Baseline Monitoring Document
and
As built Report
Draft
UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Project
SCO No. 04-06351-01A
DENR Contract No. D05053S-1
EEP Project No. 290
Brunswick County
North Carolina
Data Collection: March 1st through December 6th 2010
Submission Date: September 16, 2011

Prepared for:

North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
2728 Capital Boulevard, Suite 1H-103
Raleigh, NC 27606

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Prepared by:

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2.0 Table of Contents

1.0 Title Page……i
2.0 Table of Contents……ii
3.0 Executive Summary/Project Abstract……1
4.0 Project Goals, Background and Attributes……2
5.0 Success Criteria……4
6.0 Monitoring Plan Guidelines……5
7.0 Maintenance and Contingency Plans……6
8.0 As-Built Conditions (Baseline)……6
9.0 References……6

Appendix A. General Tables and Figures
Appendix B. Morphological Summary Data and Plots
Appendix C. Vegetation Data
Appendix D. As-Built Plan Sheets

3.0 Executive Summary/Project Abstract

The UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Site is located in Boiling Spring Lakes, Brunswick County. The restoration project is located on a 516.73 acre tract purchased (fee simple) by the State of North Carolina (Ecosystem Enhancement Program) in December 2004. The UT Lilliput Stream and Wetland Restoration Site was previously owned by International Paper and used in rotation as a pine plantation. Pine plantations in southeastern North Carolina are typically characterized by major site alterations constructed to provide sufficient surface and groundwater drainage in wet conditions which allows planted pine trees to grow and cultivate. Site alterations also destroy ecological function, decrease water quality and disrupts habitat for wildlife, including federally threatened and endangered species.

The goal for the UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Site is to restore ecological function, improve overall water quality, and enhance native wildlife habitat. This goal will be accomplished by two main objectives. The first objective is restoration of channelized tributaries to the headwater outer coastal plain stream type, as described in the "Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina" guidance document (COE 2005). The stream restoration will re-establish the riparian vegetation zone, re-connect flood plain areas, and enhance wildlife habitat. These ecological functions have been non-existent for decades due to the previous ditch and drainage regime. The second objective is to restore and enhance the altered wetlands. The restoration and enhancement of wetlands onsite will generate longer soil saturation periods and the result is improved water quality. Restoring the native hydrologic characteristics will also restore the conditions that are beneficial for the longleaf pine community type that previously dominated the site before human intervention. The longleaf pine forest will also restore native habitat for the red-cockaded woodpecker.

The UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Site was previously a pine plantation. Pine plantations in southeastern North Carolina are typically characterized by major site alterations that were made to eliminate much of the wet conditions. When modified, these sites provide sufficient surface and groundwater drainage that allow planted loblolly pine (*Pinus taeda*) and longleaf pine (*Pinus palustris*) trees to grow be cultivated. Foresters typically perform two major site alterations in preparation for a pine plantation: channelization of natural stream channels and bedding. These site alterations were utilized extensively throughout the project site. Restoring these alterations back to natural condition were key in both project design and implementation.

Stream Restoration and Stream Preservation are both components of this project (Table 1). Stream restoration for UT Lilliput is divided into two tributaries. The North Tributary (**1,535 linear feet**) and South Tributary (**1,703 linear feet**) were constructed utilizing the guidance entitled "Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina" (COE 2005). A total of **3,238 linear feet** of stream restoration will be provided in accordance with the enclosed plans. Stream Preservation areas will consist of **5,332 linear feet**. (See Table 1 for Project Components and Figure 2 for Component Location)

The wetland component of the UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Site consists of non-riparian wetland preservation, restoration, enhancement, and riparian preservation. The non-riparian wetland preservation areas total **87.74 acres** and riparian wetland

preservation areas total **20.45 acres**. Non-riparian wetland enhancement totals **96.46 acres** and Non-riparian wetland restoration totals **7.83 acres** (See Table 1 for Project Components and Figure 2 for Component Location). Non-riparian wetland restoration was accomplished by removing spoil materials, re-grading to natural elevations, and replanting with native species. Wetland enhancement was accomplished on the eastern side of Boiling Springs Lake Road through the stream restoration process and planting. The stream restoration will enhance hydrology throughout the site and restore conditions that will enable the native plantings to flourish. Wetland enhancement on the west side of Boiling Springs Lake Road was accomplished by removing spoil material and re-grading to natural elevations to enhance hydrology to pre-altered conditions.

As-built conditions are congruent with design specifications and no major deviations have occurred. The stream restoration longitudinal profile and cross sections can be viewed in Appendix B. Baseline vegetation sampling yielded a site density of 709 stems per acre and species distribution was consistent with the planting plan specifications (Appendix C).

Monitoring for the UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Site will be conducted annually for a five (5) year period. Headwater stream monitoring will be comprised of an annual channel centerline profile survey and eight (8) cross sections will be surveyed each year utilizing total station survey technology. Vegetation data will be compiled annually utilizing EEP-CVS Protocol Level 1 methods consisting of fifteen (15) vegetation monitoring plots and one (1) total stem count. The site will also be inspected visually and documented with photography. Hydrology will be monitored through a series of thirty-eight (38) total monitoring gauges. Of these, Twenty-eight (28) gauges are installed to monitor groundwater, eight (8) gauges will monitor surface water in the restored headwater stream channels and one (1) surface and four (4) groundwater monitoring gauges will be utilized for the reference areas.

UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Site by design is a restoration of the Longleaf pine (*Pinus palustris*) community type. This design includes maintenance strategies that utilize controlled burning. EEP is currently working with The Nature Conservancy and the North Carolina Department of Agriculture and Consumer Sciences Plant Conservation Program to determine a maintenance schedule for controlled burning. It is recommended that controlled burns occur every three (3) to five (5) years or as needed. With regards to current site conditions, it is recommended that the initial controlled burn occur during 2011 to optimize longleaf pine mortality rates.

4.0 Project Goals, Background, and Attributes

The UT UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Site is located in Boiling Spring Lakes, Brunswick County in the lower Coastal Plain of North Carolina (Figure 1). The Soil Survey for Brunswick County (USDA 1982) reveals elevations generally vary from 75 feet to sea level. Total annual precipitation ranges from 50 to 60 inches per year in the eight-digit hydrologic unit 03030005 and fourteen-digit hydrologic unit 03030005070010 of the Cape Fear River Basin. Adjacent landuse consists of mostly forested sandhill vegetation with roughly 10% of the area in residential development.

The goal for the UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Site is to restore ecological function, improve overall water quality, and enhance native wildlife habitat. This goal will be accomplished by these main objectives.

- Restore lost ecological function
- Improve overall water quality
- Enhance and Improve native wildlife habitat and diversity
- Reduce erosion and sedimentation
- Restore the native longleaf pine community
- Restore headwater wetlands

The first objective is restoration of channelized tributaries to the headwater outer coastal plain stream type, as described in the "Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina" guidance document (COE 2005). The stream restoration will re-establish the riparian vegetation zone, re-connect flood plain areas, and enhance wildlife habitat. With proper stream restoration design, the project will also reduce erosion and sedimentation. These ecological functions have been non-existent for decades due to the previous ditch and drainage regime. The restoration and enhancement of wetlands onsite will generate longer soil saturation periods and the result is improved water quality. Restoring the native hydrologic characteristics will also restore the conditions that are beneficial for the longleaf pine community type that previously dominated the site before human intervention. The longleaf pine forest will also restore native habitat for the red-cockaded woodpecker.

The first component of the UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Site is restoration of the headwater streams, as described in the "Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina" guidance by the USACE and DWQ (COE 2005). The second component is wetland restoration and enhancement. By accomplishing these two objectives, the site hydrology is restored to pre-altered conditions thereby improving water quality by increasing saturation periods, enhancing native wildlife habitat, and reestablishing lost ecological function.

Stream Restoration: The North Tributary (**1,535 linear feet**) and South Tributary (**1,703 linear feet**) were constructed utilizing the December 2005 USACE guidance "Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina". The referenced document states that restoration of dimension, pattern and profile in accordance with the typical natural channel design is often not appropriate in environments similar to the project site. For headwater stream restoration, a width of 100 feet centered along the resulting valley will determine the area that can be considered for stream restoration (COE 2005). The resulting longitudinal profile and cross slopes of the stream valley will be largely dependent on the topography along each restoration reach. A total of **3,238 linear feet** of stream restoration has been accomplished.

Non-riparian wetland restoration (**7.83 acres**): The previous logging activities created large logging decks (discarded materials from the logging operation) which are areas that the harvested loblolly pine logs were de-limbed, cut, sorted, and loaded on trucks. The discarded material accumulated at three different areas across the site with depths reaching up to approximately eight feet in thickness. Non-riparian wetland restoration was accomplished by removing these logging decks, grading to pre-existing

elevation, and planting native species (Site1, Site 2, and Site 3). Site 6 contained fill that originated from erosion created by a maintained power line right of way and an adjacent access road. This fill material was removed and replanted with native species (Figure 2). The south headwater and north headwater wetland restoration areas (Figure 2) were accomplished by filling the existing drainage ditched and re-grading to pre-existing elevations and planted with native species.

Non-riparian wetland enhancement (**96.46 acres**): Vegetative enhancement was provided by planting with native species and the hydrology was enhanced through the stream restoration process in the wetland enhancement areas west of SR 1539 (Figure 2). The restored stream raised the existing water table and generated longer saturation periods. Non-riparian enhancement areas Site 4, Site 5, and Site 7 are wetlands that have been ditched and drained. Enhancement on these areas was a result of plugging the existing ditches and enhancing hydrology (Figure 2).

In addition to the restored and enhanced areas described above. UT Lilliput Stream and Wetland Restoration Site also provided **5,332 linear feet** of stream preservation and **20.45 acres** or riparian wetland preservation (Figure 2). Guidance from the North Carolina Department of Water Quality (DWQ) was used for stream delineations and guidance from the US Army Corps of Engineers (COE) 1987 Manual was used in delineating wetlands. These jurisdictional features were GPS located with sub-meter GPS technology and cataloged for preservation credit. All jurisdictional features were reviewed and approved by agency representatives after field review.

5.0 Success Criteria

Stream Restoration for UT Lilliput utilized "Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina" guidance document (COE 2005), for both design and design implementation. Therefore, traditional stream success criteria accepted for natural channel design cannot be used for this project. Headwater stream restoration will employ a monitoring plan that is more consistent with that of a wetland monitoring strategy since there will not be a constructed channel with pattern, dimension, and profile. The constructed headwater stream areas will be monitored with annual surveys, photos, vegetation monitoring, and groundwater/surface water monitoring gauges.

To monitor the restored groundwater, Remote Data Systems (RDS) WM20 and WM40 groundwater monitoring gauges will be paired with a surface water monitoring gauge (RDS WM40), and placed every 500 feet in restored valley length. Likewise, one pair of gauges will be placed on every restored reach that does not measure a total of 500 feet in length. The data from these gauges will be compared to the reference site gauges.

Cross-section surveys will also occur. Although typical stream monitoring techniques will not be applied, these surveys will be used as a year-to-year comparison to as-built conditions. Migration of flow paths across cross section plots are expected from year to year. To be considered successful the overall cross section geometry should remain consistent without significant sediment aggradation or degradation.

Photographic documentation and visual monitoring will also be utilized to note success or problem areas throughout the monitoring period. Visual inspections along each of the stream valleys is intended to confirm the presence of a braided, diffuse flow pattern, plant success, and performance of the

woody structures. Problem areas will be documented in the annual monitoring reports and consultation with EEP will be carried out to reach a resolution.

Success criteria are based on overall performance of the designed headwater stream restoration so that no substantial aggradation, degradation, down-cutting, or erosion occurs in longitudinal profiles and cross sections. The hydrologic regime should demonstrate jurisdictional wetland hydrology for groundwater monitoring gauges within the constructed channel as recommended in the "Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina" guidance document (COE 2005). Surface gauges should demonstrate periods of intermittent surface flow and relevance to the reference conditions to be deemed successful.

Wetland monitoring gauges (RDS WM20 or WM40) will be used to monitor the groundwater levels in wetland restoration and enhancement areas. On-site reference gauge data can be used as a basis of comparison. Post construction monitoring gauge locations are shown in Figure 2.

Hydrologic success criteria for restored wetlands are based on specific site conditions to determine wetland hyrdroperiods. To meet the success criteria for hydrology, the area must be inundated or saturated (within 12 inches of the surface) by surface or groundwater for at least a consecutive 12% of the growing season. Areas inundated or saturated less than 12% can be classified as wetlands depending upon factors such as the presence of hydrophytic vegetation and hydric soils. The growing season start and end dates are based on the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual criterion of five (5) years in ten (10) frequency having a twenty-eight (28) degrees Fahrenheit or lower temperature threshold. Therefore, UT Lilliput Stream and Wetland Restoration Site growing season will be defined as March 7th through November 28th. Hydroperiods should also demonstrate similar conditions to the reference monitoring gauges. Additional reference groundwater monitoring gauges were installed in July 2011 in both Murville and Leon soil types. The restored and enhanced non-riparian wetlands onsite are located on these soil types and additional reference data from these soils will aid in determining wetland restoration and enhancement success.

Wetland enhancement areas are monitored for hydrology as well. Although there is no standard protocol for success criteria in hydrologic wetland enhancement, the monitoring effort will demonstrate an improvement in hydroperiods over time and this improvement should be documented as it occurs. Improvements in hydroperiod can be determined by referencing current gauge location and data with pre-construction gauge location and data. The pre-construction gauge locations were determined to ascertain the effect of the ditching on the groundwater levels and effect on the surrounding wetland communities. In some areas, the post-construction gauges were installed on or near pre-construction locations. Groundwater monitoring gauge transects were also installed (December 2010 after MY1) perpendicular to the headwater stream channel to document improved groundwater hyrdroperiods.

Based upon CVS-EEP protocol for establishing vegetation monitoring plots, the UT to Lilliput Creek (Hog Branch Ponds) Stream and Wetland Restoration Site utilizes 15 vegetation monitoring plots throughout all zones. Because of its small size (0.043 acre) Site 6 will have a total stem count. CVS-EEP Level 1 monitoring protocol and Level 2 for MY2 through MY5. The vegetative restoration occurs in four (4) planting zones: Zone I - Coastal Plain Small Stream Swamp, Zone II – Wet Pine Flatwoods, Zone III – Pine Savanna, and Zone IV – Cypress Gum Swamp. See appendix D for planting plan.

Success Criteria state that there must be a minimum of 320 trees per acre surviving for three consecutive years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e. 288 trees/acre for year 4, and 260 trees/acre for year 5). To meet success there should be at least 260 5 year-old trees per acre after year 5.

6.0 Monitoring Plan Guidelines

Hydrology – Hydrologic monitoring will be accomplished through a series of forty (40) monitoring gauges. Twenty-eight (28) monitoring gauges are installed to monitor groundwater, and eight (8) gauges will monitor surface water in the restored headwater stream channels. The reference site utilizes one (1) surface water monitoring gauge and three (3) groundwater monitoring gauges. Data will be collected monthly through the growing season March through November (Figure 2).

Dimension – Channel dimension will be surveyed once each year at 8 permanently established cross-sections; four (4) along the Northern Tributary and four (4) along the Southern tributary. Cross sections will be surveyed using total station methodology and the data will be analyzed and plotted using CADD and Microsoft Excel software packages (Figure 2).

Profile – Channel profile will be surveyed once each year using total station methodology to survey centerline and water surface elevations for both the Northern and Southern tributaries (thalwag survey is not applicable due to the braided nature of headwater stream type). Each profile survey must be taken down the centerline of each channel with start and stop points the same. All data will be analyzed and plotted using CADD and Microsoft Excel software packages (Figure 2).

Pattern - Channel pattern data will be collected as part of the channel profile survey.

Sediment Transport – Visual inspection and survey data will be used to confirm no significant aggradation or degradation of the constructed channels.

Visual Assessment – Visual assessment of the stream features will occur during the stream profile survey. Visual assessment will photographically document any feature that needs immediate attention by EEP (Figure 2).

Bank Stability Assessments – Headwater stream restoration does not incorporated typical channel and bank features normally associated with natural channel design. Therefore, BEHI and NBS are not applicable to this project.

Vegetation – Vegetation sampling will follow the 2008 CVS-EEP Protocol for Level 1 (Version 4.2). Fifteen (15) $100m^2$ plots have been established and will be sampled every year to determine if vegetation survival is above or below the criteria that the U.S. Army Corps of Engineers require for a successful project. CVS-EEP Microsoft Access software package will be used for vegetation data analysis and reporting to EEP and CVS. Site 6 will require a total stem count (Figure 2).

Digital Photos – Digital photo documentation of each permanent cross section, each vegetation plot, each designated photo point, and representative stream photos shall occur annually. One representative photo

of each vegetation plot must be taken on the same day vegetative assessments are conducted. All photos should be taken during the same general time frame each year. Figure 2.

Other Parameters – There are currently one (1) surface water monitoring gauge and four (4) groundwater monitoring gauge located in reference areas. These gauges will require monthly data download throughout the growing season (March 7 through November 28).

7.0 Maintenance and Contingency Plans

EEP is currently working with The Nature Conservancy and the North Carolina Department of Agriculture and Consumer Sciences Plant Conservation Program to determine a maintenance schedule for controlled burning. It is recommended that controlled burns occur every three (3) to (5) years or as needed. The current site conditions will require an initial burning by the end of year 2011. If any problem should arise that will require remedial action, this problem should be immediately reported to EEP with photographic documentation and should include a brief description.

8.0 As-Built Conditions (Baseline)

A comparison of as-built site conditions and design plans reveals no significant changes have occurred. Cross section survey shows that channel dimensions are congruent with design and the longitudinal profile is holding grade. Stream dimension, pattern, and profile, plots are found in Appendix B and Appendix D. Monitoring features and location are noted in Figure 2.

EEP protocol requires baseline vegetation baseline data to be collected within twenty one (21) days of the completion of site planting. This requirement was met and an accurate baseline sample of planted stems was taken within CVS/EEP parameters. Vegetation sampling yielded a site density of 709 stems per acre and distribution was consistent with the planting plan. Vegetation data including plot photos are found in Appendix C.

9.0 References

Harrelson, C.C., C.L. Rawlins and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. United States Department of Agriculture, Fort Collins, CO.

NCEEP. 2006. UT to Lilliput Stream and Wetland Restoration Project Restoration Plan. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 3, October 16, 2006.

NCEEP. 2010. Content, Format and Data Requirements for EEP Baseline Monioring Report. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 2.0 October 14, 2010.

NCEEP. 2008. CVS-EEP Vegetation Sampling Protocol. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 4.2, 2008.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

U.S. Army Corps. Of Engineers. 1987. U.S. Army Corps. of Engineers. Tech Report Y-87-1, 1987 Wetland Delineation Manual, Washington, DC. AD/A176.

U.S. Army Corps. Of Engineers. 2005. U.S. Army Corps. of Engineers. Information Regarding Stream Restoration in the Outer Coastal Plain of North Carolina, Wilmington Regulatory Field Office.

APPENDIX A

General Tables and Figures

APPENDIX B

Morphological Summary Data, Plots, and Photos

APPENDIX C

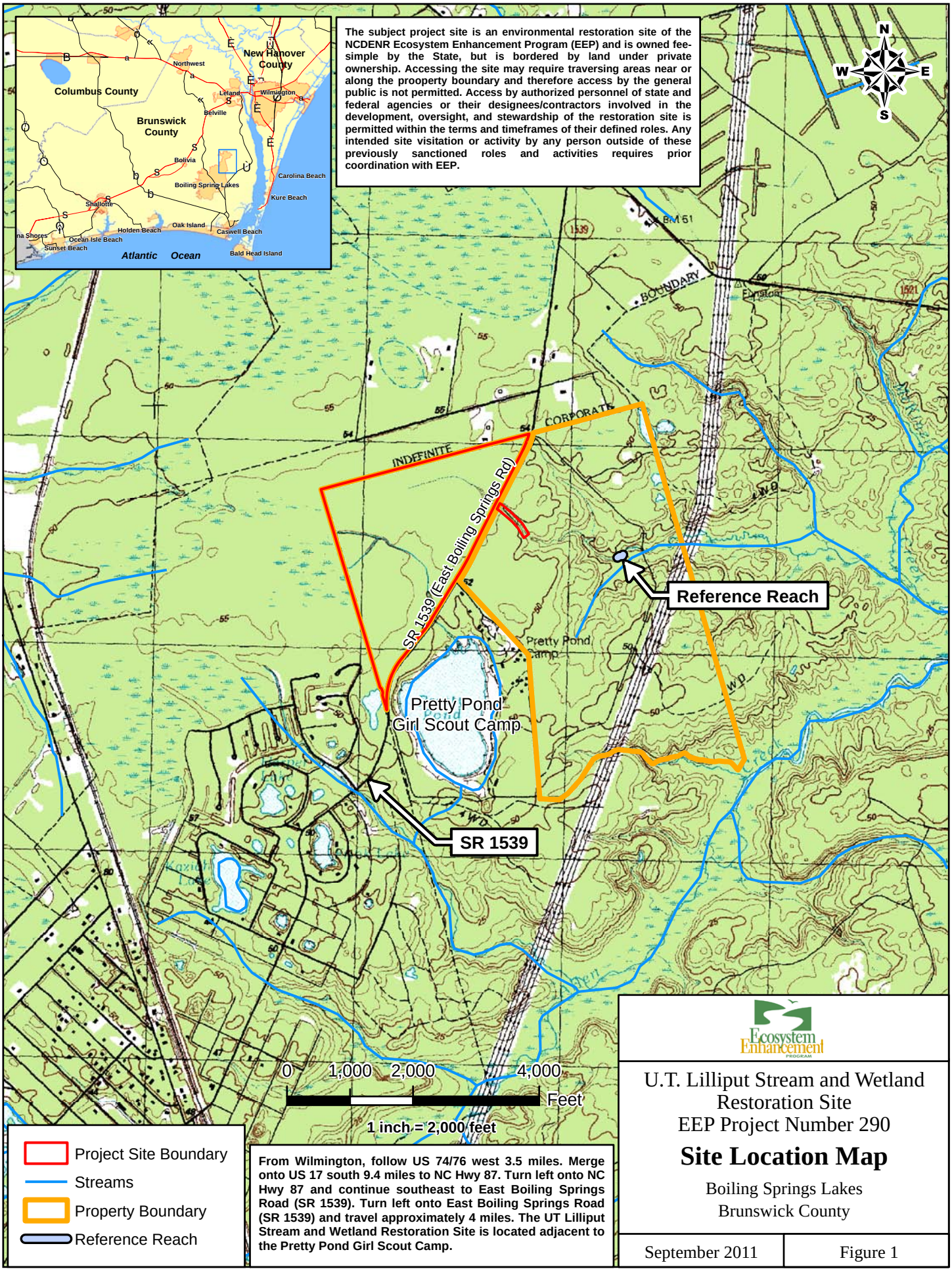
Vegetation Data

APPENDIX D

As-Built Plan Sheets

APPENDIX A

General Tables and Figures



Source: USGS 7.5 Minute Quadrangle, Funston, NC

FIGURE 2

Project Components

U.T. Lilliput Stream and Wetland Restoration Site
Project No: D05053S
EEP No. 290

Brunswick County

Legend

Restoration Plan Component

- Property Boundary
- Stream Restoration (7.23 Ac., 3238 LF.)
- Non-Riparian Wetland Restoration (7.83 Ac.)
- Non-Riparian Wetland Enhancement (96.46 Ac.)
- Non-Riparian Wetland Preservation (87.74 Ac.)
- Riparian Wetland Preservation (20.45 Ac.)
- Wetland in Powerline ROW (4.54 Ac.)
- Stream Preservation (100' buffer, 8.67 Ac., 5332 LF)

N
W E
S

0 250 500 1,000 Feet

Ecosystem Enhancement Program

September 2011

FIGURE 3

Monitoring Plan Features

U.T. Lilliput Stream and Wetland Restoration Site
Project No: D05053S
EEP No. 290

Brunswick County

Legend

- Vegetation Monitoring Plot

Monitoring Gauges

- Surface Gauges
- Groundwater Gauges

Photo Monitoring

- Photo Point and Direction

Restoration Plan Component

- Stream Restoration (7.23 Ac., 3238 LF.)
- Non-Riparian Wetland Restoration (7.83 Ac.)
- Non-Riparian Wetland Enhancement (96.46 Ac.)
- Property Boundary
- Surveyed Cross Sections
- Surveyed Longitudinal Profile

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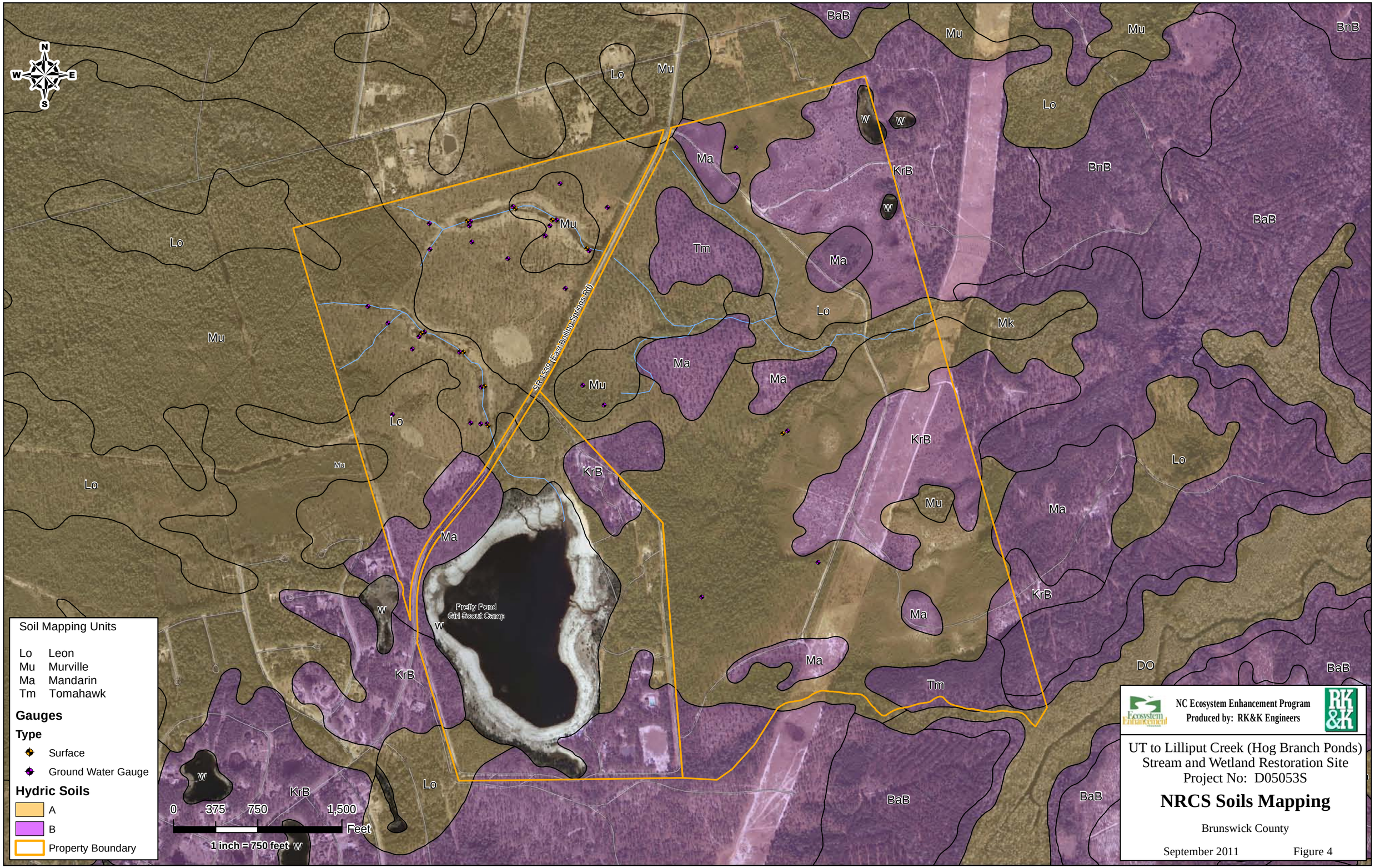
Feet

Ecosystem Enhancement Program

September 2011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SR 1539 (East Boiling Springs Rd)
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Mu
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KrB
Mu
KrB
Lo
Lo
Mu
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Mu
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KrB
Pretty Pond
Girl Scout Camp
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DO
BaB
Tm
w
KrB
Lo
BaB
BaB
0
375
750
1,500
Feet
1 inch = 750 feet
Soil Mapping Units
Lo Leon
Mu Murville
Ma Mandarin
Tm Tomahawk
Gauges
Type
Surface
Ground Water Gauge
Hydric Soils
A
B
Property Boundary
NC Ecosystem Enhancement Program
Produced by: RK&K Engineers
UT to Lilliput Creek (Hog Branch Ponds)
Stream and Wetland Restoration Site
Project No: D05053S
NRCS Soils Mapping
Brunswick County
September 2011
Figure 4

Table 1. Project Components and Mitigation Credits
UT Lilliput Stream and Wetland Restoration Project, EEP No. 290

Mitigation Credits

	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	3,238	1,066.4		4.09	7.83	65.72			

Project Components

Project Component	Stationing/Location	Existing Footage/Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
0 to 1st Order Stream Restoration	Northern Tributary	1,535 LF	Headwater Stream Restoration	Restoration	1,535 LF	1:1
0 to 1st Order Stream Restoration	Southern Tributary	1,703 LF	Headwater Stream Restoration	Restoration	1,703 LF	1:1
Stream Preservation	See Figure 2	5,332 LF	Preservation	Preservation (RE)	5,332 LF	5:1
Non-riparian Wetland Restoration	See Figure 2	7.83 acres	Restoration	Restoration	7.83 acres	1:1
Non-riparian Wetland Enhancement	See Figure 2	96.46 acres	Enhancement	Enhancement (RE)	96.46 acres	2:1
Non-riparian Wetland Preservation	See Figure 2	87.74 acres	Preservation	Preservation (RE)	87.74 acres	5:1
Riparian Wetland Preservation	See Figure 2	20.45 acres	Preservation	Preservation (RE)	20.45 acres	5:1

Component Summation

Restoration Level	Stream (Linear Feet)	Riparian Wetland (acres)	Non-riparian Wetland (acres)	Buffer (acres)	Upland (acres)
Restoration	3,238 LF		7.83 acres		
Enhancment			96.46 acres		
Enhancement I					
Enhancement II					
Creation					
Preservation	5,332 LF	20.45 acres	87.74 acres		
High Quality Preservation					

BMP Elements*

Element	Location	Purpose/Function	Notes

*BMP Elements are not part of the UT Lilliput Project

Table 2. Project Activity and Reporting History UT Lilliput Stream and Wetland Restoration Project - EEP Project No. 290		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan	NA	October 2006
Final Design – Construction Plans	NA	April 2008
Construction	NA	February 2010
Temporary S&E mix applied to entire project area	NA	March 2009
Permanent seed mix applied to entire project area	NA	March 2009
Containerized and B&B plantings	NA	February 2010
Baseline Monitoring Document (Year 0 Monitoring - baseline)	December 2010	December 2010
Year 1 Monitoring	December 2010	January 2011
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

Table 3. Project Contacts Table UT Lilliput Stream and Wetland Restoration Project - EEP Project No. 290	
Designer Primary project design POC	RK&K Engineers 900 Ridgefield Drive Suite 350 Raleigh, NC 27609 Pete Stafford (919)-878-9560
Construction Contractor Construction contractor POC	River Works Inc. 8000 Regency Parkway Cary, NC 27518 Will Pedersen (919)-459-9001
Planting Contractor Planting Contractor POC	River Works Inc. 8000 Regency Parkway Cary, NC 27518 Will Pedersen (919)-459-9001
Seeding Contractor Seeding Contractor POC	River Works Inc. 8000 Regency Parkway Cary, NC 27518 Will Pedersen (919)-459-9001
Seed Mix Sources	Contact River Works Inc.
Nursery Stock Suppliers	Contact River Works Inc.
Monitoring Performers (MY1)	Rummel, Klepper, and Kahl, LLP 900 Ridgefield Drive Suite 250 Raleigh, NC 27609
Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	Pete Stafford (919)878-9560 Pete Stafford (919)878-9560 Pete Stafford (919)878-9560

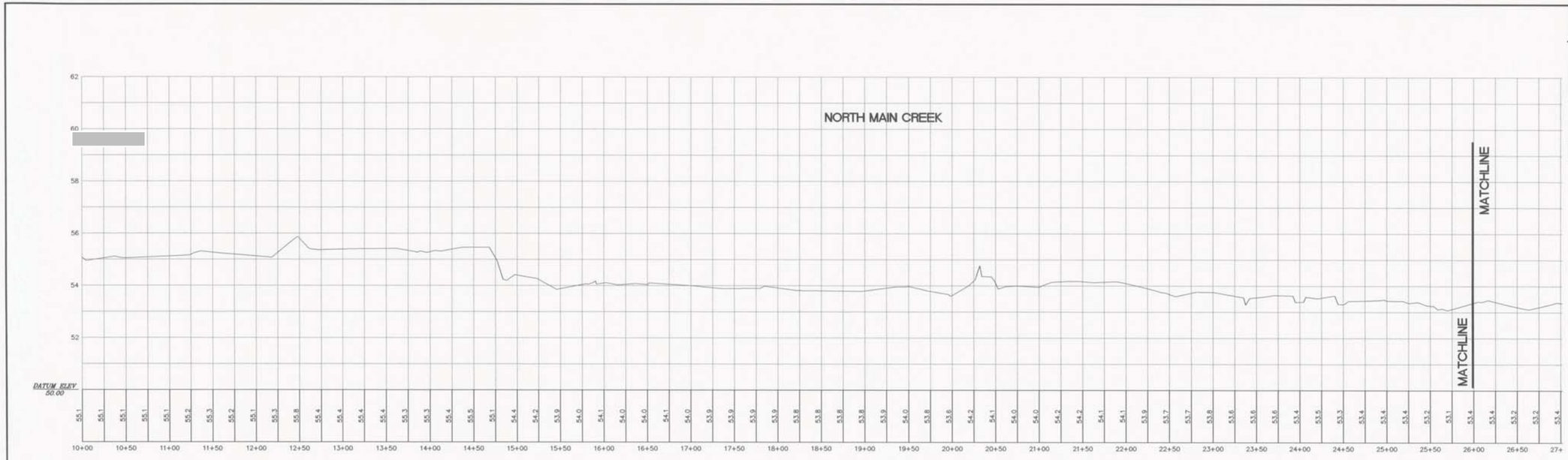
Table 4. Project Baseline Information and Attributes UT Lilliput Stream and Wetland Restoration Project - EEP Project No. 290		
Project Information		
Project Name	UT Lilliput Stream and Wetland Restoration Project	
Project County	Brunswick	
Project Area	517 acres	
Project Coordinates (Lat and Long)	34.078043,-78.026662	
Project Watershed Summary Information		
Physiographic Region	Coastal Plain	
River Basin	Cape Fear	
USGS HUC 8 Digit 03020103	USGS HUC 14 Digit 03030005070010	
NCDWQ Subbasin	03-06-17	
Project Drainage Area	N/A	
Project Drainage impervious cover estimate (%)	< 5%	
CGIA Land Use Classification		
Reach Summary Information		
Parameters	**North Tributary**	**South Tributary**
Length of Reach	1,535 LF	1,703 LF
Valley Classification	0 to 1st order	0 to 1st order
Drainage Area	52.49 acres	66.94 acres
NCDWQ Stream Identification Score	N/A	N/A
NCDWQ Water Quality Classification	CNSW	CNSW
Morphological Description (stream type)	0 to 1st order	0 to 1st order
Evolutionary Trend	N/A	N/A
Underlying Mapped Soils	Leon	Murville
Drainage Class	Poorly Drained	Poorly Drained
Soil Hydric Status	Hydric A	Hydric A
Slope	.001	.001
FEMA Classification	Zone X	Zone X
Native Vegetation Community	N/A	N/A
Percent Composition Exotic Invasive Vegetation	< 1%	< 1%

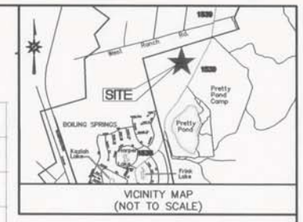
Wetland Summary Information		
Parameter	**Wetland 1**	**Wetland 2**
Size (acres)	87.74	22.45
Wetland Type	Non-Riparian	Riparian
Mapped Soils Series	Murville and Leon	Muckalee
Drainage Class	Very Poorly Drained, Poorly drained	Very poorly drained
Soil Hydric Status	A	A
Source of Hydrology	Groundwater	Groundwater
Hydrologic Impairment	N/A	N/A
Native Vegetation Community	Long Leaf Pine	Coastal Plain Blackwater Small Stream
Percent of Exotic/Invasive Veg	<1%	<1%

Table 4. Continued UT Lilliput Stream and Wetland Restoration Project - EEP Project No. 290			
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Yes	Upon Request
Waters of the United States – Section 401	Yes	Yes	Upon Request
Endangered Species Act	Yes	Yes	Upon Request
Historic Preservation Act	Yes	Yes	Upon Request
Coastal Zone Management Act (CZMA) Coastal Area Management Act (CAMA)	Yes	Yes	Upon Request
FEMA Floodplain Compliance	Yes	Yes	Upon Request
Essential Fisheries Habitat	No		

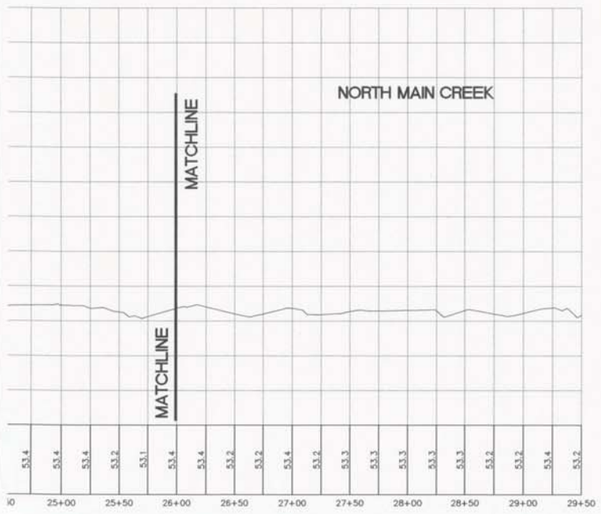
APPENDIX B

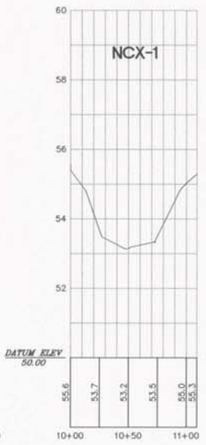
Morphological Summary Data, Plots, and Photos

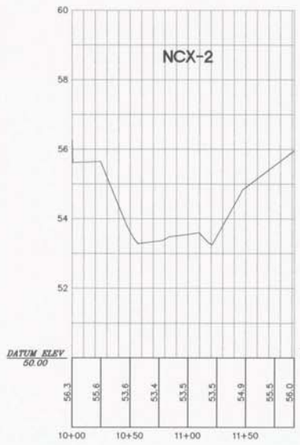


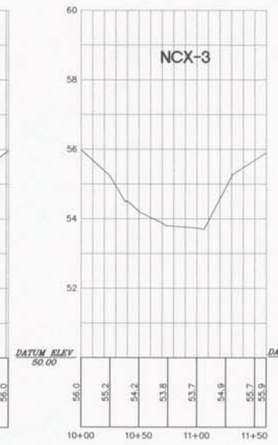


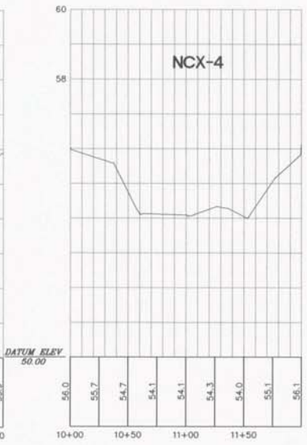
VICINITY MAP
(NOT TO SCALE)











HORIZONTAL
SCALE: 1" = 60'
0 30 60 120 180

VERTICAL
SCALE: 1" = 2 '
0 1 2 4 6

- SECTION LOCATION MARKER
- SURFACE GAUGE, ELEVATION SHOT AT CALIBRATION POINT
- IRON ROD FOUND AT CORNERS OF VEGETATION PLOTS
- GROUNDWATER GAUGE
- FLOW DISRUPTER
- LIMITS OF GRADING
- LOG CURTIN

NOTES:
1) ALL DISTANCES SHOWN ARE GROUND HORIZONTAL UNLESS OTHERWISE NOTED.
2) HORIZONTAL DATUM IS NAD 83, 1986.
3) VERTICAL DATUM IS NGVD 29.
4) RECORD DRAWING– THE INFORMATION SHOWN HEREON IS TAKEN FROM CONTRACTOR RECORDS AND POST–CONSTRUCTION SURVEY.
5) ALL CONTOURS SHOWN IN GREY SCALE AND DASHED ARE REFERENCED FROM PREVIOUS SURVEYS AND ARE FOR INFORMATIONAL PURPOSES ONLY.
6) ENGINEER OF RECORD:
HOWARD T. WOODALL, III, PE
RUMMEL, KLEPPER & KAHL, LLP
900 RIDGEFIELD DRIVE, STE. 350
RALEIGH, NC 27609
NC LICENSE NO. F–0112
7) FIELD SURVEYS PERFORMED JUNE 2009.

DATE	REVISION	INITIAL

McKIM & CREED
3904 Bus. Hwy. 17 East
Bolivia, North Carolina 28422
Phone: (910)253–6622, Fax: (910)253–6634
NC FIRM C–0342
Internet Site: http://www.mckimcreed.com

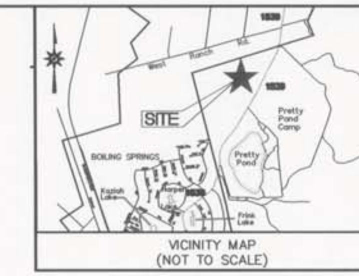
DATE:_____

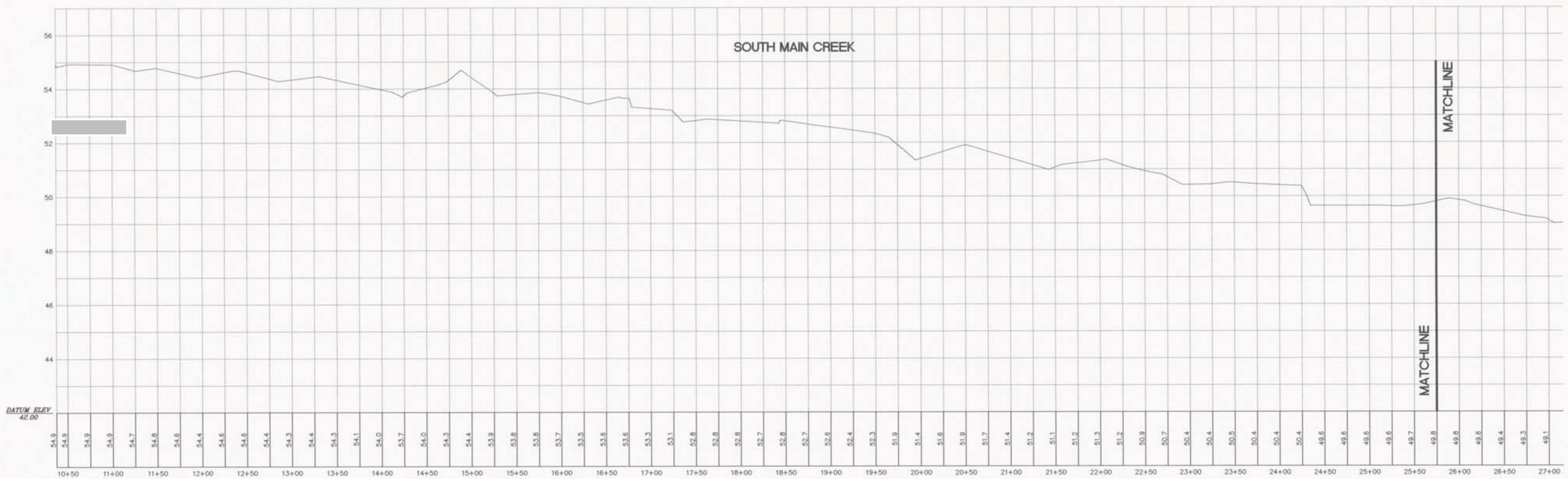
AS–BUILT SURVEY OF
UNNAMED TRIBUTARY TO LILLIPUT STREAM AND WETLAND RESTORATION
FOR
RIVER WORKS, INC
4117 PLEASANT GARDEN ROAD
GREENSBORO, NC 27406
DATE: JUNE 23, 2010 SCALE: 1" = 60'
TOWNCREEK TOWNSHIP BRUNSWICK COUNTY NORTH CAROLINA

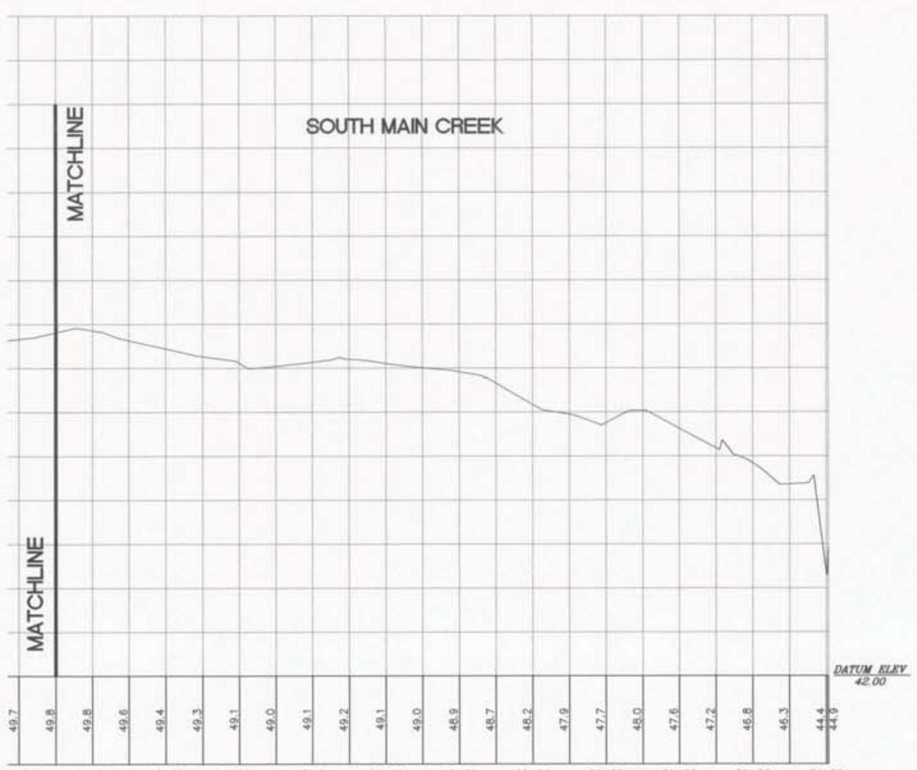
PROJECT # : 05631–0001
PROJ. SVYR : MRS
DRAWN BY :
FIELD BK. :
COMP. FILE : VA101–056310001
SHEET # : 8 OF 9

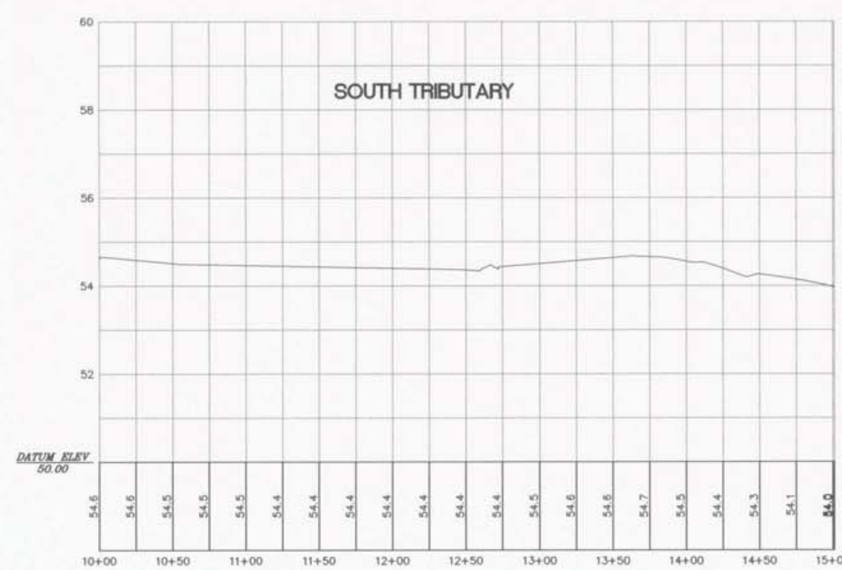
Appendix B

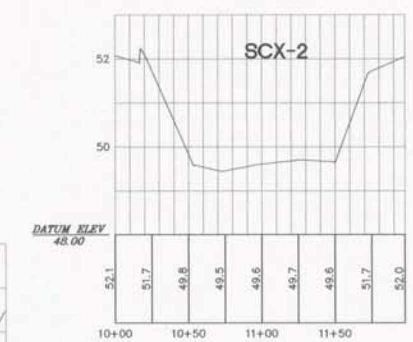
DWG. # : VA101–056310001

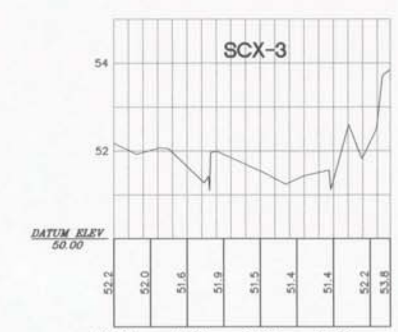


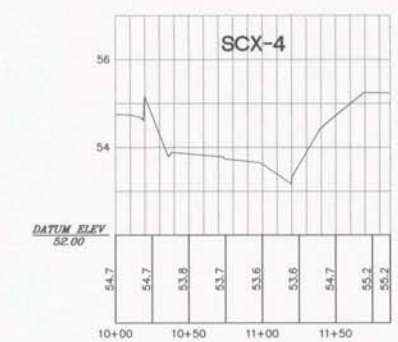












NOTES:
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900 RIDGEFIELD DRIVE, STE. 350
RALEIGH, NC 27609
NC LICENSE NO. F-0112
7) FIELD SURVEYS PERFORMED JUNE 2009.

□ SECTION LOCATION MARKER
○ SURFACE GAUGE, ELEVATION SHOT AT CALIBRATION POINT
• IRON ROD FOUND AT CORNERS OF VEGETATION PLOTS
GROUNDWATER GAUGE
FLOW DISRUPTER
LIMITS OF GRADING
LOG CURTIN

HORIZONTAL
SCALE: 1" = 60'
0 30 60 120 180

VERTICAL
SCALE: 1" = 2 '
0 1 2 4 6

DATE	REVISION	INITIAL

McKIM&CREED
3904 Bus. Hwy. 17 East
Bolivia, North Carolina 28422
Phone: (910)253-6622, Fax: (910)253-6634
NC FIRM C-0342
Internet Site: http://www.mckimcreed.com

DATE:

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UNNAMED TRIBUTARY TO LILLIPUT STREAM
AND WETLAND RESTORATION
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RIVER WORKS, INC
4117 PLEASANT GARDEN ROAD
GREENSBORO, NC 27406
DATE: JUNE 23, 2010 SCALE: 1" = 60'
TOWNCREEK TOWNSHIP BRUNSWICK COUNTY NORTH CAROLINA

PROJECT # : 05631-0001
PROJ. SVYR : MRS
DRAWN BY :
FIELD BK. :
COMP. FILE : VA101-056310001
SHEET # : 9 OF 9

Appendix B

DWG. # : VA101-056310001

Appendix B - Stream and Cross Section Photos (all photos recorded on December 6, 2010)

Photo Station 1. Southern Tributary Station 15+00 – Looking upstream

Photo Station 2. Southern Tributary Station 15+00 – SCX4 - Looking downstream

Photos recorded on December 6, 2010

Photo Station 3. Southern Tributary Station 23+00 – SCX3 - Looking upstream

Photo Station 4. Southern Tributary Station 23+00 – SCX2 - Looking downstream

Photos recorded on December 6, 2010

Photo Station 5. Southern Tributary Station 29+00 – Looking upstream

Photo Station 6. Southern Tributary Station 29+00 – SCX1 - Looking downstream

Photos recorded on December 6, 2010

Photo Station 7. Northern Tributary Station 14+00 – NCX4 - Looking downstream

Photo Station 8. Northern Tributary Station 21+00 – NCX3 - Looking upstream

Photos recorded on December 6, 2010

Photo Station 9. Northern Tributary Station 21+00 – NCX2 - Looking downstream

Photo Station 10. Northern Tributary Station 28+25 – Looking upstream

Photos recorded on December 6, 2010

Photo Station 11. Northern Tributary Station 28+25 –NCX1 - Looking downstream

Photo Station 12. Site 1 Non-Riparian Wetland Restoration

Photos recorded on December 6, 2010

Photo Station 13. Site 2 Non-Riparian Wetland Restoration

Photo Station 14. Site 3 Non-Riparian Wetland Restoration

Photos recorded on December 6, 2010

Photo Station 15. Site 4 Non-Riparian Wetland Enhancement

Photo Station 16. Site 5 Non-Riparian Wetland Enhancement

Photos recorded on December 6, 2010

Photo Station 17. Site 6 Non-Riparian Wetland Restoration (Photo Recorded on 10/2010)

Photo Station 18. Site 7 Non-Riparian Wetland Enhancement

Photos recorded on December 6, 2010

Photo Station 19. Northern Headwater Wetland, Northern Prong

Photo Station 20. Northern Headwater Wetland, Southern Prong

Photos recorded on December 6, 2010

Photo Station 21. Southern Headwater Wetland, Northern Prong

Photo Station 22. Southern Headwater Wetland, Southern Prong

Photos recorded on December 6, 2010

Photo Station 23. Non-RiparianWetland Enhancement Area, General Site Photos

Photo Station 24. Non-RiparianWetland Enhancement Area, General Site Photos

Photos recorded on December 6, 2010

Photo Station 25. Non-RiparianWetland Enhancement Area, General Site Photos

APPENDIX C

Vegetation Data

Table 7. Planted and Total Stem Counts (Species by Plot with Annual Means)

			CURRENT DATA (Baseline 2010)																										ANNUAL MEANS	
			Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12		Plot 13		Plot 14		Plot 15		As Built (2010)	
Scientific Name	Common Name	Type	P	T*	P	T*	P	T*	P	T*	P	T*	P	T*	P	T*	P	T*	P	T*	P	T*	P	T*	P	T*	P	T*	P	T*	P	T*
Magnolia virginiana	sweetbay	Tree	6		2		2								6		3		2												21	
Nyssa biflora	swamp tupelo	Tree															1														1	
Pinus palustris	longleaf pine	Tree									7		8								20		18		12		18		17		18		118	
Pinus serotina	pond pine	Tree	7		7		7		3		6		12		6		12		4						9								73	
Quercus sp.	oak sp.	Tree	4		5		9		9						7		7		6														47	
Quercus lyrata	overcup oak	Tree																	3														3	
		Plot Area (a	0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025			
* *Not Applicable for Baseline*	Species Count		3		3		3		2		2		2		3		4		4		1		1		1		1		1		1		6	
Type = Tree or Shrub	Stem Count		17		14		18		12		13		20		19		23		15		20		18		21		18		17		18		263	
P = Planted, T = Total	Stems/Acre		687.48		566.16		727.92		485.28		525.72		808.8		768.36		930.12		606.6		808.8		727.92		849.24		727.92		687.48		727.92		709	

APPENDIX D

As-Built Plan Sheets

DENR CONTRACT: D05053S SCO CONTRACT: 04–06351–01A

ECOSYSTEM ENHANCEMENT PROGRAM

STATE	DENR CONTRACT NO.	SHEET NO.	TOTAL SHEETS
N.C.	D05053S	1	52

UNNAMED TRIBUTARY TO LILLIPUT STREAM AND WETLAND RESTORATION

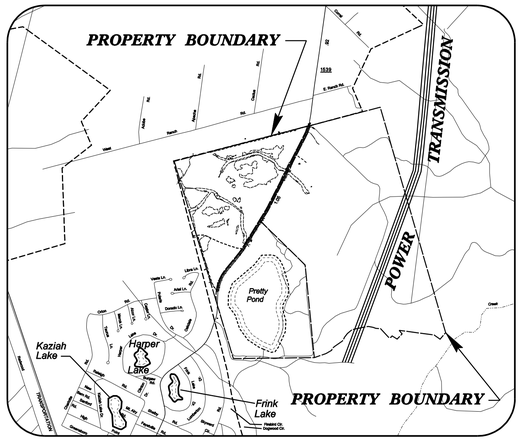
BRUNSWICK COUNTY

SCO CONTRACT NO. 04–06351–01A

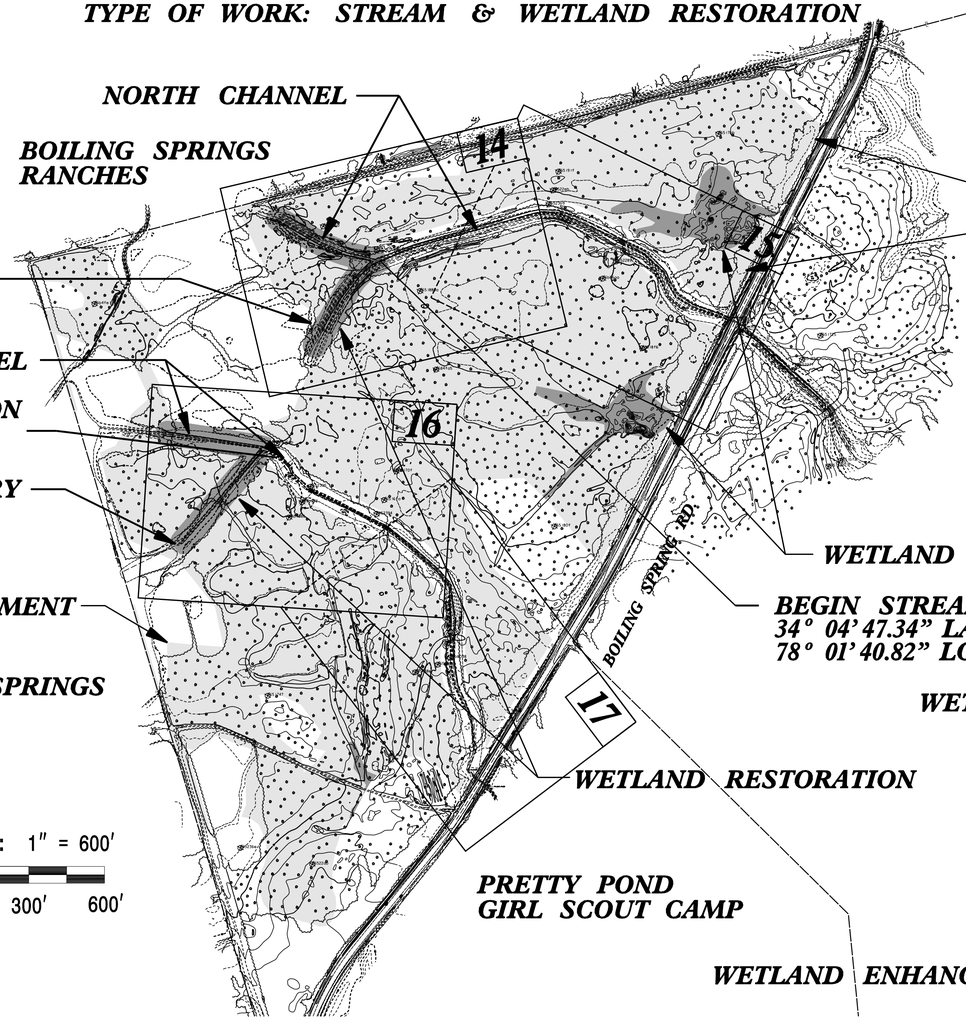
RECORD DRAWINGS

LOCATION: SR 1539 (BOILING SPRING RD.)

TYPE OF WORK: STREAM & WETLAND RESTORATION



VICINITY MAP



CONTRACTOR:
RIVER WORKS, INC.
LICENSE #54912

CONTACT:
WILL PEDERSON
3000 REGENCY PKWY, STE. 200
CARY, NC 27818
PHONE: 919–459–9001

WETLAND ENHANCEMENT

PROPERTY BOUNDARY (TYPICAL)

POWER EASEMENT

WETLAND RESTORATION

BEGIN STREAM RESTORATION
34° 04' 47.34" LATITUDE
78° 01' 40.82" LONGITUDE

WETLAND RESTORATION

WETLAND ENHANCEMENT

NAD 83

NOVEMBER 4, 2010

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE
2 THRU 2B	TYPICAL SECTION & DETAILS
3 THRU 6	EXISTING CONDITIONS
7 THRU 12	WETLAND RESTORATION & ENHANCEMENT
13 THRU 17	STREAM RESTORATION
18 THRU 19	PROFILE SHEETS
S–1 THRU S–9	AS–BUILT SURVEY
X–1 THRU X–30	CROSS SECTIONS

PROJECT DATA

STREAM RESTORATION LENGTH	3,238 FT.
WETLAND RESTORATION	7.83 AC.
WETLAND ENHANCEMENT	96.46 AC.
TOTAL DISTURBED ACREAGE	19.83 AC

PLANS PREPARED BY :
RUMMEL • KLEPPER & KAHL, LLP
consulting engineers
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
RKK.COM NC LICENSE No. F-0012 919-878-9560

FOR

ECOSYSTEM ENHANCEMENT PROGRAM

KRISTIN MIGUEZ
EEP PROJECT MANAGER

WYATT BROWN
EEP REVIEW COORDINATOR

DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

SIGNATURE:

WILLIAM E. STAFFORD
PROJECT SCIENTIST

HOWARD T. WOODALL III, P.E.
PROJECT DESIGN ENGINEER

PROJECT REFERENCE NO.	SHEET NO.
D05053S	IA

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

RECORD DRAWINGS

*S.U.E = SUBSURFACE UTILITY ENGINEER

CONVENTIONAL SYMBOLS

ROADS & RELATED ITEMS

- Edge of Pavement
- Curb
- Prop. Slope Stakes Cut
- Prop. Slope Stakes Fill
- Prop. Woven Wire Fence
- Prop. Chain Link Fence
- Prop. Barbed Wire Fence
- Prop. Wheelchair Ramp
- Curb Cut For Future Wheelchair Ramp
- Exist. Guardrail
- Prop. Guardrail
- Exist. Cable Guiderail
- Prop. Cable Guiderail
- Equality Symbol
- Pavement Removal

RIGHT OF WAY

- Baseline Control Point
- Existing Right of Way Marker
- Exist. Right of Way Line w/Marker
- Prop. Right of Way Line with Proposed R/W marker (Iron Pin & Cap)
- Prop. Right of Way Line with Proposed (Concrete or Granite) R/w Marker
- Exist. Control of Access Line
- Prop. Control of Access Line
- Exist. Easement Line
- Prop. Temp. Construction Easement Line
- Prop. Temp. Drainage Easement Line
- Prop. Perm. Drainage Easement Line

HYDROLOGY

- Stream or Body of Water
- Flow Arrow
- Disappearing Stream
- Spring
- Swamp Marsh
- Shoreline
- Falls, Rapids
- Prop Lateral, Tail, Head Ditches

STRUCTURES

MAJOR

- Bridge, Tunnel, or Box Culvert
- Bridge Wing Wall, Head Wall and End Wall

MINOR

- Head & End Wall
- Pipe Culvert
- Footbridge
- Drainage Boxes
- Paved Ditch Gutter

UTILITIES

- Exist. Pole
- Exist. Power Pole
- Prop. Power Pole
- Exist. Telephone Pole
- Prop. Telephone Pole
- Exist. Joint Use Pole
- Prop. Joint Use Pole
- Telephone Pedestal
- Cable TV Pedestal
- Hydrant
- Satellite Dish
- Exist. Water Valve
- Sewer Clean Out
- Power Manhole
- Telephone Booth
- Water Manhole
- Light Pole
- H-Frame Pole
- Power Line Tower
- Pole with Base
- Gas Valve
- Gas Meter
- Telephone Manhole
- Power Transformer
- Sanitary Sewer Manhole
- Storm Sewer Manhole
- Tank; Water, Gas, Oil
- Water Tank With Legs
- Traffic Signal Junction Box
- Fiber Optic Splice Box
- Television or Radio Tower
- Utility Power Line Connects to Traffic Signal Lines Cut Into the Pavement
- Recorded Water Line
- Designated Water Line (S.U.E.*)
- Sanitary Sewer
- Recorded Sanitary Sewer Force Main
- Designated Sanitary Sewer Force Main(S.U.E.*)
- Recorded Gas Line
- Designated Gas Line (S.U.E.*)
- Storm Sewer
- Recorded Power Line
- Designated Power Line (S.U.E.*)
- Recorded Telephone Cable
- Designated Telephone Cable (S.U.E.*)
- Recorded U/G Telephone Conduit
- Designated U/G Telephone Conduit (S.U.E.*)
- Unknown Utility (S.U.E.*)
- Recorded Television Cable
- Designated Television Cable (S.U.E.*)
- Recorded Fiber Optics Cable
- Designated Fiber Optics Cable (S.U.E.*)
- Exist. Water Meter
- U/G Test Hole (S.U.E.*)
- Abandoned According to U/G Record — ATTUR
- End of Information — E.O.I.

BOUNDARIES & PROPERTIES

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Property Line Symbol
- Exist. Iron Pin — EIP
- Property Corner
- Property Monument — ECM
- Property Number — 123
- Parcel Number — 6
- Fence Line — WW & ISBW
- Existing Wetland Boundaries — WLB
- Proposed Wetland Boundaries — WLB
- Existing Endangered Animal Boundaries — EAB
- Existing Endangered Plant Boundaries — EPB

BUILDINGS & OTHER CULTURE

- Buildings
- Foundations
- Area Outline
- Gate
- Gas Pump Vent or U/G Tank Cap
- Church
- School
- Park
- Cemetery
- Dam
- Sign
- Well
- Small Mine
- Swimming Pool

TOPOGRAPHY

- Loose Surface
- Hard Surface
- Change in Road Surface
- Curb
- Right of Way Symbol — R/W
- Guard Post — GP
- Paved Walk
- Bridge
- Box Culvert or Tunnel
- Ferry
- Culvert
- Footbridge
- Trail, Footpath
- Light House

VEGETATION

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard — VINEYARD

RAILROADS

- Standard Gauge — CSX TRANSPORTATION
- RR Signal Milepost — MILEPOST 35
- Switch — SWITCH

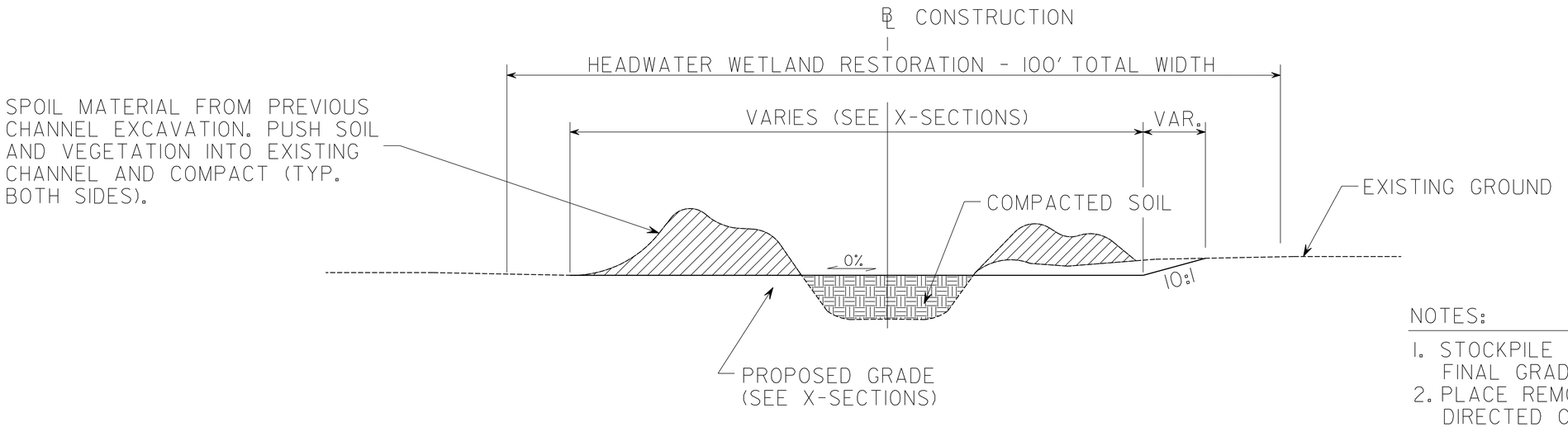
REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
D05053S	2
R /W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL, III

RECORD DRAWINGS

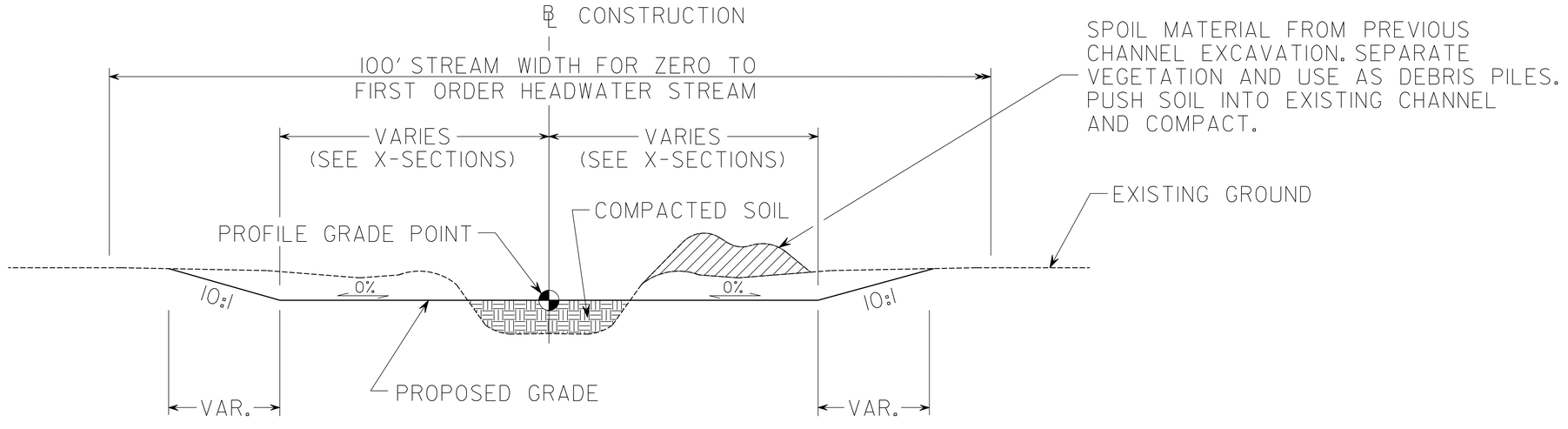


NOTES:

1. STOCKPILE TOPSOIL FOR USE IN FINAL GRADING.
2. PLACE REMOVED VEGETATION AS DIRECTED ON-SITE TO CREATE DEBRIS PILES. ALSO SEE PLAN.

TYPE I GRADING - LILLIPUT WETLAND RESTORATION TYPICAL SECTION

(Not to Scale)



TYPE 2 GRADING - LILLIPUT STREAM RESTORATION TYPICAL SECTION

(Not to Scale)

PLANS PREPARED BY :
RUMMEL KLEPPER & KAHL, LLP
consulting engineers
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE No. F-0112 (919) 878-9560
RKK.COM
FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

REVISIONS

8/17/99

12/7/2010
J:\COMMON\304045\Proj\Record Drawings\Lilliput_strm_typ.dgn
bbadey

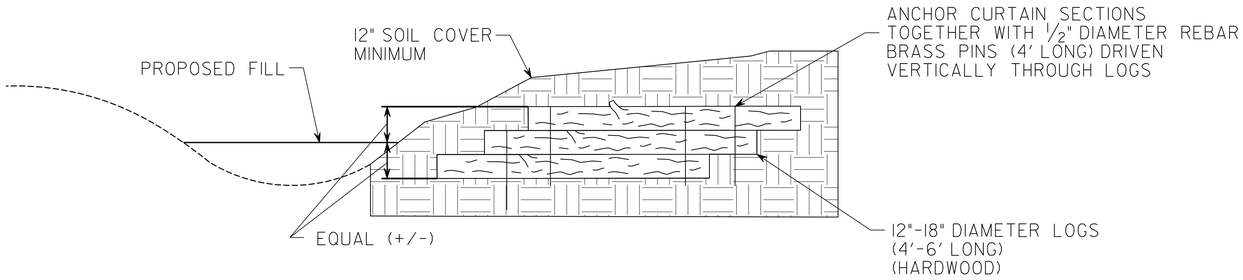
PROJECT REFERENCE NO.	SHEET NO.
D05053S	2A
R /W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

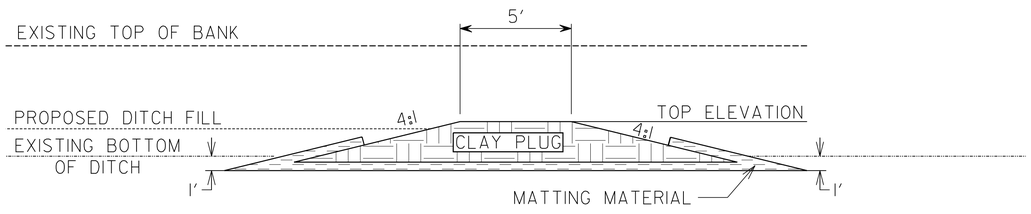
RECORD DRAWINGS

REVISIONS

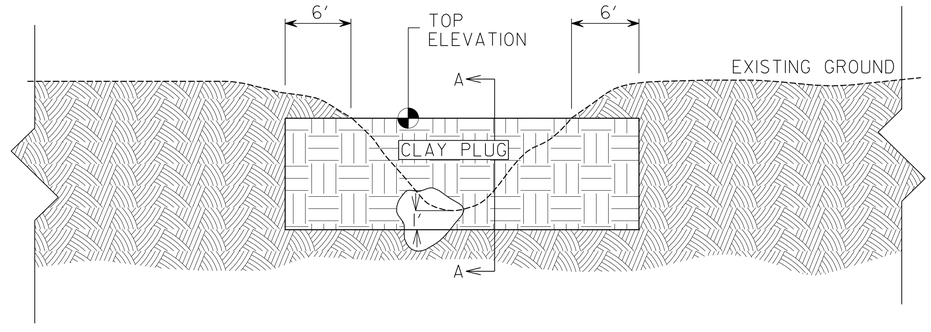


LOG CURTAIN

(Not to Scale)



SECTION A-A



CROSS SECTION OF DITCH

DITCH PLUG

(Not to Scale)

PLANS PREPARED BY :
RUMMEL KLEPPER & KAHL, LLP
consulting engineers
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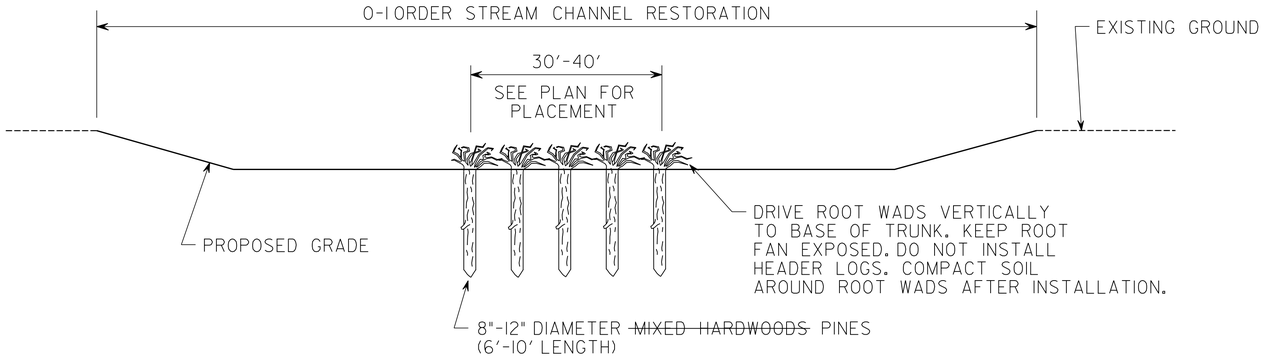
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE No. F-0112 (919) 878-9560
RKK.COM
FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

PROJECT REFERENCE NO.	SHEET NO.
D05053S	2B
R /W SHEET NO.	

HYDRAULICS ENGINEER

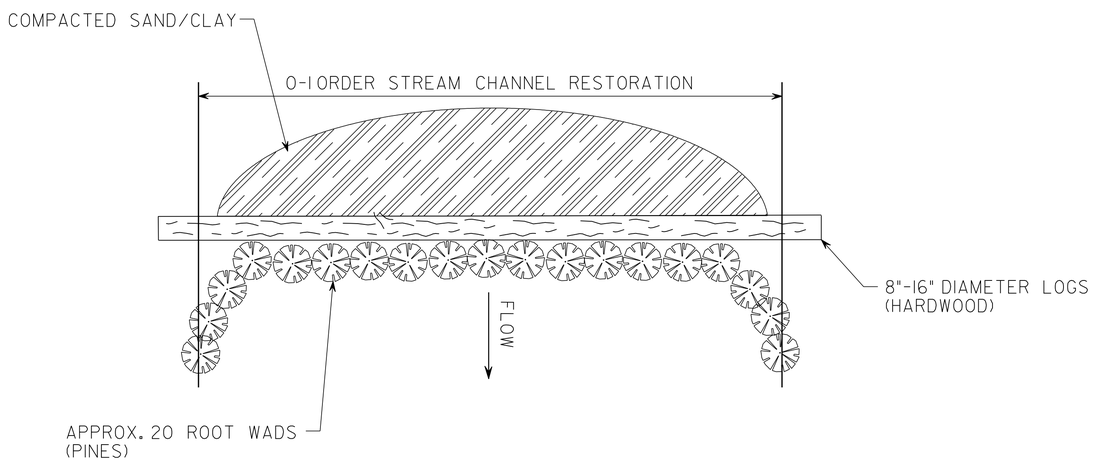
NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

RECORD DRAWINGS



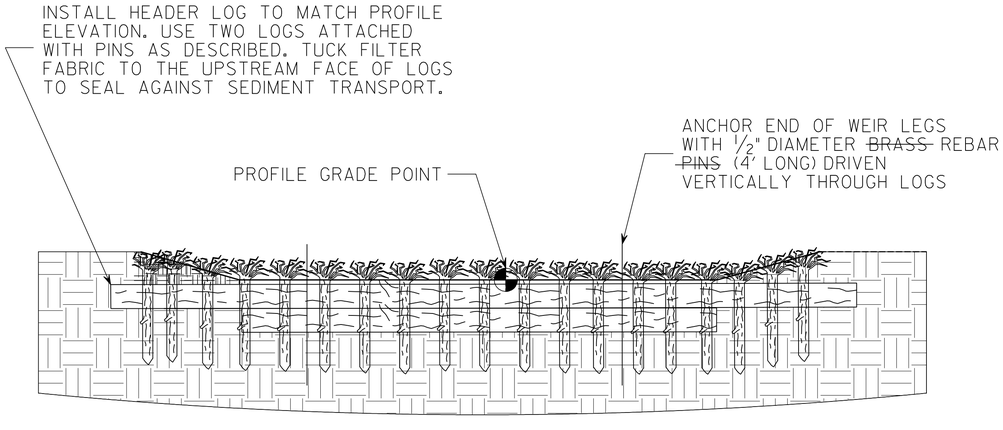
FLOW DISRUPTER

(Not to Scale)



PLAN VIEW

(Not to Scale)



CROSS SECTION

(Not to Scale)

CONTROLLED STEP WEIR

(Not to Scale)

REVISIONS

PLANS PREPARED BY :
RUMMEL KLEPPER & KAHL, LLP
consulting engineers
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE No. F-0112 (919) 878-9560
RKK.COM
FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

PROJECT REFERENCE NO.	SHEET NO.
D05053S	3
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL, III

RECORD DRAWINGS

PRECONSTRUCTION CONDITIONS

BOILING SPRINGS RANCHES

NCGS GRID NORTH (NAD 83)

GROUND WATER MONITORING GUAGE

NORTH MAIN

NORTH TRIBUTARY

GROUND WATER MONITORING GUAGE

GROUND WATER MONITORING GUAGE

MATCHLINE SEE SHEET 4

0' 40' 80'

REVISIONS

8/17/99

12/17/2010
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PLANS PREPARED BY :
RUMMEL KLEPPER & KAHL, LLP
consulting engineers
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
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FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

PROJECT REFERENCE NO.	SHEET NO.
D05053S	4
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

RECORD DRAWINGS

PRECONSTRUCTION CONDITIONS

REVISIONS

8/17/99

NCGS GRID NORTH (NAD 83)

GROUND WATER MONITORING GUAGE

NORTH MAIN

GROUND WATER MONITORING GUAGE

GROUND WATER MONITORING GUAGE

MATCHLINE SEE SHEET 3

INV. IN: 49.36'

INV. OUT: 46.56'

18" RCP

SR 1539 (BOILING SPRING RD.)

0' 40' 80'

PLANS PREPARED BY :
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900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE No. F-0112 (919) 878-9560
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FOR DENR-ECOSYSTEM ENHANCEMENT PROGRAM

12/17/2010 J:\COMMONS\304045\Proj\Record Drawings\Lilpprt_ex_psh3.dgn

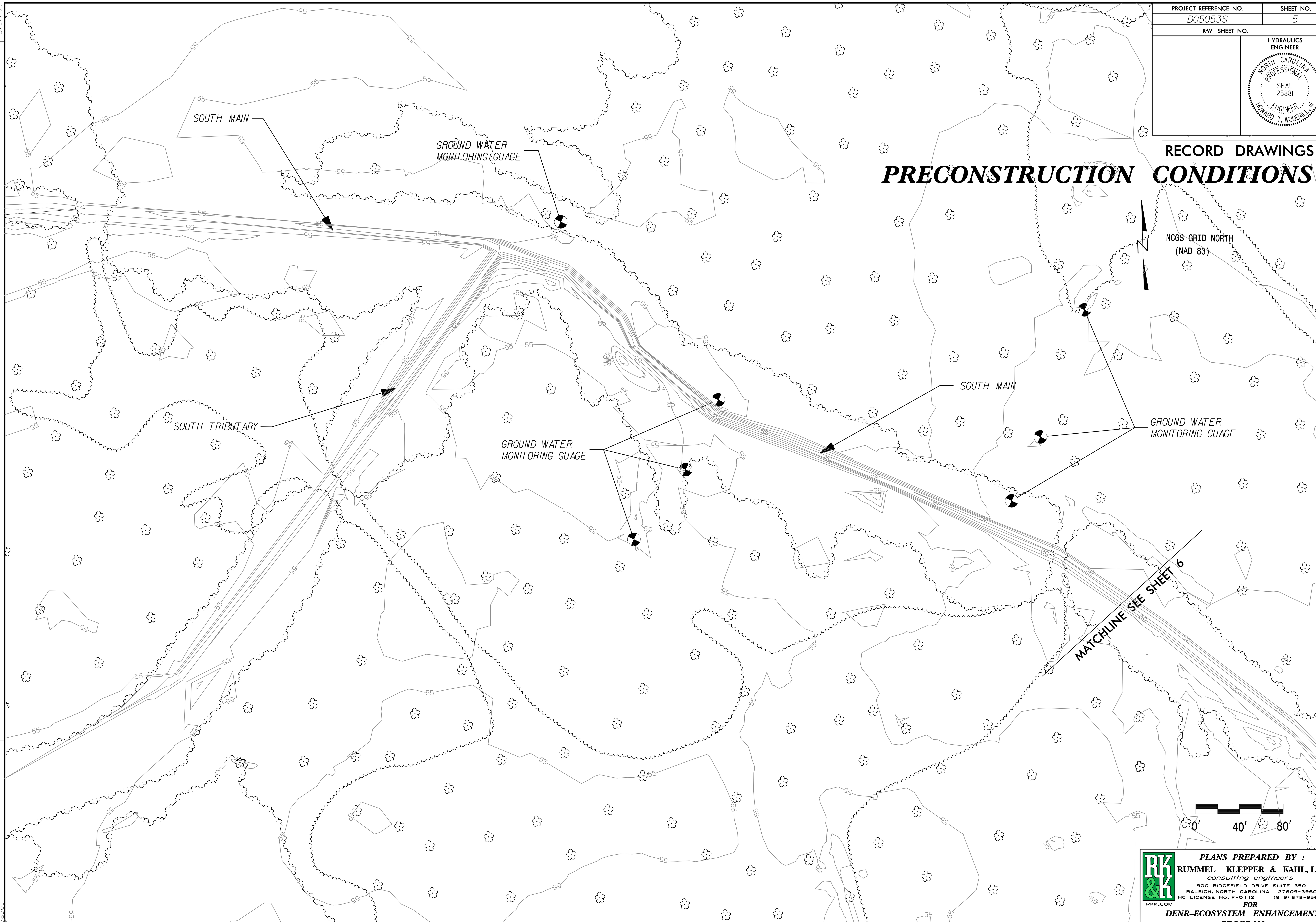
PROJECT REFERENCE NO.	SHEET NO.
D05053S	5
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL, III

RECORD DRAWINGS

PRECONSTRUCTION CONDITIONS



PLANS PREPARED BY :

RUMMEL KLEPPER & KAHL, LLP

consulting engineers

900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
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FOR

DENR–ECOSYSTEM ENHANCEMENT PROGRAM

REVISIONS

8/17/99

12/17/2010
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PROJECT REFERENCE NO.	SHEET NO.
D05053S	6
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER EDWARD T. WOODALL III

RECORD DRAWINGS

PRECONSTRUCTION CONDITIONS

NCGS GRID NORTH
(NAD 83)

SOUTH MAIN

MATCHLINE SEE SHEET 5

GROUND WATER
MONITORING GUAGE

SR 1539 (BOILING SPRING RD.)

PRETTY POND

INV. IN: 44.82'

INV. OUT: 44.58'

15" RCP

0' 40' 80'

REVISIONS

8/17/99

12/17/2001
J:\CGNDS\304045\Proj\Record Drawings\Lilliput_ex_psh5.dgn
dlowder

PLANS PREPARED BY :
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FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

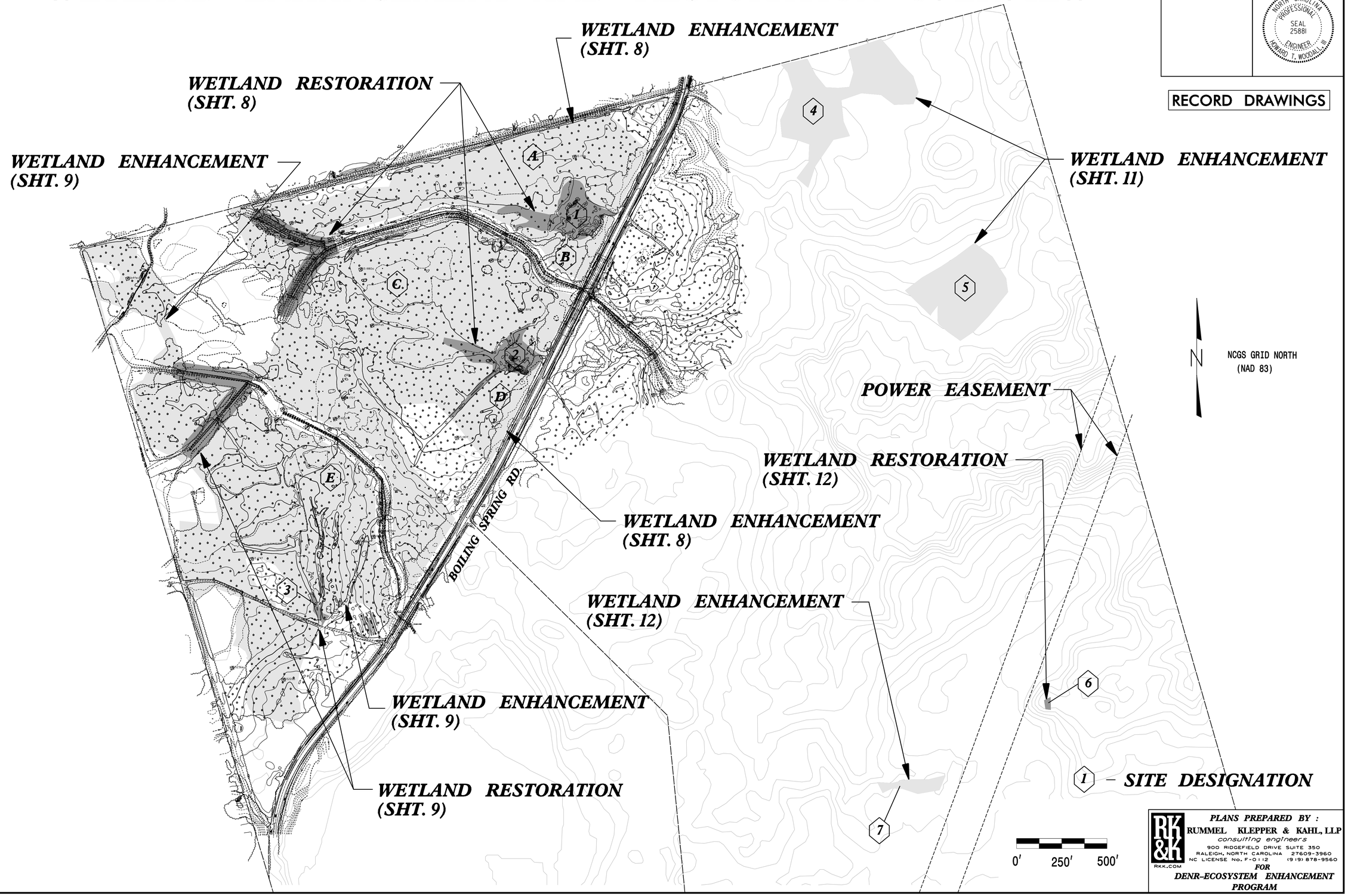
PROJECT REFERENCE NO.	SHEET NO.
D05053S	7
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

RECORD DRAWINGS

WETLAND ENHANCEMENT AND RESTORATION OVERVIEW



REVISIONS

8/17/99

PLANS PREPARED BY :
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consulting engineers
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FOR
DENR–ECOSYSTEM ENHANCEMENT PROGRAM

12/17/2008
J:\COMMONS\304045\Proj\Record Drawings\Lillipt_strm_overview.dgn
tbooth

WETLAND ENHANCEMENT AREA
(SEE SHEETS 9 & 10)

PROJECT REFERENCE NO.	SHEET NO.
D05053S	8
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

RECORD DRAWINGS

REVISIONS

SITE A

POINT	NORTH (ft)	EAST (ft)
1100	122,232.74	2,295,876.48
1101	122,205.66	2,295,849.16
1102	122,096.86	2,295,970.10
1103	121,994.68	2,296,078.76
109*	121,652.36*	2,295,906.06*
108*	121,660.18*	2,295,877.90*
107*	121,679.08*	2,295,827.26*
106*	121,713.16*	2,295,771.66*
105*	121,737.51*	2,295,749.35*
104*	121,756.67*	2,295,738.89*
103*	121,786.44*	2,295,729.87*
102*	121,811.33*	2,295,719.39*
101*	121,829.02*	2,295,702.23*
100*	121,837.66*	2,295,673.30*
145*	121,831.74*	2,295,642.89*
144*	121,814.09*	2,295,622.43*
143*	121,793.69*	2,295,605.29*
142*	121,738.42*	2,295,593.06*
141*	121,719.11*	2,295,581.58*
140*	121,684.06*	2,295,577.20*
139*	121,646.97*	2,295,579.75*
138*	121,644.35*	2,295,531.40*
137*	121,661.02*	2,295,451.67*
136*	121,684.72*	2,295,394.68*
135*	121,697.53*	2,295,348.61*
134*	121,692.53*	2,295,294.42*
133*	121,668.50*	2,295,246.90*
132*	121,650.89*	2,295,243.06*
131*	121,642.16*	2,295,249.22*
130*	121,644.79*	2,295,290.69*
129*	121,650.76*	2,295,334.85*
128*	121,634.81*	2,295,374.67*
127*	121,610.17*	2,295,420.11*
126*	121,599.64*	2,295,408.27*
125*	121,586.79*	2,295,351.44*
124*	121,571.12*	2,295,333.96*
1104	121,620.01	2,295,235.94
1105	121,668.91	2,295,137.92
1106	121,687.72	2,295,091.96
1107	121,701.81	2,295,019.01
1108	121,701.27	2,294,944.71
1109	121,691.17	2,294,896.09
1110	121,630.53	2,294,684.51
1111	121,569.89	2,294,472.93
1112	121,550.21	2,294,414.78
1113	121,519.24	2,294,335.80
1114	121,511.46	2,294,315.94
1115	121,532.36	2,294,222.89
1116	121,552.07	2,294,163.91
1117	121,587.54	2,294,091.41
1118	121,627.60	2,294,023.00
1119	121,667.66	2,293,954.59
1120	121,674.51	2,293,930.38
1121	121,668.02	2,293,904.67
1122	121,650.75	2,293,886.76
1123	121,618.53	2,293,879.68
1124	121,601.10	2,293,885.14
1125	121,581.37	2,293,904.05
1126	121,541.31	2,293,972.46
1127	121,501.25	2,294,040.87
1128	121,479.31	2,294,081.64
1129	121,459.25	2,294,126.69
1130	121,447.08	2,294,159.75
1131	121,434.11	2,294,201.89
1132	121,431.16	2,294,203.83
1133	121,426.18	2,294,202.18
1134	121,400.95	2,294,181.73
1135	121,369.48	2,294,161.07
1136	121,240.50	2,294,085.97
1137	121,262.25	2,294,062.57
1138	121,363.89	2,293,908.87
1139	121,670.46	2,293,765.92
1140	121,722.23	2,293,963.98
1141	121,766.53	2,294,125.62
1142	121,745.40	2,294,142.25
1143	121,694.06	2,294,187.77
1144	121,739.68	2,294,318.51
1145	121,785.30	2,294,449.24
1146	121,796.08	2,294,647.56
1147	121,913.58	2,294,684.91
1148	122,063.87	2,295,239.56
1149	122,160.67	2,295,603.55

* SHARED BOUNDARY WITH SITE 1

SITE B

POINT	NORTH (ft)	EAST (ft)
110*	121,631.87*	2,295,893.24*
1200	121,259.95	2,295,707.72
1201	121,295.00	2,295,676.98
1202	121,328.45	2,295,588.59
1203	121,354.95	2,295,548.36
1204	121,396.11	2,295,523.32
1205	121,436.01	2,295,503.69
1206	121,469.46	2,295,474.39
1207	121,504.30	2,295,434.68
1208	121,539.61	2,295,388.79
122*	121,559.22*	2,295,355.09*
121*	121,572.35*	2,295,410.89*
120*	121,568.18*	2,295,442.87*
119*	121,551.03*	2,295,491.26*
118*	121,554.78*	2,295,539.18*
117*	121,549.78*	2,295,576.24*
116*	121,523.12*	2,295,640.08*
115*	121,505.81*	2,295,667.03*
114*	121,501.82*	2,295,704.52*
113*	121,511.11*	2,295,732.18*
112*	121,544.99*	2,295,786.72*
111*	121,636.24*	2,295,839.78*

* SHARED BOUNDARY WITH SITE 1

SITE C

POINT	NORTH (ft)	EAST (ft)
1300	121,202.30	2,295,678.77
209*	120,854.04*	2,295,501.20*
208*	120,869.97*	2,295,485.03*
207*	120,878.59*	2,295,467.71*
206*	120,903.55*	2,295,433.64*
205*	120,944.70*	2,295,386.28*
204*	120,966.59*	2,295,385.67*
203*	120,983.67*	2,295,391.73*
202*	121,012.50*	2,295,414.45*
201*	121,034.16*	2,295,430.04*
200*	121,040.83*	2,295,423.52*
243*	121,024.15*	2,295,391.16*
242*	121,004.62*	2,295,358.65*
241*	120,973.44*	2,295,306.87*
240*	120,932.78*	2,295,277.14*
239*	120,900.81*	2,295,249.31*
238*	120,875.59*	2,295,223.45*
237*	120,927.53*	2,295,125.14*
236*	120,963.92*	2,294,950.99*
235*	120,933.79*	2,294,944.38*
234*	120,916.65*	2,294,970.93*
233*	120,903.61*	2,295,006.27*
232*	120,877.25*	2,295,055.73*
231*	120,836.75*	2,295,083.25*
230*	120,822.43*	2,295,112.26*
229*	120,820.72*	2,295,179.93*
228*	120,809.26*	2,295,219.34*
227*	120,789.89*	2,295,220.19*
226*	120,767.78*	2,295,212.47*
225*	120,711.08*	2,295,138.82*
224*	120,661.61*	2,295,101.81*
223*	120,609.15*	2,295,057.44*
222*	120,575.03*	2,295,023.36*
221*	120,529.31*	2,294,974.25*
1301	120,599.98	2,294,901.74
1302	120,593.63	2,294,717.66
1303	120,481.55	2,294,669.85
1304	120,238.05	2,294,782.88
1305	120,142.49	2,294,873.07
1306	119,959.16	2,295,011.98
1307	119,909.62	2,294,984.71
1308	119,738.66	2,294,874.37
1309	119,528.78	2,294,749.30
1310	119,674.15	2,294,734.53
1311	119,790.54	2,294,685.29
1312	119,859.21	2,294,671.88
1313	120,075.57	2,294,671.16
1314	120,167.77	2,294,655.83
1315	120,249.51	2,294,610.49
1316	120,387.78	2,294,459.80
1317	120,432.25	2,294,402.09
1318	120,468.71	2,294,339.01
1319	120,587.04	2,294,098.81
1320	120,626.33	2,294,045.94
1321	120,674.66	2,294,008.38
1322	120,706.76	2,293,979.79
1323	120,745.35	2,293,928.12
1324	120,757.16	2,293,903.17
1325	120,765.61	2,293,878.98
1326	120,772.78	2,293,846.65
1327	120,787.87	2,293,748.13
1328	120,793.22	2,293,850.04
1329	120,854.32	2,293,986.36
1330	121,032.53	2,294,053.93
1331	121,075.56	2,294,066.70
1332	121,078.23	2,294,095.02
1333	121,088.60	2,294,111.05
1334	121,099.46	2,294,119.57
1335	121,319.17	2,294,247.49
1336	121,388.43	2,294,307.15
1337	121,426.14	2,294,372.30
1338	121,457.10	2,294,451.27
1339	121,473.76	2,294,500.48
1340	121,534.40	2,294,712.06
1341	121,595.04	2,294,923.64
1342	121,604.10	2,294,992.52
1343	121,600.90	2,295,027.21
1344	121,592.62	2,295,061.04
1345	121,579.42	2,295,093.28
1346	121,479.24	2,295,294.12
1347	121,456.59	2,295,333.04
1348	121,429.13	2,295,368.72
1349	121,394.29	2,295,408.43
1350	121,380.52	2,295,420.50
1351	121,364.09	2,295,428.58
1352	121,335.64	2,295,440.59
1353	121,309.26	2,295,456.65
1354	121,285.52	2,295,476.40
1355	121,264.93	2,295,499.41
1356	121,247.94	2,295,525.20
1357	121,234.92	2,295,553.20
1358	121,218.20	2,295,597.40
1359	121,201.47	2,295,641.59
1360	121,198.43	2,295,661.06

* SHARED BOUNDARY WITH SITE 2

SITE D

POINT	NORTH (ft)	EAST (ft)
1370	120,410.64	2,295,280.11
1371	120,304.33	2,295,224.64
1372	120,262.25	2,295,199.73
1373	120,282.07	2,295,178.47
1374	120,496.68	2,295,007.73
220*	120,513.87*	2,294,990.09*
219*	120,542.03*	2,295,021.63*
218*	120,578.32*	2,295,060.01*
217*	120,651.12*	2,295,127.68*
216*	120,703.98*	2,295,172.38*
215*	120,747.91*	2,295,229.61*
214*	120,778.94*	2,295,283.51*
213*	120,759.05*	2,295,373.51*
212*	120,756.83*	2,295,407.94*
211*	120,790.23*	2,295,457.45*
210*	120,825.18*	2,295,482.97*

* SHARED BOUNDARY WITH SITE 2

SITE E

POINT	NORTH (ft)	EAST (ft)
1400	121,532.67	2,293,252.90
1401	121,413.82	2,293,253.14
1402	121,354.85	2,293,326.85
1403	121,273.76	2,293,400.57
1404	121,195.19	2,293,464.24
1405	121,065.70	2,293,409.44
1406	120,961.06	2,293,462.31
1407	120,824.83	2,293,506.82
1408	120,826.52	2,293,487.85
1409	120,816.94	2,293,461.67
1410	120,802.42	2,293,448.43
1411	120,783.09	2,293,441.68
1412	120,765.40	2,293,442.54
1413	120,746.14	2,293,451.64
1414	120,734.24	2,293,464.75
1415	120,727.21	2,293,483.69
1416	120,705.54	2,293,625.19
1417	120,683.86	2,293,766.69
1418	120,680.73	2,293,770.59
1419	120,675.65	2,293,769.71
1420	120,378.16	2,293,512.21
1421	120,354.78	2,293,500.90
1422	120,339.59	2,293,500.36
1423	120,320.18	2,293,506.87
1424	120,308.00	2,293,516.87
1425	120,296.26	2,293,540.95
1426	120,295.75	2,293,555.58
1427	120,303.32	2,293,576.96
1428	120,316.81	2,293,591.34
1429	120,648.80	2,293,878.73
1430	120,652.25	2,293,886.00
1431	120,650.58	2,293,891.83
1432	120,629.76	2,293,916.26
1433	120,604.69	2,293,936.29
1434	120,571.89	2,293,959.94
1435	120,542.70	2,293,987.91
1436	120,517.69	2,294,019.68
1437	120,497.33	2,294,054.62
1438	120,379.00	2,294,294.82
1439	120,349.17	2,294,346.43
1440	120,312.79	2,294,393.64
1441	120,260.61	2,294,452.79
1442	120,208.43	2,294,511.94
1443	120,186.85	2,294,532.56
1444	120,134.83	2,294,561.41
1445	120,076.16	2,294,571.17
1446	119,979.65	2,294,570.60
1447	119,883.13	2,294,570.03
1448	119,788.26	2,294,581.65
1449	119,742.70	2,294,596.42
1450	119,659.49	2,294,635.03
1451	119,617.24	2,294,646.73
1452	119,529.87	2,294,649.78
1453	119,490.80	2,294,641.86
1454	119,468.25	2,294,636.13
1455	119,441.77	2,294,635.16
1456	119,422.53	2,294,644.31
1457	119,412.28	2,294,659.47
1458	119,410.06	2,294,673.63
1459	119,353.43	2,294,641.63
1460	119,399.10	2,294,614.05
1461	119,423.94	2,294,596.85
1462	119,451.45	2,294,567.38
1463	119,473.62	2,294,535.70
1464	119,499.55	2,294,478.29
1465	119,487.00	2,294,411.49
1466	119,446.87	2,294,340.78
304*	119,422.99*	2,294,319.37*
303*	119,437.66*	2,294,282.81*
302*	119,465.54*	2,294,267.02*
301*	119,552.21*	2,294,233.52*
300*	119,556.63*	2,294,217.65*
316*	119,507.26*	2,294,221.90*
315*	119,479.44*	2,294,227.84*
314*	119,449.91*	2,294,225.67*
313*	119,415.31*	2,294,253.40*
312*	119,383.81*	2,294,275.54*
311*	119,310.60*	2,294,240.63*
310*	119,288.70*	2,294,218.06*
309*	119,254.41*	2,294,209.98*
1467	119,223.29	2,294,180.26
1468	119,191.82	2,294,175.67
1469	119,131.56	2,294,155.42
1470	119,064.68	2,294,143.95
1471	118,971.74	2,294,141.27
1472	118,940.46	2,294,155.42
1473	118,898.42	2,294,157.33
1474	118,846.83	2,294,142.04
1475	118,825.81	2,294,117.20
1476	118,823.69	2,294,091.28
1477	118,835.36	2,294,059.87
1478	118,843.01	2,294,027.38
1479	118,888.87	2,293,891.70
1480	118,910.65	2,293,872.74
1481	118,944.29	2,293,861.13
1482	118,986.33	2,293,853.48
1483	119,024.55	2,293,855.40
1484	119,064.68	2,293,872.59
1485	119,104.80	2,293,884.47
1486	119,154.49	2,293,882.15
1487	119,226.75	2,293,853.11
1488	119,251.95	2,293,819.09
1489	119,258.10	2,293,783.73
1490	119,304.96	2,293,802.47
1491	119,421.50	2,293,800.50
1492	119,523.49	2,293,827.68
1493	119,579.31	2,293,681.49
1494	119,546.48	2,293,634.99
1495	119,523.39	2,293,592.45
1496	119,528.53	2,293,564.66
1497	119,366.19	2,293,611.28
1498	119,203.86	2,293,657.90
1499	119,190.80	2,293,639.46
1500	119,183.24	2,293,619.44
1501	119,334.74	2,293,574.00
1502	119,644.61	2,293,481.14
1503	119,802.69	2,293,433.80
1504	120,048.08	2,293,361.15
1505	120,096.15	2,293,347.65
1506	120,095.88	2,293,359.69
1507	119,922.04	2,293,411.55
1508	119,748.19	2,293,463.40
1509	119,793.20	2,293,492.30
1510	119,947.25	2,293,489.66
1511	119,928.85	2,293,712.64
1512	120,087.89	2,293,679.70
1513	120,261.21	2,293,540.00
1514	120,372.74	2,293,299.96
1515	120,698.79	2,293,223.65
1516	120,726.91	2,293,286.88
1517	120,851.94	2,293,348.64
1518	120,915.51	2,293,419.63
1519	121,061.92	2,293,350.72
1520	121,127.21	2,293,177.68
1521	121,170.56	2,293,046.74
1522	121,019.00	2,293,090.05
1523	120,867.43	2,293,133.36
1524	120,860.05	2,293,117.51
1525	121,066.74	2,293,055.43
1526	121,259.11	2,292,999.85
1527	121,268.05	2,293,052.36
1528	121,260.20	2,293,102.12
1529	121,274.77	2,293,156.46
1530	121,308.38	2,293,163.33
1531	121,331.75	2,293,151.78
1532	121,358.39	2,293,112.87
1533	121,376.12	2,293,060.47
1534	121,379.99	2,292,995.89
1535	121,387.11	2,292,960.88
1536	121,451.52	2,292,940.29

* SHARED BOUNDARY WITH SITE 3

PLANS PREPARED BY :
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FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

WETLAND RESTORATION & ENHANCEMENT

PROJECT REFERENCE NO.	SHEET NO.
D05053S	9
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER EDWARD T. WOODALL III

RECORD DRAWINGS

REVISIONS

8/17/99

WETLAND RESTORATION

WETLAND ENHANCEMENT

SITE 1

POINT	NORTH (ft)	EAST (ft)
100	121,837.66	2,295,673.30
101	121,829.02	2,295,702.23
102	121,811.33	2,295,719.39
103	121,786.44	2,295,729.87
104	121,756.67	2,295,738.89
105	121,737.51	2,295,749.35
106	121,713.16	2,295,771.66
107	121,679.08	2,295,827.26
108	121,660.18	2,295,877.90
109	121,652.36	2,295,906.06
110	121,631.87	2,295,893.24
111	121,636.24	2,295,839.78
112	121,544.99	2,295,786.72
113	121,511.11	2,295,732.18
114	121,501.82	2,295,704.52
115	121,505.81	2,295,667.03
116	121,523.12	2,295,640.08
117	121,549.78	2,295,576.24
118	121,554.78	2,295,539.18
119	121,551.03	2,295,491.26
120	121,568.18	2,295,442.87
121	121,572.35	2,295,410.89
122	121,559.22	2,295,355.09
123	121,568.73	2,295,338.75
124	121,571.12	2,295,333.96
125	121,586.79	2,295,351.44
126	121,599.64	2,295,408.27
127	121,610.17	2,295,420.11
128	121,634.81	2,295,374.67
129	121,650.76	2,295,334.85
130	121,644.79	2,295,290.69
131	121,642.16	2,295,249.22
132	121,650.89	2,295,243.06
133	121,668.50	2,295,246.90
134	121,692.53	2,295,294.42
135	121,697.53	2,295,348.61
136	121,684.72	2,295,394.68
137	121,661.02	2,295,451.67
138	121,644.35	2,295,531.40
139	121,646.97	2,295,579.75
140	121,684.06	2,295,577.20
141	121,719.11	2,295,581.58
142	121,738.42	2,295,593.06
143	121,793.69	2,295,605.29
144	121,814.09	2,295,622.43
145	121,831.74	2,295,642.89

SITE 2

POINT	NORTH (ft)	EAST (ft)
200	121,040.83	2,295,423.52
201	121,034.16	2,295,430.04
202	121,012.50	2,295,414.45
203	120,983.67	2,295,391.73
204	120,966.59	2,295,385.67
205	120,944.70	2,295,386.28
206	120,903.55	2,295,433.64
207	120,878.59	2,295,467.71
208	120,869.97	2,295,485.03
209	120,854.04	2,295,501.20
210	120,825.18	2,295,482.97
211	120,790.23	2,295,457.45
212	120,756.83	2,295,407.94
213	120,759.05	2,295,373.51
214	120,778.94	2,295,283.51
215	120,747.91	2,295,229.61
216	120,703.98	2,295,172.38
217	120,651.12	2,295,127.68
218	120,578.32	2,295,060.01
219	120,542.03	2,295,021.63
220	120,513.87	2,294,990.09
221	120,529.31	2,294,974.25
222	120,575.03	2,295,023.36
223	120,609.15	2,295,057.44
224	120,661.61	2,295,101.81
225	120,711.08	2,295,138.82
226	120,767.78	2,295,212.47
227	120,789.89	2,295,220.19
228	120,809.26	2,295,219.34
229	120,820.72	2,295,179.93
230	120,822.43	2,295,112.26
231	120,836.75	2,295,083.25
232	120,877.25	2,295,055.73
233	120,903.61	2,295,006.27
234	120,916.65	2,294,970.93
235	120,933.79	2,294,944.38
236	120,963.92	2,294,950.99
237	120,927.53	2,295,125.14
238	120,875.59	2,295,223.45
239	120,900.81	2,295,249.31
240	120,932.78	2,295,277.14
241	120,973.44	2,295,306.87
242	121,004.62	2,295,358.65
243	121,024.15	2,295,391.16

SITE A (PTS. 1100–1149) SEE SHEET 8 FOR COORDINATES

SITE 1 (PTS. 100–145)

SITE B (PTS. 1200–1208) SEE SHEET 8 FOR COORDINATES

SITE C (PTS. 1300–1360) SEE SHEET 8 FOR COORDINATES

SITE 2 (PTS. 200–243)

SITE D (PTS. 1370–1374) SEE SHEET 8 FOR COORDINATES

BOILING SPRING ROAD

NORTH CHANNEL

MATCHLINE SEE SHEET 10

MATCHLINE SEE SHEET 10

NCGS GRID NORTH (NAD 83)

0′ 100′ 200′

PLANS PREPARED BY :
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NC LICENSE No. F-0112 (919) 878-9560
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FOR DENR–ECOSYSTEM ENHANCEMENT PROGRAM

12/17/2010
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PROJECT REFERENCE NO.	SHEET NO.
D05053S	10
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

RECORD DRAWINGS

WETLAND RESTORATION & ENHANCEMENT

REVISIONS

8/17/99

MATCHLINE SEE SHEET 9

MATCHLINE SEE SHEET 9

SITE C (PTS. 1300–1360) SEE SHEET 8 FOR COORDINATES

SITE D (PTS. 1370–1374) SEE SHEET 8 FOR COORDINATES

SITE E (PTS. 1400–1548) SEE SHEET 8 FOR COORDINATES

SITE 3 (PTS. 300–317)

SOUTH CHANNEL

LIMITS OF GRADING

BEGIN STREAM RESTORATION SOUTH MAIN STA. 15+00.00 SOUTH TRIB STA. 15+01.62

BEGIN WETLAND RESTORATION SOUTH MAIN POT STA. 10+00.00 ELEV. +55.06

BEGIN WETLAND RESTORATION SOUTH TRIB POT STA. 10+00.00 ELEV. +54.98

WASTE MATERIAL MOUND

SR 1539 BOLING SPRING ROAD

BOILING SPRING ROAD

NCGS GRID NORTH (NAD 83)

PRETTY POND GIRL SCOUT CAMP

0' 100' 200'

SITE 3		
POINT	NORTH (ft)	EAST (ft)
300	119,556.63	2,294,217.65
301	119,552.21	2,294,233.52
302	119,465.54	2,294,267.02
303	119,437.66	2,294,282.81
304	119,422.99	2,294,319.37
305	119,391.45	2,294,291.10
306	119,343.37	2,294,263.78
307	119,261.51	2,294,222.30
308	119,250.20	2,294,209.86
309	119,254.41	2,294,209.98
310	119,288.70	2,294,218.06
311	119,310.60	2,294,240.63
312	119,383.81	2,294,275.54
313	119,415.31	2,294,253.40
314	119,449.91	2,294,225.67
315	119,479.44	2,294,227.84
316	119,507.26	2,294,221.90
317	119,550.76	2,294,205.26

WETLAND RESTORATION

WETLAND ENHANCEMENT

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FOR DENR–ECOSYSTEM ENHANCEMENT PROGRAM

12/17/2000
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PROJECT REFERENCE NO.	SHEET NO.
D05053S	11
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER EDWARD T. WOODALL, III

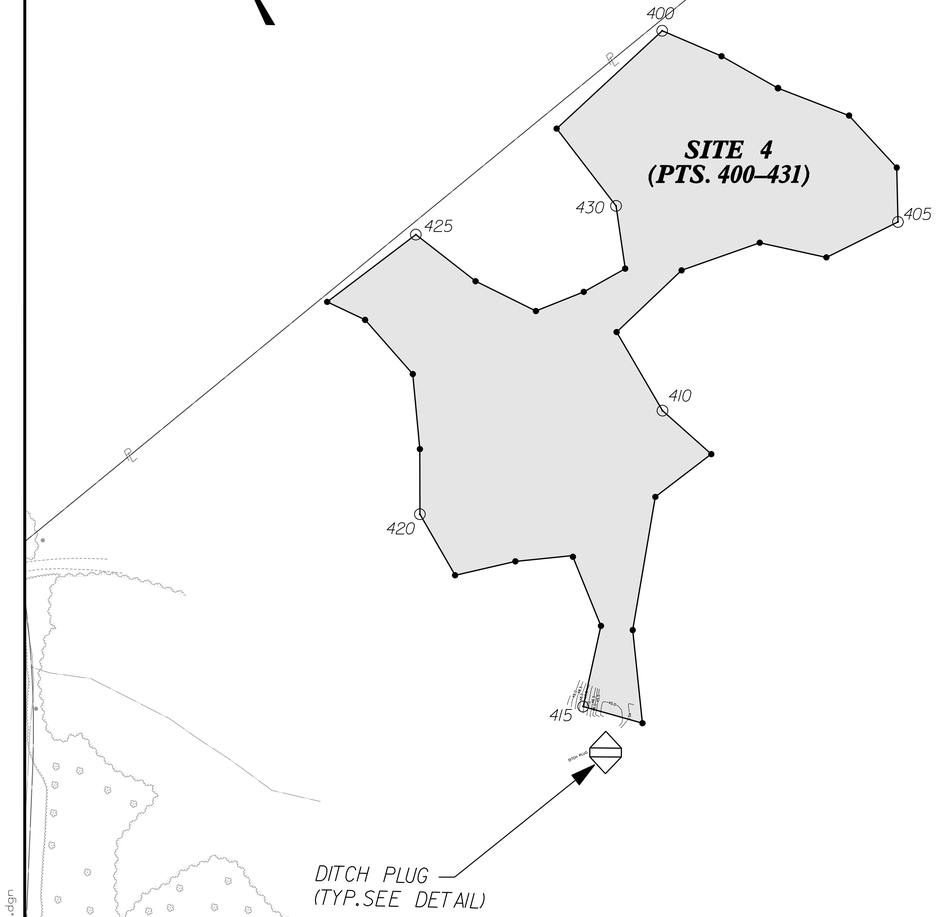
WETLAND RESTORATION

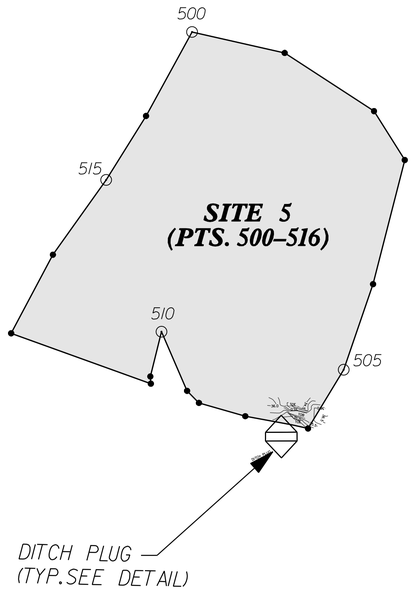
WETLAND ENHANCEMENT

RECORD DRAWINGS

WETLAND RESTORATION & ENHANCEMENT

NCGS GRID NORTH (NAD 83)





SITE 4		
POINT	NORTH (ft)	EAST (ft)
400	122,613.01	2,297,367.57
401	122,550.02	2,297,424.87
402	122,480.59	2,297,475.18
403	122,408.78	2,297,545.46
404	122,320.22	2,297,574.23
405	122,254.28	2,297,545.92
406	122,250.89	2,297,440.52
407	122,305.00	2,297,368.52
408	122,314.75	2,297,259.54
409	122,276.25	2,297,147.71
410	122,156.73	2,297,159.74
411	122,077.80	2,297,194.53
412	122,057.12	2,297,103.91
413	121,909.69	2,297,003.75
414	121,792.49	2,296,964.37
415	121,845.03	2,296,902.32
416	121,932.12	2,296,967.86
417	122,030.40	2,296,972.06
418	122,056.41	2,296,900.49
419	122,072.75	2,296,820.49
420	122,165.37	2,296,811.66
421	122,243.61	2,296,847.29
422	122,337.56	2,296,879.97
423	122,428.72	2,296,852.40
424	122,471.11	2,296,816.74
425	122,503.29	2,296,960.03
426	122,414.62	2,297,006.25
427	122,345.75	2,297,062.29
428	122,342.53	2,297,130.31
429	122,347.70	2,297,192.78
430	122,428.09	2,297,216.16
431	122,553.40	2,297,187.18

SITE 5		
POINT	NORTH (ft)	EAST (ft)
500	121,484.76	2,297,883.97
501	121,408.75	2,297,983.71
502	121,289.95	2,298,059.07
503	121,214.43	2,298,069.28
504	121,082.75	2,297,963.07
505	120,996.10	2,297,880.92
506	120,945.09	2,297,805.96
507	120,994.27	2,297,737.28
508	121,035.59	2,297,688.91
509	121,056.63	2,297,681.27
510	121,141.60	2,297,682.97
511	121,093.91	2,297,645.09
512	121,085.03	2,297,641.73
513	121,222.11	2,297,501.61
514	121,293.60	2,297,594.84
515	121,354.21	2,297,699.76
516	121,409.09	2,297,782.70

0' 100' 200'

REVISIONS

8/17/99

12/17/2008
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PLANS PREPARED BY :
RUMMEL KLEPPER & KAHL, LLP
consulting engineers
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FOR
DENR–ECOSYSTEM ENHANCEMENT PROGRAM

8/17/99

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
D05053S	12
R/W SHEET NO.	

HYDRAULICS ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL, III

RECORD DRAWINGS

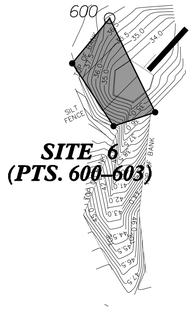
WETLAND RESTORATION & ENHANCEMENT

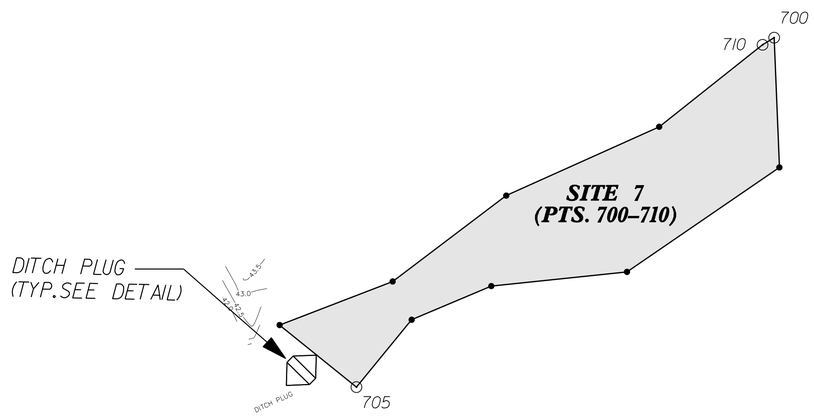
SITE 6		
POINT	NORTH (ft)	EAST (ft)
600	118,972.54	2,298,304.96
601	118,903.62	2,298,306.58
602	118,906.73	2,298,277.79
603	118,955.72	2,298,270.18

SITE 7		
POINT	NORTH (ft)	EAST (ft)
700	118,539.28	2,297,725.89
701	118,459.96	2,297,693.63
702	118,439.02	2,297,573.33
703	118,467.40	2,297,485.81
704	118,469.05	2,297,428.76
705	118,443.70	2,297,337.14
706	118,502.02	2,297,348.01
707	118,497.18	2,297,427.84
708	118,517.63	2,297,519.57
709	118,517.02	2,297,630.25
710	118,537.90	2,297,714.79

WETLAND RESTORATION

WETLAND ENHANCEMENT





NCGS GRID NORTH
(NAD 83)

0′ 50′ 100′

PLANS PREPARED BY :
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FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

12/17/2010
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PROJECT REFERENCE NO.	SHEET NO.
D05053S	13
R /W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL, III

RECORD DRAWINGS

REVISIONS

8/17/99

COORDINATE GEOMETRY - NORTH MAIN

10+00.00		POT	121,624.52	2,293,929.32					
	T1				S 59° 38' 45.25" E	158.56'	N/A	N/A	N/A
11+58.56		PC	121,544.39	2,294,066.14					
	C1	CC	122,053.51	2,294,364.29	S 68° 42' 39.11" E	185.91'	186.69'	18° 07' 47.73" left	590.00'
13+45.25		PT	121,476.89	2,294,239.37					
	T2				S 77° 46' 32.98" E	67.52'	N/A	N/A	N/A
14+12.77		PC	121,462.59	2,294,305.36					
	C2	CC	121,511.46	2,294,315.94	N 8° 24' 32.56" E	28.93'	29.35'	33° 37' 48.92" left	50.00'
14+42.11		PT	121,464.91	2,294,334.19					
	T3				N 68° 35' 38.10" E	106.16'	N/A	N/A	N/A
15+48.27		PC	121,503.65	2,294,433.03					
	C3	CC	120,945.04	2,294,652.01	N 71° 18' 2.43" E	56.67'	56.69'	05° 24' 48.65" right	600.00'
16+04.96		PT	121,521.82	2,294,486.70					
	T4				N 74° 00' 26.75" E	440.20'	N/A	N/A	N/A
20+45.16		PC	121,643.10	2,294,909.86					
	C4	CC	121,369.13	2,294,988.38	S 84° 44' 27.23" E	206.61'	211.42'	42° 30' 12.03" right	285.00'
22+56.58		PT	121,624.17	2,295,115.60					
	T5				S 63° 29' 21.21" E	224.44'	N/A	N/A	N/A
24+81.01		PC	121,523.98	2,295,316.44					
	C5	CC	121,166.04	2,295,137.89	S 56° 06' 45.34" E	102.71'	103.00'	14° 45' 11.74" right	400.00'
25+84.01		PT	121,466.72	2,295,401.70					
	T6				S 48° 44' 9.47" E	52.83'	N/A	N/A	N/A
26+36.84		PC	121,431.87	2,295,441.41					
	C6	CC	121,341.67	2,295,362.27	S 33° 42' 19.31" E	62.24'	62.96'	30° 03' 40.32" right	120.00'
26+99.80		CRC	121,380.10	2,295,475.95					
	C7	CC	121,431.33	2,295,627.53	S 43° 58' 25.23" E	136.75'	141.30'	50° 35' 52.16" left	160.00'
28+41.10		PT	121,281.68	2,295,570.90					
	T7				S 69° 16' 21.31" E	158.72'	N/A	N/A	N/A
29+99.81		PT	121,225.51	2,295,719.34					

COORDINATE GEOMETRY - NORTH TRIB

10+00.00			121,124.61	2,294,076.36					
	T10				N 30° 12' 26.25" E	254.24'	N/A	N/A	N/A
12+54.24		PC	121,344.33	2,294,204.28					
	C10	CC	121,193.39	2,294,463.54	N 49° 24' 2.17" E	197.25'	200.99'	38° 23' 11.86" right	300.00'
14+55.23		PT	121,472.69	2,294,354.05					

COORDINATE GEOMETRY - SOUTH MAIN

10+00.00			120,776.63	2,293,491.26					
	T20				S 81° 17' 28.47" E	351.87'	N/A	N/A	N/A
13+51.87		PC	120,723.36	2,293,839.08					
	C20	CC	120,525.66	2,293,808.80	S 56° 32' 32.06" E	167.46'	172.78'	49° 29' 52.82" right	200.00'
15+24.65		CRC	120,631.03	2,293,978.79					
	C21	CC	120,757.48	2,294,182.78	S 47° 46' 59.20" E	132.22'	133.96'	31° 58' 47.11" left	240.00'
16+58.61		PT	120,542.19	2,294,076.71					
	T21				S 63° 46' 22.75" E	267.77'	N/A	N/A	N/A
19+26.38		PC	120,423.85	2,294,316.91					
	C22	CC	119,975.33	2,294,095.95	S 56° 10' 39.68" E	132.18'	132.56'	15° 11' 26.15" right	500.00'
20+58.94		PT	120,350.28	2,294,426.72					
	T22				S 48° 34' 56.61" E	157.75'	N/A	N/A	N/A
22+16.69		PC	120,245.93	2,294,545.02					
	C23	CC	120,077.20	2,294,396.17	S 24° 07' 18.71" E	186.33'	192.11'	48° 55' 15.79" right	225.00'
24+08.80		PT	120,075.87	2,294,621.17					
	T23				S 00° 20' 19.19" W	193.04'	N/A	N/A	N/A
26+01.84		PC	119,882.83	2,294,620.02					
	C24	CC	119,880.91	2,294,945.02	S 14° 18' 17.45" E	164.32'	166.13'	29° 17' 13.28" left	325.00'
27+67.96		CRC	119,723.61	2,294,660.63					
	C25	CC	119,563.88	2,294,371.86	S 06° 29' 44.47" E	252.07'	258.64'	44° 54' 19.23" right	330.00'
30+26.60		PT	119,473.16	2,294,689.14					
	T24				S 15° 57' 25.15" W	13.97'	N/A	N/A	N/A
30+40.57		PC	119,459.72	2,294,685.30					
	C26	CC	119,452.85	2,294,709.34	S 10° 29' 51.30" E	22.27'	23.09'	52° 54' 32.90" left	25.00'
30+63.65		PT	119,437.82	2,294,689.36					
	T25				S 36° 57' 7.75" E	37.84'	N/A	N/A	N/A
31+01.50		PT	119,407.58	2,294,712.11					

COORDINATE GEOMETRY - SOUTH MAIN

10+00.00			120,345.43	2,293,550.02					
	T30				N 40° 52' 45.07" E	476.13'	N/A	N/A	N/A
14+76.13		PC	120,705.43	2,293,861.63					
	C30	CC	120,692.34	2,293,876.75	N 76° 31' 46.24" E	23.31'	24.89'	71° 18' 2.35" right	20.00'
15+01.02		PT	120,710.86	2,293,884.30					

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PLANS PREPARED BY :
RUMMEL KLEPPER & KAHL, LLP
consulting engineers
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE No. F-0112 (919) 878-9560
FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

PROJECT REFERENCE NO.	SHEET NO.
D05053S	14
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

RECORD DRAWINGS

STREAM & WETLAND RESTORATION

REVISIONS

8/17/99

BOILING SPRINGS RANCHES

NCGS GRID NORTH (NAD 83)

BEGIN WETLAND RESTORATION -NORTH MAIN- POT Sta. 10+00.00 ELEV.= 54.29'

GW GAUGE 10 SN-11312C28

WETLAND RESTORATION AREAS SEE TYP.SECTION

VEGETATION PLOT 9

FLOW DISRUPTER (TYP.SEE DETAIL)

℄ CONSTRUCTION

SW GAUGE 8 SN-b6518d8

GW GAUGE 8 SN-b652394

GW GAUGE 27 SN-ebd3f40

STREAM RESTORATION WIDTH

VEGETATION PLOT 8

GW GAUGE 7 SN-b651949

SW GAUGE 7 SN-b6516eb

MATCHLINE -NORTH MAIN- STA. 19+78

DITCH PLUG (TYP.SEE DETAIL)

BEGIN WETLAND RESTORATION -NORTH TRIB- POT Sta. 10+00.00 ELEV.= 53.76'

GW GAUGE 9 SN-b6b86aa

GW GAUGE 28 SN-113137d2

BEGIN STREAM RESTORATION -NORTH MAIN- Sta. 14+63.44 = -NORTH TRIB- Sta. 14+55.23

VEGETATION PLOT 10

0' 40' 80'

PLANS PREPARED BY :
RUMMEL KLEPPER & KAHL, LLP
consulting engineers
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE No. F-0112 (919) 878-9560
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FOR DENR-ECOSYSTEM ENHANCEMENT PROGRAM

12/17/2010 J:\CGNDS\304045\Proj\Record Drawings\Lillputstrm_psh2.dgn

PROJECT REFERENCE NO.	SHEET NO.
D05053S	15
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER EDWARD T. WOODALL, III

RECORD DRAWINGS

STREAM & WETLAND RESTORATION

REVISIONS

8/17/99

NCGS GRID NORTH (NAD 83)

STREAM RESTORATION WIDTH

FLOW DISRUPTER (TYP.SEE DETAIL)

FLOW DISRUPTER

SECTION NO.2

SECTION NO.3

MATCHLINE -NORTH MAIN- STA. 19+78

GW GAUGE 7 SN- b651949

SW GAUGE 7 SN- b6516eb

VEGETATION PLOT 8

VEGETATION PLOT 10

VEGETATION PLOT 7

VEGETATION PLOT 6

℄ CONSTRUCTION

SW GAUGE 6 SN- b651794

GW GAUGE 6 SN- b651839

GW GAUGE 26 SN- a27a7b0

GW GAUGE 25 SN- 1130ee20

END STREAM RESTORATION -NORTH MAIN- SPOT Sta. 29+97.94 ELEV.= 49.36'

LOG CURTAIN (TYP.SEE DETAIL)

GW GAUGE 5 SN- b6b4fa5

SW GAUGE 5 SN- b65191a

SECTION NO.1

CONTROLLED STEP WEIR

INV.OUT: 46.56'

18" RCP

END GRADE -NORTH MAIN- Sta. 29+00.00 ELEV.= 52.01'

CONTROLLED STEP WEIR (TYP.SEE DETAIL)

LOG CURTAINS (TYP)

LOG CURTAIN (TYP.SEE DETAIL)

SR 1539 (BOILING SPRING RD.)

0' 40' 80'

PLANS PREPARED BY :
RUMMEL KLEPPER & KAHL, LLP
consulting engineers
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3860
NC LICENSE No. F-0112 (919) 878-9560
RKK.COM

FOR DENR-ECOSYSTEM ENHANCEMENT PROGRAM

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PROJECT REFERENCE NO.	SHEET NO.
D05053S	16
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

RECORD DRAWINGS

STREAM & WETLAND RESTORATION

REVISIONS

8/17/99

BEGIN WETLAND RESTORATION
-SOUTH MAIN- POT Sta. 10+00.00
ELEV. = 55.06'

GW GAUGE 16
SN- b651747

BEGIN STREAM RESTORATION
-SOUTH MAIN- Sta. 13+98.90 =
-SOUTH TRIB- Sta. 15+01.02

VEGETATION PLOT 11

NCGS GRID NORTH
(NAD 83)

STREAM RESTORATION WIDTH

FLOW DISRUPTER
(TYP. SEE DETAIL)

WETLAND RESTORATION AREAS
SEE TYP. SECTION

DITCH PLUG
(TYP. SEE DETAIL)

VEGETATION PLOT 3

GW GAUGE 4
SN- b6523b9

GW GAUGE 21
SN- ab372f9

VEGETATION PLOT 2

SW GAUGE 3
SN-b6b5189d

GW GAUGE 15
SN- b6h7d86

SW GAUGE 4
SN-b651939

℄ CONSTRUCTION

VEGETATION PLOT 1

GW GAUGE 22
SN- b6519lf

MATCHLINE -SOUTH MAIN- STA. 20+46

GW GAUGE 3
SN-b652289

FLOW DISRUPTER
(TYP. SEE DETAIL)

BEGIN WETLAND RESTORATION
-SOUTH TRIB- POT Sta. 10+00.00
ELEV. = 53.90'

0' 40' 80'

PLANS PREPARED BY :
RUMMEL KLEPPER & KAHL, LLP
consulting engineers
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE No. F-0112 (919) 878-9560
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FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

12/17/2000
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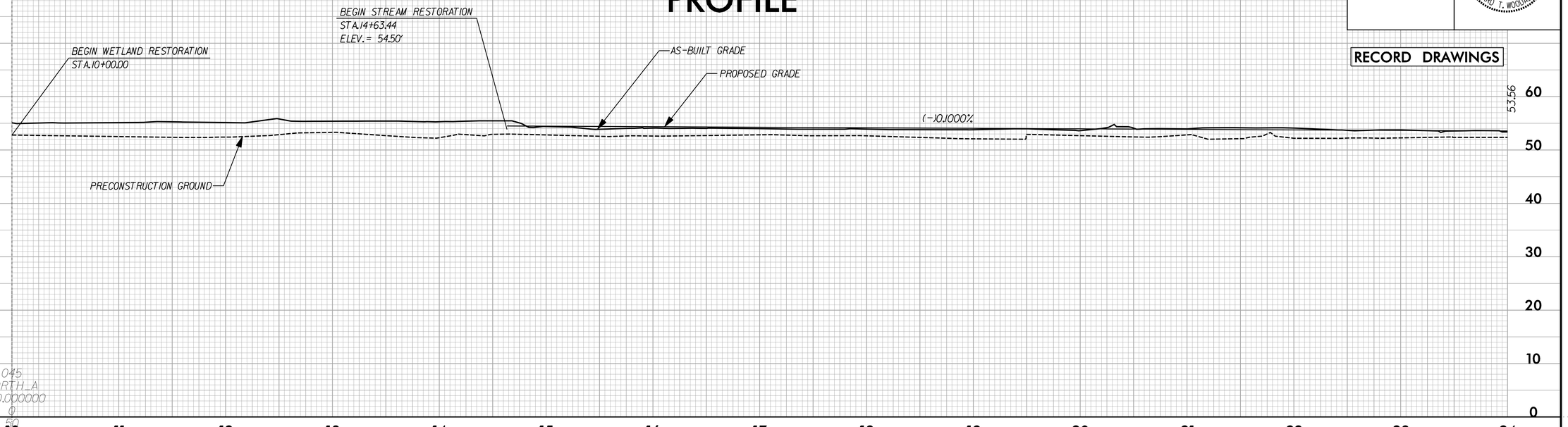
PROJECT REFERENCE NO.
D05053S
SHEET NO.
17
RW SHEET NO.
HYDRAULICS ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III
RECORD DRAWINGS
STREAM RESTORATION
NCGS GRID NORTH
(NAD 83)
SW GAUGE 3
SN-b6b5189d
FLOW DISRUPTER
(TYP.SEE DETAIL)
STREAM RESTORATION WIDTH
SW GAUGE 2
SN-b9b8038
FLOW DISRUPTER
(TYP.SEE DETAIL)
MATCHLINE -SOUTH MAIN- STA. 20+46
GW GAUGE 3
SN-b652289
GW GAUGE 2
SN-b651725
VEGETATION PLOT
END GRADE
-SOUTH MAIN- Sta. 29+80.00
ELEV.= 47.97'
GW GAUGE 1
SN-b6518f6
SR 1539 (BOILING SPRING RD.)
PRETTY POND
℄ CONSTRUCTION
GW GAUGE 23
SN-136b1b1a
SW GAUGE 1
SN-b6518le
GW GAUGE 24
SN-abd7242
FLOW DISRUPTER
(TYP.SEE DETAIL)
CONTROLLED STEP WEIR
(TYP.SEE DETAIL)
LOG CURTAIN
(TYP.SEE DETAIL)
END STREAM RESTORATION
-SOUTH MAIN- POT Sta. 31+01.50
ELEV.= 44.82'
0'
40'
80'
REVISIONS
PLANS PREPARED BY :
RUMMEL KLEPPER & KAHL, LLP
consulting engineers
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960
NC LICENSE No. F-0112 (919) 878-9560
RKK.COM
FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

PROJECT REFERENCE NO.	SHEET NO.
D05053S	18
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

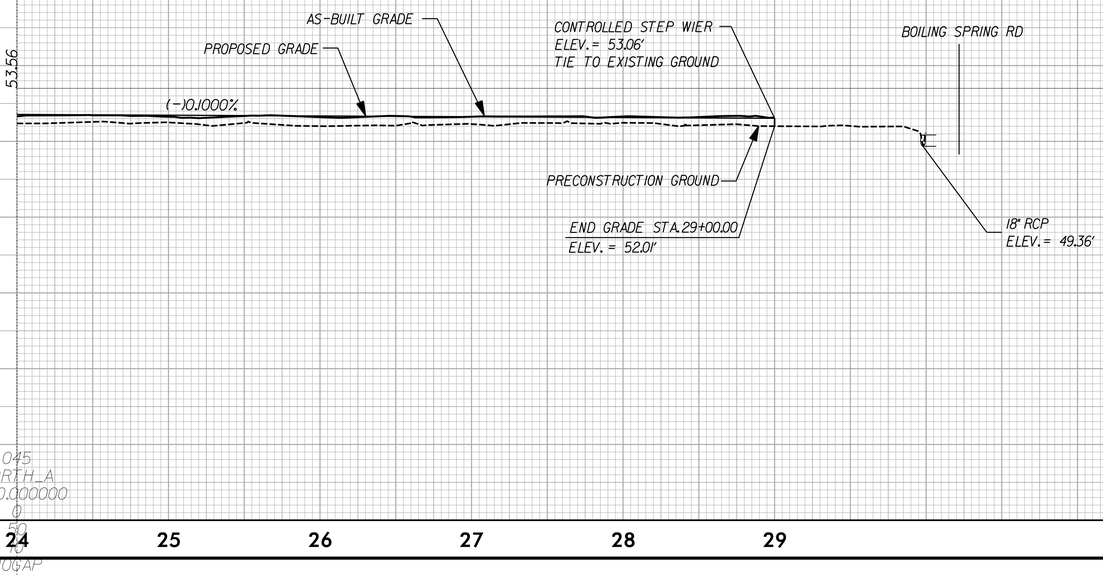
NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

RECORD DRAWINGS

–NORTH MAIN– PROFILE



–NORTH MAIN– PROFILE



PROJECT REFERENCE NO.	SHEET NO.
D05053S	19

ROADWAY DESIGN ENGINEER

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL III

RECORD DRAWINGS

–SOUTH MAIN– PROFILE

BEGIN STREAM RESTORATION
STA.13+98.20
EL = 54.50'

BEGIN WETLAND RESTORATION
STA.10+00.00

55.00

PRECONSTRUCTION GROUND

(–)0.4596%

PROPOSED GRADE

(–)0.2500%

AS-BUILT GRADE

50.10

60 50 40 30 20 10 0

10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

045
SOUTH
1000.000000
0
50
NOGAP

–SOUTH MAIN– PROFILE

PI = 25+00.00
EL = 49.85'

PROPOSED GRADE

50.10

(–)0.2500%

(–)0.4000%

AS-BUILT GRADE

CONTROLLED STEP WIER
TIE TO EXISTING GROUND

BOILING SPRING RD

PRECONSTRUCTION GROUND

END GRADE STA.29+81.00
ELEV.47.93'

15" RCP
ELEV.= 44.82'

60 50 40 30 20 10 0

24 25 26 27 28 29 30 31

045
SOUTH
2400.000000
0
50
NOGAP

12/7/2010
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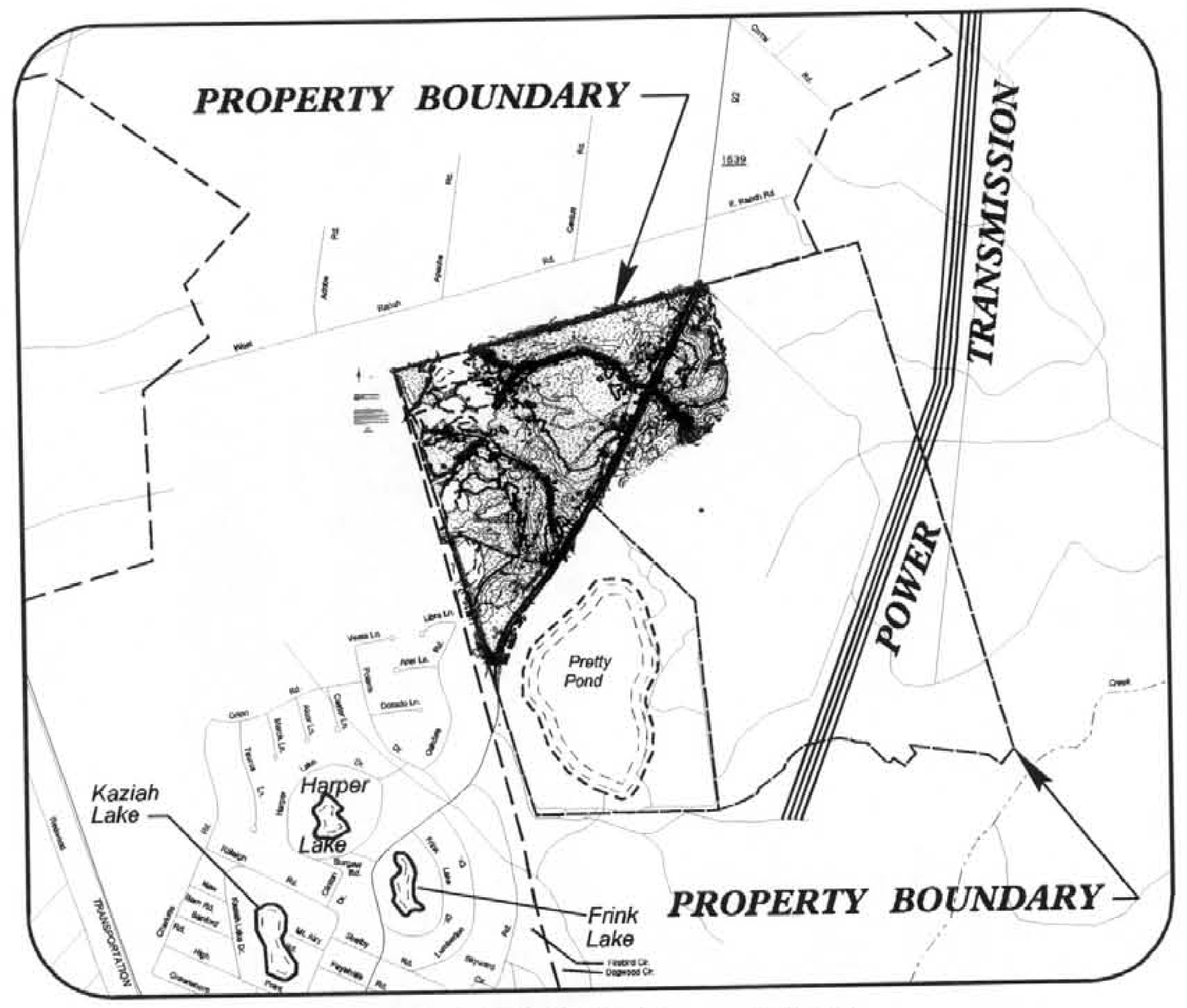
bbadel

STATE	DENR CONTRACT NO.	SHEET NO.	TOTAL SHEETS
N.C.	D05053S	PL-1	5

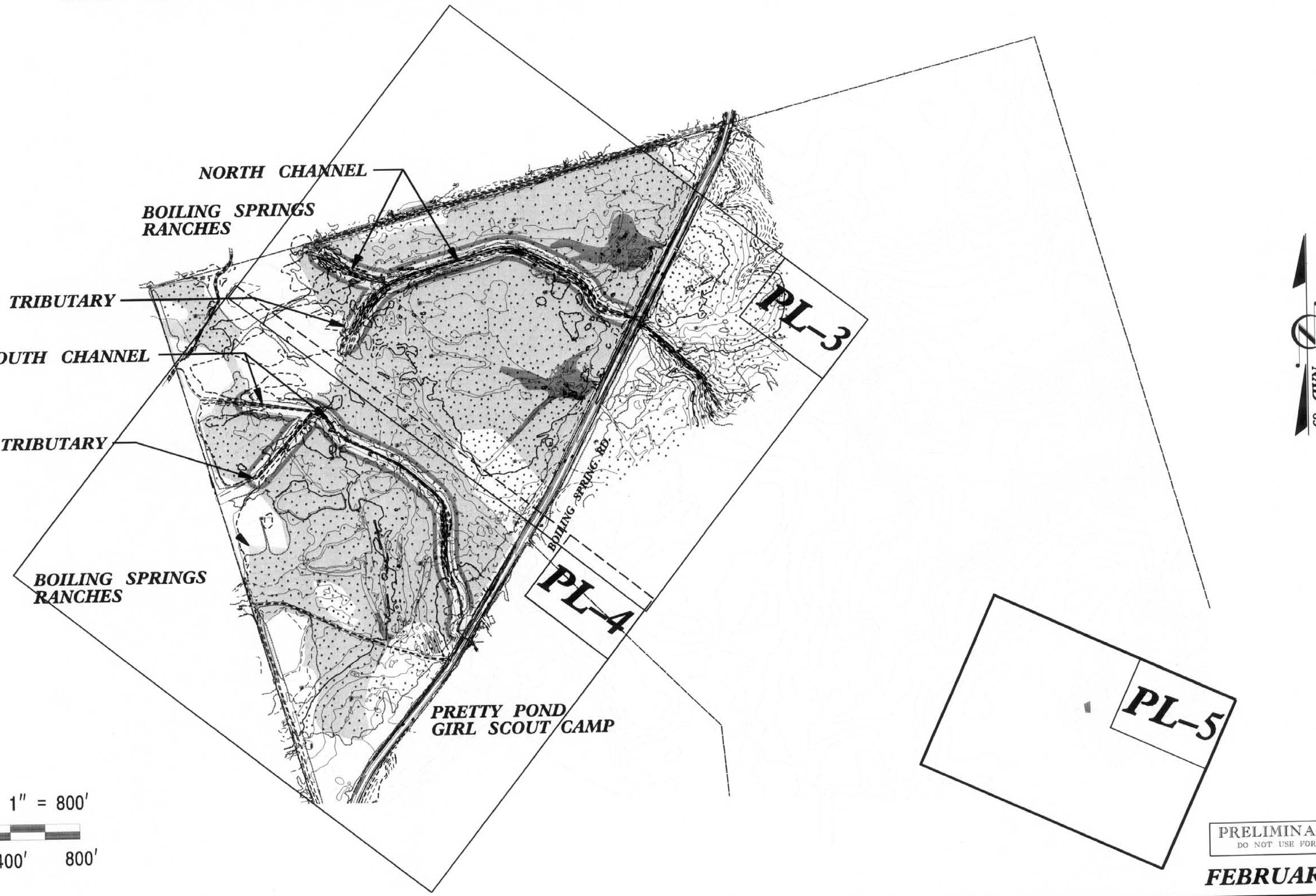
ECOSYSTEM ENHANCEMENT PROGRAM

PLANTING PLAN

LOCATION: SR 1539 (BOILING SPRING RD.)
TYPE OF WORK: STREAM & WETLAND RESTORATION



VICINITY MAP



Scale: 1" = 800'
0' 400' 800'

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

FEBRUARY 1, 2007

DENR CONTRACT: D05053S

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
PL-1	TITLE
PL-1A	SPECIFICATIONS
PL-2	DETAILS
PL-3 THRU PL-5	PLANTING PLANS

PLANS PREPARED BY :
RUMMEL • KLEPPER & KAHL, LLP
consulting engineers
900 RIDGEFIELD DRIVE SUITE 350
RALEIGH, NORTH CAROLINA 27609-3960

FOR

ECOSYSTEM ENHANCEMENT PROGRAM

KRISTIN MIGUEZ
EEP PROJECT MANAGER

WYATT BROWN
EEP REVIEW COORDINATOR

DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL, III

SIGNATURE: Howard T. Woodall III 4/9/08

WILLIAM E. STAFFORD
PROJECT SCIENTIST

HOWARD T. WOODALL III, P.E.
PROJECT DESIGN ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PROJECT REFERENCE NO.	SHEET NO.
D05053S	PL-2
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER EDWARD T. WOODALL III

REVISIONS

POINT	NORTH (ft)	EAST (ft)
100	121,837.66	2,295,673.30
101	121,829.02	2,295,702.23
102	121,811.33	2,295,719.39
103	121,786.44	2,295,729.87
104	121,756.67	2,295,738.89
105	121,737.51	2,295,749.35
106	121,713.16	2,295,771.66
107	121,679.08	2,295,827.26
108	121,660.18	2,295,877.90
109	121,652.36	2,295,906.06
110	121,631.87	2,295,893.24
111	121,636.24	2,295,839.78
112	121,544.99	2,295,786.72
113	121,511.11	2,295,732.18
114	121,501.82	2,295,704.52
115	121,505.81	2,295,667.03
116	121,523.12	2,295,640.08
117	121,549.78	2,295,576.24
118	121,554.78	2,295,539.18
119	121,551.03	2,295,491.26
120	121,568.18	2,295,442.87
121	121,572.35	2,295,410.89
122	121,559.22	2,295,355.09
123	121,567.82	2,295,391.27
124	121,579.18	2,295,372.29
125	121,587.88	2,295,356.25
126	121,599.64	2,295,408.27
127	121,610.17	2,295,420.11
128	121,634.81	2,295,374.67
129	121,650.76	2,295,334.85
130	121,644.79	2,295,290.69
131	121,642.16	2,295,249.22
132	121,650.89	2,295,243.06
133	121,668.50	2,295,246.90
134	121,692.53	2,295,294.42
135	121,697.53	2,295,348.61
136	121,684.72	2,295,394.68
137	121,661.02	2,295,451.67
138	121,644.35	2,295,531.40
139	121,646.97	2,295,579.75
140	121,684.06	2,295,577.20
141	121,719.11	2,295,581.58
142	121,738.42	2,295,593.06
143	121,793.69	2,295,605.29
144	121,814.09	2,295,622.43
145	121,831.74	2,295,642.89

POINT	NORTH (ft)	EAST (ft)
200	121,040.83	2,295,423.52
201	121,034.16	2,295,430.04
202	121,012.50	2,295,414.45
203	120,983.67	2,295,391.73
204	120,966.59	2,295,385.67
205	120,944.70	2,295,386.28
206	120,903.55	2,295,433.64
207	120,878.59	2,295,467.71
208	120,869.97	2,295,485.03
209	120,854.04	2,295,501.20
210	120,825.18	2,295,482.97
211	120,790.23	2,295,457.45
212	120,756.83	2,295,407.94
213	120,759.05	2,295,373.51
214	120,778.94	2,295,283.51
215	120,747.91	2,295,229.61
216	120,703.98	2,295,172.38
217	120,651.12	2,295,127.68
218	120,578.32	2,295,060.01
219	120,542.03	2,295,021.63
220	120,513.87	2,294,990.09
221	120,529.31	2,294,974.25
222	120,575.03	2,295,023.36
223	120,609.15	2,295,057.44
224	120,661.61	2,295,101.81
225	120,711.08	2,295,138.82
226	120,767.78	2,295,212.47
227	120,789.89	2,295,220.19
228	120,809.26	2,295,219.34
229	120,820.72	2,295,179.93
230	120,822.43	2,295,112.26
231	120,836.75	2,295,083.25
232	120,877.25	2,295,055.73
233	120,903.61	2,295,006.27
234	120,916.65	2,294,970.93
235	120,933.79	2,294,944.38
236	120,963.92	2,294,950.99
237	120,927.53	2,295,125.14
238	120,875.59	2,295,223.45
239	120,900.81	2,295,249.31
240	120,932.78	2,295,277.14
241	120,973.44	2,295,306.87
242	121,004.62	2,295,358.65
243	121,024.15	2,295,391.16

POINT	NORTH (ft)	EAST (ft)
300	121,257.95	2,294,067.20
301	121,262.25	2,294,062.57
302	121,363.89	2,293,908.87
303	121,670.46	2,293,765.92
304	121,722.23	2,293,963.98
305	121,766.53	2,294,125.62
306	121,745.40	2,294,142.25
307	121,694.06	2,294,187.77
308	121,739.68	2,294,318.51
309	121,785.30	2,294,449.24
310	121,796.08	2,294,647.56
311	121,913.58	2,294,684.91
312	122,063.87	2,295,239.56
313	122,160.67	2,295,603.55
314	122,232.74	2,295,876.48
315	122,205.66	2,295,849.16
316	122,096.86	2,295,970.10
317	121,994.68	2,296,078.76
318	121,289.53	2,295,721.89

POINT	NORTH (ft)	EAST (ft)
400	121,202.30	2,295,678.77
401	120,599.98	2,294,901.74
402	120,593.63	2,294,717.66
403	120,481.55	2,294,669.85
404	120,238.16	2,294,782.88
405	120,142.49	2,294,873.07
406	119,959.16	2,295,011.98
407	119,909.62	2,294,984.71
408	119,738.66	2,294,874.37
409	119,575.69	2,294,776.68
410	120,796.39	2,293,857.11
411	120,854.32	2,293,986.36
412	121,032.53	2,294,053.93
413	121,051.43	2,294,059.95

POINT	NORTH (ft)	EAST (ft)
500	120,410.64	2,295,280.11
501	120,304.33	2,295,224.64
502	120,262.25	2,295,199.73
503	120,282.07	2,295,178.47
504	120,496.68	2,295,007.73

POINT	NORTH (ft)	EAST (ft)
600	119,556.63	2,294,217.65
601	119,552.21	2,294,233.52
602	119,465.54	2,294,267.02
603	119,437.66	2,294,282.81
604	119,422.99	2,294,319.37
605	119,391.45	2,294,291.10
606	119,343.37	2,294,263.78
607	119,261.51	2,294,222.30
608	119,250.20	2,294,209.86
609	119,254.41	2,294,209.98
610	119,288.70	2,294,218.06
611	119,310.60	2,294,240.63
612	119,383.81	2,294,275.54
613	119,415.31	2,294,253.40
614	119,449.91	2,294,225.67
615	119,479.44	2,294,227.84
616	119,507.26	2,294,221.90
617	119,550.76	2,294,205.26

POINT	NORTH (ft)	EAST (ft)
700	119,702.14	2,294,019.72
701	119,592.92	2,294,101.14
702	119,530.92	2,294,067.72
703	119,518.19	2,294,119.36
704	119,479.23	2,294,085.61
705	119,430.66	2,294,029.85
706	119,495.32	2,294,017.43
707	119,572.14	2,293,926.92
708	119,666.01	2,293,870.12
709	119,740.21	2,293,852.07
710	119,746.54	2,293,924.44

SITE E		
POINT	NORTH (ft)	EAST (ft)
800	121,532.67	2,293,252.90
801	121,413.82	2,293,253.14
802	121,354.85	2,293,326.85
803	121,273.76	2,293,400.57
804	121,195.19	2,293,464.24
805	121,065.70	2,293,409.44
806	120,851.32	2,293,462.31
807	119,386.12	2,293,498.17
808	120,961.06	2,294,660.10
809	119,353.43	2,294,641.63
810	119,399.10	2,294,614.05
811	119,423.94	2,294,596.85
812	119,451.45	2,294,567.38
813	119,473.62	2,294,535.70
814	119,499.55	2,294,478.29
815	119,487.00	2,294,411.49
816	119,446.87	2,294,340.78
817	119,223.29	2,294,180.26
818	119,191.82	2,294,175.67
819	119,131.56	2,294,155.42
820	119,064.68	2,294,143.95
821	118,971.74	2,294,141.27
822	118,940.46	2,294,155.42
823	118,898.42	2,294,157.33
824	118,846.83	2,294,142.04
825	118,825.81	2,294,117.20
826	118,823.69	2,294,091.28
827	118,835.36	2,294,059.87
828	118,843.01	2,294,027.38
829	118,888.87	2,293,891.70
830	118,910.65	2,293,872.74
831	118,944.29	2,293,861.13
832	118,986.33	2,293,853.48
833	119,024.55	2,293,855.40
834	119,064.68	2,293,872.59
835	119,104.80	2,293,884.47
836	119,154.49	2,293,882.15
837	119,226.75	2,293,853.11
838	119,251.95	2,293,819.09
839	119,258.10	2,293,783.73
840	119,304.96	2,293,802.47
841	119,421.50	2,293,800.50
842	119,523.49	2,293,827.68
843	119,579.31	2,293,681.49
844	119,546.48	2,293,634.99
845	119,523.39	2,293,592.45
846	119,528.53	2,293,564.66
847	119,366.19	2,293,611.28
848	119,203.86	2,293,657.90
849	119,190.80	2,293,639.46
850	119,183.24	2,293,619.44
851	119,334.74	2,293,574.00
852	119,644.61	2,293,481.14
853	119,802.69	2,293,433.80
854	120,048.08	2,293,361.15
855	120,096.15	2,293,347.65
856	120,095.88	2,293,359.69
857	119,922.04	2,293,411.55
858	119,748.19	2,293,463.40
859	119,793.20	2,293,492.30
860	119,947.25	2,293,489.66
861	119,928.85	2,293,712.64
862	120,087.89	2,293,679.70

SITE E		
POINT	NORTH (ft)	EAST (ft)
863	120,261.21	2,293,540.00
864	120,372.74	2,293,299.96
865	120,698.79	2,293,223.65
866	120,726.91	2,293,286.88
867	120,851.94	2,293,348.64
868	120,915.51	2,293,419.63
869	121,061.92	2,293,350.72
870	121,127.21	2,293,177.68
871	121,170.56	2,293,046.74
872	121,019.00	2,293,090.05
873	120,867.43	2,293,133.36
874	120,860.05	2,293,117.51
875	121,066.74	2,293,055.43
876	121,259.11	2,292,999.85
877	121,268.05	2,293,052.36
878	121,260.20	2,293,102.12
879	121,274.77	2,293,156.46
880	121,308.38	2,293,163.33
881	121,331.75	2,293,151.78
882	121,358.39	2,293,112.87
883	121,376.12	2,293,060.47
884	121,379.99	2,292,995.89
885	121,387.11	2,292,960.88
886	121,451.52	2,292,940.29
887	121,532.99	2,293,243.10

PLANS PREPARED BY :
RK&K
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consulting engineers
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(919) 878-9560
FOR
DENR-ECOSYSTEM ENHANCEMENT PROGRAM

PROJECT REFERENCE NO.	SHEET NO.
D05053S	PL-3
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL, III

4/9/08

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

REVISIONS

-PLANTING PLAN-

PLANTING DESCRIPTION				
AREA	TYPE	AREA (AC)	TOTAL SEEDLINGS/AREA	PLANTING REQUIREMENTS
1	PINE SAVANNA	15.56	10,581	LONG LEAF PINE STEMS SHALL BE PLACED 8 FT.X 8 FT. OR 1 STEM EVERY 64 SQ.FT OR 680 STEMS PER ACRE.
2	PINE SAVANNA	1.42	966	
3	PINE SAVANNA	30.71	20,883	
4	PINE SAVANNA	2.61	1,775	
5	WET PINE FLATWOODS	2.01	1,367	LONG LEAF PINE POND PINE STEMS SHALL BE PLACED 8 FT.X 8 FT. OR 1 STEM EVERY 64 SQ.FT OR 680 STEMS PER ACRE.
6	WET PINE FLATWOODS	1.55	1,054	
7	WET PINE FLATWOODS	1.12	762	
8	WET PINE FLATWOODS	1.70	1156	
9	COASTAL PLAIN SMALL STREAM SWAMP	5.36	3,645	BLACKGUM, POND PINE, LAUREL OAK, OVERCUP OAK, SWEETBAY STEM SHALL BE PLACED 8 FT.X 8 FT. OR 1 STEM EVERY 64 SQ.FT. OR 680 STEMS PER ACRE. USE CONTAINERIZED SEEDLINGS ONLY.

NOTES:

1. EVENLY DISTRIBUTE NUMBER OF SEEDLING TYPES +/- 5% PER SPECIES

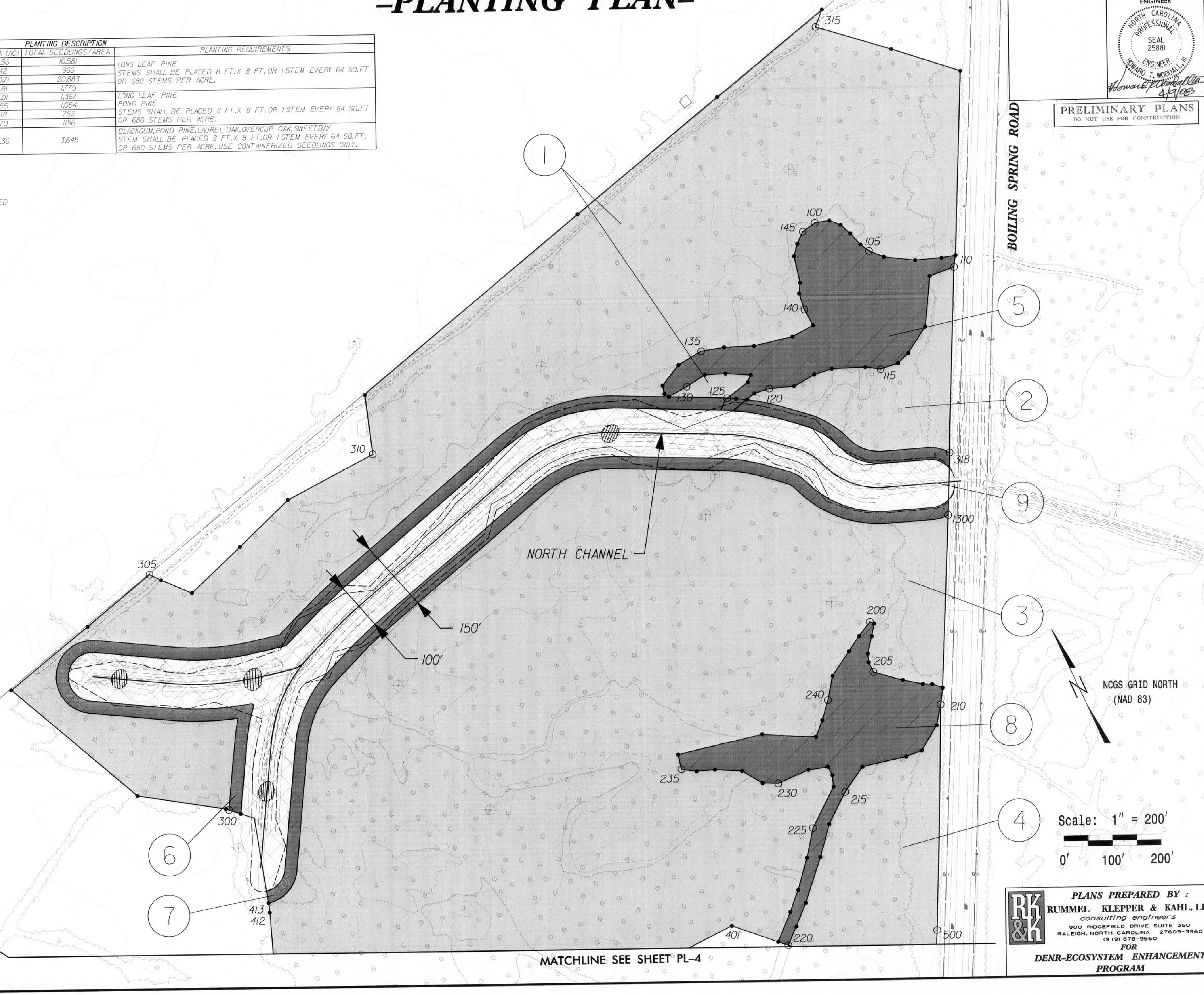
2. PLANTING REQUIRED ONLY IN THE AREAS SHADED OR HATCHED.

WET PINE FLATWOODS

PINE SAVANNA

COASTAL PLAIN SMALL STREAM SWAMP

SEE SHEET PL-2 FOR POINT DESCRIPTIONS



PLANS PREPARED BY :
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-PLANTING PLAN-

PROJECT REFERENCE NO.	SHEET NO.
D05053S	PL-4
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER HOWARD T. WOODALL, III

4/9/08

PRELIMINARY PLANS
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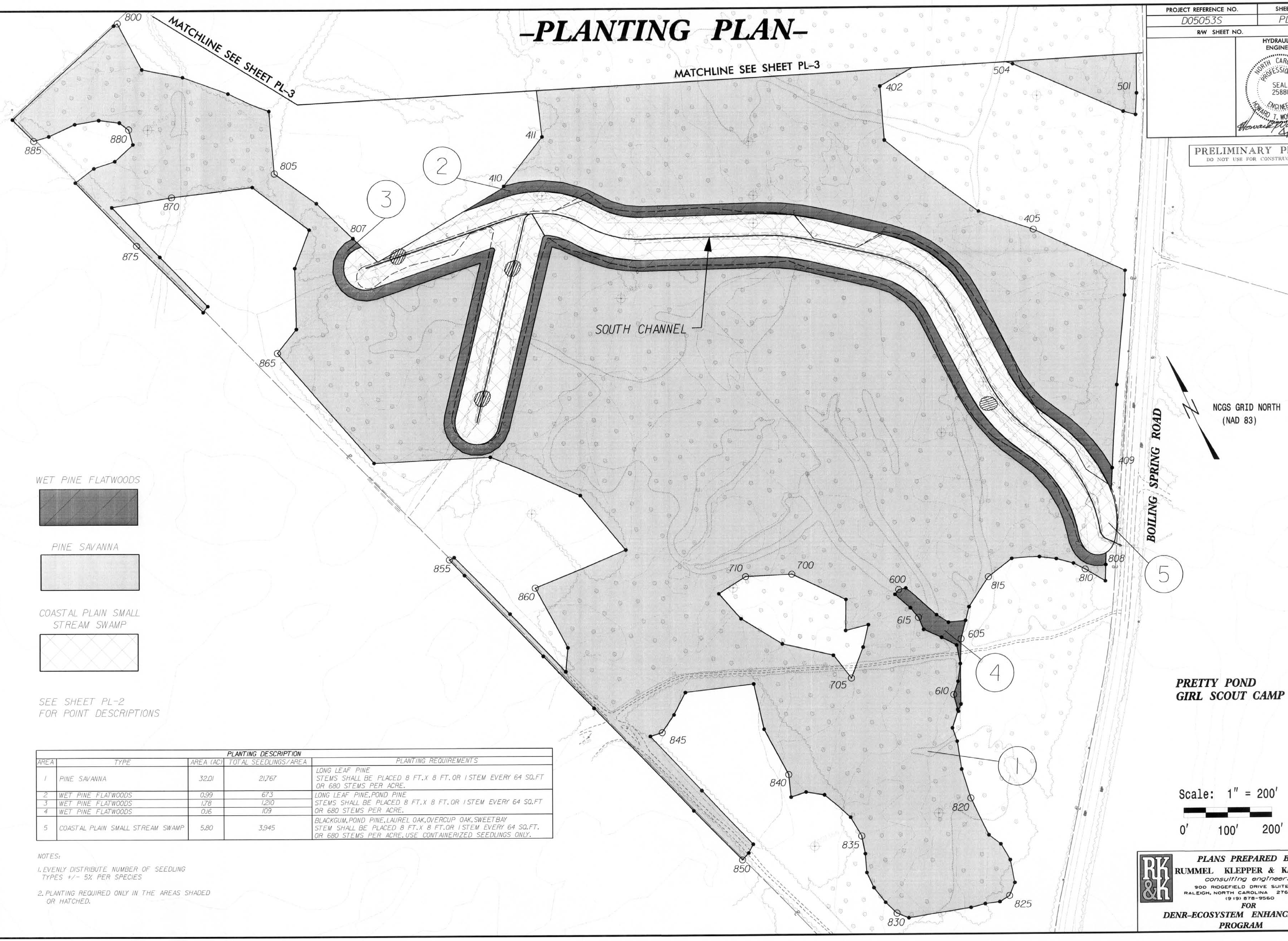

SEE SHEET PL-2
FOR POINT DESCRIPTIONS

PLANTING DESCRIPTION

AREA	TYPE	AREA (AC)	TOTAL SEEDLINGS/AREA	PLANTING REQUIREMENTS
1	PINE SAVANNA	32.01	21,767	LONG LEAF PINE STEMS SHALL BE PLACED 8 FT.X 8 FT. OR 1 STEM EVERY 64 SQ.FT OR 680 STEMS PER ACRE.
2	WET PINE FLATWOODS	0.99	673	LONG LEAF PINE,POND PINE STEMS SHALL BE PLACED 8 FT.X 8 FT. OR 1 STEM EVERY 64 SQ.FT OR 680 STEMS PER ACRE.
3	WET PINE FLATWOODS	1.78	1,210	
4	WET PINE FLATWOODS	0.16	109	
5	COASTAL PLAIN SMALL STREAM SWAMP	5.80	3,945	BLACKGUM,POND PINE,LAUREL OAK,OVERCUP OAK,SWEETBAY STEM SHALL BE PLACED 8 FT.X 8 FT.OR 1 STEM EVERY 64 SQ.FT. OR 680 STEMS PER ACRE.USE CONTAINERIZED SEEDLINGS ONLY.

NOTES:

1. EVENLY DISTRIBUTE NUMBER OF SEEDLING TYPES +/- 5% PER SPECIES
2. PLANTING REQUIRED ONLY IN THE AREAS SHADED OR HATCHED.

PRETTY POND GIRL SCOUT CAMP

Scale: 1" = 200'

0' 100' 200'

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-PLANTING PLAN-

PROJECT REFERENCE NO.	SHEET NO.
D05053S	PL-5
R/W SHEET NO.	

HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 25881 ENGINEER EDWARD T. WOODALL III

4/9/08

PRELIMINARY PLANS
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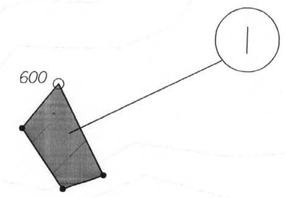
REVISIONS

8.17.99



NCGS GRID NORTH
(NAD 83)

POINT	NORTH (ft)	EAST (ft)
600	118,972.54	2,298,304.96
601	118,903.62	2,298,306.58
602	118,906.73	2,298,277.79
603	118,955.72	2,298,270.18

WETLAND RESTORATION

POWER EASEMENT

PLANTING DESCRIPTION				
AREA	TYPE	AREA (AC)	TOTAL SEEDLINGS/AREA	PLANTING REQUIREMENTS
1	CYPRESS GUM SWAMP	.044	30	BLACKGUM, BALD CYPRESS STEMS SHALL BE PLACED 8 FT. X 8 FT. OR 1 STEM EVERY 64 SQ.FT OR 680 STEMS PER ACRE. USE CONTAINERIZED SEEDLINGS ONLY.

NOTES:

1. EVENLY DISTRIBUTE NUMBER OF SEEDLING TYPES +/- 5% PER SPECIES

2. PLANTING REQUIRED ONLY IN THE AREAS SHADED OR HATCHED.

Scale: 1" = 100'

0' 50' 100'

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