1
2
3
4
5
6
7
8
Jan.
Feb.
March
April
May
June
July
August
Sept.
Oct.
Nov.
Dec.
7.08 in - Maximum Capacity at 2.4 inches above soil surface
1.56 in. - Jurisdictional Boundary (12" below ground)
Dry Year (1963)
Average Year (1973)
Wet Year (1979)

Daniels Farm #2 - Existing Conditions for Water Budget #2

Dry Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1963	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-63	3.22	0.31	0.00	0.17	0.31	0.00	1.04	2.01	0.00	2.01
Feb-63	3.75	0.62	0.00	0.34	0.62	0.00	1.04	2.37	0.00	4.38
Mar-63	3.7	0.42	0.00	1.05	0.42	0.00	1.04	1.61	1.31	4.68
Apr-63	1.38	0.20	0.00	2.20	0.20	0.00	1.04	-1.86	0.00	2.82
May-63	3.24	0.66	0.00	3.62	0.66	0.00	1.04	-1.42	0.00	1.40
Jun-63	2.28	0.00	0.00	5.34	0.00	0.00	1.04	-4.10	0.00	0.00
Jul-63	2.56	0.28	0.00	6.10	0.28	0.00	1.04	-4.58	0.00	0.00
Aug-63	1.32	0.00	0.00	5.40	0.00	0.00	1.04	-5.12	0.00	0.00
Sep-63	4.35	1.69	0.00	3.89	1.69	0.00	1.04	-0.58	0.00	0.00
Oct-63	0.46	0.00	0.00	1.99	0.00	0.00	1.04	-2.57	0.00	0.00
Nov-63	7.85	3.41	0.00	0.92	3.41	0.00	1.04	5.89	1.21	4.68
Dec-63	3.85	0.59	0.00	0.31	0.59	0.00	1.04	2.50	2.50	4.68
Annual Totals	**37.96**	**8.17**	**0.00**	**31.32**	**8.17**	**0.00**	**12.48**			

Avg. Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1973	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-73	2.38	0.00	0.00	0.17	0.00	0.00	1.04	1.17	0.00	1.17
Feb-73	5.36	1.49	0.00	0.34	1.49	0.00	1.04	3.98	0.47	4.68
Mar-73	3.56	0.00	0.00	1.05	0.00	0.00	1.04	1.47	1.47	4.68
Apr-73	4.86	1.72	0.00	2.20	1.72	0.00	1.04	1.62	1.62	4.68
May-73	4.51	0.58	0.00	3.62	0.58	0.00	1.04	-0.15	0.00	4.53
Jun-73	8.57	3.96	0.00	5.34	3.96	0.00	1.04	2.19	2.04	4.68
Jul-73	3.06	0.29	0.00	6.10	0.29	0.00	1.04	-4.08	0.00	0.60
Aug-73	5.35	1.56	0.00	5.40	1.56	0.00	1.04	-1.09	0.00	0.00
Sep-73	2.47	0.29	0.00	3.89	0.29	0.00	1.04	-2.46	0.00	0.00
Oct-73	0.59	0.00	0.00	1.99	0.00	0.00	1.04	-2.44	0.00	0.00
Nov-73	0.74	0.00	0.00	0.92	0.00	0.00	1.04	-1.22	0.00	0.00
Dec-73	6.27	1.81	0.00	0.31	1.81	0.00	1.04	4.92	0.24	4.68
Annual Totals	**47.72**	**11.69**	**0.00**	**31.32**	**11.69**	**0.00**	**12.48**			

Wet Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1979	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-79	6.35	1.86	0.00	0.17	1.86	0.00	1.04	5.14	0.46	4.68
Feb-79	4.31	0.99	0.00	0.34	0.99	0.00	1.04	2.93	2.93	4.68
Mar-79	3.47	0.34	0.00	1.05	0.34	0.00	1.04	1.38	1.38	4.68
Apr-79	5.33	1.51	0.00	2.20	1.51	0.00	1.04	2.09	2.09	4.68
May-79	5.42	0.82	0.00	3.62	0.82	0.00	1.04	0.76	0.76	4.68
Jun-79	6.19	3.06	0.00	5.34	3.06	0.00	1.04	-0.19	0.00	4.49
Jul-79	3.45	0.43	0.00	6.10	0.43	0.00	1.04	-3.69	0.00	0.80
Aug-79	3.68	1.44	0.00	5.40	1.44	0.00	1.04	-2.76	0.00	0.00
Sep-79	7.48	2.26	0.00	3.89	2.26	0.00	1.04	2.55	0.00	2.55
Oct-79	3.72	0.50	0.00	1.99	0.50	0.00	1.04	0.69	0.00	3.24
Nov-79	6.76	2.71	0.00	0.92	2.71	0.00	1.04	4.80	3.36	4.68
Dec-79	0.58	0.00	0.00	0.31	0.00	0.00	1.04	-0.77	0.00	3.91
Annual Totals	**56.74**	**15.91**	**0.00**	**31.32**	**15.91**	**0.00**	**12.48**			


Water Budget #2
Existing Conditions
Growing Season
March 20th - Nov. 11th
Maximum Capacity
(Ground Surface)
12" Below
Ground Surface
Wetland Water Volume (inches)
0
1
2
3
4
5
6
7
8
Jan.
Feb.
March
April
May
June
July
August
Sept.
Oct.
Nov.
Dec.
1.56 in. - Jurisdictional Boundary (12" below ground)
4.68 in - Maximum Capacity/Soil Surface
Dry Year (1963)
Average Year (1973)
Wet Year (1979)

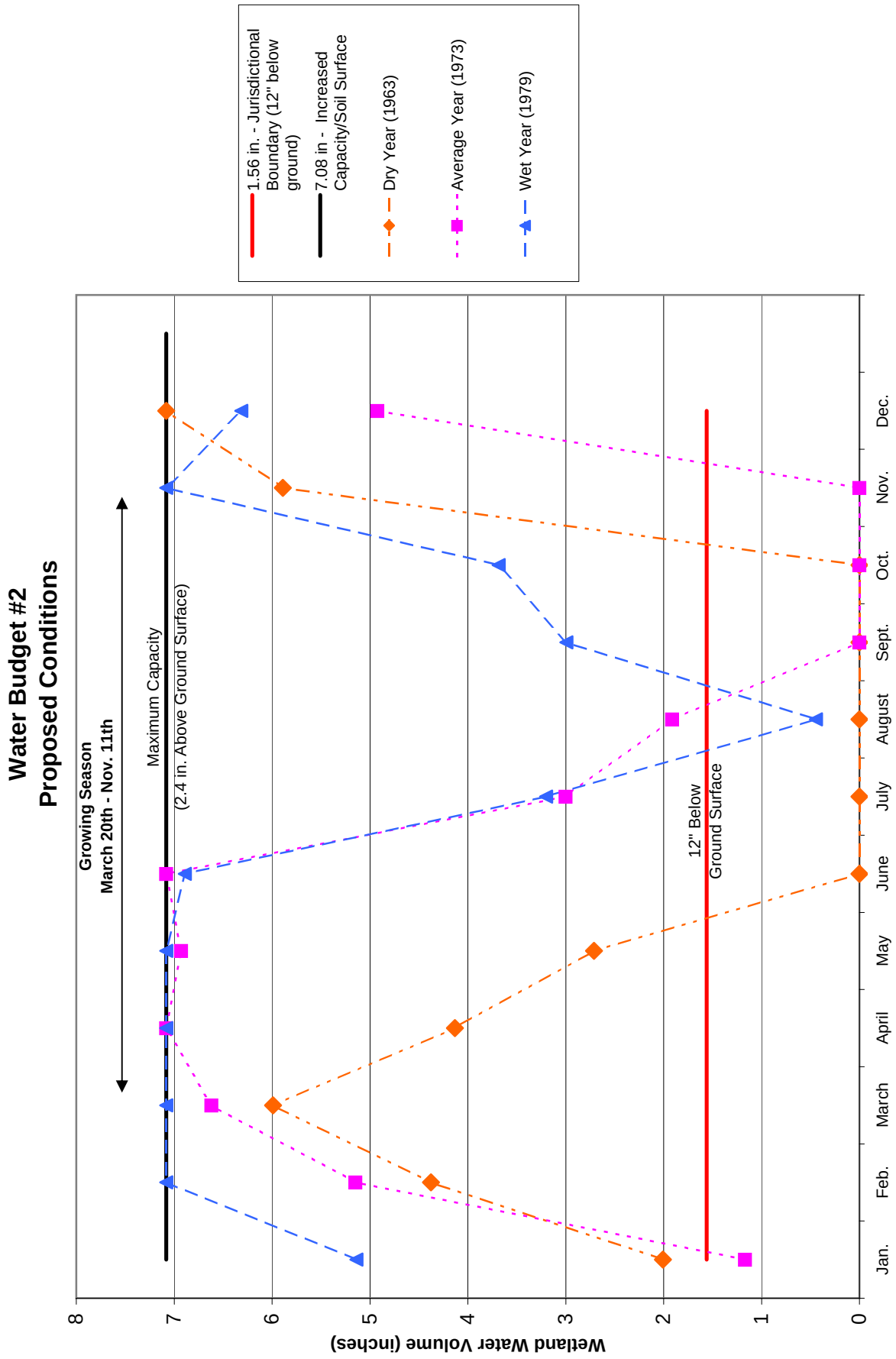
Daniels Farm #2 - Proposed Conditions for Water Budget #2

Dry Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1963	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-63	3.22	0.31	0.00	0.17	0.31	0.00	1.04	2.01	0.00	2.01
Feb-63	3.75	0.62	0.00	0.34	0.62	0.00	1.04	2.37	0.00	4.38
Mar-63	3.7	0.42	0.00	1.05	0.42	0.00	1.04	1.61	0.00	5.99
Apr-63	1.38	0.20	0.00	2.20	0.20	0.00	1.04	-1.86	0.00	4.13
May-63	3.24	0.66	0.00	3.62	0.66	0.00	1.04	-1.42	0.00	2.71
Jun-63	2.28	0.00	0.00	5.34	0.00	0.00	1.04	-4.10	0.00	0.00
Jul-63	2.56	0.28	0.00	6.10	0.28	0.00	1.04	-4.58	0.00	0.00
Aug-63	1.32	0.00	0.00	5.40	0.00	0.00	1.04	-5.12	0.00	0.00
Sep-63	4.35	1.69	0.00	3.89	1.69	0.00	1.04	-0.58	0.00	0.00
Oct-63	0.46	0.00	0.00	1.99	0.00	0.00	1.04	-2.57	0.00	0.00
Nov-63	7.85	3.41	0.00	0.92	3.41	0.00	1.04	5.89	0.00	5.89
Dec-63	3.85	0.59	0.00	0.31	0.59	0.00	1.04	2.50	1.31	7.08
Annual Totals	**37.96**	**8.17**	**0.00**	**31.32**	**8.17**	**0.00**	**8.17**			

Avg. Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1973	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-73	2.38	0.00	0.00	0.17	0.00	0.00	1.04	1.17	0.00	1.17
Feb-73	5.36	1.49	0.00	0.34	1.49	0.00	1.04	3.98	0.00	5.15
Mar-73	3.56	0.00	0.00	1.05	0.00	0.00	1.04	1.47	0.00	6.62
Apr-73	4.86	1.72	0.00	2.20	1.72	0.00	1.04	1.62	1.16	7.08
May-73	4.51	0.58	0.00	3.62	0.58	0.00	1.04	-0.15	0.00	6.93
Jun-73	8.57	3.96	0.00	5.34	3.96	0.00	1.04	2.19	2.04	7.08
Jul-73	3.06	0.29	0.00	6.10	0.29	0.00	1.04	-4.08	0.00	3.00
Aug-73	5.35	1.56	0.00	5.40	1.56	0.00	1.04	-1.09	0.00	1.91
Sep-73	2.47	0.29	0.00	3.89	0.29	0.00	1.04	-2.46	0.00	0.00
Oct-73	0.59	0.00	0.00	1.99	0.00	0.00	1.04	-2.44	0.00	0.00
Nov-73	0.74	0.00	0.00	0.92	0.00	0.00	1.04	-1.22	0.00	0.00
Dec-73	6.27	1.81	0.00	0.31	1.81	0.00	1.04	4.92	0.00	4.92
Annual Totals	**47.72**	**11.69**	**0.00**	**31.32**	**11.69**	**0.00**	**12.48**			

Wet Year	*Water Inputs*			*Water Outputs*				Change in	Excess	Wetland
1979	**P**	**Si ***	**Gi**	**PET**	**So**	**Go**	**Infiltration**	**Storage**	**Water**	**Volume**
Jan-79	6.35	1.86	0.00	0.17	1.86	0.00	1.04	5.14	0.00	5.14
Feb-79	4.31	0.99	0.00	0.34	0.99	0.00	1.04	2.93	0.99	7.08
Mar-79	3.47	0.34	0.00	1.05	0.34	0.00	1.04	1.38	1.38	7.08
Apr-79	5.33	1.51	0.00	2.20	1.51	0.00	1.04	2.09	2.09	7.08
May-79	5.42	0.82	0.00	3.62	0.82	0.00	1.04	0.76	0.76	7.08
Jun-79	6.19	3.06	0.00	5.34	3.06	0.00	1.04	-0.19	0.00	6.89
Jul-79	3.45	0.43	0.00	6.10	0.43	0.00	1.04	-3.69	0.00	3.20
Aug-79	3.68	1.44	0.00	5.40	1.44	0.00	1.04	-2.76	0.00	0.44
Sep-79	7.48	2.26	0.00	3.89	2.26	0.00	1.04	2.55	0.00	2.99
Oct-79	3.72	0.50	0.00	1.99	0.50	0.00	1.04	0.69	0.00	3.69
Nov-79	6.76	2.71	0.00	0.92	2.71	0.00	1.04	4.80	1.41	7.08
Dec-79	0.58	0.00	0.00	0.31	0.00	0.00	1.04	-0.77	0.00	6.31
Annual Totals	**56.74**	**15.91**	**0.00**	**31.32**	**15.91**	**0.00**	**12.48**			

Note: A retention of 0.2 feet (2.4 inches) of surface water is assumed based on the creation of microtopography during wetland restoration.


Water Budget #2
Proposed Conditions
Growing Season
March 20th - Nov. 11th
Maximum Capacity
(2.4 in. Above Ground Surface)
12" Below
Ground Surface
1.56 in. - Jurisdictional Boundary (12" below ground)
7.08 in - Increased Capacity/Soil Surface
Dry Year (1963)
Average Year (1973)
Wet Year (1979)
Wetland Water Volume (inches)
0
1
2
3
4
5
6
7
8
Jan.
Feb.
March
April
May
June
July
August
Sept.
Oct.
Nov.
Dec.

Appendix 7. Vegetative Sampling

Daniels Farm #2 Vegetation Monitoring Protocol

Stake and flag the sample point and collect information on each vegetation layer according to the following rules:

Tree Layer (Any non-climbing, woody plant with a DBH >= 3.0 in, regardless of height)

1. Identify and record each tree within a 30 ft radius circle around the sampling point.
2. Measure its basal area (BA) or DBH (if using DBH use $BA=pi*(DBH/2)^2$).
3. Sum BA for each species and rank top 3 species.
4. Record Top 3 dominant species and indicate their indicator status and desirable/undesirable value.

Sapling/Shrub Layer (Any woody plant >3.2 ft with a stem diameter <3.0 in, excluding of woody vines)

1. Identify and record each sapling/shrub within a 10 ft radius circle around the sampling point.
2. Estimate its height range and enter the corresponding height class midpoint.

height class, ft	midpoint of range, ft
1-3	2
3-5	4
5-7	6
7-9	8
9-11	10
>11	12

3. Sum heights for each species and rank top 3 species.
4. Record Top 3 dominant species and indicate their indicator status and desirable/undesirable value.

Vegetative Sample Point – Enhancement Wetland #3

Tree Layer - Measure BA or DBH of Each Plant >3.0 in DBH within a 30-ft radius							
	Common Name	**Scientific Name**	**DBH (in)**	**BA, in^2 BA = PI * $(DBH/2)^2$**	**Total BA for species, in^2**	**Rank**	**Desirable/ Undesirable**
1	red maple	*Acer rubrum*	9.6	72.4	545.7	1	Undesirable
2	green ash	*Fraxinus pennsylvanica*	7.2	40.7	462.3	2	Desirable
3	green ash	*Fraxinus pennsylvanica*	8.4	55.4			
4	red maple	*Acer rubrum*	5.2	20.9			
5	red maple	*Acer rubrum*	4.2	13.9			
6	green ash	*Fraxinus pennsylvanica*	8.4	55.4			
7	red maple	*Acer rubrum*	8.4	55.4			
8	red maple	*Acer rubrum*	3.6	10.2			
9	green ash	*Fraxinus pennsylvanica*	8.4	55.4			
10	green ash	*Fraxinus pennsylvanica*	7.2	40.7			
11	red maple	*Acer rubrum*	5.6	25.0			
12	red maple	*Acer rubrum*	6.4	31.8			
13	red maple	*Acer rubrum*	7.8	47.8			
14	green ash	*Fraxinus pennsylvanica*	8.4	55.4			
15	green ash	*Fraxinus pennsylvanica*	9.0	63.6			
16	red maple	*Acer rubrum*	4.3	14.7			
17	red maple	*Acer rubrum*	10.8	91.6			
18	red maple	*Acer rubrum*	9.0	63.6			
19	green ash	*Fraxinus pennsylvanica*	7.8	47.8			
20	red maple	*Acer rubrum*	8.0	50.8			
21	red maple	*Acer rubrum*	7.8	47.8			
22	green ash	*Fraxinus pennsylvanica*	7.8	47.8			

Sapling/Shrub Layer - Estimate Height of Each Plant >3.2 ft and <3.0 in DBH within a 10-ft radius							
	Common Name	**Scientific Name**	**Height, ft**	**Midpoint, ft**	**Total height for species, ft**	**Rank**	**Desirable/ Undesirable**
			1-3	2			
			3-5	4			
			5-7	6			
			7-9	8			
			9-11	10			
			>11	12			
1	American elm	*Ulmus americana*	3-5	4.0	8	1	Desirable
2	American elm	*Ulmus americana*	3-5	4.0			

Vegetative Sample Point – Reference Wetland

Tree Layer - Measure BA or DBH of Each Plant >3.0 in DBH within a 30-ft radius							
	Common Name	**Scientific Name**	**DBH, in**	**BA, in^2 BA = PI * $(DBH/2)^2$**	**Total BA for species, in^2**	**Rank**	**Desirable/ Undesirable**
1	red maple	*Acer rubrum*	4.56	16.3	173.0		
2	winged elm	*Ulmus alata*	3.12	7.6			
3	red maple	*Acer rubrum*	4.32	14.7			
4	red maple	*Acer rubrum*	4.8	18.1			
5	sweetgum	*Liquidambar styraciflua*	6.6	34.2	436.2	1	Undesirable
6	red maple	*Acer rubrum*	3.12	7.6			
7	red maple	*Acer rubrum*	3.6	10.2			
8	sweetgum	*Liquidambar styraciflua*	6	28.3			
9	sweetgum	*Liquidambar styraciflua*	5.52	23.9			
10	sweetgum	*Liquidambar styraciflua*	6	28.3			
11	green ash	*Fraxinus pennsylvanica*	4.2	13.9	24.0		
12	winged elm	*Ulmus alata*	6	28.3	56.5		
13	American elm	*Ulmus americana*	6	28.3	200.9	3	Desirable
14	American elm	*Ulmus americana*	5.52	23.9			
15	American elm	*Ulmus americana*	3.6	10.2			
16	American elm	*Ulmus americana*	3.36	8.9			
17	sweetgum	*Liquidambar styraciflua*	4.08	13.1			
18	sweetgum	*Liquidambar styraciflua*	4.56	16.3			
19	sweetgum	*Liquidambar styraciflua*	5.28	21.9			
20	sweetgum	*Liquidambar styraciflua*	3.48	9.5			
21	sweetgum	*Liquidambar styraciflua*	4.44	15.5			
22	red maple	*Acer rubrum*	3	7.1			
23	red maple	*Acer rubrum*	3.24	8.2			
24	red maple	*Acer rubrum*	3.24	8.2			
25	swamp chestnut oak	*Quercus michauxii*	4.08	13.1	241.3	2	Desirable
26	red maple	*Acer rubrum*	3.36	8.9			
27	sweetgum	*Liquidambar styraciflua*	6	28.3			
28	American elm	*Ulmus americana*	4.08	13.1			
29	sweetgum	*Liquidambar styraciflua*	6	28.3			
30	sweetgum	*Liquidambar styraciflua*	3.84	11.6			
31	sweetgum	*Liquidambar styraciflua*	9	63.6			
32	sweetgum	*Liquidambar styraciflua*	3.12	7.6			
33	sweetgum	*Liquidambar styraciflua*	6	28.3			
34	red maple	*Acer rubrum*	5.52	23.9			
35	American elm	*Ulmus americana*	3.48	9.5			
36	ironwood	*Carpinus caroliniana*	3	7.1	7.1		
37	sweetgum	*Liquidambar styraciflua*	8.76	60.3			
38	sweetgum	*Liquidambar styraciflua*	3	7.1			
39	American elm	*Ulmus americana*	4.44	15.5			
40	swamp chestnut oak	*Quercus michauxii*	2.88	6.5			
41	green ash	*Fraxinus pennsylvanica*	3.6	10.2			
42	red maple	*Acer rubrum*	4.08	13.1			
43	red maple	*Acer rubrum*	3.96	12.3			
44	red maple	*Acer rubrum*	2.88	6.5			
45	red maple	*Acer rubrum*	3.12	7.6			

	Common Name	Scientific Name	DBH, in	BA, in^2 $BA = PI * (DBH/2)^2$	Total BA for species, in^2	Rank	Desirable/ Undesirable
46	red maple	*Acer rubrum*	3.6	10.2			
47	willow oak	*Quercus phellos*	3.6	10.2	10.2		
48	red maple	*Acer rubrum*	4.8	18.1			
49	American elm	*Ulmus americana*	10.8	91.6			
50	swamp chestnut oak	*Quercus michauxii*	16.8	221.7			

Sapling/Shrub Layer - Estimate Height of Each Plant >3.2 ft and <3.0 in DBH within a 10-ft radius

	Common Name	Scientific Name	Height, ft	Midpoint, ft	Total height for species, ft	Rank	Desirable/ Undesirable
			1-3	2			
			3-5	4			
			5-7	6			
			7-9	8			
			9-11	10			
			>11	12			
1	winged elm	*Ulmus alata*	>11	12.0	36.0	1	Desirable
2	winged elm	*Ulmus alata*	>11	12.0			
3	red maple	*Acer rubrum*	>11	12.0	24.0	2	Undesirable
4	sweetgum	*Liquidambar styraciflua*	>11	12.0	12.0	3	Undesirable
5	winged elm	*Ulmus alata*	>11	12.0			
6	red maple	*Acer rubrum*	>11	12.0			

Appendix 8. No-rise Certification

KCI TECHNOLOGIES

MEMORANDUM

TO: File

FROM: Audrey Burnette, P.E

DATE: 1/19/2006

SUBJECT: Daniels Farm # 2
KCI Job Order No. 12054238
FLOODPLAIN ANALYSIS

The Daniels Farm # 2 Wetland Restoration Site lies entirely within the 100-year floodplain of the Tar River in central Franklin County, NC. See attached floodplain map. The wetland restoration will fill agricultural ditches and allow the site to achieve a more natural flood pattern. Though the agricultural ditches are fairly shallow, and the floodway and floodplain are very extensive, a floodplain analysis was conducted to verify that the restoration project would not impact the 100-year flood.

The analysis was conducted in ESRI ArcMap 9.1 software. A 10-foot resolution bare earth LIDAR elevation grid and DFIRM Panel 2814 were downloaded from the NC Floodplain Mapping Program website. The LIDAR data was processed into ESRI GRID format and a floodplain transect line was created across the floodplain and through the project site. The ArcGIS extension EZ Profiler 9.03, created by Min-Lang Huang, was downloaded from ESRI ArcSripts webpage (http://arcscripts.esri.com) and installed. The extension was used to create a cross-section point file with elevations from the LIDAR data along the floodplain transect and a user-specified interval.

After testing 200, 100, 50, 25, 5, and 1-foot intervals, a 50-foot interval was used in the analysis. This interval produced good vertical resolution and captured the topographic features identifiable from the LIDAR data that will be modified in this project. The extension created a point file along the transect line at 50-foot intervals and included attributes of the X, Y, and Z coordinates. The X and Y coordinates are in NC Stateplane Feet NAD83 coordinate system and the Z coordinates are elevations from the LIDAR data.

The data were then imported into Microsoft Excel for further analysis. The cross-section was plotted and manually verified for accuracy using the ESRI elevation grid. The horizontal stations of the agricultural ditches were identified and the proposed cross-section was created by adjusting the elevation at the three points in the cross-section that will be modified. See attached cross section and tables of existing and proposed elevations.

The results of this analysis indicate that the wetland restoration project will have no significant impact on the cross-section of the Tar River floodplain and as a result will not impact the base flood elevation.

KCI TECHNOLOGIES

MEMORANDUM

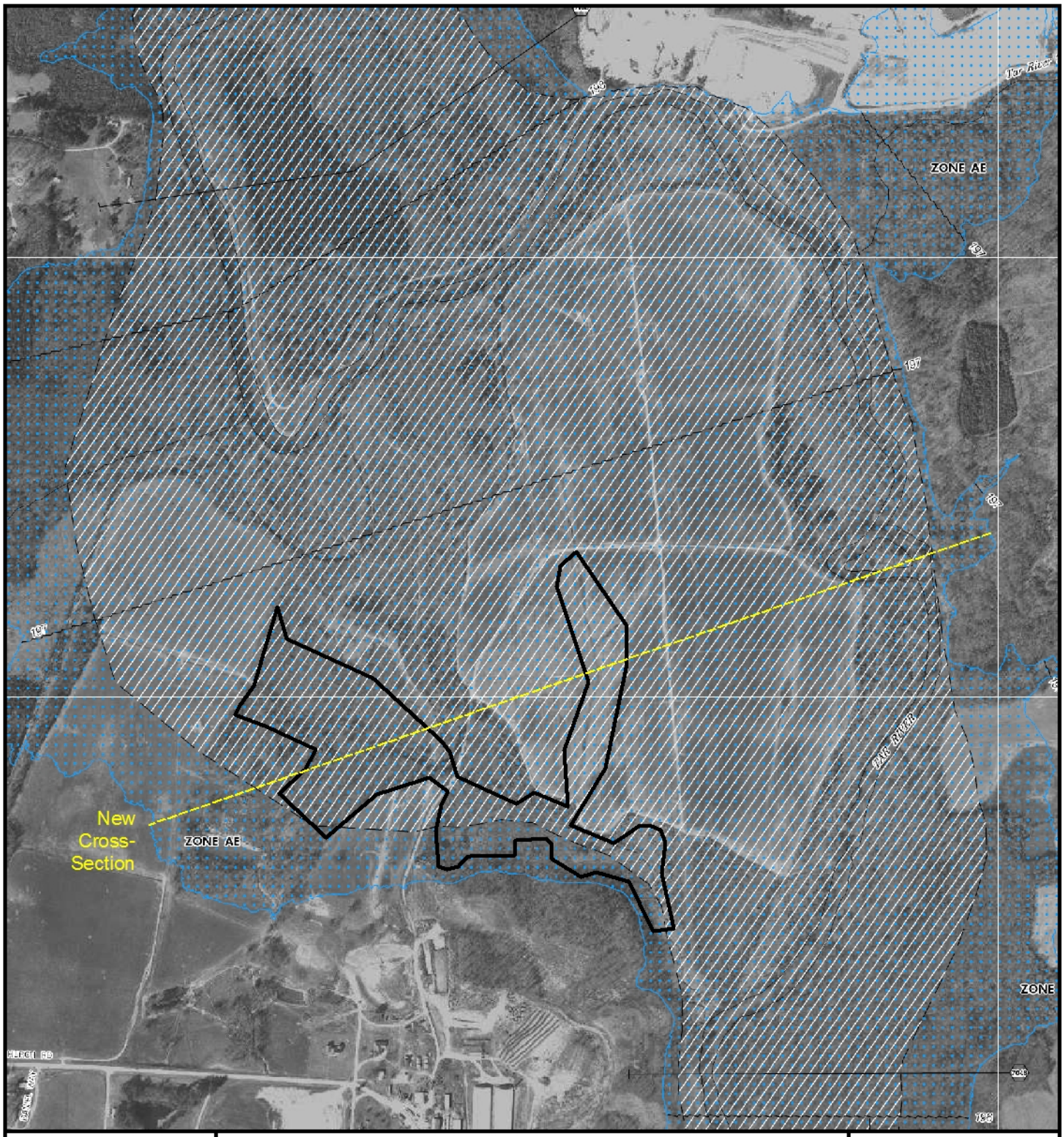
This memo is to certify that the proposed Daniels Farm # 2 **Stream Restoration Project** will not impact the 100-year flood elevations, floodway elevations or floodway widths on the **Tar River**, as shown on **Panel No. 370377**, at published sections in the Flood Insurance Study for Franklin County dated **January 16, 2004**.

1/19/06
(Date)

Audrey B. Burnette
(Signature)

Audrey B. Burnette, P.E.
(Name)

KCI Associates of North Carolina, P.A.
Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609-5210
(Address)



KCI TECHNOLOGIES

Floodplain Map - Daniels Farm #2 Site

Project Site Boundary

Floodway Areas in Zone AE

Special Flood Hazard Area
(Subject to inundation by the 1% annual chance flood)

Source: NC Floodplain Mapping Program, DFIRM Panel 2814

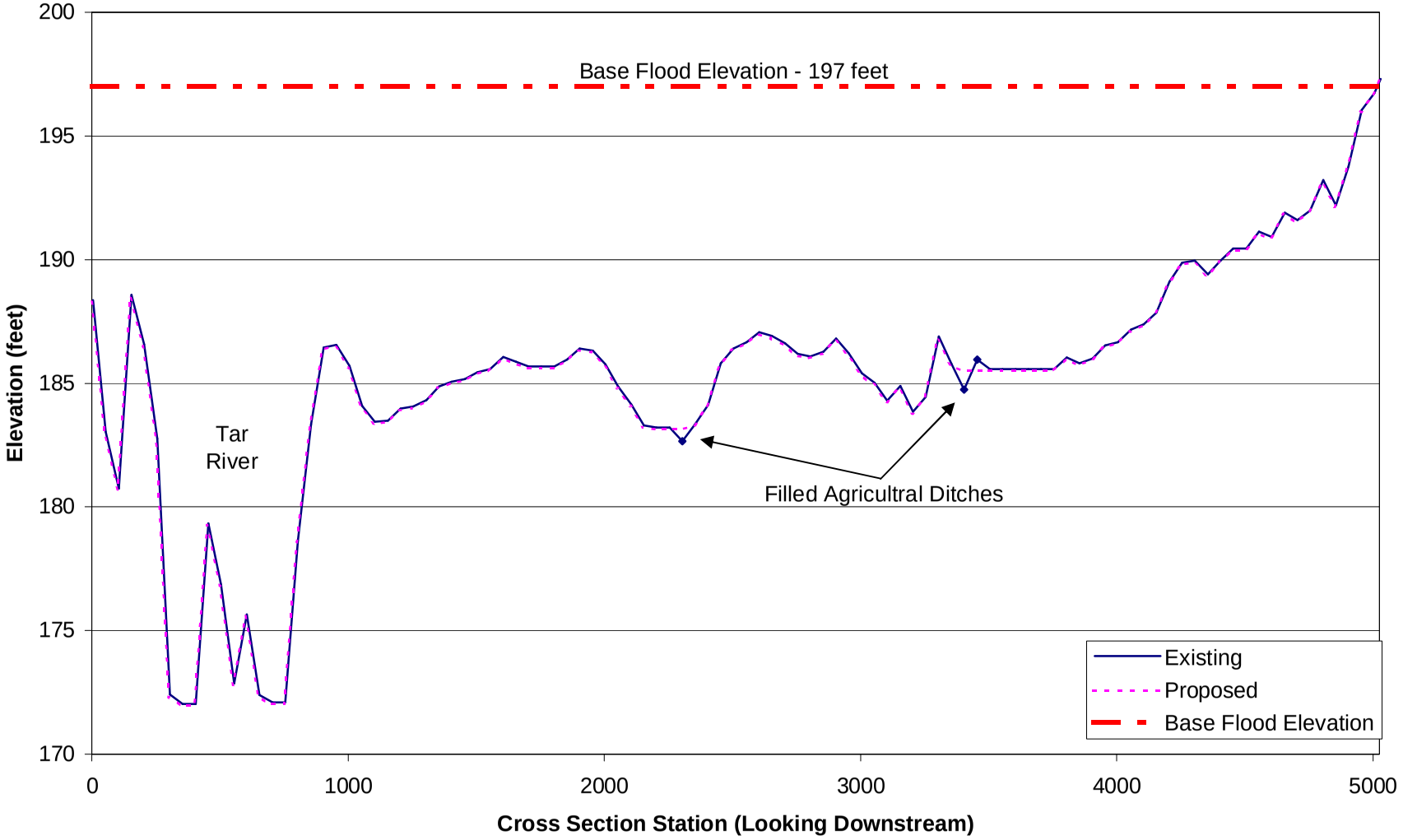
1:9,600
1 inch equals 800 feet

800 400 0 800 Feet

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

Tar River Floodplain Cross Section
Through Daniels Farm #2 Wetland Restoration Site



Tar River Cross Section
Elevation Based on NC Floodplain Mapping Program LIDAR Data
X and Y Coordinates in NC Stateplane Feet Coordinate System

Id	X Coord	Y Coord	Z Coord Existing	Status	Z Coord Proposed	Horizontal Station	Notes
0	2217410.4	843420.5	188.29		188.29	0	Left Edge of Floodplain
1	2217363.1	843404.1	182.97		182.97	50	
2	2217315.9	843387.7	180.66		180.66	100	
3	2217268.7	843371.3	188.51		188.51	150	
4	2217221.5	843354.8	186.49		186.49	200	
5	2217174.2	843338.4	182.69		182.69	250	
6	2217127.0	843322.0	172.35		172.35	300	
7	2217079.8	843305.5	171.96		171.96	350	
8	2217032.6	843289.1	171.97		171.97	400	
9	2216985.3	843272.7	179.26		179.26	450	
10	2216938.1	843256.3	176.79		176.79	500	
11	2216890.9	843239.8	172.79		172.79	550	
12	2216843.7	843223.4	175.57		175.57	600	
13	2216796.4	843207.0	172.32		172.32	650	
14	2216749.2	843190.5	172.02		172.02	700	
15	2216702.0	843174.1	172.02		172.02	750	
16	2216654.8	843157.7	178.57		178.57	800	
17	2216607.5	843141.3	183.26		183.26	850	
18	2216560.3	843124.8	186.37		186.37	900	
19	2216513.1	843108.4	186.48		186.48	950	
20	2216465.9	843092.0	185.63		185.63	1000	
21	2216418.6	843075.5	184.01		184.01	1050	
22	2216371.4	843059.1	183.38		183.38	1100	
23	2216324.2	843042.7	183.40		183.40	1150	
24	2216277.0	843026.3	183.90		183.90	1200	
25	2216229.8	843009.8	183.98		183.98	1250	
26	2216182.5	842993.4	184.23		184.23	1300	
27	2216135.3	842977.0	184.79		184.79	1350	
28	2216088.1	842960.5	184.98		184.98	1400	
29	2216040.9	842944.1	185.10		185.10	1450	
30	2215993.6	842927.7	185.38		185.38	1500	
31	2215946.4	842911.3	185.50		185.50	1550	
32	2215899.2	842894.8	185.98		185.98	1600	
33	2215852.0	842878.4	185.81		185.81	1650	
34	2215804.7	842862.0	185.60		185.60	1700	
35	2215757.5	842845.5	185.60		185.60	1750	
36	2215710.3	842829.1	185.60		185.60	1800	
37	2215663.1	842812.7	185.89		185.89	1850	
38	2215615.8	842796.3	186.33		186.33	1900	
39	2215568.6	842779.8	186.24		186.24	1950	
40	2215521.4	842763.4	185.69		185.69	2000	
41	2215474.2	842747.0	184.79		184.79	2050	
42	2215426.9	842730.5	184.08		184.08	2100	
43	2215379.7	842714.1	183.22		183.22	2150	
44	2215332.5	842697.7	183.13		183.13	2200	
45	2215285.3	842681.3	183.14		183.14	2250	
46	2215238.0	842664.8	182.59	Changed	183.14	2300	
47	2215190.8	842648.4	183.26		183.26	2350	
48	2215143.6	842632.0	184.05		184.05	2400	

49	2215096.4	842615.5	185.74		185.74	2450	
50	2215049.1	842599.1	186.33		186.33	2500	
51	2215001.9	842582.7	186.58		186.58	2550	
52	2214954.7	842566.3	186.99		186.99	2600	
53	2214907.5	842549.8	186.84		186.84	2650	
54	2214860.3	842533.4	186.55		186.55	2700	
55	2214813.0	842517.0	186.12		186.12	2750	
56	2214765.8	842500.5	186.00		186.00	2800	
57	2214718.6	842484.1	186.21		186.21	2850	
58	2214671.4	842467.7	186.73		186.73	2900	
59	2214624.1	842451.3	186.14		186.14	2950	
60	2214576.9	842434.8	185.33		185.33	3000	
61	2214529.7	842418.4	184.95		184.95	3050	
62	2214482.5	842402.0	184.22		184.22	3100	
63	2214435.2	842385.6	184.82		184.82	3150	
64	2214388.0	842369.1	183.78		183.78	3200	
65	2214340.8	842352.7	184.37		184.37	3250	
66	2214293.6	842336.3	186.83		186.83	3300	
67	2214246.3	842319.8	185.71		185.71	3350	
68	2214199.1	842303.4	184.68	Changed	185.51	3400	
69	2214151.9	842287.0	185.87	Changed	185.51	3450	
70	2214104.7	842270.6	185.51		185.51	3500	
71	2214057.4	842254.1	185.51		185.51	3550	
72	2214010.2	842237.7	185.51		185.51	3600	
73	2213963.0	842221.3	185.51		185.51	3650	
74	2213915.8	842204.8	185.51		185.51	3700	
75	2213868.5	842188.4	185.51		185.51	3750	
76	2213821.3	842172.0	185.96		185.96	3800	
77	2213774.1	842155.6	185.74		185.74	3850	
78	2213726.9	842139.1	185.92		185.92	3900	
79	2213679.7	842122.7	186.46		186.46	3950	
80	2213632.4	842106.3	186.59		186.59	4000	
81	2213585.2	842089.8	187.10		187.10	4050	
82	2213538.0	842073.4	187.31		187.31	4100	
83	2213490.8	842057.0	187.78		187.78	4150	
84	2213443.5	842040.6	189.03		189.03	4200	
85	2213396.3	842024.1	189.80		189.80	4250	
86	2213349.1	842007.7	189.88		189.88	4300	
87	2213301.9	841991.3	189.34		189.34	4350	
88	2213254.6	841974.8	189.89		189.89	4400	
89	2213207.4	841958.4	190.37		190.37	4450	
90	2213160.2	841942.0	190.37		190.37	4500	
91	2213113.0	841925.6	191.07		191.07	4550	
92	2213065.7	841909.1	190.85		190.85	4600	
93	2213018.5	841892.7	191.83		191.83	4650	
94	2212971.3	841876.3	191.53		191.53	4700	
95	2212924.1	841859.8	191.91		191.91	4750	
96	2212876.8	841843.4	193.15		193.15	4800	
97	2212829.6	841827.0	192.12		192.12	4850	
98	2212782.4	841810.6	193.70		193.70	4900	
99	2212735.2	841794.1	195.97		195.97	4950	
100	2212687.9	841777.7	196.66		196.66	5000	
101	2212665.3	841769.8	197.23		197.23	5024	Right Edge of Floodplain

Appendix 9. Project Photographs

Restoration Site #1: Top of agricultural field looking south toward unknown tributary to the Tar River.

Restoration Site #1: Bottom of site where grassed waterway exits, crosses dirt road and enters unknown tributary to the Tar River.

2

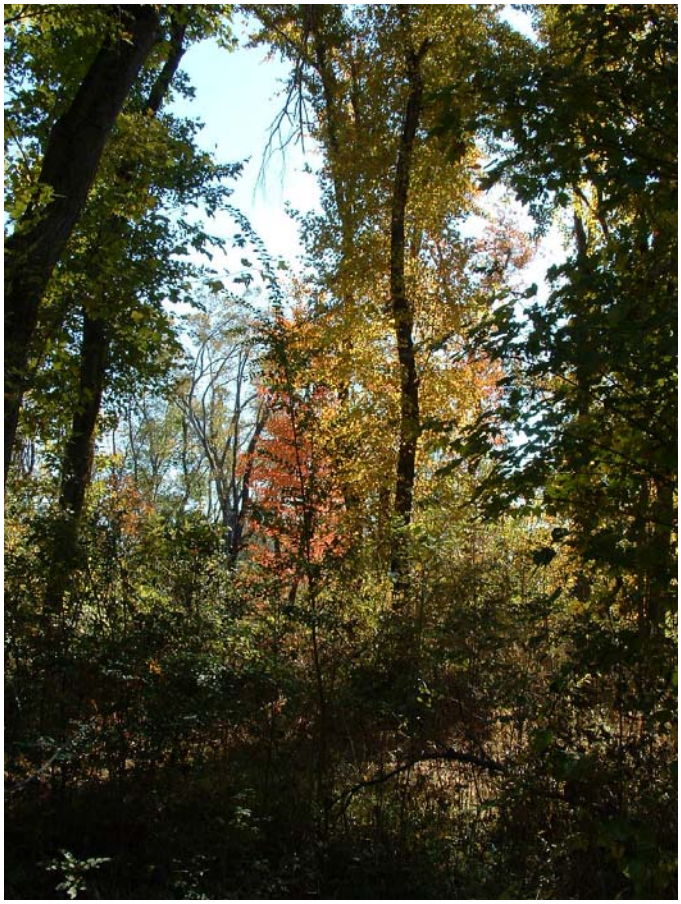
Directly east of agricultural field where the ditch drains into the unknown tributary of the Tar River (Restoration Wetland #2).

Looking downstream (east) along Ditch #2 that will be filled during the restoration project. Restoration Wetland #2 is on either side of this ditch.

Looking upstream (south) along unnamed tributary to the Tar River, upstream of the confluence with Ditch #2.

Enhancement Site #3: Forested wetland area contains mature wetland vegetation, but could benefit from hydrologic enhancements.

Cypress knees in Enhancement Wetland #3.



Vegetation in
Enhancement Wetland #3.

Reference wetland looking north (Restoration Wetland #2 in background).

Reference wetland looking west toward the Daniels I Restoration Project.

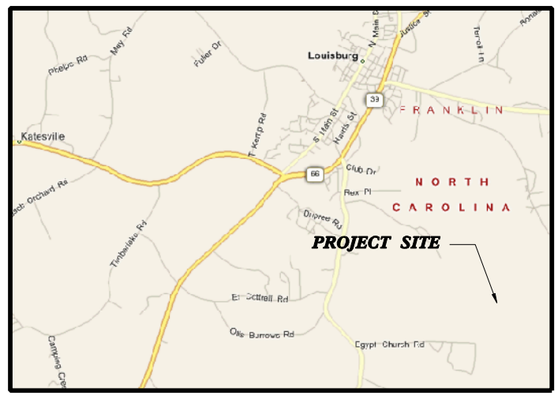
STATE	STATE CONSTRUCTION PROJECT NO.	SHEET NO.	TOTAL SHEETS
N.C.		1	11

SYM.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

CONTRACT #: D05025

STATE OF NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

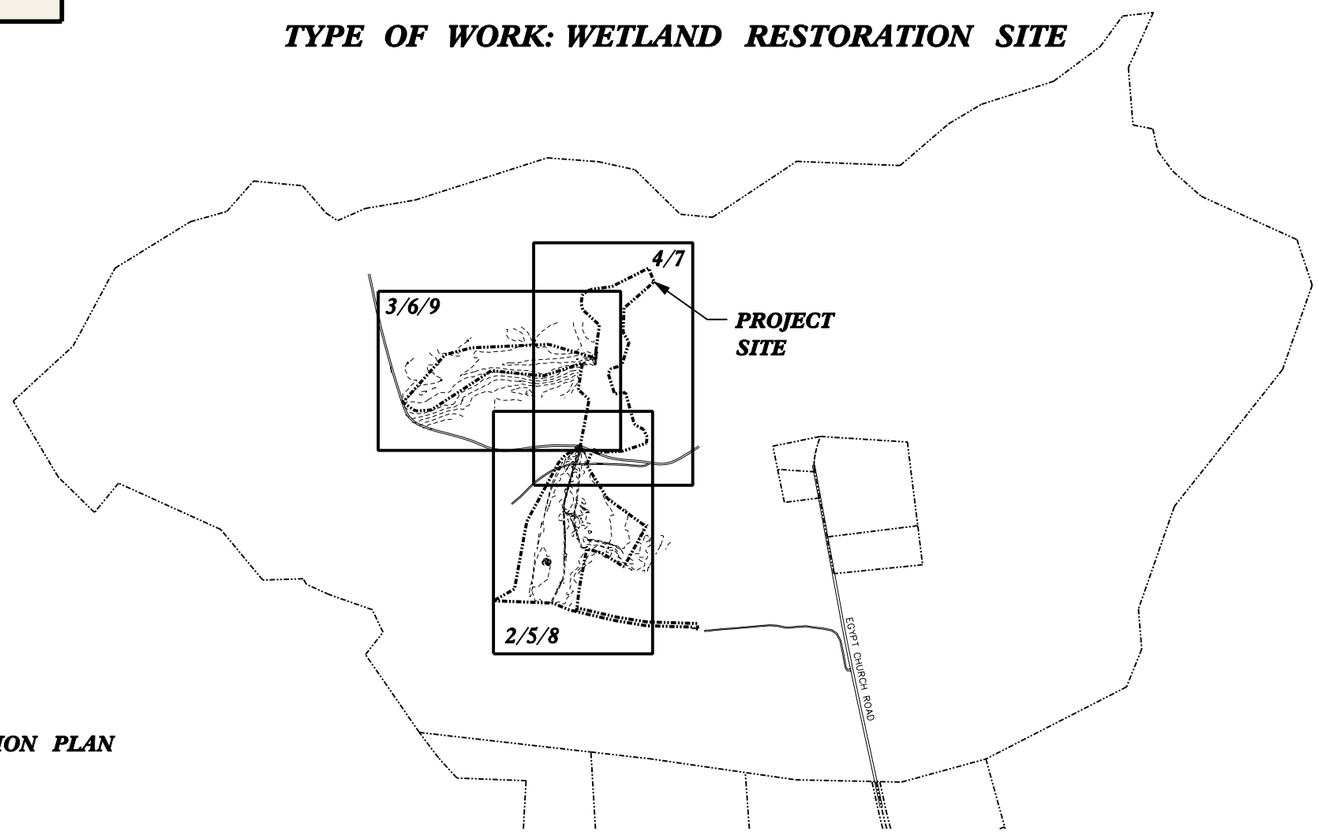
FRANKLIN COUNTY



VICINITY MAP
NOT TO SCALE

LOCATION: DANIELS FARM
691 EGYPT CHURCH ROAD
LOUISBURG, NC 27549

TYPE OF WORK: WETLAND RESTORATION SITE



INDEX OF SHEETS

1	*TITLE SHEET*
2,3,4	*SITE PLAN*
5,6,7	*PLANTING PLAN*
8,9	*SEDIMENTATION & EROSION PLAN*
10	*DETAILS*
11	*GENERAL NOTES*

GRAPHIC SCALES

–30 –15 0 30 60
PLANS

Prepared in the Office of:

KCI TECHNOLOGIES
ENGINEERS•PLANNERS•ECOLOGISTS
SUITE 220 LANDMARK CENTER II
4601 SIX FORKS RD., RALEIGH, NC

JAMES W. BLAKE, PE
PROJECT ENGINEER

JOSEPH J. PFEIFFER, PWS
PROFESSIONAL WETLAND SCIENTIST

STEVEN F. STOKES, LSS
SOIL SCIENTIST

PROJECT ENGINEER:

P.E.
SIGNATURE:

PROFESSIONAL WETLAND SCIENTIST:

P.W.S.
SIGNATURE:

SOIL SCIENTIST:

L.S.S.
SIGNATURE:

GRAPHIC SCALE
–60 –30 0 60 120

NC GRID
NAD '83

TBM#1
N=842643.03
E=2212895.65
ELEV=186.75

TBM#2
N=842085.15
E=2212787.92
ELEV=190.41

TBM#3
N=842833.42
E=2214044.00
ELEV=186.45

GENERAL PLAN LEGEND

- EXISTING EASEMENT LINE
- EXISTING 5' CONTOUR LINES
- EXISTING 1' CONTOUR LINES
- EXISTING DRAINAGE DITCH
- FENCE LINE
- TREE LINE
- DITCH PLUG
- EXISTING DITCH TO BE FILLED
- PROPOSED CONTOUR LINES
- ROCK STABILIZED DITCH PLUG
- SURVEY CONTROL POINT
- PROPOSED MICROTOPOGRAPHY

NOTE:
CREATE MICROTOPOGRAPHY WITH DEPRESSIONS AND RISES APPROX. SIX INCHES PLUS OR MINUS THE EXISTING ELEVATIONS.

CONSERVATION EASEMENT

CONSERVATION EASEMENT

DIRT PATH

DIRT ROAD

MATCH LINE - SHEET 3

REVISIONS

SYM.	DESCRIPTION	DATE	APPROVED

KCI TECHNOLOGIES
ENGINEERS◆PLANNERS◆ECOLOGISTS
SUITE 220 LANDMARK CENTER II
4601 SIX FORKS RD., RALEIGH, NC

DANIELS FARM II
WETLAND RESTORATION PROJECT
LOUISBURG, FRANKLIN COUNTY, NORTH CAROLINA

DATE: JAN. 2006
SCALE: 1"=60'

SITE PLAN

SHEET 2 OF 11

GRAPHIC SCALE
–60 –30 0 60 120

NC GRID
NAD '83

GENERAL PLAN LEGEND

- EXISTING EASEMENT LINE
- EXISTING 5' CONTOUR LINES
- EXISTING 1' CONTOUR LINES
- EXISTING DRAINAGE DITCH
- FENCE LINE
- TREE LINE
- DITCH PLUG
- EXISTING DITCH TO BE FILLED
- PROPOSED CONTOUR LINES
- ROCK STABILIZED DITCH PLUG
- SURVEY CONTROL POINT
- PROPOSED MICROTOPOGRAPHY

CONSERVATION EASEMENT

CONSERVATION EASEMENT

MATCH LINE - SHEET 4

185

185

185

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • ECOLOGISTS
SUITE 220 LANDMARK CENTER II
4601 SIX FORKS RD, RALEIGH, NC

DANIELS FARM II
WETLAND RESTORATION PROJECT
LOUISBURG, FRANKLIN COUNTY, NORTH CAROLINA

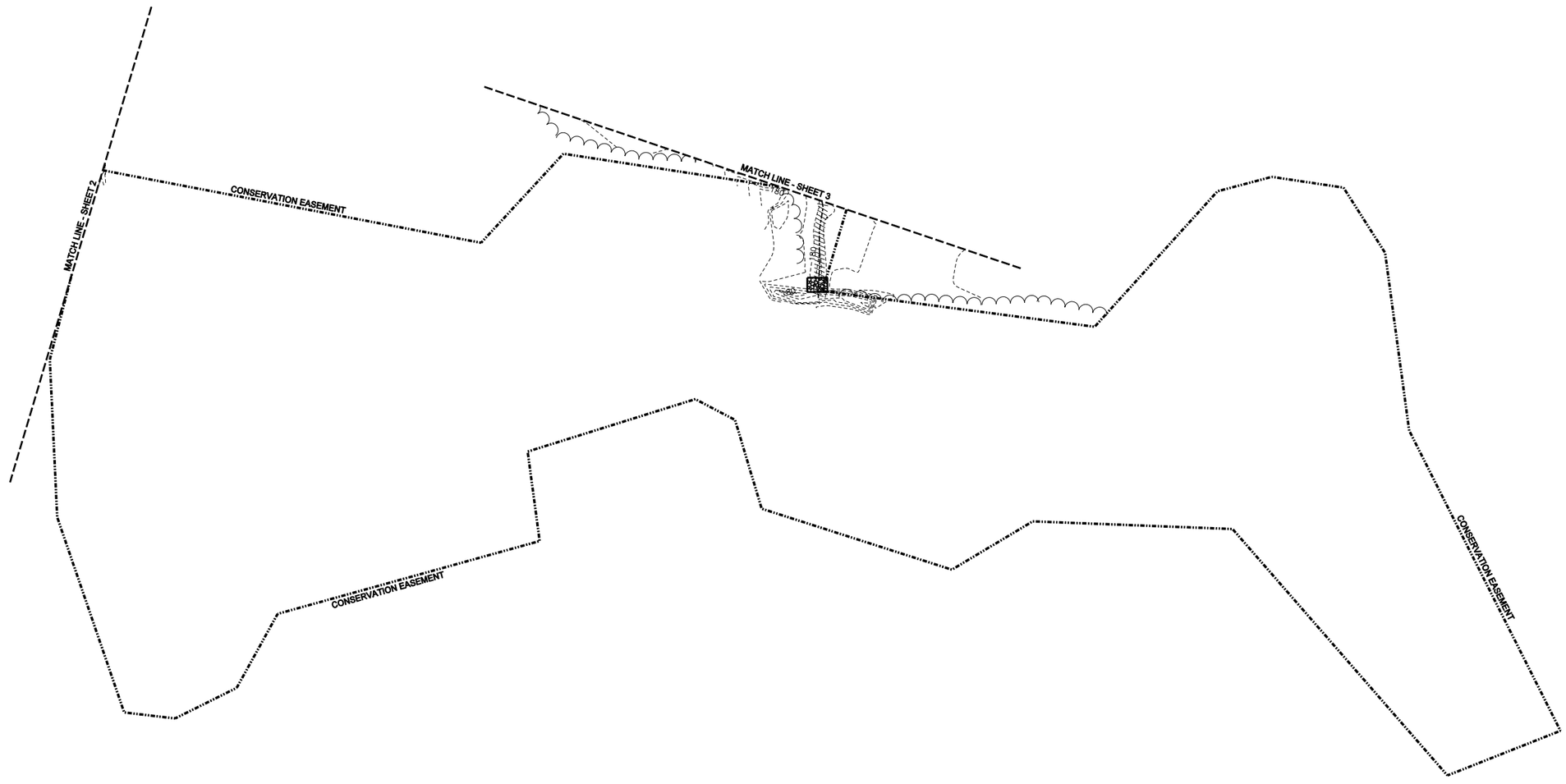
DATE: JAN. 2006
SCALE: 1"=60'

SITE PLAN

SHEET 3 OF 11

GENERAL PLAN LEGEND

- EXISTING EASEMENT LINE
- EXISTING 5' CONTOUR LINES
- EXISTING 1' CONTOUR LINES
- EXISTING DRAINAGE DITCH
- FENCE LINE
- TREE LINE
- DITCH PLUG
- EXISTING DITCH TO BE FILLED
- PROPOSED CONTOUR LINES
- ROCK STABILIZED DITCH PLUG
- SURVEY CONTROL POINT
- PROPOSED MICROTOPOGRAPHY



REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

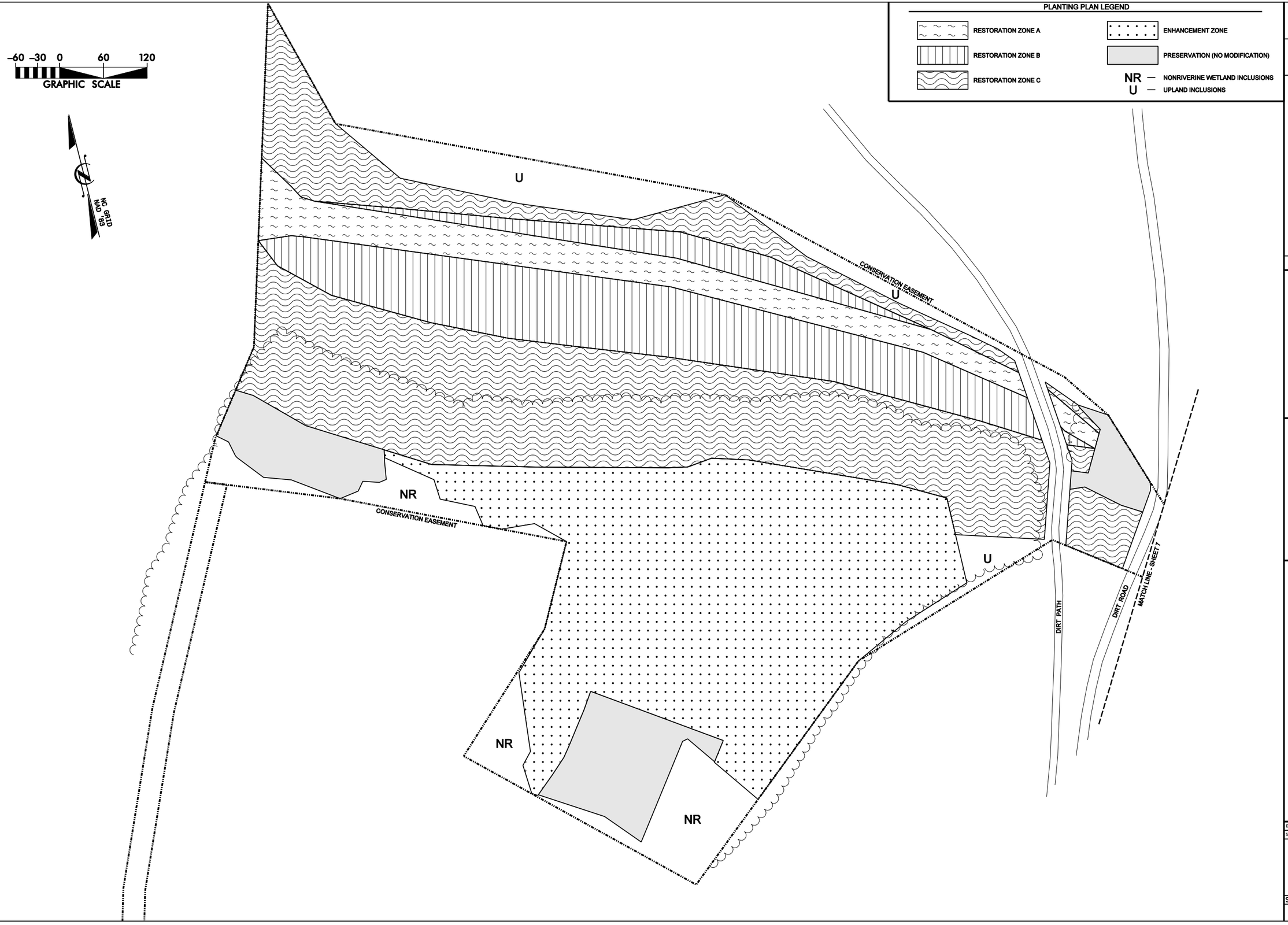
KCI TECHNOLOGIES
ENGINEERS • PLANNERS • ECOLOGISTS
SUITE 220 LANDMARK CENTER II
4601 SIX FORKS RD., RALEIGH, NC

DANIELS FARM II
WETLAND RESTORATION PROJECT
LOUISBURG, FRANKLIN COUNTY, NORTH CAROLINA

DATE: JAN. 2006
SCALE: 1"=60'

SITE PLAN

SHEET 4 OF 11



REVISIONS

SYM.	DESCRIPTION	DATE	APPROVED

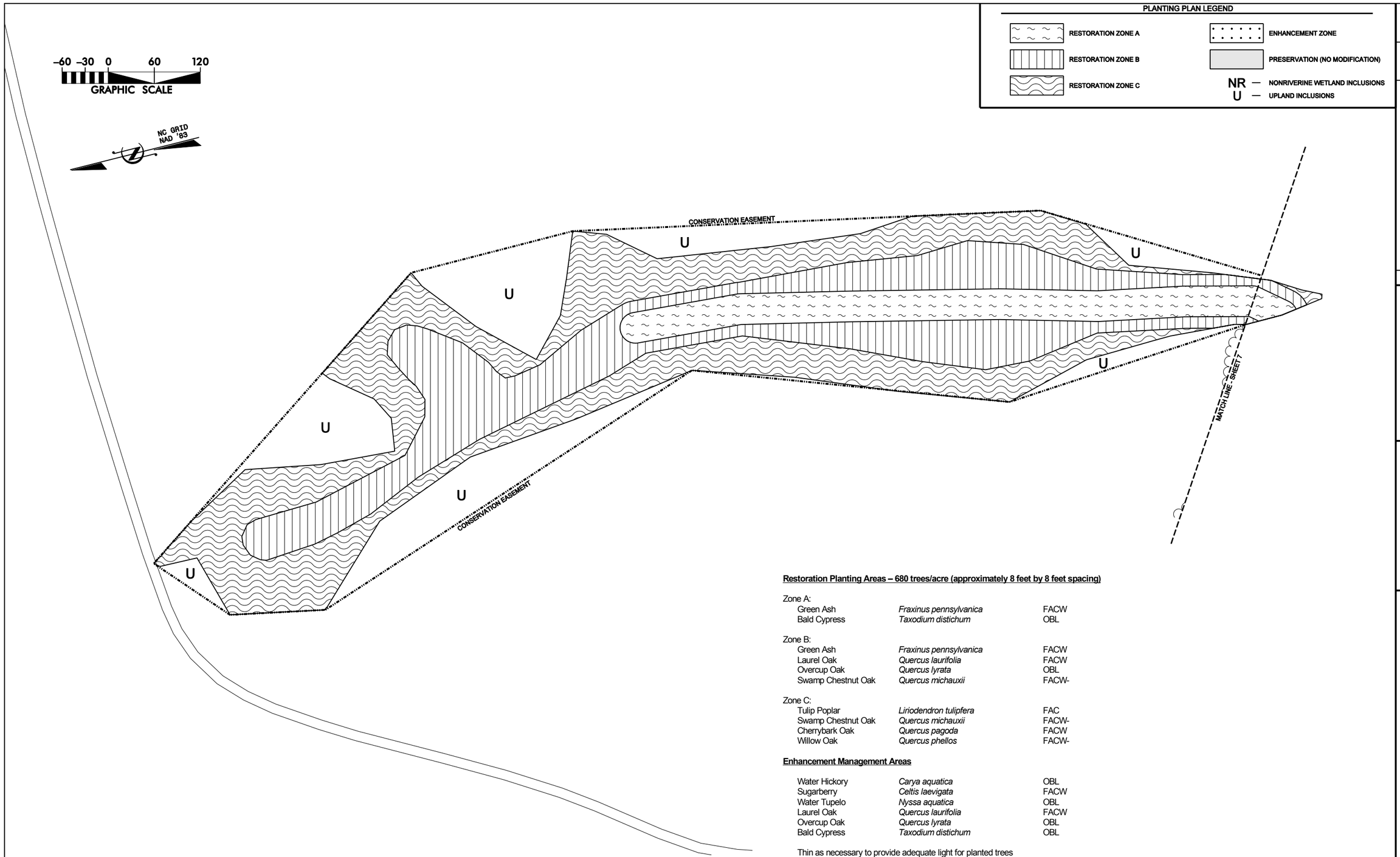
KCI TECHNOLOGIES
ENGINEERS•PLANNERS•ECOLOGISTS
SUITE 220 LANDMARK CENTER II
4601 SIX FORKS RD., RALEIGH, NC

DANIELS FARM II
WETLAND RESTORATION PROJECT
LOUISBURG, FRANKLIN COUNTY, NORTH CAROLINA

DATE: JAN. 2008
SCALE: 1"=60'

PLANTING PLAN

SHEET 5 OF 11



Restoration Planting Areas – 680 trees/acre (approximately 8 feet by 8 feet spacing)

Zone A:		
Green Ash	*Fraxinus pennsylvanica*	FACW
Bald Cypress	*Taxodium distichum*	OBL
Zone B:		
Green Ash	*Fraxinus pennsylvanica*	FACW
Laurel Oak	*Quercus laurifolia*	FACW
Overcup Oak	*Quercus lyrata*	OBL
Swamp Chestnut Oak	*Quercus michauxii*	FACW-
Zone C:		
Tulip Poplar	*Liriodendron tulipfera*	FAC
Swamp Chestnut Oak	*Quercus michauxii*	FACW-
Cherrybark Oak	*Quercus pagoda*	FACW
Willow Oak	*Quercus phellos*	FACW-

Enhancement Management Areas

Water Hickory	*Carya aquatica*	OBL
Sugarberry	*Celtis laevigata*	FACW
Water Tupelo	*Nyssa aquatica*	OBL
Laurel Oak	*Quercus laurifolia*	FACW
Overcup Oak	*Quercus lyrata*	OBL
Bald Cypress	*Taxodium distichum*	OBL
Thin as necessary to provide adequate light for planted trees		
Red Maple	*Acer rubrum*	FAC
Green Ash	*Fraxinus pennsylvanica*	FACW
Sweetgum	*Liquidambar styraciflua*	FAC+
American Elm	*Ulmus Americana*	FACW
Invasive Species Control		
Chinese Privet	*Ligustrum sinense*	FAC

REVISIONS

SYM.	DESCRIPTION	DATE	APPROVED

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • ECOLOGISTS
SUITE 220 LANDMARK CENTER II
4601 SIX FORKS RD., RALEIGH, NC

DANIELS FARM II
WETLAND RESTORATION PROJECT
LOUISBURG, FRANKLIN COUNTY, NORTH CAROLINA

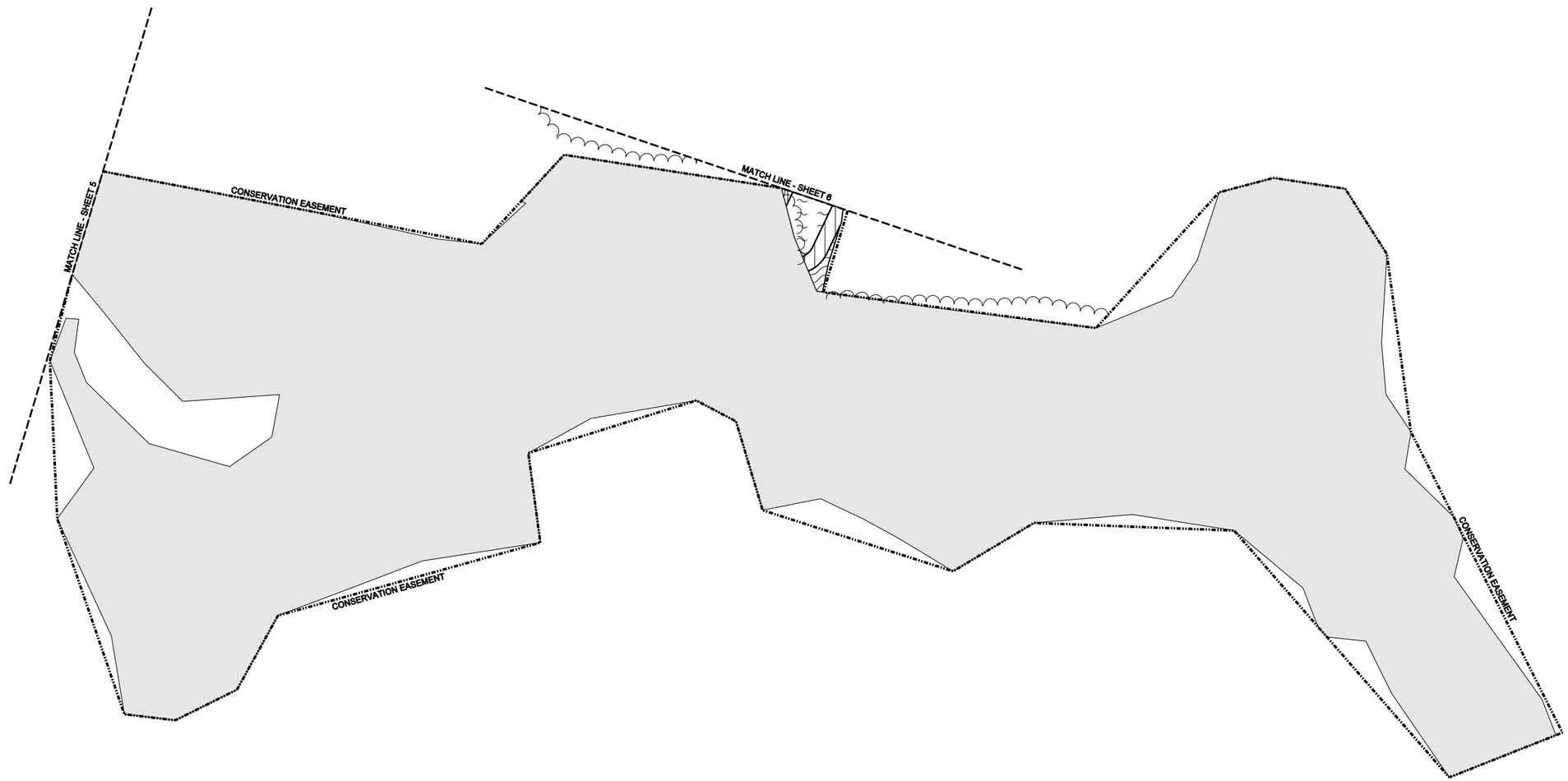
DATE: JAN. 2006
SCALE: 1"=60'

PLANTING PLAN

SHEET 6 OF 11

PLANTING PLAN LEGEND

- RESTORATION ZONE A
- RESTORATION ZONE B
- RESTORATION ZONE C
- ENHANCEMENT ZONE
- PRESERVATION (NO MODIFICATION)
- NR — NONRIVERINE WETLAND INCLUSIONS
- U — UPLAND INCLUSIONS



NC GRID NAD 83

–60 –30 0 60 120

GRAPHIC SCALE

REVISIONS

SYM.	DESCRIPTION	DATE	APPROVED

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • ECOLOGISTS
SUITE 220 LANDMARK CENTER II
4601 SIX FORKS RD., RALEIGH, NC

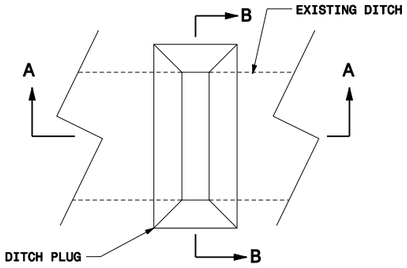
DANIELS FARM II
WETLAND RESTORATION PROJECT
LOUISBURG, FRANKLIN COUNTY, NORTH CAROLINA

DATE: JAN. 2008

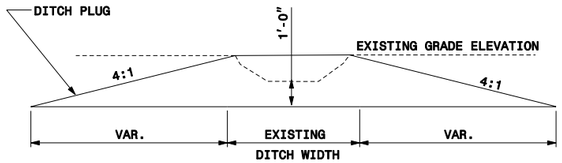
SCALE: 1"=60'

PLANTING PLAN

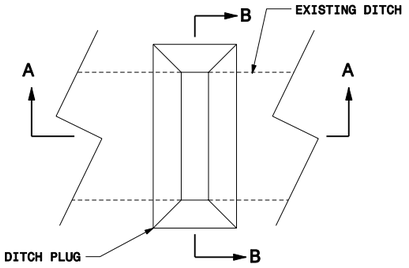
SHEET 7 OF 11



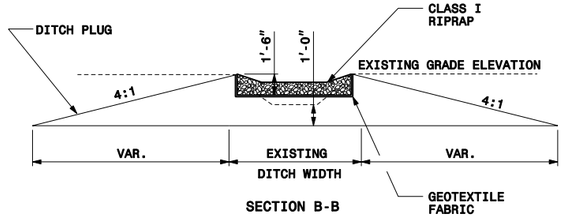
PLAN VIEW



SECTION B-B



PLAN VIEW



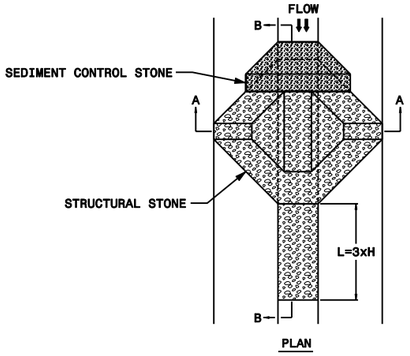
SECTION B-B

DITCH PLUG DETAIL

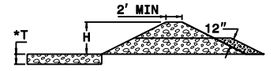
NOTES:
SEE PLAN SHEETS FOR LOCATIONS OF DITCH PLUGS.
SEE PROJECT SPECIAL PROVISONS FOR MATERIAL SPECIFICATIONS.

ROCK STABILIZED DITCH PLUG DETAIL

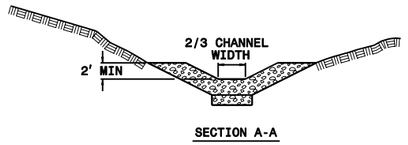
NOTES:
SEE PLAN SHEETS FOR LOCATIONS OF DITCH PLUGS.
SEE PROJECT SPECIAL PROVISONS FOR MATERIAL SPECIFICATIONS.



PLAN



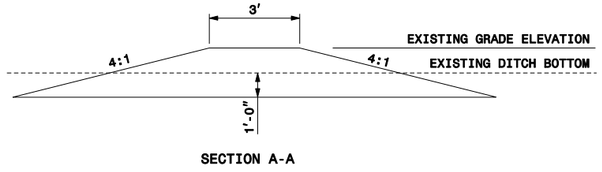
SECTION B-B
*T = 12" MIN., 18" MAX.



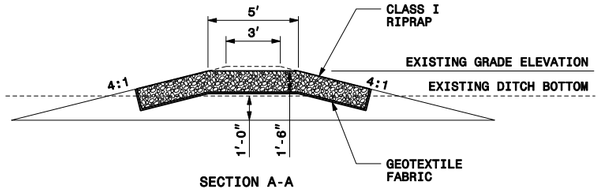
SECTION A-A

NOTE:
USE CLASS B EROSION CONTROL STONE FOR STRUCTURAL STONE.
USE NO. 5 OR NO 57 STONE FOR SEDIMENT CONTROL STONE.

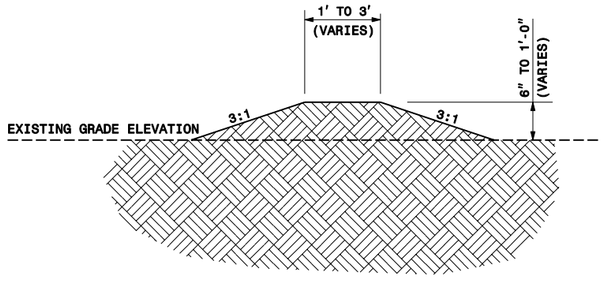
TEMPORARY ROCK SILT CHECK TYPE 'A'



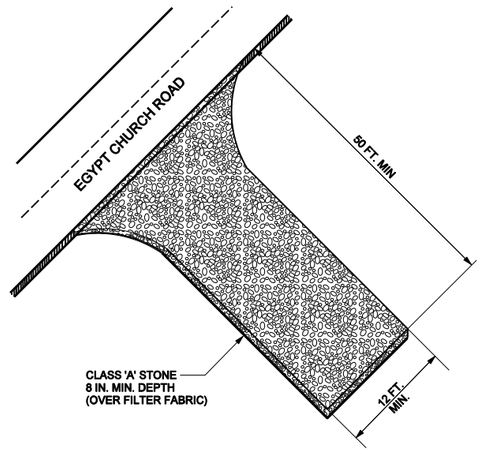
SECTION A-A



SECTION A-A



TEMPORARY WATER DIVERSION BERM DETAIL



NOTES:
1. TURNING RADIUS SUFFICIENT TO ACCOMODATE LARGE TRUCKS SHALL BE PROVIDED.
2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOPDRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED UP IMMEDIATELY.
5. GRAVEL CONSTRUCTION ENTRANCE SHALL BE LOCATED AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE MUST BE PROVIDED.

STABILIZED CONSTRUCTION ENTRANCE (SCE)

SCALE: NTS

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • ECOLOGISTS
SUITE 220 LANDMARK CENTER II
4601 SIX FORKS RD., RALEIGH, NC

DANIELS FARM II
WETLAND RESTORATION PROJECT
LOUISBURG, FRANKLIN COUNTY, NORTH CAROLINA

DATE: JAN. 2006
SCALE: N.T.S.

DETAIL SHEET