BROCK STREAM ENHANCEMENT

FINAL AS-BUILT & BASELINE MONITORING REPORT

Jones County, North Carolina
SCO Project Number 050650601-A
EEP Project Number 92333

Prepared for:
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Status of Plan: Final
Submission Date: August 2010

Prepared by:

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EXECUTIVE SUMMARY

The northern Jones County site is located approximately 12 miles southeast of Kinston, North Carolina. The Mitigation Plan presented here includes the enhancement of an unnamed tributary to Big Chinquapin Branch and restoration of its riparian buffer.

Restoration, enhancement, and preservation of a degraded stream system can provide a more stable condition leading to improvements in the aquatic and terrestrial communities that depend on it. Big Chinquapin Branch is a major tributary to the Trent River and both systems are nutrient sensitive waters (NCDWQ, 1998). The goals of the project were to improve the biological integrity of the stream system, reduce impacts from surrounding nutrient runoff, reduce downstream sedimentation, increase dissolved oxygen, moderate pH levels, and moderate water temperatures of the stream through shading by the surrounding buffer.

In 2005, the United States Army Corps of Engineers (USACE) released new mitigation guidance related to stream restoration in the outer Coastal Plain of North Carolina (USACE 2005). The new guidance, developed in cooperation with the North Carolina Division of Water Quality (NCDWQ), addresses mitigation credits for headwater streams. Many natural headwater streams and wetlands in the Coastal Plain were historically channelized for agricultural purposes. A number of these channels, including the channel on the Brock Restoration Site, are eroding and lack functionality and habitat. While many of these areas would benefit from restoration, traditional natural channel design with pattern and profile has been determined to be inappropriate for coastal headwater streams. The driving factor behind the new guidance is that it is difficult to discern the original condition of these first order channels: whether they were historically intermittent streams or headwater wetlands. Emphasis is now being placed on restoring habitat and floodplain functionality to these types of channels. The Brock Restoration Site is one of the first Ecosystem Enhancement Program projects to fall under the new guidelines.

Using Rosgen classification (Rosgen, 1996), the existing channel before restoration was classified as a G5, which is narrow and deep. The stream system has been enhanced using Stream Enhancement Level II methodology, which involved excavation of a new bankfull bench near the existing channel elevation and vegetating the new riparian zone. The bankfull bench has been constructed entirely on the right bank of the channel to minimize construction costs and avoid disturbing a cemetery located onsite. The restored stream channel is classified as an E5 channel with a sinuosity less than 1.05. Wetlands are expected to form within portions of the newly created floodplain, especially in the more downstream section of the project where backwater from Big Chinquapin Branch will affect the stream. Designing this project presented a number of challenges due to various site constraints including the cemetery along the left side of the channel, a maintenance road for the local drainage district along Big Chinquapin Branch, existing culverts upstream and downstream, and active farming occurring along the edges of the easement.

The constructed project does not deviate from the design except for changes to the planting plan. Sixteen specimen boundary trees were planted along the conservation easement limits. The size of the floodplain and upland buffer plantings was increased from bare roots to tublings since planting occurred in the summer. Due to plant availability, bitternut hickory was replaced with American beech. The plantings exhibited poor survivability due to hot and dry conditions at the time of planting. A portion of the site was replanted in February 2010. The channel and riparian buffer will be monitored for five years.

The Brock Restoration Site is located in an area of intense agricultural land use. The project has reforested the riparian buffer along the restored floodplain. By reforesting a mosaic of vegetative communities, local biological diversity will be increased. The buffer has also intercepted overland flow from a swale draining the agricultural fields on the Brock property. Buffer reforestation at this site will reduce the input of nutrients from the fields to the waters downstream of the unnamed tributary to Big Chinquapin Branch, designated as nutrient sensitive waters by NCDWQ.

Table of Contents

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1.0 Project Goals, Background and Attributes

1.1 LOCATION AND SETTING

The Brock Restoration Site is located approximately 12 miles southeast of Kinston, North Carolina and lies in northern Jones County. (Figure 1, Appendix A). The project stream is an Unnamed Tributary (UT) to Big Chinquapin Branch and is located within the Neuse River Basin (NCDWQ Subbasin 03-04-11) and the United States Geological Survey (USGS) 14-digit Hydrologic Unit Code 03020204010060. The UT is a perennial stream and is located within an easement on property owned by Clare Brock. The project reach begins at a 54-inch corrugated metal pipe under a farm path crossing. The channel flows in a northerly direction along agricultural fields, along the east side of a small cemetery, and terminates at its confluence with Big Chinquapin Branch.

1.2 PROJECT GOALS AND OBJECTIVES

The health of a watershed is dependent on the quality of the headwater system(s), individual tributaries, and major channels. High quality tributaries with functioning floodplains and vegetated buffers filter contaminants, maintain moderate water temperatures, provide high quality aquatic and terrestrial habitat and regulate flows downstream. Big Chinquapin Branch is a major tributary to the Trent River, and both water bodies are nutrient sensitive (NCDWQ, 1998). Agricultural land use practices have narrowed or removed many natural, vegetated buffers along streams within the Trent River watershed as well as draining and converting non-riverine wet hardwood forests to cropland. This project will enhance functional elements of the unnamed tributary.

The major project components include the enhancement of the unnamed tributary to Big Chinquapin Branch through the creation of a stable channel and riverine floodplain, and reforestation of the associated riparian buffer. Creation of the floodplain bench will provide stream enhancement II credit at a 1.5:1 ratio by restoration of 2 out of the 3 morphological features.

The restoration of riparian buffers along the restored stream channel will improve water quality. The re-establishment of the riparian buffers with hardwood species will also improve wildlife habitat on the property. These measures will improve the physical, chemical, and biological components of the unnamed tributary and the Brock property, as well as Big Chinquapin Branch and other downstream waters. Specific project goals to achieve desired ecological function include:

- Improvement of water quality by limiting bank erosion
- Creation of 1850 linear feet of stable stream channel (stream enhancement II)
- Restoration of 6.2 acres of riparian buffer along the project reach
- Improvement of aquatic and terrestrial habitat within the unnamed tributary to Big Chinquapin Branch

- The 40’ wide floodplain bench will dissipate the flow and maintain channel stability during moderate to high discharge events

1.3 PROJECT STRUCTURE, RESTORATION, AND APPROACH

1.3.1 Project Structure

The project involved the establishment of a woody riparian buffer and a floodplain on the right bank of an 1850 linear foot reach. Refer to Figures 2a and 2b in Appendix A for a detailed plan view of the project components.

1.3.2 Restoration Type and Approach

The fluvial processes occurring before restoration were causing incision in the stream channel. Continued incision would cause the stream to begin to widen. This trend would have continued if the stream were not enhanced to create more stable conditions. The channel is also a pathway for nutrients from the surrounding agricultural areas to the nutrient sensitive waters of the Trent River. Impacts resulting from sediment and nutrient depositions are predicted to decrease after completion of the project.

The project reach has been designed using Stream Enhancement Level II methodology. Pre-restoration existing shear stress and stream power have been compared with the design in order to evaluate aggradation and degradation. The state of the channel before restoration was shown to be capable of handling the system’s flow and sediment supply.

Buffer reforestation was conducted along the restoration reaches extending beyond 50 feet on either side of the channel to the limits of the conservation easement. The planting plan is based on the hydrology of the site, the surrounding vegetative communities, and available supply of species. The plan is modeled after mature, unaltered systems as outlined in the *Natural Communities of North Carolina* (Schafale and Weakley, 1990). A floodplain was created by excavating soil from the right bank, and replacing the topsoil to the excavated area to facilitate riparian vegetation. The newly excavated floodplain was planted with a Coastal Plain Bottomland Hardwood Forest community. Remaining areas outside the floodplain, excluding the cemetery, were planted as a Mesic Mixed Hardwood Forest Coastal Plain Subtype.

Since this project was initiated before 10/2/2007, buffer credit will be sought for the area along the UT to Big Chinquapin Branch from the top of bank to the edges of the conservation easement (averaging 60 feet on each side).

1.4 PROJECT HISTORY, CONTACTS, AND ATTRIBUTE DATA

The 315 acre project watershed is located in the eastern portion of the Coastal Plain Physiographic Province. Slopes are generally less than four percent. Elevations on the Brock Site range from approximately 39 to 52 feet above mean sea level. The soil survey for Jones County (Barnhill, 1981) indicates that the area is underlain by Goldsboro loamy sand, Grifton fine sandy loam, Lynchburg fine sandy loam, Muckalee loam, and Norfolk loamy sand.

The watershed is a mixture of forested lands, agricultural row crops, two-lane roadways, farm roads, cemeteries, minor culverts, and a few single-family homes. Agricultural drainage features, including ditches and drain tiles, have been constructed and maintained on the Brock and neighboring properties. The Brock Site and adjacent properties are utilized primarily for agricultural purposes.

Refer to Tables 2-4 in Appendix A for additional project details.

2.0 Success Criteria

2.1 MORPHOLOGIC PARAMETERS AND CHANNEL STABILITY

Due to the nature of the design, a full geomorphic survey will not be conducted annually to monitor the project. The structural stability of the stream channel will be assessed visually for pattern and profile, and dimensional stability will be assessed through cross-sectional data annually during the 5 year monitoring period.

2.1.1 Dimension

Dimensional characteristics obtained from cross-sectional surveying will be compared year to year. Natural variability is expected, however the system should not experience trends toward excessive increasing bank erosion, channel degradation or aggradation. General maintenance of a stable cross-section and hydrologic access to the floodplain features over the course of the monitoring period will represent success in dimensional stability.

2.1.2 Other

This project involved the establishment of a floodplain bench on the right bank. The pattern and profile were not altered during this project and will not be surveyed during this monitoring effort. These features will be visually assessed each year to monitor stability and to highlight any areas of significant erosion, aggradation or degradation. Also, no formal survey of sediment transport or substrate material distribution will be undertaken.

2.2 VEGETATION

The vegetative success of the riparian buffer will be evaluated based on the species density and survival rates. Vegetation monitoring will be considered successful for stream enhancement purposes if at least 260 woody stems/acre (USACE 2003) at the end of five years. Alternatively vegetation will be considered successful for Neuse Buffer restoration credits if 320 trees/acre are surviving at the end of five years (Neuse Riparian Buffer Protection Rule .0242). In addition, the buffer must be intact within the areas shown for credit on maps 2A and 2B of this report. During monitoring, any encroachments into the conservation easement should be reported to NCEEP and remediated.

2.3 HYDROLOGY

A minimum of two bankfull events must be documented within the standard 5 year monitoring period. In order for the monitoring to be considered complete, the two verification events must occur in separate monitoring years.

3.0 Monitoring Plan Guidelines

3.1 HYDROLOGY

3.1.1 Wetland

Wetlands were not restored as part of this project therefore no groundwater monitoring gauges are present onsite. However, it is possible that wetlands may develop in depressional areas within the floodplain. The overall condition of the floodplain will be visually assessed and noted in subsequent monitoring reports.

3.1.2 Stream

One crest gauge has been installed onsite and is located near station 18+50. Each visit to the site must include documentation of the highest stage for the monitoring interval and a reset of the device. Other indications of bankfull flow including the presence of wrack lines, sediment or flooding will also be recorded and documented photographically. Refer to the As-Built Plan Sheets in Appendix D for location of the crest gauge.

3.2 STREAM CHANNEL STABILITY AND GEOMORPHOLOGY

3.2.1 Dimension

Three cross-sections will be surveyed each monitoring year for the entire reach of UT to Big Chinquapin Branch. Permanent cross-section pins were installed at each of the three cross-sections at the left and right banks. Data collected will include, at a minimum, cross-sectional area, bankfull width, bankfull mean depth, bankfull max depth, floodprone width, width to depth ratio, and entrenchment ratio. Stream type will also be determined. Dimensional data will be compared from year to year to ensure project stability. Refer to As-Built Plan Sheets in Appendix D for locations of cross-sections.

3.2.2 Pattern and Profile

The pattern and profile were not altered as part of this project. These features will be visually assessed each year to monitor stability and to highlight any areas of significant erosion, aggradation or degradation.

3.2.3 Bank Stability Assessments

As this project is a stream enhancement project and no bank stability information was collected prior to construction, BEHI and NBS assessments will not be performed.

3.3 VEGETATION

Vegetative sample plots will be quantitatively monitored during September of each monitoring year. Vegetation will be monitored as per the CVS-EEP Protocol for Recording Vegetation, version 4.2 (CVS-EEP 2008). Species composition, density, and survival will be monitored for a minimum of 5 years. Four $100m^2$ plots were established within the project area. In each plot, four plot corners were permanently located with conduit and are included in the monitoring plan sheets. Planted vegetation (Level 1) will be recorded for the baseline monitoring, while both planted vegetation and natural volunteers (Level 2) will be recorded for Monitoring Years 1-5+. Baseline monitoring data is provided in the Appendix C data tables. Refer to the As-Built Plan Sheets in Appendix D for the locations of the Vegetation Plots.

Any vegetative problem areas in the project will be noted and reported in each subsequent monitoring report. Vegetative problem areas include areas that either lack vegetation or include populations of exotic vegetation.

3.4 PHOTO STATIONS

Representative photo reference points have been identified and located using a Global Positioning System. The stations are shown on the As-Built Plan Sheets in Appendix D. Photos will be taken at each location at approximately the same time each year. Vegetation plot photos will be taken during the vegetation monitoring event. Vegetation station photos for the baseline monitoring year are provided in Appendix C.

3.5 WATERSHED

Any changes to land use in the watershed that would cause changes to flow within the project streams will be assessed over the five-year monitoring period.

3.6 MONITORING PLAN VIEW

A plan view of the monitoring scheme is presented in the As-Built Plan Sheets in Appendix D.

4.0 Maintenance and Contingency Plans

Any maintenance needs will be determined during monitoring visits. During the baseline monitoring year upon completion of construction, the contractor must address any issues under their warranty. In subsequent monitoring years, the monitoring firm will determine maintenance needs. Small maintenance tasks that can be completed by hand may be performed by the monitoring firm while any large maintenance items will be coordinated with NCEEP to determine the appropriate course of action.

The monitoring firm will visually assess the site to verify that the stream and wetland are functioning as needed and note any adjustments that may be necessary. It is not anticipated that invasive plant species will be a significant problem onsite. During the monitoring, any invasive species problems will be noted and specific management options will be proposed.

5.0 As-Built Conditions / Baseline

5.1 AS-BUILT/RECORD DRAWINGS

Site grading was complete on June 12th, 2009. The as-built survey was completed by Bateman Civil Survey Company, PC on July 23rd, 2009. The As-Built Plan Sheets are located in Appendix D. Planting was initially completed on June 23rd and the baseline vegetation data collection occurred on July 2, 2009.

5.2 BASELINE DATA (YEAR 0)

5.2.1 Channel Morphology

5.2.1.1. Profile

The profile of the stream was not altered during this project, therefore was not and will not be monitored other than by visual assessment to evaluate stability. At the end of construction, the channel was stable.

5.2.1.2. Dimension

This project involved the establishment of a floodplain bench on the right bank. In general, the As-Built survey demonstrates that the project overall was built in accordance to the design specifications. The elevation and width of the bankfull bench are as designed, though the bankfull bench is not as flat as was specified. The graded slope that ties in the bankfull bench to existing ground was designed as 3:1. The As-Built survey shows that this varies over the project area, but it is generally 3:1 or flatter. Baseline surveyed morphological data is presented in Tables 5 and 6 in Appendix B, along with cross-sectional data at the three permanent cross-sections.

5.2.1.3. Pattern

The pattern of the stream was not altered during this project, therefore was not and will not be monitored other than by visual assessment to evaluate stability. At the end of construction, the channel was stable.

5.2.1.4. Substrate

As per NCEEP guidance, substrate sampling is only necessary when constructed riffles have been installed (NCEEP 2008). No changes to the streambed have been made therefore no substrate sampling was undertaken.

5.2.2 Sediment Transport

Analysis was not conducted as the streambed was not altered for this project.

5.2.3 Verification of Plantings

Stantec staff completed the as-built vegetation monitoring on 7/02/09 and, as requested by NCEEP, provided an entire site assessment of viability on 12/03/09. Throughout the project site, it was found that many of the plants had not survived. Stretches with no plants were found in the upland areas. Some plants were found dead although the majority of plants were missing entirely. *Clethra alnifolia* seems to have completely died off as Stantec staff found areas where mulch remained with no plant. This likely occurred due to harsh planting conditions and little maintenance. Most of the floodplain exhibited more than sufficient viable plant density although three wet areas were found with little to no woody vegetation. Most of the livestakes were not alive and had not sprouted any new stems since planting. The replanting plan recommended lower density replanting in uplands and livestakes to account for the minimal percentage found alive.

The site was partially replanted in February 2010. It was determined that the 1 year plant warranty will begin at that time. The floodplain areas were replanted, a portion of the upland areas were replanted, two of the large specimen trees were replaced, however no additional livestakes were installed as recommended. The vegetation data included within the data tables in this report do not include the additional plants.

The July 2009 baseline vegetation monitoring was completed using CVS-EEP Protocol for Recording Vegetation, version 4.2 (CVS-EEP 2008) in four plots, two in the floodplain and two in the uplands. According to the data collected, the average plant density is 637.4 stems/acre with the highest densities in the floodplain. The original planting plan specified 680 stems/acre.

Plot 1 is located in the floodplain near the upstream end of the project and primarily contains green ash and willow oak. This plot has the highest density at 1052 stems/acre. Plot 4 is located in the floodplain near the downstream end of the project and contains a variety of plants including a number of livestakes. At the time of monitoring Plot 4 had 849.8 stems/acre. Plot 2 is located on the right bank upland sideslope near the middle of the site. Plot 2 is primarily made up of American sycamore with a variety of oaks. This plot is at 485.6 stems/acre which is above the success criteria but below the planting specifications. Plot 3 is located on the left bank upland just downstream of the cemetery and includes tulip poplar and swamp chestnut oak. This plot is only at 161.9 stems/acre and does not meet success criteria. Additional vegetation planted during the supplemental planting effort will be added to the data during the next annual monitoring event.

5.2.4 Photo Documentation

Photo stations were established in 16 locations along the project. The location of the stations can be seen on the monitoring plan view map within the record drawings plan set. Baseline station photos were taken on July 2, 2009 during the baseline vegetation monitoring.

5.2.5 Hydrology

Large rain events onsite occurred in the middle of April and first half of May 2009. Bankfull flow is evidenced by the wrack lines of straw observed at the downstream end of the project reach on May 13,

2009 (Photo 17). A crest gauge was installed onsite on July 2, 2009. The gauge will be used in future monitoring to verify bankfull events.

6.0 References

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (http://cvs.bio.unc.edu/methods.htm)

NCEEP. 2006. Content, Format and Data Requirements for EEP Monitoring Reports. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 1.2, November 16, 2005.

NCEEP. 2008. Mitigation Plan Document – Format Data Requirements, and Content Guidelines. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 2.0, March 27, 2008.

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

United States Army Corps of Engineers – Wilmington District, North Carolina Division of Water Quality, United States Environmental Protection Agency – Region IV, Natural Resources Conservation Service, North Carolina Wildlife Resources Commission. 2003. Stream Mitigation Guidelines.

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7.0 Appendices

Appendix A – General Tables and Figures

Appendix B – Morphological Summary Data and Plots

Appendix C – Vegetation Data

Appendix D – As-Built Plan Sheets

Appendix A - General Tables and Figures

Figure 1-Vicinity Map

Brock Stream Restoration
SCO # 050650601
Jones County, NC

As-Built & Baseline Monitoring Plan
April 2010

Local Roads
Major Roads
Railroads
Site Boundary
County Boundary
Streams
Municipality

0 0.5 1 2 3 Miles

Ecosystem Enhancement PROGRAM

Stantec

Directions to the Brock Stream Restoration Site: From Raleigh, take HWY 70 East to Kinston, NC. The Brock Restoration Site is located approximately 12 miles southeast of Kinston, North Carolina and lies in northern Jones County. From US 70 East in Kinston turn right on NC 58 and travel approximately 12 miles. The site is located on the left approximately three miles past the beginning of the Pine Street loop (SR 1301).

The project site is an environmental restoration site of NCDENR EEP and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP.

Kinston
Dover
Trenton
Brock Project Site
US 70
NC 58
State Highway 58
State Highway 41
United States Highway 70
Roy White Rd
British Rd
Blonnie Brown Rd
Burkett Rd
Jenkins Rd
Silo Rd
Webb Farm Rd
Worley Hill Rd
Moore Rd
Cobb Rd
Middle Rd
Old Kinston-Trenton Rd
Pine St
Taylor Rd
Green Rd
Wyse Fork Rd
Chinquapin Chapel Rd
Phillips Rd
Thigpen Ln
Nobles Ln
Henderson Rd
Henderson Ln
Old New Bern R
Greentown Rd
2nd St
Landfill Rd
Mayfield Rd
Market St
Stroud Rd
State Road 1129
Pleasant Hill Rd
Burney Town Road
Hoosie Ln
Fordham Rd
Vine Swamp Rd
Lenoir County
Jones County
Craven County
Core Creek
Trent River
Big Chinquapin Branch
Little Chinquapin Branch
Rattlesnake Branch
Vine Swamp
Flat Swamp
Beaver Creek
Kingsfie
Brimm

Figure 2A

PROJECT ASSET MAP

STREAM ENHANCEMENT II = 1850 LINEAR FEET
NEUSE BUFFER RESTORATION (50' BUFFER) = 4.23 ACRES
NEUSE BUFFER RESTORATION (BEYOND 50') = 1.97 ACRES
TOTAL NEUSE BUFFER RESTORATION = 6.20 ACRES

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	SHEET 1
PROJECT ENGINEER	

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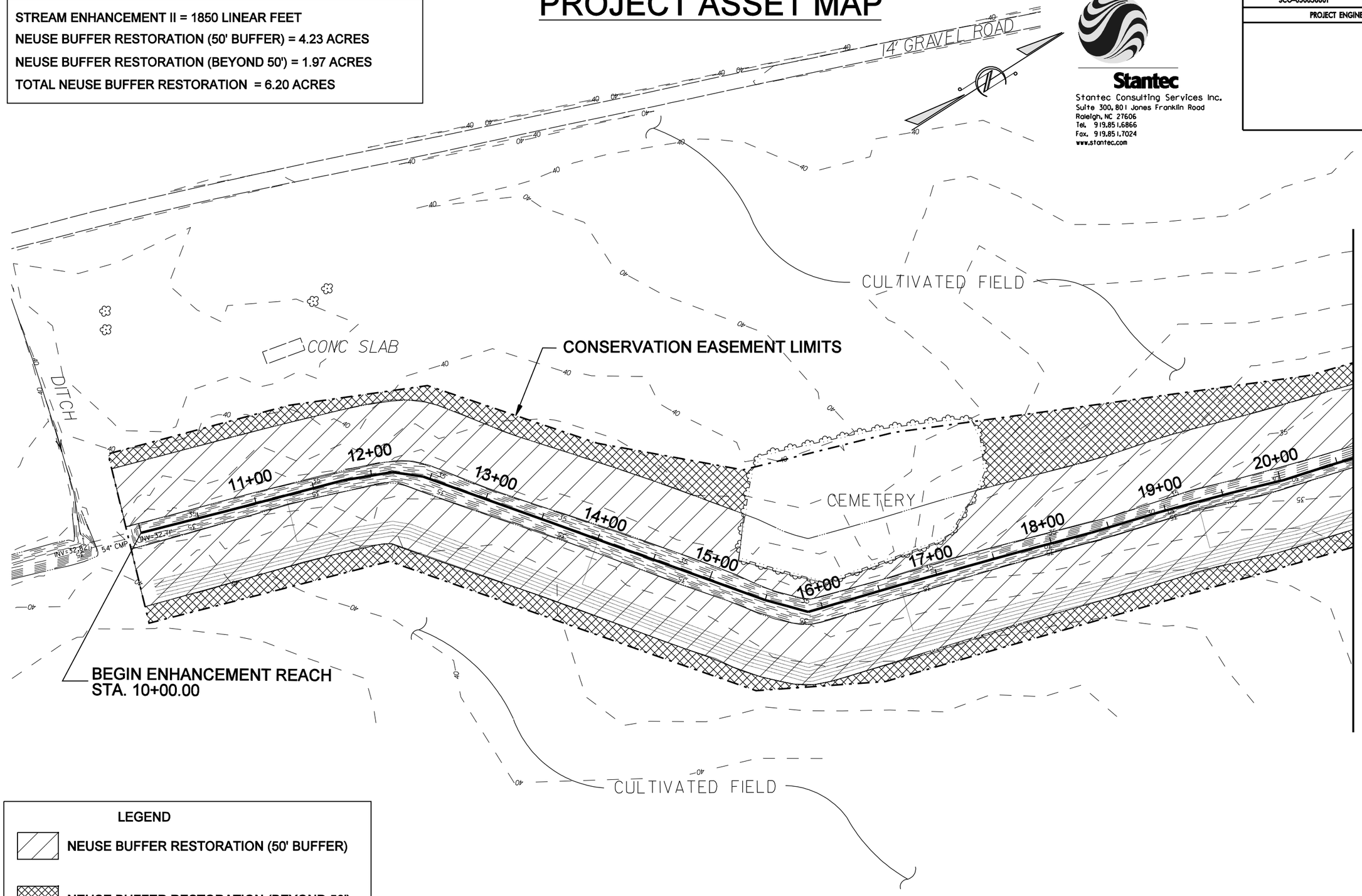

LEGEND

NEUSE BUFFER RESTORATION (50' BUFFER)

NEUSE BUFFER RESTORATION (BEYOND 50')

NOTE:
ENHANCEMENT STA. 10+00.00 TO STA.20+64.22

SCALE 20 0 40

LOCATION:	PROJECT ASSET MAP BROCK STREAM ENHANCMENT
PROJECT NO.:	SCO-050650601
COUNTY:	JONES
DESIGNED BY:	NEJ
DRAWN BY:	RLA
CHECKED BY:	ALC
DATE:	04/2010

9/7/2010
10:47:43 AM
M:\Documents\Projects\Brock Stream Enhancement\Figure 2A Project Asset Map.mxd

Figure 2B

PROJECT ASSET MAP

STREAM ENHANCEMENT II = 1850 LINEAR FEET
NEUSE BUFFER RESTORATION (50' BUFFER) = 4.23 ACRES
NEUSE BUFFER RESTORATION (BEYOND 50') = 1.97 ACRES
TOTAL NEUSE BUFFER RESTORATION = 6.20 ACRES

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PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	SHEET 2
PROJECT ENGINEER	

CULTIVATED FIELD

CONSERVATION EASEMENT LIMITS

ABANDONED CHINQUAPIN BR. TRIB. 1

CHINQUAPIN BR. TRIB. 1A

END ENHANCEMENT REACH
STA. 28+50.16

INV. 26.18

INV. 25.63

MATCHLINE SEE SHEET PL-3 STA.20+64.22

21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00

FARM PATH
APPROX 10' WIDE

CULTIVATED FIELD

DITCH

DITCH

INV. 24.66

LEGEND

NEUSE BUFFER RESTORATION (50' BUFFER)

NEUSE BUFFER RESTORATION (BEYOND 50')

NOTE:
ENHANCEMENT STA.20+64.22 TO STA. 28+50.16

20 0 40
SCALE

LOCATION:	PROJECT ASSET MAP BROCKSTREAM RESTORATION
PROJECT NO.:	SCO-050650601
COUNTY:	JONES
DESIGNED BY:	NEJ
DRAWN BY:	RLA
CHECKED BY:	ALC
DATE:	04/2010

Table 1 - Project Components Brock Stream Restoration SCO Project #050650601									
Project Component or Reach ID	**Existing Feet/Acres**	**Restoration Level**	**Approach**	**Footage or Square Feet**	**Stationing**	**Mitigation Ratio**	**Mitigation Units**	**BMP Elements**	**Comment**
Reach I	1850	Enhancement II	P3	1850	00+00 - 28+50.16	1.5:1	1233	N/A	
Neuse Buffer	N/A	Restoration	N/A	270,072	N/A	1:1	270,072	N/A	

Component Summations							
Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Riparian Wetland (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration (0-50')						184,259	
Restoration (50'+)						85,813	
Enhancement							
Enhancement							
Enhancement I							
Enhancement II	1,850						
Creation							
Preservation							
HQ Preservation							
Totals	1,850					270,072	

Not Applicable

Table 2 - Project Activity and Reporting History Brock Stream Restoration EEP#92333		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Restoration Plan	May, 2006	May, 2006
Final Design - Construction Plans	NA	April, 2008
Construction	NA	March-June, 2009
Temporary S&E mix applied to entire project	NA	March-June, 2009
Permanent seed mix applied to Reach	NA	June, 2009
Mitigation Plan / As-Built (Year 0 Monitoring - baseline)	September , 2009	April, 2010
Supplemental Planting	February, 2010	February, 2010
Year 1 Monitoring	September , 2010	November , 2010
Year 2 Monitoring	September , 2011	November, 2011
Year 3 Monitoring	September , 2012	November , 2012
Year 4 Monitoring	September , 2013	November , 2013
Year 5 Monitoring	September , 2014	November , 2014
Year 6 Monitoring	September , 2015	November , 2015
Year 7 Monitoring	September , 2016	November , 2016

Table 3 - Project Contact Table Brock Stream Restoration EEP#92333	
Designer Primary Project Design POC	Stantec Consulting, Inc. 801 Jones Franklin Rd. Suite 300 Raleigh, NC 27606 Nathan Jean (919) 865-7387
Construction Contractor Construction Contractor POC	Shamrock Environmental Corporation 6106 Corporate Park Dr. Browns Summit, NC 27214
Planting Contractor Planting Contractor POC	Carolina Wetland Services 550 E. Westinghouse Blvd. Charlotte, NC 28273 Josh Frost 866-527-1177
Seeding Contractor Planting Contractor POC	Seal Brothers Contracting PO Box 86 Dobson, NC 27017 Mari Seal (336) 786-2263
Seed Mix Sources	unknown
Nursery Stock Suppliers	Natives 550 Westinghouse Blvd. Charlotte, NC 28273 (704) 527-1177
Baseline Monitoring Performers Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	Stantec Consulting, Inc. 801 Jones Franklin Rd. Suite 300 Raleigh, NC 27606 CW Gaskill (919) 865-7584 Amber Coleman (919) 865-7399 n/a

Table 4 - Project Attribute Table Brock Stream Restoration EEP#92333	
Project County	Jones
Physiographic Region	Coastal Plain
Ecoregion	63h - Carolina Flatwoods
Project River Basin	Neuse
USGS HUC for Project (14 Digit)	03020204010060
NCDWQ Sub-basin for project	03-04-11
EEP Watershed	N/A
WRC class	Warm
% of project easement fenced or demarcated	100%
Beaver Activity	none observed

Restoration Component Attribute Table	
	Reach 1
Drainage Area (Ac)	315
Stream Order	First
Restored Length (lf)	1850
Perennial or Intermittent	Perennial
Watershed Type	Rural
Watershed LULC Distribution	Ag-row crop
Watershed Impervious cover (%)	<1%
NCDWQ AU/Index Number	03-04-11
NCDWQ Classification	C Sw NSW
303d Listing	No
Reasons For 303d Listing	N/A
Total Acreage of Easement	4.75
Total Vegetated Acreage Within Easement	4.75
Total Planted Acreage as part of Restoration	4.75
Rosgen Classification (pre-existing)	G5
Rosgen Classification (as-built)	E5
Valley Type	E
Valley Slope	<0.02
Valley Side Slope Range	<0.02
Valley Toe Slope Range	<0.02
Cowardin Classification	N/A
Trout Waters Designation	No
Species of Concern	No
Dominant Soil Series and Characteristics	
Series	Norfolk
Depth (in)	0-14
Clay (%)	2-8
K	0.17
T	5

Appendix B – Morphological Summary Data and Plots

Table 5. Baseline Stream Data Summary
Brock Stream Restoration Project - EEP#92333

Parameter	Gauge	Regional Curve			Pre-Existing Condition						Design			As-Built / Baseline					
Dimension and Substrate (Riffle)		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)						7.0						7.0			7.0				
Flood Prone Width (ft)						13.0						42.0			40.0				
BF Mean Depth (ft)						1.4						1.4			1.4				
BF Max Depth (ft)						2.2						2.2			2.2				
BF Cross Sectional Area (ft^2)						9.9						9.9			9.9				
Width/Depth Ratio						4.9						4.9			4.9				
Entrenchment Ratio						1.9						6.0			6.0				
Bank Height Ratio						3.30						1.0			1.0				
d50 (mm)																			
Profile																			
Riffle Length (ft)																			
Riffle Slope (ft)						0.021						0.021			0.021				
Pool Length (ft)						20						20			20				
Pool Max Depth (ft)						3						3			3				
Pool Spacing (ft)						20						20			20				
*Pool Volume (ft^2)						15.2						15.2			15.2				
Pattern																			
Channel Beltwidth (ft)						20						20			20				
Radius of Curvature (ft)						N/A						N/A			N/A				
Rc: Bankfull Width (ft/ft)						N/A						N/A			N/A				
Meander Wavelength (ft)						N/A						N/A			N/A				
Meander Width Ratio						2.9						2.9			2.9				
Substrate,, Bed, and Transport Parameters																			
Ri% / Ru% / P% / G% / S%																			
SC% / Sa% / G% / C% / B% / Be%																			
d16 / d35 / d50/ d84 / d95 / diP / diSP (mm)																			
Reach Shear Stress (competency) lb/ft^2																			
Max part size (mm) mobilized at bankfull																			
Stream Power (transport capacity)																			
Additional Reach Parameters																			
Drainage Area (sq. miles)						0.49						0.49			0.49				
Impervious Cover Estimate (%)																			
Rosgen Classification						G5						E5			E5				
Bankfull Velocity (fps)						2.1						2.1			2.1				
Bankfull Discharge (cfs)						20.8						20.8			20.8				
Valley Length (ft)																			
Channel Thalweg Length (ft)																			
Sinuosity						1.05						1.05			1.1				
Water Surface Slope (Channel) (ft/ft)						0.0031						0.0031			0.0031				
BF Slope (ft/ft)																			
Bankfull Floodplain Area (Ac)																			
Proportion over wide (%)																			
Entrenchment Class (ER Range)																			
Incision Class (BHR Range)																			
BEHI VL% / L% / M% / H% / VH% / E%																			
Channel Stability or Habitat Metric																			
Biological or Other																			

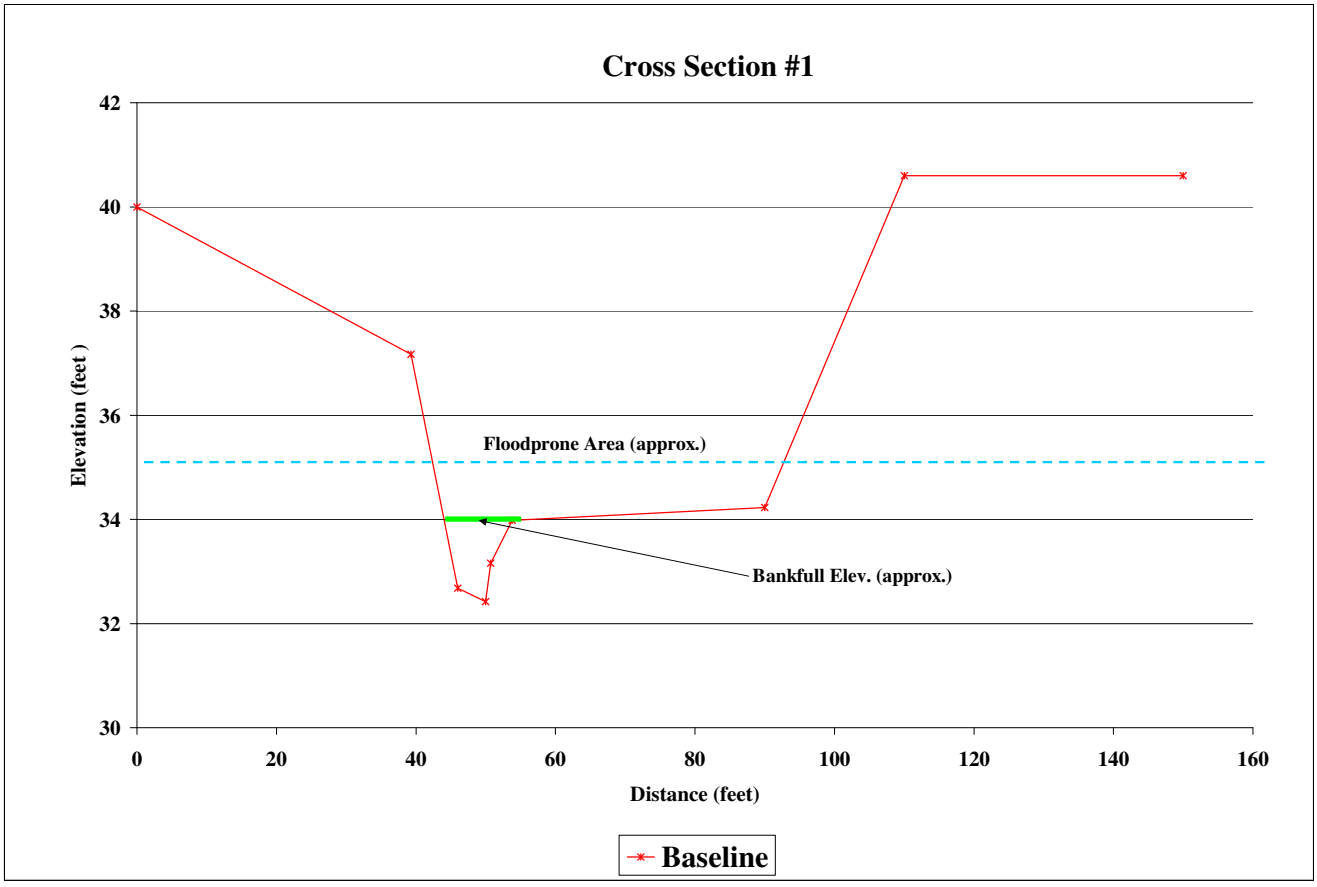
Table 6. Morphology and Hydraulic Monitoring Summary (Dimensional Parameters - Cross Section)
Brock Stream Restoration Project - EEP#92333

	Cross Section 1 (Riffle)							Cross Section 2 (Riffle)							Cross Section 3 (Riffle)						
Dimension and Substrate (Riffle)	Base	MY1	MY2	MY3	MY4	MY5	My+	Base	MY1	MY2	MY3	MY4	MY5	My+	Base	MY1	MY2	MY3	MY4	MY5	My+
Bankfull Width (ft)	9.3							8.0							8.2						
Flood Prone Width (ft)	42.0							41.0							40.0						
BF Mean Depth (ft)	0.9							1.1							1.0						
BF Max Depth (ft)	1.6							1.5							1.5						
BF Cross Sectional Area (ft^2)	8.5							8.5							8.5						
Width/Depth Ratio	10.2							7.5							7.9						
Entrenchment Ratio	4.5							5.1							4.9						
Bank Height Ratio	1.0							1.0							1.0						
Based on current/developing bankfull feature																					
Bankfull Width (ft)																					
Flood Prone Width (ft)																					
BF Mean Depth (ft)																					
BF Max Depth (ft)																					
BF Cross Sectional Area (ft^2)																					
Width/Depth Ratio																					
Entrenchment Ratio																					
Bank Height Ratio																					
Cross Sectional Area between end pins (ft^2)																					
d50 (mm)																					

Project Name	Brock
Cross Section	Cross Section 1 Sta 11+00
Feature	
Date	As Built -7/23/2009
Crew	

Year 5			Year 4			Year 3			Year 2			Year 1			Baseline Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
															0	40	Left Pin
															39.3	37.17	
															46	32.68	
															50	32.42	
															50.7	33.16	
															53.8	33.98	RBK
															90	34.23	
															110	40.6	
															150	40.6	Right Pin

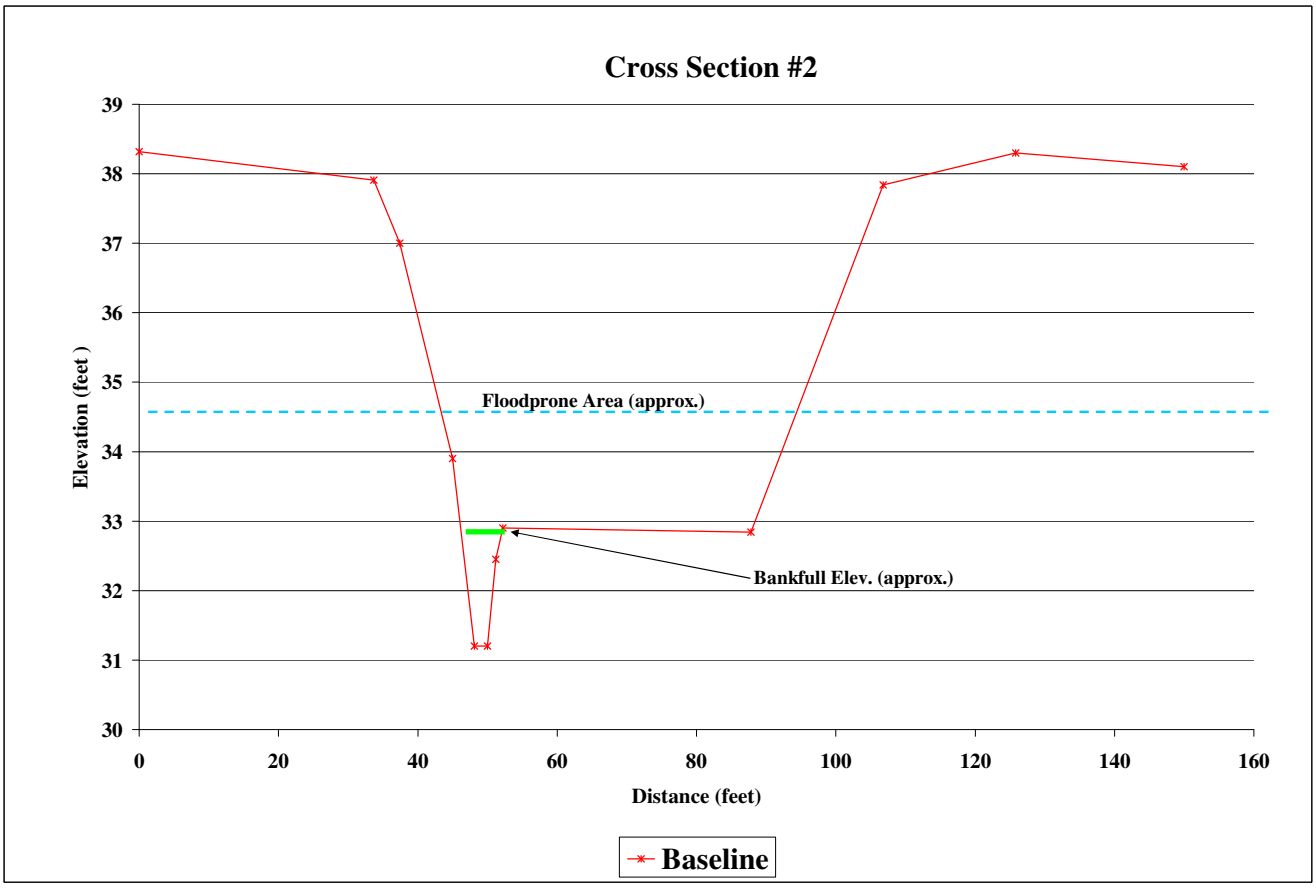
Summary						
	Year 5	**Year 4**	**Year 3**	**Year 1**	**Bench 2005**	**Bench**
Area						8.5
Width						9.3
Mean Depth						0.9
Max Depth						1.6
W/D						10.2



Project Name	Brock
Cross Section	Cross Section 2 Sta 15+00
Feature	
Date	As Built -7/23/2009
Crew	

Year 5			Year 4			Year 3			Year 2			Year 1			Baseline Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
															0	38.32	Left Pin
															33.7	37.91	
															37.4	37	
															45	33.9	
															48.1	31.2	
															50	31.2	
															51.2	32.45	
															52.2	32.9	RBK
															87.8	32.84	
															106.8	37.84	Right Pin
															125.8	38.3	
															150	38.1	

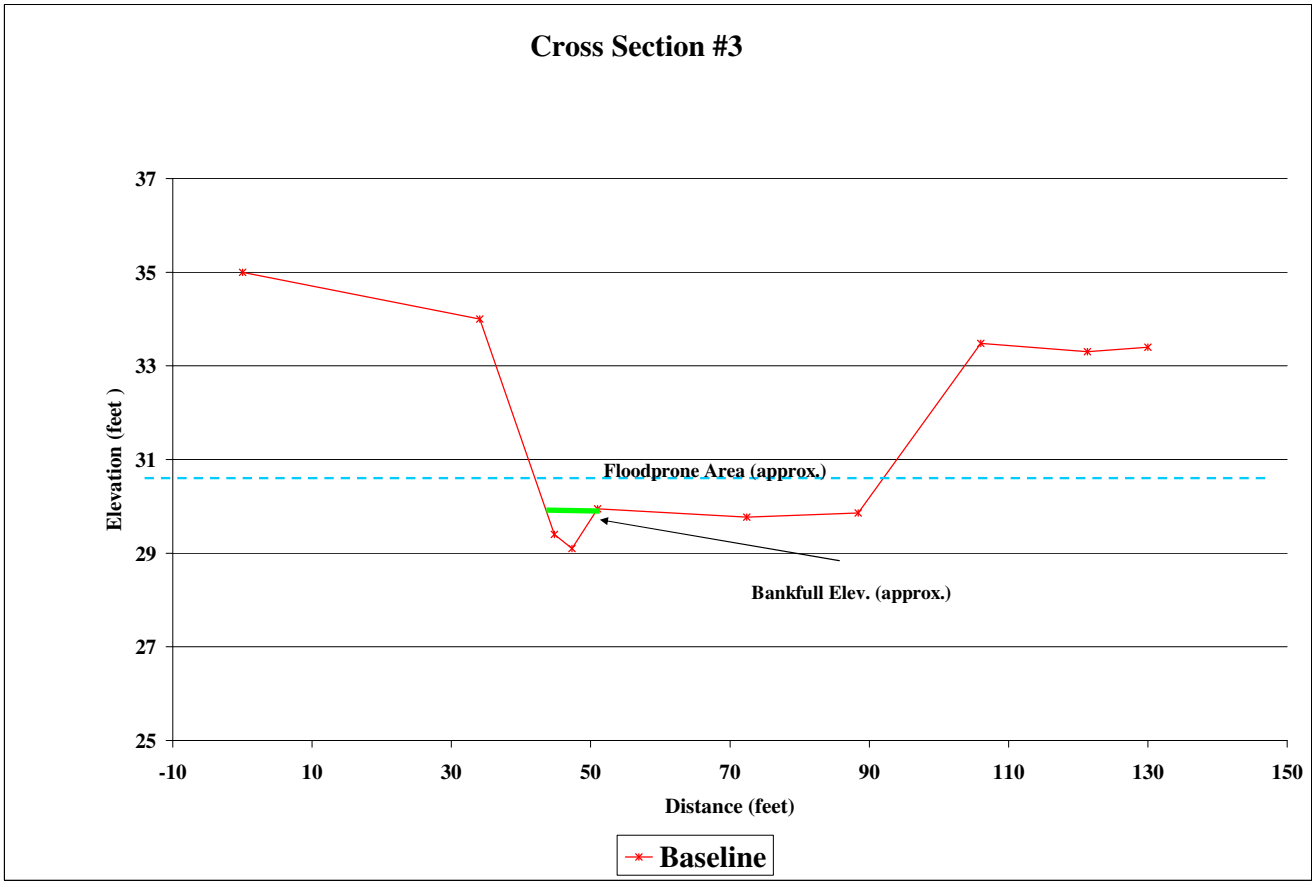
Summary					
	Year 5	**Year 4**	**Year 3**	**Year 1**	**Bench**
Area					8.5
Width					8.0
Mean Depth					1.1
Max Depth					1.5
W/D					7.5



Project Name	Brock
Cross Section	Cross Section 3 Sta 22+00
Feature	
Date	As Built -7/23/2009
Crew	

Year 5			Year 4			Year 3			Year 2			Year 1			Baseline Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
															0	35	Left Pin
															34.1	34	
															44.8	29.4	
															47.3	29.1	
															51	29.95	RBK
															72.4	29.77	
															88.4	29.86	
															106	33.48	
															121.3	33.3	
															130	33.4	Right Pin

Summary					
	Year 5	**Year 4**	**Year 3**	**Year 1**	**Bench**
Area					8.5
Width					8.2
Mean Depth					1.0
Max Depth					1.5
W/D					7.9



Stream Monitoring Photos

Photo B1 – Pre-construction stream channel looking downstream near station 14+00 (3/10/09)

Photo B2 – (Photo Station 1) Pre-construction, top of reach looking downstream to permanent cross-section 11+00 (3/10/2009)

Photo B3 – (Photo Station 1) Post-construction, top of reach looking downstream to cross-section 11+00 (marked by PVC pipes) (7/2/2009 Year 0)

Photo B4 – (Photo Station 4) Stream channel looking downstream at cross-section 15+00 (7/2/2009 Year 0)

Photo B5 – (Photo Station 10) Stream channel looking downstream at cross-section 23+00 (marked by PVC poles just downstream of Veg Plot 4) (7/2/2009 Year 0)

Photo B6 – (Photo Station 13) Lower end of stream enhancement looking upstream (7/2/2009 Year 0)

Photo B7 – (Photo Station 7) – Crest gauge looking downstream (7/2/2009 Year 0)

Photo B8 – Evidence of bankfull flow (wrack lines of straw and sediment on plants). Lower end of stream enhancement looking upstream (5/13/2009 Year 0)

Appendix C - Vegetation Data

Table 7 - Stem Count Totals and Planted by Plot and Species Brock Stream Restoration EEP Project Code 92333																		
			Current Plot Data (MY0 2009)													Annual Means		
			92333-ALC-0001			92333-ALC-0002			92333-ALC-0003			92333-ALC-0004				MY0 (2009)		
Scientific Name	Common Name	Species Type	Pw/oLS	P-all	T	Pw/oLS	P-all	T	Pw/oLS	P-all	T	Pw/oLS	P-all	T		Pw/oLS	P-all	T
Clethra alnifolia	coastal sweetpepperbu	Shrub					2	2									2	2
Cornus stricta	swamp dogwood	Shrub Tree										4	4	4		4	4	4
Fraxinus pennsylvanica	green ash	Tree		14	14												14	14
Quercus michauxii	swamp chestnut oak	Tree		1	1		1	1		2	2		3	3			7	7
Quercus nigra	water oak	Tree											4	4			4	4
Quercus pagoda	cherrybark oak	Tree					1	1									1	1
Quercus phellos	willow oak	Tree		8	8								2	2			10	10
Quercus	oak	Shrub Tree					1	1									1	1
Liriodendron tulipifera	tuliptree	Tree					1	1		2	2						3	3
Platanus occidentalis	American sycamore	Tree		3	3		6	6					5	5			14	14
Unknown		unknown										3	3	3		3	3	3
		Stem count	0	26	26	0	12	12	0	4	4	7	21	21		7	63	63
		size (ares)	1			1			1			1				4		
		size (ACRES)	0.02			0.02			0.02			0.02				0.10		
		Species count	0	4	4	0	6	6	0	2	2	2	6	6		2	11	11
		Stems per ACRE	0	1052	1052	0	485.6	485.6	0	161.9	161.9	283.28	849.8	849.8		70.82	637.4	637.4

CVS Table 1- Vegetation Metadata Brock Stream Restoration - EEP#92333	
Report Prepared By	Richard Andrews
Date Prepared	7/7/2009 12:00
database name	cvs-eep-entrytool-v2.2.6.mdb
database location	C:\Documents and Settings\randrews\Desktop
computer name	ANDREWSR
file size	33660928
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY	
Project Code	50650601
project Name	Brock Stream Restoration
Description	EEP Brock Stream Restoration□ Jones County, NC
River Basin	Neuse
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	4

CVS Table 2 - Vigor by Species
Brock Stream Restoration - EEP#92333

	Species	4	3	2	1	0	Missing	Unknown
	Clethra alnifolia				2	10		
	Cornus stricta			1	3	4		
	Fraxinus pennsylvanica	10	4					
	Quercus michauxii	6			1			
	Quercus nigra	2	1	1				
	Quercus pagoda				1	2		
	Quercus phellos	4	4	1	1	2		
	Sambucus canadensis					2		
	Quercus				1			
	Liriodendron tulipifera		2	1				
	Platanus occidentalis	2	4	6	2	1		
	Unknown				3	3		
TOT:	**12**	**24**	**15**	**10**	**14**	**24**		

CVS Table 3 - Vegetation Damage by Species
Brock Stream Restoration - EEP#92333

	Species	All Damage Categories	(no damage)	Site Too Dry	Site Too Wet	(other damage)
	Clethra alnifolia	12		6		6
	Cornus stricta	8	4			4
	Fraxinus pennsylvanica	14	14			
	Liriodendron tulipifera	3	2	1		
	Platanus occidentalis	15	9	4	1	1
	Quercus	1		1		
	Quercus michauxii	7	6	1		
	Quercus nigra	4	4			
	Quercus pagoda	3		3		
	Quercus phellos	12	10		1	1
	Sambucus canadensis	2				2
	Unknown	6	3			3
TOT:	**12**	**87**	**52**	**16**	**2**	**17**

CVS Table 4 - Vegetation Damage by Plot
Brock Stream Restoration - EEP#92333

	plot	All Damage Categories	(no damage)	Site Too Dry	Site Too Wet	(other damage)
	050650601-ALC-0001	26	21			5
	050650601-ALC-0002	18	2	16		
	050650601-ALC-0003	10	4			6
	050650601-ALC-0004	33	25		2	6
TOT:	**4**	**87**	**52**	**16**	**2**	**17**

CVS Table 5 - Planted Stems by Plot and Species
Brock Stream Restoration - EEP#92333

	Species	Total Planted Stems	# plots	avg# stems	plot 050650601-ALC-0001	plot 050650601-ALC-0002	plot 050650601-ALC-0003	plot 050650601-ALC-0004
	Clethra alnifolia	2	1	2		2		
	Cornus stricta	4	1	4	4			
	Fraxinus pennsylvanica	14	1	14				14
	Liriodendron tulipifera	3	2	1.5		1	2	
	Platanus occidentalis	14	3	4.67	5	6		3
	Quercus	1	1	1		1		
	Quercus michauxii	7	4	1.75	3	1	2	1
	Quercus nigra	4	1	4	4			
	Quercus pagoda	1	1	1		1		
	Quercus phellos	10	2	5	2			8
	Unknown	3	1	3	3			
TOT:	**11**	**63**	**11**		**21**	**12**	**4**	**26**

Vegetation Monitoring Plot Photos

Photo C1 – (Photo Station 2) Veg Plot 1 looking downstream (7/2/2009 Year 0)

Photo C2 – (Photo Station 3) Veg Plot 1 looking north across floodplain (7/2/2009 Year 0)

Photo C4 - (Photo Station 5) Veg Plot 2 looking downstream (crest gauge in far left of photo) (7/2/2009 Year 0)

Photo C5 – (Photo Station 6) Veg Plot 2 looking northwest across floodplain (crest gauge in right portion of photo) (7/2/2009 Year 0)

Photo C6 – (Photo Station 8) Veg Plot 3 looking upstream (toward cemetery) (7/2/2009 Year 0)

Photo C7 – (Photo Station 9) Veg Plot 3 looking southeast across floodplain (7/2/2009 Year 0)

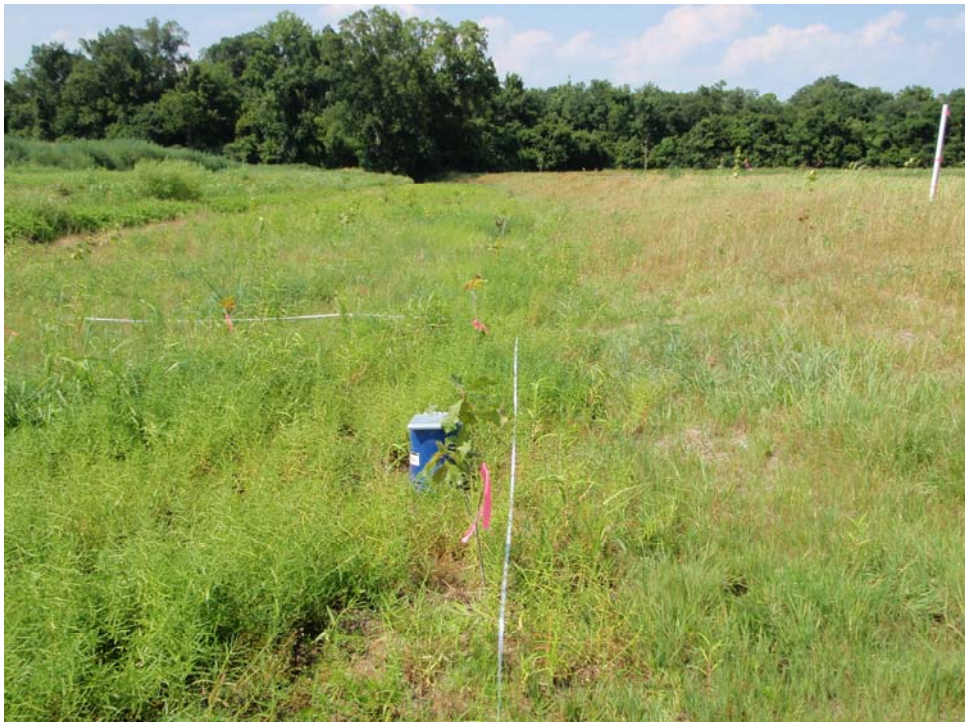


Photo C8 – (Photo Station 11) Veg Plot 4 looking downstream (7/2/2009 Year 0)

Photo C9 – (Photo Station 12) Veg Plot 4 looking north across floodplain (7/2/2009 Year 0)

Photo C10 – (Photo Station 14) Upland Buffer planting zone looking toward Big Chinquapin Branch from lower end of stream enhancement reach (7/2/2009 Year 0)

Photo C11 – (Photo Station 15) Upland buffer planting zone along UT near Big Chinquapin Branch, looking southwest (7/2/2009 Year 0)

Photo C12 – (Photo Station 16) Upland Buffer planting zone along Big Chinquapin Branch, looking southeast (7/2/2009 Year 0)

Appendix D - As-Built Plan Sheet

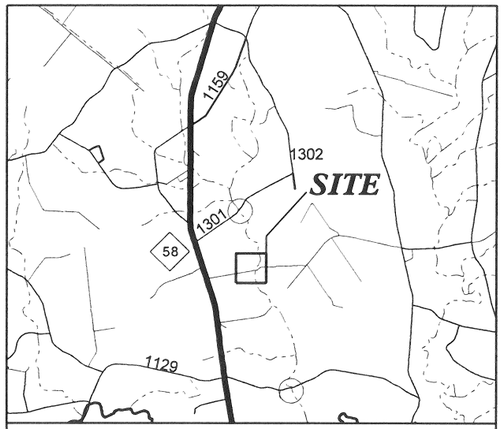
PROJECT: SCO-050650601 \ BROCK

STATE OF NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SCO-050650601	1	

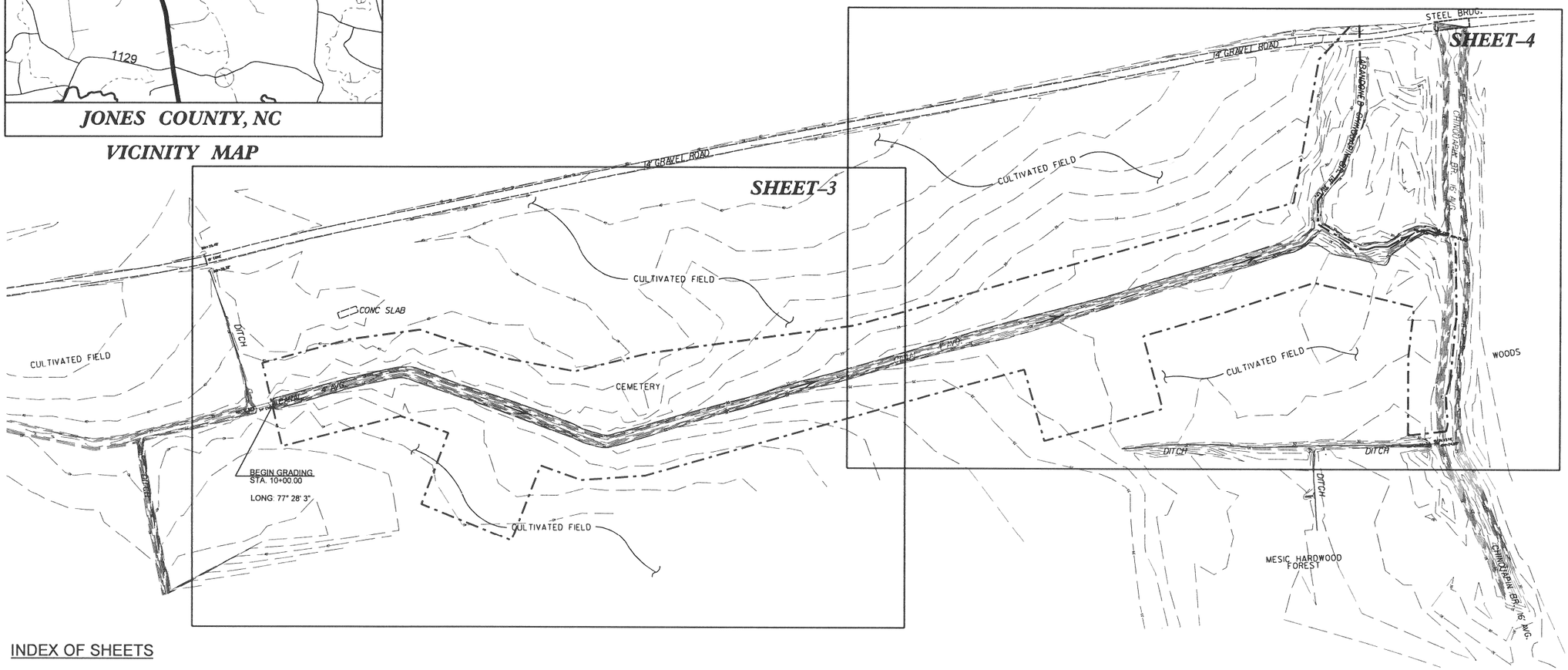
BROCK STREAM RESTORATION PROJECT
RECORD DRAWING

LOCATION: JONES COUNTY, NC



JONES COUNTY, NC

VICINITY MAP



INDEX OF SHEETS

GRAPHIC SCALES

20 10 0 20 40
PLANS

DESIGN DATA

CROSS-SECTION AREA	=	*9.0 SQ.FT.*
CROSS-SECTION DEPTH	=	*1.4 FT.*
CROSS-SECTION WIDTH	=	*7.0 FT.*
WIDTH /DEPTH RATIO	=	*5.0*
FLOOD PRONE AREA WIDTH	=	*42.0 FT.*

PROJECT LENGTH

TOTAL EXISTING STREAM LENGTH	=	*1850'*
STREAM ENHANCEMENT LENGTH	=	*1850'*
NON-RIVERINE BUFFER ACREAGE	=	*4.54 AC*
BUFFER PRESERVATION ACREAGE	=	*0.50 AC*
RESTORATION ACREAGE	=	*1.70 AC*
TOTAL DISTURBED ACREAGE	=	*4.75 AC*

EEP CONTACT:

Jessica Kemp
EEP PROJECT MANAGER

Lin Xu
REVIEW COORDINATOR

PREPARED IN THE OFFICE OF:

Stantec

Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Road
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

Brad G. Fairley
PROJECT MANAGER

C.W. GASKILL, JR., PE
CONSTRUCTION ENGINEER

CONSTRUCTION ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 034257 ENGINEER C.W. GASKILL, JR.

7-17-12

SIGNATURE *P.E.*

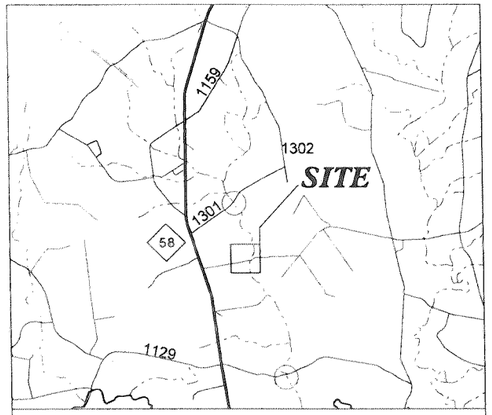
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SCO-050650601	1	

STATE OF NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

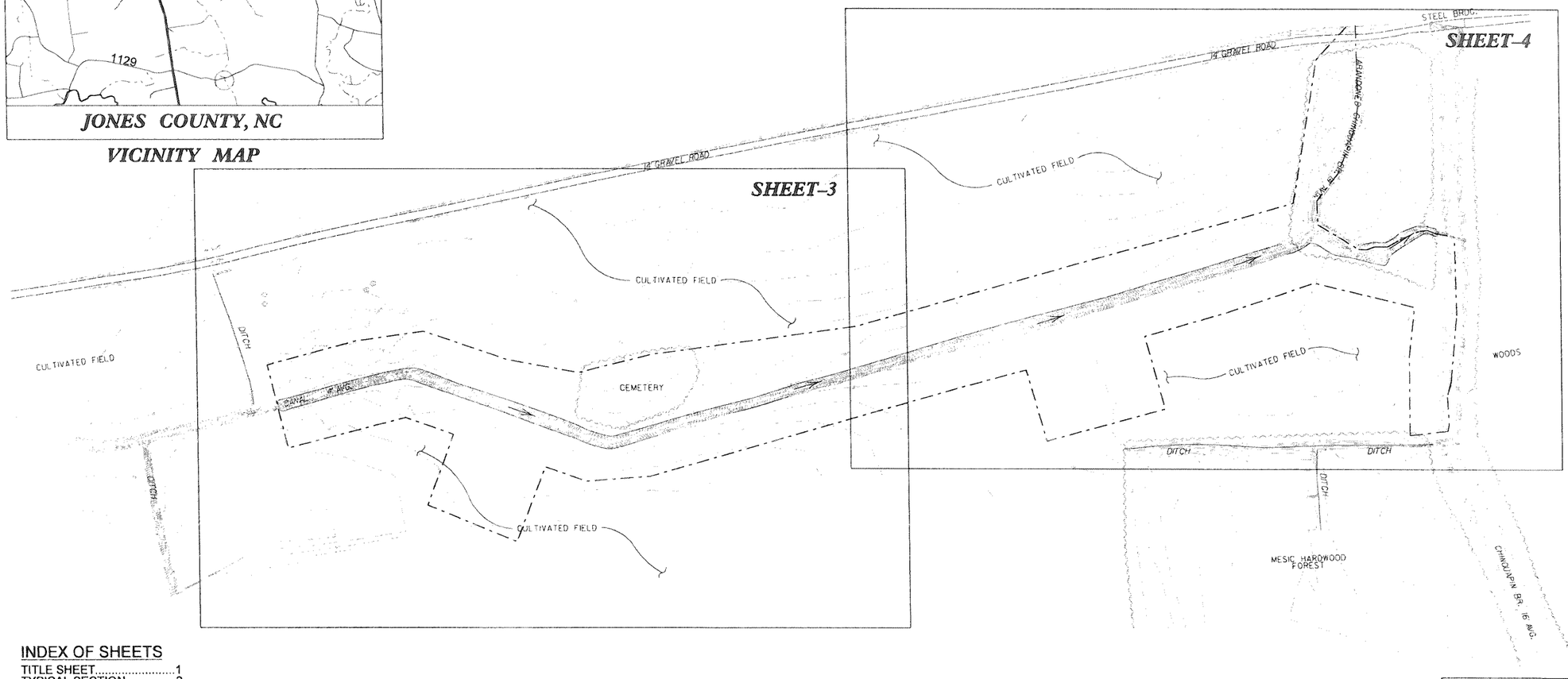
BROCK STREAM RESTORATION PROJECT

LOCATION: JONES COUNTY, NC

PROJECT: SCO-050650601 \ BROCK



VICINITY MAP



INDEX OF SHEETS

GRAPHIC SCALES

20 10 0 20 40
PLANS

DESIGN DATA

CROSS-SECTION AREA	=	*9.0 SQ.FT.*
CROSS-SECTION DEPTH	=	*1.4 FT.*
CROSS-SECTION WIDTH	=	*7.0 FT.*
WIDTH /DEPTH RATIO	=	*5.0*
FLOOD PRONE AREA WIDTH	=	*42.0 FT.*

PROJECT LENGTH

TOTAL EXISTING STREAM LENGTH	=	*1850'*
STREAM ENHANCEMENT LENGTH	=	*1850'*
NON-RIVERINE BUFFER ACREAGE	=	*4.54 AC*
BUFFER PRESERVATION ACREAGE	=	*0.50 AC*
RESTORATION ACREAGE	=	*1.70 AC*
TOTAL DISTURBED ACREAGE	=	*4.75 AC*

EEP CONTACT:

Jessica Kemp
EEP PROJECT MANAGER

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Brad G. Fairley
PROJECT MANAGER

Nathan E. Jean, PE
PROJECT DESIGNER

PROJECT DESIGN ENGINEER

07-16-

SEAL 032400 ENGINEER

SIGNATURE

8:35 AM
1/30/2012
J:\projects\050601\24\em\design\plan\brock_em_title_psh_v8.dgn

TYPICAL CHANNEL SECTION

SCALE: NTS

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Stantec Consulting Services Inc.
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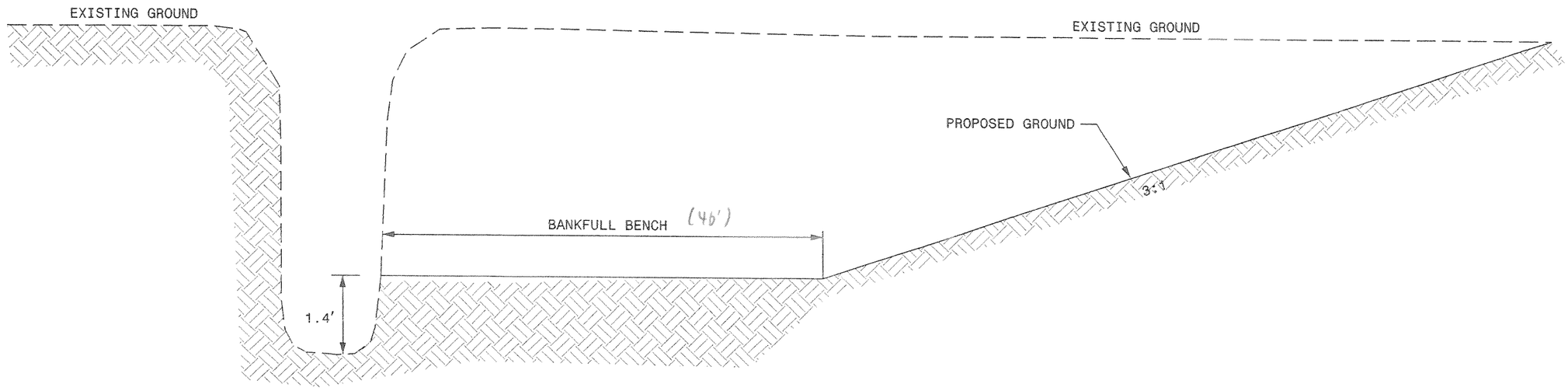
PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	2
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 04/01/08



- 5.0' VARING DEPTHS OF CUT
- 40.0' FLOODPLAIN WIDTH (BANKFULL BENCH)
- 60.0' FLOODPLAIN SLOPE GRADING LIMITS

NOTE:
SEE SLOPE STAKE LINES ON PLANSHEETS OR E&SC SHEETS

LOCATION:	RESTORATION PLANS FOR BROCK STREAM RESTORATION
PROJECT NO.: SCO-050650601	COUNTY: JONES
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAM	DATE:

4/1/2008
9:47 PM
U:\NC\RDU\Projects\Environmental\Mitigation\SCO-050650601\Design\Plans\Sheets\Typical Channel Section.dgn

CONSTRUCTION SEQUENCE

Stantec
Stantec Consulting Services Inc.
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Fax 919.851.7024
www.stantec.com

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	2A
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 029511 ENGINEER
04/01/08

SEQUENCE OF CONSTRUCTION EVENTS

The Contractor is responsible for the following sequence of construction in accordance with the construction plans and the Special Provisions. Any changes or improvements to the sequence of construction must be approved by the design engineer or by an on-site constructor engineer intern.

I. Initial Site Preparation
1. Install construction entrances.
2. Prepare staging and stockpiling areas in locations as shown on the construction plans or as approved by the Owner or owner's representative.
3. Stake limits of construction as shown on the construction plans or as directed by the Owner or Owner's representative.
4. Install construction entrance.
5. Please note that all heavy equipment shall enter the site on the temporary driveway off NC-58 on Clare Brock's property.

II. Channel Construction
1. Note: Project will be constructed from the upstream working in the downstream direction.
2. Install all silt fences as shown on plans.
3. Improve access road from NC 58 to sta. 10+00. Beginning at sta. 10+00 and working north construct construction access road as shown on plans. Access road does not require gravel, but is the contractor's responsibility to maintain through out the Sequence of Construction.
4. Construct the proposed bankfull bench between Stations 10+00 and the end of the project at sta. 28+50. This includes excavation of proposed bench as shown on plans. Construct only that portion of the bench that can be completed and stabilized within the same day. Silt fence shall be installed immediatley after (within the same day) the berm is graded for the bankfull bench. Construct the proposed bankfull bench to the grade specified. Stockpile and separate all soil suitable for fill or topsoil in the area indicated on the construction plans. Any soil unsuitable for fill shall be disposed of as directed in Special Provisions.

III. The contractor is responsible for maintaining all erosion control measures:
1. Inspect all measures for stability and operation weekly or within 24 hours after any storm event.
2. Clean out silt traps and sediment basins when half of capacity is reached.
3. Remove sediment from behind silt fence when it's height reaches 0.5'.
4. If any erosion and sedimentation control measure is found to be unstable or not functioning properly, repairs should be done immediately to maintain measures as designed or as directed by the engineer.

IV. Remove sediment and erosion control devices, any temporary fencing, staking, sensitive area marking materials, trash, etc. from the site as approved by the owner or owner's representative.

V. Seed and mulch staging, stockpiling, and any bare areas with permanent seed mixture. Deep rip access road from sta. 10+00 to 28+50 prior to seeding. No seeding shall be placed on access road from NC 58 to sta. 10+00.

VI. Plant project in accordance with the planting plan.

VII. Site clean up shall occur after all construction processes have been completed. Site clean up shall include pick up of trash and construction materials.

OVERALL SITE LEGEND

- CONSERVATION EASEMENT LIMITS
- SLOPE STAKE LINES
- TREE LINE
- TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- SILT FENCE
- LIMITS OF DISTURBANCE
- STREAMBANK PLANTING
- FLOODPLAIN BUFFER PLANTING
- UPLAND BUFFER PLANTING
- BOTTOMLAND HARDWOOD PRESERVATION

LOCATION:	RESTORATION PLANS FOR BROCK STREAM RESTORATION
PROJECT NO.	SCO-050650601 COUNTY: JONES
DESIGNED BY:	NEJ DRAWN BY: CGM
CHECKED BY:	BAM DATE:

PLAN VIEW

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	3
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 033611 ENGINEER MATTHEW A. KEA

4/9/08

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14' GRAVEL ROAD

CULTIVATED FIELD

CONSERVATION EASEMENT LIMITS

DITCH

CANAL

CEMETERY

11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00

MATCHLINE SEE SHEET 4 STA.20+64.22

SLOPE STAKE LINES

BEGIN GRADING
STA. 10+00.00
LAT: 35° 6' 17"
LONG: 77° 28' 3"

CULTIVATED FIELD

KNOWN DRAIN TILE LOCATIONS
LAT: 35.096364, LONG: 77.467685
LAT: 35.099746, LONG: 77.465579
SUSPECTED DRAIN TILE LOCATIONS
LAT: 35098775, LONG: 77.465964
LAT: 35.099224, LONG: 77.465796
LAT: 35.099544, LONG: 77.465679
LAT: 35.100782, LONG: 77.465355
ALL DRAIN TILES ARE TO BE MAINTAINED AND OUTFALL ONTO THE FLOOD PLAIN

LEGEND

- CONSERVATION EASEMENT LIMITS
- SLOPE STAKE LINES
- TREE LINE

NOTE:
REMOVE EXISTING TOPSOIL WITHIN THE AREAS TO BE RERESTORED.
THE EXCAVATED MATERIAL WILL BE STOCKPILED AND SPREAD ACROSS AGRICULTURE FIELD.
ENHANCEMENT STA. 10+00.00 TO STA. 20+64.22

SCALE 20 0 40

LOCATION:	RESTORATION PLANS FOR BROCK STREAM RESTORATION
PROJECT NO.	SCO-050650601
COUNTY:	JONES
DESIGNED BY:	NEJ
DRAWN BY:	CGM
CHECKED BY:	BAM
DATE:	

PLAN VIEW

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	4
PROJECT ENGINEER	

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NORTH CAROLINA PROFESSIONAL SEAL 032511 ENGINEER BRIAN A. MURDOCK
4-20-18

KNOWN DRAIN TILE LOCATIONS
LAT: 35.096364, LONG: 77.467685
LAT: 35.099746, LONG: 77.465579
SUSPECTED DRAIN TILE LOCATIONS
LAT: 35098775, LONG: 77.465964
LAT: 35.099224, LONG: 77.465796
LAT: 35.099544, LONG: 77.465679
LAT: 35.100782, LONG: 77.465355
ALL DRAIN TILES ARE TO BE MAINTAINED
AND OUTFALL ONTO THE FLOOD PLAIN

14' GRAVEL ROAD

CULTIVATED FIELD

CONSERVATION EASEMENT LIMITS

ABANDONED CHANNEL BFR = 12' AVG.

END GRADING
STA. 28+50.16
LAT: 35° 6' 4"
LONG: 77° 27' 55"

MATCHLINE SEE SHEET 3 STA.20+64.22

21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00

SLOPE STAKE LINES

CULTIVATED FIELD

DITCH

LEGEND

CONSERVATION EASEMENT LIMITS

SLOPE STAKE LINES

TREE LINE

NOTE:
REMOVE EXISTING TOPSOIL WITHIN THE AREAS TO BE RERESTORED.
THE EXCAVATED MATERIAL WILL BE STOCKPILED
AND SPREAD ACROSS AGRICULTURE FIELD.
ENHANCEMENT STA. 20+64.22 TO STA. 28+50.16

20 0 40
SCALE

LOCATION: RESTORATION PLANS FOR BROCK STREAM RESTORATION
PROJECT NO: SCO-050650601 COUNTY: JONES
DESIGNED BY: NEJ DRAWN BY: CGM
CHECKED BY: BAM DATE:

4/4/2018
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EROSION CONTROL

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	EC-1
PROJECT ENGINEER	

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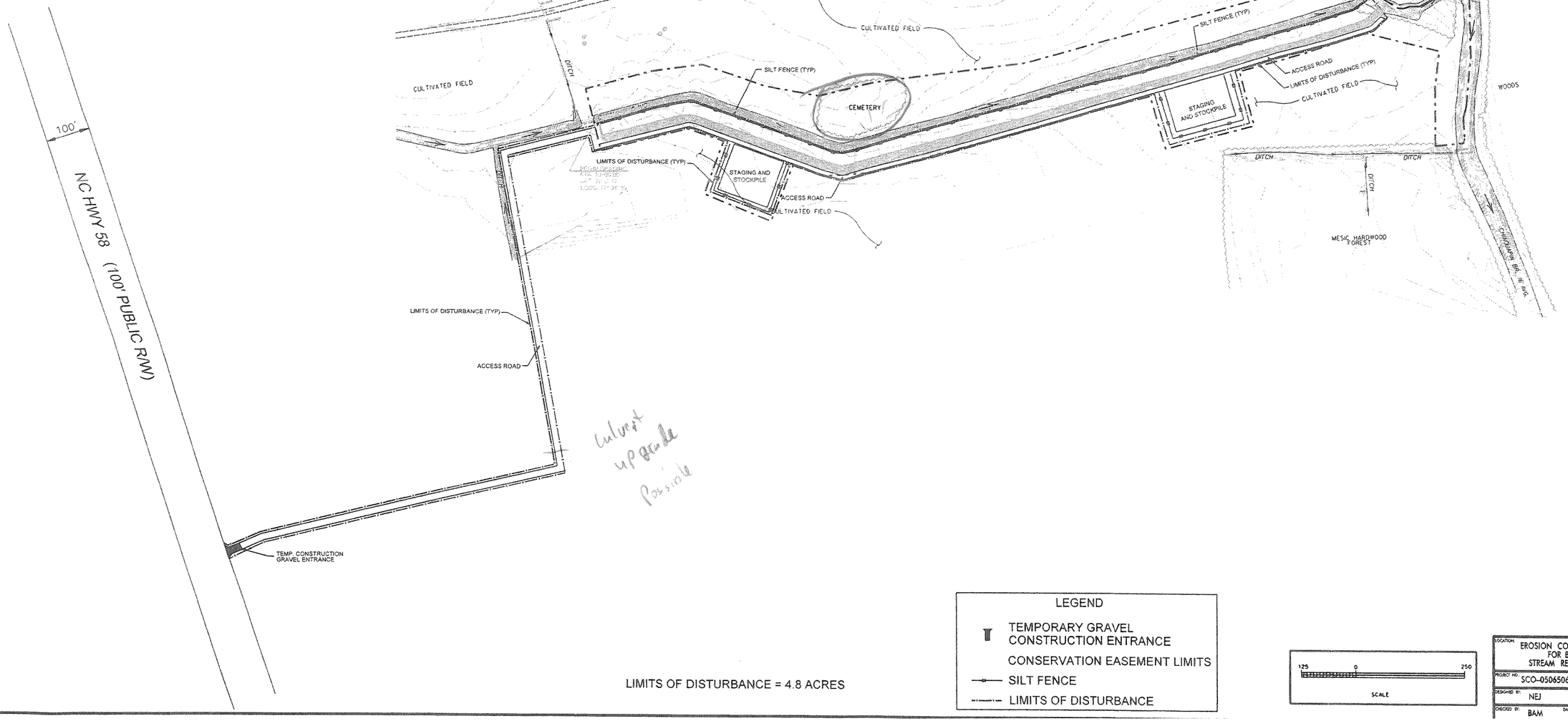

LIMITS OF DISTURBANCE = 4.8 ACRES

LEGEND

- TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- CONSERVATION EASEMENT LIMITS
- SILT FENCE
- LIMITS OF DISTURBANCE

125 0 250
SCALE

LOCATION: EROSION CONTROL PLANS FOR BROCK STREAM RESTORATION
PROJECT NO: SCO-050650601 COUNTY: JONES
DESIGNED BY: NEJ DRAWN BY: CGM
CHECKED BY: BAM DATE:

4/4/2008
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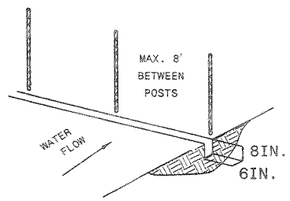
DETAILS

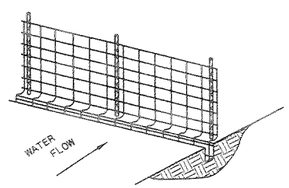
STANDARD TEMPORARY SILT FENCE

SCALE: N.T.S.

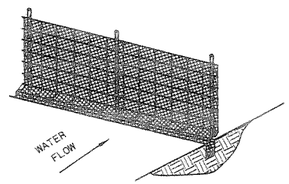
STEP 1:
DRIVE STEEL POSTS 18IN. INTO GROUND AND EXCAVATE A 6IN.x 6IN. TRENCH UPHILL ALONG THE LINE OF POSTS. WOOD POSTS 4IN. IN DIAMETER MAY BE USED.



STEP 2:
ATTACH WIRE FENCE TO POSTS AND EXTEND THE BOTTOM OF THE FENCE 8IN. INTO THE EXCAVATED TRENCH.

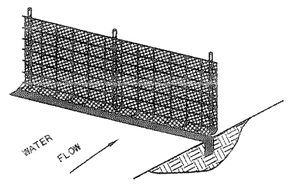


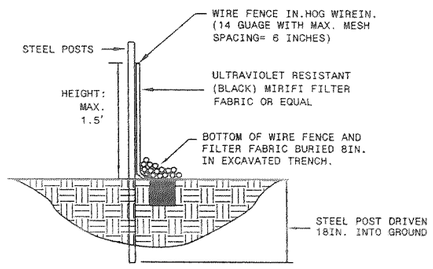
STEP 3:
ATTACH THE FILTER FABRIC TO THE WIRE FENCE AND EXTEND THE BOTTOM OF THE FABRIC 8IN. INTO THE TRENCH.



SECTION

STEP 4:
BACKFILL THE TRENCH AND COMPACT THE SOIL FIRMLY TO ANCHOR THE BOTTOM OF THE SILT FENCE SO THAT RUNOFF IS FORCED TO GO THROUGH THE FENCE AND CANNOT GO UNDER IT.





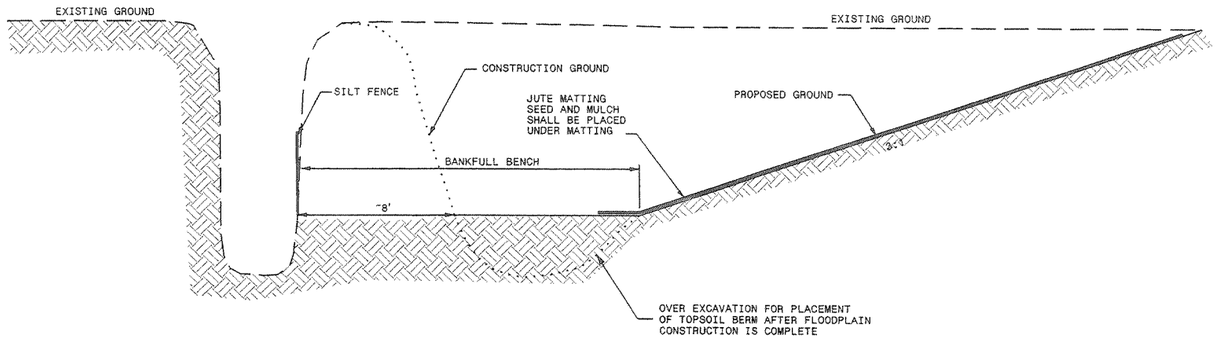
NOTE:
BOTTOM OF FILTER MUST BE PLACED IN TRENCH AND SECURED BY EITHER BACK-FILLING WITH SOIL MATERIAL AND TAMPING OR BY PLACING WASHED STONE TO A HEIGHT OF 6IN. ABOVE GROUND LEVEL.

CONSTRUCTION SPECIFICATIONS

1. CONSTRUCT SEDIMENT FENCE ON LOW SIDE OF TOPSOIL STOCKPILE TO PREVENT SEDIMENT FROM BEING WASHED INTO THE DRAINAGE SYSTEM. FENCE TO EXTEND AROUND APPROXIMATELY 70% OF THE PERIMETER OF THE STOCKPILE.
2. LOCATE POSTS DOWNSLOPE OF FABRIC TO HELP SUPPORT FENCING.
3. BURY TOE OF FENCE APPROXIMATELY 8" DEEP TO PREVENT UNDERCUTTING.
4. WHEN JOINTS ARE NECESSARY, SECURELY FASTEN THE FABRIC AT A SUPPORT POST WITH OVERLAP TO THE NEXT POST.
5. FILTER FABRIC TO BE ON NYLON, PLOYESTER, PROPYLENE OR ETHYLENE YARN WITH EXTRA STRENGTH-50LB/ LIN. IN. (MINIMUM) AND WITH A FLOW RATE OF AT LEAST 0.3 GAL./FT / MINUTE. FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABLIZERS.

CONSTRUCTION DETAIL

SCALE: NTS



NOTE:
1. CONTRACTOR IS TO EXCAVATE THE PROPOSED FLOODPLAIN AS SHOWN IN THE CONSTRUCTION PLANS. CONTRACTOR SHALL LEAVE A SOIL BERM BEHIND PROPOSED SILT FENCE AND EXCAVATE AND AREA BEHIND THE BERM FOR PLACEMENT OF SOIL FROM BERM WHEN CONSTRUCTION OF THE FLOODPLAIN IS COMPLETE. THE OVER EXCAVATED PORTION SHALL BE LARGE ENOUGH TO HOLD THE ENTIRE SOIL BERM.
2. SILT FENCE SHALL BE INSTALLED IMMEDIATELY AFTER THE BERM IS REMOVED. SILT FENCE SHALL REMAIN UNTIL GROUND COVER IS ESTABLISHED. ALL WORK IS TO BE STABILIZED AT THE END OF EACH DAY.

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PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	EC-2
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 024181 ENGINEER BRIAN A. MATTOX
4-10-08

Temporary Seeding

Temporary seeding shall be at the rate of 50 pounds per acre.
The contractor may choose between using foxtail millet or pearl top millet in summer months.
Rye grain and barley (Hordeum sp.) shall be used during the remainder of the year.
The dates for seeding during summer months are March 1 through August 31 and dates for seeding during the winter months are September 1 through February 28. Temporary seeding shall occur in all disturbed areas within the limits of disturbance. If the disturbed area is at final grade and ready for the final seeding, temporary seeding may be replaced with permanent seeding.

Temporary seeding will be carried out daily immediately following the completion of construction activities. All areas to be seeded shall also be mulched. Straw mulch is to be spread by hand, blower, or other suitable equipment.

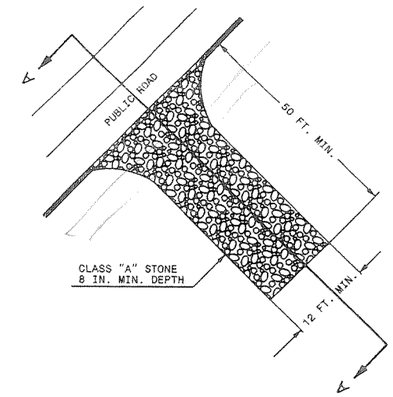
Fertilizer Topdressing

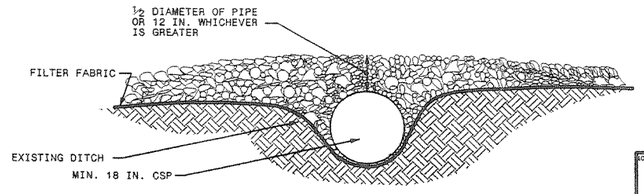
Fertilizer Topdressing
Fertilizer used for topdressing shall be 10 * 10 * 10 analysis and shall be applied at the rate of 50 pounds per acre. Upon written approval of the Owner or Owner's Representative, a different analysis and application rate of fertilizer may be used provided the 10 * 10 * 10 ratio is maintained. Fertilizer application will correspond with the temporary seeding.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

SCALE:NTS

NOTES:
1. TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS SHALL BE PROVIDED.
2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOP DRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED UP IMMEDIATELY.
5. GRAVEL CONSTRUCTION ENTRANCE SHALL BE LOCATED AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE MUST BE PROVIDED.
6. FILTER FABRIC TO BE PLACED BENEATH STONE
7. 18" CSP SHALL BE PLACED UNDER CONSTRUCTION ENTRANCE WHERE THE CONSTRUCTION ENTRANCE CROSSES OVER THE EXISTING DITCH. THE PIPE SHALL BE INSTALLED SO THAT IT HAS POSITIVE DRAINAGE, AND IT SHALL BE KEEP FREE FROM DEBRIS.





SECTION A-A

LOCATION:	EROSION CONTROL PLANS FOR BROCK STREAM RESTORATION
PROJECT NO.	SCO-050650601 COUNTY: JONES
DESIGNED BY:	NEJ DRAWN BY: CGM
CHECKED BY:	BAM DATE:

DETAILS

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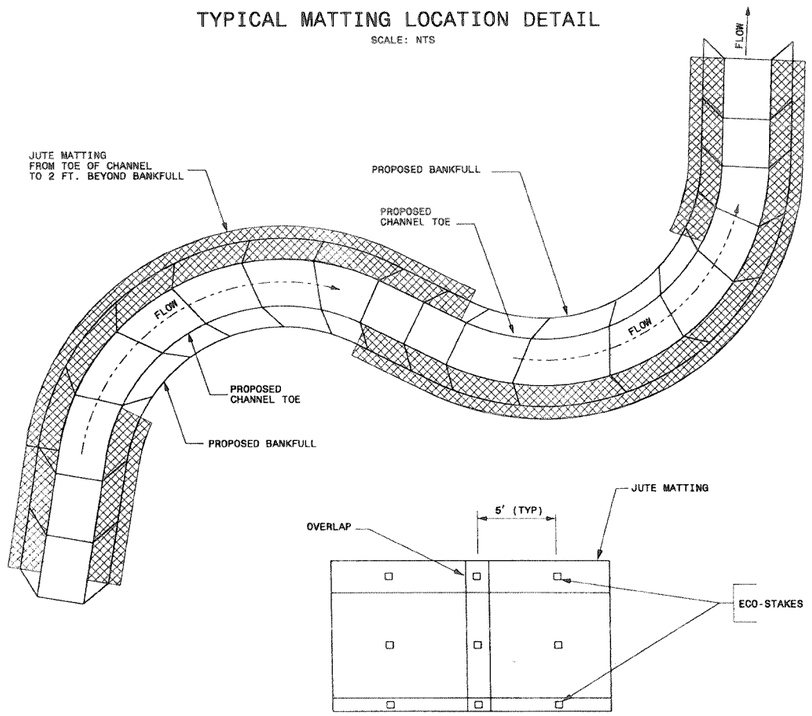
PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	EC-2A
PROJECT ENGINEER	

07/12/08

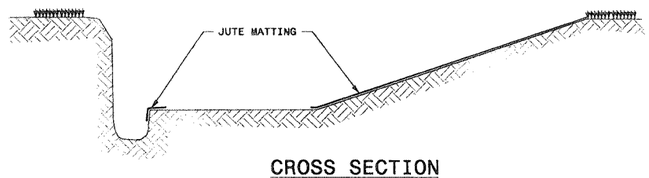
TYPICAL MATTING LOCATION DETAIL

SCALE: NTS

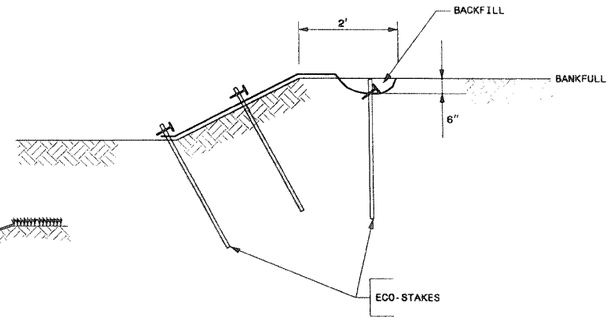


MATTING STAKING VIEW

NOTES:
1. USE ECO-STAKES TO SECURE MATTING\
2. JUTE MATTING IS IN TWO (2) LOCATIONS:
A) FROM THE TOE OF CHANNEL TO 2 FT. BEYOND BANKFUL
B) ALONG GRADED SLOPE, KEYED IN 2 FT. TOP AND BOTTOM



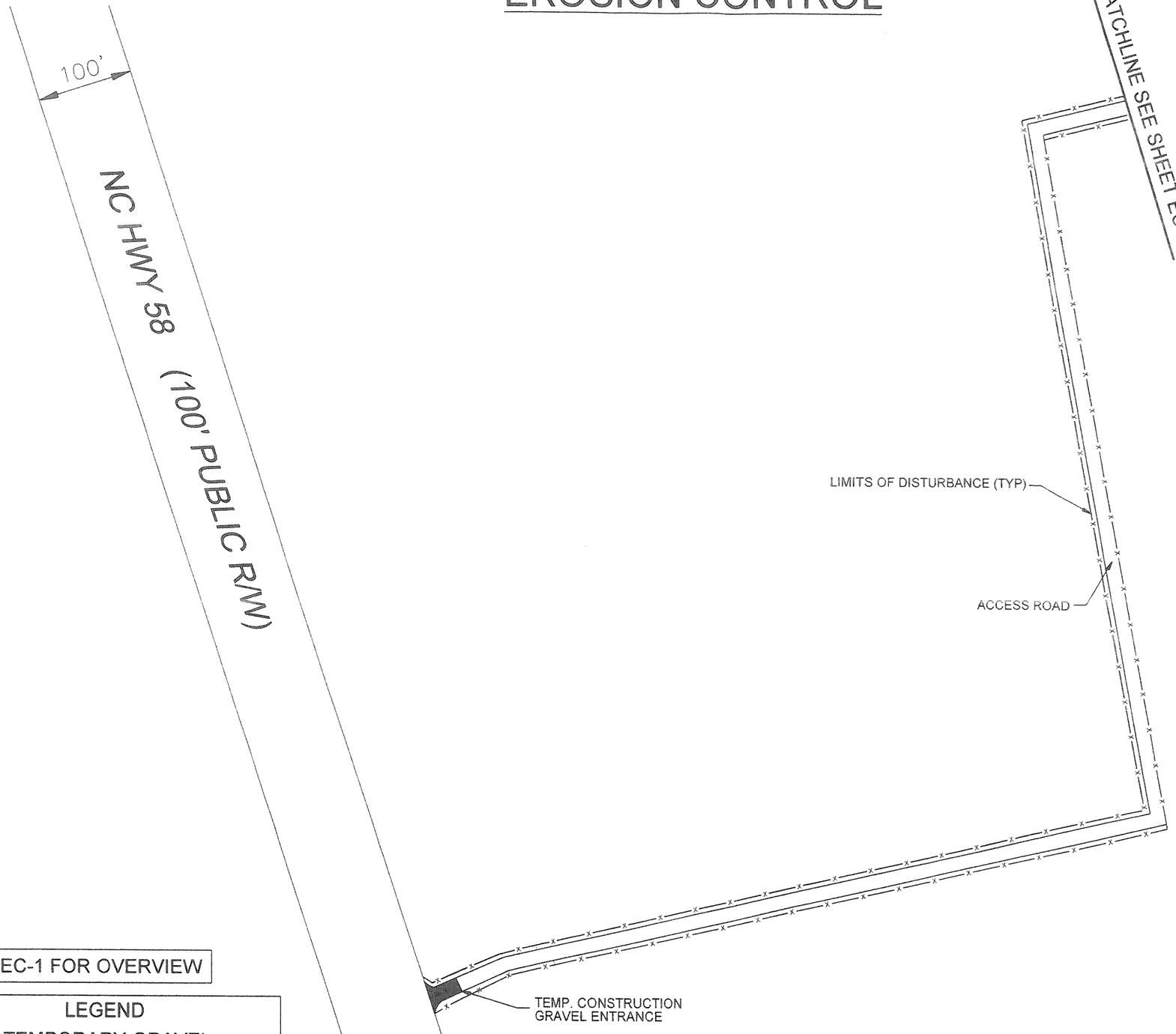
CROSS SECTION



SECTION A-A

LOCATION: EROSION CONTROL PLANS FOR BROCK STREAM RESTORATION	
PROJECT NO.: SCO-050650601	COUNTY: JONES
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAM	DATE:

EROSION CONTROL



SEE SHEET EC-1 FOR OVERVIEW

LEGEND

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

LIMITS OF DISTURBANCE

NOTE:
1. ACCESS ROAD SHALL BE "DEEP RIPPED" PRIOR TO PLANTING FROM STA. 10+00 TO 28+50
2. LIMITS OF DISTURBANCE = 4.8 ACRES

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	EC-3
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER

04-01-08

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SCALE 30 0 60

LOCATION	EROSION CONTROL PLANS FOR BROCK STREAM RESTORATION
PROJECT NO.	SCO-050650601
COUNTY	JONES
DESIGNED BY	NEJ
DRAWN BY	CGM
CHECKED BY	BAM
DATE	

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EROSION CONTROL

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	EC-4
PROJECT ENGINEER	

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NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER MATTHEW A. BOYER

04-04-08

14' GRAVEL ROAD

CULTIVATED FIELD

CONSERVATION EASEMENT LIMITS

SILT FENCE (TYP)

DITCH

CANAL

CEMETERY

11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00

1' AVG

MATCHLINE SEE SHEET EC-3

MATCHLINE SEE SHEET EC-5 STA.20+64.22

LIMITS OF DISTURBANCE (TYP)

BEGIN GRADING
STA. 10+00.00
LAT: 35° 6' 17"
LONG: 77° 28' 3"

STAGING AND STOCKPILE

SLOPE STAKE LINES

ACCESS ROAD

CULTIVATED FIELD

SEE SHEET EC-1 FOR OVERVIEW

LEGEND

- TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- CONSERVATION EASEMENT LIMITS
- SILT FENCE
- LIMITS OF DISTURBANCE

NOTE:
1. ENHANCEMENT STA. 10+00.00 TO STA.20+64.22
2. ACCESS ROAD SHALL BE "DEEP RIPPED" PRIOR TO PLANTING FROM STA. 10+00 TO 28+50
3. LIMITS OF DISTURBANCE = 4.8 ACRES

SCALE 20 0 40

LOCATION:	EROSION CONTROL PLANS FOR BROCK STREAM RESTORATION
PROJECT NO.:	SCO-050650601
COUNTY:	JONES
DESIGNED BY:	NEJ
DRAWN BY:	CGM
CHECKED BY:	BAM
DATE:	

EROSION CONTROL

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	EC-5
PROJECT ENGINEER	

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NORTH CAROLINA PROFESSIONAL SEAL 036261 ENGINEER

04-03-08

Nathan Steel

14' GRAVEL ROAD

CULTIVATED FIELD

CONSERVATION EASEMENT LIMITS

MATCHLINE SEE SHEET EC-4 STA.20+64.22

SILT FENCE (TYP)

21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00

SLOPE STAKE LINES

STAGING AND STOCKPILE

ACCESS ROAD

LIMITS OF DISTURBANCE (TYP)

CULTIVATED FIELD

DITCH

ADAMDAM-EP- CHANNEL PLAN -PR- 17 AUG

END GRADING
STA. 28+50.16
LAT. 35° 6' 4"
LONG: 77° 27' 55"

SEE SHEET EC-1 FOR OVERVIEW

LEGEND

- CONSERVATION EASEMENT LIMITS
- SILT FENCE
- LIMITS OF DISTURBANCE

NOTE:
1. ENHANCEMENT STA. 20+64.22 TO STA. 28+50.16
2. ACCESS ROAD SHALL BE "DEEP RIPPED" PRIOR TO PLANTING FROM STA. 10+00 TO 28+50
3. LIMITS OF DISTURBANCE = 4.8 ACRES

20 0 40
SCALE

LOCATION: EROSION CONTROL PLANS FOR BROCK STREAM RESTORATION	
PROJECT NO. SCO-050650601	COUNTY: JONES
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAM	DATE:

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PLANTING PLAN

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	PL-1
PROJECT ENGINEER	

04-9-08

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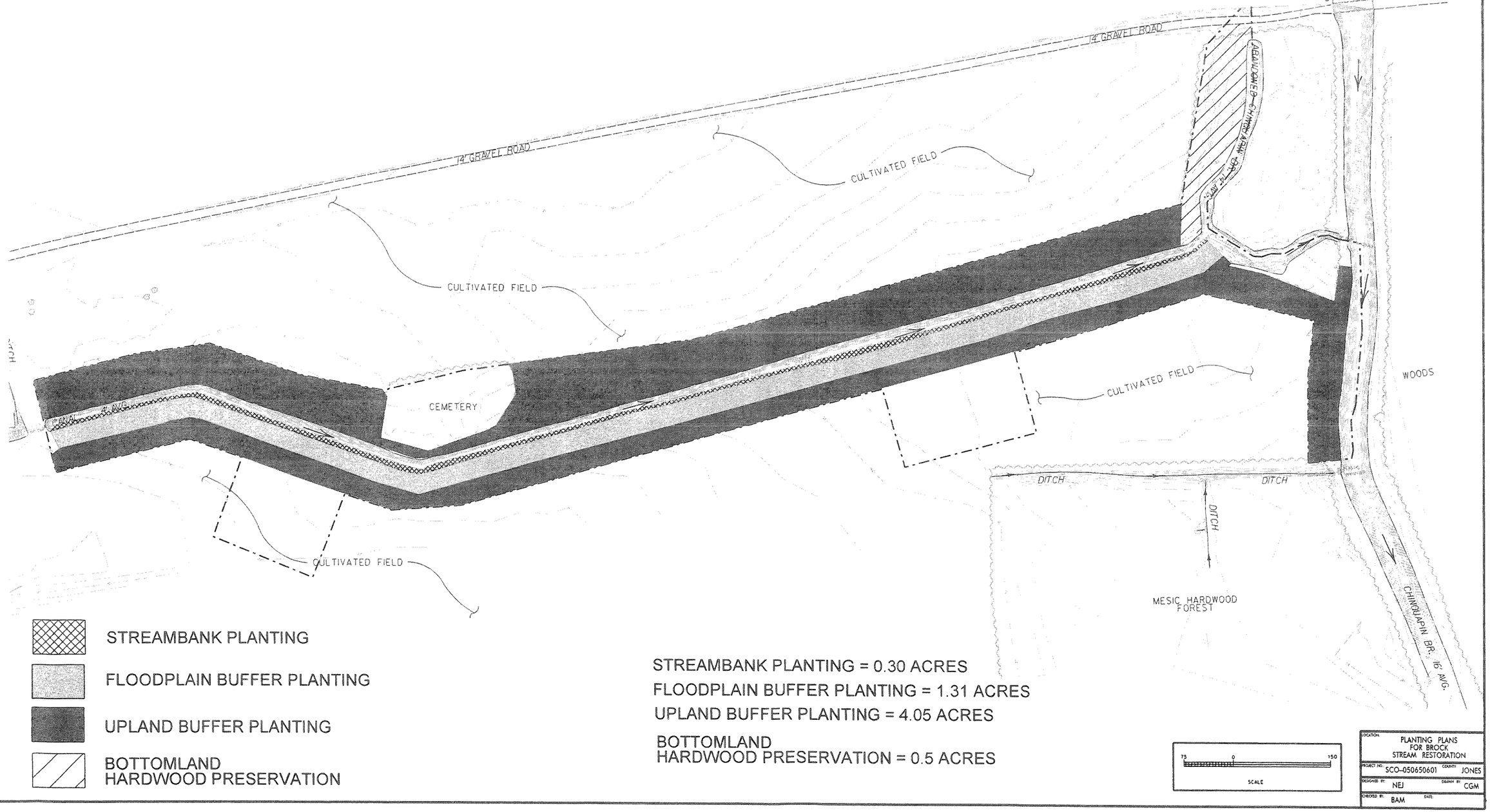

STREAMBANK PLANTING

FLOODPLAIN BUFFER PLANTING

UPLAND BUFFER PLANTING

BOTTOMLAND HARDWOOD PRESERVATION

STREAMBANK PLANTING = 0.30 ACRES
FLOODPLAIN BUFFER PLANTING = 1.31 ACRES
UPLAND BUFFER PLANTING = 4.05 ACRES
BOTTOMLAND HARDWOOD PRESERVATION = 0.5 ACRES

75 0 150
SCALE

LOCATION:	PLANTING PLANS FOR BROCK STREAM RESTORATION
PROJECT NO.	SCO-050650601
COUNTY	JONES
DESIGNED BY:	NEJ
DRAWN BY:	CGM
CHECKED BY:	BAM
DATE:	

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DETAILS

PLANT LIST FOR TREES AND SHRUBS BY ZONE		
COMMON NAME	SCIENTIFIC NAME	SOUTHEAST REGION INDICATOR
STREAMBANK PLANTING		
SMOOTH ALDER	*Alnus serrulata*	FACULTATIVE WETLAND +
SWAMP DOGWOOD	*Cornus stricta*	FACULTATIVE WETLAND -
VIRGINIA WILLOW	*Itea virginica*	FACULTATIVE WETLAND +
ELDERBERRY	*Sambucus Canadensis*	FACULTATIVE WETLAND -
FLOODPLAIN BUFFER PLANTING- COASTAL PLAIN BOTTOMLAND HARDWOOD FOREST		
GREEN ASH	*Fraxinus pennsylvanica*	FACULTATIVE WETLAND
AMERICAN SYCAMORE	*Platanus occidentalis*	FACULTATIVE WETLAND -
SWAMP CHESTNUT OAK	*Quercus michauxii*	FACULTATIVE WETLAND -
WATER OAK	*Quercus nigra*	FACULTATIVE
WILLOW OAK	*Quercus phellos*	FACULTATIVE WETLAND -
UPLAND BUFFER PLANTING- MIXED MESIC HARDWOOD FOREST COASTAL PLAIN SUBTYPE		
BITTERNUT HICKORY	*Carya cordiformis*	FACULTATIVE
SWEET PEPPERBUSH	*Clethra alnifolia*	FACULTATIVE WETLAND
AMERICAN SYCAMORE	*Plantanus occidentalis*	FACULTATIVE WETLAND -
CHERRYBARK OAK	*Quercus alacate* var *pagodaefolia*	FACULTATIVE +
WHITE OAK	*Quercus alba*	FACULTATIVE UPLAND
SWAMP CHESTNUT OAK	*Quercus michauxii*	FACULTATIVE WETLAND -

PERMANENT SEEDING MIX			
COMMON NAME	SPECIES	SEEDING DATA	SEEDING RATE (LBS/ACRE)
REDTOP	*Agrostis alba*	APRIL 1 - JULY 1	5
BIG BLUESTEM	*Andopogon geradii*	APRIL 15 - JULY 1	5
INDIAN GRASS	*Sorgastrum nutans*	APRIL 15 - JULY 1	5
SWITCHGRASS	*Panicum virgatum*	APRIL 15 - JULY 1	15
BROWN TOP MILLET	*Pennisetum glaucoma*	MAY 1 - JULY 15	10
TOTAL			40

TEMPORARY SEEDING
FOXTAIL MILLET OR PEARL TOP MILLET IN SUMMER MONTHS. RYE GRAIN AND BARLEY SHALL BE USED DURNING THE REMAINDER OF THE YEAR

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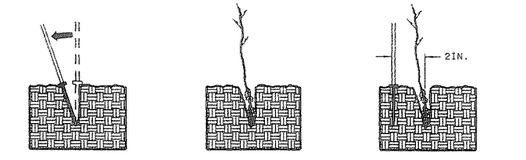
Raleigh, NC 27606
Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	PL-2
PROJECT ENGINEER	

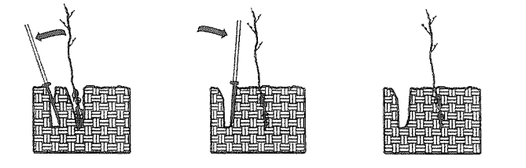
NORTH CAROLINA PROFESSIONAL SEAL 032611 ENGINEER BRIAN A. MATTHEWS
04-01-08

PLANTING DETAILS
SEEDLING / LINER BAREROOT PLANTING DETAIL
SCALE:NTS

DIBBLE PLANTING METHOD
USING THE KBC PLANTING BAR
(FOR FLOODPLAIN BUFFER PLANTING AND UPLAND BUFFER PLANTING)



1. Insert planting bar as shown and pull handle toward planter.
2. Remove planting bar and place seedling at correct depth.
3. Insert planting bar 2IN. toward planter from seedling.



4. Pull handle of bar toward planter, firming soil at bottom.
5. Push handle forward firming soil at top.
6. Leave compaction hole open. Water thoroughly.

PLANTING NOTES:

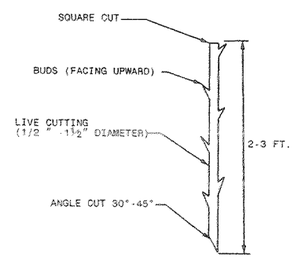
PLANTING BAG
During planting, seedlings shall be kept in a moist canvas bag or similar container to prevent the root systems from drying.

KBC PLANTING BAR
Planting bar shall have a blade with a triangular cross section, and shall be 12IN. long, 4IN. wide and 1IN. thick at center.

ROOT PRUNING
All seedlings shall be root pruned, if necessary, so that no roots extend more than 10 inches (10IN.) below the root collar.

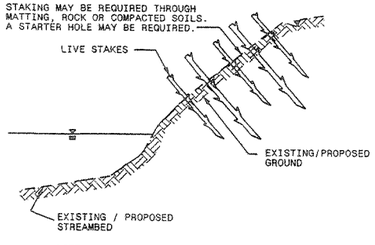
NOTES:
1. TREE REFORESTATION SHALL BE PLANTED 6' TO 10' ON CENTER, RANDOM SPACING, AVERAGING 8' ON CENTER, APPROXIMATELY 680 PLANTS PER ACRE.
2. OTHER PLANTING METHOD CAN BE USED WITH THE PERMISSION OF THE PLANTING SUPERVISOR.

LIVE STAKE DETAIL
(FOR STREAMBANK PLANTING)
SCALE:NTS



LIVE STAKE

NOTE: STAKING MAY BE REQUIRED THROUGH MATTING, ROCK OR COMPACTED SOILS. A STARTER HOLE MAY BE REQUIRED.



NOTE:
1. LIVE STAKES SHALL BE EVENLY SPACED 3 FT. APART.
2. LIVE STAKES SHALL BE DRIVEN UNTIL APPROXIMATELY ¾ OF LIVE STAKE IS WITHIN GROUND.
3. IF STARTER HOLE IS NEEDED, MINIMIZE AIR POCKET.
4. UTILIZE ALL ON SITE TRANSPLANT MATERIALS MADE AVAILABLE BY THE OWNER. ONCE SOURCE OF TRANSPLANT MATERIAL HAS BEEN HARVESTED, THEN UTILIZE LIVE STAKING.

BANK STABILIZATION WITH LIVE STAKES

LOCATION:	PLANTING PLANS FOR BROCK STREAM RESTORATION
PROJECT NO:	SCO-050650601
COUNTY:	JONES
DESIGNED BY:	NEJ
DRAWN BY:	CGM
CHECKED BY:	BAM
DATE:	

4/1/2008
08:49 PM
U:\NC\Raleigh\Projects\Planting plans\brock_pp_PL_details_v2.dgn

PLANTING PLAN

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	PL-3
PROJECT ENGINEER	

04-01-08

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14' GRAVEL ROAD

CULTIVATED FIELD

CONSERVATION EASEMENT LIMITS

DITCH

CEMETERY

BEGIN GRADING
STA. 10+00.00

SLOPE STAKE LINES

MATCHLINE SEE SHEET PL-4 STA.20+64.22

LEGEND

STREAMBANK PLANTING

FLOODPLAIN BUFFER PLANTING

UPLAND BUFFER PLANTING

NOTE:
ENHANCEMENT STA. 10+00.00 TO STA.20+64.22

20 0 40
SCALE

LOCATION:	PLANTING PLANS FOR BROCK STREAM RESTORATION
PROJECT NO: SCO-050650601	COUNTY: JONES
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAM	DATE:

PLANTING PLANS

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	PL-4
PROJECT ENGINEER	

04-d-28

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14' GRAVEL

CULTIVATED FIELD

CONSERVATION EASEMENT LIMITS

ABANDONED CHANNEL - BFI = 14' AVG.

21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00

MATCHLINE SEE SHEET PL-3 STA.20+64.22

SLOPE STAKE LINES

CULTIVATED FIELD

DITCH

DITCH

N

LEGEND

- STREAMBANK PLANTING
- FLOODPLAIN BUFFER PLANTING
- UPLAND BUFFER PLANTING
- BOTTOMLAND HARDWOOD PRESERVATION

NOTE:
ENHANCEMENT STA.20+64.22 TO STA. 28+50.16

20 0 40
SCALE

LOCATION:	PLANTING PLANS FOR BROCK STREAM RESTORATION
PROJECT NO:	SCO-050650601
COUNTY:	JONES
DESIGNED BY:	NEJ
DRAWN BY:	CGM
CHECKED BY:	BAM
DATE:	

RE-PLANTING MAP

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	PL-3
PROJECT ENGINEER	

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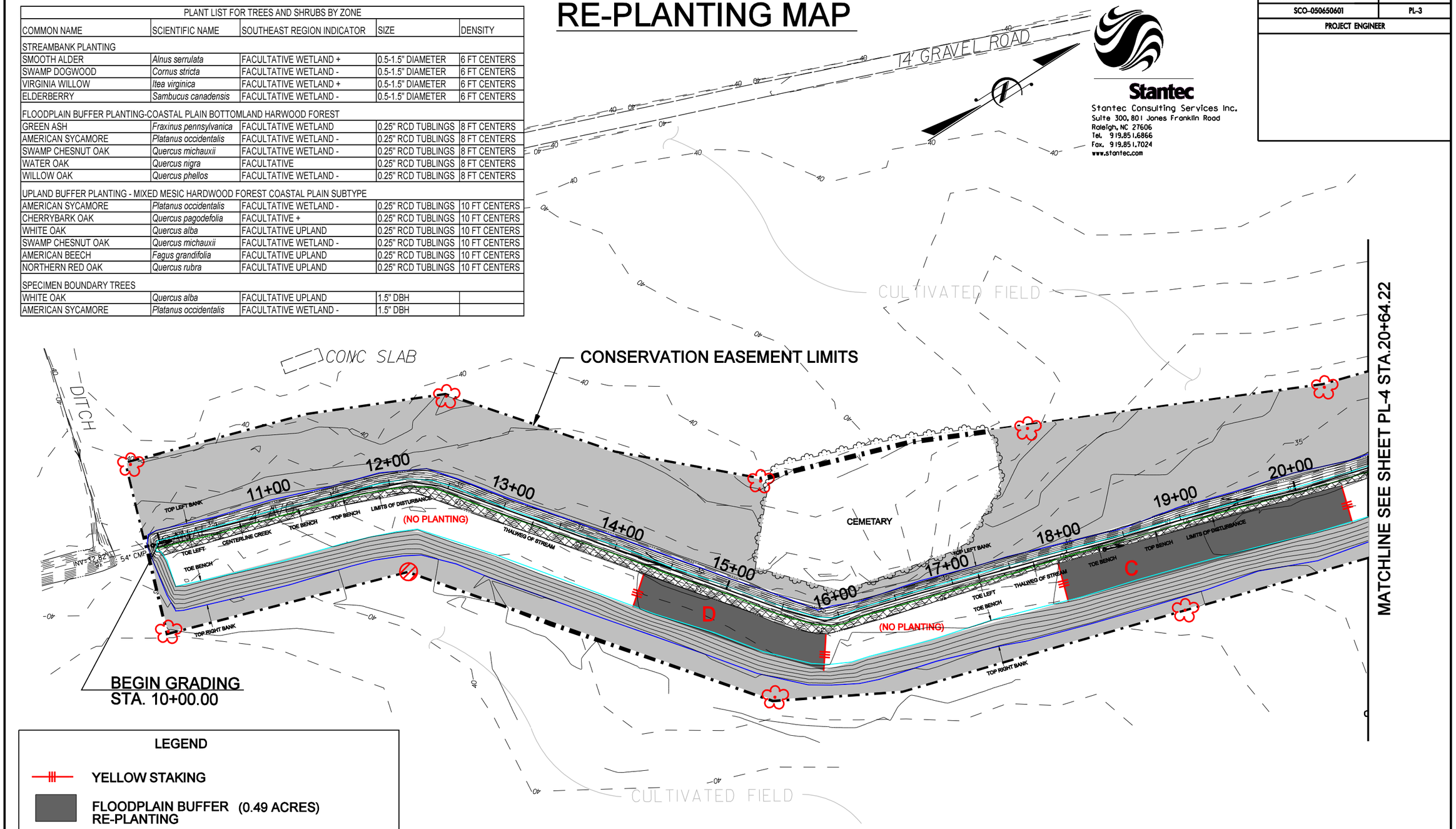
PLANT LIST FOR TREES AND SHRUBS BY ZONE

COMMON NAME	SCIENTIFIC NAME	SOUTHEAST REGION INDICATOR	SIZE	DENSITY
STREAMBANK PLANTING				
SMOOTH ALDER	*Alnus serrulata*	FACULTATIVE WETLAND +	0.5-1.5" DIAMETER	6 FT CENTERS
SWAMP DOGWOOD	*Cornus stricta*	FACULTATIVE WETLAND -	0.5-1.5" DIAMETER	6 FT CENTERS
VIRGINIA WILLOW	*Itea virginica*	FACULTATIVE WETLAND +	0.5-1.5" DIAMETER	6 FT CENTERS
ELDERBERRY	*Sambucus canadensis*	FACULTATIVE WETLAND -	0.5-1.5" DIAMETER	6 FT CENTERS
FLOODPLAIN BUFFER PLANTING-COASTAL PLAIN BOTTOMLAND HARWOOD FOREST				
GREEN ASH	*Fraxinus pennsylvanica*	FACULTATIVE WETLAND	0.25" RCD TUBLINGS	8 FT CENTERS
AMERICAN SYCAMORE	*Platanus occidentalis*	FACULTATIVE WETLAND -	0.25" RCD TUBLINGS	8 FT CENTERS
SWAMP CHESNUT OAK	*Quercus michauxii*	FACULTATIVE WETLAND -	0.25" RCD TUBLINGS	8 FT CENTERS
WATER OAK	*Quercus nigra*	FACULTATIVE	0.25" RCD TUBLINGS	8 FT CENTERS
WILLOW OAK	*Quercus phellos*	FACULTATIVE WETLAND -	0.25" RCD TUBLINGS	8 FT CENTERS
UPLAND BUFFER PLANTING - MIXED MESIC HARDWOOD FOREST COASTAL PLAIN SUBTYPE				
AMERICAN SYCAMORE	*Platanus occidentalis*	FACULTATIVE WETLAND -	0.25" RCD TUBLINGS	10 FT CENTERS
CHERRYBARK OAK	*Quercus pagodefolia*	FACULTATIVE +	0.25" RCD TUBLINGS	10 FT CENTERS
WHITE OAK	*Quercus alba*	FACULTATIVE UPLAND	0.25" RCD TUBLINGS	10 FT CENTERS
SWAMP CHESNUT OAK	*Quercus michauxii*	FACULTATIVE WETLAND -	0.25" RCD TUBLINGS	10 FT CENTERS
AMERICAN BEECH	*Fagus grandifolia*	FACULTATIVE UPLAND	0.25" RCD TUBLINGS	10 FT CENTERS
NORTHERN RED OAK	*Quercus rubra*	FACULTATIVE UPLAND	0.25" RCD TUBLINGS	10 FT CENTERS
SPECIMEN BOUNDARY TREES				
WHITE OAK	*Quercus alba*	FACULTATIVE UPLAND	1.5" DBH	
AMERICAN SYCAMORE	*Platanus occidentalis*	FACULTATIVE WETLAND -	1.5" DBH	



LEGEND

- YELLOW STAKING
- FLOODPLAIN BUFFER (0.49 ACRES) RE-PLANTING
- UPLAND BUFFER RE-PLANTING (4.59 ACRES)
- STREAMBANK RE-PLANTING (1830 LF)
- LIVE SPECIMEN BOUNDARY TREE
- DEAD SPECIMEN BOUNDARY TREE (4)

SCALE 20 0 40

LOCATION:	AS-BUILT PLANTING PLANS FOR BROCK STREAM RESTORATION
PROJECT NO.: SCO-050650601	COUNTY: JONES
DESIGNED BY: CWG	DRAWN BY: RLA
CHECKED BY: ALC	DATE: 12-07-09

RE-PLANTING MAP

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	PL-4
PROJECT ENGINEER	

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CULTIVATED FIELD

CONSERVATION EASEMENT LIMITS

MATCHLINE SEE SHEET PL-3 STA.20+64.22

21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00

(NO PLANTING)

(NO PLANTING)

B

A

TOP RIGHT BANK

ABANDONED CHINQUAPIN BR. 14 ATS

CHINQUAPIN BR. 16 ATS

DITCH

DITCH

INV-25.65

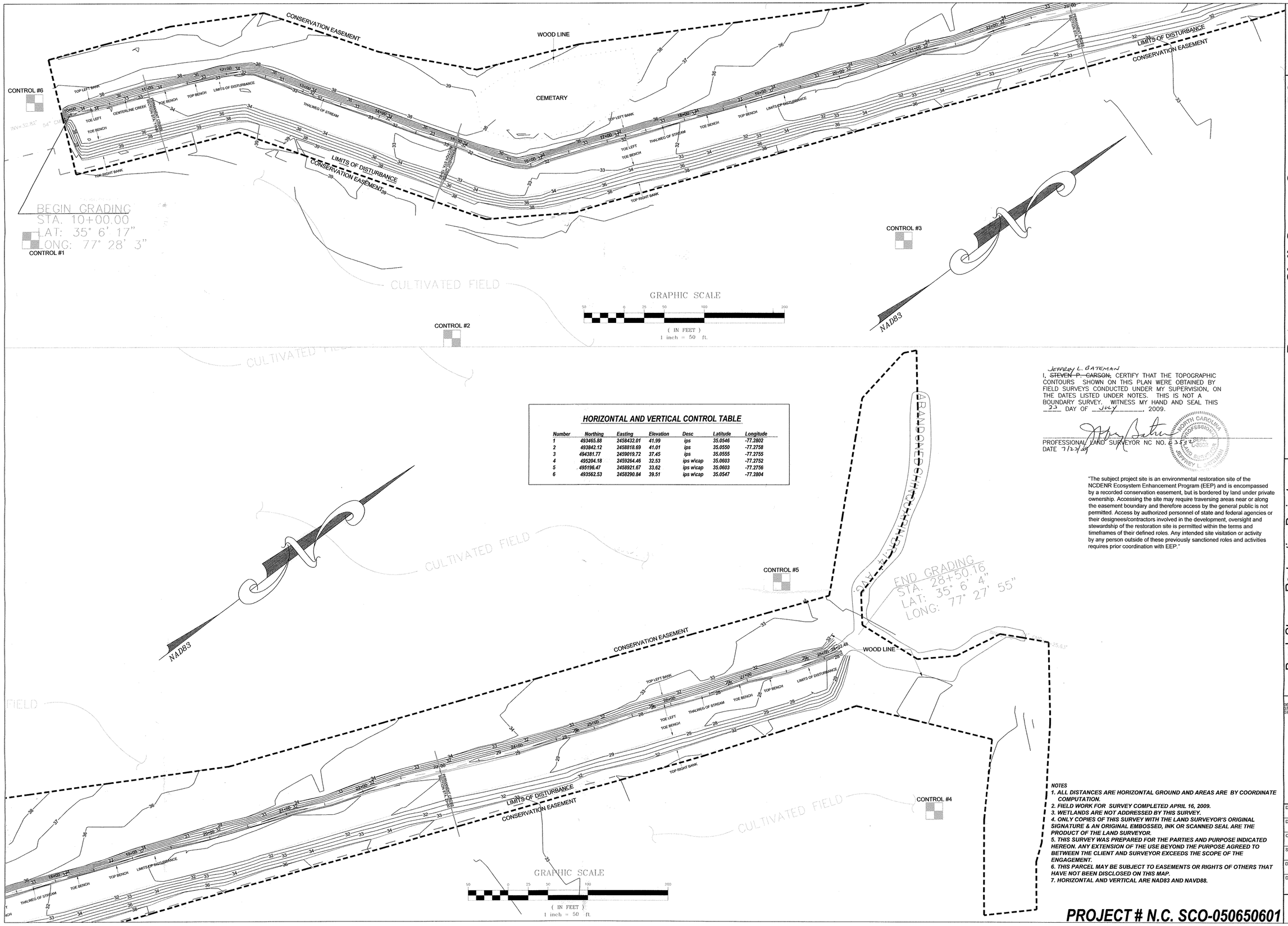
INV-24.65

LEGEND

- YELLOW STAKING
- FLOODPLAIN BUFFER (0.49 ACRES) RE-PLANTING
- UPLAND BUFFER RE-PLANTING (4.59 ACRES)
- STREAMBANK RE-PLANTING (1830 LF)
- LIVE SPECIMEN BOUNDARY TREE
- DEAD SPECIMEN BOUNDARY TREE (4)

20 0 40
SCALE

LOCATION:	AS-BUILT PLANTING PLANS FOR BROCK STREAM RESTORATION
PROJECT NO.: SCO-050650601	COUNTY: JONES
DESIGNED BY: CWG	DRAWN BY: RLA
CHECKED BY: ALC	DATE: 12-07-09



HORIZONTAL AND VERTICAL CONTROL TABLE

Number	Northing	Easting	Elevation	Desc	Latitude	Longitude
1	493465.88	2458432.01	41.99	ips	35.0546	-77.2802
2	493842.12	2458818.69	41.01	ips	35.0550	-77.2758
3	494381.77	2459019.72	37.45	ips	35.0555	-77.2755
4	495204.18	2459264.46	32.53	ips w/cap	35.0603	-77.2752
5	495196.47	2458921.67	33.62	ips w/cap	35.0603	-77.2756
6	493562.53	2458290.84	39.51	ips w/cap	35.0547	-77.2804

ABANDONED CHANNEL OF CHINKAPIN CREEK

I, ~~STEVEN P. CARSON,~~ JEFFREY L. BATEMAN CERTIFY THAT THE TOPOGRAPHIC CONTOURS SHOWN ON THIS PLAN WERE OBTAINED BY FIELD SURVEYS CONDUCTED UNDER MY SUPERVISION, ON THE DATES LISTED UNDER NOTES. THIS IS NOT A BOUNDARY SURVEY. WITNESS MY HAND AND SEAL THIS 23 DAY OF JULY, 2009.

PROFESSIONAL LAND SURVEYOR NC NO. L-3502
DATE 7/23/09

"The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP."

NOTES

1. ***ALL DISTANCES ARE HORIZONTAL GROUND AND AREAS ARE BY COORDINATE COMPUTATION.***
2. ***FIELD WORK FOR SURVEY COMPLETED APRIL 16, 2009.***
3. ***WETLANDS ARE NOT ADDRESSED BY THIS SURVEY.***
4. ***ONLY COPIES OF THIS SURVEY WITH THE LAND SURVEYOR'S ORIGINAL SIGNATURE & AN ORIGINAL EMBOSSED, INK OR SCANNED SEAL ARE THE PRODUCT OF THE LAND SURVEYOR.***
5. ***THIS SURVEY WAS PREPARED FOR THE PARTIES AND PURPOSE INDICATED HEREON. ANY EXTENSION OF THE USE BEYOND THE PURPOSE AGREED TO BETWEEN THE CLIENT AND SURVEYOR EXCEEDS THE SCOPE OF THE ENGAGEMENT.***
6. ***THIS PARCEL MAY BE SUBJECT TO EASEMENTS OR RIGHTS OF OTHERS THAT HAVE NOT BEEN DISCLOSED ON THIS MAP.***
7. ***HORIZONTAL AND VERTICAL ARE NAD83 AND NAVD88.***

PROJECT # N.C. SCO-050650601

Bateman Civil Survey Company, PC
Engineers • Surveyors • Planners
200 North Main Street, Holy Springs, NC 27540
Phone:(919) 577-1080 Fax:(919) 577-1081
Info@BatemanCivilSurvey.com

Brock Stream Restoration Project
Asbuilt Topographic Survey
PROJECT # N.C. SCO-050650601

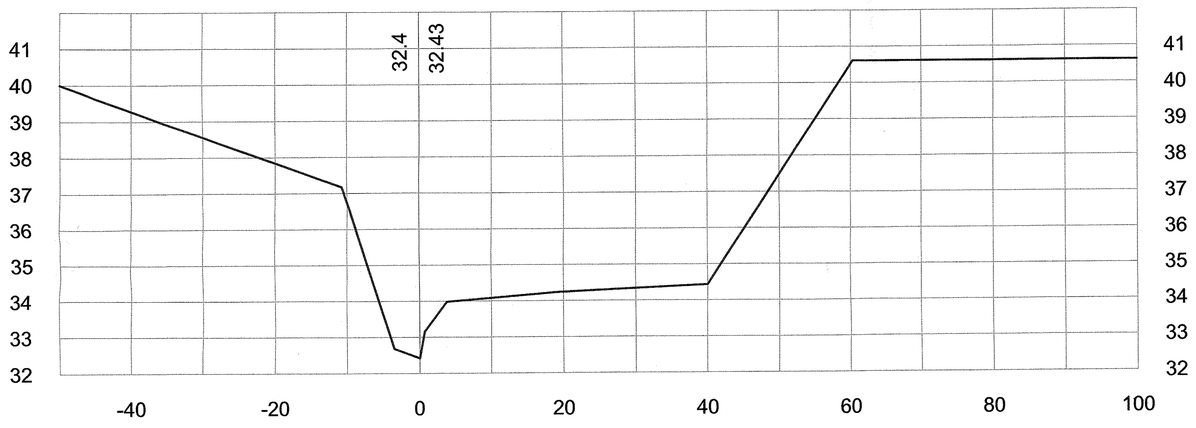
Exclusively For
Shamrock Environmental
Jones County, North Carolina

Revisions
06/09/2009-Additional Topographic Shots
07/09/2009-Additional Topographic Shots
07/21/2009-Map Revisions Per EEP

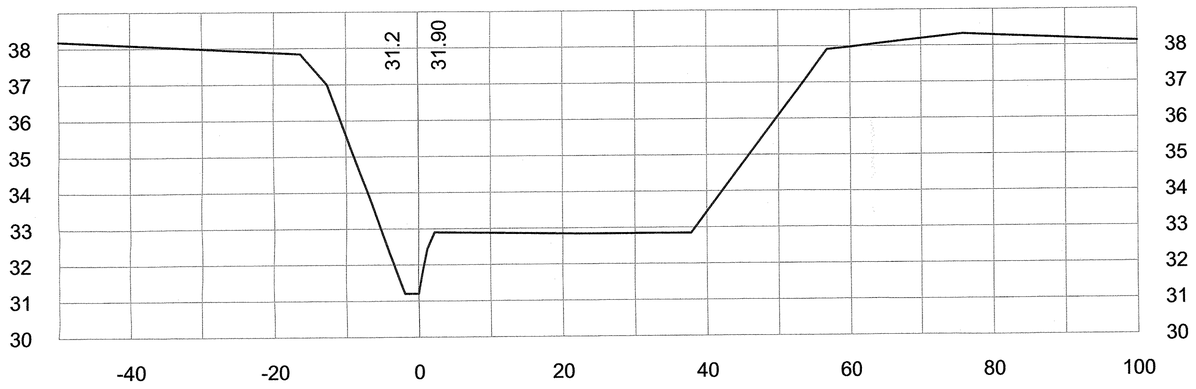
Designed By:	
Drawn By:	SPC
Checked By:	JLB
Scale:	1" = 50'
Date:	04/21/2009
Drawing Number: 080362	

SUR1
1 of 2

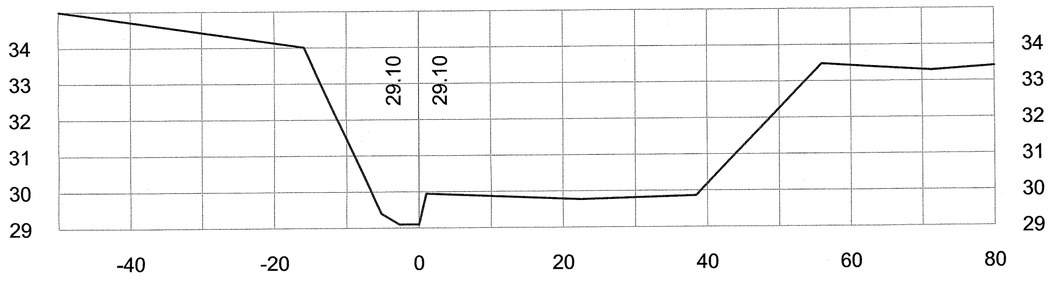
11+00



15+00



23+00



GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

HORZ. 1" = 10'
VERT. 1" = 2'

Pnt #	Northing	Easting	Elevation	Desc
84000	493915.63	2458664.90	38.32	gs
84001	493930.52	2458653.05	37.91	top
84002	493944.33	2458639.81	32.84	toe
84003	493954.94	2458628.15	32.84	gs
84004	493974.03	2458622.98	32.90	top
84005	493974.70	2458622.21	32.45	top
84006	493975.53	2458621.35	30.96	toe
84007	493976.43	2458619.64	30.92	toe
84008	493982.41	2458610.74	37.00	top
84009	493985.40	2458608.53	37.84	top
84010	493690.35	2458347.81	37.17	top
84011	493688.10	2458354.69	32.68	toe
84012	493687.38	2458358.13	32.42	toe
84013	493687.30	2458358.77	33.16	top
84014	493686.43	2458361.76	33.98	top
84015	493681.71	2458376.16	34.23	gs
84016	493674.12	2458395.77	34.43	toe
84017	493668.38	2458415.26	40.60	top
84018	493663.01	2458430.43	40.61	gs
84019	494691.57	2458960.29	33.29	gs
84020	494696.40	2458945.72	33.48	top
84021	494700.82	2458928.81	29.86	toe
84022	494706.47	2458913.79	29.77	gs
84023	494711.59	2458893.04	29.95	top
84024	494711.36	2458892.01	29.20	toe
84025	494713.73	2458887.56	29.39	toe
84026	494716.64	2458877.26	34.01	top
84027	494713.22	2458890.01	29.10	gs

Bateman Civil Survey Company, PC
Engineers • Surveyors • Planners
200 North Main Street, Holly Springs, NC 27540
Phone:(919) 577-1080 Fax:(919) 577-1081
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Brock Stream Restoration Project
Detailed Cross Sections & Raw Data Table
PROJECT # N.C. SCO-050650601
Exclusively For
Shamrock Environmental
Jones County, North Carolina

Revisions
06/09/2009-Additional Topographic Shots
07/09/2009-Additional Topographic Shots
07/21/2009-Map Revisions Per EEP
07/22/2009-Profile Scale Revisions Per EEP

Designed By:	
Drawn By:	SPC
Checked By:	JLB
Scale:	HORZ. 1" = 20' VERT. 1" = 2'
Date:	04/21/2009
Drawing Number: 080362	

SUR2
2 of 2

RECORD DRAWING

PT. NAME	LATITUDE	LONGITUDE
VEG. PLOT#4 ORIGIN	35d 05m 57.84614s	77d 27m 56.29291s
VEG. PLOT#4	35d 05m 58.15282s	77d 27m 56.16520s
VEG. PLOT#4	35d 05m 58.26524s	77d 27m 56.54235s
VEG. PLOT#4	35d 05m 57.95164s	77d 27m 56.66096s
X-SEC 23+00 LT	35d 05m 58.49527s	77d 27m 56.70047s
X-SEC 23+00 RT	35d 05m 58.23462s	77d 27m 55.70590s

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www.stantec.com

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	4A
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 034257 ENGINEER C. W. GASKILL, JR.

2-17-10

CONSERVATION EASEMENT LIMITS

MATCHLINE SEE SHEET PL-3 STA.20+64.22

21+00 22+00 PS10 23+00 24+00 25+00 26+00 27+00 28+00

PS12 PS11 PS13 PS14 PS15 PS16

TOP LEFT BANK
TOE LEFT
THALWEG OF STREAM
TOE BENCH
TOP BENCH
TOE BENCH
TOP RIGHT BANK

VEGATATION PLOT #4 ORIGIN

X-SEC STA.23+00

ABANDONED CHINQUAPIN BR. 14 AVG.

CHINQUAPIN BR. 16 AVG.

INV=29.48

INV=25.65

CULTIVATED FIELD

DITCH

DITCH

INV=24.66

15" PLASTIC

LEGEND

- STREAMBANK PLANTING
- FLOODPLAIN BUFFER PLANTING
- UPLAND BUFFER PLANTING
- SPECIMEN BOUNDARY TREE
- PS11 PHOTOSTATION
- EXISTING TOPOGRAPHY
- AS-BUILT TOPOGRAPHY

DESIGN AND AS-BUILT DRAIWINGS ARE THE SAME. ONLY DEVIATIOPNS ARE IN RED.

20 0 40
SCALE

LOCATION:	RECORD DRAWING BROCK STREAM RESTORATION EEP#: 92333
PROJECT NO: SCO-050650601	COUNTY: JONES
DESIGNED BY: CWG	DRAWN BY: CWG
CHECKED BY: ALC	DATE: 09-04-09

RECORD DRAWING

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	4B

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 034257 ENGINEER

2-17-10

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Raleigh, NC 27606
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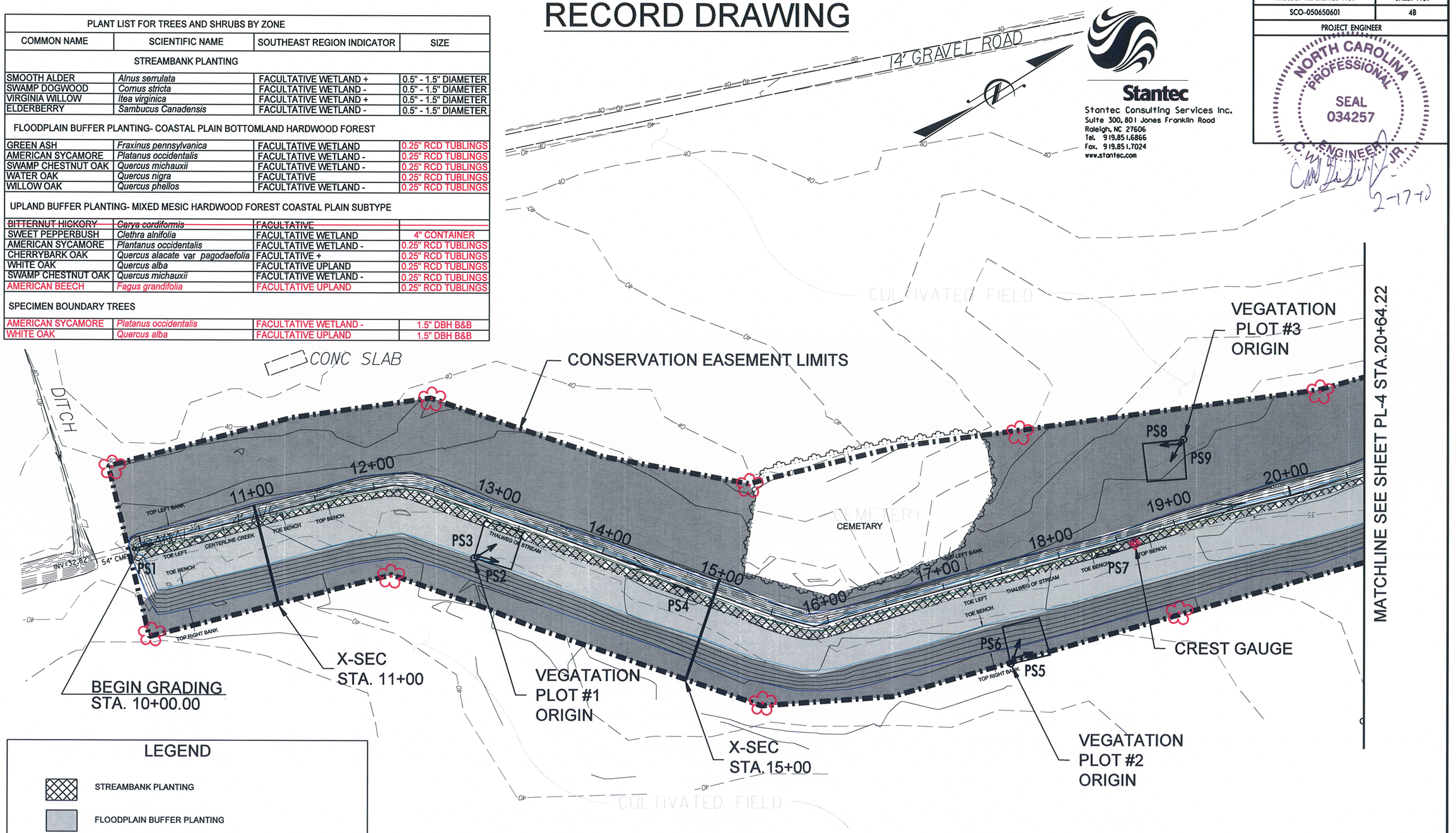
Fax. 919.851.7024
www.stantec.com

PLANT LIST FOR TREES AND SHRUBS BY ZONE			
COMMON NAME	SCIENTIFIC NAME	SOUTHEAST REGION INDICATOR	SIZE
STREAMBANK PLANTING			
SMOOTH ALDER	*Alnus serrulata*	FACULTATIVE WETLAND +	0.5" - 1.5" DIAMETER
SWAMP DOGWOOD	*Cornus stricta*	FACULTATIVE WETLAND -	0.5" - 1.5" DIAMETER
VIRGINIA WILLOW	*Itea virginica*	FACULTATIVE WETLAND +	0.5" - 1.5" DIAMETER
ELDERBERRY	*Sambucus Canadensis*	FACULTATIVE WETLAND -	0.5" - 1.5" DIAMETER
FLOODPLAIN BUFFER PLANTING- COASTAL PLAIN BOTTOMLAND HARDWOOD FOREST			
GREEN ASH	*Fraxinus pennsylvanica*	FACULTATIVE WETLAND	0.25" RCD TUBLINGS
AMERICAN SYCAMORE	*Platanus occidentalis*	FACULTATIVE WETLAND -	0.25" RCD TUBLINGS
SWAMP CHESTNUT OAK	*Quercus michauxii*	FACULTATIVE WETLAND -	0.25" RCD TUBLINGS
WATER OAK	*Quercus nigra*	FACULTATIVE	0.25" RCD TUBLINGS
WILLOW OAK	*Quercus phellos*	FACULTATIVE WETLAND -	0.25" RCD TUBLINGS
UPLAND BUFFER PLANTING- MIXED MESIC HARDWOOD FOREST COASTAL PLAIN SUBTYPE			
~~BITTERNUT HICKORY~~	~~*Carya cordiformis*~~	~~FACULTATIVE~~	
SWEET PEPPERBUSH	*Clethra alnifolia*	FACULTATIVE WETLAND	4" CONTAINER
AMERICAN SYCAMORE	*Plantanus occidentalis*	FACULTATIVE WETLAND -	0.25" RCD TUBLINGS
CHERRYBARK OAK	*Quercus alacate var pagodaefolia*	FACULTATIVE +	0.25" RCD TUBLINGS
WHITE OAK	*Quercus alba*	FACULTATIVE UPLAND	0.25" RCD TUBLINGS
SWAMP CHESTNUT OAK	*Quercus michauxii*	FACULTATIVE WETLAND -	0.25" RCD TUBLINGS
AMERICAN BEECH	*Fagus grandifolia*	FACULTATIVE UPLAND	0.25" RCD TUBLINGS
SPECIMEN BOUNDARY TREES			
AMERICAN SYCAMORE	*Platanus occidentalis*	FACULTATIVE WETLAND -	1.5" DBH B&B
WHITE OAK	*Quercus alba*	FACULTATIVE UPLAND	1.5" DBH B&B



LEGEND

- STREAMBANK PLANTING
- FLOODPLAIN BUFFER PLANTING
- UPLAND BUFFER PLANTING
- SPECIMEN BOUNDARY TREE
- PS11 PHOTOSTATION
- EXISTING TOPOGRAPHY
- AS-BUILT TOPOGRAPHY

DESIGN AND AS-BUILT DRAIWINGS ARE THE SAME. ONLY DEVIATIOPNS ARE IN RED.

PT. NAME	LATITUDE	LONGITUDE
X-SEC 11+00 LT	*35d 05m 48.42553s*	*77d 28m 03.26289s*
X-SEC 11+00 RT	*35d 05m 48.14250s*	*77d 28m 02.27370s*
X-SEC 15+00 LT	*35d 05m 51.30393s*	*77d 28m 00.07048s*
X-SEC 15+00 RT	*35d 05m 50.60525s*	*77d 27m 59.40507s*
VEG. PLOT #1 ORIGIN	*35d 05m 49.70404s*	*77d 28m 01.60066s*
VEG. PLOT #1	*35d 05m 49.90930s*	*77d 28m 01.30033s*
VEG. PLOT #1	*35d 05m 50.15822s*	*77d 28m 01.54822s*
VEG. PLOT #1	*35d 05m 49.94774s*	*77d 28m 01.85500s*

PT. NAME	LATITUDE	LONGITUDE
VEG. PLOT #2 ORIGIN	*35d 05m 52.92220s*	*77d 28m 57.74959s*
VEG. PLOT #2	*35d 05m 53.23564s*	*77d 27m 57.60521s*
VEG. PLOT #2	*35d 05m 53.32958s*	*77d 27m 57.97970s*
VEG. PLOT #2	*35d 05m 53.03343s*	*77d 27m 58.10576s*
VEG. PLOT #3 ORIGIN	*35d 05m 54.69609s*	*77d 27m 58.52392s*
VEG. PLOT #3	*35d 05m 54.97705s*	*77d 27m 58.33375s*
VEG. PLOT #3	*35d 05m 55.13508s*	*77d 27m 58.67760s*
VEG. PLOT #3	*35d 05m 54.83470s*	*77d 27m 58.86883s*

20 0 40
SCALE

LOCATION: RECORD DRAWING BROCK STREAM RESTORATION EEP #:92333
PROJECT NO.: SCO-050650601 COUNTY: JONES
DESIGNED BY: CWG DRAWN BY: CWG
CHECKED BY: ALC DATE: 09-04-09