

**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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**Stantec**

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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.

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## **1.0 Project Goals, Background and Attributes**

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### **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**

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### **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 NCEP 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**

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### **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<sup>2</sup> 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**

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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**

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### **5.1 AS-BUILT/RECORD DRAWINGS**

Site grading was complete on June 12<sup>th</sup>, 2009. The as-built survey was completed by Bateman Civil Survey Company, PC on July 23<sup>rd</sup>, 2009. The As-Built Plan Sheets are located in Appendix D. Planting was initially completed on June 23<sup>rd</sup> 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

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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

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Appendix A – General Tables and Figures

Appendix B – Morphological Summary Data and Plots

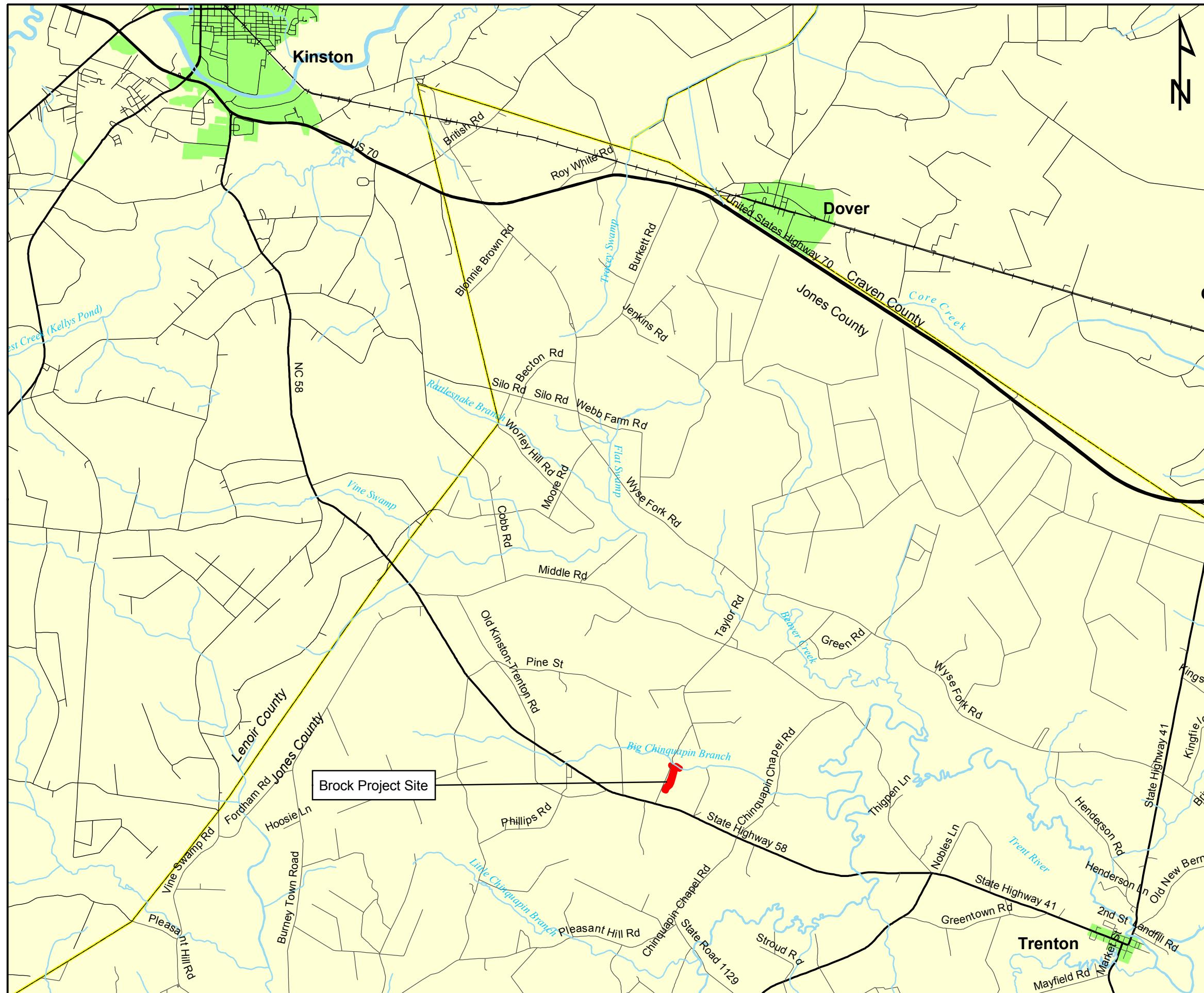
Appendix C – Vegetation Data

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



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.

Figure 2A

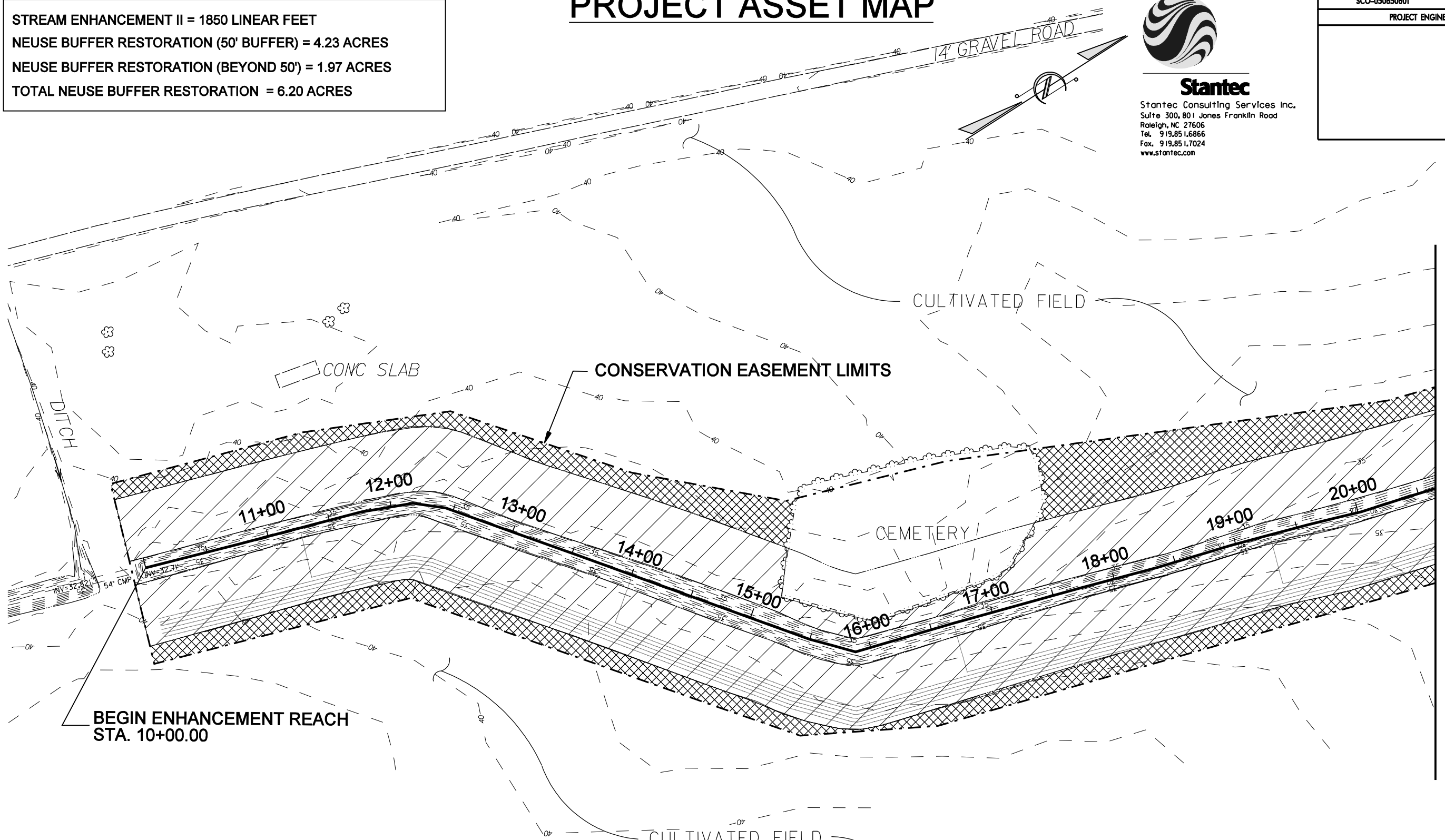
**STREAM ENHANCEMENT II = 1850 LINEAR FEET**  
**NEUSE BUFFER RESTORATION (50' BUFFER) = 4.23 ACRES**  
**NEUSE BUFFER RESTORATION (BEYOND 50') = 1.97 ACRES**  
**TOTAL NEUSE BUFFER RESTORATION = 6.20 ACRES**

# PROJECT ASSET MAP



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

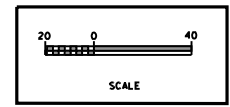


MATCHLINE SEE SHEET PL-4 STA. 20+64.22

**LEGEND**

- NEUSE BUFFER RESTORATION (50' BUFFER)
- NEUSE BUFFER RESTORATION (BEYOND 50')

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



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

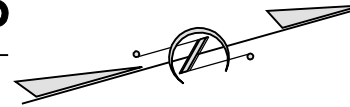
8/17/2010 10:58 AM C:\Users\rla\Documents\Projects\SCO-050650601\Map\Map.plt



Figure 2B

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

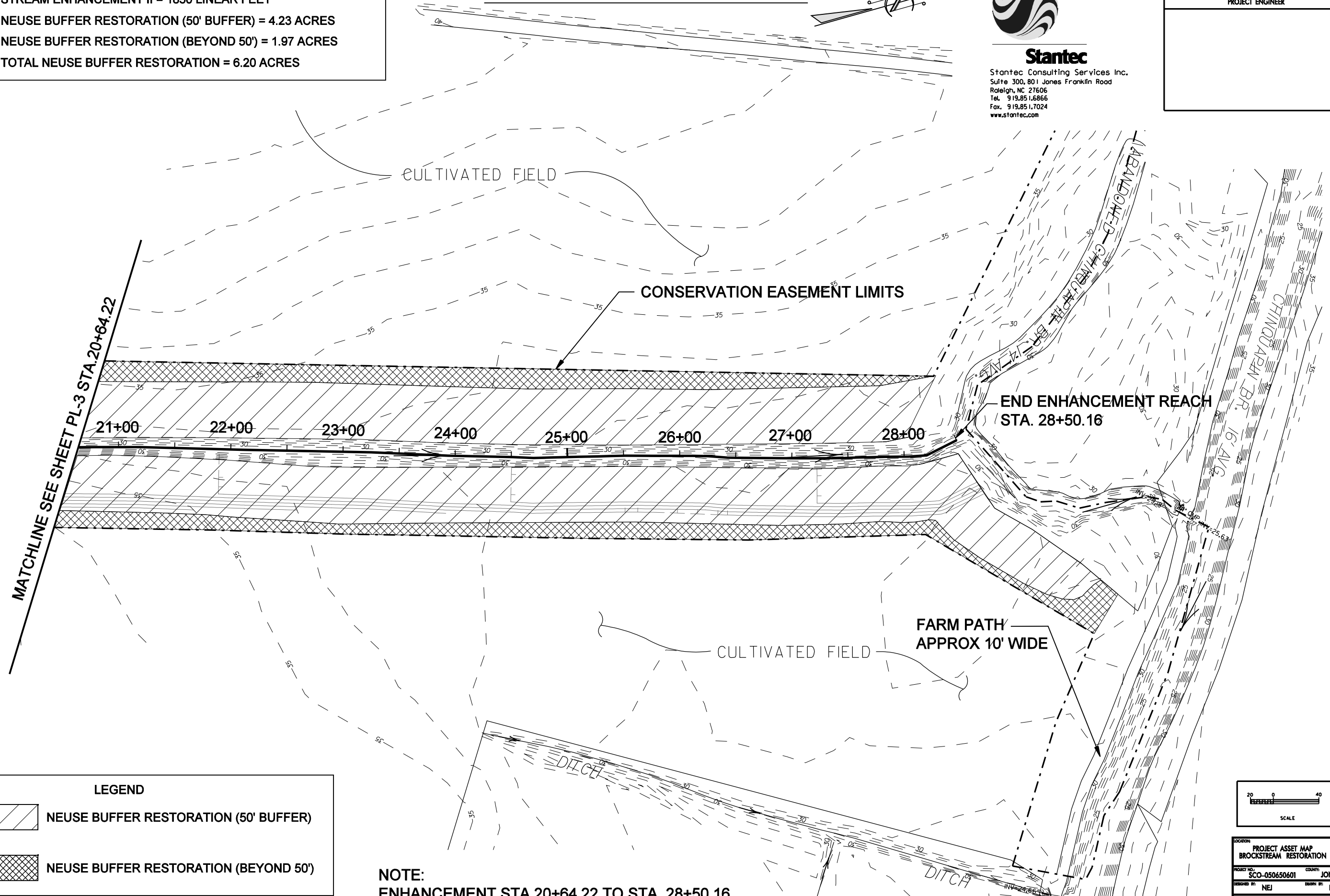
# PROJECT ASSET MAP



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



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

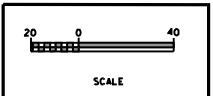
CONSERVATION EASEMENT LIMITS

END ENHANCEMENT REACH  
STA. 28+50.16

FARM PATH  
APPROX 10' WIDE

LEGEND	
	NEUSE BUFFER RESTORATION (50' BUFFER)
	NEUSE BUFFER RESTORATION (BEYOND 50')

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



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

DATE PLOTTED: 04/20/10 10:58:52 AM

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	

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

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

<b>Table 3 - Project Contact Table</b> <b>Brock Stream Restoration EEP#92333</b>	
<b>Designer</b> Primary Project Design POC	Stantec Consulting, Inc. 801 Jones Franklin Rd. Suite 300 Raleigh, NC 27606 Nathan Jean (919) 865-7387
<b>Construction Contractor</b> Construction Contractor POC	Shamrock Environmental Corporation 6106 Corporate Park Dr. Browns Summit, NC 27214
<b>Planting Contractor</b> Planting Contractor POC	Carolina Wetland Services 550 E. Westinghouse Blvd. Charlotte, NC 28273 Josh Frost 866-527-1177
<b>Seeding Contractor</b> 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
<b>Baseline Monitoring Performers</b> 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**







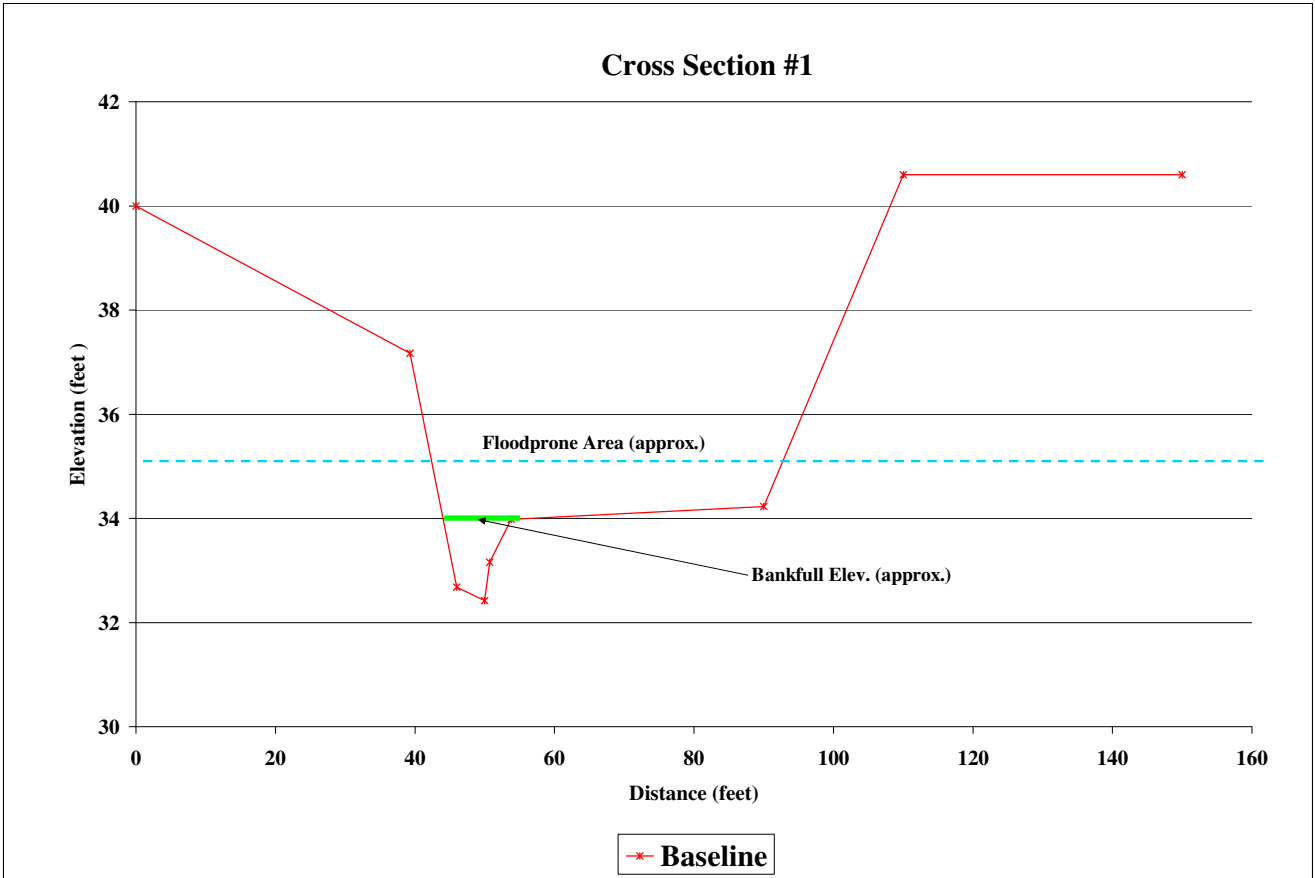




Project Name: Brock  
 Cross Section: Cross Section 1 Sta 11+00  
 Feature:  
 Date: As Built -7/23/2009  
 Crew:

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	FBK			
												90	34.23				
												110	40.6				
												150	40.6	Right Pin			

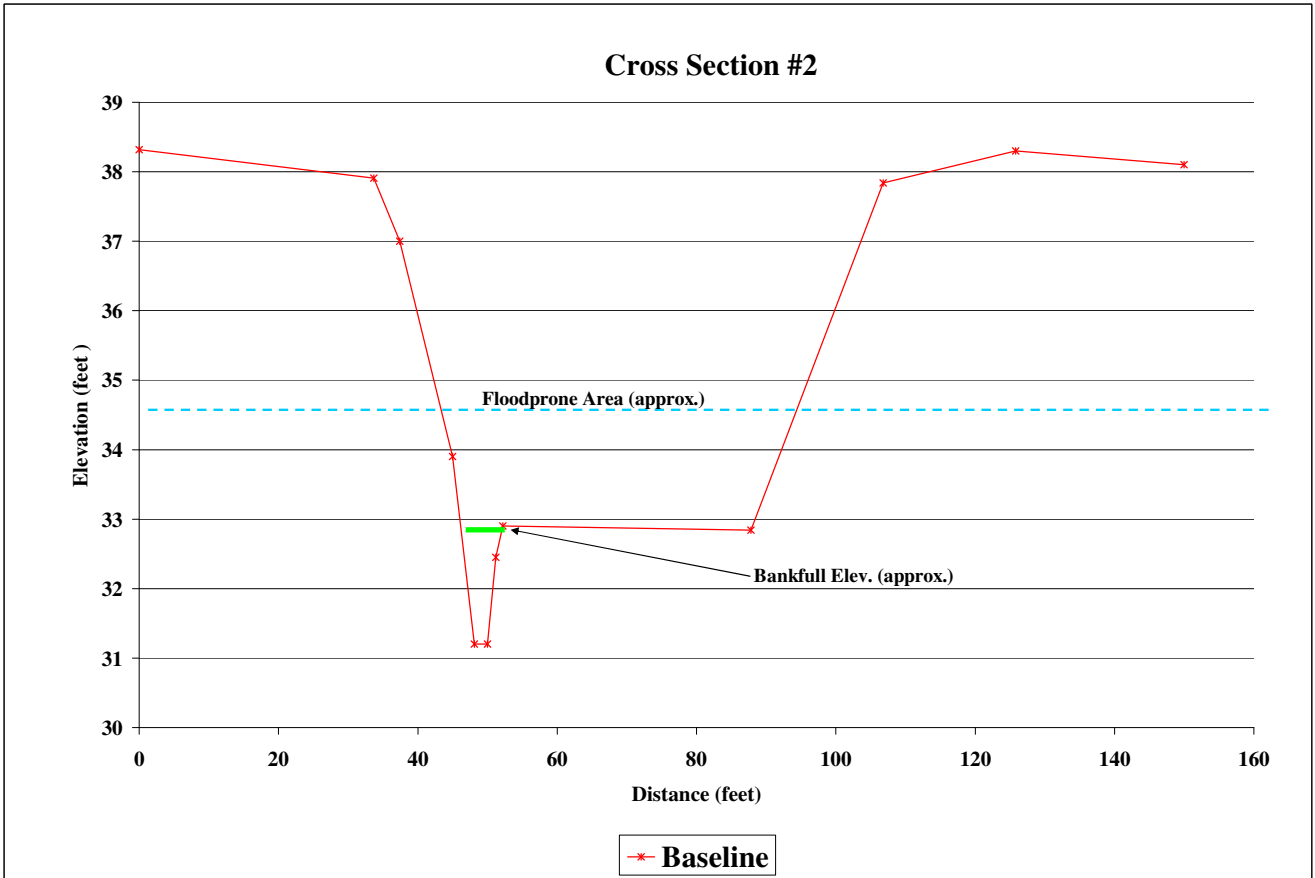
Summary						
	Year 5	Year 4	Year 3	Year 1	Bench 2005	Bench
Area						8.5
Width						9.3
Mean Depth						0.9
Max Depth						1.6
W/D						10.2



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				

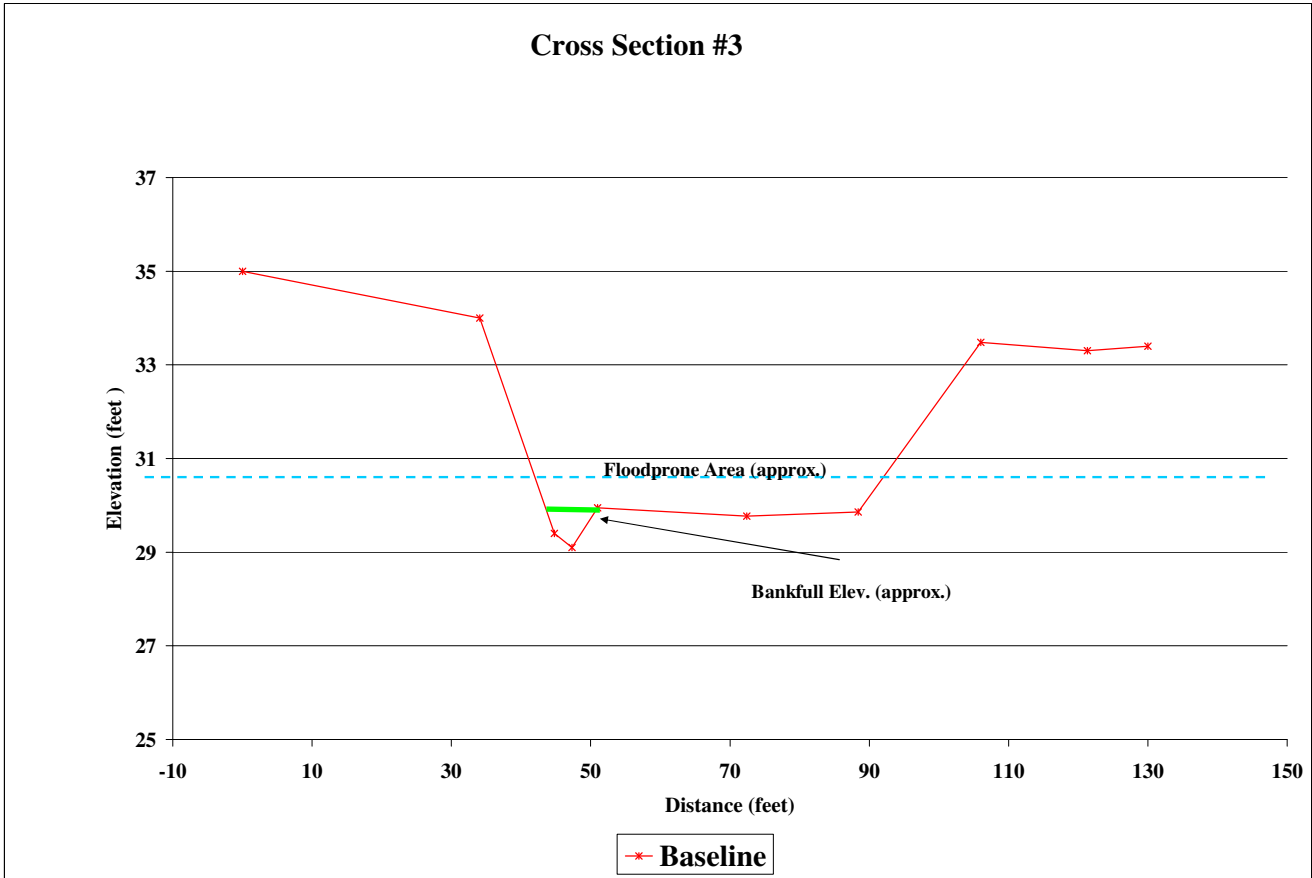
Summary					
	Year 5	Year 4	Year 3	Year 1	Bench
Area					8.5
Width					8.0
Mean Depth					1.1
Max Depth					1.5
W/D					7.5



Project Name: Brock  
 Cross Section: Cross Section 3 Sta 22+00  
 Feature: As Built -7/23/2009  
 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 (wreck 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		
Scientific Name	Common Name	Species Type	92333-ALC-0001			92333-ALC-0002			92333-ALC-0003			92333-ALC-0004			MY0 (2009)		
			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
<b>Stem count</b>			0	26	26	0	12	12	0	4	4	7	21	21	7	63	63
<b>size (ares)</b>			1			1			1			1			4		
<b>size (ACRES)</b>			0.02			0.02			0.02			0.02			0.10		
<b>Species count</b>			0	4	4	0	6	6	0	2	2	2	6	6	2	11	11
<b>Stems per ACRE</b>			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**

<b>Report Prepared By</b>	Richard Andrews
<b>Date Prepared</b>	7/7/2009 12:00
<b>database name</b>	cvs-eep-entrytool-v2.2.6.mdb
<b>database location</b>	C:\Documents and Settings\randrews\Desktop
<b>computer name</b>	ANDREWSR
<b>file size</b>	33660928
<b>DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT</b>	
<b>Metadata</b>	Description of database file, the report worksheets, and a summary of project(s) and project data.
<b>Proj, planted</b>	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
<b>Proj, total stems</b>	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.
<b>Plots</b>	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
<b>Vigor</b>	Frequency distribution of vigor classes for stems for all plots.
<b>Vigor by Spp</b>	Frequency distribution of vigor classes listed by species.
<b>Damage</b>	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
<b>Damage by Spp</b>	Damage values tallied by type for each species.
<b>Damage by Plot</b>	Damage values tallied by type for each plot.
<b>Planted Stems by Plot and Spp</b>	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
<b>PROJECT SUMMARY</b>	
<b>Project Code</b>	50650601
<b>project Name</b>	Brock Stream Restoration EEP Brock Stream Restoration <input type="checkbox"/>
<b>Description</b>	Jones County, NC
<b>River Basin</b>	Neuse
<b>length(ft)</b>	
<b>stream-to-edge width (ft)</b>	
<b>area (sq m)</b>	
<b>Required Plots (calculated)</b>	
<b>Sampled Plots</b>	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		
<b>TOT:</b>	<b>12</b>	<b>24</b>	<b>15</b>	<b>10</b>	<b>14</b>	<b>24</b>		

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
	Quercus	1		1	
	Quercus michauxii	7	6	1	
	Quercus nigra	4	4		
	Quercus pagoda	3		3	
	Quercus phellos	12	10		1
	Sambucus canadensis	2			2
	Unknown	6	3		3
<b>TOT:</b>	<b>12</b>	<b>87</b>	<b>52</b>	<b>16</b>	<b>2</b>

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
<b>TOT:</b>	<b>4</b>	<b>87</b>	<b>52</b>	<b>16</b>	<b>2</b>	<b>17</b>

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

Species	Total Planted Stems			Plot			
	# plots	avg# stems		050650601-ALC-0001	050650601-ALC-0002	050650601-ALC-0003	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			
<b>TOT:</b>	<b>11</b>	<b>63</b>	<b>11</b>	<b>21</b>	<b>12</b>	<b>4</b>	<b>26</b>

## 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**

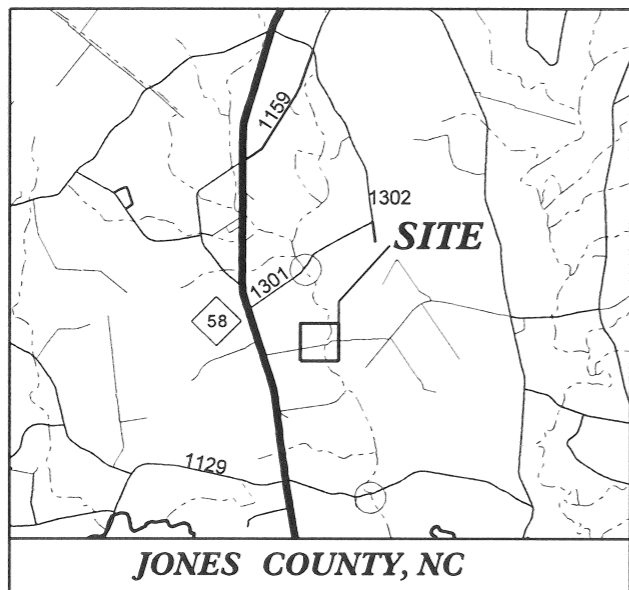
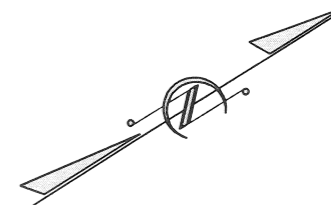


STATE OF NORTH CAROLINA  
ECOSYSTEM ENHANCEMENT PROGRAM

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

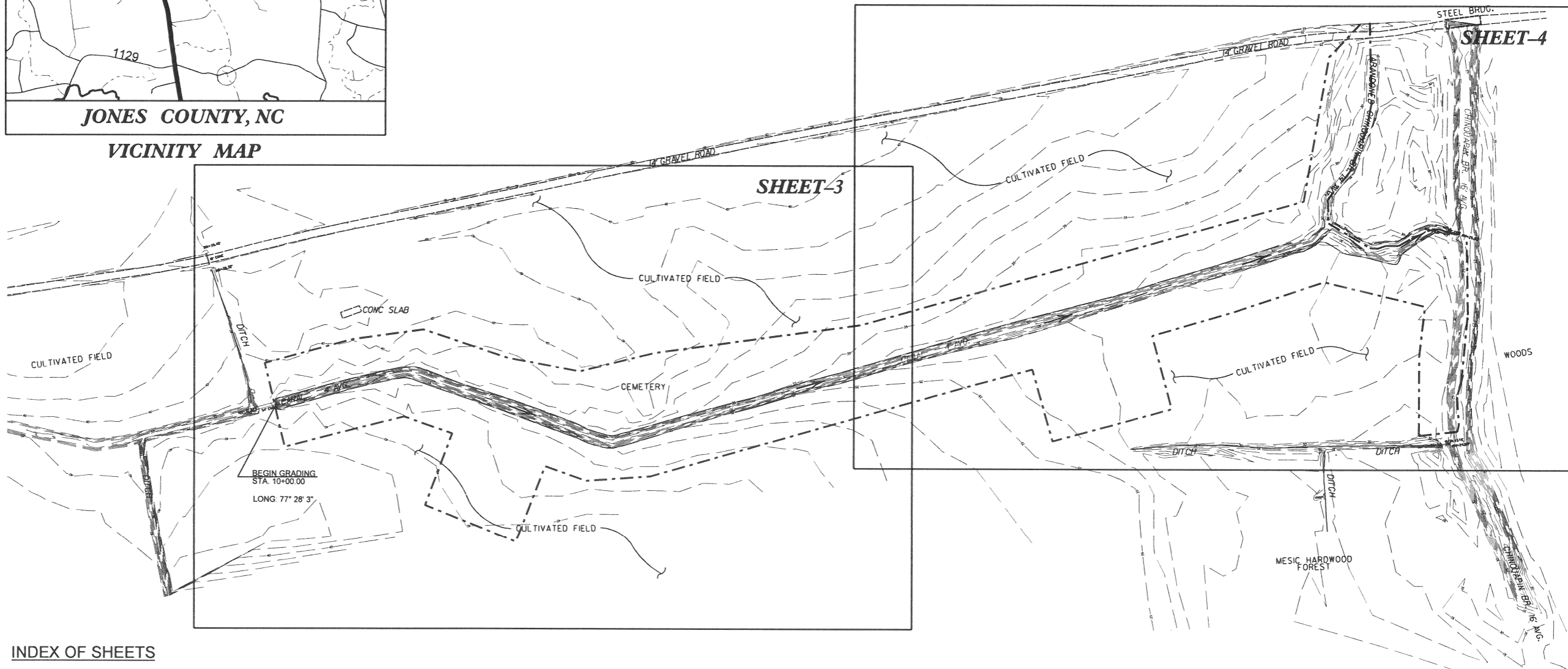
**BROCK STREAM RESTORATION PROJECT  
RECORD DRAWING**

LOCATION: JONES COUNTY, NC



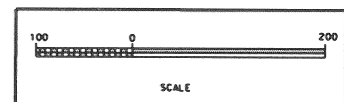
JONES COUNTY, NC

VICINITY MAP

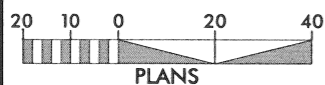


INDEX OF SHEETS

TITLE SHEET.....	1
CONSTRUCTION SHEETS.....	SEC. 2
AS-BUILT SHEETS.....	SEC. 3
RECORD DRAWING SHEETS.....	SEC. 4



GRAPHIC SCALES



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:



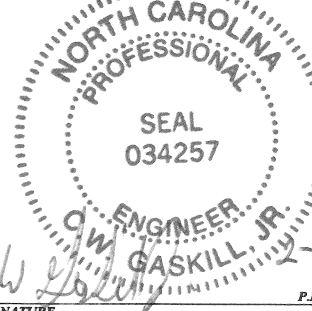
Stantec

Stantec Consulting Services Inc.  
Suite 300, 301 Jones Franklin Road  
Raleigh, NC 27608  
Tel. 919.251.6886  
Fax. 919.251.7094  
www.stantec.com

Brad G. Fairley  
PROJECT MANAGER

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

CONSTRUCTION ENGINEER



SIGNATURE

P.E.

S:\2014\10\124\em\construction\management\as-builts\7-13-09\ASBULLT-brock\_em\_title.psh.v8.dgn

**PROJECT: SCO-050650601 | BROCK**

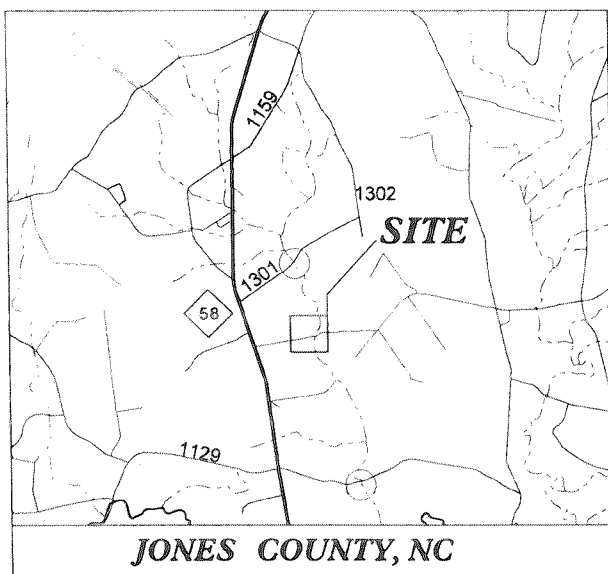
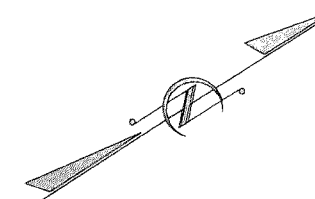


STATE OF NORTH CAROLINA  
ECOSYSTEM ENHANCEMENT PROGRAM

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

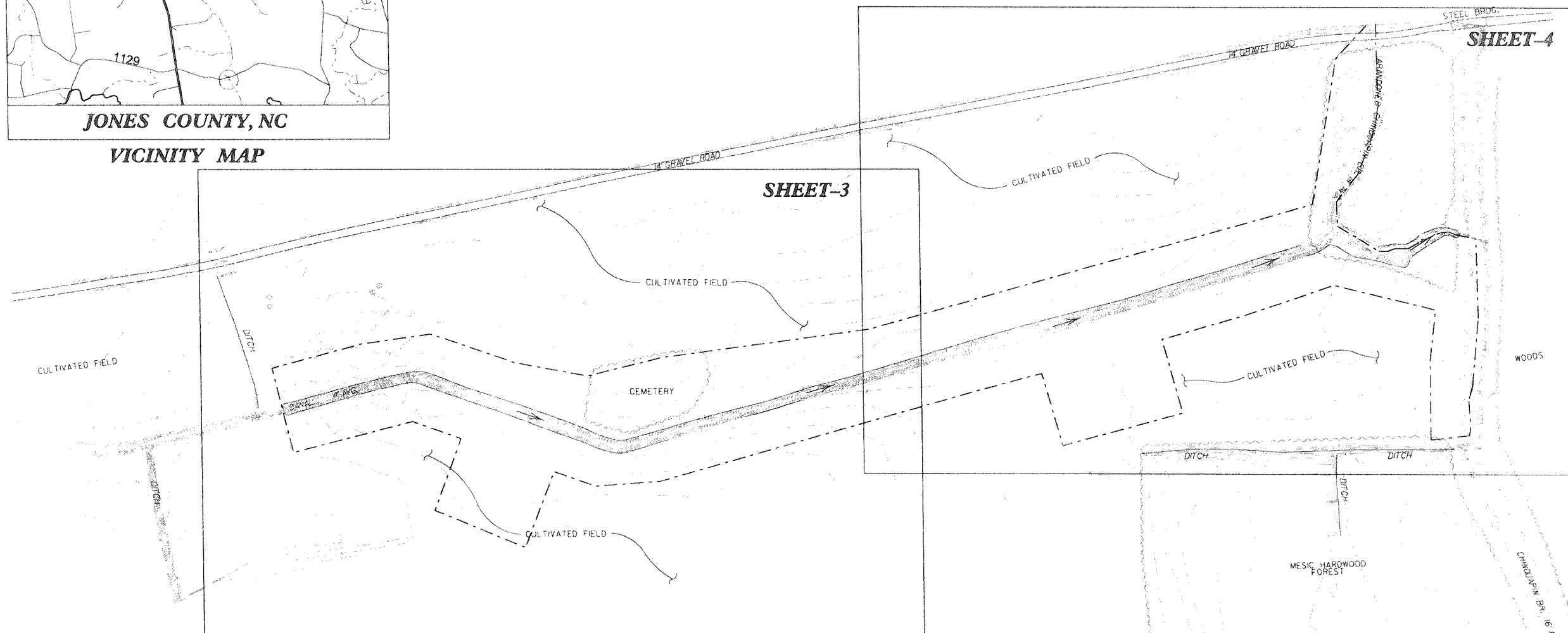
**BROCK STREAM RESTORATION PROJECT**

LOCATION: JONES COUNTY, NC



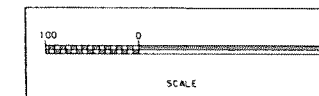
JONES COUNTY, NC

VICINITY MAP



INDEX OF SHEETS

TITLE SHEET.....	1
TYPICAL SECTION.....	2
CONSTRUCTION SEQUENCE.....	2A
PLANSHEETS.....	3-4
EROSION CONTROL.....	EC-1 - EC-5
PLANTING PLAN.....	PL-1 - PL-4



PROJECT: SCO-050650601 | BROCK

1:18:35 AM J:\171300\24\em\design\plan\brock.em\_title.psh\_v8.dgn

GRAPHIC SCALES



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 27604  
Tel. 919.851.6888  
Fax. 919.851.7024  
www.stantec.com

Brad G. Fairley  
PROJECT MANAGER

Nathan E. Jean, PE  
PROJECT DESIGNER

PROJECT DESIGN ENGINEER

07-16  
NATHAN E. JEAN, PE  
03281  
SIGNATURE

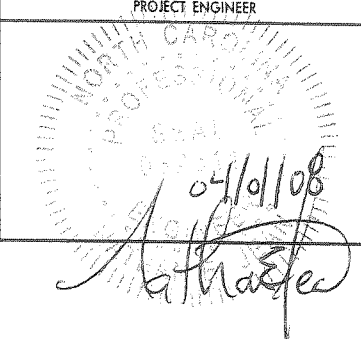
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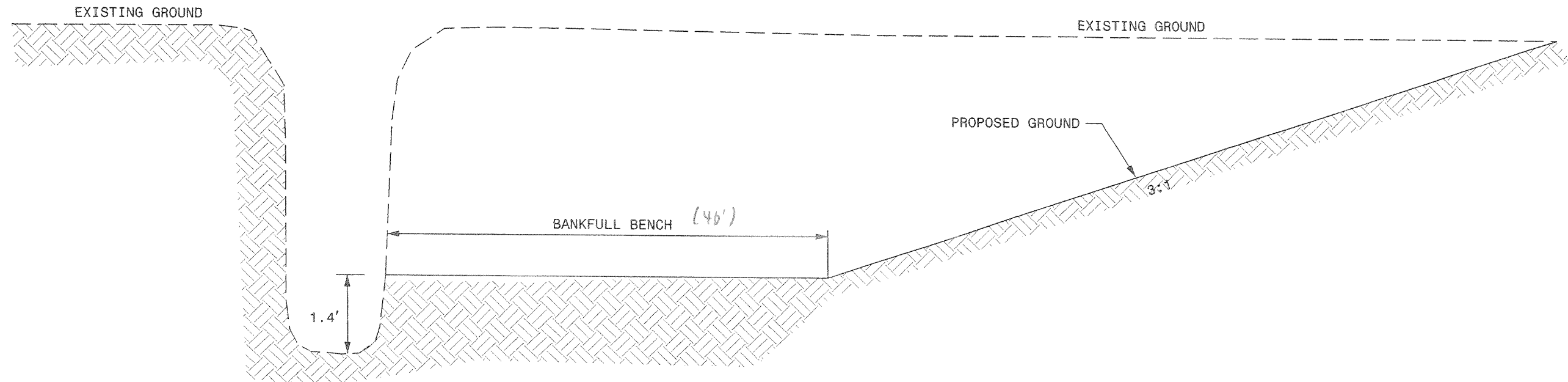
SCALE: NTS



**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

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



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

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

4/1/2008  
 4:47 PM  
 C:\Users\jones\Documents\Projects\SCO-050650601\Drawings\02.dwg

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

# CONSTRUCTION SEQUENCE

## 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 immediately 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.

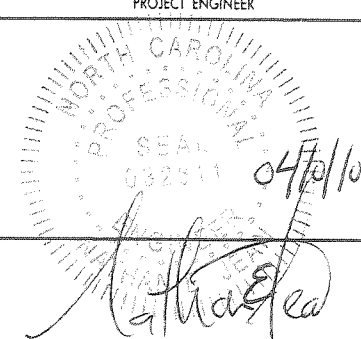
### VI. Plant project in accordance with the planting plan.

### 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.


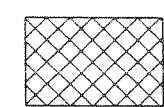

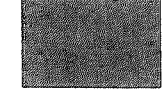
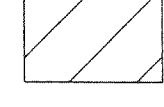


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PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	2A
PROJECT ENGINEER	
	

## OVERALL SITE LEGEND

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

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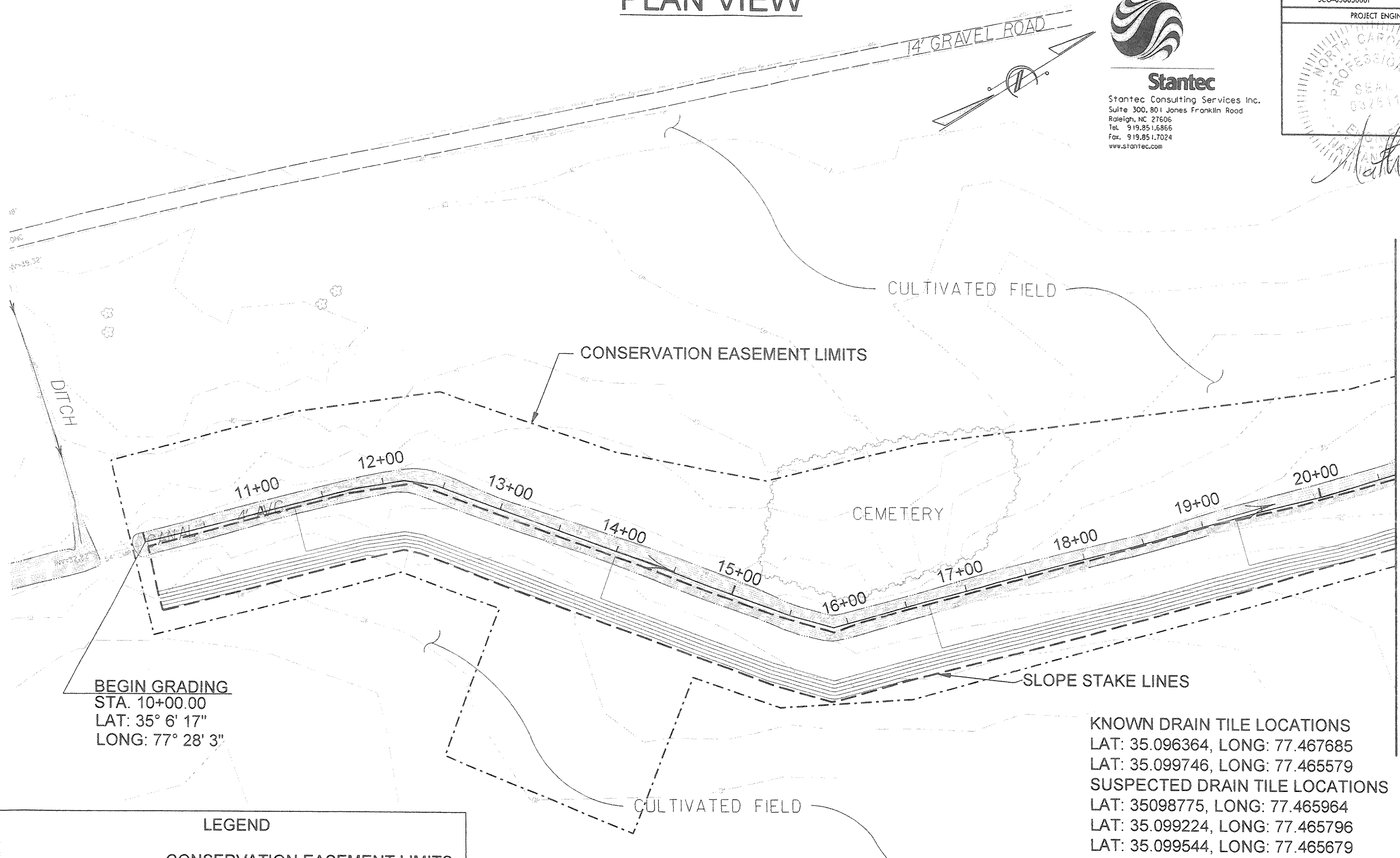
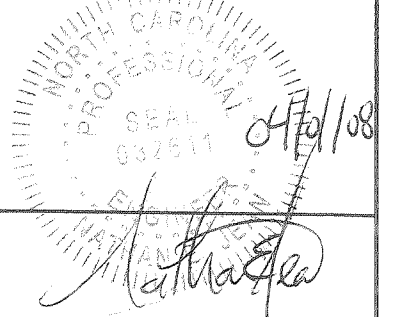
LOCATION: RESTORATION PLANS FOR BROCK STREAM RESTORATION	
PROJECT NO. SCO-050650601	COUNTY: JONES
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAM	DATE:

# PLAN VIEW

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



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

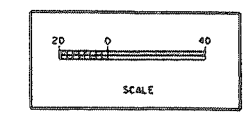
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 LAT: 35.096364, LONG: 77.467685  
 LAT: 35.099746, LONG: 77.465579

**SUSPECTED DRAIN TILE LOCATIONS**  
 LAT: 35.098775, 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

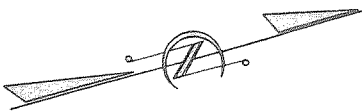


RESTORATION PLANS FOR BROCK STREAM RESTORATION	
PROJECT NO. SCO-050650601	COUNTY: JONES
DESIGNED BY: NEJ	DRAWN BY: CGM
CHECKED BY: BAH	DATE:

MATCHLINE SEE SHEET 4 STA. 20+64.22

4/11/2008 10:00 AM

# PLAN VIEW



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

KNOWN DRAIN TILE LOCATIONS  
 LAT: 35.096364, LONG: 77.467685  
 LAT: 35.099746, LONG: 77.465579  
 SUSPECTED DRAIN TILE LOCATIONS  
 LAT: 35.098775, 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

MATCHLINE SEE SHEET 3 STA. 20+64.22

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

CULTIVATED FIELD

CONSERVATION EASEMENT LIMITS

SLOPE STAKE LINES

CULTIVATED FIELD

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

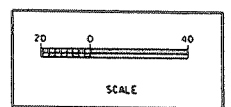
14' GRAVEL ROAD

ABANDONED CHANNEL BR. 14' W.C.

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



RESTORATION 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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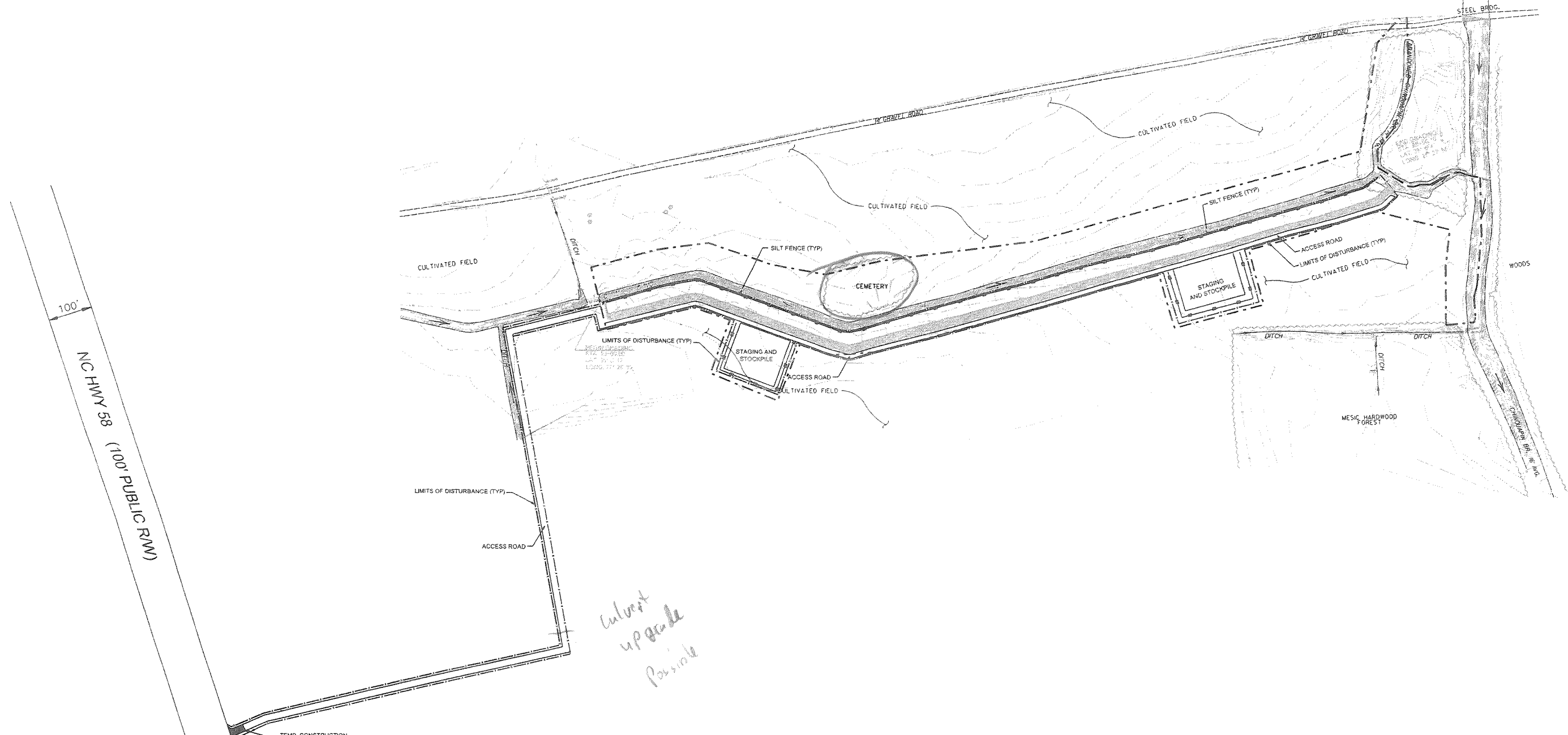
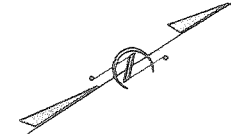
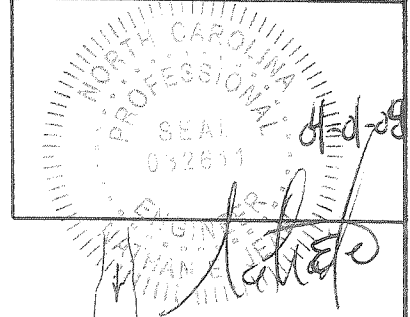
# EROSION CONTROL



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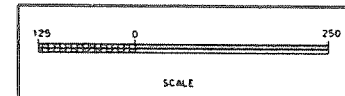
PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	EC-1
PROJECT ENGINEER	



*Culvert upgrade possible*

LIMITS OF DISTURBANCE = 4.8 ACRES

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



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

04/17/2009  
 08:15:10  
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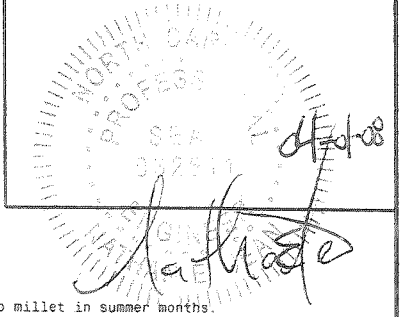
# DETAILS

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



**Stantec**

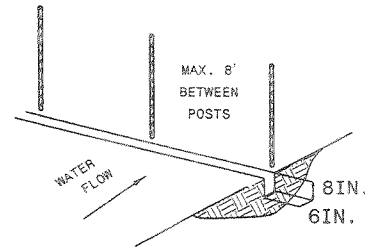
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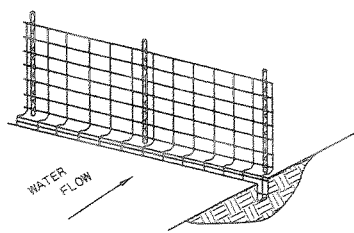
## STANDARD TEMPORARY SILT FENCE

SCALE: N.T.S.

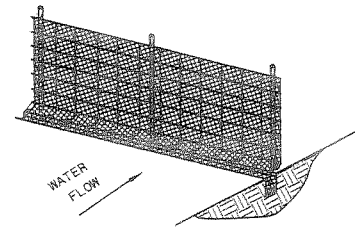
STEP 1:  
 DRIVE STEEL POSTS 18IN. INTO GROUND AND EXCAVATE A 6IN. x 6IN. TRENCH UPHILL ALONG THE LINE OF POSTS. WOOD POSTS 4IN. IN DIAMETER MAY BE USED.



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

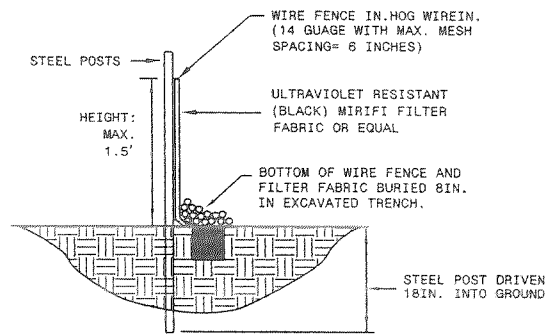
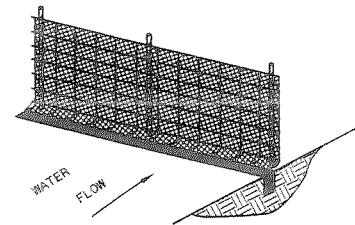


STEP 3:  
 ATTACH THE FILTER FABRIC TO THE WIRE FENCE AND EXTEND THE BOTTOM OF THE FABRIC 8IN. INTO THE TRENCH.



### 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 STABILIZERS.

## 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.

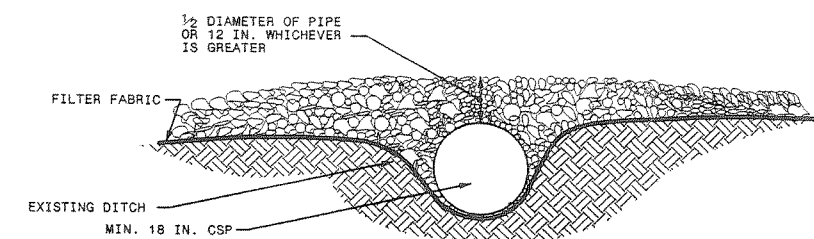
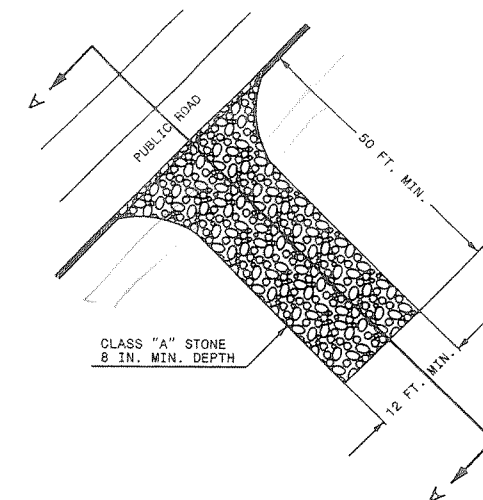
## Fertilizer Topdressing

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

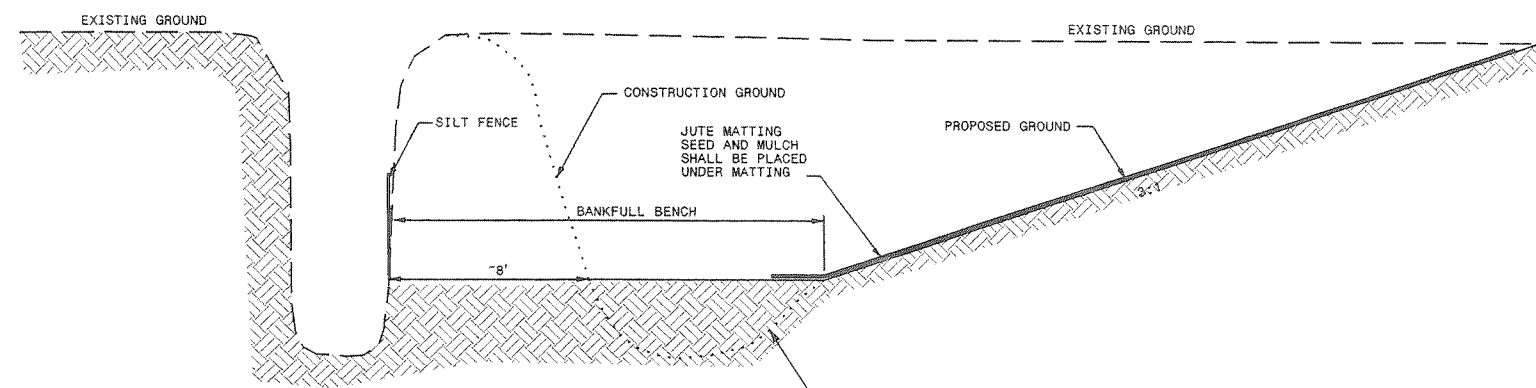
- NOTES:
1. TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS SHALL BE PROVIDED.
  2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
  3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOP DRESSING 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. 1.8" 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

## CONSTRUCTION DETAIL

SCALE: NTS



OVER EXCAVATION FOR PLACEMENT OF TOPSOIL BERM AFTER FLOODPLAIN CONSTRUCTION IS COMPLETE

- 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.

- ..... CONSTRUCTION GROUND
- PROPOSED GROUND
- - - - - EXISTING GROUND

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

4/1/2009  
 10:48 AM  
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# DETAILS

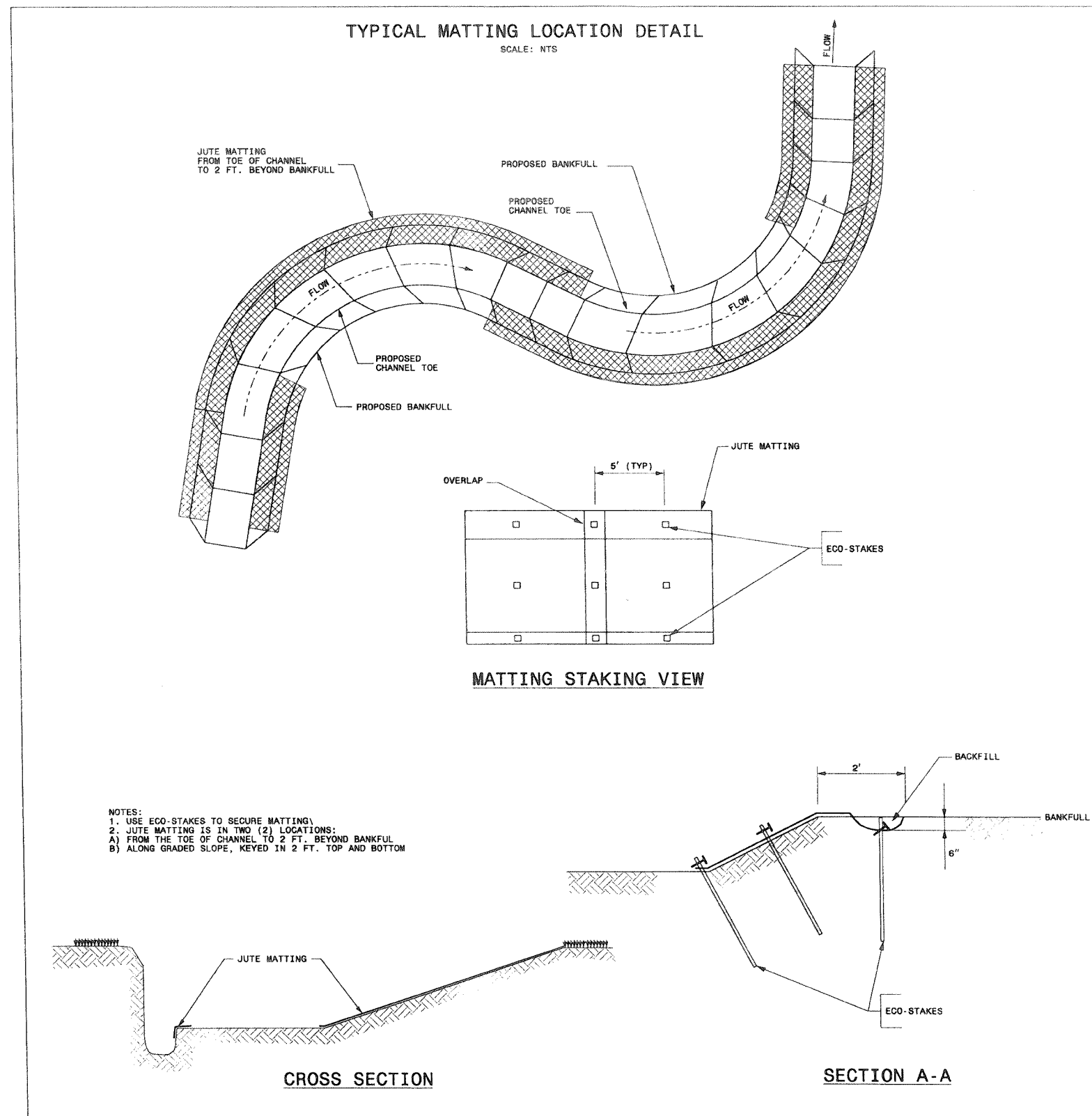


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PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	EC-2A
PROJECT ENGINEER	

*07/17/08*

*[Signature]*



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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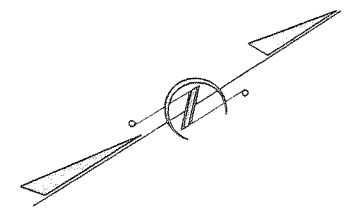


# EROSION CONTROL

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	EC-3
PROJECT ENGINEER	
PROFESSIONAL SEAL 032611 04-21-08	



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100'  
NC HWY 58 (100' PUBLIC RM)

MATCHLINE SEE SHEET EC-4

LIMITS OF DISTURBANCE (TYP)

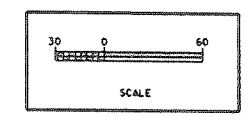
ACCESS ROAD

TEMP. CONSTRUCTION GRAVEL ENTRANCE

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



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

DATE PLOTTED: 04/21/08 10:00 AM

# EROSION CONTROL



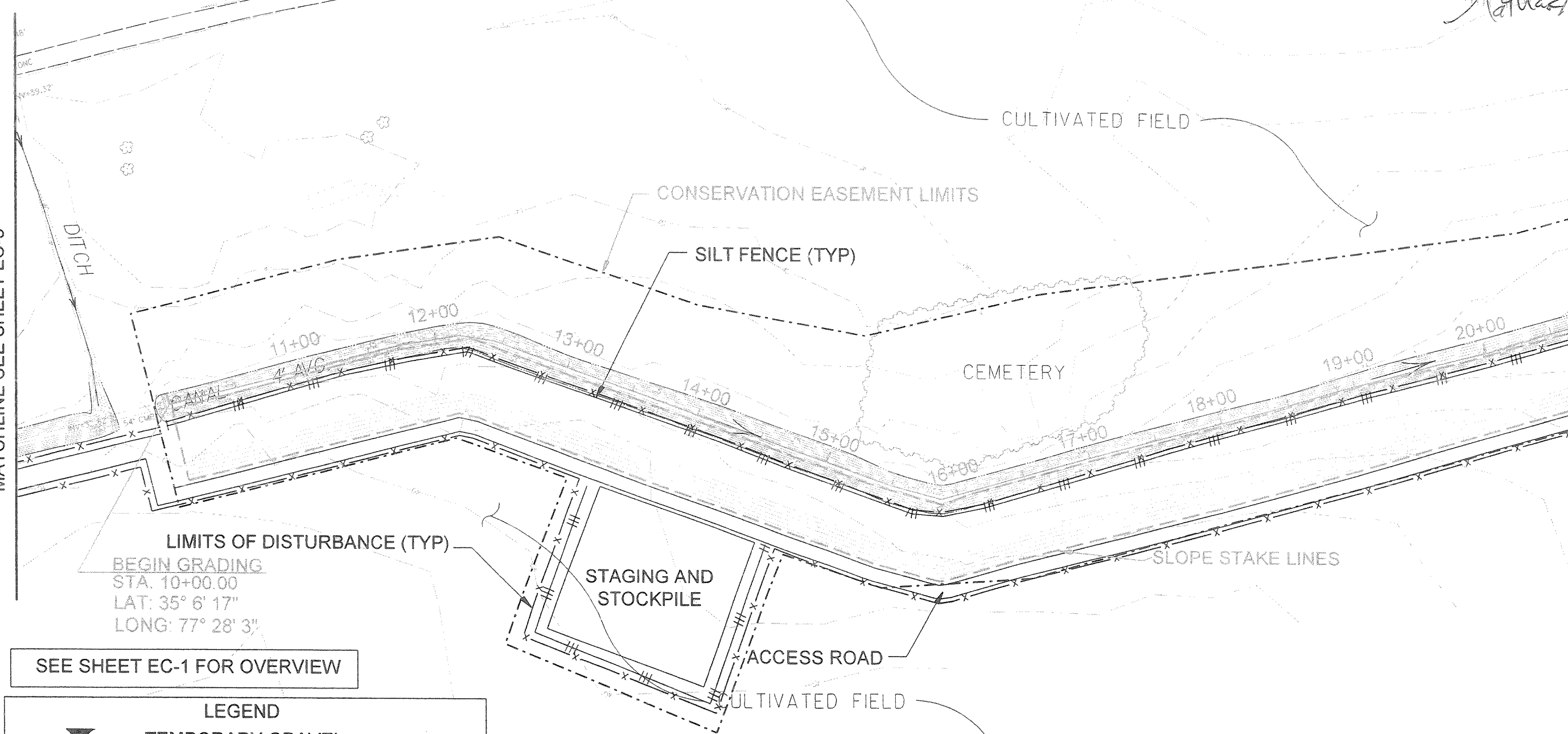
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PROJECT REFERENCE NO. SCO-050650601	SHEET NO. EC-4
PROJECT ENGINEER	

Professional Seal  
 NORTH CAROLINA  
 PROFESSIONAL SEAL  
 052811  
 [Signature]

MATCHLINE SEE SHEET EC-3

MATCHLINE SEE SHEET EC-5 STA. 20+64.22

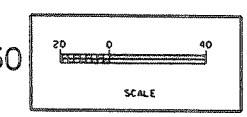


**LIMITS OF DISTURBANCE (TYP)**  
 BEGIN GRADING  
 STA. 10+00.00  
 LAT: 35° 6' 17"  
 LONG: 77° 28' 3"

SEE SHEET EC-1 FOR OVERVIEW

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

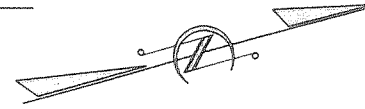
- NOTE:**
1. ENHANCEMENT STA. 10+00.00 TO STA. 20+64.22
  2. ACCESS ROAD SHALL BE "DEEP RIPPED" PRIOR TO PLANTING FROM STA. 10+00 TO 28+50
  3. LIMITS OF DISTURBANCE = 4.8 ACRES



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

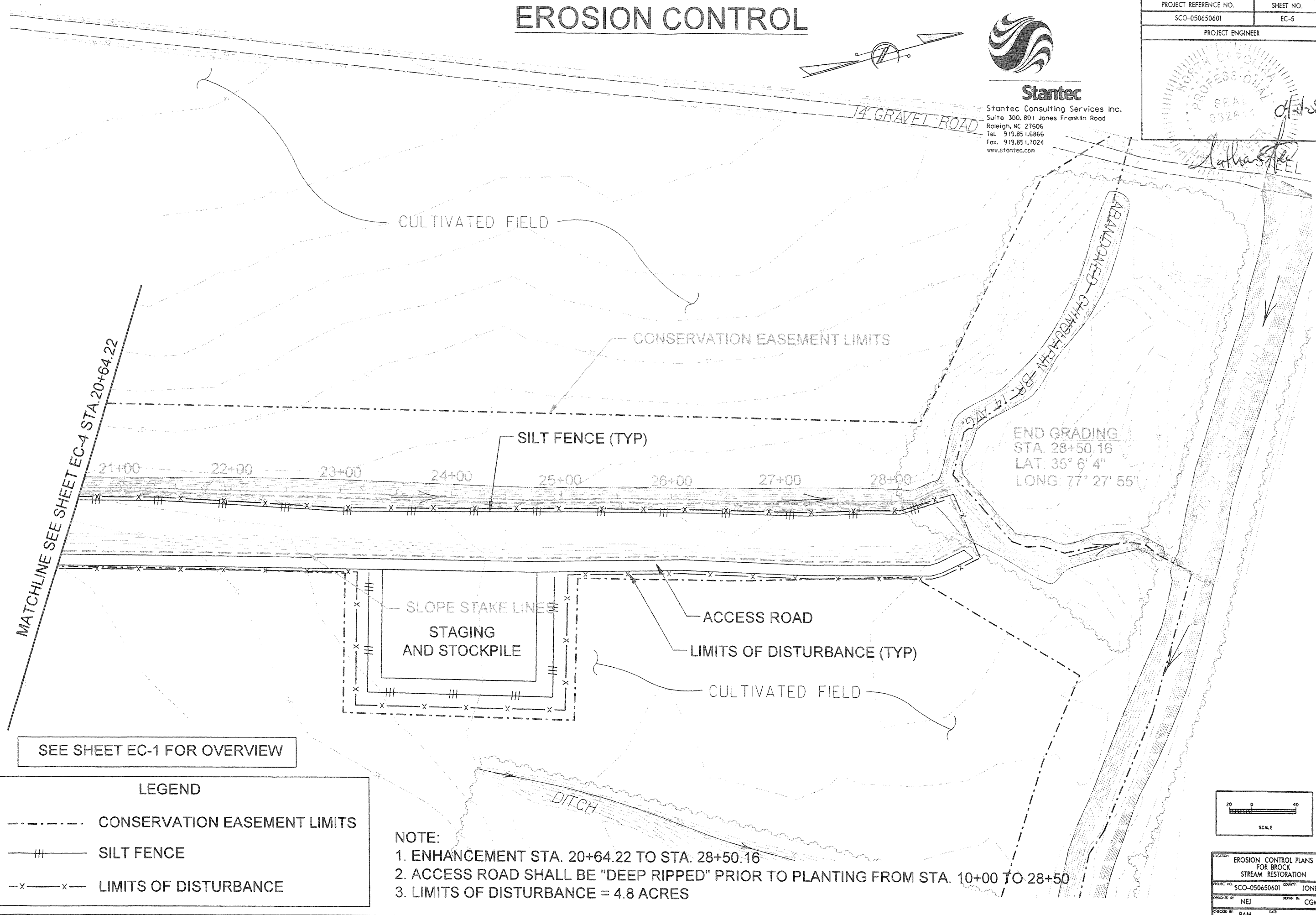
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# EROSION CONTROL



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

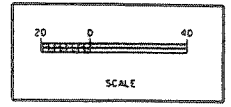


MATCHLINE SEE SHEET EC-4 STA. 20+64.22

SEE SHEET EC-1 FOR OVERVIEW

LEGEND	
-----	CONSERVATION EASEMENT LIMITS
	SILT FENCE
-x-x-	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



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

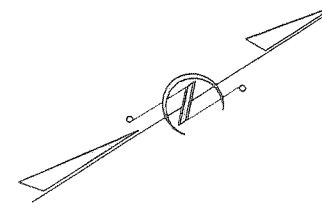
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# PLANTING PLAN



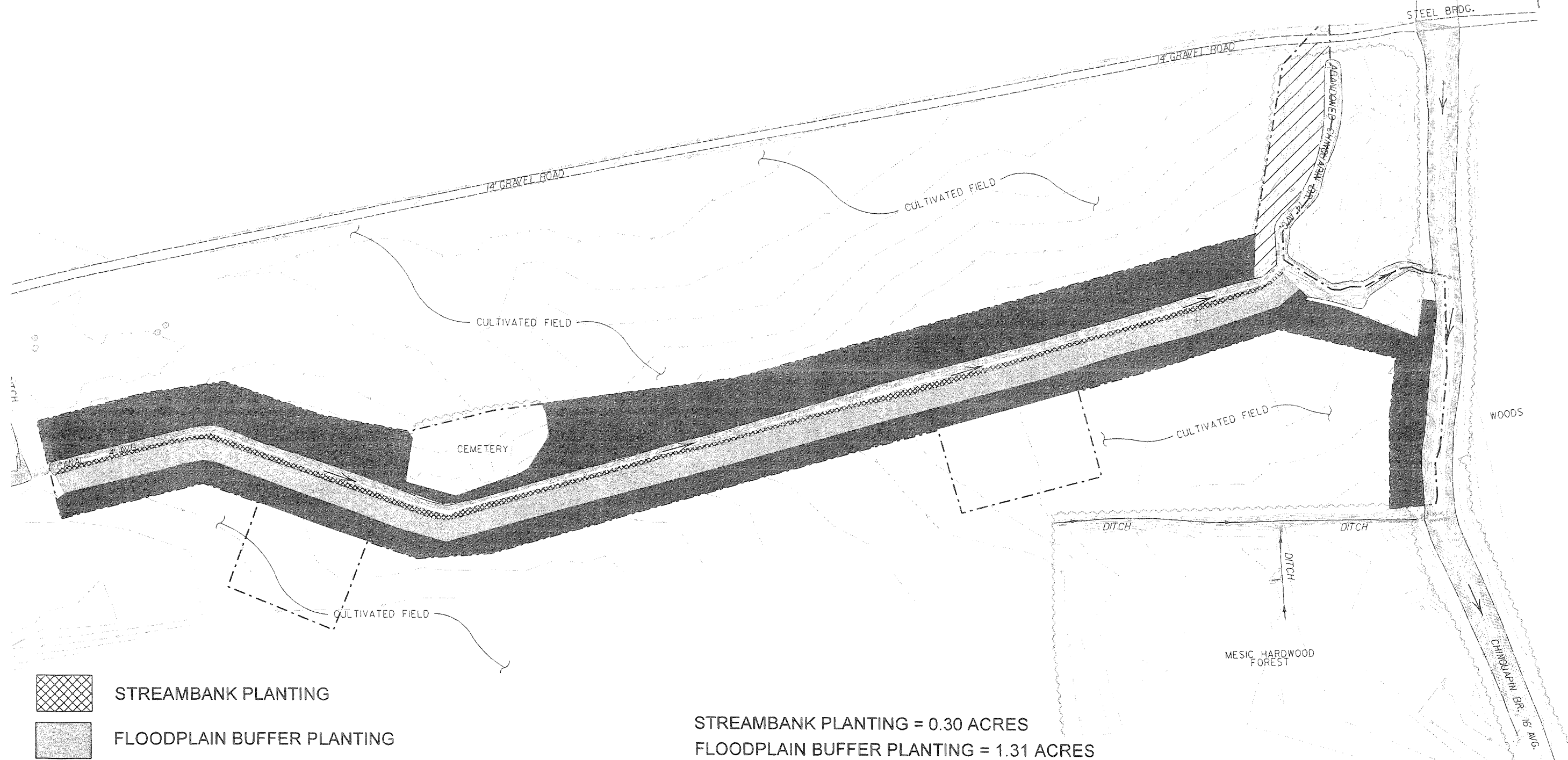
**Stantec**





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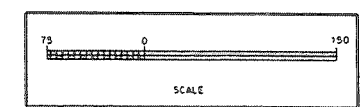
PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	PL-1
PROJECT ENGINEER	

04-01-08  
*Jeffrey L. Jones*



-  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



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

4/1/2008  
10:40:00 AM  
C:\Users\jeffrey.l.jones\Documents\Projects\SCO-050650601\PL-1.dwg

# DETAILS



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



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

PERMANENT SEEDING MIX			
COMMON NAME	SPECIES	SEEDING DATA	SEEDING RATE (LBS/ACRE)
REDFOP	<i>Agrostis alba</i>	APRIL 1 - JULY 1	5
BIG BLUESTEM	<i>Andropogon gerardii</i>	APRIL 15 - JULY 1	5
INDIAN GRASS	<i>Sorghastrum nutans</i>	APRIL 15 - JULY 1	5
SWITCHGRASS	<i>Panicum virgatum</i>	APRIL 15 - JULY 1	15
BROWN TOP MILLET	<i>Pennisetum glaucoma</i>	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 DURING THE REMAINDER OF THE YEAR

### 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:**

- TREE REFORESTATION SHALL BE PLANTED 6' TO 10' ON CENTER, RANDOM SPACING, AVERAGING 8' ON CENTER, APPROXIMATELY 680 PLANTS PER ACRE.
- 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:**

- LIVE STAKES SHALL BE EVENLY SPACED 3 FT. APART.
- LIVE STAKES SHALL BE DRIVEN UNTIL APPROXIMATELY 3/4 OF LIVE STAKE IS WITHIN GROUND.
- IF STARTER HOLE IS NEEDED, MINIMIZE AIR POCKET.
- 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

04/17/08  
 04:00 PM  
 C:\Users\jones\Documents\Projects\050650601\050650601.dwg

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

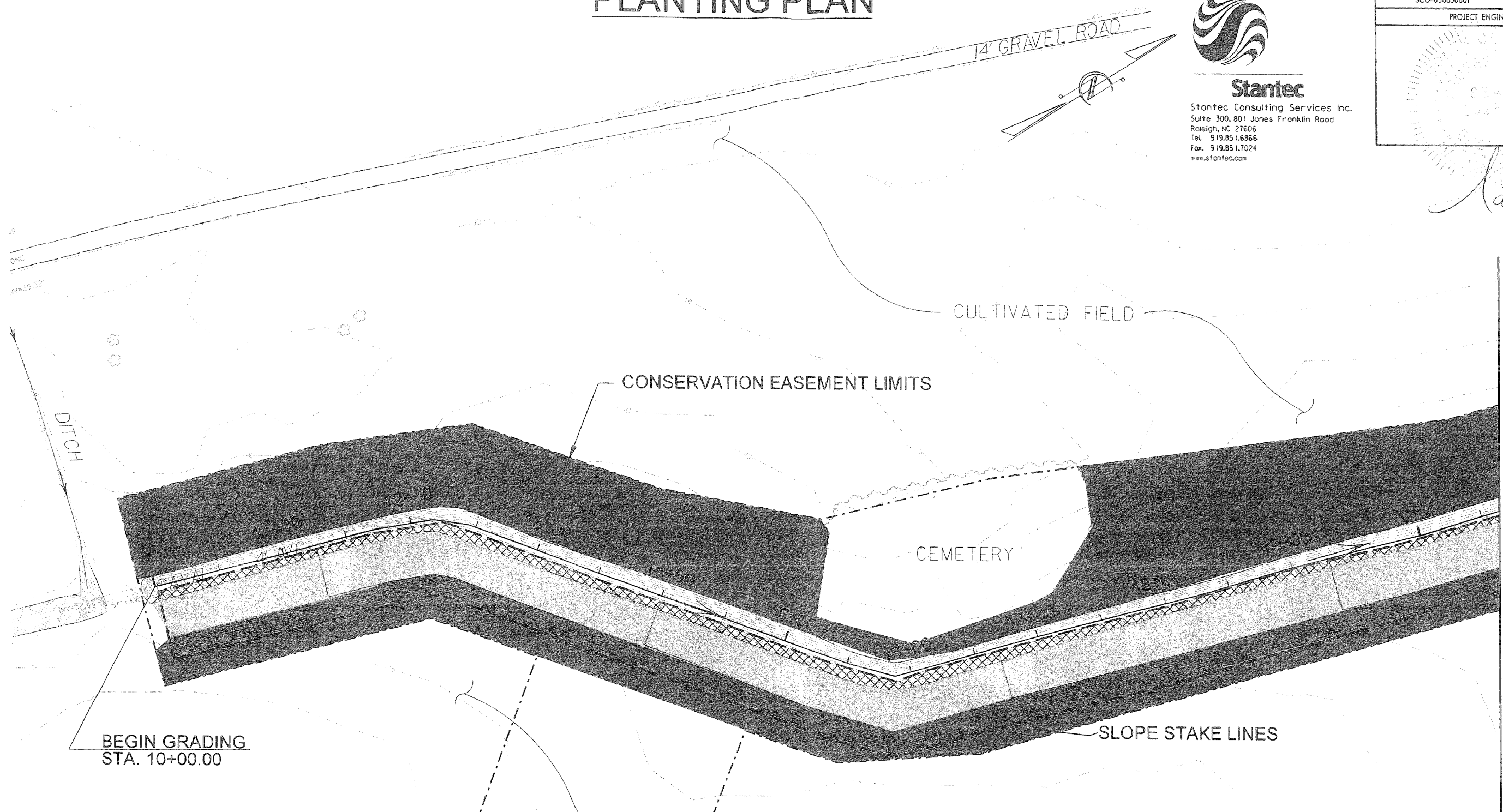
# PLANTING PLAN



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PROJECT REFERENCE NO. SCO-050650601	SHEET NO. PL-3
PROJECT ENGINEER	
H-d-08	

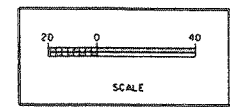
*Nathan E. [Signature]*



MATCHLINE SEE SHEET PL-4 STA. 20+64.22

LEGEND	
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	FLOODPLAIN BUFFER PLANTING
	UPLAND BUFFER PLANTING

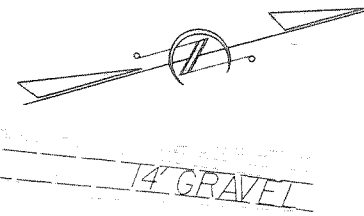
NOTE:  
 ENHANCEMENT STA. 10+00.00 TO STA. 20+64.22



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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# PLANTING PLANS



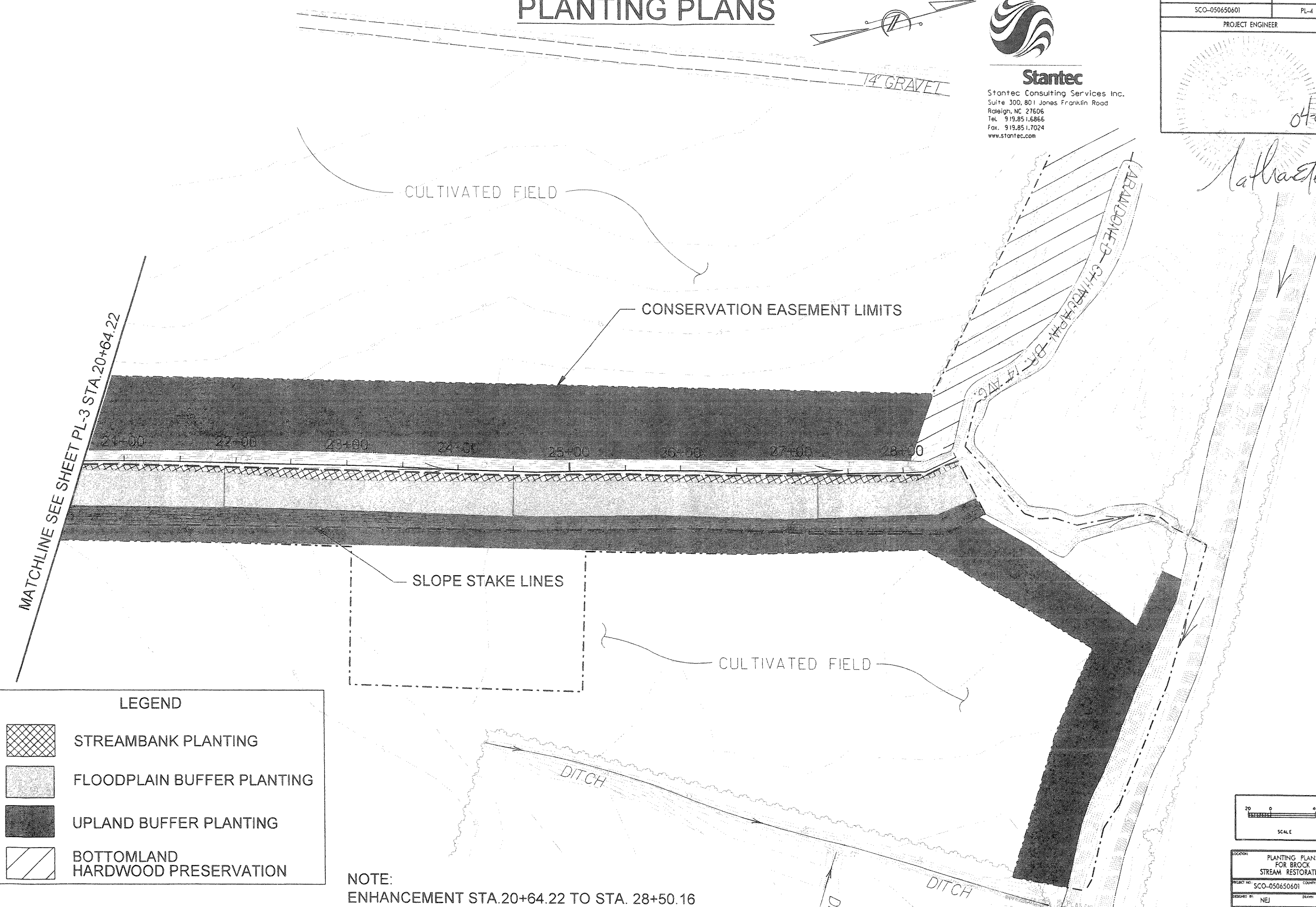
**Stantec**

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

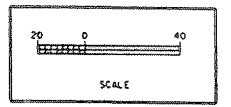
*04/10/08*  
*Natraester*

MATCHLINE SEE SHEET PL-3 STA. 20+64.22



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

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



PROJECT NO. SCO-050650601		COUNTY JONES	
DESIGNED BY NEJ	DATE	DRAWN BY CGM	DATE
CHECKED BY BAM			

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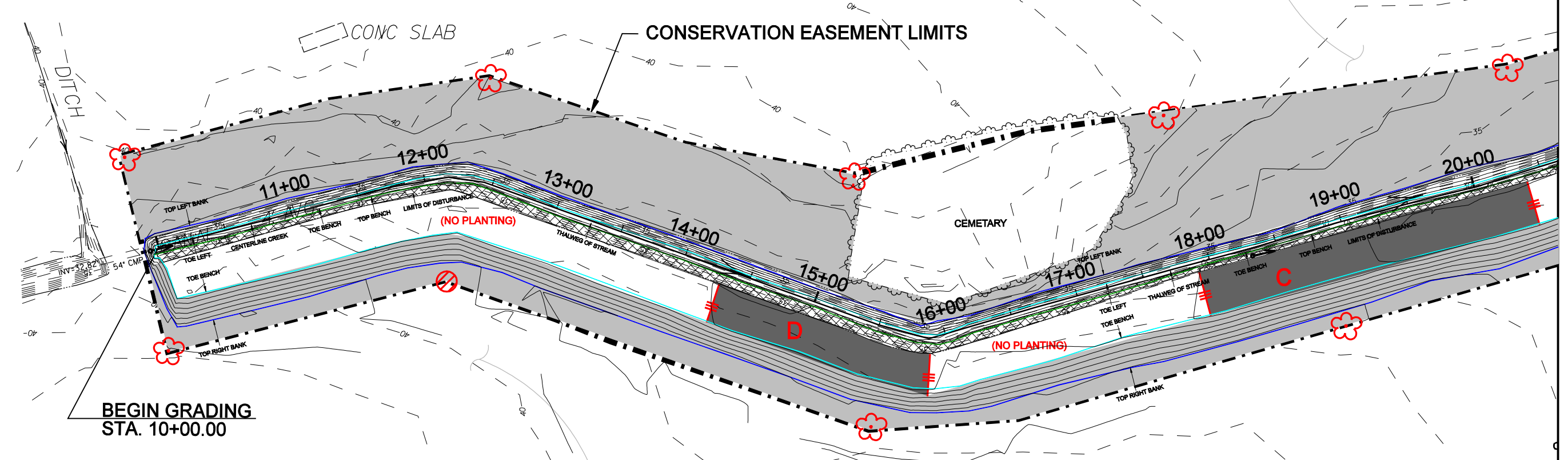
PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	PL-3
PROJECT ENGINEER	

# RE-PLANTING MAP



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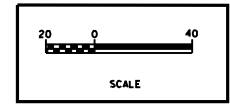
PLANT LIST FOR TREES AND SHRUBS BY ZONE				
COMMON NAME	SCIENTIFIC NAME	SOUTHEAST REGION INDICATOR	SIZE	DENSITY
<b>STREAMBANK PLANTING</b>				
SMOOTH ALDER	<i>Alnus serrulata</i>	FACULTATIVE WETLAND +	0.5-1.5" DIAMETER	6 FT CENTERS
SWAMP DOGWOOD	<i>Cornus stricta</i>	FACULTATIVE WETLAND -	0.5-1.5" DIAMETER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



MATCHLINE SEE SHEET PL-4 STA. 20+64.22

**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)



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

DATE PLOTTED: 12/15/09



# RE-PLANTING MAP

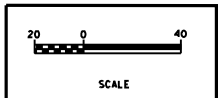
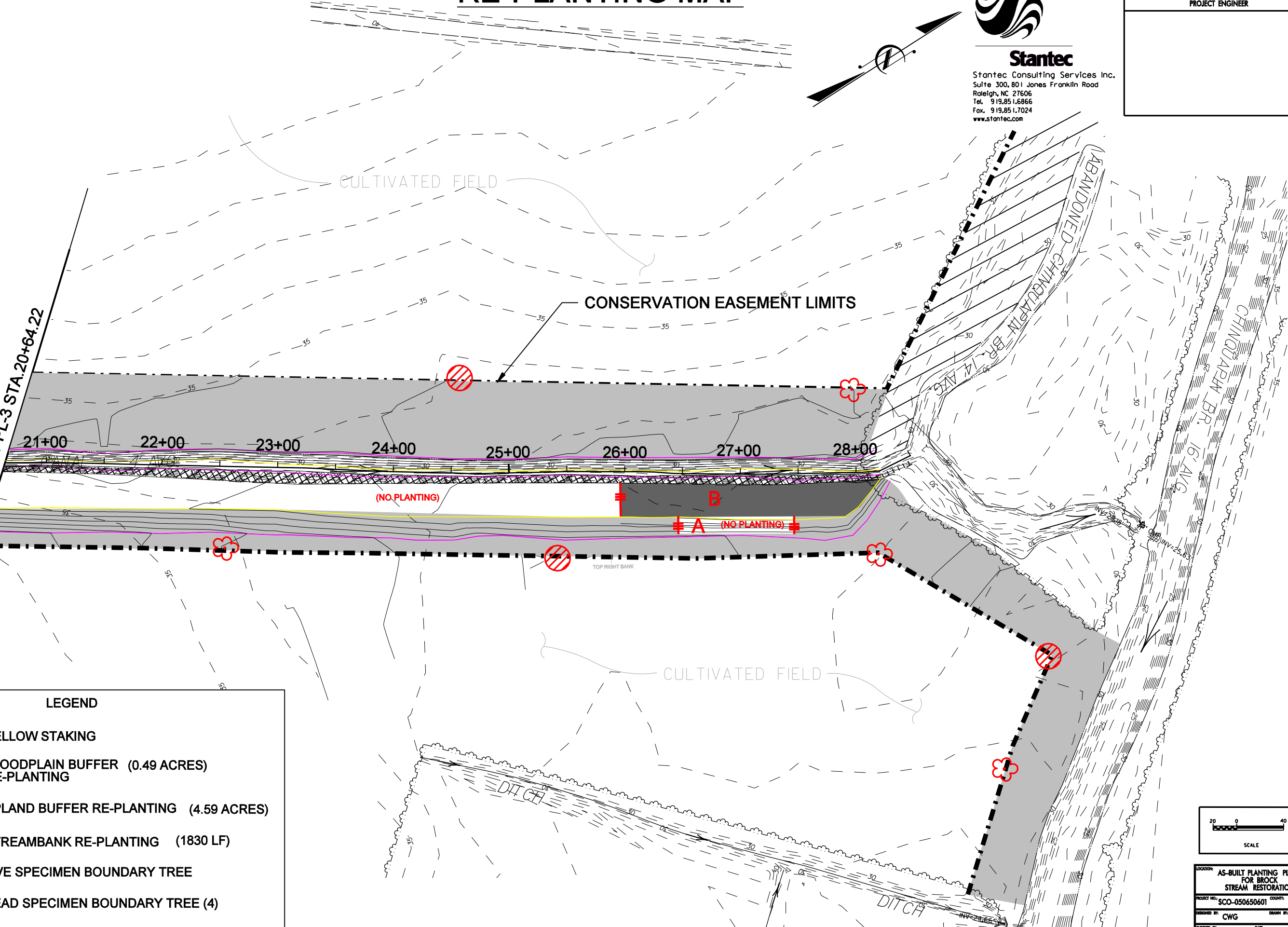


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PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	PL-4
PROJECT ENGINEER	

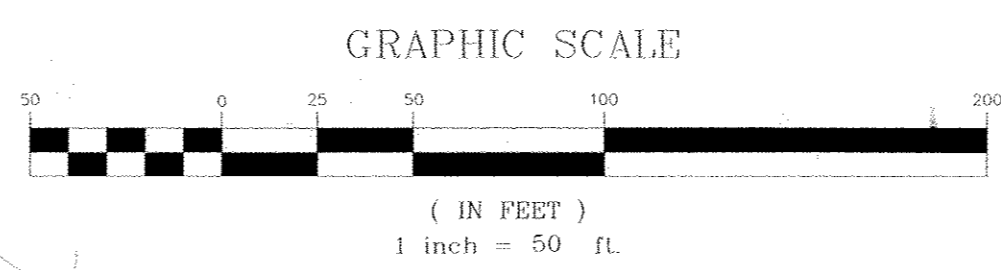
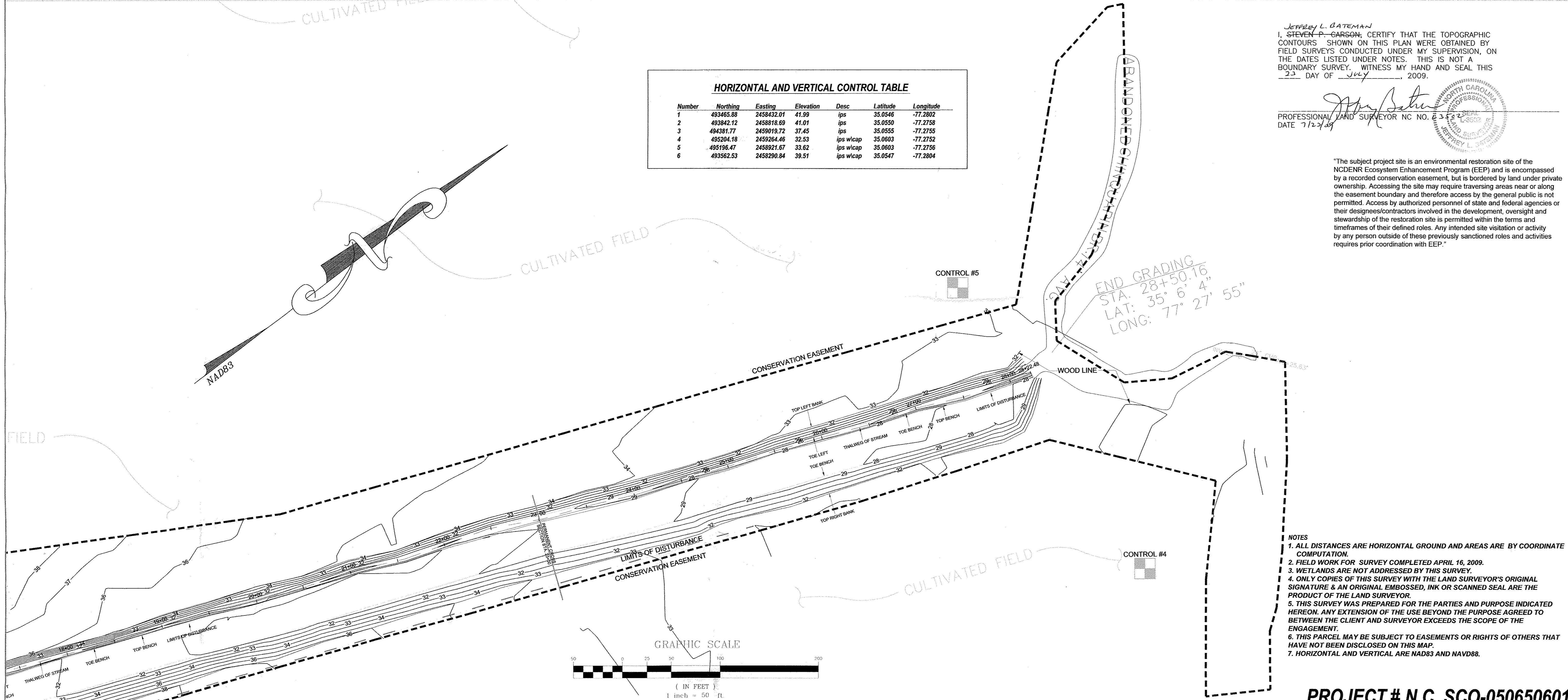
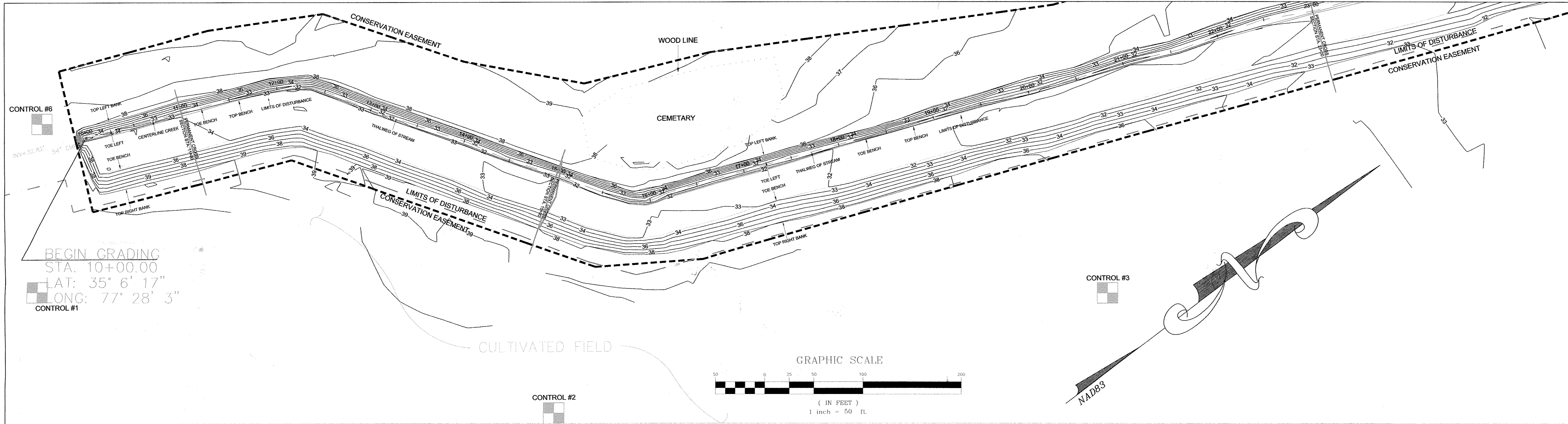
MATCHLINE SEE SHEET PL-3 STA. 20+64.22

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)



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

DATE PLOTTED: 12/14/09



**HORIZONTAL AND VERTICAL CONTROL TABLE**

Number	Northing	Easting	Elevation	Desc	Latitude	Longitude
1	493465.88	2458432.01	41.89	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

JEFFREY L. BATEMAN  
I, STEVEN P. CARSON, 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.

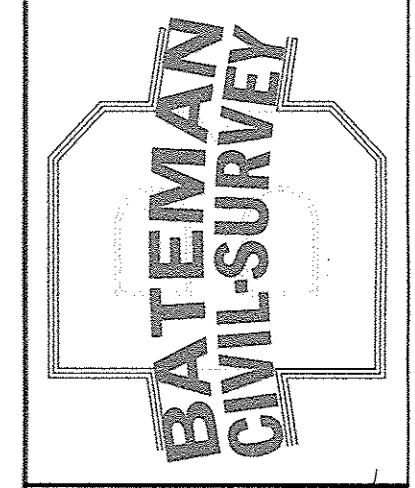
*Jeffrey L. Bateman*  
PROFESSIONAL LAND SURVEYOR NC NO. 23722  
DATE 7/23/09

"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.



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Engineers • Surveyors • Planners  
200 North Main Street, Holly Springs, NC 27540  
Phone: (919) 577-1080 Fax: (919) 577-1081  
Info@BatemanCivilSurvey.com

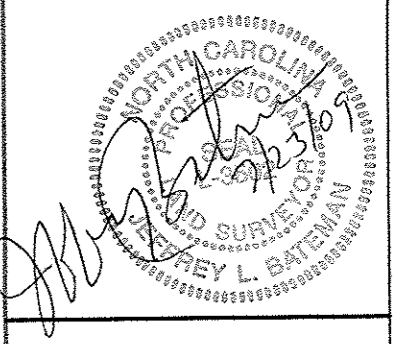


**Brock Stream Restoration Project**  
Asbuilt Topographic Survey  
**PROJECT # N.C. SCO-050650601**  
Exclusively For  
**Shamrock Environmental**  
Jones County, North Carolina

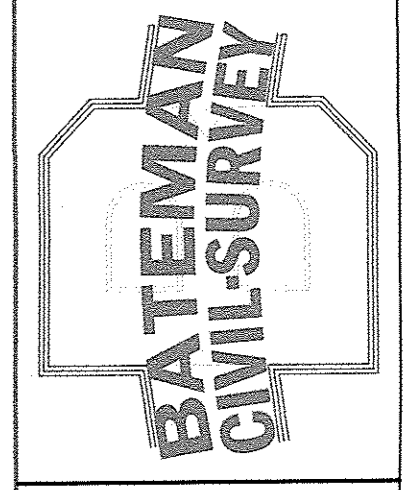
Revisions  
06/05/2009-Additional Topographic Shots  
07/09/2009-Additional Topographic Shots  
07/27/2009-Map Revisions Per EEP

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

**PROJECT # N.C. SCO-050650601**  
SUR1  
1 of 2



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 info@BatemanCivilSurvey.com



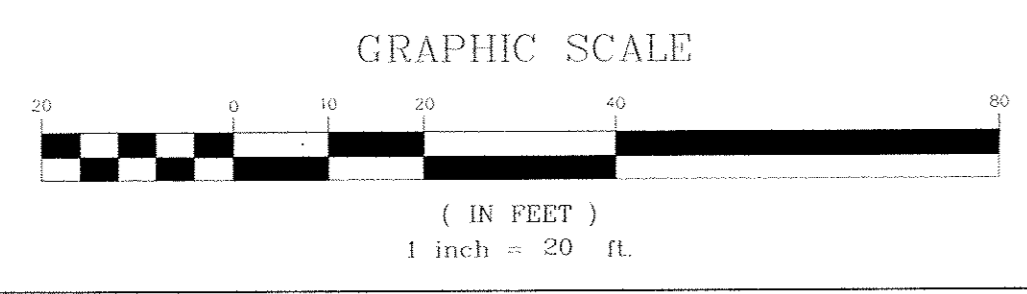
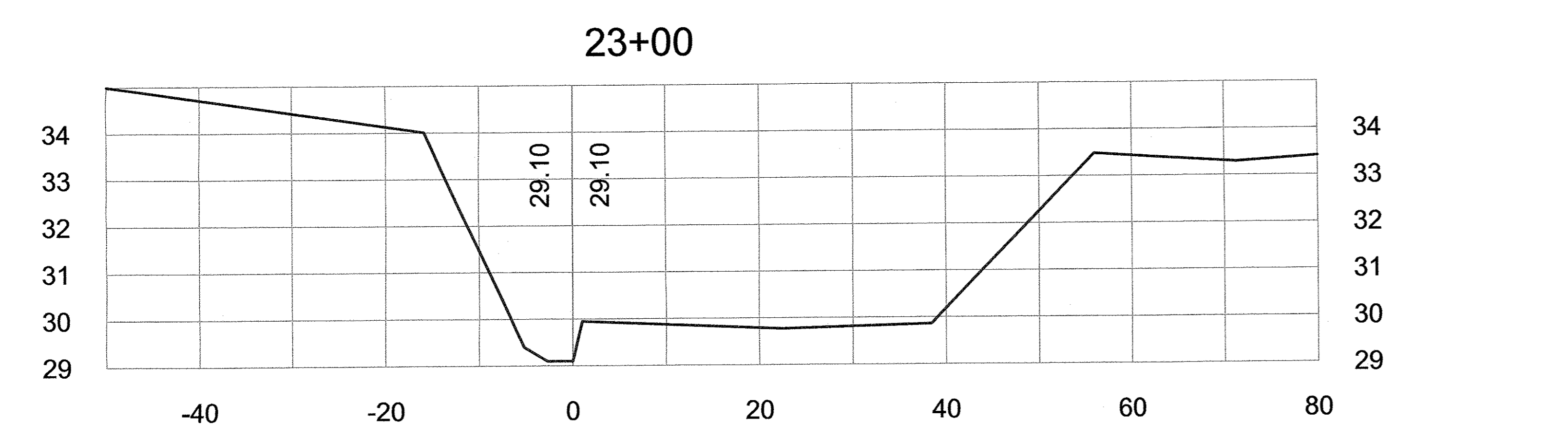
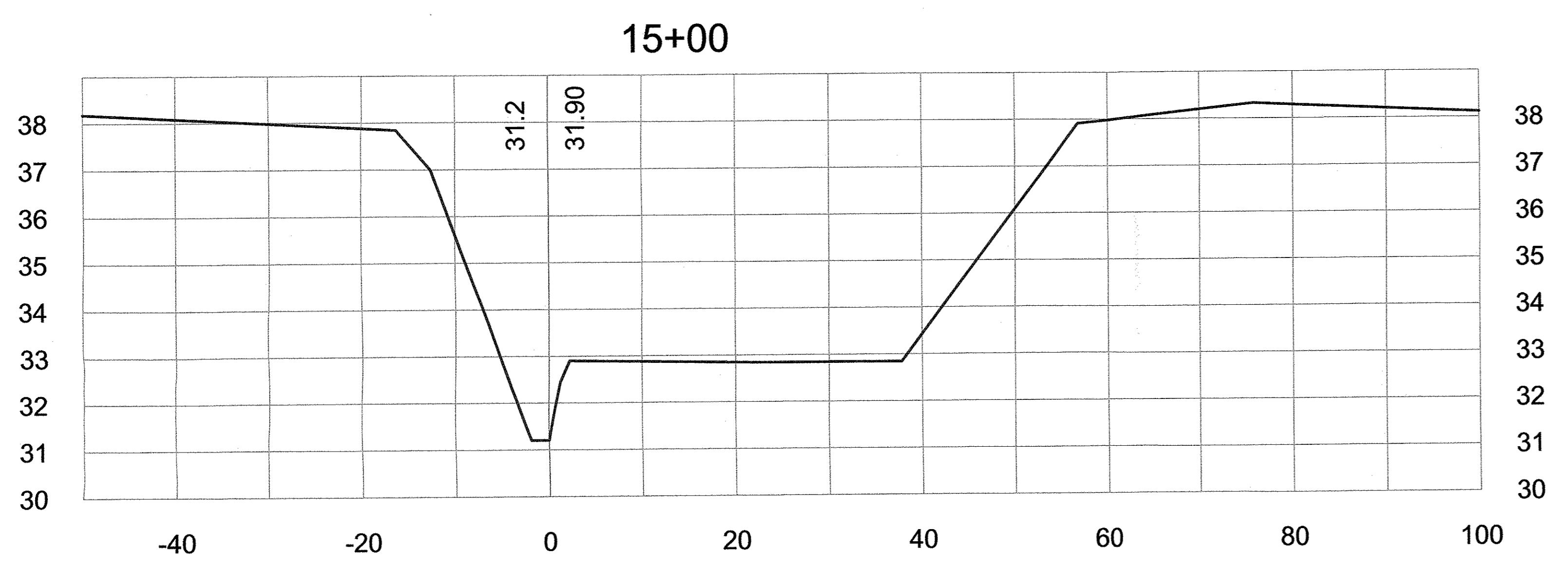
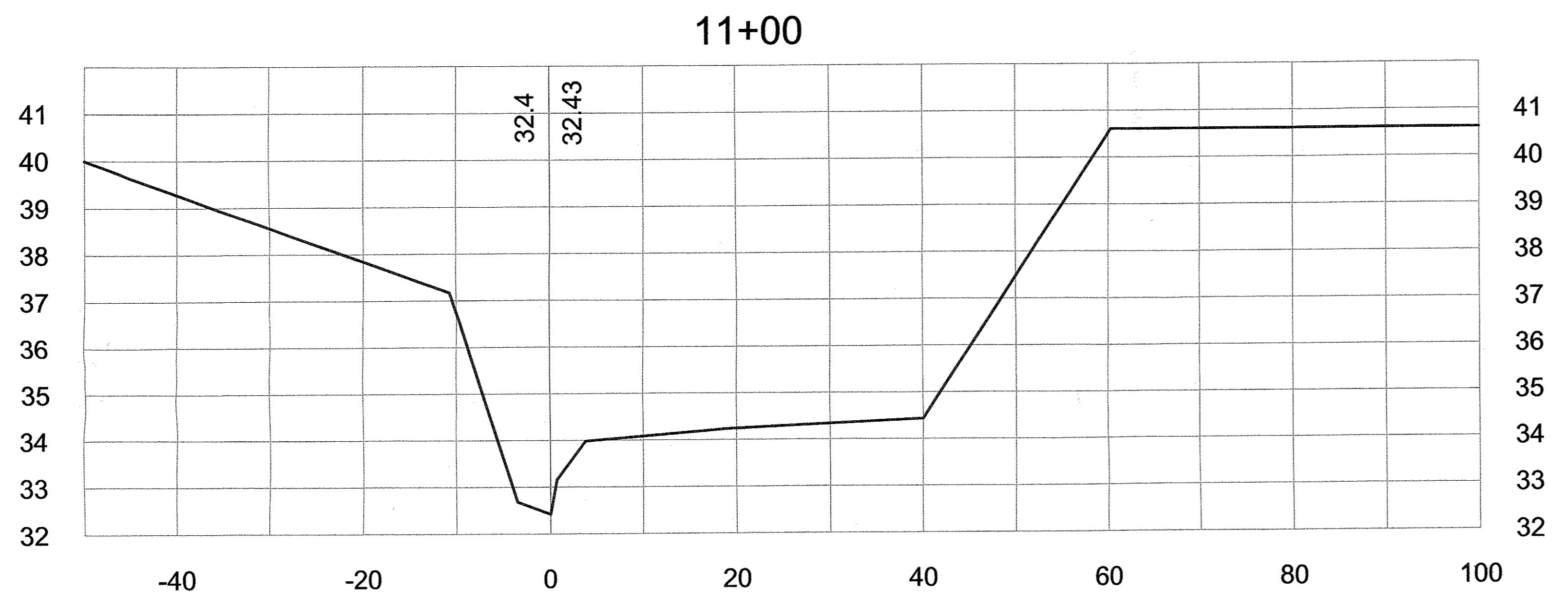
Brock Stream Restoration Project  
 Detailed Cross Sections & Raw Data Table  
**PROJECT # N.C. SCO-050650601**  
 Exclusively For  
**Shamrock Environmental**  
 Jones County, North Carolina

Revisions  
 06/09/2009-Additional Topographic Shots  
 07/08/2009-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: HORIZ: 1" = 20'  
 VERT: 1" = 2'  
 Date: 04/21/2009  
 Drawing Number: 081062

**SUR2**  
 2 of 2

Pnt #	Northing	Easting	Elevation	Desc
84000	493915.63	2458664.90	38.32	gs
84001	493930.52	2458663.05	37.91	top
84002	493944.33	2458658.81	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	493990.35	2458347.81	37.17	top
84011	493988.10	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



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

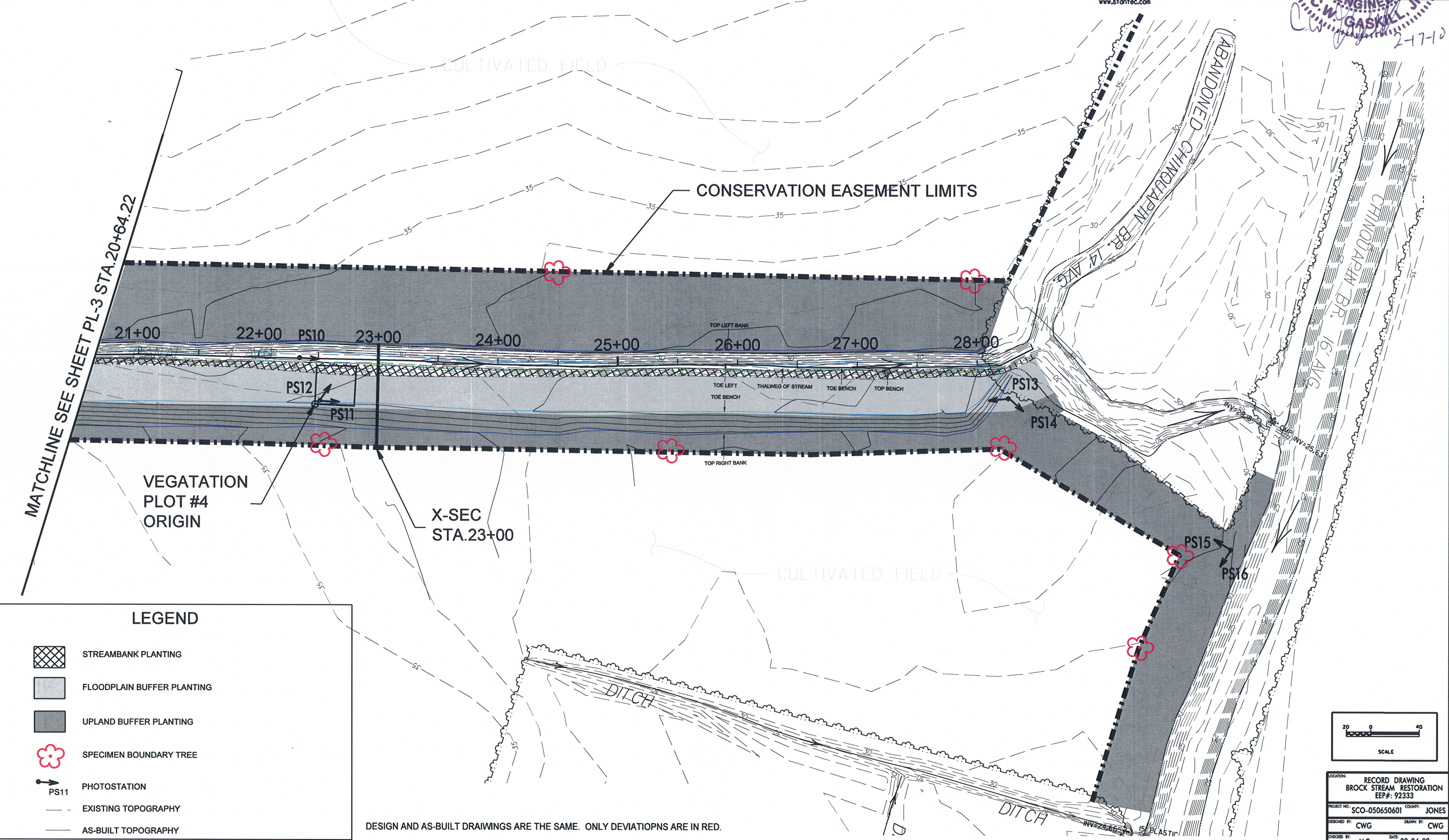
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VEG. PLOT#4	35d 05m 58.26524s	77d 27m 56.54235s
VEG. PLOT#4	35d 05m 57.95164s	77d 27m 56.66096s
X-SEC 23+00 LT	35d 05m 58.49527s	77d 27m 56.70047s
X-SEC 23+00 RT	35d 05m 58.23462s	77d 27m 55.70590s



**Stantec**  
 Stantec Consulting Services Inc.  
 Suite 300, 801 Jones Franklin Road  
 Raleigh, NC 27606  
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 Fax. 919.851.7024  
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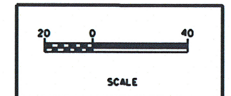
PROJECT REFERENCE NO. SCO-050650601	SHEET NO. 4A
PROJECT ENGINEER <b>NORTH CAROLINA PROFESSIONAL SEAL</b> SEAL 034257 C.W. GASKILL, JR. 2-17-10	



**LEGEND**

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


DESIGN AND AS-BUILT DRAWINGS ARE THE SAME. ONLY DEVIATION ARE IN RED.



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

DATE: 09-04-09

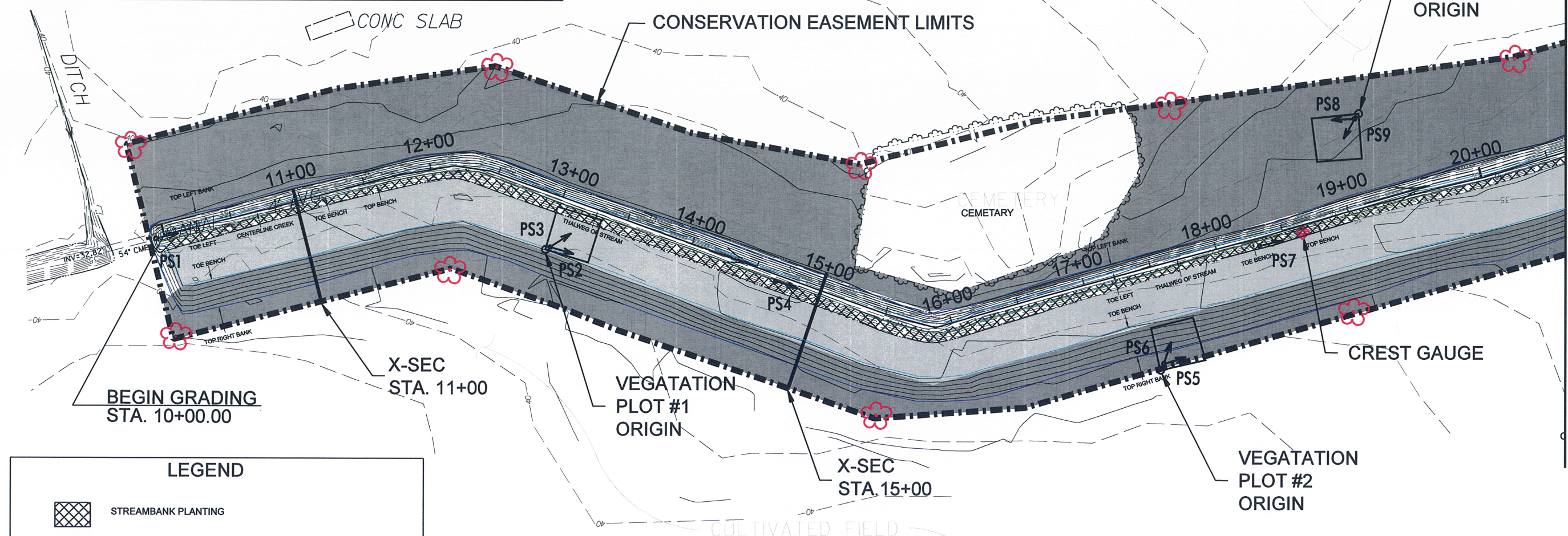
# RECORD DRAWING

PROJECT REFERENCE NO.	SHEET NO.
SCO-050650601	48
PROJECT ENGINEER	
 SEAL 034257	



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

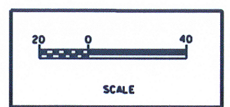


LEGEND	
	STREAMBANK PLANTING
	FLOODPLAIN BUFFER PLANTING
	UPLAND BUFFER PLANTING
	SPECIMEN BOUNDARY TREE
	PHOTOSTATION
	EXISTING TOPOGRAPHY
	AS-BUILT TOPOGRAPHY

DESIGN AND AS-BUILT DRAWINGS ARE THE SAME. ONLY DEVIATION 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



MATCHLINE SEE SHEET PL-4 STA. 20+64.22

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