MITIGATION REPORT (FINAL)

BISHOP SITE STREAM AND WETLAND RESTORATION
ANSON COUNTY, NORTH CAROLINA
YADKIN RIVER BASIN CATALOGING UNITS 03040104 AND 03040105

SCO ID# 040611701A

PREPARED FOR:

Ecosystem Enhancement PROGRAM

NCDENR - ECOSYSTEM ENHANCEMENT PROGRAM
Project Manager: Melonie Allen
1652 Mail Service Center
Raleigh, North Carolina 27699-16152

OCTOBER 2007

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SCO ID# 040611701A

PREPARED BY:

EcoScience

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EXECUTIVE SUMMARY

EcoScience Corporation (ESC) was retained by the North Carolina Ecosystem Enhancement Program (EEP) to provide stream and wetland restoration/enhancement design services for the Bishop Site Stream and Wetland Restoration (hereafter referred to as the Site). The Site, which is in the Yadkin River Basin (Cataloguing Units 03040104 and 03040105), is located north of Wadesboro in Anson County, North Carolina (Figure 1, Appendix A). Three separate construction areas, each confined within an EEP-owned conservation easement, comprise the approximate 200-acre Site: Camp Branch (Site A, 94.9 acres), Dula Thoroughfare (Site B, 70.8 acres), and the Unnamed Tributary (UT) to Dula Thoroughfare (Site C, 33.7 acres).

Pre-Construction Site Conditions

Prior to restoration activities, land use within the Site was primarily agricultural, with forested strips occupying low areas between cultivated fields. There are three major on-Site drainage features where restoration activities occurred: Camp Branch, Dula Thoroughfare, and the UT to Dula Thoroughfare (Sites A, B, and C, respectively). Each of these three watercourses was dredged and straightened to accommodate past agricultural land use, resulting in unstable F and G type channels (Rosgen 1996). In their pre-disturbance conditions, Camp Branch and the UT to Dula Thoroughfare were likely classifiable as C or E stream types (Rosgen 1996), while Dula Thoroughfare, due to its landscape position at the edge of the Rocky River floodplain, was likely a low-gradient backwater slough (an E or D stream type [Rosgen 1996]). The following table summarizes the pre-construction conditions of each stream.

Pre-Construction Site Stream Channel Conditions				
Stream	**Stream Type (Rosgen 1996)**	**Drainage Area at Site (mi^2)**	**Stream Order (per USGS)**	**Extent within Site (linear feet)**
Camp Branch	F4/5	2.9	2nd	5,078
Dula Thoroughfare	G5	0.4	1st	5,230
UT to Dula Thoroughfare	G4/5	0.2	1st	4,880

Due to the presence of hydric soil inclusions, riverine wetlands were likely adjacent to Dula Thoroughfare (Site B) in its downstream portions within the Site prior to anthropogenic channel impacts. However, channel alteration resulted in hydrologic modifications that effectively drained adjacent wetlands with the exception of those within the fringe of the channel. Headwater riverine wetlands, many of which are forested, occur elsewhere along various Site drainage features.

Restoration Plan

Stream restoration and/or enhancement activities were undertaken along Camp Branch (including an adjacent UT) (Site A), Dula Thoroughfare (Site B), and the UT to Dula Thoroughfare (Site C). In order to provide Priority 1 stream restoration along the UT to Camp Branch (Site A), an appropriately sized bankfull channel was excavated on new location within the Camp Branch floodplain. Priority 2 stream restoration was achieved along Camp Branch and the UT to Camp Branch (Site A) and Dula Thoroughfare (Site B) via floodplain and stream channel excavation on new location. Level 1 stream enhancement was achieved along the UT to Dula Thoroughfare by backfilling ditched and dredged portions of the channel, thereby returning stream flow to the adjacent, stable relic portions of the stream. Boulder sill structures were also installed in downstream portions of the UT to Dula Thoroughfare to

stabilize headcut areas. Level 2 stream enhancement was achieved in upstream portions of Camp Branch (Site A) and the UT to Dula Thoroughfare (Site C) by performing supplemental riparian plantings with the appropriate indigenous suite of species adjacent to the existing channel.

Wetland restoration adjacent to Dula Thoroughfare (Site B) were achieved by floodplain excavation and Site planting to mimic the Piedmont Bottomland Forest community described by Schafale and Weakley (1990). Wetland enhancement was also achieved in the headwaters of the UT to Dula Thoroughfare (Site C) via site planting. Exotic species removal (Chinese privet, *Ligustrum sinense*) was undertaken within forested portions of the active restoration areas at each of the three sites.

Post-Construction Site Conditions

On-Site restoration activities provided the following project totals (see Tables 1 and 2 and Figures 2 and 2A-C [Appendix A] for additional details):

- Priority 1 Stream Restoration: 403 linear feet
- Priority 2 Stream Restoration: 4,640 linear feet
- Level 1 Stream Enhancement: 1,871 linear feet
- Level 2 Stream Enhancement: 1,425 linear feet
- Stream Preservation: 12,918 linear feet
- Riverine Wetland Restoration: 3.1 acres
- Riverine Wetland Enhancement: 1.0 acres
- Riverine Wetland Preservation: 7.5 acres

Numerous ecological benefits are anticipated as a result of on-Site restoration activities. Stream channel restoration will reintroduce stable bankfull dimension, pattern, and profile along restored stream reaches, which is expected to greatly enhance lotic habitat quality and stream function. Floodplain excavation adjacent to restored streams will restore the characteristic flood regime to the stream as well as provide a lateral hydrologic input to restored wetland areas along the Dula Thoroughfare (Site B) floodplain. Restored and enhanced wetland areas will help to improve water quality via nutrient removal, increase local vegetative biodiversity, provide wildlife habitat, and serve as a forested corridor, linking the Site with adjacent forested areas.

Monitoring Plan

In order to ensure the Site meets regulatory stream and wetland restoration/enhancement monitoring criteria, each parameter on-Site will be monitored annually for five (5) years or until success criteria has been achieved. Refer to Figures 3A-C (Appendix A) and Section 3.0 (Monitoring Plan) of this Mitigation Report for details.

Along Camp Branch (Site A), the UT to Camp Branch (Site A), and Dula Thoroughfare (Site B), permanent cross-sections have been established to monitor stream restoration and level 1 enhancement reaches. Longitudinal profiles have been established along the entire restored Camp Branch and UT to Camp Branch reaches. Success criteria for stream restoration will include 1) successful classification of enhanced reaches as functioning systems (Rosgen 1996), and 2) channel stability indicative of a stable stream system. In addition, stream crest gauges have been installed to verify the required occurrence of at least two bankfull events over the course of the five year monitoring period in these locations. Permanent

channel cross-sections and photo points have been established along the UT to Dula Thoroughfare to monitor channel stability within Level 1 stream enhancement reaches.

Site groundwater hydrology within wetland restoration areas adjacent to Dula Thoroughfare (Site B) will be monitored by three (3) auto-logging monitoring gauges. Gauges will be downloaded monthly throughout the growing season. Hydrologic success criteria will be achieved by gauges registering groundwater levels within the upper 12 inches of the soil surface for a minimum number of consecutive days corresponding to at least 12.5 percent of the growing season in Anson County under normal annual precipitation. Exceptions will be made if monitoring gauges do not achieve success criteria during documented Site drought conditions.

In order to monitor planted vegetation (i.e., bare root seedlings), 10 X 10m^2 vegetation monitoring plots have been established within planted portions of Site restoration and enhancement areas. Site vegetation will be monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey (CVS) (CVS-EEP Protocol for Recording Vegetation, Level 1-2 Plot Sampling Only, Version 4.0, 2006). Stem counts of planted and volunteer species as well as an assessment of planted stem survivability will be performed annually. Vegetative monitoring success criteria will be achieved by plot data indicating an average number of planted stems per acre exceeding 320 stems/acre after the third year of monitoring and 260 stems/acre after the fifth and final year of project monitoring.

If vegetative success criteria are not achieved, supplemental plantings will be performed with native species approved by the appropriate regulatory agencies. Supplemental plantings will be performed as needed until success criteria are achieved.

Table 1: Project Mitigation Structure and Objectives

Project Segment or Reach ID	Mitigation Type	Approach	Restored Linear Footage (LF) or Acreage (AC)	Stationing	Comment
Reach 1 (Camp Branch)	R	P2	1,767 LF	0+00 – 17+94	Total includes 27 LF gap in easement at channel ford
Reach 2 (Camp Branch)	E2	NA	945 LF	NA	Enhancement reaches not stationed
Reach 3 (UT to Camp Branch)	R	P1	403 LF	0+00 – 4+33	Total includes 30 LF gap in easement at channel ford
Reach 4 (UT to Camp Branch)	R	P2	143 LF	4+33 – 5+76	
Reach 5 (Dula Thoroughfare -T- Channel)	R	P2	2,025 LF	0+00 – 20+25	
Reach 6 (Dula Thoroughfare-D- Channel)	R	P2	705 LF	0+00 – 7+05	
Reach 7 (UT to Dula Thoroughfare)	E1	NA	1,871 LF	NA	Enhancement reaches not stationed
Reach 8 (UT to Dula Thoroughfare)	E2	NA	480 LF	NA	Enhancement reaches not stationed
Stream Preservation	P	NA	12,918 LF	NA	
Riverine Wetland Restoration	R	NA	3.1 AC	NA	
Riverine Wetland Enhancement	WE	NA	1.0 AC	NA	
Riverine Wetland Preservation	P	NA	7.5 AC	NA	

R = Restoration
E1 = Level 1 Stream Enhancement
E2 = Level 2 Stream Enhancement
WE = Wetland Enhancement
P = Preservation
P1 = Priority 1
P2 = Priority 2
NA = Not applicable

Table 2. Project Mitigation Totals by USGS 8-Digit Cataloguing Unit

	USGS Cataloguing Unit	
Mitigation Type	**03040104**	**03040105**
Priority 1 Stream Restoration	--	403 LF
Priority 2 Stream Restoration	2,730 LF	1,910 LF
Level 1 Stream Enhancement	1,871 LF	--
Level 2 Stream Enhancement	480 LF	945 LF
Stream Preservation	6,355 LF	6,563 LF
Wetland Restoration	3.1 AC	--
Wetland Enhancement	1.0 AC	--
Wetland Preservation	2.3 AC	5.2 AC

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Figure 3C: UT to Dula Thoroughfare (Site C) Monitoring Plan

MITIGATION REPORT

BISHOP SITE STREAM AND WETLAND RESTORATION
ANSON COUNTY, NORTH CAROLINA
YADKIN RIVER BASIN CATALOGING UNITS 03040104 AND 03040105

SCO ID# 040611701A

1.0 INTRODUCTION

EcoScience Corporation (ESC) was retained by the North Carolina Ecosystem Enhancement Program (EEP) to provide stream and wetland restoration/enhancement design services for the Bishop Site Stream and Wetland Restoration (hereafter referred to as the Site). The Site, which is in the Yadkin River Basin (Cataloguing Units 03040104 and 03040105), is located north of Wadesboro in Anson County, North Carolina (Figure 1, Appendix A). It is just northwest (upstream) of the Rocky River's confluence with the Pee Dee River. Three separate construction areas, each confined within an EEP-owned conservation easement, comprise the approximate 200-acre Site: Camp Branch (Site A, 94.9 acres), Dula Thoroughfare (Site B, 70.8 acres), and the Unnamed Tributary (UT) to Dula Thoroughfare (Site C, 33.7 acres).

The table below provides summary information of the three major drainage features present within the Site prior to restoration activities. Camp Branch is a second-order stream (per United States Geological Survey [USGS] mapping) that flows approximately 5,078 linear feet through the Site before its confluence with the Rocky River. Dula Thoroughfare is a first-order stream that flows approximately 5,230 linear feet through the Site before its eventual confluence with the Pee Dee River. Its setting at the western edge of the Rocky River floodplain it was previously part of a backwater slough wetland/stream system. The Unnamed Tributary (UT) to Dula Thoroughfare is also a first-order stream that flows approximately 4,880 linear feet within the Site before its confluence with Dula Thoroughfare.

Pre-Construction Site Stream Channel Conditions				
Stream	**Stream Type (Rosgen 1996)**	**Drainage Area at Site (mi^2)**	**Stream Order (per USGS)**	**Extent within Site (linear feet)**
Camp Branch	F4/5	2.9	2nd	5,078
Dula Thoroughfare	G5	0.4	1st	5,230
UT to Dula Thoroughfare	G4/5	0.2	1st	4,880

The goals of the Site restoration effort included stream channel restoration, enhancement, and preservation, and riverine wetland restoration, enhancement, and preservation. Priority 1 and Priority 2 stream restoration were achieved by excavating an appropriately sized (using reference reach data as guidance) bankfull channel on new location. In the Priority 1 stream restoration approach (performed along the UT to Camp Branch), a bankfull channel was excavated along the existing floodplain such that the stream's bankfull elevation corresponded to the existing floodplain grade. A bankfull channel was constructed within a new floodplain excavated at an elevation lower than the existing floodplain grade using the Priority 2 stream restoration approach (Camp Branch and Dula Thoroughfare). Level 1 stream

enhancement was performed along the UT to Dula Thoroughfare by backfilling previously ditched and dredged portions of the channel, thereby reintroducing flow into the appropriately sized adjacent relic streambed. Level 2 stream enhancement was achieved by performing supplemental riparian plantings along Camp Branch (upstream of the Priority 2 restoration reach) and UT to Dula Thoroughfare (upstream of the Level 1 enhancement reach). Stream preservation will be applied to all stream reaches within the Site where no restoration or enhancement activities occurred.

On-Site wetland restoration was achieved by excavating a floodplain adjacent to Dula Thoroughfare, thereby intercepting the local water table to saturate floodplain soils for sufficient periods of time to achieved jurisdictional wetland hydrology. Restored wetland areas were also planted with the appropriate suite of native hardwood species to emulate the Piedmont Bottomland Forest community described by Schafale and Weakley (1990). Wetland enhancement was achieved by performing plantings within deforested (or sparsely forested) jurisdictional wetland areas. Wetland preservation will be applied to all wetland areas within the Site identified during the project's jurisdictional delineation where no restoration or enhancement activities occurred.

On-Site restoration activities provided the following project totals (see Tables 1 and 2 and Figures 2 and 2A-C [Appendix A] for additional details):

- Priority 1 Stream Restoration: 403 linear feet
- Priority 2 Stream Restoration: 4,640 linear feet
- Level 1 Stream Enhancement: 1,871 linear feet
- Level 2 Stream Enhancement: 1,425 linear feet
- Stream Preservation: 12,918 linear feet
- Riverine Wetland Restoration: 3.1 acres
- Riverine Wetland Enhancement: 1.0 acres
- Riverine Wetland Preservation: 7.5 acres

2.0 RESTORATION SUMMARY

2.1 Project Mitigation Goals

The primary Site restoration goals included the restoration of stable dimension, pattern, and profile for impacted on-Site stream reaches including Camp Branch, the UT to Camp Branch, Dula Thoroughfare, and the UT to Dula Thoroughfare. A second primary project goal was the restoration of riverine wetlands adjacent to Dula Thoroughfare.

Secondary Site restoration goals included stream channel enhancement and preservation as well as wetland enhancement and preservation. These goals were achieved via site planting with bare root seedlings to recreate pre-disturbance vegetative communities within their appropriate landscape contexts. See Section 2.1 (Site Restoration Approaches) for details.

At Camp Branch (Site A), specific Site restoration goals included:

- Priority II stream restoration (including all attendant benefits outlined in Rosgen 1996) via excavation of approximately 1,767 linear feet of a designed E/C-type stream of the main Camp Branch channel on new location, including adjacent floodplain excavation to achieve an entrenchment ratio characteristic of E/C-type streams;
- Priority I stream restoration (including all attendant benefits outlined in Rosgen 1996) of approximately 403 linear feet and Priority II restoration of approximately 143 linear feet of a designed E/C-type stream of a UT to Camp Branch, including floodplain excavation along the UT upstream of Camp Branch to achieve a stable confluence;
- Level II stream enhancement of approximately 945 linear feet of Camp Branch upstream of its confluence with the UT via riparian plantings adjacent to the Camp Branch stream banks; and
- Re-establishment of the characteristic, pre-disturbance Piedmont Bottomland Forest (Schafale and Weakley 1990) community adjacent to restoration reaches using bare root seedling plantings.

At Dula Thoroughfare (Site B), specific Site restoration goals included:

- Priority II stream restoration via excavation of approximately 2,730 linear feet of a designed E-type stream of Dula Thoroughfare (including an associated tributary), including adjacent floodplain excavation to achieve and entrenchment ratio characteristic of E-type streams;
- Restoration of approximately 3.1 acres of riverine wetlands adjacent to Dula Thoroughfare via floodplain excavation in previously identified hydric soil areas, thereby re-establishing jurisdictional wetland hydrology;
- Aquatic habitat creation via excavation of vernal pools within floodplain cut areas; and
- Re-establishment of the characteristic, pre-disturbance Piedmont Bottomland Forest (Schafale and Weakley 1990) community adjacent to restoration reaches using bare root seedling plantings.

At UT to Dula Thoroughare (Site C), specific Site restoration goals included:

- Level I enhancement of approximately 1,871 linear feet of stream via backfill of straightened and ditched portions of the existing watercourse, thereby re-establishing characteristic stream dimension and pattern by reintroducing flow into adjacent relic channel areas;
- Level II enhancement of approximately 480 linear feet of stream via riparian plantings adjacent to the UT to Dula Thoroughfare stream banks; and
- Re-vegetation of open areas adjacent to the UT to Dula Thoroughfare via plantings of characteristic, pre-disturbance community types described by Schafale and Weakley (1990) using bare root seedling plantings.

Prior to restoration activities, each of the on-Site drainage features listed above had been impacted to accommodate agricultural land usage (primarily row crop cultivation). In the classic scenario, stream channels are traditionally relocated to the toe of the adjacent valley slope, straightened, and dredged in an attempt to decrease flooding and increase the size of the cultivatable areas within the floodplain. Field evidence suggests this was the case with Camp Branch, while Dula Thoroughfare and the UT to Dula Thoroughfare were straightened and ditched along their existing locations. The straightening and ditching of Dula Thoroughfare likely drained adjacent riverine wetlands with the exception of those along the fringe of the channel.

2.1 Site Restoration Approaches

Site restoration approaches are discussed below. Site restoration activities consisted of stream restoration, enhancement, and preservation, and wetland restoration, enhancement, and preservation. Stream and wetland preservation do not involve active restoration activities and thus are not detailed below; however, Site preservation totals are summarized in Tables 1 and 2 and depicted on Figures 2 and 2A-C (Appendix A).

2.1.1 Stream Channel Restoration

Priority 2 stream restoration (Reaches 1, 4, 5, and 6, Table 1) was achieved by restoring Camp Branch, UT to Camp Branch, and Dula Thoroughfare's bankfull dimensions to reflect those exhibited by reference streams in similar geographic contexts within the Piedmont physiographic province. This was accomplished by the construction of a new bankfull channel within an excavated floodplain, thereby re-establishing the stream's appropriate bankfull dimensions and geometry to enable bankfull and higher-volume flows to exit the channel. Although riffle and pool depths were specified along Camp Branch and the UT to Camp Branch, they were not along Dula Thoroughfare because the intent of restoration efforts was to recreate a low-gradient backwater slough system. Priority 2 stream restoration reaches are displayed on Figures 2 and 2A-B (Appendix A). The total stream channel length improved by Priority 2 restoration is 4,640 linear feet.

Priority 1 stream restoration (Reach 3, Table 1) was achieved by excavating a new bankfull channel within the existing UT to Camp Branch floodplain such that the channel bankfull elevation corresponded with the existing floodplain grade. Priority 1 stream restoration provides the same fluvial hydrologic benefits as those offered by Priority 2 restoration (discussed above), but is preferable since less land disturbance is required. Also, the natural soil profile is preserved using this approach. The Site's Priority 1 stream restoration reach is displayed on Figure 2A (Appendix A). The total stream channel length improved by Priority 1 restoration is 403 linear feet.

2.1.2 Stream Channel Enhancement

Level 1 stream channel enhancement was undertaken along the UT to Dula Thoroughfare (Reach 7, Table 1). Prior to restoration activities, the stream had been diverted into an adjacent ditched and straightened channel, while soil material leftover from the excavation was left adjacent to the relic stream. In order to provide Level 1 stream enhancement along this reach, the previously ditched and straightened portions of the channel were backfilled with the leftover excavated material and flow was reintroduced into the adjacent relic channel. The Site's Level 1 stream enhancement reach is displayed on Figure 2C (Appendix A). The total stream channel length improved by Level 1 stream enhancement is 1,871 linear feet.

Level 2 stream channel enhancement was performed along reaches of Camp Branch and the UT to Dula Thoroughfare upstream of restoration and Level 1 enhancement reaches. (Reaches 2 and 8, Table 1). Riparian bare root seedling plantings were performed adjacent to the stream banks in these areas, thereby increasing canopy shading, floral diversity, and contributing to floodplain roughness to dissipate higher-energy flood flows upon tree maturity. The suite of species used to plant riparian areas mimicked the Piedmont Bottomland Forest described by Schafale and Weakley (1990). Level 2 stream enhancement

reaches are displayed on Figures 2A and 2C (Appendix A). The total stream channel length improved by Level 2 stream enhancement is 1,425 linear feet.

2.1.3 Riverine Wetland Restoration

Riverine wetland restoration was performed by excavating downstream floodplain areas adjacent to Dula Thoroughfare that contained hydric soil inclusions. Floodplain excavation effectively lowered the ground surface elevation in excavated areas closer to the seasonal high water table. In addition, floodplain excavation restored Dula Thoroughfare's natural flood regime, enabling bankfull and higher flows to spread out over the floodplain, providing an additional hydrologic input. In order to diversify floodplain habitat and increase local microtopographical complexity, floodplain pools were constructed within the excavated floodplain. In essence, grading activities along Dula Thoroughfare resulted in the restoration of a backwater slough ESC believes the watercourse mimicked in its pre-disturbance condition. Riverine wetland restoration areas are displayed on Figure 2B (Appendix A). The total area of riverine wetland restoration is 3.1 acres (Table 1).

2.1.4 Riverine Wetland Enhancement

Riverine wetland enhancement was accomplished by restoring the characteristic, native plant communities within deforested (or sparsely forested) jurisdictional wetland areas. Aside from incidental grading within a small seep wetland adjacent to the UT to Dula Thoroughfare (Figure 2C, Appendix A), grading activities were not performed in wetland enhancement areas. The total area of riverine wetland enhancement is 1.0 acre (Table 1).

3.0 MONITORING PLAN

In order to ensure the Site meets regulatory stream and wetland restoration monitoring criteria, each parameter on-Site will be monitored annually for five (5) years or until success criteria has been achieved. Refer to Figures 3A-C (Appendix A) for monitoring plan details.

3.1 Stream Channel

In order to ensure stable channel bankfull dimension, pattern, and profile along stream restoration reaches, stream channel assessment surveys will be undertaken. Longitudinal profiles along the entirety of the Camp Branch and UT to Camp Branch restoration reaches (Reaches 1, 3, and 4) are proposed to verify stream profile stability (see Figures 3A-B [Appendix A] for longitudinal profile locations). Longitudinal profiles are not proposed along Dula Thoroughfare because riffles and pool depths (i.e., variations in bedform) were not specified (see Section 2.1.1). Within each longitudinal profile monitoring reach and along Dula Thoroughfare (Reaches 5 and 6) and the UT to Dula Thoroughfare (Reach 7), stream channel cross-sections are proposed (approximately one cross-section for every 500 linear feet of stream) to monitor any potential instability and adverse changes in channel geometry (see Figures 3A-B [Appendix A] for cross-section locations). Measured parameters will include cross-sectional area, bankfull width, average and maximum bankfull depth, width-to-depth ratio, and substrate size class distribution. Stream channel photographs will also be taken at each cross-section location looking upstream and downstream at the channel at the cross-section midpoint. Longitudinal profiles and cross-sections will be surveyed annually throughout the 5-year project monitoring period. Channel geomorphic data will be analyzed and presented in the Site's Annual Monitoring Reports. Success criteria for stream

restoration and Level 1 enhancement will include 1) successful classification of the reach as a functioning system (Rosgen 1996), and 2) channel stability indicative of a stable stream system.

Photo points are proposed along the UT to Dula Thoroughfare (Reach 7) in conjunction with channel cross-sections to monitor Level 1 stream enhancement activities. Photo points are proposed at strategic locations within the reach so that any potential areas of instability will be documented and addressed with remedial maintenance measures.

Stream crest gauges have been installed adjacent to stream restoration reaches at Camp Branch, the UT to Camp Branch, and Dula Thoroughfare to monitor for the occurrence of bankfull events (see Figures 3A-B [Appendix A] for crest gauge locations). In order to achieve success criteria, at least two bankfull events must occur over the course of the five year monitoring period. It should be noted that at least two bankfull events were observed on Camp Branch, the UT to Camp Branch, and Dula Thoroughfare following the completion of Site grading activities before the project's final walkthrough.

3.2 Groundwater Hydrology

Three (3) auto-logging groundwater monitoring gauges have been installed in wetland restoration areas adjacent to Dula Thoroughfare (see Figure 3B [Appendix A] for monitoring gauge locations). Gauges will be downloaded monthly throughout the growing season. Hydrologic success criteria will be achieved by registering groundwater levels within the upper 12 inches of the soil surface for a minimum number of consecutive days corresponding to at least 12.5 percent of the growing season in Anson County under normal annual precipitation. Exceptions will be made if monitoring gauges do not achieve success criteria during documented Site drought conditions.

3.3 Vegetation

Vegetation monitoring (10 X 10m^2) plots will be installed to monitor planted vegetation within Site restoration and enhancement areas. Site vegetation will be monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey (CVS) (CVS-EEP Protocol for Recording Vegetation, Level 1-2 Plot Sampling Only, Version 4.0, 2006). Proposed vegetation monitoring plot locations are displayed on Figures 3A-C (Appendix A). Plots will be monitored annually, and a stem count of planted and volunteer species as well as an assessment of survivability of planted stems will be performed. Vegetative monitoring success will be achieved by plot data indicating an average number of planted stems per acre exceeding 320 stems/acre after the third year of monitoring and 260 stems/acre after the fifth and final year of project monitoring.

4.0 MAINTENNANCE AND CONTINGENCY PLANS

Graded areas within the Site will be inspected throughout the five year monitoring period. Areas of erosion will be noted, photographed, and discussed with EEP staff to determine if remedial maintenance measures should be undertaken.

If vegetation success criteria are not achieved by on average planted stem/acre density calculations from combined sample plot data, supplemental plantings will be performed with native tree species approved by the appropriate regulatory agencies (i.e., the EEP, USACE, and DWQ). Supplemental plantings will be performed as needed until vegetative success criteria are achieved.

Beaver activity has been observed within the UT to Camp Branch (Site A) just upstream of the access road ford. Throughout the five-year monitoring period, the Site will be periodically monitored for beaver activity encroachment into the conservation easement. If beaver activity is observed on-Site, EEP will be notified to pursue remedial measures.

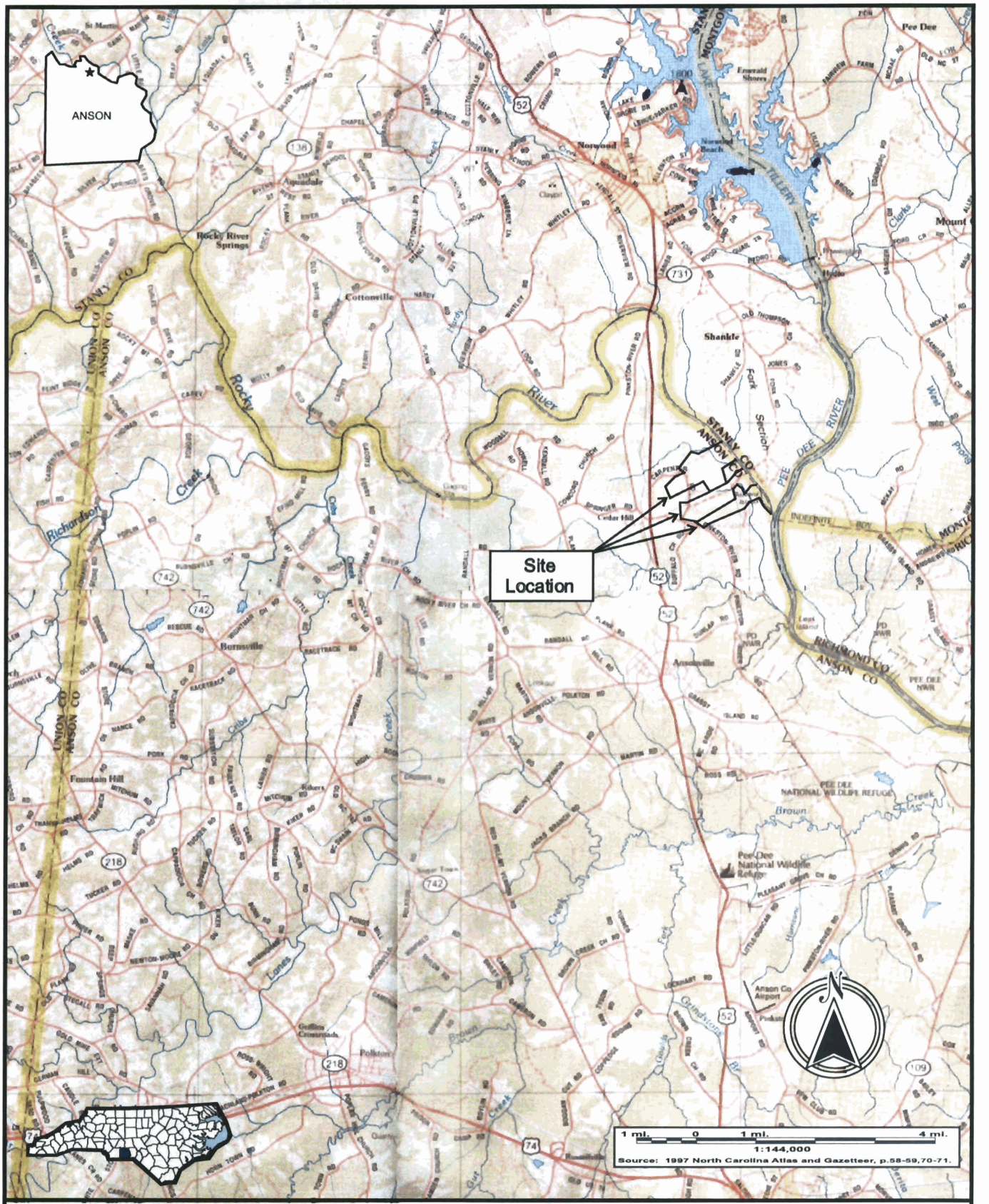
5.0 REFERENCES

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

Schafale, M. P. and A. S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, North Carolina.

APPENDICES

APPENDIX A: FIGURES



EcoScience Corporation
Raleigh, North Carolina

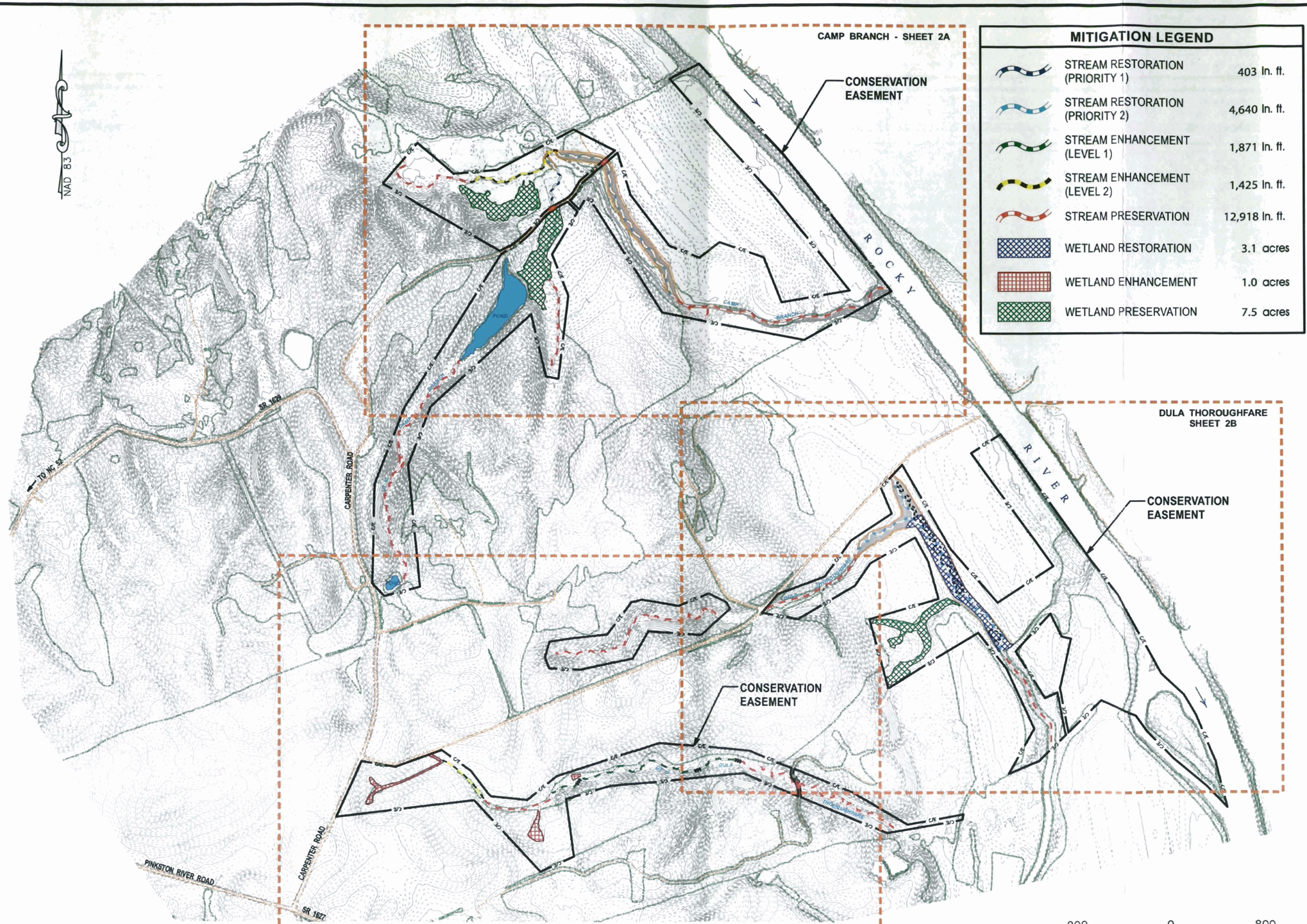
SITE LOCATION

EEP Bishop Site Stream and Wetland Restoration

Anson County, North Carolina

Dwn. by:	HJS
Ckd by:	JDC
Date:	AUG 2007
Project:	04-212

Figure 1



MITIGATION LEGEND

STREAM RESTORATION (PRIORITY 1)	403 ln. ft.
STREAM RESTORATION (PRIORITY 2)	4,640 ln. ft.
STREAM ENHANCEMENT (LEVEL 1)	1,871 ln. ft.
STREAM ENHANCEMENT (LEVEL 2)	1,425 ln. ft.
STREAM PRESERVATION	12,918 ln. ft.
WETLAND RESTORATION	3.1 acres
WETLAND ENHANCEMENT	1.0 acres
WETLAND PRESERVATION	7.5 acres

EcoScience Corporation
Raleigh, North Carolina

	REVISIONS

Client:
Ecosystem Enhancement PROGRAM

Project:

EEP BISHOP SITE MITIGATION PLAN

ANSON COUNTY, NORTH CAROLINA

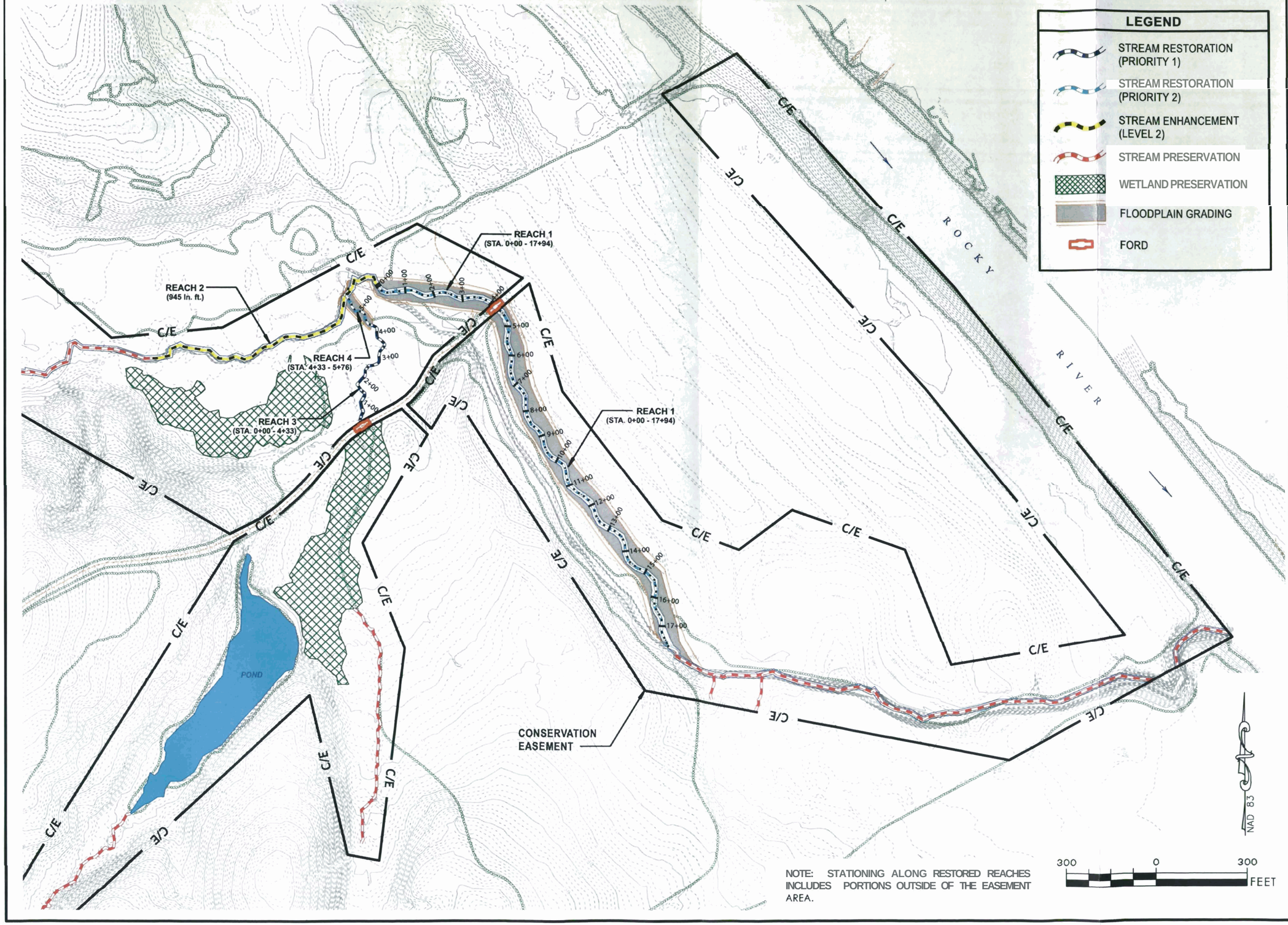
Title:

STREAM AND WETLAND MITIGATION UNITS

Dwn By: DGJ	Date: AUG 2007
Ckd By: JDC	Scale: 1" = 800'
ESC Project No.: 04-212.00	

FIGURE

2



EcoScience Corporation
Raleigh, North Carolina

REVISIONS

Client:
Ecosystem Enhancement Program

Project:

EEP BISHOP SITE MITIGATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

STREAM AND WETLAND MITIGATION

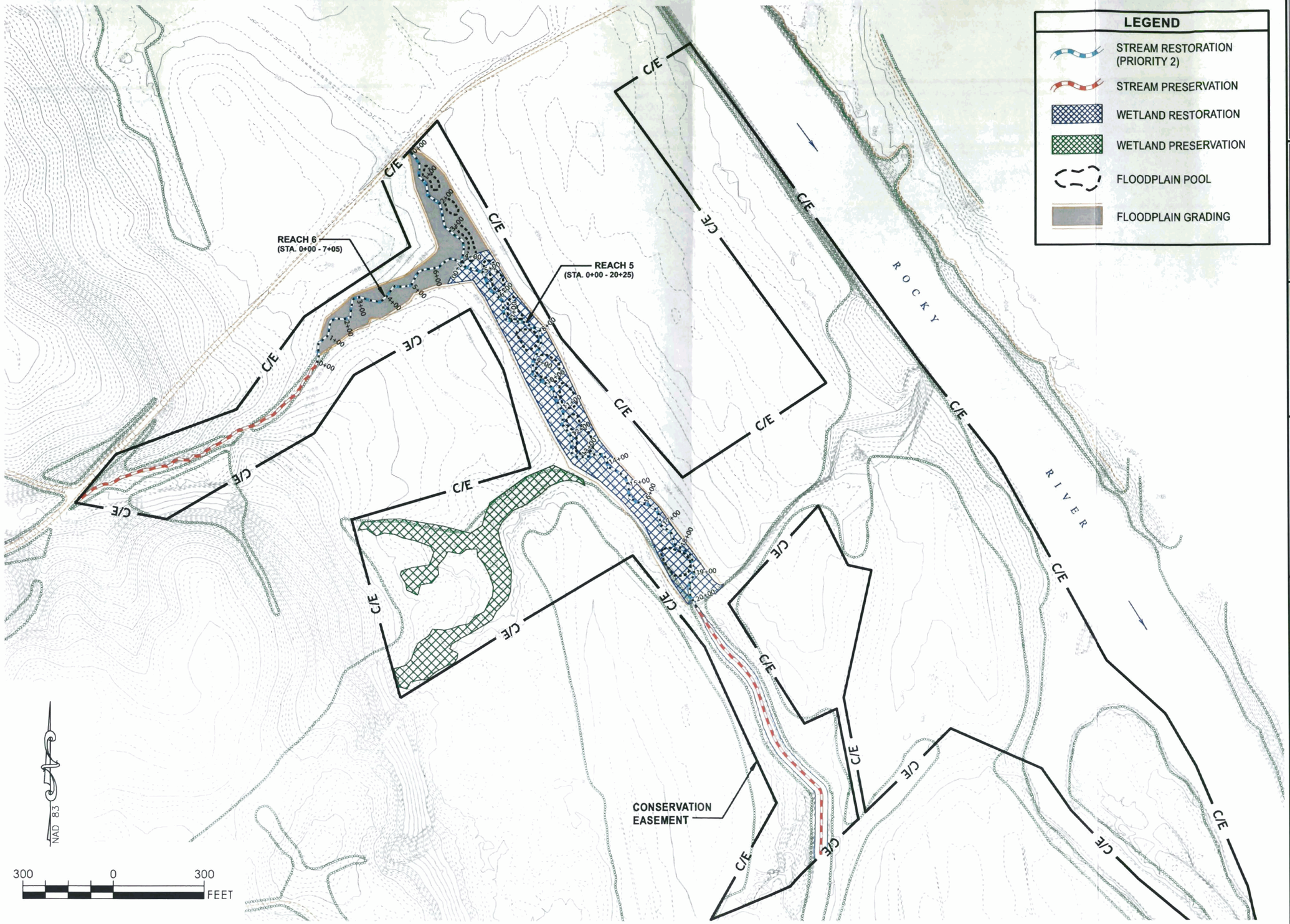
CAMP BRANCH (SITE A)

Dwn By:	Date:
DGJ	AUG 2007
Ckd By:	Scale:
JDC	1" = 300'

ESC Project No.: 04-212.00

FIGURE

2A



EcoScience Corporation
Raleigh, North Carolina

	REVISIONS

Client:
Ecosystem Enhancement PROGRAM

Project:

EEP BISHOP SITE MITIGATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

STREAM AND WETLAND MITIGATION

DULA THOROUGHFARE (SITE B)

Dwn By:	Date:
DGJ	AUG 2007
Ckd By:	Scale:
JDC	1" = 300'

ESC Project No.: 04-212.00

FIGURE

2B

LEGEND

- STREAMENHANCEMENT (LEVEL 1)
- STREAMENHANCEMENT (LEVEL 2)
- STREAM PRESERVATION
- WETLAND ENHANCEMENT
- ROCK SILLS
- FORD

C/E

CONSERVATION EASEMENT

REACH 8 (480 ln. ft.)

REACH 7 (1,871 ln. ft.)

NAD 83

300 0 300 FEET

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

Client: Ecosystem Enhancement Program

Project:

EEP BISHOP SITE MITIGATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

STREAM AND WETLAND MITIGATION

UT TO DULA THOROUGHFARE (SITE C)

Dwn By:	Date:
DGJ	AUG 2007
Ckd By:	Scale:
JDC	1" = 300'

ESC Project No.: 04-212.00

FIGURE

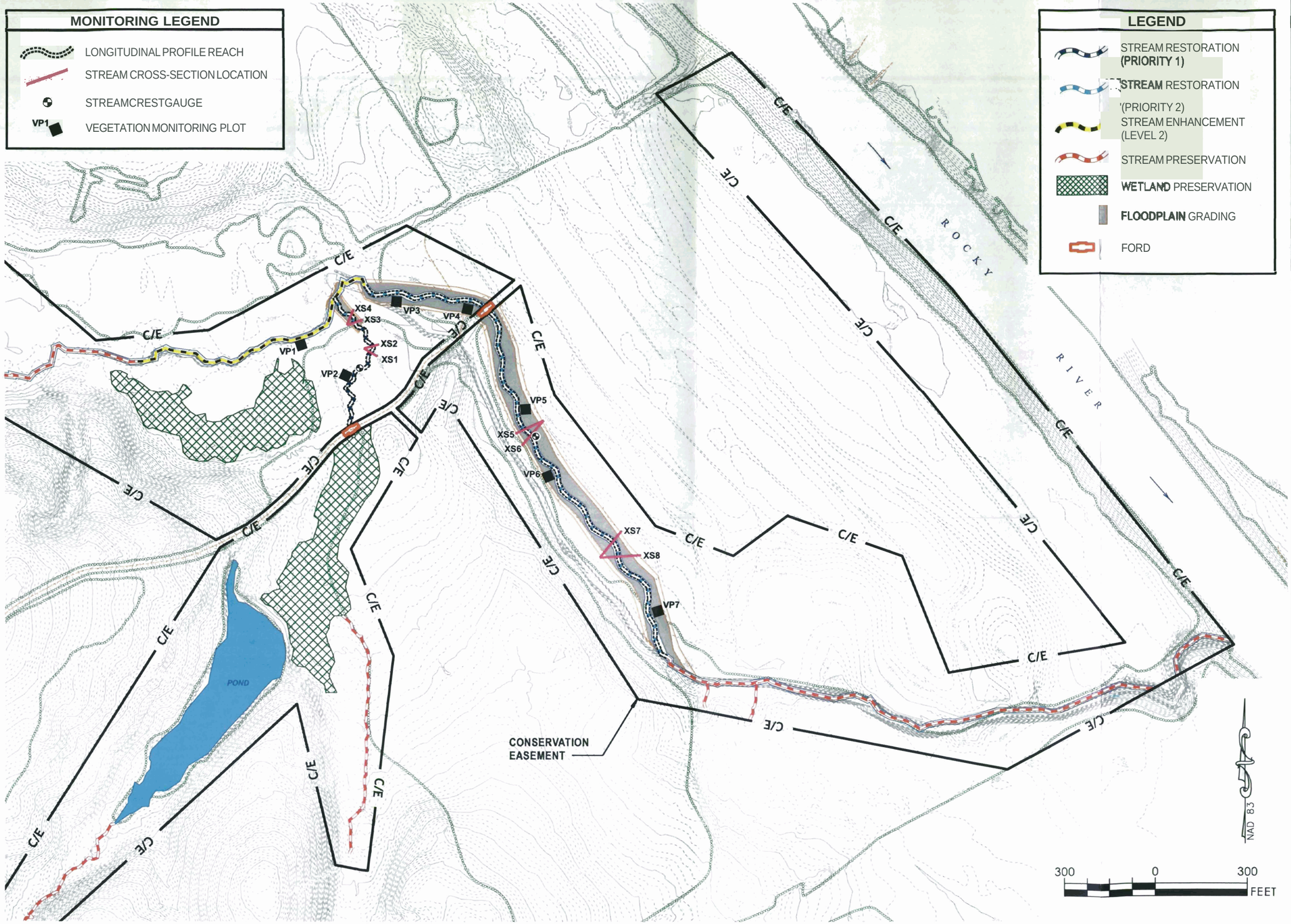
2C

MONITORING LEGEND

- LONGITUDINAL PROFILE REACH
- STREAM CROSS-SECTION LOCATION
- STREAMCRESTGAUGE
- VP1 VEGETATION MONITORING PLOT

LEGEND

- STREAM RESTORATION (PRIORITY 1)
- STREAM RESTORATION (PRIORITY 2)
- STREAM ENHANCEMENT (LEVEL 2)
- STREAM PRESERVATION
- WETLAND PRESERVATION
- FLOODPLAIN GRADING
- FORD



EcoScience Corporation
Raleigh, North Carolina

REVISIONS

Client: Ecosystem Enhancement Program

Project:

EEP BISHOP SITE MITIGATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

MONITORING PLAN

CAMP BRANCH (SITE A)

Dwn By:	Date:
DGJ	AUG 2007
Ckd By:	Scale:
JDC	1" = 300'

ESC Project No.: 04-212.00

FIGURE

3A

MONITORING LEGEND

- STREAM CROSS-SECTION LOCATION
- STREAM CREST GAUGE
- GROUNDWATER MONITORING GAUGE
- VP1 VEGETATION MONITORING PLOT

LEGEND

- STREAM RESTORATION (PRIORITY 2)
- STREAM PRESERVATION
- WETLAND RESTORATION
- WETLAND PRESERVATION
- FLOODPLAIN POOL
- FLOODPLAIN GRADING

C/E

XS9 XS10 XS11 XS12

VP8 VP9 VP10 VP11 VP12

ROCKY

RIVER

CONSERVATION EASEMENT

NAD 83

300 0 300 FEET

EcoScience Corporation
Raleigh, North Carolina

	REVISIONS

Client:

Ecosystem Enhancement PROGRAM

Project:

EEP BISHOP SITE MITIGATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

MONITORING PLAN

DULA THOROUGHFARE (SITE B)

Dwn By:	Date:
DGJ	AUG 2007
Ckd By:	Scale:
JDC	1" = 300'

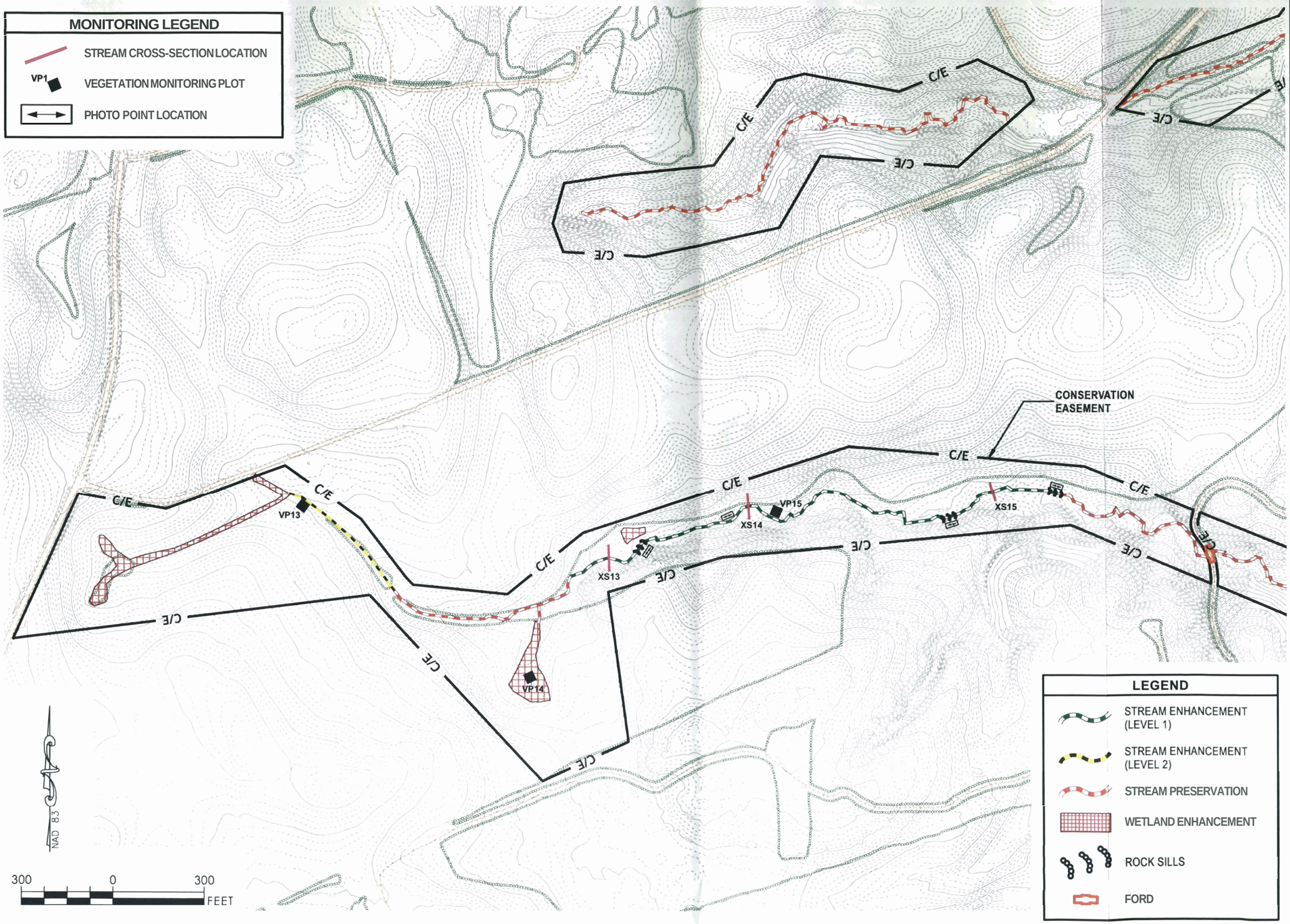
ESC Project No.: 04-212.00

FIGURE

3B

MONITORING LEGEND

- STREAM CROSS-SECTION LOCATION
- VP1 — VEGETATION MONITORING PLOT
- PHOTO POINT LOCATION



LEGEND

- STREAM ENHANCEMENT (LEVEL 1)
- STREAM ENHANCEMENT (LEVEL 2)
- STREAM PRESERVATION
- WETLAND ENHANCEMENT
- ROCK SILLS
- FORD

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

Client: Ecosystem Enhancement Program

Project:

EEP BISHOP SITE MITIGATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

MONITORING PLAN

UT TO DULA THOROUGHFARE (SITE C)

Dwn By:	Date:
DGJ	AUG 2007
Ckd By:	Scale:
JDC	1" = 300'

ESC Project No.: 04-212.00

FIGURE

3C

APPENDIX B: RECORD DRAWINGS

PROJECT: BISHOP SITE STREAM AND WETLAND RESTORATION

BISHOP SITE STREAM AND WETLAND RESTORATION

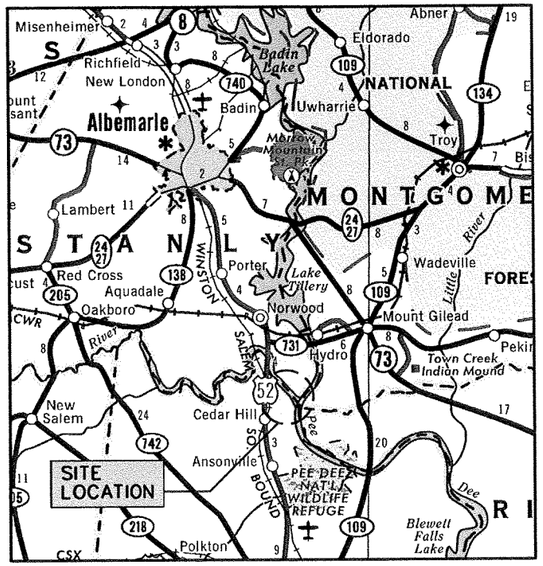
ANSON COUNTY, NORTH CAROLINA

LOCATION:

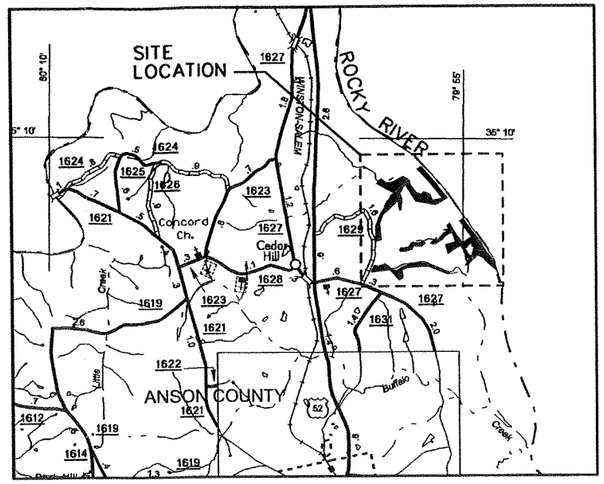
SITE IS LOCATED IN NORTHERN ANSON COUNTY, APPROXIMATELY 3 MILES NORTH OF THE TOWN OF ANSONVILLE AND APPROXIMATELY 1.5 MILES EAST OF THE TOWN OF CEDAR HILL NEAR THE CONFLUENCE OF THE ROCKY RIVER AND THE PEE DEE RIVER.

TYPE OF WORK: STREAM AND WETLAND RESTORATION / ENHANCEMENT

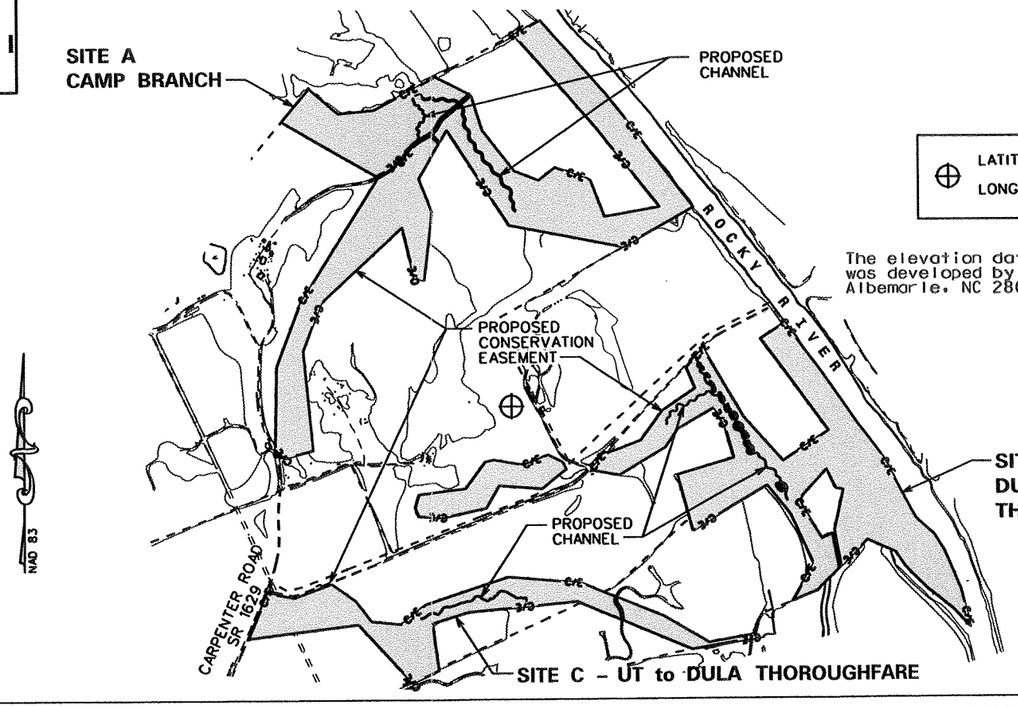
- STREAM RESTORATION / ENHANCEMENT
- WETLAND RESTORATION / ENHANCEMENT
- IN-STREAM STRUCTURES
- FLOODPLAIN GRADING
- NEW CHANNEL CONSTRUCTION
- SITE PLANTING



LOCATION MAP
NOT TO SCALE



VICINITY MAP
NOT TO SCALE



LATITUTE: 35° 09' 13.82"
LONGITUDE: 80° 06' 12.46"

The elevation data utilized in the Bishop As-Built Plans was developed by Barry D Davis Surveying, 1503 Old Charlotte Rd., Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384

CAMP BRANCH:

CONSERVATION EASEMENT AREA: 94.9± ACRES
AREA OF DISTURBANCE: 22.4± ACRES

DULA THOROUGHFARE:

CONSERVATION EASEMENT AREA: 70.8± ACRES
AREA OF DISTURBANCE: 24.6± ACRES

UT to DULA THOROUGHFARE:

CONSERVATION EASEMENT AREA: 33.7± ACRES
AREA OF DISTURBANCE: 11.3± ACRES

Prepared in the office of:

EcoScience Corporation
1101 Haynes St., Suite 101
Raleigh, North Carolina 27604
Ph: 919 828-3433
Fax: 919 828-3518

ENGINEER: DAVID G. MODLIN

PROJECT MANAGER: JAMES D. COOPER

SEAL:

NORTH CAROLINA PROFESSIONAL SEAL 026951 ENGINEER DAVID G. MODLIN
22Oct07

Prepared for:

ECOSYSTEM ENHANCEMENT PROGRAM
Raleigh, North Carolina

No.	Revisions	Date
1	REV'D SHEETS A-2B, A-3, B-2B, B-3, C-2B, C-3	09/29/05 JDG
2	AS-BUILT	JULY 2007

Dsn. By:	Dwn. By:	Ckd. By:
JDC	MAF	EBB

Date: JUL 2007

ESC Project No: 04-212

SHEET 1

INDEX OF SHEETS

1: TITLE SHEET
1A: INDEX OF SHEETS / GENERAL NOTES
1B: ELEMENT SYMBOLOGY
2: SITE ACCESS

CAMP BRANCH

A: CONSTRUCTION SEQUENCE
A-1: MORPHOLOGICAL TABLE / SHEAR STRESS TABLE
A-1A: POOL RADIUS TABLE / RIFFLE TABLE
A-2: TYPICAL SECTIONS
A-2A, A-2B: GENERAL DETAILS
A-2C: NEW CHANNEL CENTERLINE DATA
A-3: SUMMARY OF QUANTITIES / SUMMARY OF EARTHWORK
A-4: EXISTING CONDITIONS
A-5: NEW CHANNEL LAYOUT
A-6, A-6A: SITE PLAN
A-7: PROFILE - CAMP BRANCH -C- CHANNEL
A-7A: AS-BUILT PROFILE - CAMP BRANCH -C- CHANNEL
A-8: PROFILE - UT to CAMP BRANCH -A- CHANNEL
A-8A: AS-BUILT PROFILE - UT to CAMP BRANCH -A- CHANNEL
A-EC1, A-EC1A: EROSION CONTROL PLAN
A-EC2: EROSION CONTROL DETAILS
A-L1: PLANTING PLAN
X1-X4: CROSS-SECTIONS
X1A-X4A: AS-BUILT CROSS-SECTIONS

DULA THOROUGHFARE

B: CONSTRUCTION SEQUENCE
B-1: RADIUS TABLE / SHEAR STRESS TABLE
B-2: TYPICAL SECTIONS / GENERAL DETAILS
B-2A, B-2B: GENERAL DETAILS
B-2C: NEW CHANNEL CENTERLINE DATA
B-3: SUMMARY OF QUANTITIES / SUMMARY OF EARTHWORK
B-4: EXISTING CONDITIONS
B-5: NEW CHANNEL LAYOUT
B-6: SITE PLAN
B-7: PROFILE - DULA THOROUGHFARE -T- CHANNEL
B-7A: AS-BUILT PROFILE - DULA THOROUGHFARE -T- CHANNEL
B-8: PROFILE - DULA THOROUGHFARE -D- CHANNEL
B-8A: AS-BUILT PROFILE - DULA THOROUGHFARE -D- CHANNEL
B-EC1: EROSION CONTROL PLAN
B-EC2: EROSION CONTROL DETAILS
B-L1: PLANTING PLAN
X5-X7: CROSS-SECTIONS
X5A-X7A: AS-BUILT CROSS-SECTIONS

UT TO DULA THOROUGHFARE

C: CONSTRUCTION SEQUENCE
C-1: MORPHOLOGICAL TABLE / STRUCTURE TABLE - NOT APPLICABLE
C-2: TYPICAL SECTIONS
C-2A, C-2B: GENERAL DETAILS
C-3: SUMMARY OF QUANTITIES / SUMMARY OF EARTHWORK
C-4: EXISTING CONDITIONS
C-5: NEW CHANNEL LAYOUT - NOT APPLICABLE
C-6: SITE PLAN
C-7: PROFILE - UT TO DULLA THOROUGHFARE - NOT APPLICABLE
C-EC1: EROSION CONTROL PLAN
C-EC2: EROSION CONTROL DETAILS
C-L1: PLANTING PLAN
X: CROSS-SECTIONS - NOT APPLICABLE

GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING STANDARDS:

   A) NORTH CAROLINA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES, ENGLISH" DATED JANUARY 2002, AND ANY SUPPLEMENTS THERETO ISSUED PRIOR TO THE DATE OF RECEIPT OF BIDS.

   B) NORTH CAROLINA DEPARTMENT OF TRANSPORTATION "ROADWAY STANDARD DRAWINGS, ENGLISH" DATED JANUARY 2002 AND ANY SUPPLEMENTS ISSUED THERETO PRIOR TO THE DATE OF RECEIPT OF BIDS.

   C) REQUIREMENTS OF THE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES.

2. ALL CONSERVATION EASEMENT CORNER MARKERS HAVE BEEN PLACED BY OTHERS. THE CONTRACTOR SHOULD CONFIRM THE CONSERVATION EASEMENT BOUNDARIES BEFORE COMMENCING WORK.

3. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND DIMENSIONS WHICH AFFECT NEW WORK PRIOR TO ANY CONSTRUCTION.

4. THE CONTRACTOR IS SOLEY RESPONSIBLE FOR ALL SAFETY ACCORDING TO CURRENT OSHA REGULATIONS.

5. THE CONTRACTOR IS RESPONSIBLE FOR AVOIDING ANY DISTURBANCE OR DAMAGE TO UTILITIES AND SHALL BE RESPONSIBLE FOR IMMEDIATELY REPARING ANY DAMAGES AT A COST INCIDENT TO THIS CONTRACT. CALL BEFORE YOU DIG — 1-800-632-4949.

6. THE EXISTING CHANNELS TO BE FILLED SHALL BE FILLED TO THE MAXIMUM EXTENT FEASIBLE WITH MATERIAL EXCAVATED FROM ON-SITE AND STOCKPILED ADJACENT TO REACHES OF THE OLD CHANNEL. DISTURBANCES SHALL BE PROTECTED IN ACCORDANCE WITH THE APPROVED SEDIMENT AND EROSION CONTROL PLAN.

7. SILT FENCE SHALL BE PLACED BETWEEN STOCKPILE AREAS AND THE EXISTING CHANNEL AND SHALL BE INSTALLED ACCORDING TO THE APPROVED SEDIMENT AND EROSION CONTROL PLAN.

8. THE CONTRACTOR MAY UTILIZE THE DESIGNATED STAGING AREA AND THE AREA INSIDE THE PROPOSED CONSERVATION EASEMENT FOR STAGING AND STOCKPILING EQUIPMENT AND MATERIALS.

9. THE COORDINATE SYSTEM IS THE NAD 83 STATE PLANE GRID. THE VERTICAL DATUM IS BASED ON NVD 1929.

10. EXISTING GRAVEL ACCESS ROADS WILL BE LEFT IN "AS IS OR BETTER" CONDITION. STONE, CLASS ABC, HAS BEEN ESTIMATED AND INCLUDED IN THE QUANTITY ESTIMATES SHOULD EXISTING GRAVEL ROADS NEED REPAIR AT THE PROJECT CONCLUSION. AN ALLOWANCE OF 3 INCHES OF CLASS ABC STONE AND 16-FOOT WIDTH OF EXISTING ROAD WERE ESTIMATED FOR THE ENTIRE LENGTH OF EXISTING ACCESS ROADS. FINAL PAY QUANTITIES WILL BE ON ACTUAL QUANTITIES USED FOR IMPROVED EXISTING ACCESS ROADS.

11. SHOULD ACCESS ROADS AS SHOWN ON THE PLAN SHEETS REQUIRE IMPROVEMENT, CLASS A STONE AND FILTER FABRIC HAVE BEEN ESTIMATED AND INCLUDED IN THE QUANTITY ESTIMATE. AN ALLOWANCE OF 480 TONS OF CLASS A STONE AND 1333 SQUARE YARDS OF FILTER FABRIC WERE ESTIMATED PER 1000 FEET OF 12-FOOT WIDE IMPROVED ACCESS ROAD. QUANTITIES ESTIMATED ALLOW FOR IMPROVING THE ENTIRE LENGTH OF EACH ACCESS ROAD SHOWN ASSUMING WORST CASE WEATHER CONDITIONS. FINAL PAY QUANTITIES WILL BE ON ACTUAL QUANTITIES USED FOR IMPROVED ACCESS ROADS. THE PROPOSED ACCESS ROADS WILL BE REMOVED OR REMAIN AS INDICATED ON PLAN SHEET 2.

12. THE BISHOP SITE STREAM / WETLAND RESTORATION PROJECT DRAINAGE IS SHOWN ON FIRM MAP NO. 3702840050B. THE PROJECT IS IN FLOOD ZONE A. NO DETAILED FLOOD STUDY HAS BEEN PERFORMED FOR THIS AREA OF ANSON COUNTY.

13. ALL ELEVATIONS AND GRADING POINTS WERE DERIVED FROM TOPOGRAPHIC MAPPING PROVIDED TO ECOSCIENCE CORPORATION BY THE OWNER. SUPPLEMENTAL SURVEYING WAS PROVIDED BY K2 DESIGN, GOLDSBORO, NC. THE GRADING PLAN AND SPECIFIED ELEVATIONS, AS SHOWN, ARE RELATIVE TO THIS TOPOGRAPHIC MAPPING. TOPOGRAPHIC DISCREPANCIES IDENTIFIED AS A RESULT OF FIELD SURVEYS DURING CONSTRUCTION MAY BE ADJUSTED AT THE DISCRETION OF THE PROJECT MANAGER. ALSO, EARTHWORK QUANTITY ESTIMATES WERE DERIVED FROM ELEVATION CONTOURS SHOWN ON THESE PLANS.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS	
1	AS-BUILT - JULY 2007

22Oct07

Client: Ecosystem Enhancement Program

Project: BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title: INDEX OF SHEETS / GENERAL NOTES

Dsn. By: JDC	Dwn. By: MAF
Ckd. By: EBB	Date: JUL 2007

Scale: NO SCALE

ESC Project No.: 04-212

SHEET 1A

ECOSCIENCE CORPORATION
ELEMENT SYMBOLOGY

TOPOGRAPHY & HYDROGRAPHY

- MAJOR CONTOUR 650
- MINOR CONTOUR .....
- GRAVEL / DIRT ROAD .....
- PAVED ROAD .....
- WETLAND / SWAMP .....
- DIRECTION OF FLOW .....
- EXISTING STREAM .....
- EXISTING WETLAND BOUNDARY ..... -WLB-
- HIGH QUALITY WETLAND BOUNDARY ..... -HQ WLB-
- MEDIUM QUALITY WETLAND BOUNDARY ..... -MQ WLB-
- LOW QUALITY WETLAND BOUNDARY ..... -LQ WLB-
- PROPOSED WETLAND BOUNDARY ..... -WLB-
- EXISTING SPOT ELEVATION 648
- PROPOSED SPOT ELEVATION 648

BOUNDARIES, PROPERTIES, AND EASEMENTS

- COUNTY LINE .....
- CITY LINE .....
- PROPERTY LINE ..... PL
- EXISTING IRON PIN ..... EIP
- RIGHT OF WAY ..... R/W
- PROPERTY MONUMENT ..... ECM
- PARCEL NUMBER 6
- ESC BENCHMARK ESC-BM1
- NCDOT MONUMENT NCDOT-BM5
- UTILITY EASEMENT ..... E
- POWER LINE ..... P
- EXISTING EASEMENT ..... E
- PROPOSED CONSERVATION EASEMENT ..... C/E

BUILDINGS & OTHER STRUCTURES

- BUILDINGS .....
- WELL ..... W
- BRIDGE .....
- BOX CULVERT OR TUNNEL .....
- CULVERT .....
- BRIDGE WING WALL, HEAD WALL, AND END WALL ..... CONC WW
- HEAD AND END WALL ..... CONC HW
- PIPE CULVERT .....
- FOOTBRIDGE .....
- DRAINAGE BOXES ..... CB
- EXISTING FENCE .....
- POWER POLE .....
- TELEPHONE POLE .....
- LIGHT POLE .....
- POWER LINE TOWER .....
- SANITARY SEWER MANHOLE .....
- STORM SEWER MANHOLE .....
- SANITARY SEWER ..... SS SS
- STORM SEWER ..... S S
- FOOTBRIDGE .....
- TRAIL, FOOTPATH .....
- RAIL ROAD ..... CSX TRANSPORTATION

VEGETATION

- SINGLE TREE .....
- SINGLE SHRUB .....
- EXISTING WOODS LINE .....

PROPOSED FEATURES AND STRUCTURES

- PROPOSED CONSTRUCTION ENTRANCE .....
- PROPOSED ROCK SILL .....

PROPOSED FEATURES AND STRUCTURES

- RADIUS OF CURVATURE CENTER MARK ..... +R2
- CHANNEL FORD .....
- CROSS-VANE .....
- MODIFIED CROSS-VANE .....
- J-HOOK VANE .....
- STEP CROSS-VANE .....
- LOG VANE .....
- ROOT WAD .....
- TEMPORARY STAGING AREA, SOIL STOCKPILING .....
- NEW CHANNEL .....
- BORROW AREA .....
- CHANNEL BACKFILL .....
- MEANDER REVETMENT .....
- RIPRAP APRON .....
- IMPERVIOUS CHANNEL BLOCK .....
- TOP OF RIFFLE TR1
- BOTTOM OF RIFFLE BR1
- CONSTRUCTED BERM .....
- PROPOSED WOVEN WIRE FENCE .....
- PROPOSED BARBED WIRE FENCE .....
- PROPOSED SAFETY FENCE ..... SF
- PROPOSED SILT FENCE .....
- PROPOSED MAJOR CONTOURS 755
- PROPOSED MINOR CONTOURS .....
- PROPOSED DIVERSION DITCH .....
- LIMITS OF DISTURBANCE .....
- PROPOSED ACCESS ROAD .....
- PROPOSED CLEARING LIMITS .....
- PROPOSED STONE OUTLET .....

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN
ANSON COUNTY, NORTH CAROLINA

Title:
ELEMENT SYMBOLOGY

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

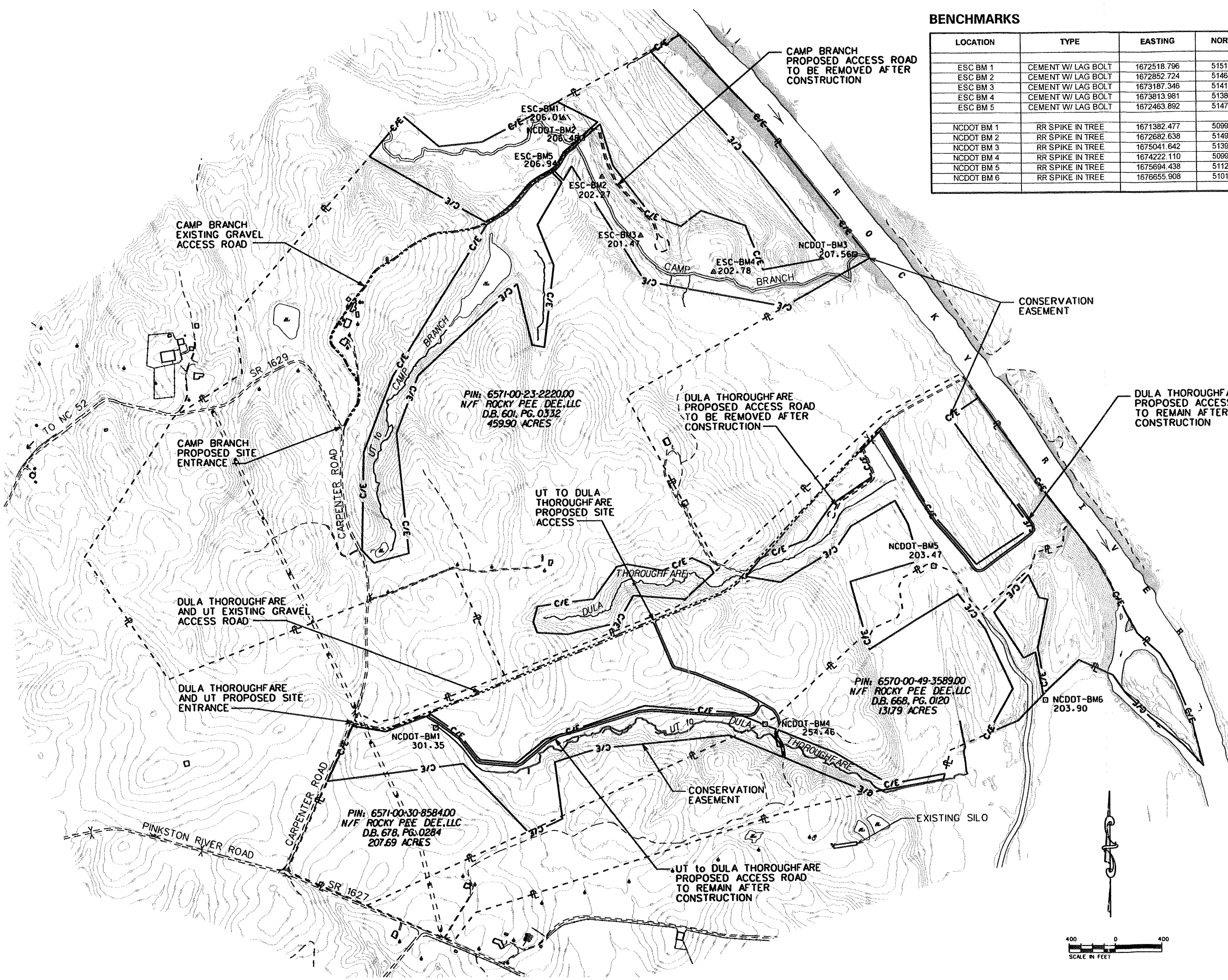
Scale: NO SCALE

ESC Project No.: 04-212

SHEET
1B

BENCHMARKS

LOCATION	TYPE	EASTING	NORTHING	REVISED ELEVATION
ESC BM 1	CEMENT W/ LAG BOLT	1672518.796	515161.114	206.01
ESC BM 2	CEMENT W/ LAG BOLT	1672852.724	514653.341	202.27
ESC BM 3	CEMENT W/ LAG BOLT	1673187.346	514144.998	201.47
ESC BM 4	CEMENT W/ LAG BOLT	1673813.981	513828.702	202.78
ESC BM 5	CEMENT W/ LAG BOLT	1672463.892	514762.773	206.94
NCDOT BM 1	RR SPIKE IN TREE	1671382.477	509938.956	301.35
NCDOT BM 2	RR SPIKE IN TREE	1672682.638	514987.957	206.48
NCDOT BM 3	RR SPIKE IN TREE	1675041.642	513968.682	207.56
NCDOT BM 4	RR SPIKE IN TREE	1674222.110	509949.013	254.46
NCDOT BM 5	RR SPIKE IN TREE	1675694.438	511289.397	203.47
NCDOT BM 6	RR SPIKE IN TREE	1676655.908	510132.466	203.90



CAMP BRANCH PROPOSED ACCESS ROAD TO BE REMOVED AFTER CONSTRUCTION
ESC-BM1 206.01
NCDOT-BM2 206.48
ESC-BM5 206.94
ESC-BM2 202.27
ESC-BM3 201.47
ESC-BM4 202.78
NCDOT-BM3 207.56
CAMP BRANCH
CAMP BRANCH EXISTING GRAVEL ACCESS ROAD
CONSERVATION EASEMENT
SR 1629
TO NC 52
CAMP BRANCH PROPOSED SITE ENTRANCE
CARPENTER ROAD
UT to CAMP BRANCH
PIN: 6571-00-23-2220.00 N/F ROCKY PEE DEE, LLC D.B. 601, PG. 0332 459.90 ACRES
DULA THOROUGHFARE PROPOSED ACCESS ROAD TO BE REMOVED AFTER CONSTRUCTION
DULA THOROUGHFARE PROPOSED ACCESS ROAD TO REMAIN AFTER CONSTRUCTION
ROCKY RIVER
UT TO DULA THOROUGHFARE PROPOSED SITE ACCESS
NCDOT-BM5 203.47
DULA THOROUGHFARE
DULA THOROUGHFARE AND UT EXISTING GRAVEL ACCESS ROAD
DULA THOROUGHFARE AND UT PROPOSED SITE ENTRANCE
PIN: 6570-00-49-3589.00 N/F ROCKY PEE DEE, LLC D.B. 668, PG. 0120 131.79 ACRES
NCDOT-BM6 203.90
NCDOT-BM1 301.35
NCDOT-BM4 254.46
UT to DULA THOROUGHFARE
CONSERVATION EASEMENT
EXISTING SILO
PIN: 6571-00-30-8584.00 N/F ROCKY PEE DEE, LLC D.B. 678, PG. 0284 207.69 ACRES
PINKSTON RIVER ROAD
SR 1627
UT to DULA THOROUGHFARE PROPOSED ACCESS ROAD TO REMAIN AFTER CONSTRUCTION
400 0 400
SCALE IN FEET

EcoScience Corporation

Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 8607 DAVID G. MODLIN, JR.

Client:

Ecosystem Enhancement PROGRAM

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

SITE ACCESS

Dsn. By: JDC	Dwn. By: MAF
Ckd. By: DGM	Date: JUN 2005
Scale: AS SHOWN	
ESC Project No.: 04-212	

SHEET

2

PROJECT: BISHOP SITE STREAM AND WETLAND RESTORATION

CONSTRUCTION SEQUENCE

1. MOBILIZE EQUIPMENT AND MATERIALS TO CAMP BRANCH SITE.

2. ESTABLISH ACCESS ROADS AND STAGING AREAS AS DEPICTED ON THE PLANS OR AS DIRECTED BY THE PROJECT MANAGER AND MARK CONSTRUCTION EQUIPMENT ACCESS LOCATIONS WITH VISIBLE MARKERS. CONSTRUCTION EQUIPMENT SHALL BE MAINTAINED AND SERVICED WITHIN THE LIMITS OF THE ESTABLISHED STAGING AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL STAGING AREAS IN AN ENVIRONMENTALLY SENSITIVE MANNER.

3. INSTALL IMPROVEMENTS TO SITE ACCESS ROAD IF REQUIRED AND INSTALL TEMPORARY EROSION CONTROL MEASURES (I.E., SILT FENCE, STONE OUTLETS, ETC.) AS REQUIRED.

4. AT THE END OF EACH DAY OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE TEMPORARY SEED AND MULCH AND APPLY COIR FIBER MATTING, AS APPROPRIATE, TO ALL DISTURBED AREAS. IN ADDITION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL TEMPORARY EROSION CONTROL MEASURES ON A DAILY BASIS THROUGHOUT THE CONSTRUCTION PERIOD.

5. THE UT TO CAMP BRANCH SHALL BE DUG IN THE DRY EASTWARD FROM THE EXISTING ACCESS ROAD AND CONNECTED TO CAMP BRANCH. THE EXISTING LOW AREA PARALLEL TO THE UT SHALL BE FILLED WITH MATERIAL FROM THE UT EXCAVATION.

6. CAMP BRANCH AND THE ASSOCIATED FLOODPLAIN WORK SHALL BE DUG IN THE DRY WITH THE WASTE MATERIAL TEMPORARILY STOCKPILED BETWEEN THE PROPOSED CHANNEL AND THE EXISTING CHANNEL. THE PROPOSED PERMANENT FORD SHALL BE CONSTRUCTED AT THIS TIME, ALSO IN THE DRY. IT IS ASSUMED THE CONNECTION AT THE BOTTOM END OF THE PROJECT CAN BE MADE AT THIS TIME WITHOUT CONSEQUENCES.

7. A PUMP-AROUND OPERATION SHALL BE PROVIDED JUST ABOVE THE DIVERGENCE OF EXISTING CAMP BRANCH AND THE PROPOSED CAMP BRANCH TO FACILITATE THE CONSTRUCTION OF THE PROPOSED CHANNEL BLOCK AND CONNECTION OF EXISTING CAMP BRANCH TO THE NEW CHANNEL.

8. THE EXISTING CAMP BRANCH SHALL BE BACKFILLED WITH THE STOCKPILED MATERIAL FROM THE EXCAVATION OF THE NEW CHANNEL. THE EXISTING DITCH SECTION PARALLELING THE EXISTING ACCESS ROAD SHALL BE EXTENDED TO TIE TO THE NEW LOCATION CAMP BRANCH. NO WORK IS ANTICIPATED AT THE PIPE AT THE BREAK IN THE CONSERVATION EASEMENT.

9. THE PROPOSED FORD ACROSS THE EXISTING ACCESS ROAD AT THE UT TO CAMP BRANCH SHALL BE CONSTRUCTED FOLLOWED BY THE PROPOSED CHANNEL BLOCK. THE PURPOSE OF THE BLOCK IS TO DIRECT FLOW FROM THE UT HEADWATER ALONG THE NEW UT CHANNEL TO CAMP BRANCH.

10. THE CONTRACTOR SHALL COMPACT THE PROPOSED FILL IN THE FILLED CHANNELS TO 90 PERCENT PROCTOR. THE PROPOSED CHANNEL BLOCKS SHALL HAVE A CORE OF IMPERVIOUS SELECT MATERIAL AS SPECIFIED IN THE PROJECT DETAIL AND SPECIAL PROVISIONS.

11. THE CONTRACTOR SHALL PLACE FINAL WASTE MATERIAL IN AREAS DESIGNATED ON THE PLANS AND AT THE DIRECTION OF THE PROJECT MANAGER. STOCKPILE AREAS SHALL BE PROTECTED BY SILT FENCING AS APPROPRIATE.

12. ONCE CONSTRUCTION IS COMPLETE, THE CONTRACTOR SHALL REMOVE ALL CONSTRUCTION MATERIALS FROM THE CONSERVATION EASEMENT, DISPOSE OF THEM IN AN APPROVED DUMP SITE AND SCARIFY ANY COMPACTED AREAS AS DIRECTED BY THE PROJECT MANAGER. TO COMPLETE SEEDING AND MULCHING, ALL DISTURBED AREAS SHALL BE DISKED OR PLOWED TO CREATE MICRO TOPOGRAPHY TO THE SATISFACTION OF THE PROJECT MANAGER AND PERMANENTLY SEEDED AND MULCHED. STONE APPLIED TO ACCESS ROADS, IF ANY, SHALL REMAIN OR BE REMOVED AS INDICATED ON PLAN SHEET 2.

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CAMP BRANCH

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A–2:	TYPICAL SECTIONS
A–2A, A–2B:	GENERAL DETAILS
A–2C:	NEW CHANNEL CENTERLINE DATA
A–3:	SUMMARY OF QUANTITIES / SUMMARY OF EARTHWORK
A–4:	EXISTING CONDITIONS
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A–6, A–6A:	SITE PLAN
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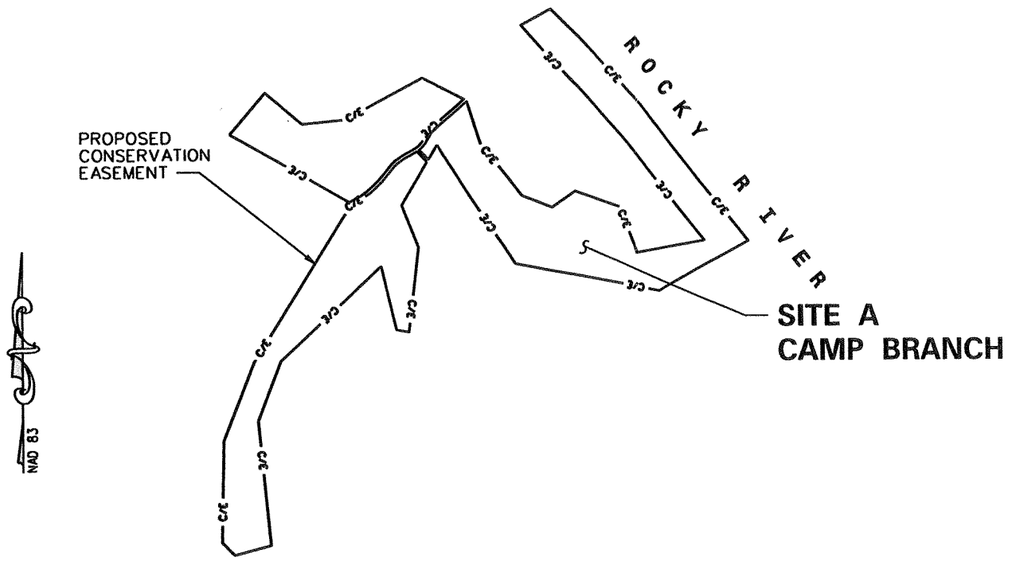
SITE A
CAMP BRANCH

TYPE OF WORK: *STREAM AND WETLAND RESTORATION / ENHANCEMENT*

- STREAM RESTORATION / ENHANCEMENT
- NEW CHANNEL CONSTRUCTION
- FLOODPLAIN GRADING
- SITE PLANTING



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SEAL:

SEAL 026451 NORTH CAROLINA PROFESSIONAL ENGINEER DAVID GUERRY MODLIN

22Oct07

Prepared for:

Ecosystem Enhancement Program

ECOSYSTEM ENHANCEMENT PROGRAM
Raleigh, North Carolina

No.	Revisions	Date
1	REV'D SHEETS A-2B, A-3,	09/29/05 JDG
2	AS-BUILT	JULY 2007

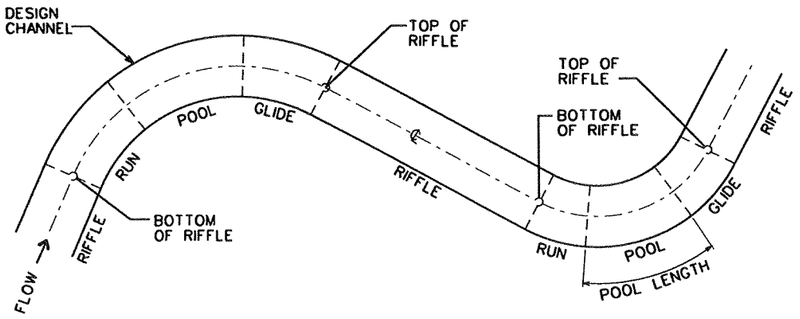
Dsn. By:	Dwn. By:	Ckd. By:
JDC	MAF	EBB

Date: JUL 2007

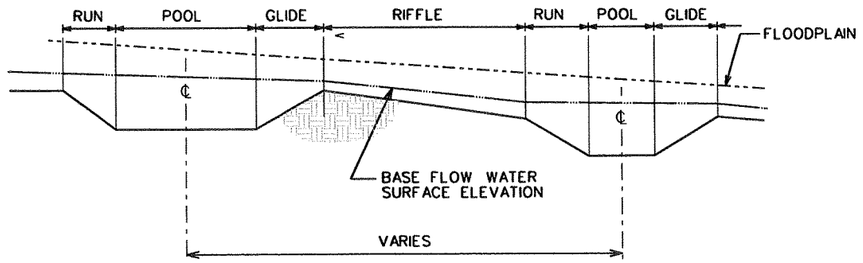
ESC Project No: 04-212

SHEET

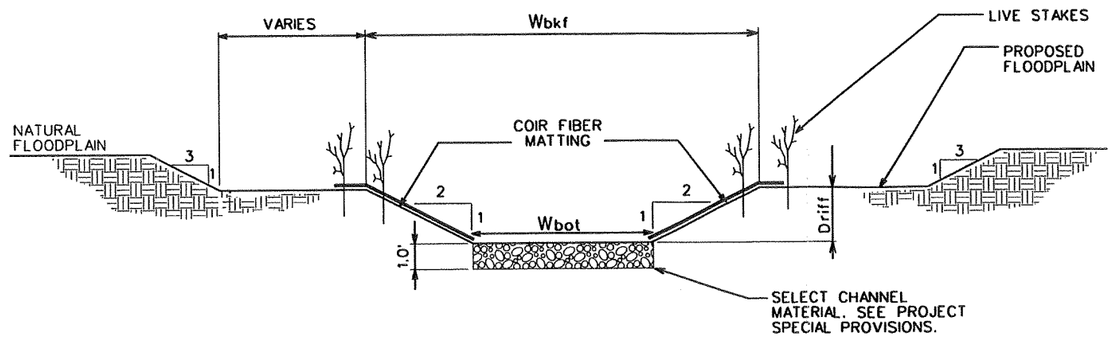
A



TYPICAL CHANNEL PLAN VIEW

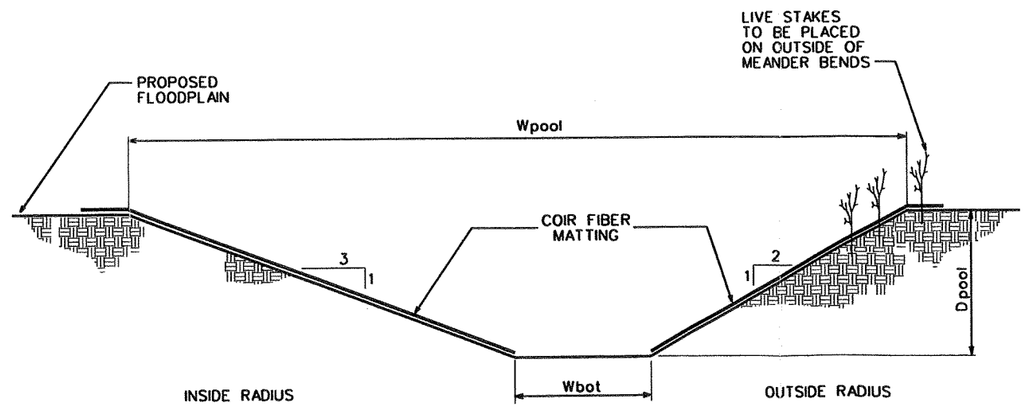


TYPICAL CHANNEL PROFILE



TYPICAL RIFFLE CROSS-SECTION

CROSS-SECTION DIMENSIONS							
REACH	Wbkf (ft.)	Wbot (ft.) Riffle	Driff (ft.)	Wpool (ft.)	Wbot (ft.) Pool	Dpool (ft.)	Width/Depth Ratio
CAMP BRANCH	19	11	2	25	10	3	11.9
UT TO CAMP BRANCH	6	2.8	0.8	8	2.5	1.1	10



TYPICAL POOL CROSS-SECTION

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

TYPICAL SECTIONS

CAMP BRANCH

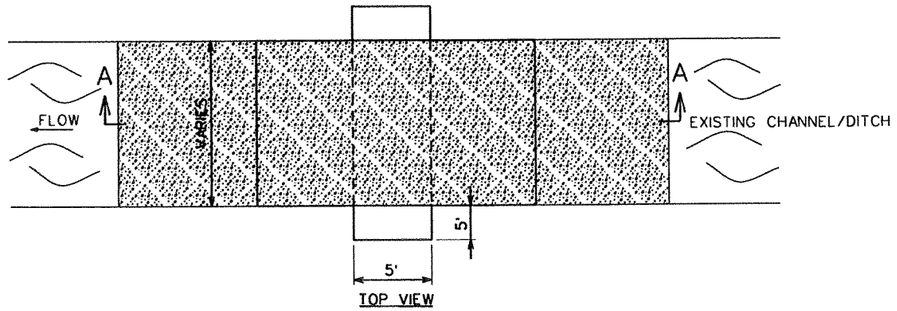
Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

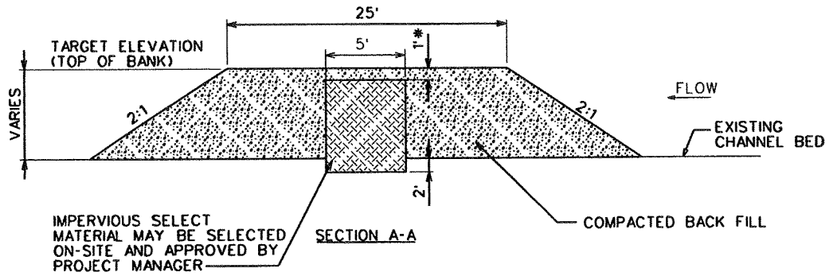
Scale: NO SCALE

ESC Project No.: 04-212

SHEET

A-2





NOTES:

1. CHANNEL PLUG WILL BE INITIALLY FILLED WITH AVAILABLE WASTE AND COMPACTED TO NINETY-FIVE PERCENT STANDARD PROCTOR.
2. THEN A CENTRAL PORTION FIVE FEET WIDE WILL BE REMOVED AND REPLACED WITH IMPERVIOUS SELECT MATERIAL (SEE SPECIAL PROVISIONS).
3. THE IMPERVIOUS SELECT MATERIAL WILL BE KEYED INTO THE ORIGINAL BANK A MINIMUM OF FIVE FEET AND INTO THE ORIGINAL BED A MINIMUM OF TWO FEET.

IMPERVIOUS CHANNEL BLOCK
CAMP BRANCH

IMPERVIOUS CHANNEL BLOCK
UT to CAMP BRANCH

NOTES:

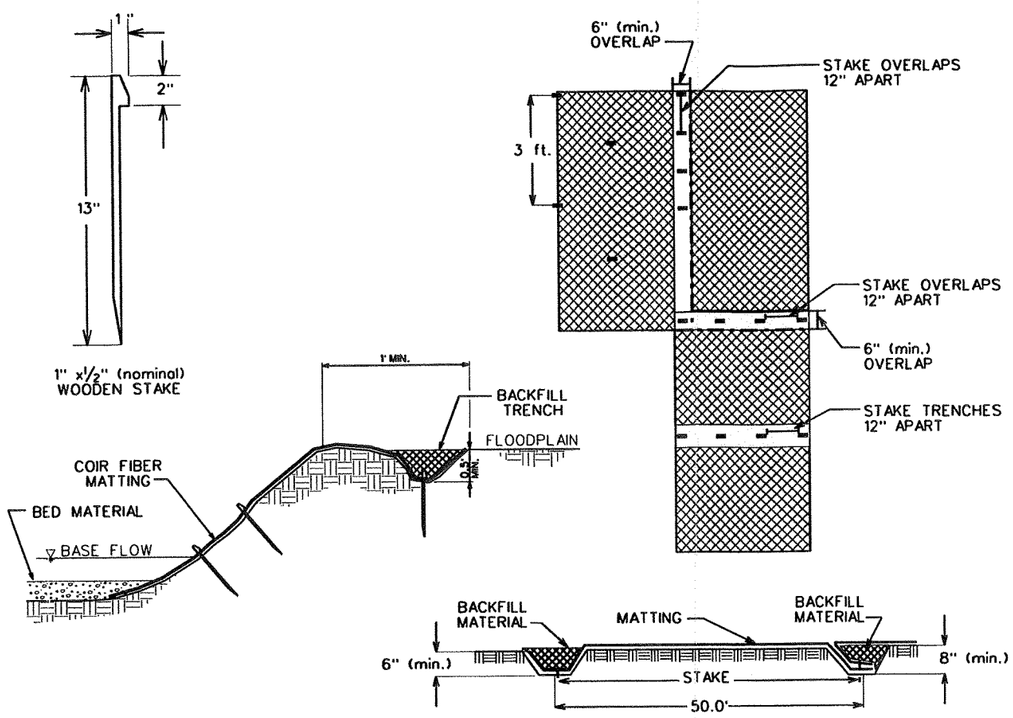
1. THE IMPERVIOUS SELECT MATERIAL WILL BE KEYED INTO THE ORIGINAL BANK A MINIMUM OF TWO FEET AND INTO THE ORIGINAL BED A MINIMUM OF ONE FOOT.

* 2. IN THE UT TO CAMP BRANCH CHANNEL ONLY, THE IMPERVIOUS SELECT MATERIAL SHALL EXTEND TO THE TOP OF THE IMPERVIOUS CHANNEL BLOCK AND HAVE NO BACKFILL LAYER ON TOP.

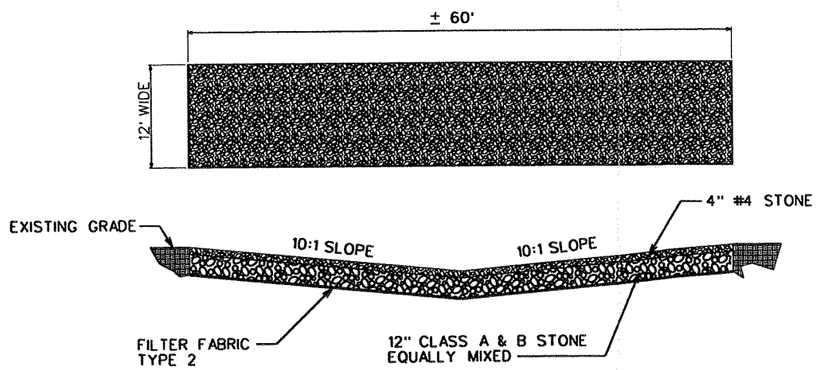
NOTES:

1. CONTRACTOR TO EXCAVATE APPROXIMATELY ONE FOOT DEEP CHANNEL FOR PERMANENT STREAM CROSSING.
2. LAY FILTER FABRIC ALONG ENTIRE LENGTH OF BED.
3. FILL WITH EIGHT INCHES OF "CLASS A" STONE, FOLLOWED BY FOUR INCHES OF #4 STONE TO BRING FINISHED GRADE UP TO LEVEL OF PROPOSED STREAM BED.

PERMANENT CHANNEL FORD
UT to CAMP BRANCH



COIR FIBER MATTING DETAIL



NOTES:

1. CONTRACTOR TO EXCAVATE APPROXIMATELY SIXTEEN INCHES DEEP CHANNEL FOR PERMANENT STREAM CROSSING.
2. LAY FILTER FABRIC ALONG ENTIRE LENGTH OF BED.
3. FILL WITH TWELVE INCHES OF "CLASS A" AND "CLASS B" STONE, EQUALLY MIXED, FOLLOWED BY FOUR INCHES OF #4 STONE TO BRING FINISHED GRADE UP TO LEVEL OF PROPOSED STREAM BED.

PERMANENT CHANNEL FORD
CAMP BRANCH

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

GENERAL DETAILS

CAMP BRANCH

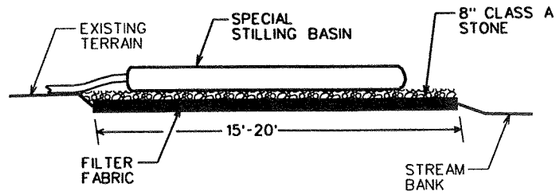
Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET

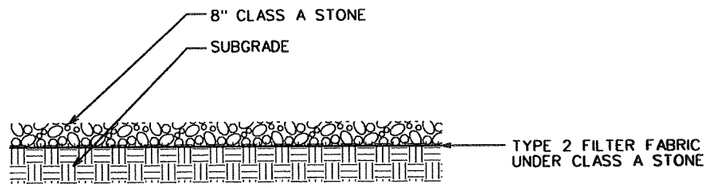
A-2A



⚠1 NOTE:

1. WHEN PUMPING CLEAN WATER, THE CONTRACTOR MAY PROVIDE A STABILIZED OUTLET BY OMITTING THE SPECIAL STILLING BASIN AND PROVIDING THE ROCK PAD AS SHOWN WITH MINIMUM DIMENSIONS 10 FEET WIDE BY 15 FEET LONG.

SPECIAL STILLING BASIN WITH ROCK PAD



NOTES:

1. THIS IS THE MINIMUM ACCEPTABLE SECTION.

ACCESS ROAD SECTION DETAIL

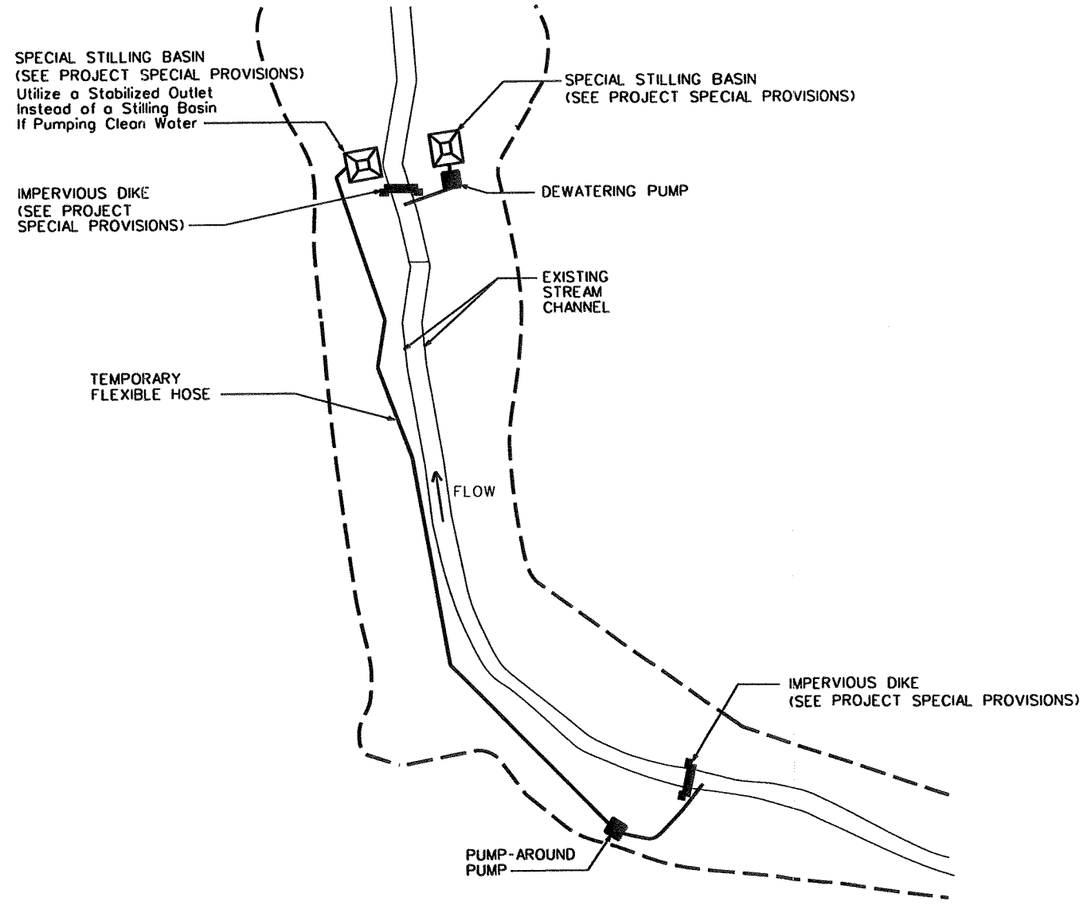
SUGGESTED OR EQUIVALENT

NOTES:

1. ALL EXCAVATION SHALL BE PERFORMED IN ONLY DRY OR ISOLATED SECTIONS OF CHANNEL.
2. IMPERVIOUS DIKES ARE TO BE USED TO ISOLATE WORK FROM STREAM FLOW WHEN NECESSARY.
3. ALL GRADED AREAS SHALL BE STABILIZED WITHIN 24 HOURS.
4. MAINTENANCE OF STREAM FLOW OPERATIONS SHALL BE INCIDENTAL TO THE WORK. THIS INCLUDES POLYETHYLENE SHEETING, DIVERSION PIPES, PUMPS AND HOSES.
5. PUMPS AND HOSES SHALL BE OF SUFFICICIENT SIZE TO DEWATER THE WORK AREA.

SEQUENCE OF CONSTRUCTION FOR TYPICAL WORK AREA

1. INSTALL SPECIAL STILLING BASIN(S).
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA. AREA TO BE DEWATERED SHALL BE EQUAL TO ONE DAY'S WORK.
5. PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE. (DOWNSTREAM IMPERVIOUS DIKES FIRST).
7. ALL GRADING AND STABILIZATION MUST BE COMPLETED AT THE END OF EASCH DAY WITHIN THE PUMP AROUND AREAS BETWEEN THE IMPERVIOUS DIKES. THE IMPERVIOUS DIKE LOCATIONS AS SHOWN ON THIS SHEET ONLY SHOW THE UPPER AND LOWER EXTENT OF WORK FOR EACH STREAM SEGMENT. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF THE IMPERVIOUS DIKE(S) FOR EACH DAY'S WORK.
8. REMOVE SPECIAL STILLING BASIN(S) AND BACKFILL. STABILIZE DISTURBED AREA WITH SEED AND MULCH.



TYPICAL PUMP-AROUND OPERATION

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

1 LAND QUALITY COMMENTS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G MODLIN JR.

Client: Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

GENERAL DETAILS

CAMP BRANCH

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET

A-2B

-A- CHANNEL CURVE DATA

UT to CAMP BRANCH

1
P.I. Sta. 0+38.01
D = 7°4' 16" 25.56" (RT)
T = 12.12
L = 20.74
R = 16.00
P.C. Sta. 0+25.90
P.T. Sta. 0+46.64
Back = N 32° 49' 26.38" W
Ahead = N 41° 26' 59.18" E

2
P.I. Sta. 0+68.07
D = 78° 08' 07.12" (LT)
T = 13.80
L = 23.18
R = 17.00
P.C. Sta. 0+54.27
P.T. Sta. 0+77.45
Back = N 41° 26' 59.18" E
Ahead = N 36° 41' 07.94" W

3
P.I. Sta. 0+97.92
D = 79° 07' 21.88" (RT)
T = 14.87
L = 24.86
R = 18.00
P.C. Sta. 0+83.05
P.T. Sta. 1+07.90
Back = N 36° 41' 07.94" W
Ahead = N 42° 26' 13.94" E

4
P.I. Sta. 1+40.33
D = 110° 29' 10.11" (LT)
T = 21.62
L = 28.93
R = 15.00
P.C. Sta. 1+18.72
P.T. Sta. 1+47.64
Back = N 42° 26' 13.94" E
Ahead = N 68° 02' 56.17" W

5
P.I. Sta. 1+94.54
D = 132° 36' 28.74" (RT)
T = 38.73
L = 39.35
R = 17.00
P.C. Sta. 1+55.81
P.T. Sta. 1+95.15
Back = N 68° 02' 56.17" W
Ahead = N 64° 33' 32.57" E

6
P.I. Sta. 2+18.05
D = 68° 01' 30.30" (LT)
T = 12.82
L = 22.56
R = 19.00
P.C. Sta. 2+05.23
P.T. Sta. 2+27.79
Back = N 64° 33' 32.57" E
Ahead = N 03° 27' 57.74" W

7
P.I. Sta. 2+56.22
D = 98° 30' 42.01" (RT)
T = 18.57
L = 27.51
R = 16.00
P.C. Sta. 2+37.64
P.T. Sta. 2+65.15
Back = N 03° 27' 57.74" W
Ahead = S 84° 57' 15.73" E

8
P.I. Sta. 2+98.33
D = 106° 02' 32.52" (LT)
T = 22.58
L = 31.46
R = 17.00
P.C. Sta. 2+75.75
P.T. Sta. 3+07.21
Back = S 84° 57' 15.73" E
Ahead = N 10° 59' 48.25" W

9
P.I. Sta. 3+29.71
D = 55° 58' 42.87" (RT)
T = 10.63
L = 19.54
R = 20.00
P.C. Sta. 3+19.09
P.T. Sta. 3+38.63
Back = N 10° 59' 48.25" W
Ahead = N 44° 58' 54.61" E

10
P.I. Sta. 3+73.48
D = 111° 46' 12.33" (LT)
T = 20.67
L = 27.31
R = 14.00
P.C. Sta. 3+52.81
P.T. Sta. 3+80.12
Back = N 44° 58' 54.61" E
Ahead = N 66° 47' 17.71" W

11
P.I. Sta. 4+02.54
D = 76° 33' 52.49" (RT)
T = 12.63
L = 21.38
R = 16.00
P.C. Sta. 3+89.91
P.T. Sta. 4+11.29
Back = N 66° 47' 17.71" W
Ahead = N 09° 46' 34.78" E

12
P.I. Sta. 4+39.19
D = 89° 27' 54.33" (LT)
T = 16.84
L = 26.54
R = 17.00
P.C. Sta. 4+22.35
P.T. Sta. 4+48.89
Back = N 09° 46' 34.78" E
Ahead = N 79° 41' 19.55" W

13
P.I. Sta. 4+76.92
D = 89° 36' 31.86" (RT)
T = 14.90
L = 23.46
R = 15.00
P.C. Sta. 4+62.03
P.T. Sta. 4+85.49
Back = N 79° 41' 19.55" W
Ahead = N 09° 55' 12.31" E

14
P.I. Sta. 5+16.43
D = 109° 44' 43.75" (LT)
T = 28.43
L = 38.31
R = 20.00
P.C. Sta. 4+88.00
P.T. Sta. 5+26.31
Back = N 09° 55' 12.31" E
Ahead = S 80° 10' 28.56" W

15
P.I. Sta. 5+48.99
D = 96° 30' 34.77" (RT)
T = 20.17
L = 30.32
R = 18.00
P.C. Sta. 5+28.82
P.T. Sta. 5+59.14
Back = S 80° 10' 28.56" W
Ahead = N 03° 18' 56.67" W

16
P.I. Sta. 5+72.19
D = 40° 25' 16.56" (LT)
T = 6.99
L = 13.40
R = 19.00
P.C. Sta. 5+65.19
P.T. Sta. 5+78.60
Back = N 03° 18' 56.67" W
Ahead = N 43° 44' 13.22" W

17
P.I. Sta. 6+05.94
D = 72° 37' 10.89" (RT)
T = 22.05
L = 36.02
R = 30.00
P.C. Sta. 5+83.90
P.T. Sta. 6+21.92
Back = N 43° 44' 13.22" W
Ahead = N 28° 52' 57.67" E

PI Sta.- center of pool

D- deflection angle (Δ) between tangent lines T2 and T measured along direction of travel

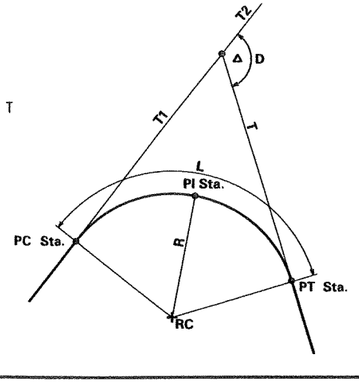
L- arc/pool length

T/T1- tangent length

R- radius of curvature

PC Sta.- point of curvature (where arc/pool begins)

PT Sta.- point of terminus (where arc/pool ends)



-C- CHANNEL CURVE DATA

CAMP BRANCH

1
P.I. Sta. 0+36.53
D = 60° 16' 42.22" (LT)
T = 34.84
L = 63.12
R = 60.00
P.C. Sta. 0+01.69
P.T. Sta. 0+64.82
Back = S 49° 04' 03.77" E
Ahead = N 70° 39' 14.00" E

2
P.I. Sta. 1+12.69
D = 60° 49' 54.34" (RT)
T = 24.66
L = 44.59
R = 42.00
P.C. Sta. 0+88.03
P.T. Sta. 1+32.62
Back = N 70° 39' 14.00" E
Ahead = S 48° 30' 51.66" E

3
P.I. Sta. 1+67.58
D = 67° 24' 22.94" (LT)
T = 28.01
L = 49.41
R = 42.00
P.C. Sta. 1+39.57
P.T. Sta. 1+88.98
Back = S 48° 30' 51.66" E
Ahead = N 64° 04' 45.40" E

4
P.I. Sta. 2+35.99
D = 56° 54' 01.41" (RT)
T = 27.09
L = 49.66
R = 50.00
P.C. Sta. 2+08.90
P.T. Sta. 2+58.56
Back = N 64° 04' 45.40" E
Ahead = S 59° 01' 13.19" E

5
P.I. Sta. 2+95.41
D = 40° 20' 31.79" (LT)
T = 16.90
L = 32.39
R = 46.00
P.C. Sta. 2+78.51
P.T. Sta. 3+10.90
Back = S 59° 01' 13.19" E
Ahead = N 80° 38' 15.02" E

6
P.I. Sta. 3+72.28
D = 55° 40' 21.65" (RT)
T = 30.10
L = 55.39
R = 57.00
P.C. Sta. 3+42.18
P.T. Sta. 3+97.57
Back = N 80° 38' 15.02" E
Ahead = S 43° 41' 23.33" E

7
P.I. Sta. 4+98.65
D = 60° 58' 29.93" (RT)
T = 34.74
L = 62.79
R = 59.00
P.C. Sta. 4+63.92
P.T. Sta. 5+26.70
Back = S 43° 41' 23.33" E
Ahead = S 17° 17' 06.60" W

8
P.I. Sta. 5+57.00
D = 57° 04' 22.74" (LT)
T = 32.30
L = 40.84
R = 41.00
P.C. Sta. 5+34.70
P.T. Sta. 5+75.54
Back = S 17° 17' 06.60" W
Ahead = S 39° 47' 16.14" E

9
P.I. Sta. 6+04.53
D = 64° 08' 12.21" (RT)
T = 25.06
L = 44.78
R = 40.00
P.C. Sta. 5+79.47
P.T. Sta. 6+24.25
Back = S 39° 47' 16.14" E
Ahead = S 24° 20' 56.07" W

10
P.I. Sta. 6+72.41
D = 72° 45' 17.51" (LT)
T = 42.73
L = 73.65
R = 58.00
P.C. Sta. 6+29.68
P.T. Sta. 7+03.33
Back = S 24° 20' 56.07" W
Ahead = S 48° 24' 21.44" E

11
P.I. Sta. 7+58.99
D = 64° 20' 30.56" (RT)
T = 25.16
L = 44.92
R = 40.00
P.C. Sta. 7+33.83
P.T. Sta. 7+78.75
Back = S 48° 24' 21.44" E
Ahead = S 15° 56' 09.12" W

12
P.I. Sta. 8+34.31
D = 73° 40' 37.61" (LT)
T = 46.45
L = 79.73
R = 62.00
P.C. Sta. 7+87.86
P.T. Sta. 8+67.59
Back = S 15° 56' 09.12" W
Ahead = S 01° 44' 28.49" E

13
P.I. Sta. 9+07.54
D = 55° 30' 41.31" (RT)
T = 24.21
L = 44.57
R = 46.00
P.C. Sta. 8+83.34
P.T. Sta. 9+27.90
Back = S 01° 44' 28.49" E
Ahead = S 02° 13' 47.17" E

14
P.I. Sta. 9+78.87
D = 68° 42' 44.90" (LT)
T = 27.34
L = 47.97
R = 40.00
P.C. Sta. 9+51.53
P.T. Sta. 9+99.50
Back = S 02° 13' 47.17" E
Ahead = S 70° 56' 32.07" E

15
P.I. Sta. 10+50.09
D = 70° 56' 32.07" (RT)
T = 29.21
L = 50.77
R = 41.00
P.C. Sta. 10+20.87
P.T. Sta. 10+71.64
Back = S 70° 56' 32.07" E
Ahead = Due South

16
P.I. Sta. 11+22.86
D = 61° 14' 41.94" (LT)
T = 37.88
L = 68.41
R = 64.00
P.C. Sta. 10+84.98
P.T. Sta. 11+53.39
Back = Due South
Ahead = S 61° 14' 41.94" E

17
P.I. Sta. 12+12.29
D = 46° 23' 08.26" (RT)
T = 32.56
L = 61.53
R = 76.00
P.C. Sta. 11+79.73
P.T. Sta. 12+41.26
Back = S 61° 14' 41.94" E
Ahead = S 14° 51' 33.69" E

18
P.I. Sta. 12+85.22
D = 50° 09' 50.65" (LT)
T = 23.87
L = 44.65
R = 51.00
P.C. Sta. 12+61.35
P.T. Sta. 13+06.00
Back = S 14° 51' 33.69" E
Ahead = S 65° 01' 24.33" E

19
P.I. Sta. 13+73.31
D = 57° 01' 16.21" (RT)
T = 28.85
L = 52.84
R = 53.00
P.C. Sta. 13+44.47
P.T. Sta. 13+97.30
Back = S 65° 01' 24.33" E
Ahead = S 07° 54' 08.12" E

20
P.I. Sta. 14+67.39
D = 61° 05' 34.23" (LT)
T = 37.77
L = 68.24
R = 64.00
P.C. Sta. 14+29.62
P.T. Sta. 14+97.86
Back = S 07° 54' 08.12" E
Ahead = S 68° 59' 42.35" E

21
P.I. Sta. 15+75.23
D = 85° 33' 33.31" (RT)
T = 53.67
L = 86.61
R = 58.00
P.C. Sta. 15+21.55
P.T. Sta. 16+08.17
Back = S 68° 59' 42.35" E
Ahead = S 16° 33' 50.97" W

22
P.I. Sta. 16+54.66
D = 59° 35' 37.24" (LT)
T = 25.77
L = 46.81
R = 45.00
P.C. Sta. 16+28.89
P.T. Sta. 16+75.70
Back = S 16° 33' 50.97" W
Ahead = S 43° 01' 46.27" E

23
P.I. Sta. 17+11.39
D = 55° 38' 51.63" (RT)
T = 23.75
L = 43.71
R = 45.00
P.C. Sta. 16+87.64
P.T. Sta. 17+31.34
Back = S 43° 01' 46.27" E
Ahead = S 12° 37' 05.36" W

24
P.I. Sta. 17+73.61
D = 71° 17' 34.89" (LT)
T = 33.71
L = 58.48
R = 47.00
P.C. Sta. 17+39.90
P.T. Sta. 17+98.38
Back = S 12° 37' 05.36" W
Ahead = S 58° 40' 29.53" E

NOTE:
FOR NEW CHANNEL LAYOUT, SEE SHEET A-5.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client:
Ecosystem Enhancement Program

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:
NEW CHANNEL CENTERLINE DATA

CAMP BRANCH

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET
A-2C

⚠1 SUMMARY OF QUANTITIES

CAMP BRANCH –C– CHANNEL
AND UT TO CAMP BRANCH –A– CHANNEL

SUMMARY OF QUANTITIES
Bishop Site Stream/Wetland Restoration - Camp Branch

ITEM	SPEC	ITEM DESCRIPTION	QUANTITIES	UNIT
1	SP1	Mobilization	1	LS
2	SP2	Construction Surveying	1	LS
3	SP3	Grading	1	LS
4	1056	Filter Fabric, Type 2	1850	SY
5	1605	Temporary Silt Fence	3520	LF
6	1610	Stone for Erosion Control, Class A	675	TON
7	1610	Stone for Erosion Control, Class B	90	TON
8	1610	Stone for Erosion Control, No. 4	30	TON
9	1610	Stone for Erosion Control, ABC	925	TON
10	1610	Stone for Erosion Control, No. 57	40	TON
11	1615	Temporary Mulching	15	ACR
12	1620	Seed for Temporary Seeding	975	LB
13	1620	Fertilizer for Temporary Seeding	2.25	TON
14	1630	Silt Excavation	300	CY
15	1660	Permanent Seeding and Mulching	15	ACR
16	1661	Seed for Repair Seeding	325	LB
17	1661	Fertilizer for Repair Seeding	0.75	TON
18	1662	Supplemental Seeding	325	LB
19	SP6	Coir Fiber Matting, 900 gm	4000	SY
20	SP8	Impervious Select Material	150	CY
21	SP9	Pump Around Operation	1	LS
22	SP10	Special Stilling Basin	2	EA
23	SP12	Bare Root Seedlings	30450	EA
24	SP13	Live Staking	4700	EA
25	SP14	Invasive Plant Removal	1	LS
26	SP5	Safety Fence	400	LF
27	SP16	Channel Substrate	350	TON
28	SP17	Disking/Scarification	10	ACR

Estimates do include quantities for Class A stone and filter fabric for improved on-site access roads if required by weather conditions. The quantities are approximately 480 T of Class A Stone and 1333 SY filter fabric per 1000 linear feet of 12-foot wide improved access road as shown on the plans. ABC Stone is estimated to leave existing farm road in "AS IS or BETTER" condition. Note that all quantities are estimates for infomation and bid comparison purposes only.

SUMMARY OF EARTHWORK

QUANTITIES IN CUBIC YARDS

UT to CAMP BRANCH –A– CHANNEL

Xsection	Total Cut		EXCAVATION	Total Fill			FILL	BORROW	WASTE
	sq ft	cu ft		sq ft	cu ft	cu ft + %			
0	3.3	0		0	0				
80	5.3	344.0	13	1.3	52.0	62	2	0	10
133	8.7	371.0	14	5.9	190.8	229	8	0	5
228	5.7	684.0	25	4.5	494.0	593	22	0	3
320	5.7	524.4	19	2.8	335.8	403	15	0	4
436	5.7	661.2	24	3.1	342.2	411	15	0	9
600	5.7	934.8	35	0.0	254.2	305	11	0	23
		3519	130		1669		74	0	56
									56
Project Total			130						56

APPROXIMATE QUANTITIES ONLY, UNCLASSIFIED EXCAVATION, BORROW EXCAVATION, FINE GRADING AND CLEARING AND GRUBBING WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING." A SHRINKAGE FACTOR OF 1.2 WAS ASSUMED.

CAMP BRANCH –C– CHANNEL

Xsection	Total Cut		EXCAVATION	Total Fill			FILL	BORROW	WASTE
	sq ft	cu ft		sq ft	cu ft	cu ft + %			
0	250.4	0		0	0				
120	136.6	23220.0	860	15.8	948.0	1138	42	0	818
260	157.2	20566.0	762	23.3	2737.0	3284	122	0	640
420	222.8	30400.0	1126	55.7	6320.0	7584	281	0	845
560	211.7	30415.0	1126	33.0	6209.0	7451	276	0	851
680	134.0	20742.0	768	81.8	6888.0	8266	306	0	462
760	163.2	11888.0	440	83.9	6628.0	7954	295	0	146
820	208.2	11142.0	413	80.9	4944.0	5933	220	0	193
900	259.2	18696.0	692	44.6	5020.0	6024	223	0	469
1060	192.3	36120.0	1338	94.8	11152.0	13382	496	0	842
1120	200.1	11772.0	436	112.4	6216.0	7459	276	0	160
1280	205.2	32424.0	1201	138.6	20080.0	24096	892	0	308
1360	291.5	19868.0	736	128.4	10680.0	12816	475	0	261
1460	307.1	29930.0	1109	178.6	15350.0	18420	682	0	426
1560	365.5	33630.0	1246	127.2	15290.0	18348	680	0	566
1700	517.9	61838.0	2290	108.8	16520.0	19824	734	0	1556
1800	512.3	51510.0	1908	0.0	5440.0	6528	242	0	1666
1810	0.0	2561.5	95	0.0	0.0	0	0	0	95
		446723	16545		140422		6241	0	10304
									10304
Project Total			16545						10304

APPROXIMATE QUANTITIES ONLY, UNCLASSIFIED EXCAVATION, BORROW EXCAVATION, FINE GRADING AND CLEARING AND GRUBBING WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING." A SHRINKAGE FACTOR OF 1.2 WAS ASSUMED.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS
⚠1 QUANTITIES REVISED

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN
ANSON COUNTY, NORTH CAROLINA

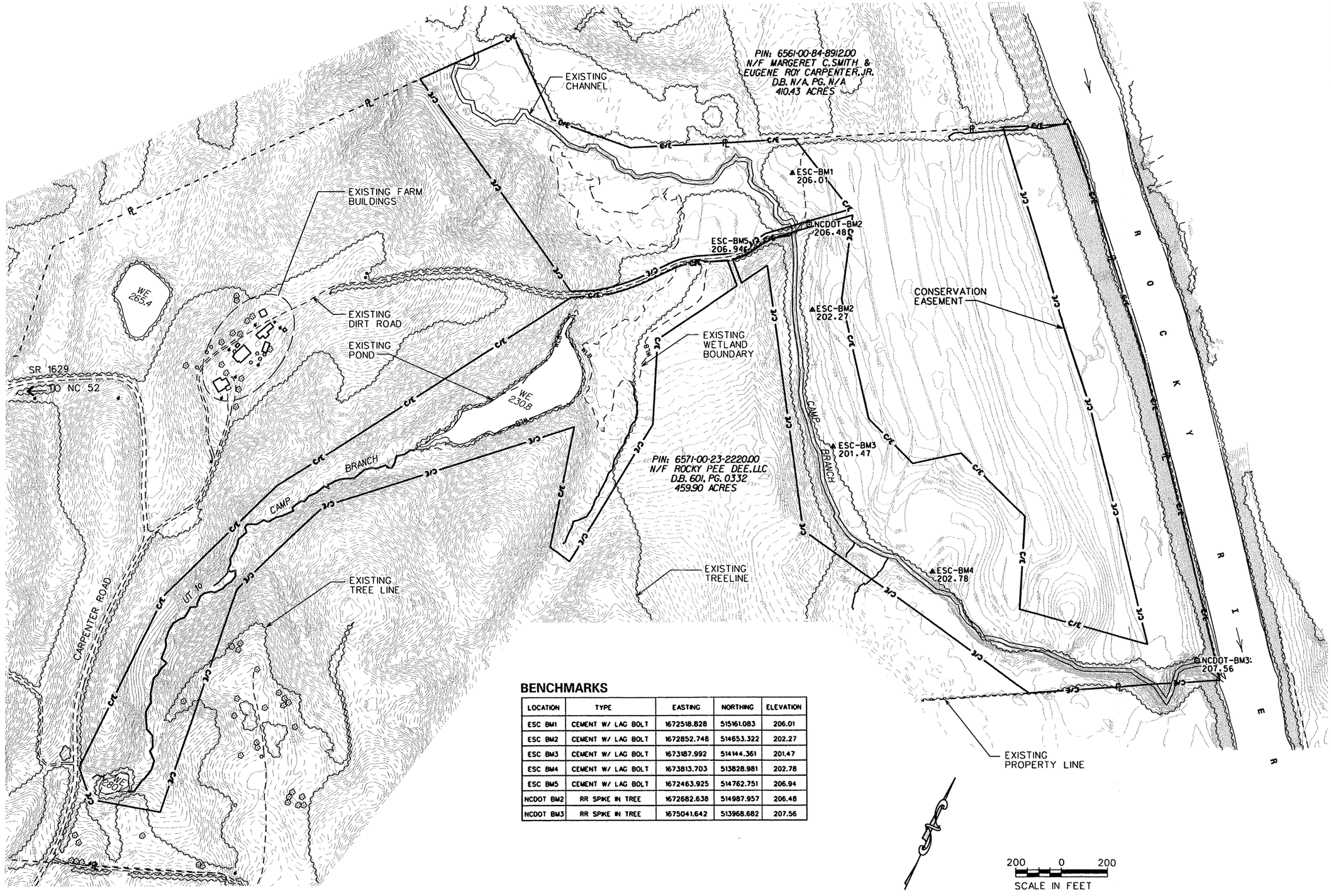
Title:
SUMMARY OF QUANTITIES / SUMMARY OF EARTHWORK
CAMP BRANCH

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET
A–3



BENCHMARKS

LOCATION	TYPE	EASTING	NORTHING	ELEVATION
ESC BM1	CEMENT W/ LAG BOLT	1672518.828	515161.083	206.01
ESC BM2	CEMENT W/ LAG BOLT	1672852.748	514653.322	202.27
ESC BM3	CEMENT W/ LAG BOLT	1673187.992	514144.361	201.47
ESC BM4	CEMENT W/ LAG BOLT	1673813.703	513828.981	202.78
ESC BM5	CEMENT W/ LAG BOLT	1672463.925	514762.751	206.94
NCDOT BM2	RR SPIKE IN TREE	1672682.638	514987.957	206.48
NCDOT BM3	RR SPIKE IN TREE	1675041.642	513968.682	207.56

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client:
Ecosystem Enhancement PROGRAM

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN
ANSON COUNTY, NORTH CAROLINA

Title:
EXISTING CONDITIONS
CAMP BRANCH

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: AS SHOWN

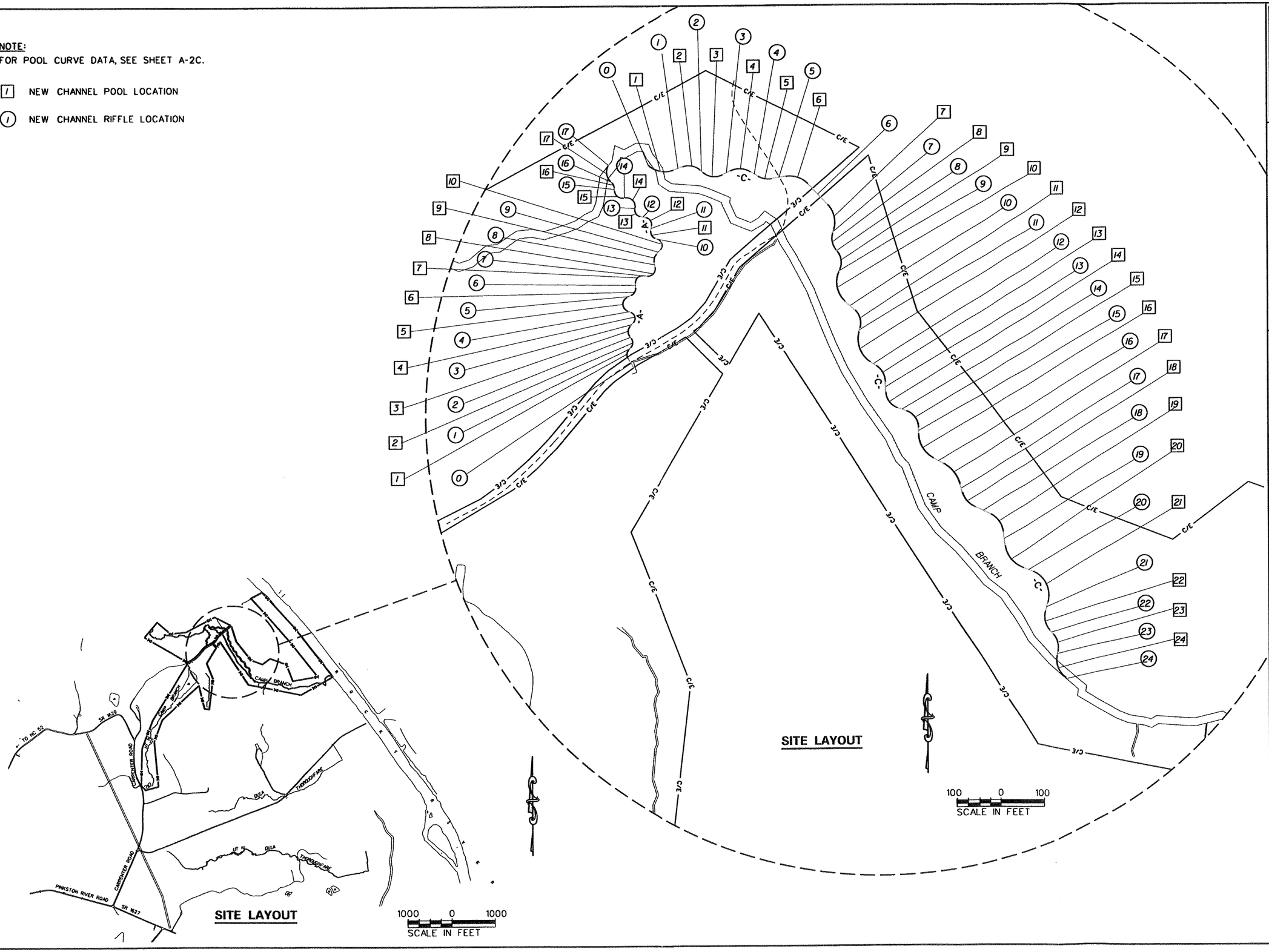
ESC Project No.: 04-212

SHEET
A-4

NOTE:
FOR POOL CURVE DATA, SEE SHEET A-2C.

[1] NEW CHANNEL POOL LOCATION

(1) NEW CHANNEL RIFFLE LOCATION



EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client:
Ecosystem Enhancement PROGRAM

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

NEW CHANNEL LAYOUT

CAMP BRANCH

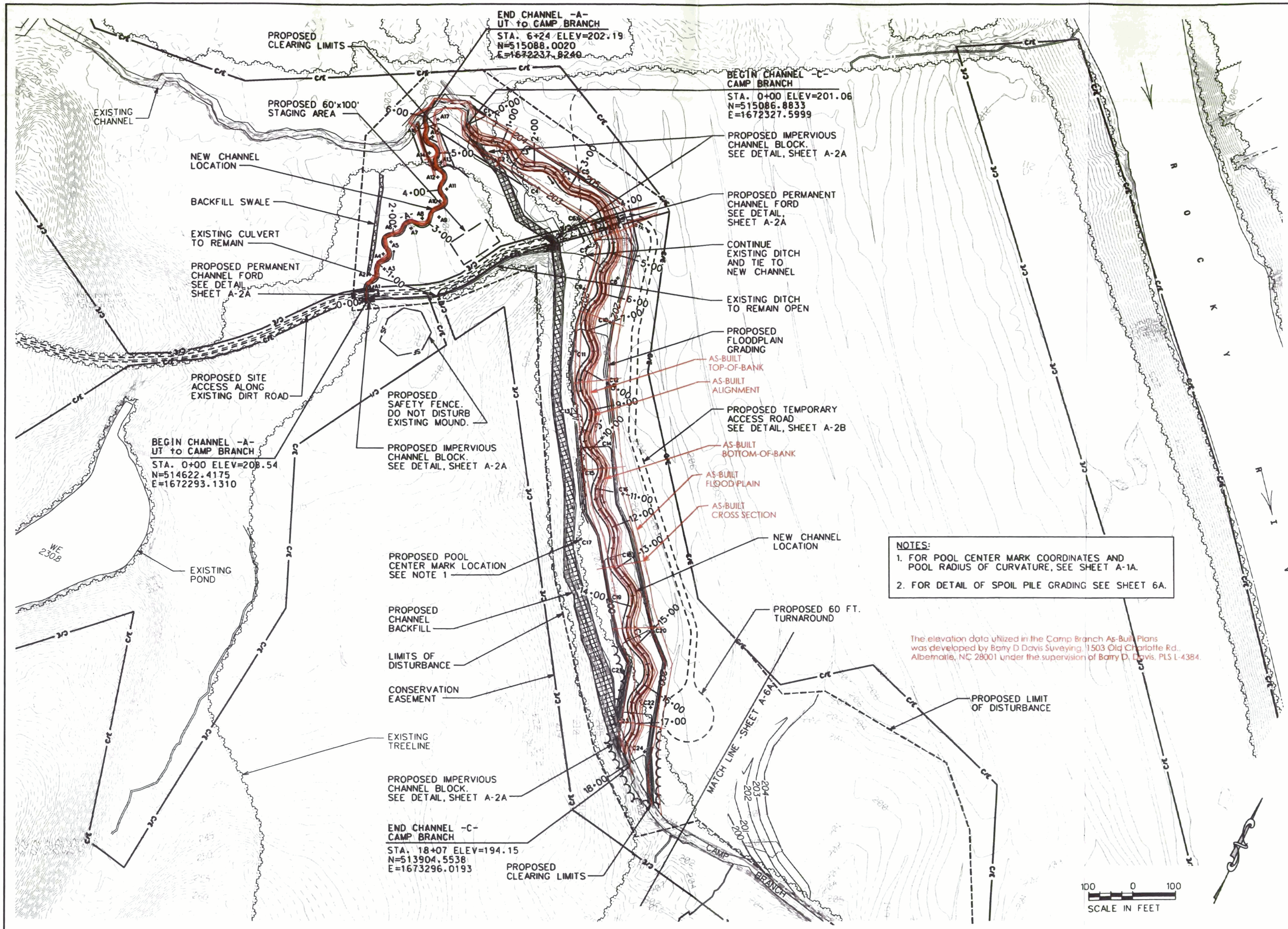
Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: AS SHOWN

ESC Project No.: 04-212

SHEET

A-5



EcoScience Corporation
Raleigh, North Carolina

REVISIONS	
1	AS-BUILT - JULY 2007

Client: Ecosystem Enhancement Program

Project: BISHOP SITE STREAM / WETLAND RESTORATION PLAN

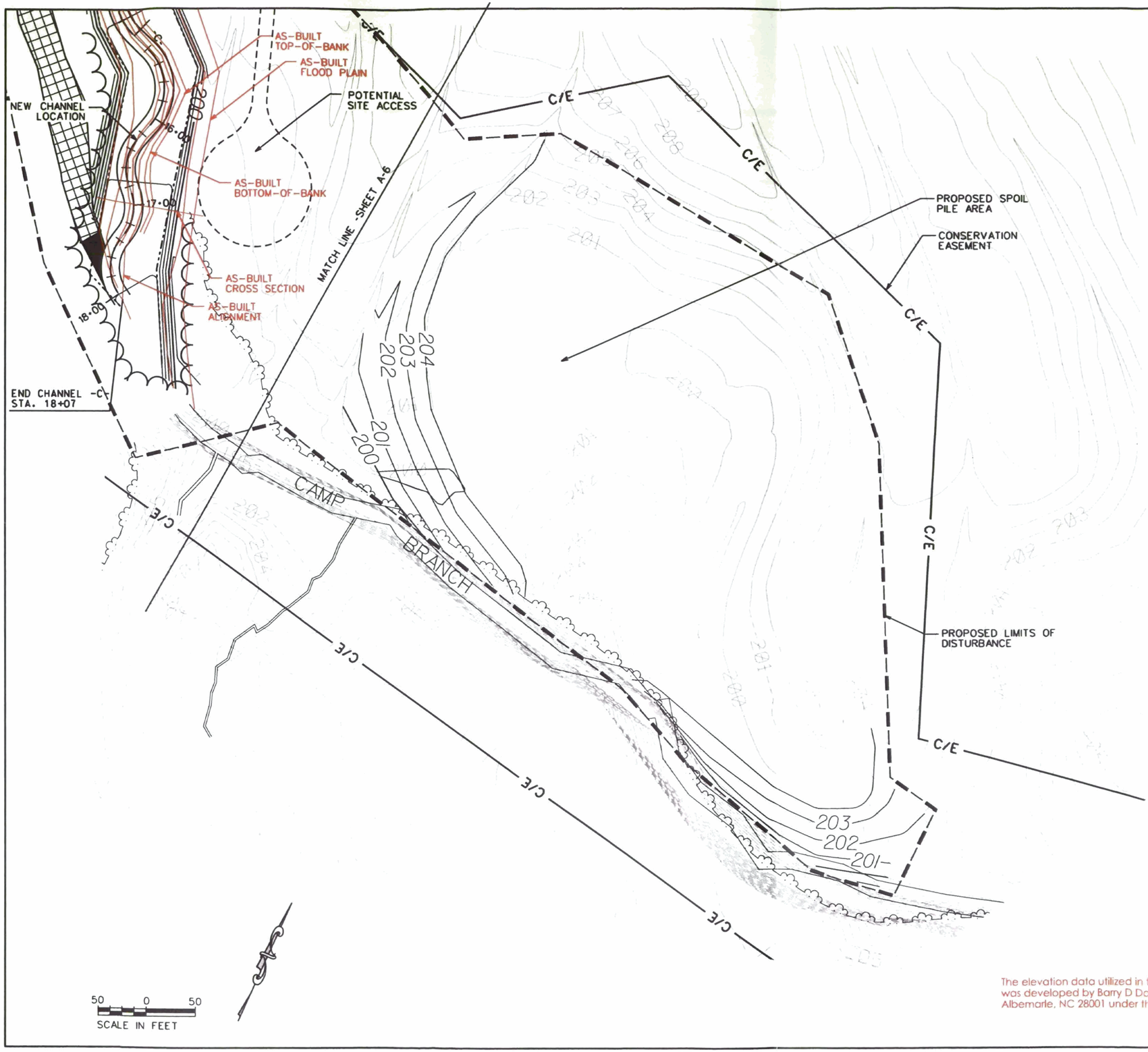
ANSON COUNTY, NORTH CAROLINA

Title: SITE PLAN CAMP BRANCH

Dsn. By: JDC	Dwn. By: MAF
Ckd. By: EBB	Date: JUL 2007
Scale: AS SHOWN	
ESC Project No.: 04-212	

SHEET

A-6



The elevation data utilized in the Camp Branch As-Built Plans was developed by Barry D Davis Suveying, 1503 Old Charlotte Rd., Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS	
1	AS-BUILT - JULY 2007

NORTH CAROLINA PROFESSIONAL SEAL 005951 ENGINEER BRIAN BORNHOFT
2207

Client:
Ecosystem Enhancement PROGRAM

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN
ANSON COUNTY, NORTH CAROLINA

Title:
SITE PLAN
CAMP BRANCH

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
EBB	JUL 2007

Scale: AS SHOWN

ESC Project No.: 04-212

SHEET
A-6A

Project # 04-212	Date JUN 2005	Scale AS SHOWN	
Des. By: MAF	Dwn. By: JDC	Chk. By: DGM	

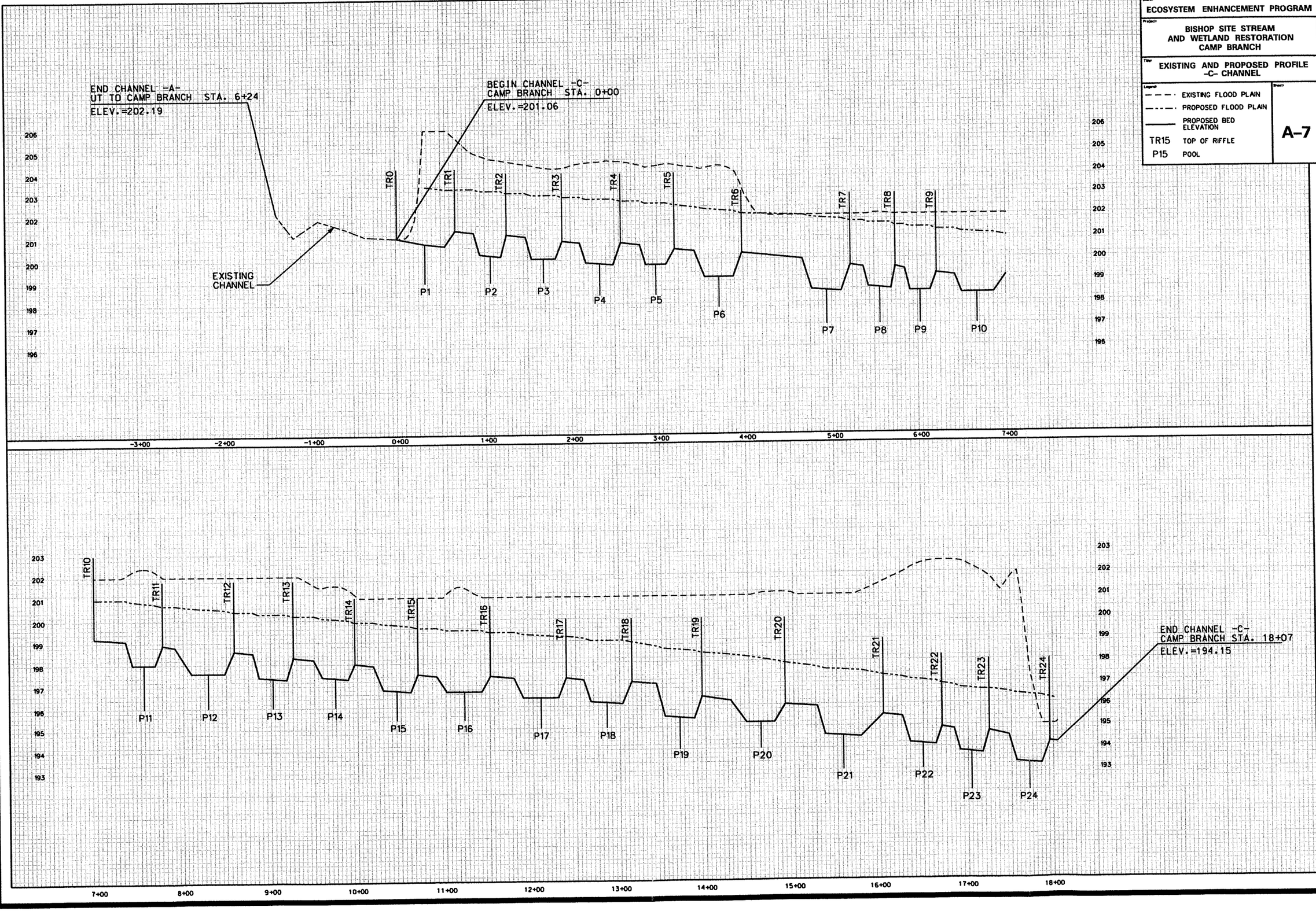
Client: ECOSYSTEM ENHANCEMENT PROGRAM

Project: BISHOP SITE STREAM AND WETLAND RESTORATION CAMP BRANCH

Title: EXISTING AND PROPOSED PROFILE -C- CHANNEL

Legend:
- EXISTING FLOOD PLAIN
- PROPOSED FLOOD PLAIN
- PROPOSED BED ELEVATION
- TR15 TOP OF RIFFLE
- P15 POOL

Sheet: A-7



Project no. 04-212	Date JULY 2007		Scale AS SHOWN
Dwn. By: JFH	Chk. By: JDC	Chk. By: EBB	

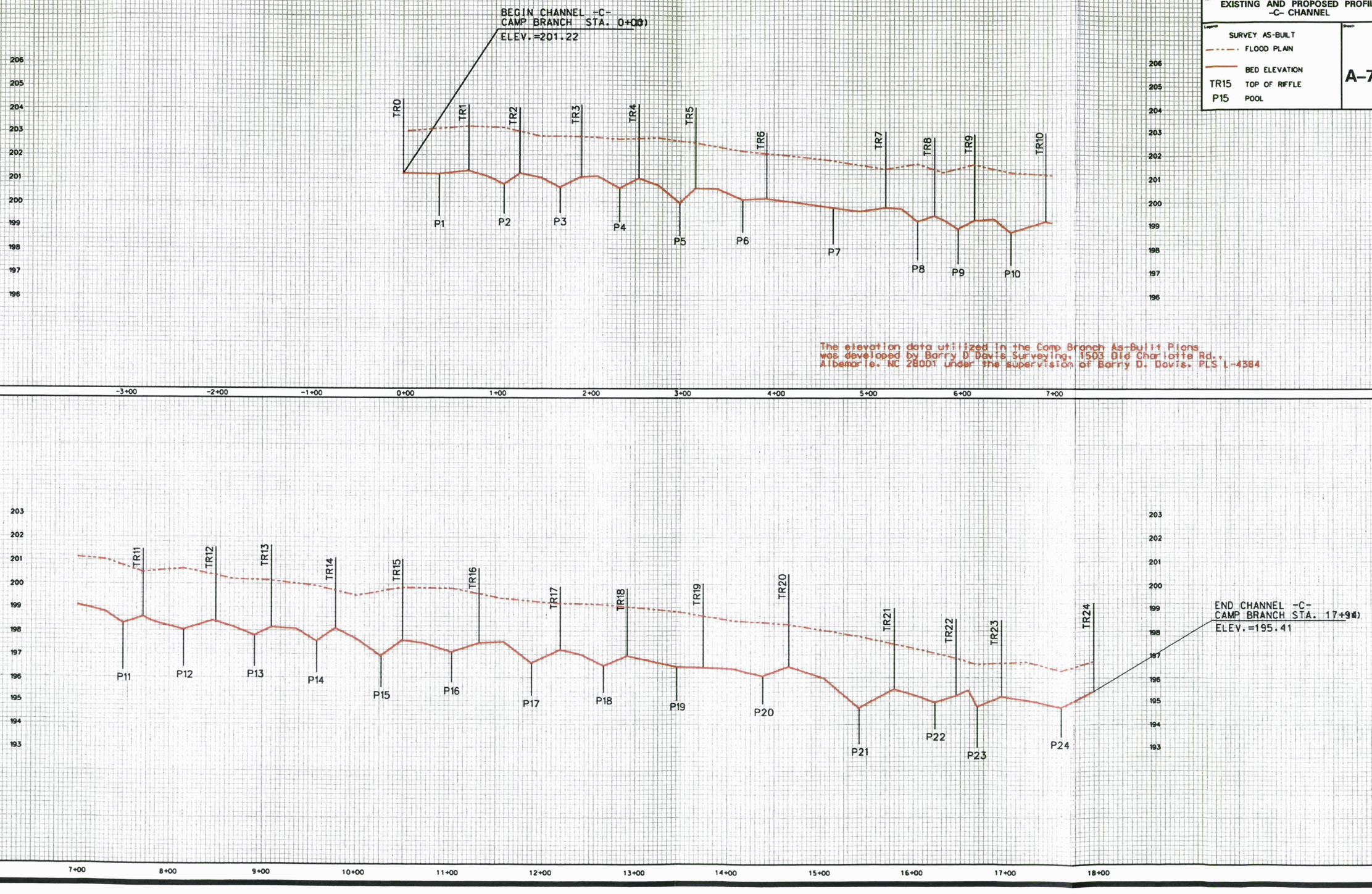
Client: ECOSYSTEM ENHANCEMENT PROGRAM

Project: BISHOP SITE STREAM AND WETLAND RESTORATION CAMP BRANCH

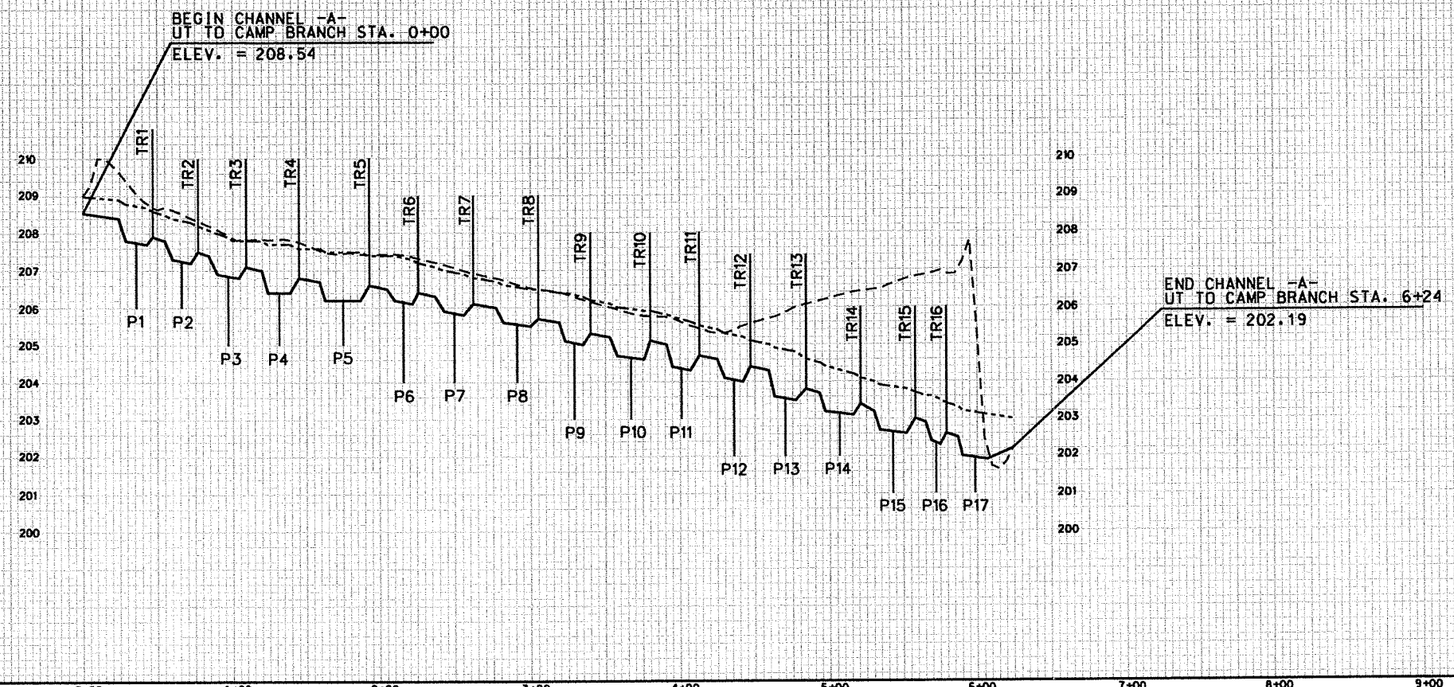
Title: EXISTING AND PROPOSED PROFILE -C- CHANNEL

Legend:
- SURVEY AS-BUILT
- FLOOD PLAIN
- BED ELEVATION
- TR15 TOP OF RIFFLE
- P15 POOL

Sheet: A-7A



The elevation data utilized in the Camp Branch As-Built Plans was developed by Barry D Davis Surveying, 1503 Old Charlotte Rd., Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384



Project # 04-212 | Date: JUN 2005 | Scale: AS SHOWN
Des. By: MAF | Dwn. By: JDC | Chd. By: DGM

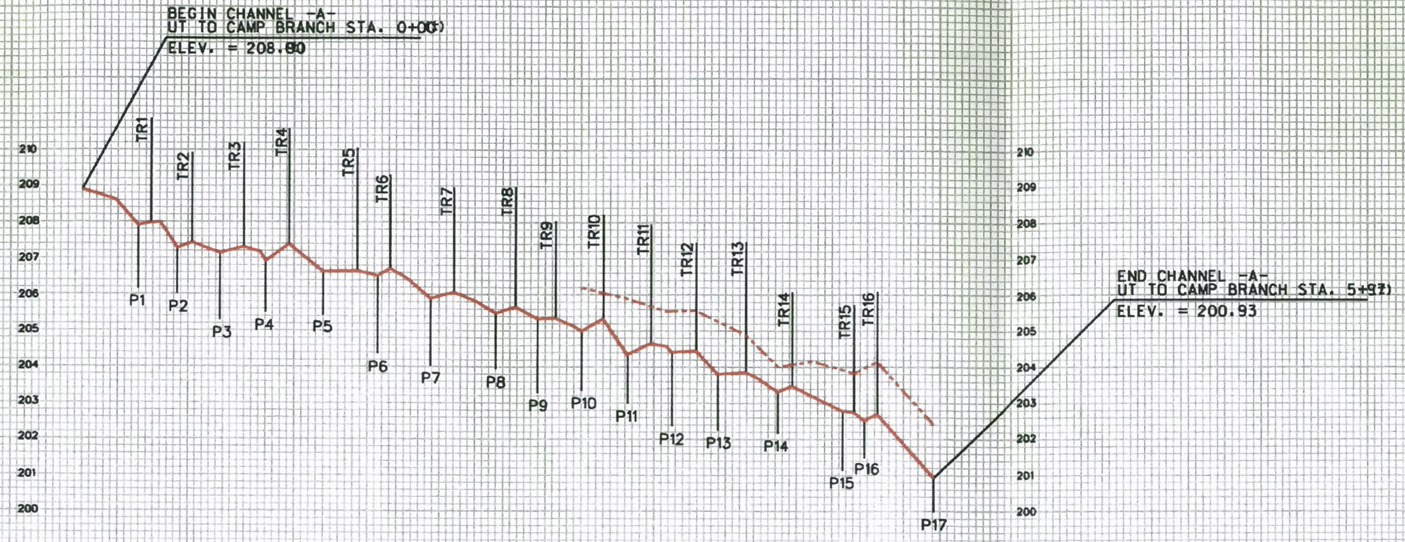
Client:
ECOSYSTEM ENHANCEMENT PROGRAM

Project:
BISHOP SITE STREAM
AND WETLAND RESTORATION
UT TO CAMP BRANCH

Title:
EXISTING AND PROPOSED PROFILE
-A- CHANNEL

Legend:
- - - - EXISTING FLOOD PLAIN
- - - - PROPOSED FLOOD PLAIN
——— PROPOSED BED ELEVATION
TR15 TOP OF RIFFLE
P15 POOL

Sheet:
A-8



The elevation data utilized in the Camp Branch As-Built Plans was developed by Barry D Davis Surveying, 1503 Old Charlotte Rd., Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384

Project No.	04-212	Date	JULY 2007
Des. By:	JFH	Dwn. By: JDC	Chk. By: EBB
Scale	AS SHOWN		

Client: ECOSYSTEM ENHANCEMENT PROGRAM

Project: BISHOP SITE STREAM AND WETLAND RESTORATION UT TO CAMP BRANCH

Title: EXISTING AND PROPOSED PROFILE -A- CHANNEL

Legend:
- SURVEY AS-BUILT
- FLOOD PLAIN
- BED ELEVATION
- TR15 TOP OF RIFFLE
- P15 POOL

Sheet: A-8A

END CHANNEL -A-
UT to CAMP BRANCH
STA. 6+24 ELEV=202.19
N=515088.0020
E=1672237.8240

BEGIN CHANNEL -C-
CAMP BRANCH
STA. 0+00 ELEV=201.06
N=515086.8833
E=1672327.5999

EXISTING CHANNEL

PROPOSED 60'x100' STAGING AREA

NEW CHANNEL LOCATION

EXISTING DIRT ACCESS ROAD

CONTINUE EXISTING DITCH AND TIE TO NEW CHANNEL

PROPOSED STONE OUTLET
SEE DETAIL, SHEET A-EC2

PROPOSED SILT FENCE
SEE DETAIL, SHEET A-EC2

PROPOSED SITE ACCESS

BEGIN CHANNEL -A-
UT to CAMP BRANCH
STA. 0+00 ELEV=208.54
N=514622.4175
E=1672293.1310

PROPOSED SAFETY FENCE DO NOT DISTURB EXISTING MOUND

EXISTING POND

WE 2308

LIMITS OF DISTURBANCE

NEW CHANNEL LOCATION

CONSERVATION EASEMENT

MATCH LINE -SHEET A-EC1A

CAMP BRANCH

EXISTING TREELINE

END CHANNEL -C-
CAMP BRANCH
STA. 18+07 ELEV=194.15
N=513904.5538
E=1673296.0193

ROCKY

100 0 100
SCALE IN FEET

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client:
Ecosystem Enhancement PROGRAM

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

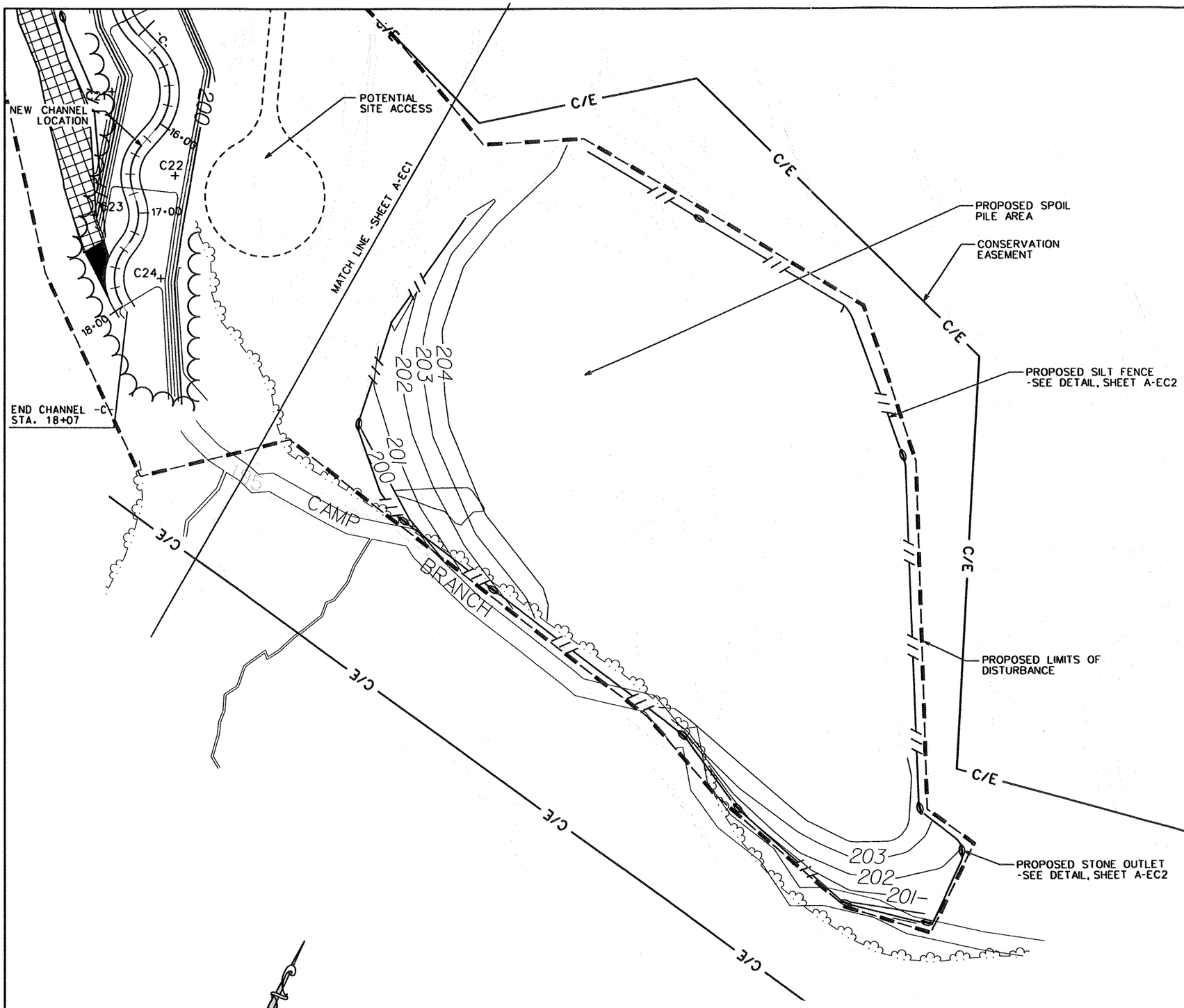
EROSION CONTROL PLAN

CAMP BRANCH

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005
Scale:	AS SHOWN
ESC Project No.:	04-212

SHEET

A-EC1



EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client:
Ecosystem Enhancement PROGRAM

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:
EROSION CONTROL PLAN

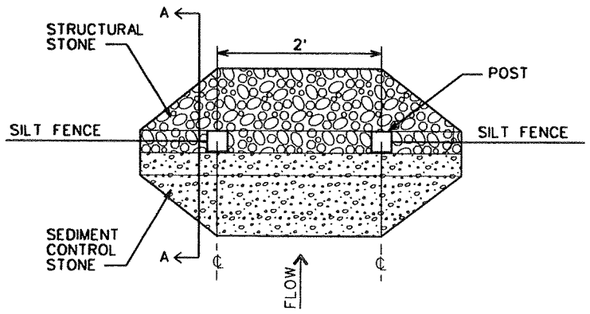
CAMP BRANCH

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

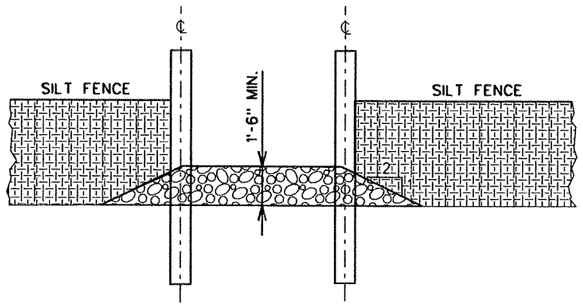
Scale: AS SHOWN

ESC Project No.: 04-212

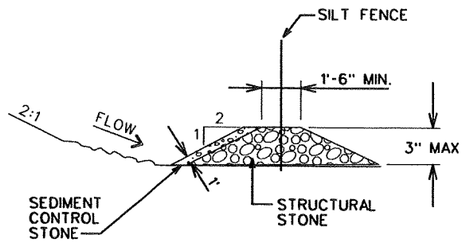
SHEET
A-EC1A



PLAN



ELEVATION

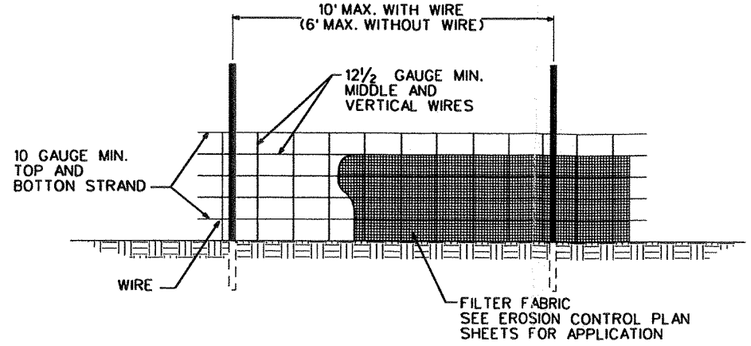


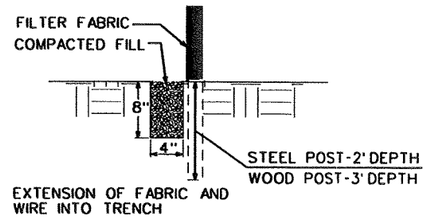
CROSS-SECTION A-A

NOTES:

1. STRUCTURAL STONE SHALL BE CLASS B STONE FOR EROSION CONTROL PURPOSES.
2. SEDIMENT CONTROL STONE SHALL BE NO. 5 OR NO. 57 STONE.

STONE OUTLET DETAIL





NOTES:

1. USE WIRE A MINIMUM OF 32 INCHES IN WIDTH AND WITH A MINIMUM OF 6 LINE WIRES WITH 12 INCH STAY SPACING.
2. USE FILTER FABRIC A MINIMUM OF 36 INCHES IN WIDTH AND FASTEN ADEQUATELY TO THE WIRE AS DIRECTED BY THE ENGINEER.
3. PROVIDE 5 FOOT STEEL POST OF THE SELF-FASTENER ANGLE STEEL TYPE.
4. USE 6 FOOT WOOD POST WITH 3 INCH DIAMETER.

NCDOT BMP'S FOR CONSTRUCTION AND MAINTENANCE ACTIVITIES, 5.1.1, AUGUST 2003

TEMPORARY SILT FENCE

NCDOT STD. DWG. 1605.01

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

EROSION CONTROL DETAILS

CAMP BRANCH

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

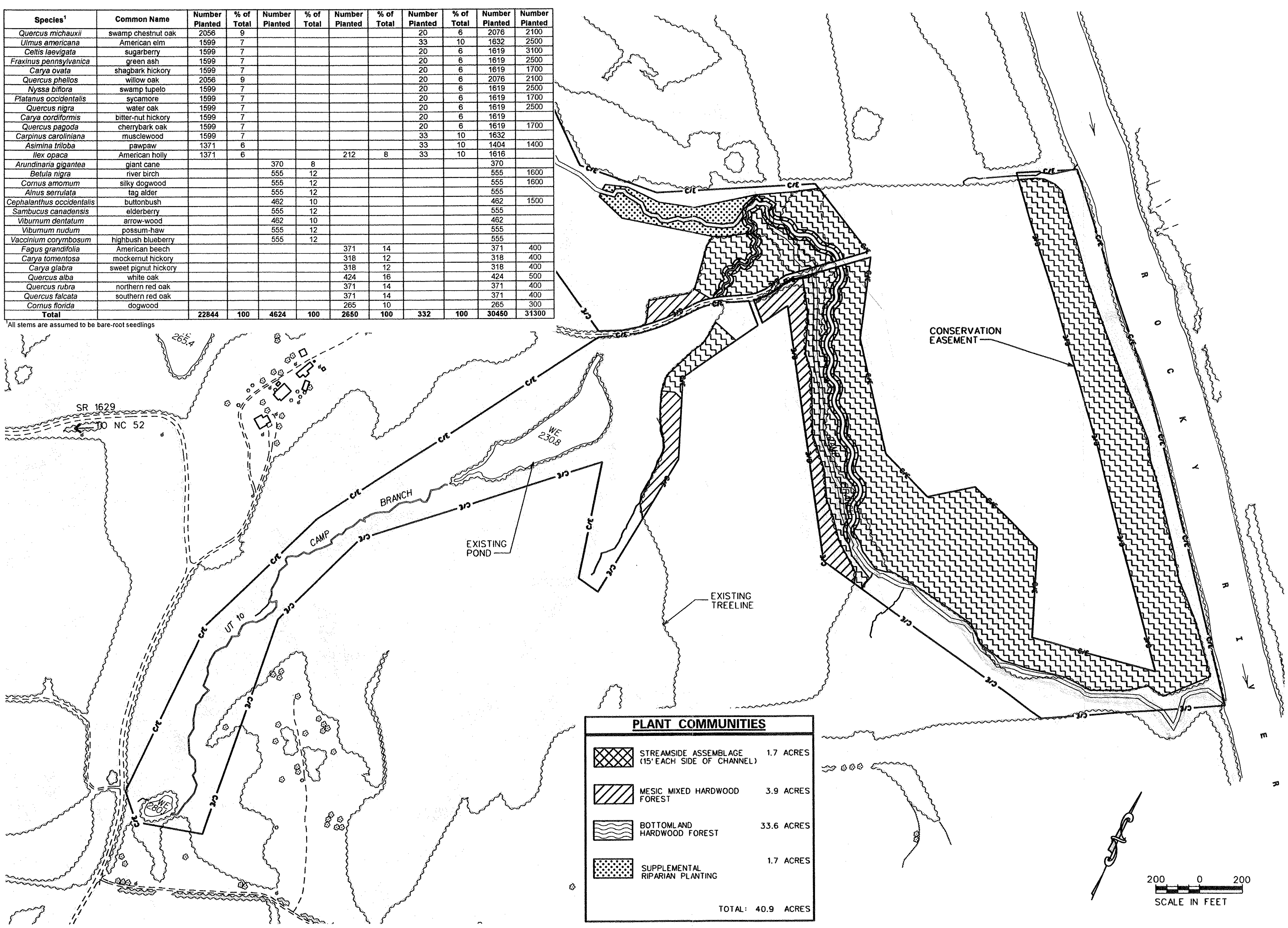
ESC Project No.: 04-212

SHEET

A-EC2

Species[1]	Common Name	Number Planted	% of Total	Number Planted	% of Total	Number Planted	% of Total	Number Planted	% of Total	Number Planted	Number Planted
Quercus michauxii	swamp chestnut oak	2056	9					20	6	2076	2100
Ulmus americana	American elm	1599	7					33	10	1632	2500
Celtis laevigata	sugarberry	1599	7					20	6	1619	3100
Fraxinus pennsylvanica	green ash	1599	7					20	6	1619	2500
Carya ovata	shagbark hickory	1599	7					20	6	1619	1700
Quercus phellos	willow oak	2056	9					20	6	2076	2100
Nyssa biflora	swamp tupelo	1599	7					20	6	1619	2500
Platanus occidentalis	sycamore	1599	7					20	6	1619	1700
Quercus nigra	water oak	1599	7					20	6	1619	2500
Carya cordiformis	bitter-nut hickory	1599	7					20	6	1619	
Quercus pagoda	cherrybark oak	1599	7					20	6	1619	1700
Carpinus caroliniana	musclewood	1599	7					33	10	1632	
Asimina triloba	pawpaw	1371	6					33	10	1404	1400
Ilex opaca	American holly	1371	6			212	8	33	10	1616	
Arundinaria gigantea	giant cane			370	8					370	
Betula nigra	river birch			555	12					555	1600
Cornus amomum	silky dogwood			555	12					555	1600
Alnus serrulata	tag alder			555	12					555	
Cephalanthus occidentalis	buttonbush			462	10					462	1500
Sambucus canadensis	elderberry			555	12					555	
Viburnum dentatum	arrow-wood			462	10					462	
Viburnum nudum	possum-haw			555	12					555	
Vaccinium corymbosum	highbush blueberry			555	12					555	
Fagus grandifolia	American beech					371	14			371	400
Carya tomentosa	mockernut hickory					318	12			318	400
Carya glabra	sweet pignut hickory					318	12			318	400
Quercus alba	white oak					424	16			424	500
Quercus rubra	northern red oak					371	14			371	400
Quercus falcata	southern red oak					371	14			371	400
Cornus florida	dogwood					265	10			265	300
Total		**22844**	**100**	**4624**	**100**	**2650**	**100**	**332**	**100**	**30450**	**31300**

[1]All stems are assumed to be bare-root seedlings



EcoScience Corporation
Raleigh, North Carolina

REVISIONS	
1	AS-BUILT - JULY 2007

Client: Ecosystem Enhancement Program

Project: BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title: PLANTING PLAN

CAMP BRANCH

Dsn. By: JDC	Dwn. By: MAF
Ckd. By: EBB	Date: JUL 2007
Scale: AS SHOWN	
ESC Project No.: 04-212	

SHEET

A-L1

Project #	04-212
Date	JUN 2005
Des. By:	MAF
Dwn. By:	JDC
Chd. By:	DGM
Scale	AS SHOWN

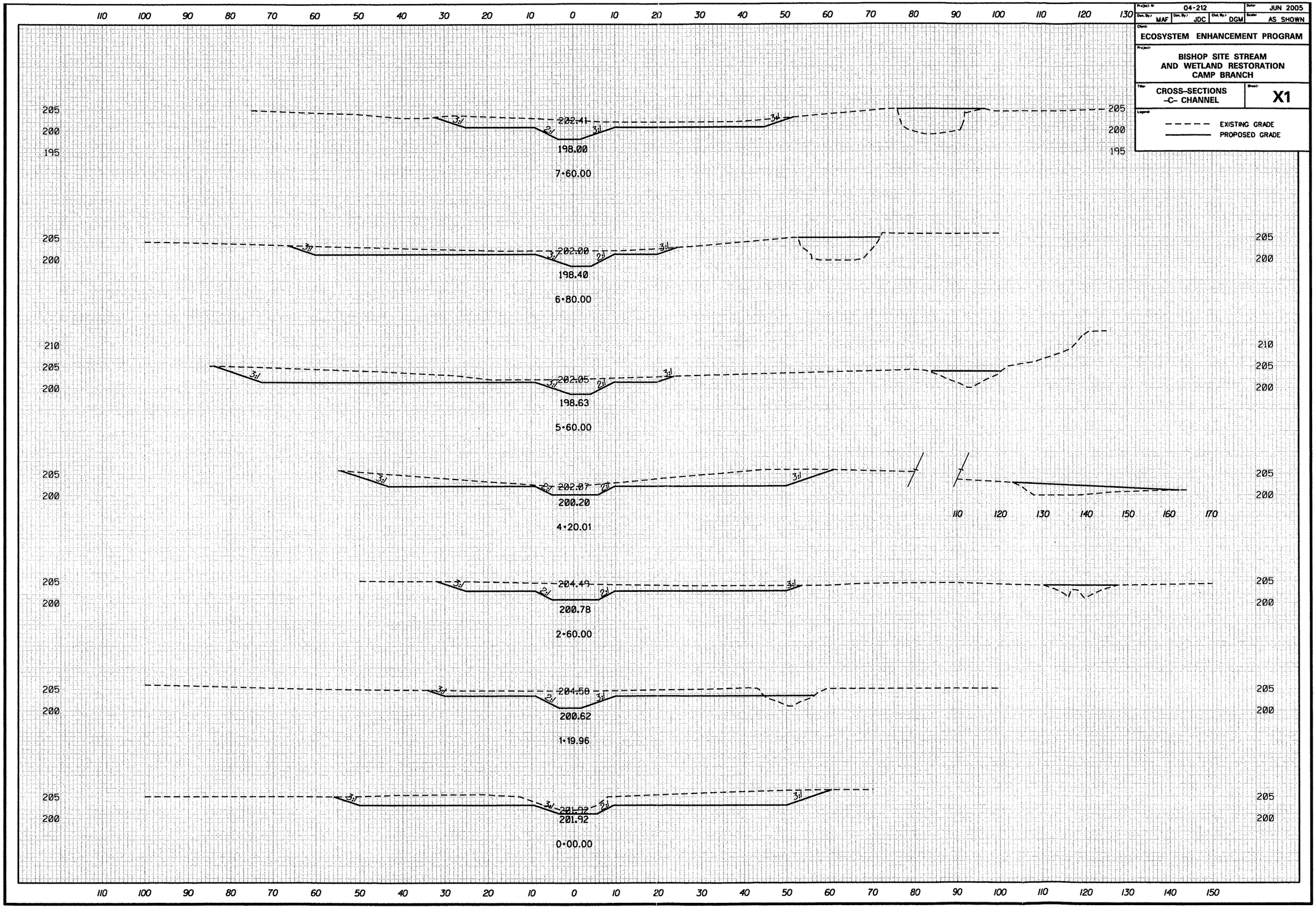
Client
ECOSYSTEM ENHANCEMENT PROGRAM

Project
BISHOP SITE STREAM
AND WETLAND RESTORATION
CAMP BRANCH

Title: CROSS-SECTIONS -C- CHANNEL

Sheet: X1

Legend
- - - - - EXISTING GRADE
——— PROPOSED GRADE



80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80

205
200
195

(±) 16+71

(±) 14+26

(±) 12+67

(±) 10+31

(±) 8+17

(±) 6+55

(±) 4+47

(±) 1+07

Project #	04-212			Date	JULY 2007
Des. By:	JFH	Dr. By:	JDC	Chd. By:	EBB	Scale	AS SHOWN

Client
ECOSYSTEM ENHANCEMENT PROGRAM

Project
BISHOP SITE STREAM
AND WETLAND RESTORATION
CAMP BRANCH

Title
CROSS-SECTIONS
-C- CHANNEL

Sheet
X1A

Legend
SURVEY AS-BUILT GRADE

The elevation data utilized in the Camp Branch As-Built Plans was developed by Barry D. Davis Surveying, 1503 Old Charlotte Rd., Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384

Project #	04-212
Date	JUN 2005
Des. By:	MAF
Dwn. By:	JDC
Chk. By:	DGM
Scale	AS SHOWN

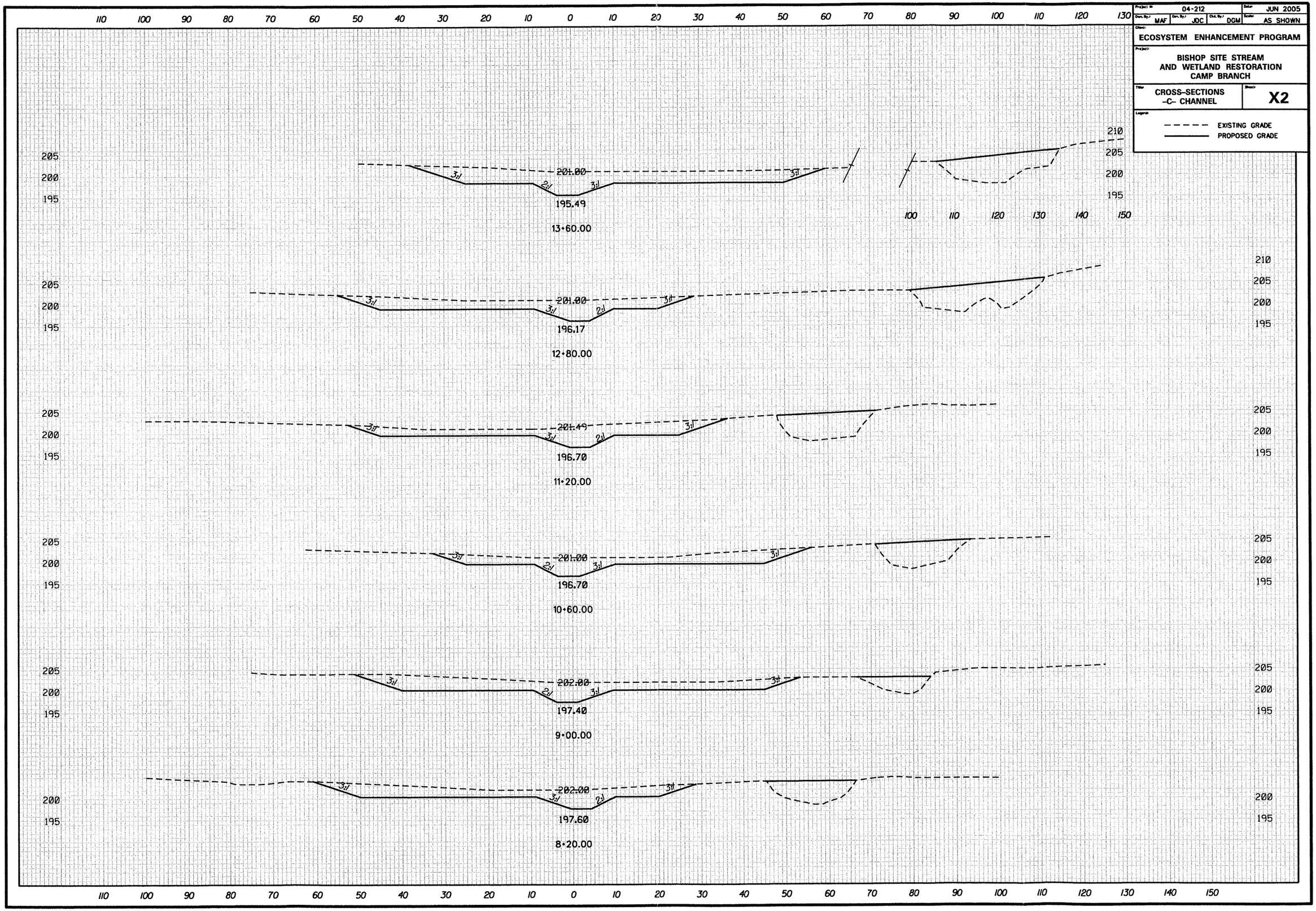
Client:
ECOSYSTEM ENHANCEMENT PROGRAM

Project:
BISHOP SITE STREAM
AND WETLAND RESTORATION
CAMP BRANCH

Title: CROSS-SECTIONS -C- CHANNEL

Sheet: X2

Legend:
- - - - - EXISTING GRADE
——— PROPOSED GRADE



Project #	04-212
Date	JUN 2005
Des. By:	MAF
Dwn. By:	JDC
Chd. By:	DGM
Scale	AS SHOWN

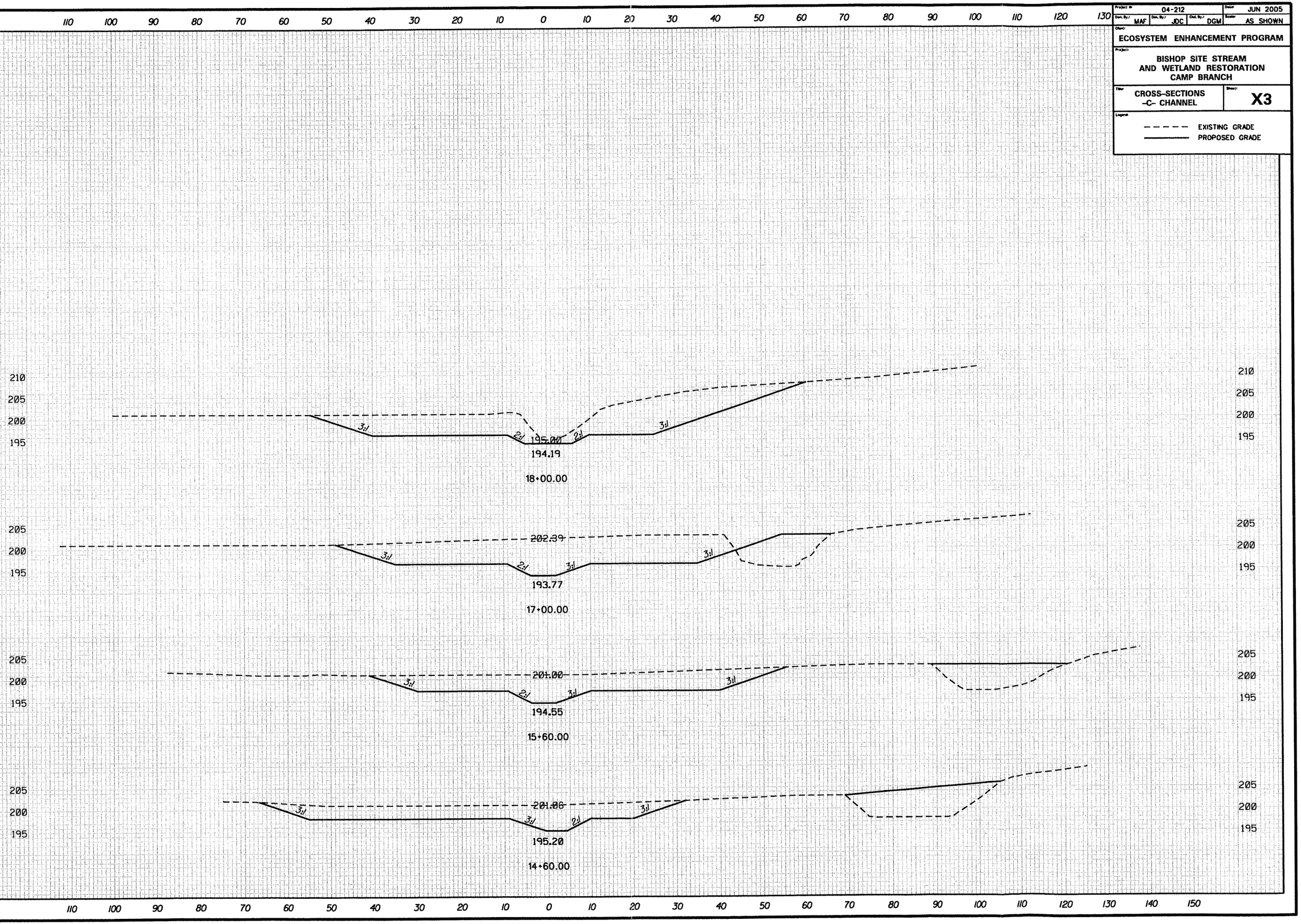
Client:
ECOSYSTEM ENHANCEMENT PROGRAM

Project:
BISHOP SITE STREAM
AND WETLAND RESTORATION
CAMP BRANCH

Title: CROSS-SECTIONS
-C- CHANNEL

Sheet: X3

Legend:
- - - - - EXISTING GRADE
——— PROPOSED GRADE



Project #	04-212
Date	JUN 2005
Des. By:	MAF
Dwn. By:	JDC
Chk. By:	DGM
Scale	AS SHOWN

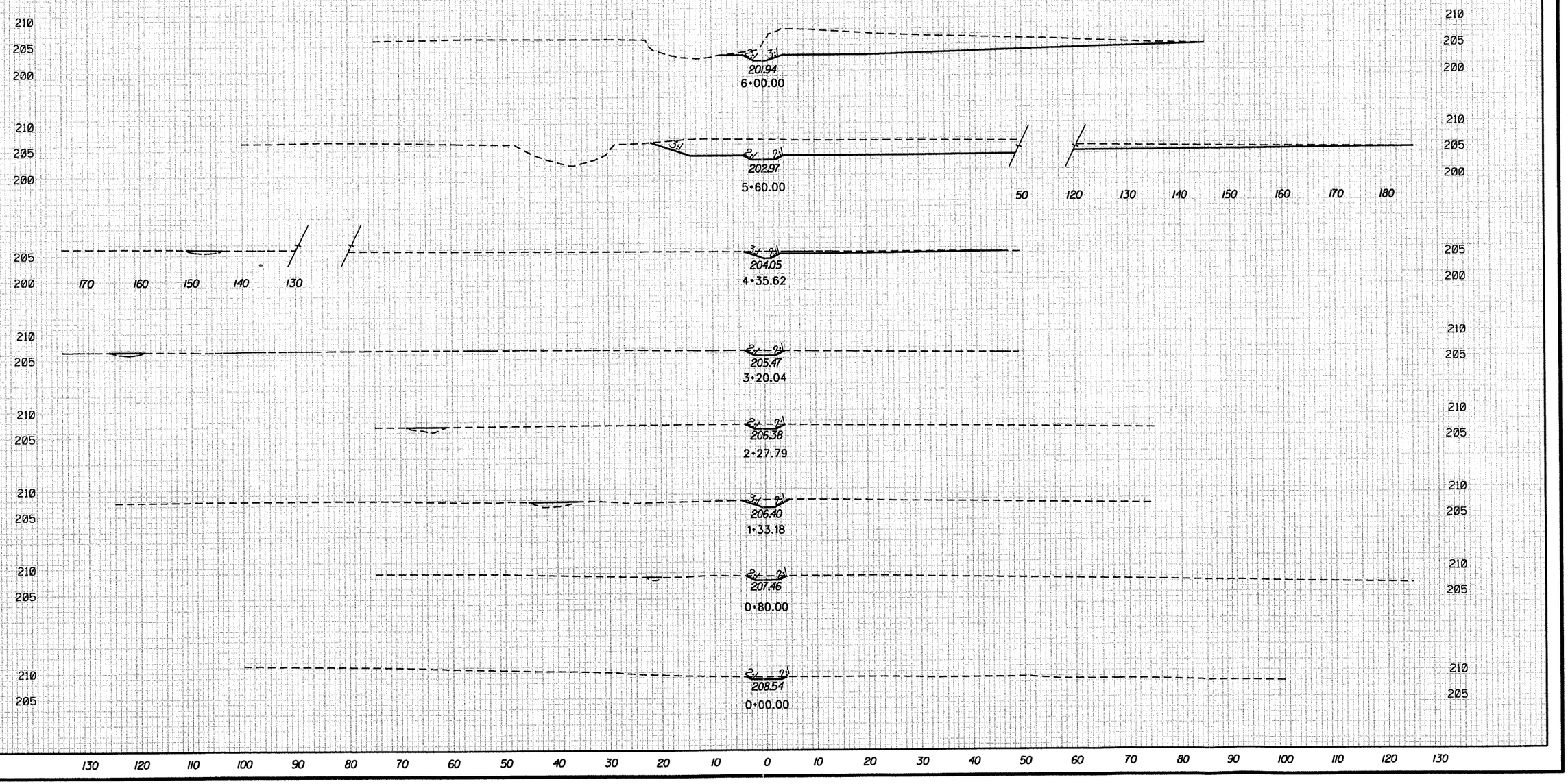
Client:
ECOSYSTEM ENHANCEMENT PROGRAM

Project:
BISHOP SITE STREAM
AND WETLAND RESTORATION
CAMP BRANCH

Title: CROSS-SECTIONS -A- CHANNEL

Sheet: X4

Legend:
- - - - - EXISTING GRADE
——— PROPOSED GRADE



Project #	04-212		Date: JULY 2007
Des. By: JFH	Dwn. By: JDC	Chd. By: EBB	Scale: AS SHOWN

Client:
ECOSYSTEM ENHANCEMENT PROGRAM

Project:
BISHOP SITE STREAM
AND WETLAND RESTORATION
CAMP BRANCH

Title: CROSS-SECTIONS
-A- CHANNEL

Sheet: X4A

Legend:
SURVEY AS-BUILT GRADE

70 60 50 40 30 20 10 0 10 20 30 40 50 60 70

205

200

(±) 4.71

205

200

The elevation data utilized in the Camp Branch As-Built Plans
was developed by Barry D. Davis Surveying, 1503 Old Charlotte Rd.,
Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384

70 60 50 40 30 20 10 0 10 20 30 40 50 60 70

PROJECT: BISHOP SITE STREAM AND WETLAND RESTORATION

CONSTRUCTION SEQUENCE

1. MOBILIZE EQUIPMENT AND MATERIALS TO DULA SITE.
2. ESTABLISH ACCESS ROADS AND STAGING AREAS AS DEPICTED ON THE PLANS OR AS DIRECTED BY THE PROJECT MANAGER AND MARK CONSTRUCTION EQUIPMENT ACCESS LOCATIONS WITH VISIBLE MARKERS. CONSTRUCTION EQUIPMENT SHALL BE MAINTAINED AND SERVICED WITHIN THE LIMITS OF THE ESTABLISHED STAGING AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL STAGING AREAS IN AN ENVIRONMENTALLY SENSITIVE MANNER.
3. INSTALL IMPROVEMENTS TO SITE ACCESS ROAD IF REQUIRED AND INSTALL TEMPORARY EROSION CONTROL MEASURES (I.E., SILT FENCE, STONE OUTLETS, ETC.) AS REQUIRED.
4. AT THE END OF EACH DAY OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE TEMPORARY SEED AND MULCH AND APPLY COIR FIBER MATTING, AS APPROPRIATE, TO ALL DISTURBED AREAS. IN ADDITION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL TEMPORARY EROSION CONTROL MEASURES ON A DAILY BASIS THROUGHOUT THE CONSTRUCTION PERIOD.
5. INSTALL PUMP-AROUND OPERATION JUST BELOW THE CONFLUENCE OF THE WEST PORTION OF DULA THOROUGHFARE (-D-) WITH THE EASTERN PORTION (-T-). ALL WORK BELOW THIS POINT SHALL BE CONSTRUCTED IN THE "DRY". THIS INCLUDES THE FLOODPLAIN GRADING, THE DEVELOPMENT OF THE VERNAL POOLS AND THE EXCAVATION OF THE PROPOSED CHANNEL. THE CONTRACTOR SHALL INITIATE THE PUMP-AROUND OPERATION ON A SCHEDULE THAT EFFICIENTLY PROSECUTES PROJECT WORK.
6. THE CONTRACTOR SHALL COMPACT THE PROPOSED FILL IN THE FILLED CHANNELS TO 90 PERCENT PROCTOR. THE PROPOSED CHANNEL BLOCKS SHALL HAVE A CORE OF IMPERVIOUS SELECT MATERIAL AS SPECIFIED IN THE PROJECT DETAIL AND SPECIAL PROVISIONS. THE VERNAL POOL AT APPROXIMATE STATION 19+00 SHALL BE "NOTCHED" TO DIRECT OVERFLOW TOWARD THE NEW CHANNEL
7. INSTALL PUMP-AROUND OPERATIONS ABOVE STATION 0+00 ON THE WESTERN PORTION OF DULA THOROUGHFARE (-D-) AND ABOVE STATION 0+00 AT CULVERT AT THE BEGINNING OF THE EASTERN SECTION (-T-). THESE PUMP-AROUNDS MAY DIRECT PROPERLY TREATED WATER TO THE NEWLY CREATED STABILIZED CHANNEL AND THE PROPOSED WORK SHALL BE CONSTRUCTED IN THE "DRY".
8. THE CONTRACTOR SHALL PLACE BORROW MATERIAL IN AREAS DESIGNATED ON THE PLANS AND AT THE DIRECTION OF THE PROJECT MANAGER. STOCKPILE AREAS SHALL BE PROTECTED BY SILT FENCING AS APPROPRIATE.
9. ONCE CONSTRUCTION IS COMPLETE THE CONTRACTOR SHALL REMOVE ALL CONSTRUCTION MATERIALS FROM THE CONSERVATION EASEMENT, DISPOSE OF THEM IN AN APPROVED DUMP SITE, AND SCARIFY ANY COMPACTED AREAS AS DIRECTED BY THE PROJECT MANAGER. TO COMPLETE PERMANENT SEEDING AND MULCHING, ALL DISTURBED AREAS SHALL BE DISKED OR PLOWED TO CREATE MICRO TOPOGRAPHY TO THE SATISFACTION OF THE PROJECT MANAGER AND PERMANENTLY SEEDED AND MULCHED. STONE APPLIED TO ACCESS ROAD, IF ANY, SHALL REMAIN OR BE REMOVED AS INDICATED ON PLAN SHEET 2.

INDEX OF SHEETS

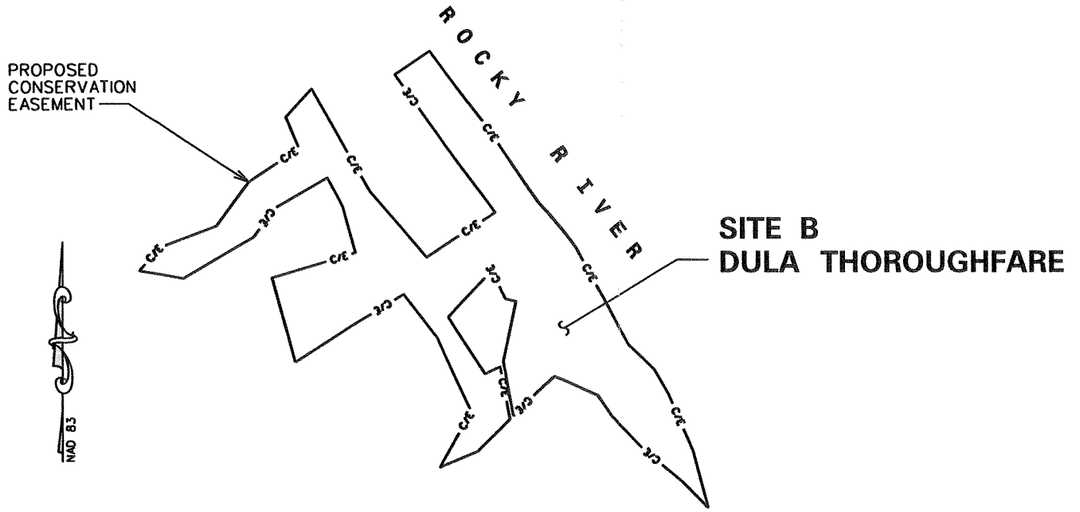
DULA THOROUGHFARE

B: CONSTRUCTION SEQUENCE
B-1: RADIUS TABLE / SHEAR STRESS TABLE
B-2: TYPICAL SECTIONS / GENERAL DETAILS
B-2A, B-2B: GENERAL DETAILS
B-2C: NEW CHANNEL CENTERLINE DATA
B-3: SUMMARY OF QUANTITIES / SUMMARY OF EARTHWORK
B-4: EXISTING CONDITIONS
B-5: NEW CHANNEL LAYOUT
B-6: SITE PLAN
B-7: PROFILE – DULA THOROUGHFARE –T– CHANNEL
B-7A: AS-BUILT PROFILE – DULA THOROUGHFARE –T– CHANNEL
B-8: PROFILE – DULA THOROUGHFARE –D– CHANNEL
B-8A: AS BUILT PROFILE – DULA THOROUGHFARE –D– CHANNEL
B-EC1: EROSION CONTROL PLAN
B-EC2: EROSION CONTROL DETAILS
B-L1: PLANTING PLAN
X5-X7: CROSS-SECTIONS
X5A-X7A: AS-BUILT CROSS-SECTIONS

SITE B
DULA
THOROUGHFARE

TYPE OF WORK: ***STREAM AND WETLAND RESTORATION / ENHANCEMENT***

- STREAM RESTORATION / ENHANCEMENT
- WETLAND RESTORATION / ENHANCEMENT
- FLOODPLAIN GRADING
- NEW CHANNEL CONSTRUCTION
- SITE PLANTING



Prepared in the office of:

EcoScience Corporation
1101 Haynes St., Suite 101 Ph: 919 828-3433
Raleigh, North Carolina 27604 Fax: 919 828-3518

ENGINEER: DAVID G. MODLIN

PROJECT MANAGER: JAMES D. COOPER

SEAL:

NORTH CAROLINA PROFESSIONAL SEAL 026051 ENGINEER DAVID G. MODLIN

22Oct07

Prepared for:

Ecosystem Enhancement PROGRAM

ECOSYSTEM ENHANCEMENT PROGRAM
Raleigh, North Carolina

No.	Revisions	Date
1	REV'D SHEETS B-2B, B-3	09/29/05 JDG
2	AS-BUILT	JUL 2007

Dsn. By:	Dwn. By:	Ckd. By:
JDC	JDG	EBB

Date: JUL 2007

ESC Project No: 04-212

SHEET

B

CURVE RADIUS TABLE

CURVE ID	NORTHING	EASTING	RADIUS OF CURVATURE (FT.)
D1	511701.2133	1674842.6507	30.00
D2	511723.9248	1674898.4724	30.00
D3	511776.8248	1674882.3079	25.00
D4	511792.4309	1674935.0515	30.00
D5	511837.8210	1674960.9682	20.00
D6	511862.4778	1675005.2406	30.00
D7	511907.9580	1675063.9353	35.00
D8	511902.4409	1675130.2828	25.00
D9	511953.2149	1675156.0843	30.00
D10	511941.9471	1675225.8063	40.00
D11	512008.4578	1675254.0567	25.00
D12	511983.7727	1675310.2663	35.00
T1	512318.5653	1675164.6548	40.00
T2	512291.7653	1675219.4537	20.00
T3	512253.6505	1675207.3186	20.00
T4	512239.8899	1675255.6814	30.00
T5	512180.7288	1675244.6142	30.00
T6	512163.5826	1675355.0795	80.00
T7	512058.4660	1675320.6382	29.00
T8	512017.2264	1675381.2954	40.00
T9	511947.8574	1675392.2492	30.00
T10	511931.0049	1675457.8222	30.00
T11	511856.3837	1675428.4163	50.00
T12	511840.8237	1675512.0724	35.00
T13	511757.5694	1675556.0557	50.00
T14	511658.3154	1675614.2386	45.00
T15	511564.1474	1675601.0327	50.00
T16	511568.5737	1675711.0115	60.00
T17	511510.7953	1675656.3041	19.57
T18	511485.2761	1675710.1305	40.00
T19	511419.5770	1675664.4838	40.00
T20	511395.5051	1675730.7029	30.00
T21	511426.5711	1675742.1843	60.00
T22	511349.2322	1675788.7683	30.00
T23	511357.8615	1675795.0251	20.00
T24	511362.8636	1675854.9586	40.00
T25	511273.2071	1675837.2276	50.00
T26	511257.0528	1675926.1340	40.00
T27	511163.0873	1675940.9706	50.00
T28	511154.1092	1676010.4440	20.00
T29	511100.3818	1676003.0692	30.00
T30	511095.4024	1676057.8437	25.00
T31	511011.9360	1676041.7702	60.00
T32	510947.2153	1676145.2711	60.00

CURVE ID D1-D12 = DULA THOROUGHFARE -D- CHANNEL
CURVE ID T1-T32 = DULA THOROUGHFARE -T- CHANNEL

FLOODPLAIN ELEVATION TABLE -T- CHANNEL

Station	Proposed Floodplain Elevation
0+00	202.2
1+50	202.0
2+75	201.9
3+60	201.8
4+50	201.8
5+75	201.6
6+90	201.5
8+25	201.3
9+75	201.1
11+25	201.0
12+00	200.9
13+00	200.9
15+00	200.7
16+75	200.4
18+15	200.2
20+00	200.0
20+56	200.0

FLOODPLAIN ELEVATION TABLE -D- CHANNEL

Station	Proposed Floodplain Elevation
0+00	206.1
1+10	205.4
2+25	204.7
3+90	203.8
5+10	203.0
6+30	202.4
7+34	201.8

SHEAR STRESS TABLE

Flows in CFS				
Dula Thoroughfare		Upper	Lower	
1-Yr. Event		20	22	
2-Yr. Event		31	34	
10-Yr. Event		82	90	

Shear Stress in LB/SQ.FT.				
Proposed	Station	Left OB	Channel	Right OB
Upper Dula (WEST)				
1-Yr, Event	0+00	0.13	0.32	0.11
2-Yr. Event	0+00	0.16	0.37	0.14
10-Yr. Event	0+00	0.23	0.48	0.20
1-Yr. Event	7+00	0.03	0.08	0.03
2-Yr. Event	7+00	0.08	0.21	0.07
10-Yr. Event	7+00	0.21	0.42	0.21
Lower Dula (EAST)				
1-Yr. Event	7+00	0.02	0.07	0.02
2-Yr. Event	7+00	0.04	0.09	0.03
10-Yr. Event	7+00	0.10	0.17	0.08

NOTE:

MORPHOLOGICAL TABLE AND RIFFLE TABLE NOT APPLICABLE
TO PROPOSED DULA THOROUGHFARE RESTORATION/ENHANCEMENT.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN
ANSON COUNTY, NORTH CAROLINA

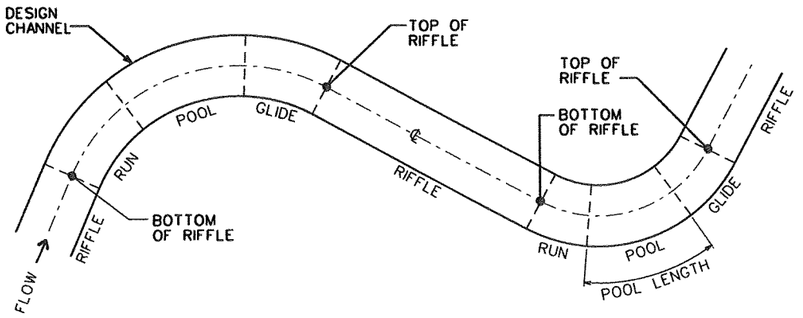
Title:
RADIUS TABLE / SHEAR STRESS TABLE
DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

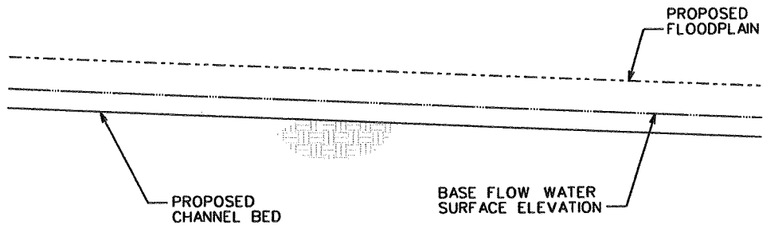
Scale: NO SCALE

ESC Project No.: 04-212

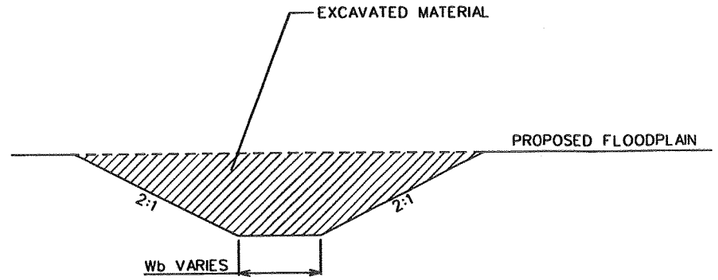
SHEET
B-1



TYPICAL CHANNEL PLAN VIEW

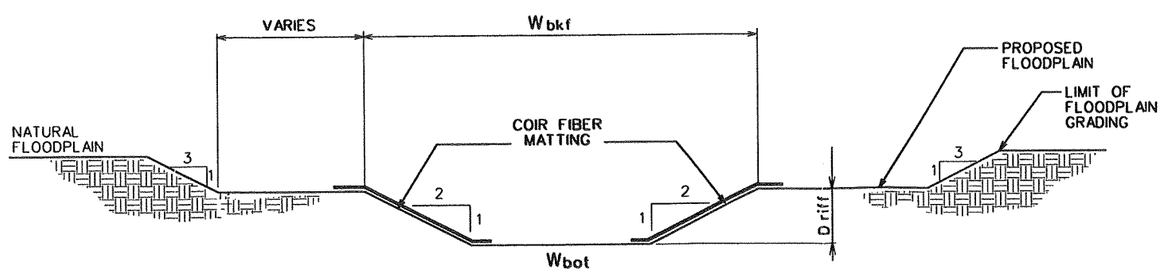


TYPICAL CHANNEL PROFILE



TYPICAL VERNAL POOL

CROSS-SECTION DIMENSIONS							
REACH	Wbkf (FT.)	Wbot (FT.) RIFFLE	Driff (FT.)	Wpool (FT.)	Wbot (FT.) POOL	Dpool (FT.)	WIDTH/DEPTH RATIO
DULA THOROUGHFARE	6.0	2.0	1.0	N/A	N/A	N/A	9.0



TYPICAL CROSS-SECTION

NOTE: USE 6.5-FOOT COIR FIBER EACH SIDE.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

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BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

TYPICAL SECTIONS / GENERAL DETAILS

DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
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DGM	JUN 2005

Scale: NO SCALE

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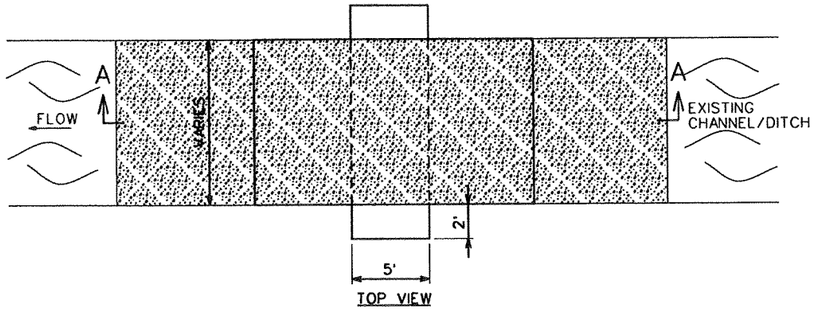
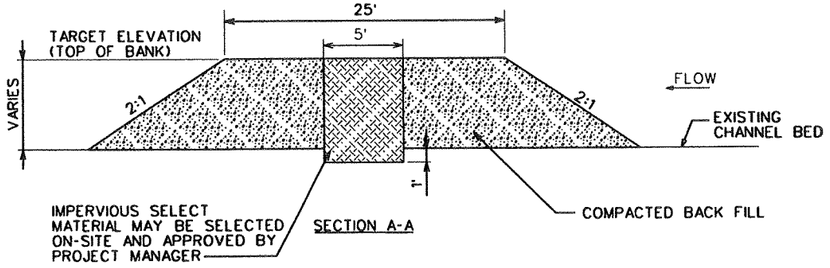
B-2

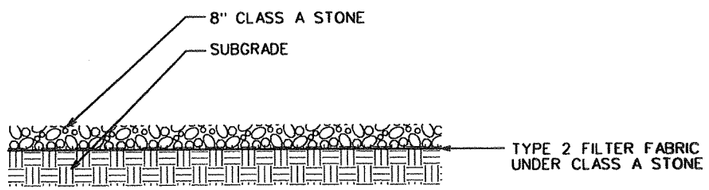




IMPERVIOUS CHANNEL BLOCK
DULA THOROUGHFARE

NOTE:

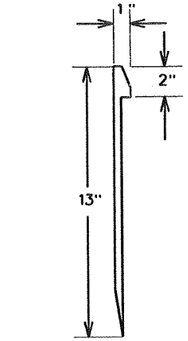
1. CHANNEL PLUG WILL BE INITIALLY FILLED WITH AVAILABLE WASTE AND COMPACTED TO NINETY-FIVE PERCENT STANDARD PROCTOR.
2. THEN A CENTRAL PORTION 5 FEET LONG WILL BE REMOVED AND REPLACED WITH IMPERVIOUS SELECT MATERIAL.
3. THE IMPERVIOUS SELECT MATERIAL WILL BE KEYED INTO THE ORIGINAL BANK A MINIMUM OF 2 FEET AND INTO THE ORIGINAL BED A MINIMUM OF 1 FEET.

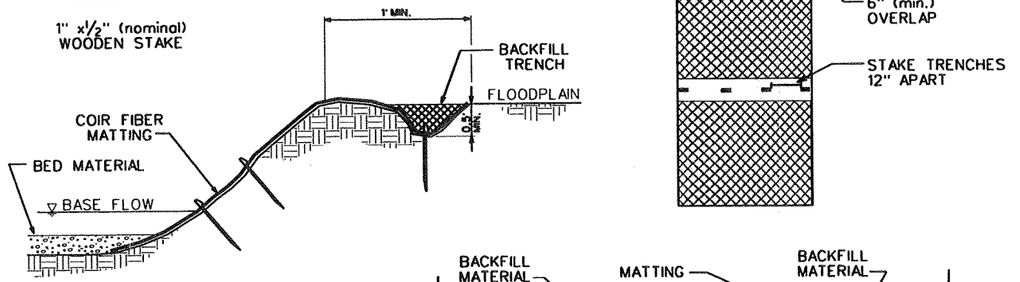


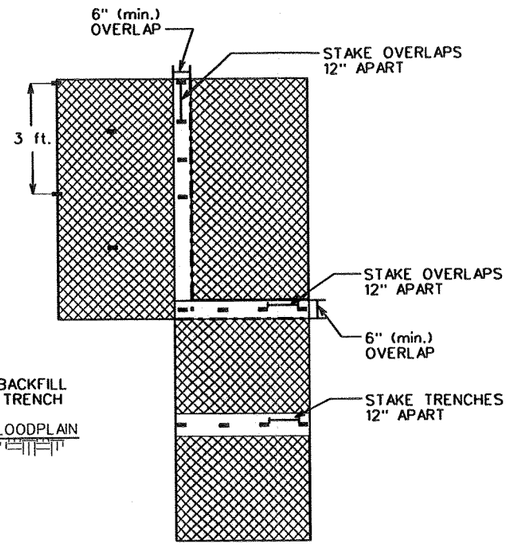
NOTES:

1. THIS IS THE MINIMUM ACCEPTABLE SECTION.

ACCESS ROAD SECTION DETAIL
SUGGESTED OR EQUIVALENT







COIR FIBER MATTING DETAIL

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

GENERAL DETAILS

DULA THOROUGHFARE

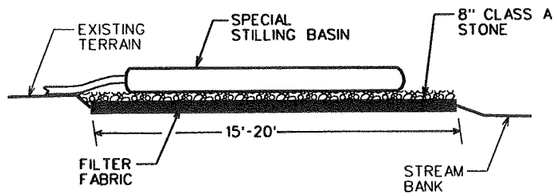
Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET

B-2A



⚠1 NOTE:

1. WHEN PUMPING CLEAN WATER, THE CONTRACTOR MAY PROVIDE A STABILIZED OUTLET BY OMITTING THE SPECIAL STILLING BASIN AND PROVIDING THE ROCK PAD AS SHOWN WITH MINIMUM DIMENSIONS 10 FEET WIDE BY 15 FEET LONG.

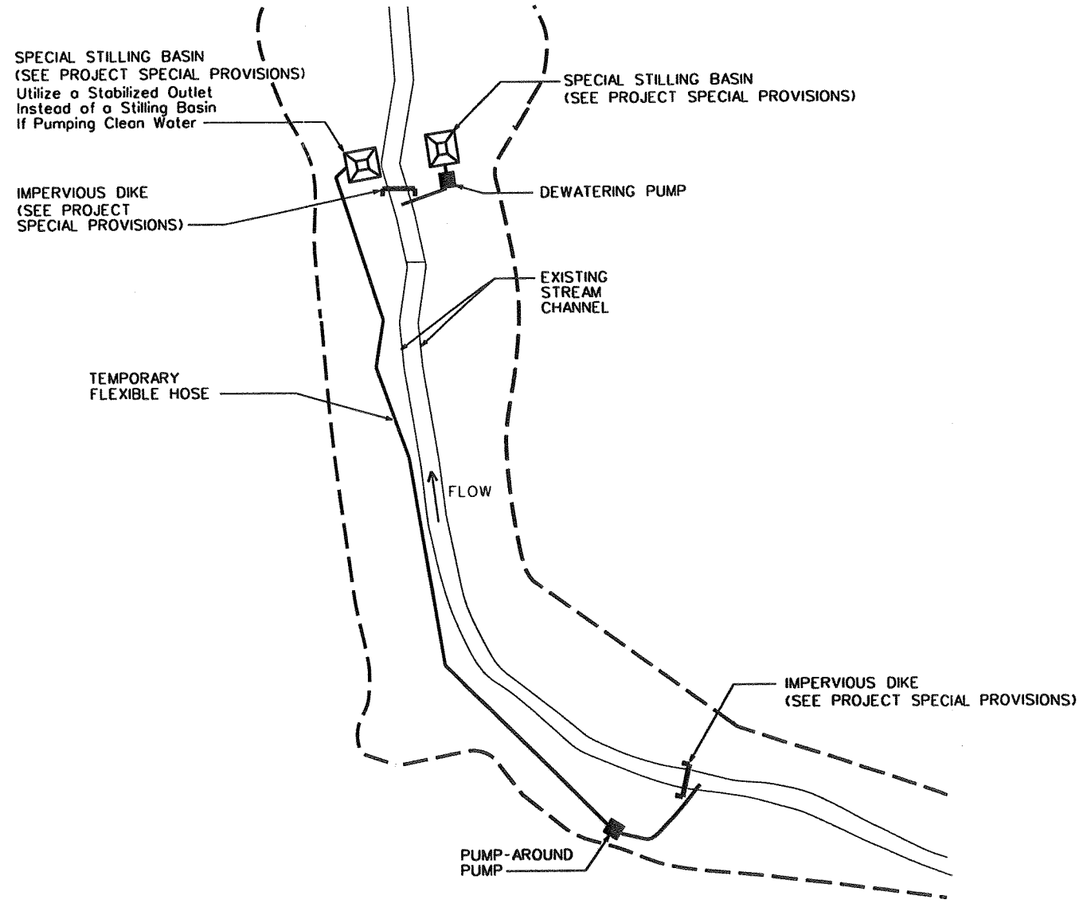
SPECIAL STILLING BASIN WITH ROCK PAD

NOTES:

1. ALL EXCAVATION SHALL BE PERFORMED IN ONLY DRY OR ISOLATED SECTIONS OF CHANNEL.
2. IMPERVIOUS DIKES ARE TO BE USED TO ISOLATE WORK FROM STREAM FLOW WHEN NECESSARY.
3. ALL GRADED AREAS SHALL BE STABILIZED WITHIN 24 HOURS.
4. MAINTENANCE OF STREAM FLOW OPERATIONS SHALL BE INCIDENTAL TO THE WORK. THIS INCLUDES POLYETHYLENE SHEETING, DIVERSION PIPES, PUMPS AND HOSES.
5. PUMPS AND HOSES SHALL BE OF SUFFICICIENT SIZE TO DEWATER THE WORK AREA.

SEQUENCE OF CONSTRUCTION FOR TYPICAL WORK AREA

1. INSTALL SPECIAL STILLING BASIN(S).
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA. AREA TO BE DEWATERED SHALL BE EQUAL TO ONE DAY'S WORK.
5. PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE. (DOWNSTREAM IMPERVIOUS DIKES FIRST).
7. ALL GRADING AND STABILIZATION MUST BE COMPLETED AT THE END OF EACHDAY WITHIN THE PUMP AROUND AREAS BETWEEN THE IMPERVIOUS DIKES. THE IMPERVIOUS DIKE LOCATIONS AS SHOWN ON THIS SHEET ONLY SHOW THE UPPER AND LOWER EXTENT OF WORK FOR EACH STREAM SEGMENT. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF THE IMPERVIOUS DIKE(S) FOR EACH DAY'S WORK.
8. REMOVE SPECIAL STILLING BASIN(S) AND BACKFILL. STABILIZE DISTURBED AREA WITH SEED AND MULCH.



TYPICAL PUMP-AROUND OPERATION

EcoScience Corporation
Raleigh, North Carolina

REVISIONS
⚠1 LAND QUALITY COMMENTS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

GENERAL DETAILS

DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET **B-2B**

-D- CHANNEL CURVE DATA

1

Curve DT 2-1
P.I. Sta. 0+22.59
D = 38° 04' 42.88" (LT)
T = 10.3528
L = 19.9379
R = 30.0000
P.C. Sta. 0+12.24
P.T. Sta. 0+32.17
Back = N 21° 18' 50.99" E
Ahead = N 16° 45' 51.89" W

2

Curve DT 2-2
P.I. Sta. 0+64.67
D = 83° 39' 34.80" (RT)
T = 26.8512
L = 43.8041
R = 30.0000
P.C. Sta. 0+37.82
P.T. Sta. 0+81.62
Back = N 16° 45' 51.89" W
Ahead = N 66° 53' 42.91" E

3

Curve DT 2-3
P.I. Sta. 1+09.51
D = 82° 41' 23.77" (LT)
T = 21.9978
L = 36.0803
R = 25.0000
P.C. Sta. 0+87.51
P.T. Sta. 1+23.60
Back = N 66° 53' 42.91" E
Ahead = N 15° 47' 40.86" W

4

Curve DT 2-4
P.I. Sta. 1+74.76
D = 118° 34' 47.32" (RT)
T = 50.5055
L = 62.0882
R = 30.0000
P.C. Sta. 1+24.26
P.T. Sta. 1+86.34
Back = N 15° 47' 40.86" W
Ahead = S 77° 12' 53.54" E

5

Curve DT 2-5
P.I. Sta. 2+38.05
D = 122° 32' 04.65" (LT)
T = 36.4813
L = 42.7727
R = 20.0000
P.C. Sta. 2+01.57
P.T. Sta. 2+44.35
Back = S 77° 12' 53.54" E
Ahead = N 19° 44' 58.19" W

6

Curve DT 2-6
P.I. Sta. 3+21.70
D = 133° 04' 09.64" (RT)
T = 69.1096
L = 69.6749
R = 30.0000
P.C. Sta. 2+52.59
P.T. Sta. 3+22.27
Back = N 19° 44' 58.19" W
Ahead = S 66° 40' 48.55" E

7

Curve DT 2-7
P.I. Sta. 3+89.07
D = 82° 53' 06.45" (LT)
T = 30.9029
L = 50.6316
R = 35.0000
P.C. Sta. 3+58.16
P.T. Sta. 4+08.79
Back = S 66° 40' 48.55" E
Ahead = N 30° 26' 04.99" E

8

Curve DT 2-8
P.I. Sta. 4+55.63
D = 71° 27' 09.20" (RT)
T = 17.9817
L = 31.1771
R = 25.0000
P.C. Sta. 4+37.65
P.T. Sta. 4+68.82
Back = N 30° 26' 04.99" E
Ahead = S 78° 06' 45.80" E

9

Curve DT 2-9
P.I. Sta. 5+11.14
D = 85° 04' 08.82" (LT)
T = 27.5232
L = 44.5421
R = 30.0000
P.C. Sta. 4+83.61
P.T. Sta. 5+28.16
Back = S 78° 06' 45.80" E
Ahead = N 16° 49' 05.37" E

10

Curve DT 2-10
P.I. Sta. 5+65.70
D= 70° 17' 19.26" (RT)
T= 28.1587
L= 49.0708
R= 40.0000
P.C. Sta. 5+37.54
P.T. Sta. 5+86.61
Back = N 16° 49' 05.37" E
Ahead = N 87° 06' 24.63" E

11

Curve DT 2-11
P.I. Sta. 6+30.16
D = 51° 10' 36.51" (LT)
T = 11.9718
L = 22.3301
R = 25.0000
P.C. Sta. 6+18.18
P.T. Sta. 6+40.51
Back = N 87° 06' 24.63" E
Ahead = N 35° 55' 48.12" E

12

Curve DT 2-12
P.I. Sta. 6+96.46
Delta = 101° 38' 45.90" (RT)
T = 42.9495
L = 62.0921
R = 35.0000
P.C. Sta. 6+53.51
P.T. Sta. 7+15.60
Back = N 35° 55' 48.12" E
Ahead = S 42° 25' 25.97" E

PI Sta.= center of pool

D= deflection angle (Δ) between tangent lines T2 and T measured along direction of travel

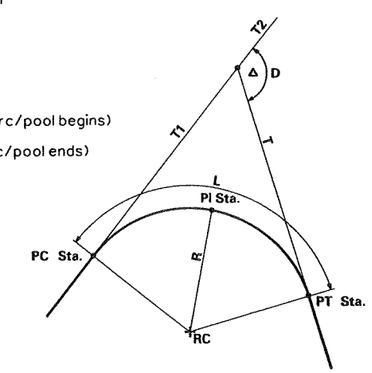
L= arc/pool length

T/T1= tangent length

R= radius of curvature

PC Sta.= point of curvature (where arc/pool begins)

PT Sta.= point of terminus (where arc/pool ends)



NOTE:
FOR NEW CHANNEL LAYOUT, SEE SHEET B-5.

-T- CHANNEL CURVE DATA 1

1

Curve DTT-1
P.I. Sta. 0+45.66
D = 49° 04' 31.92" (RT)
T = 18.2609
L = 34.2612
R = 40.0000
P.C. Sta. 0+27.40
P.T. Sta. 0+61.66
Back = S 33° 24' 34.00" E
Ahead = S 15° 39' 57.91" W

2

Curve DTT-2
P.I. Sta. 0+91.98
D = 88° 00' 20.03" (LT)
T = 19.3157
L = 30.7197
R = 20.0000
P.C. Sta. 0+72.66
P.T. Sta. 1+03.38
Back = S 15° 39' 57.91" W
Ahead = S 72° 20' 22.11" E

3

Curve DTT-3
P.I. Sta. 1+20.81
D = 82° 08' 49.25" (RT)
T = 17.4308
L = 28.6747
R = 20.0000
P.C. Sta. 1+03.38
P.T. Sta. 1+32.06
Back = S 72° 20' 22.11" E
Ahead = S 9° 48' 27.13" W

4

Curve DTT-4
P.I. Sta. 1+64.72
D = 84° 41' 19.74" (LT)
T = 27.3404
L = 44.3430
R = 30.0000
P.C. Sta. 1+37.38
P.T. Sta. 1+81.72
Back = S 9° 48' 27.13" W
Ahead = S 74° 52' 52.61" E

5

Curve DTT-5
P.I. Sta. 2+08.85
D = 73° 26' 33.84" (RT)
T = 22.3787
L = 38.4545
R = 30.0000
P.C. Sta. 1+86.47
P.T. Sta. 2+24.92
Back = S 74° 52' 52.61" E
Ahead = S 1° 26' 18.77" E

6

Curve DTT-6
P.I. Sta. 2+91.60
D = 60° 37' 01.59" (LT)
T = 46.7642
L = 84.6375
R = 80.0000
P.C. Sta. 2+44.84
P.T. Sta. 3+29.47
Back = S 1° 26' 18.77" E
Ahead = S 62° 03' 20.36" E

7

Curve DTT-7
P.I. Sta. 3+71.14
D = 76° 26' 18.83" (RT)
T = 22.8366
L = 38.6890
R = 29.0000
P.C. Sta. 3+48.31
P.T. Sta. 3+87.00
Back = S 62° 03' 20.36" E
Ahead = S 14° 22' 58.47" W

8

Curve DTT-8
P.I. Sta. 4+67.68
D = 108° 44' 00.32" (LT)
T= 55.8029
L= 75.9102
R= 40.0000
P.C. Sta. 4+11.88
P.T. Sta. 4+87.79
Back = S 14° 22' 58.47" W
Ahead = N 85° 38' 58.16" E

9

Curve DTT-9
P.I. Sta. 5+19.14
D = 81° 09' 53.09" (RT)
T = 25.6971
L = 42.4978
R = 30.0000
P.C. Sta. 4+93.45
P.T. Sta. 5+35.94
Back = N 85° 38' 58.16" E
Ahead = S 13° 11' 08.75" E

10

Curve DTT-10
P.I. Sta. 5+81.68
D = 51° 11' 49.74" (LT)
T = 14.3727
L = 26.8068
R = 30.0000
P.C. Sta. 5+67.31
P.T. Sta. 5+94.12
Back = S 13° 11' 08.75" E
Ahead = S 64° 22' 58.49" E

11

Curve DTT-11
P.I. Sta. 6+36.37
D = 72° 16' 17.94" (RT)
T = 36.5085
L = 63.0689
R = 50.0000
P.C. Sta. 5+99.86
P.T. Sta. 6+62.93
Back = S 64° 22' 58.49" E
Ahead = S 7° 53' 19.45" W

12

Curve DTT-12
P.I. Sta. 7+08.77
D = 100° 15' 21.66" (LT)
T = 41.9011
L = 61.2429
R = 35.0000
P.C. Sta. 6+66.86
P.T. Sta. 7+28.11
Back = S 7° 53' 19.45" W
Ahead = N 87° 37' 57.78" E

13

Curve DTT-13
P.I. Sta. 8+51.26
D = 117° 39' 01.51" (RT)
T = 82.6419
L = 102.6694
R = 50.0000
P.C. Sta. 7+68.61
P.T. Sta. 8+71.28
Back = N 87° 37' 57.78" E
Ahead = S 25° 16' 59.29" W

14

Curve DTT-14
P.I. Sta. 9+94.63
D = 104° 48' 54.61" (LT)
T = 58.4497
L = 82.3216
R = 45.0000
P.C. Sta. 9+36.18
P.T. Sta. 10+18.50
Back = S 25° 16' 59.29" W
Ahead = S 79° 31' 55.31" E

15

Curve DTT-15
P.I. Sta. 10+61.14
D = 75° 12' 56.06" (RT)
T = 38.5160
L = 65.6380
R = 50.0000
P.C. Sta. 10+22.63
P.T. Sta. 10+88.26
Back = S 79° 31' 55.31" E
Ahead = S 4° 18' 59.26" E

16

Curve DTT-16
P.I. Sta. 11+15.44
D = 42° 28' 21.10" (LT)
T = 23.3162
L = 44.4771
R = 60.0000
P.C. Sta. 10+92.13
P.T. Sta. 11+36.60
Back = S 4° 18' 59.26" E
Ahead = S 46° 47' 20.35" E

17

Curve DTT-17
P.I. Sta. 11+50.79
D = 71° 51' 14.23" (RT)
T = 14.1811
L = 24.5438
R = 19.5710
P.C. Sta. 11+36.60
P.T. Sta. 11+61.15
Back = S 45° 52' 25.19" E
Ahead = S 25° 58' 49.04" W

18

Curve DTT-18
P.I. Sta. 11+94.88
D = 80° 16' 26.64" (LT)
T= 33.7273
L= 56.0419
R= 40.0000
P.C. Sta. 11+61.15
P.T. Sta. 12+17.19
Back = S 25° 03' 53.87" W
Ahead = S 55° 12' 32.76" E

19

Curve DTT-19
P.I. Sta. 12+44.5
D = 68° 38' 43.06" (RT)
T = 27.3093
L = 47.9234
R = 40.0000
P.C. Sta. 12+17.19
P.T. Sta. 12+65.11
Back = S 55° 12' 32.76" E
Ahead = S 13° 26' 10.29" W

20

Curve DTT-20
P.I. Sta. 13+14.60
D = 108° 13' 15.35" (LT)
T = 41.4593
L = 56.6643
R = 30.0000
P.C. Sta. 12+73.14
P.T. Sta. 13+29.80
Back = S 13° 26' 10.29" W
Ahead = N 85° 12' 54.94" E

21

Curve DTT-21
P.I. Sta. 13+55.35
D = 21° 43' 25.17" (LT)
T = 11.5127
L = 22.7490
R = 60.0000
P.C. Sta. 13+43.84
P.T. Sta. 13+66.59
Back = N 85° 12' 54.94" E
Ahead = N 63° 29' 29.78" E

22

Curve DTT-22
P.I. Sta. 13+85.33
D = 42° 12' 04.94" (RT)
T = 11.5764
L = 22.0966
R = 30.0000
P.C. Sta. 13+73.75
P.T. Sta. 13+95.85
Back = N 63° 29' 29.78" E
Ahead = S 74° 18' 25.29" E

23

Curve DTT-23
P.I. Sta. 14+12.43
D = 65° 35' 56.51" (RT)
T = 12.8889
L = 22.8984
R = 20.0000
P.C. Sta. 13+99.54
P.T. Sta. 14+22.44
Back = S 74° 18' 25.29" E
Ahead = S 8° 42' 28.78" E

24

Curve DTT-24
P.I. Sta. 14+49.70
D = 60° 05' 19.50" (LT)
T = 23.1353
L = 41.9499
R = 40.0000
P.C. Sta. 14+26.57
P.T. Sta. 14+68.52
Back = S 8° 42' 28.78" E
Ahead = S 68° 47' 48.27" E

25

Curve DTT-25
P.I. Sta. 15+22.07
D = 73° 57' 52.89" (RT)
T = 37.6536
L = 64.5464
R = 50.0000
P.C. Sta. 14+84.41
P.T. Sta. 15+48.96
Back = S 68° 47' 48.27" E
Ahead = S 5° 10' 04.61" W

26

Curve DTT-26
P.I. Sta. 15+93.85
D = 85° 14' 20.84" (LT)
T = 36.8071
L = 59.5081
R = 40.0000
P.C. Sta. 15+57.04
P.T. Sta. 16+16.55
Back = S 5° 10' 04.61" W
Ahead = S 80° 04' 16.23" E

27

Curve DTT-27
P.I. Sta. 16+93.38
D = 85° 14' 49.42" (RT)
T = 46.0153
L = 74.3921
R = 50.0000
P.C. Sta. 16+47.36
P.T. Sta. 17+21.76
Back = S 80° 04' 16.23" E
Ahead = S 5° 10' 33.19" W

28

Curve DTT-28
P.I. Sta. 17+37.07
D = 64° 34' 38.58" (LT)
T= 12.6380
L= 22.5418
R= 20.0000
P.C. Sta. 17+24.43
P.T. Sta. 17+46.97
Back = S 5° 10' 33.19" W
Ahead = S 59° 24' 05.39" E

29

Curve DTT-29
P.I. Sta. 17+86.87
D = 64° 24' 15.10" (RT)
T = 18.8935
L = 33.7220
R = 30.0000
P.C. Sta. 17+67.97
P.T. Sta. 18+01.69
Back = S 59° 24' 05.39" E
Ahead = S 5° 00' 09.71" W

30

Curve DTT-30
P.I. Sta. 18+24.43
D = 84° 06' 08.92" (LT)
T = 22.5506
L = 36.6966
R = 25.0000
P.C. Sta. 18+01.88
P.T. Sta. 18+38.58
Back = S 5° 00' 09.71" W
Ahead = S 79° 05' 59.21" E

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

1	REPLACED -T- CHANNEL CURVE DATA 05-18-06 JDG

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client:
Ecosystem Enhancement PROGRAM

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:
NEW CHANNEL CENTERLINE DATA

DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET
B-2C

⚠1 SUMMARY OF QUANTITIES

SUMMARY OF QUANTITIES Bishop Site Stream/Wetland Restoration - Dula Thoroughfare				
ITEM	SPEC	ITEM DESCRIPTION	QUANTITIES	UNIT
29	SP1	Mobilization	1	LS
30	SP2	Construction Surveying	1	LS
31	SP3	Grading	1	LS
32	1056	Filter Fabric, Type 2	4600	SY
33	1605	Temporary Silt Fence	6900	LF
34	1610	Stone for Erosion Control, Class A	1600	TON
35	1610	Stone for Erosion Control, Class B	105	TON
36	1610	Stone for Erosion Control, No. 57	62	TON
37	1610	Stone for Erosion Control, ABC	1726	TON
38	1615	Temporary Mulching	12	ACR
39	1620	Seed for Temporary Seeding	780	LB
40	1620	Fertilizer for Temporary Seeding	1.8	TON
41	1630	Silt Excvation	300	CY
42	1660	Permanent Seeding and Mulching	20	ACR
43	1661	Seed for Repair Seeding	390	LB
44	1661	Fertilizer for Repair Seeding	0.9	TON
45	1662	Supplemental Seeding	390	LB
46	SP6	Coir Fiber Matting, 900 gm	4100	SY
47	SP8	Impervious Select Material	90	CY
48	SP9	Pump Around Operation	1	LS
49	SP10	Special Stilling Basin	4	EA
50	SP12	Bare Root Seedlings	29243	EA
51	SP14	Invasive Plant Removal	1	LS
52	SP17	Disking/Scarification	12	ACR

Estimates do include quantities for Class A stone and filter fabric for improved on-site access roads if required by weather conditions. The quantities are approximately 480 T of Class A Stone and 1333 SY filter fabric per 1000 linear feet of 12-foot wide improved access road as shown on the plans. ABC Stone is estimated to leave existing farm road in "AS IS or BETTER" condition. Note that all quantities are estimates for infomation and bid comparison purposes only.

SUMMARY OF EARTHWORK

QUANTITIES IN CUBIC YARDS

DULA THOROUGHFARE WEST –D– CHANNEL

Xsection	Total Cut		EXCAVATION	Total Fill			FILL	BORROW	WASTE
	sq ft	cu ft		sq ft	cu ft	cu ft + %			
0	21.89	0		1.25	0				
120	124.2	8763.0	325	0.0	75.0	90	3	0	321
213	128.8	11764.5	436	2.2	100.0	120	4	0	431
279	96.3	7430.9	275	8.1	336.6	404	15	0	260
364	131.2	9670.0	358	0.0	342.1	411	15	0	343
449	78.2	8899.9	330	17.7	753.1	904	33	0	296
580	133.9	13893.9	515	6.7	1599.5	1919	71	0	443
687	142.9	14807.2	548	4.9	622.7	747	28	0	521
823	284.2	29042.8	1076	3.5	574.6	690	26	0	1050
927	294.0	30070.0	1114	0.0	182.5	219	8	0	1106
1113	169.2	43082.3	1596	10.5	976.5	1172	43	0	1552
1200	165.9	14578.2	540	0.0	456.8	548	20	0	520
1294	156.6	15159.4	561	0.0	0.0	0	0	0	561
1446	37.4	14743.2	546	15.5	1178.0	1414	52	0	494
1585	49.9	6066.0	225	13.9	2043.3	2452	91	0	134
1686	63.0	5703.5	211	11.9	1302.9	1563	58	0	153
1780	66.9	6107.7	226	6.9	883.6	1060	39	0	187
1893	281.3	19674.4	729	2.5	528.3	634	23	0	705
2030	196.5	32731.4	1212	9.6	828.2	994	37	0	1175
		292188	10822		12784		568	0	10254
									10254
Project Total			10822						10254

APPROXIMATE QUANTITIES ONLY, UNCLASSIFIED EXCAVATION, BORROW EXCAVATION, FINE GRADING AND CLEARING AND GRUBBING WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING." A SHRINKAGE FACTOR OF 1.2 WAS ASSUMED.

DULA THOROUGHFARE EAST –T– CHANNEL

Xsection	Total Cut		EXCAVATION	Total Fill			FILL	BORROW	WASTE
	sq ft	cu ft		sq ft	cu ft	cu ft + %			
0	1.66	0		10.63	0				
100	13.4	754.5	28	20.4	1553.5	1864	69	41	0
220	10.1	1413.6	52	44.5	3897.0	4676	173	121	0
290	41.4	1804.6	67	0.0	1557.9	1869	69	2	0
392	37.4	4017.8	149	21.3	1088.3	1306	48	0	100
506	5.4	2435.0	90	30.4	2950.9	3541	131	41	0
568	12.9	567.0	21	0.0	943.3	1132	42	21	0
629	17.1	915.6	34	16.1	491.1	589	22	0	12
		11908	441		12482		555	226	113
									-114
Project Total			441						-114

APPROXIMATE QUANTITIES ONLY, UNCLASSIFIED EXCAVATION, BORROW EXCAVATION, FINE GRADING AND CLEARING AND GRUBBING WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING." A SHRINKAGE FACTOR OF 1.2 WAS ASSUMED.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS
⚠1 QUANTITIES REVISED

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN
ANSON COUNTY, NORTH CAROLINA

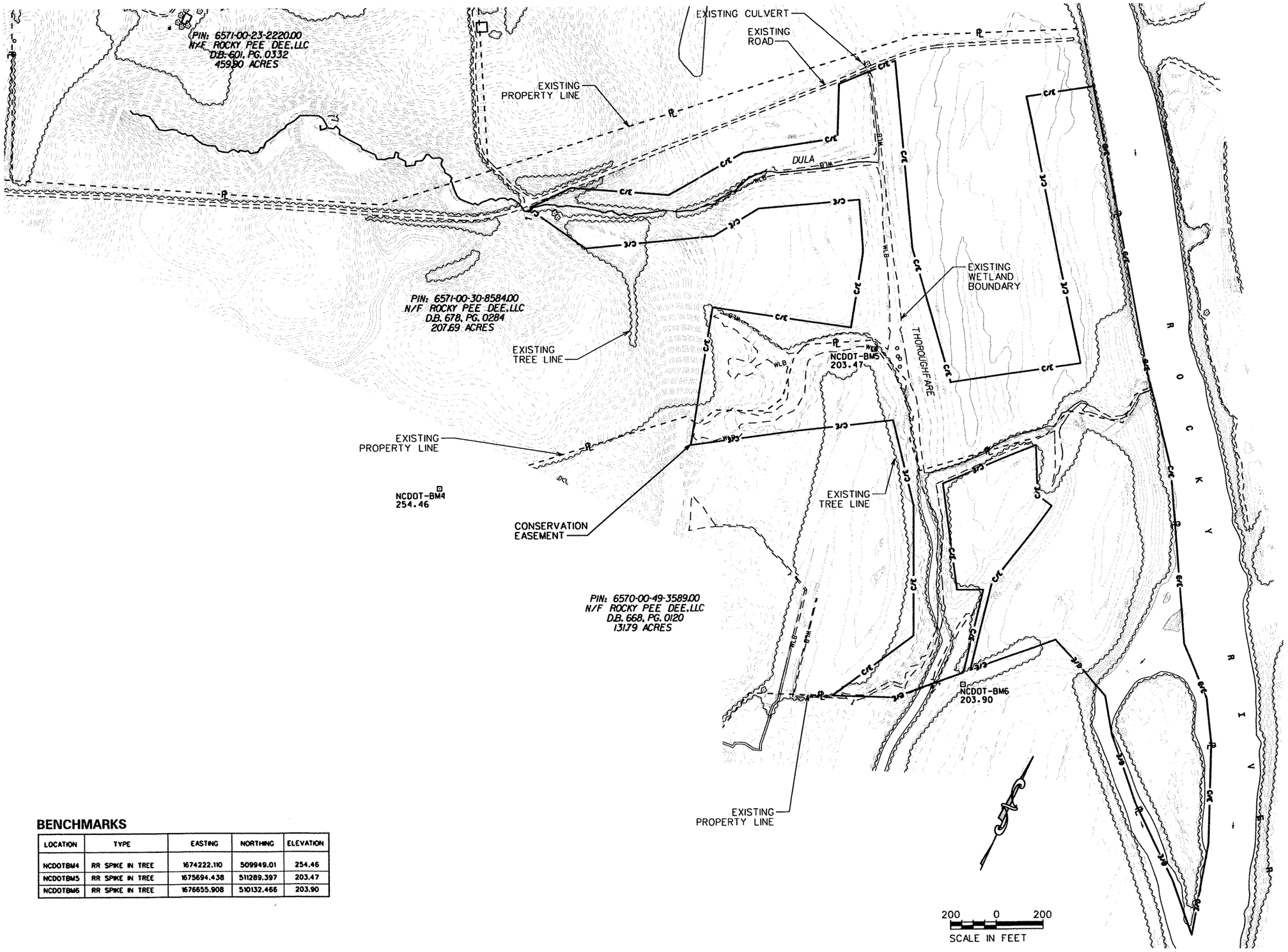
Title:
SUMMARY OF QUANTITIES / SUMMARY OF EARTHWORK

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET
B–3



BENCHMARKS

LOCATION	TYPE	EASTING	NORTHING	ELEVATION
NCDOTBM4	RR SPIKE IN TREE	1674222.110	509949.01	254.46
NCDOTBM5	RR SPIKE IN TREE	1675694.438	511289.397	203.47
NCDOTBM6	RR SPIKE IN TREE	1676655.908	510132.466	203.90

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client:
Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

EXISTING CONDITIONS

DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: AS SHOWN

ESC Project No.: 04-212

SHEET

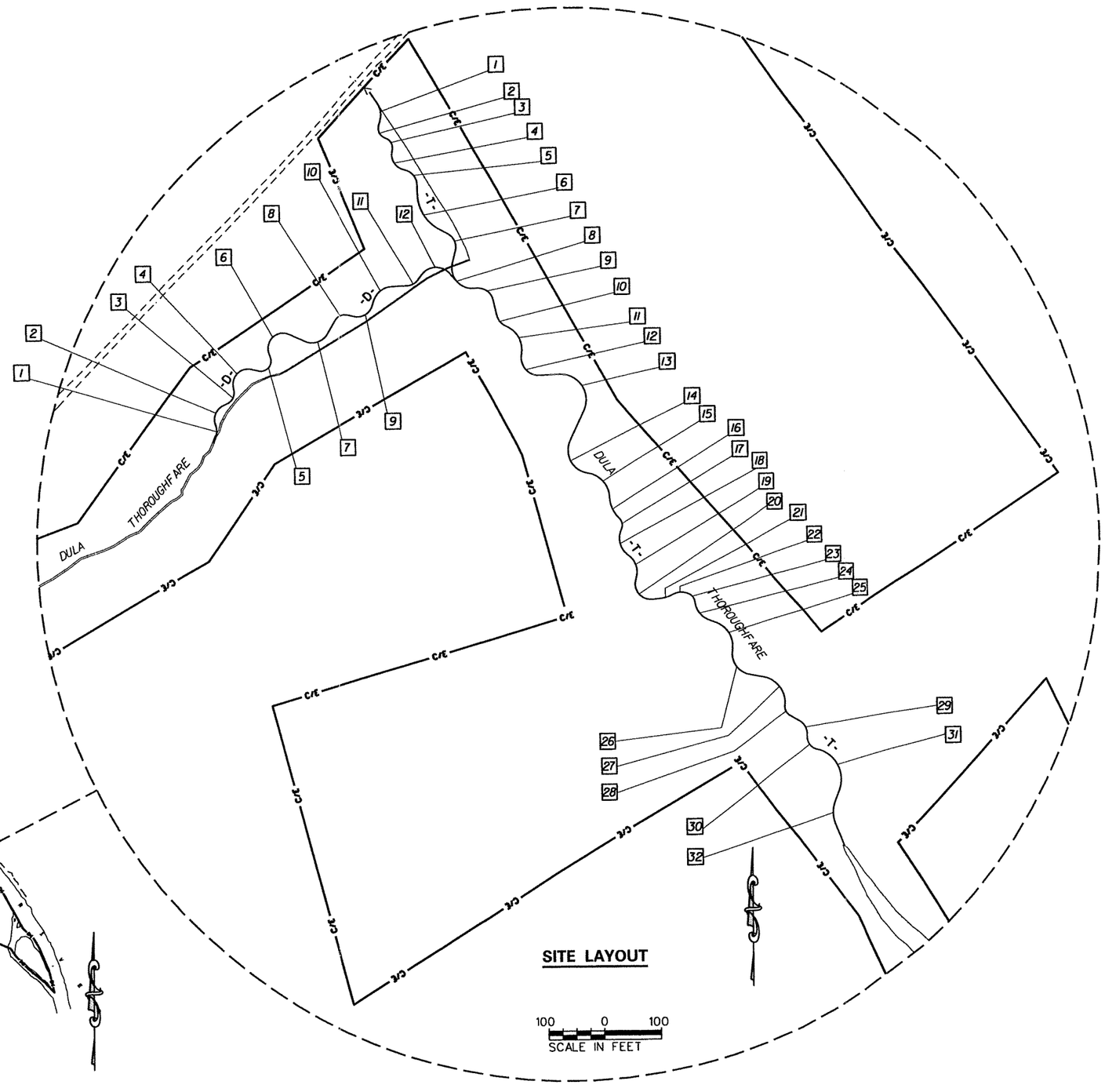
B-4

NOTE:
FOR CURVE DATA, SEE SHEET B-2C.

25 NEW CHANNEL CURVE LOCATION

SITE LAYOUT

1000 0 1000
SCALE IN FEET



SITE LAYOUT

100 0 100
SCALE IN FEET

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, P.E.

Client:
Ecosystem Enhancement PROGRAM

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

NEW CHANNEL LAYOUT

DULA THOROUGHFARE

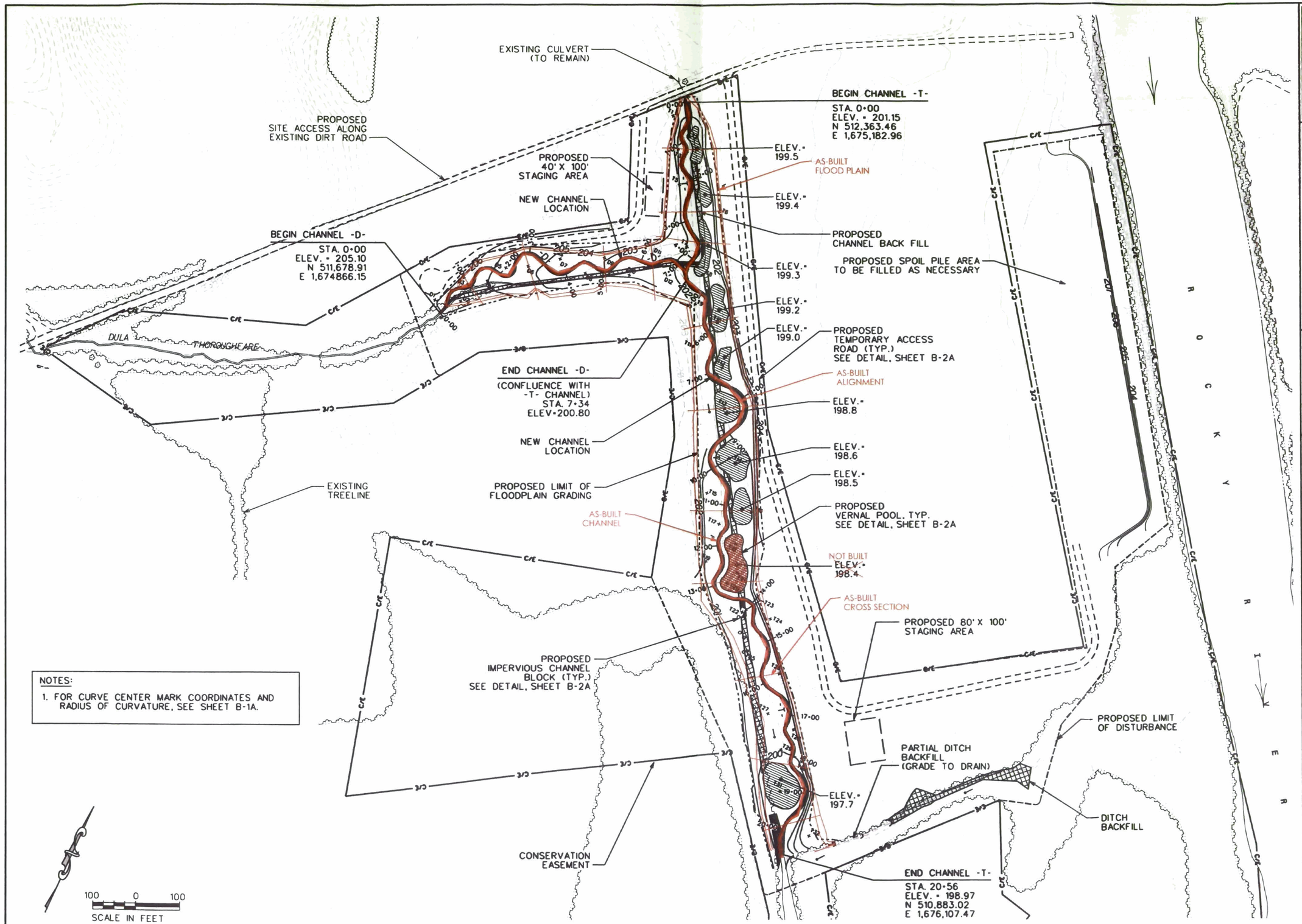
Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: AS SHOWN

ESC Project No.: 04-212

SHEET

B-5



EcoScience Corporation
Raleigh, North Carolina

REVISIONS	
1	AS-BUILT - JULY 2007

NORTH CAROLINA PROFESSIONAL SEAL (16695) ENGINEER
22oct07

Client:
Ecosystem Enhancement PROGRAM

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN
ANSON COUNTY, NORTH CAROLINA

Title:
SITE PLAN
DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
EBB	JUL 2007

Scale: AS SHOWN

ESC Project No.: 04-212

SHEET
B-6

Project # 04-212	Date MAR 2005		Scale H: 1"=50' V: 1"=2'
Des. By: JDG	Dwn. By: JDC	Chd. By: DGM	

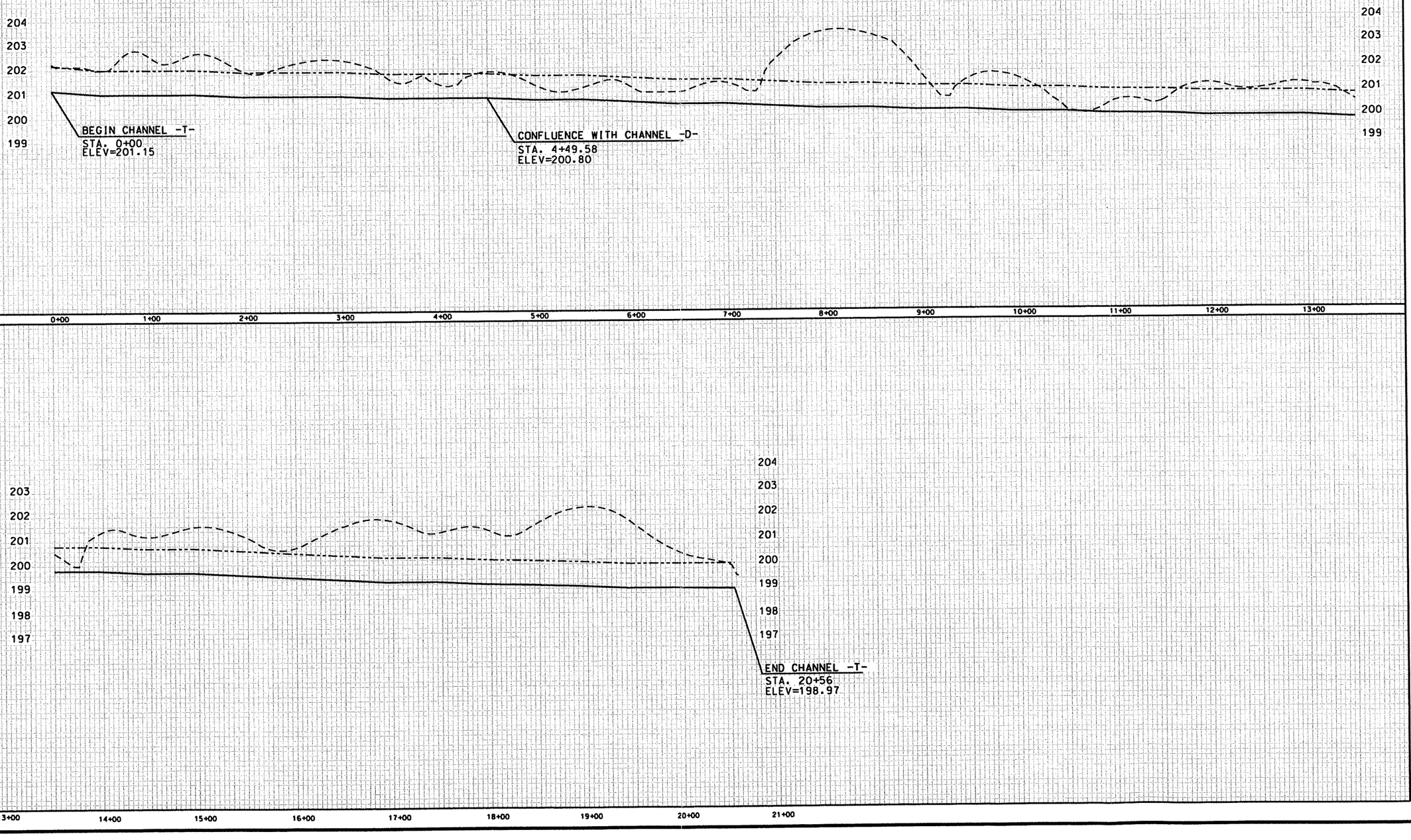
Client:
ECOSYSTEM ENHANCEMENT PROGRAM

Project:
BISHOP SITE STREAM
AND WETLAND RESTORATION
DULA THOROUGHFARE

Title:
EXISTING AND PROPOSED PROFILE
-T- CHANNEL (EASTERN CHANNEL)

Legend:
- EXISTING FLOOD PLAIN
- PROPOSED FLOOD PLAIN
- PROPOSED BED ELEVATION

Sheet:
B-7



Project No. 04-212	Date JULY 2007		H: 1"=50'
Des. By: JFH	Dwn. By: JDC	Chk. By: EBB	V: 1"=2'

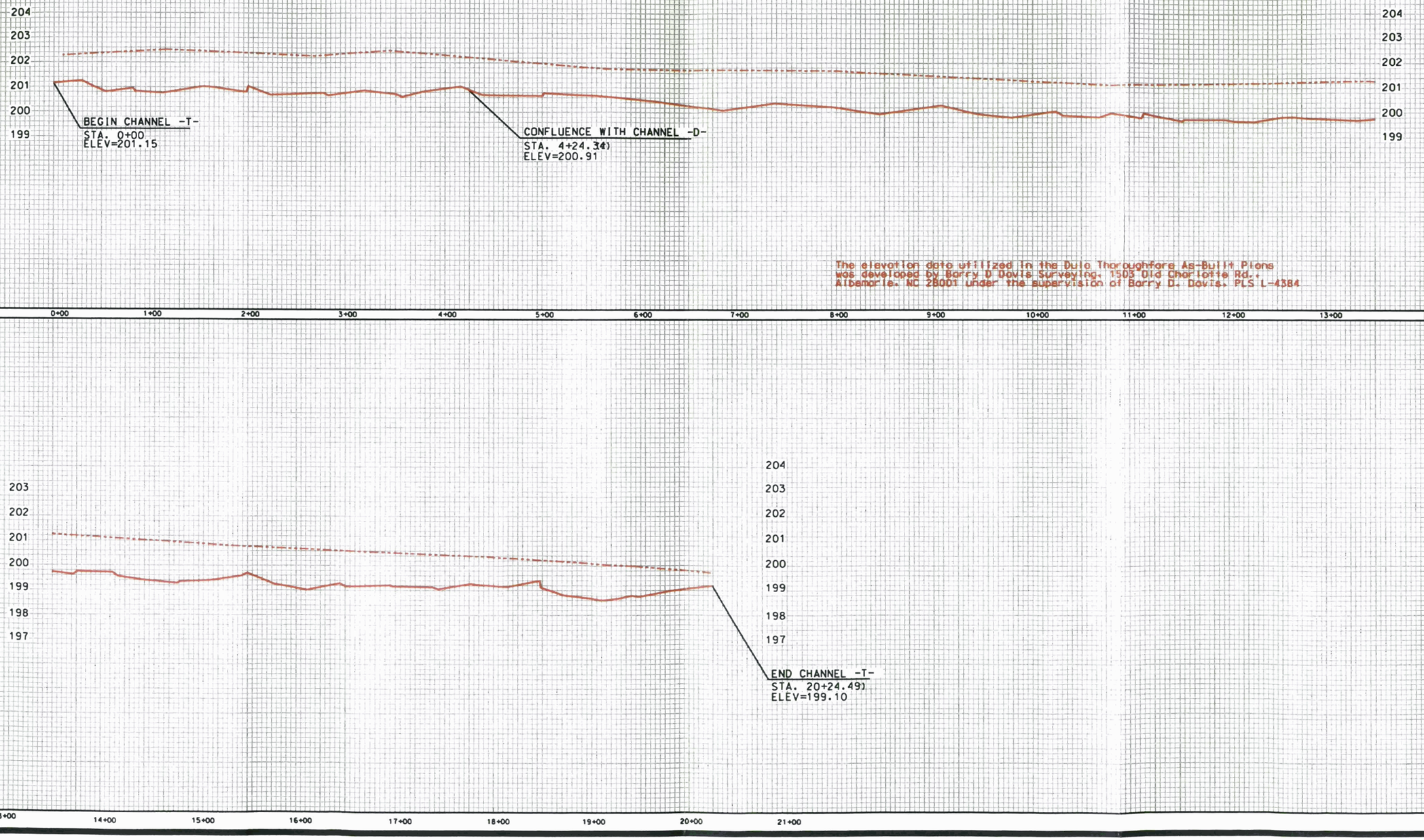
Client: ECOSYSTEM ENHANCEMENT PROGRAM

Project: BISHOP SITE STREAM AND WETLAND RESTORATION DULA THOROUGHFARE

Title: EXISTING AND PROPOSED PROFILE -T- CHANNEL (EASTERN CHANNEL)

Legend: SURVEY AS-BUILT; FLOOD PLAIN; BED ELEVATION

Sheet: B-7A



The elevation data utilized in the Dula Thoroughfare As-Built Plans was developed by Barry D Davis Surveying, 1503 Old Charlotte Rd., Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384

Project # 04-212	Date: MAR 2005	Scale: H: 1"=50' V: 1"=2'	
Dsn. By: JDG	Dft. By: JDC	Chd. By: DGM	

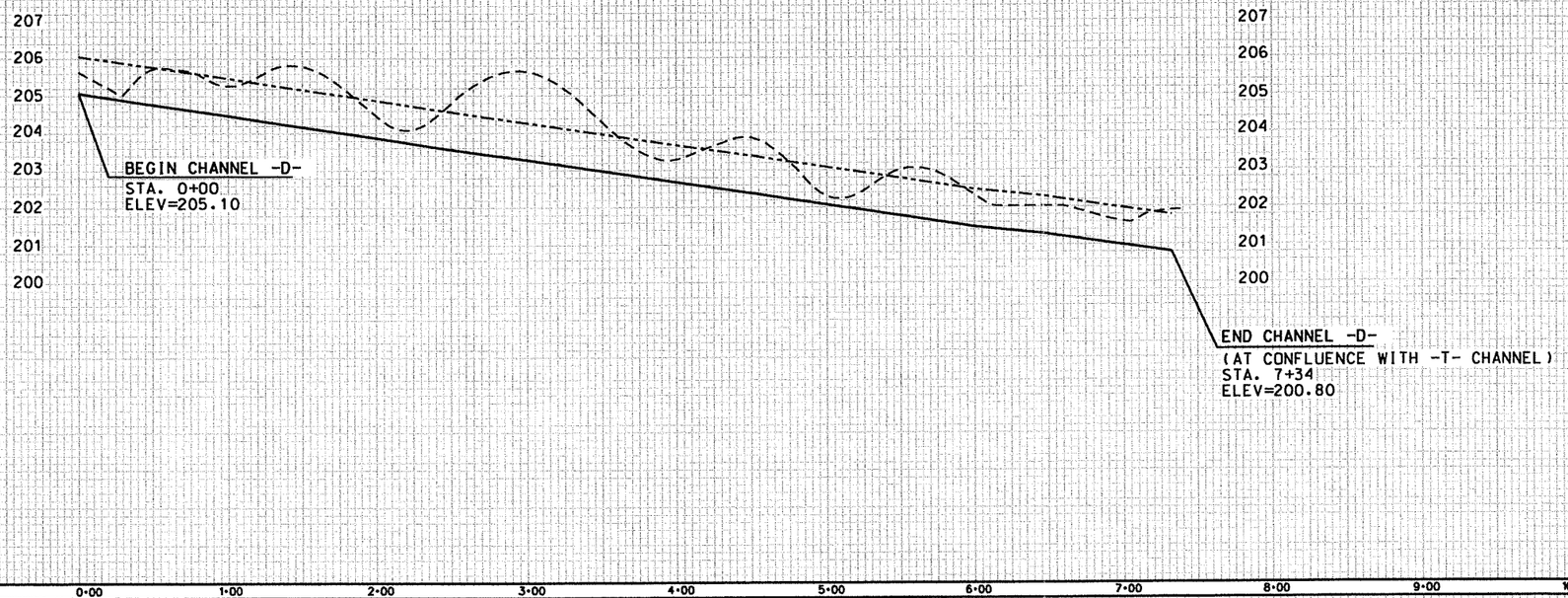
Client:
ECOSYSTEM ENHANCEMENT PROGRAM

Project:
BISHOP SITE STREAM
AND WETLAND RESTORATION
DULA THOROUGHFARE

Title:
EXISTING AND PROPOSED PROFILE
-D- CHANNEL (WESTERN CHANNEL)

Legend:
- EXISTING FLOOD PLAIN
- PROPOSED FLOOD PLAIN
- PROPOSED BED ELEVATION

Sheet:
B-8



Project # 04-212	Date JULY 2007		H: 1"=50'
Des. By: JFH	Dsn. By: JDC	Chk. By: EBB	V: 1"=2'

Client: ECOSYSTEM ENHANCEMENT PROGRAM

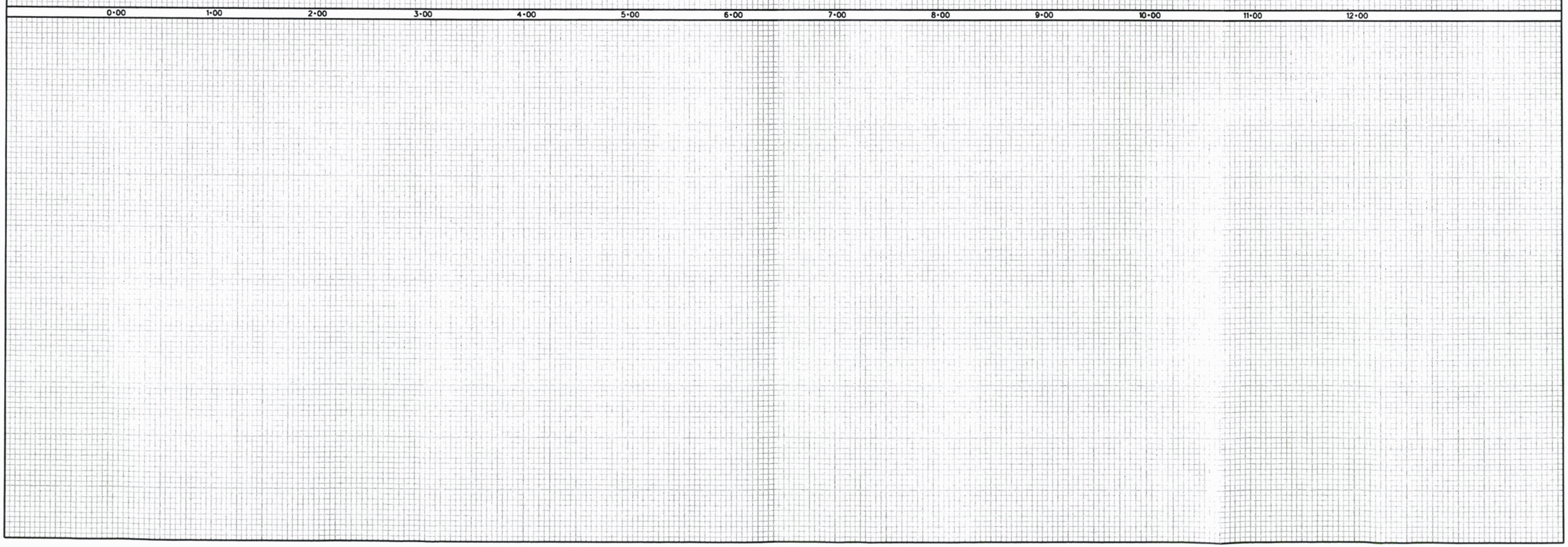
Project: BISHOP SITE STREAM AND WETLAND RESTORATION DULA THOROUGHFARE

Title: EXISTING AND PROPOSED PROFILE -D- CHANNEL (WESTERN CHANNEL)

Legend:
SURVEY AS-BUILT
FLOOD PLAIN
BED ELEVATION

Sheet: B-8A

The elevation data utilized in the Dula Thoroughfare As-Built Plans was developed by Barry D Davis Surveying, 1503 Old Charlotte Rd., Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384



EXISTING CULVERT (TO REMAIN)

EXISTING ROAD (TO REMAIN)

BEGIN CHANNEL -T-
STA. 0+00
ELEV. = 201.15
N 512,363.46
E 1,675,182.96

ELEV.= 199.5

PROPOSED 40' X 100' STAGING AREA

PROPOSED SILT FENCE SEE DETAIL, SHEET B-EC2

NEW CHANNEL LOCATION

ELEV.= 199.4

BEGIN CHANNEL -D-
STA. 0+00
ELEV. = 205.10
N 511,678.91
E 1,674866.15

PROPOSED SPOIL PILE AREA TO BE FILLED AS NECESSARY

ELEV.= 199.3

ELEV.= 199.2

ELEV.= 199.0

DULA THOROUGHFARE

END CHANNEL -D-
(CONFLUENCE WITH -T- CHANNEL)
STA. 7+34
ELEV=200.80

ELEV.= 198.8

NEW CHANNEL LOCATION

ELEV.= 198.6

ELEV.= 198.5

EXISTING TREELINE

ELEV.= 198.4

PROPOSED SILT FENCE SEE DETAIL, SHEET B-EC2

PROPOSED LIMIT OF FLOODPLAIN GRADING

PROPOSED 80' X 100' STAGING AREA

PROPOSED TEMPORARY ROCK SEDIMENT TYPE "A" SEE DETAIL, SHEET B-EC2

PARTIAL DITCH BACKFILL (GRADE TO DRAIN)

ELEV.= 197.7

PROPOSED LIMIT OF DISTURBANCE

CONSERVATION EASEMENT

END CHANNEL -T-
STA. 20+56
ELEV. = 198.97
N 510,883.02
E 1,676,107.47

ROCKY RIVER

100 0 100
SCALE IN FEET

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client:
Ecosystem Enhancement Program

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:
EROSION CONTROL PLAN

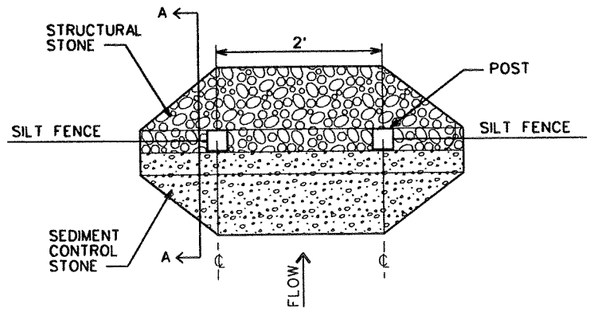
DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

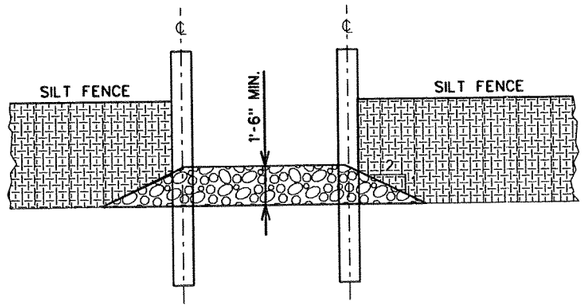
Scale: AS SHOWN

ESC Project No.: 04-212

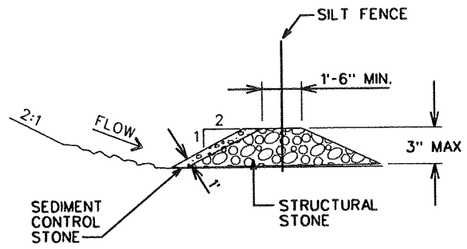
SHEET
B-EC1



PLAN



ELEVATION



CROSS-SECTION A-A

NOTES:

1. STRUCTURAL STONE SHALL BE (CLASS "B") STONE FOR EROSION CONTROL PURPOSES.
2. SEDIMENT CONTROL STONE SHALL BE NO. 5 OR NO. 57 STONE.

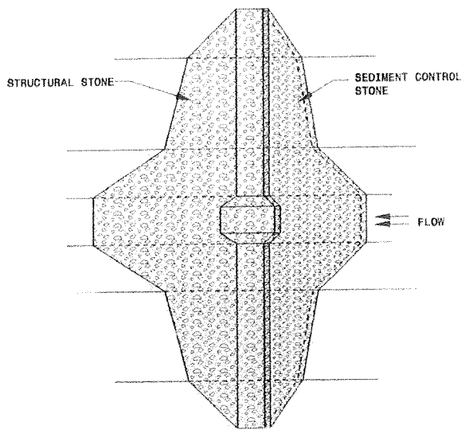
STONE OUTLET DETAIL

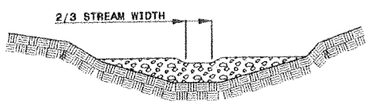
NOTE:

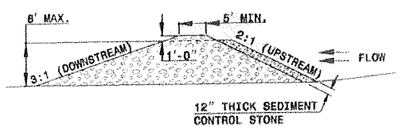
USE CLASS B STONE FOR STRUCTURAL STONE AND PAY FOR AT THE CONTRACT UNIT PRICE PER TON STONE FOR EROSION CONTROL, CLASS B.

USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL AND PAY FOR AT THE CONTRACT UNIT PRICE PER TON SEDIMENT CONTROL STONE.

DO NOT USE SEDIMENT DAM IN LIVE STREAM.

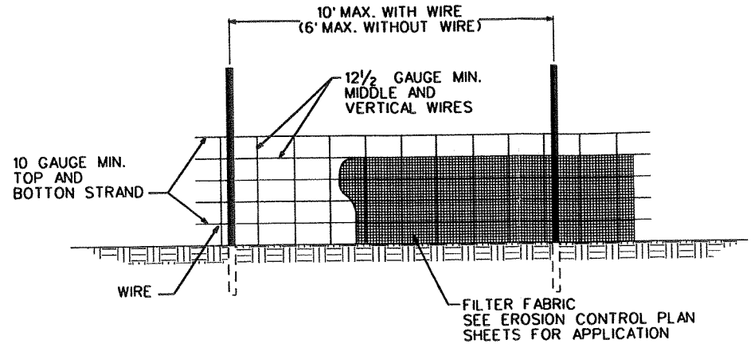


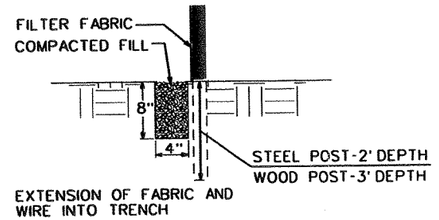




TEMPORARY ROCK SEDIMENT DAM TYPE "A"

(NCDOT 1634.01)





NOTES:

1. USE WIRE A MINIMUM OF 32 INCHES IN WIDTH AND WITH A MINIMUM OF 6 LINE WIRES WITH 12 INCH STAY SPACING.
2. USE FILTER FABRIC A MINIMUM OF 36 INCHES IN WIDTH AND FASTEN ADEQUATELY TO THE WIRE AS DIRECTED BY THE ENGINEER.
3. PROVIDE 5 FOOT STEEL POST OF THE SELF-FASTENER ANGLE STEEL TYPE.
4. USE 6 FOOT WOOD POST WITH 3 INCH DIAMETER.

NCDOT BMP'S FOR CONSTRUCTION AND MAINTENANCE ACTIVITIES, 5.1.1, AUGUST 2003

TEMPORARY SILT FENCE

NCDOT STD. DWG. 1605.01

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client:
Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

EROSION CONTROL DETAILS

DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET

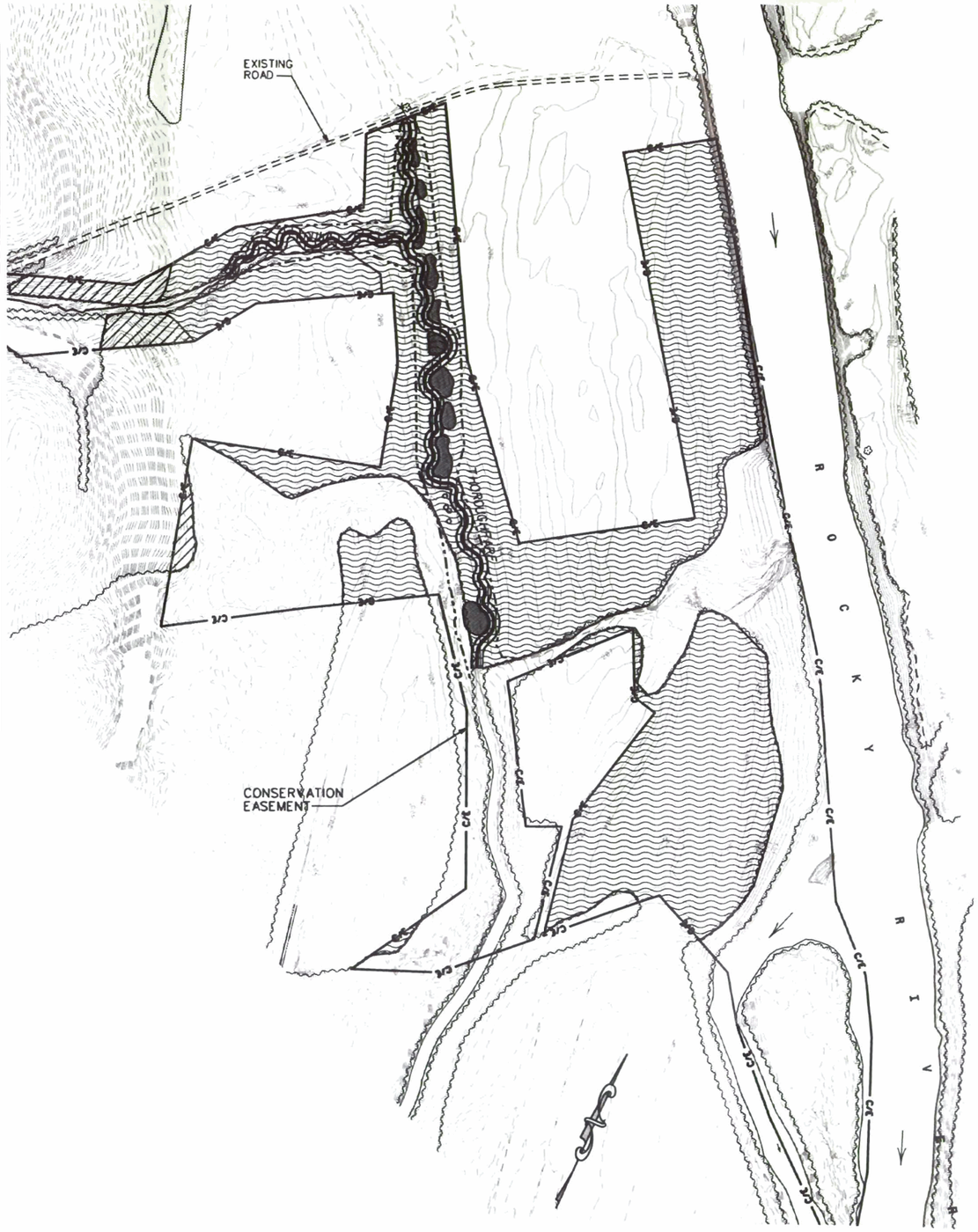
B-EC2

PLANTING TABLE

Vegetation Association		Bottomland Hardwood Forest		Stream-side Assemblage		Mesic Mixed Hardwood Forest		Total	Total
Stems/Acre (Spacing)		680 (8 feet x 8-feet)		2720 (4 feet x 4-feet)		680 (8-feet x 8-feet)			
Planted Area (acres)		34.1		1.8		1.7		37.6	
Species[1]	Common Name	Number Planted	% of Total	Number Planted	% of Total	Number Planted	% of Total	Number Planted	Number Planted
Quercus michauxii	swamp chestnut oak	2087	9					2087	2100
Ulmus americana	American elm	1623	7					1623	1700
Celtis laevigata	sugarberry	1623	7					1623	1700
Fraxinus pennsylvanica	green ash	1623	7					1623	3300
Carya ovata	shagbark hickory	1623	7					1623	1700
Quercus phellos	willow oak	2087	9					2087	2100
Nyssa biflora	swamp tupelo	1623	7					1623	3300
Platanus occidentalis	sycamore	1623	7					1623	1700
Quercus nigra	water oak	1623	7					1623	3100
Carya cordiformis	bitter-nut hickory	1623	7					1623	
Quercus pagoda	cherrybark oak	1623	7					1623	1700
Carpinus caroliniana	musclewood	1623	7					1623	
Asimina triloba	pawpaw	1391	6					1391	1400
Ilex opaca	American holly	1391	6			92	8	1483	
Arundinaria gigantea	giant cane			392	8			392	
Betula nigra	river birch			588	12			588	2000
Cornus amomum	silky dogwood			490	10			490	2000
Salix nigra[2]	black willow			490	10			490	
Alnus serrulata	tag alder			490	10			490	
Cephalanthus occidentalis	buttonbush			490	10			490	1000
Sambucus canadensis	elderberry			490	10			490	
Viburnum dentatum	arrow-wood			490	10			490	
Viburnum nudum	possum-haw			490	10			490	
Vaccinium corymbosum	highbush blueberry			490	10			490	
Fagus grandifolia	American beech					162	14	162	200
Carya tomentosa	mockernut hickory					139	12	139	200
Carya glabra	sweet pignut hickory					139	12	139	200
Quercus alba	white oak					185	16	185	200
Quercus rubra	northern red oak					162	14	162	200
Quercus falcata	southern red oak					162	14	162	200
Cornus florida	dogwood					116	10	116	200
Total		23186	100	4900	100	1157	100	29243	30200

[1] All stems are to be bare-root seedlings except where noted

[2] Live stakes are acceptable for black willow individuals if bare-root seedlings are unavailable



PLANT COMMUNITIES

STREAMSIDE ASSEMBLAGE (15' EACH SIDE OF CHANNEL)	1.8 ACRES
MESIC MIXED HARDWOOD FOREST	1.7 ACRES
BOTTOMLAND HARDWOOD FOREST	34.1 ACRES
TOTAL:	37.6 ACRES

NOTES:

1. THERE SHALL BE NO PLANTING IN AREAS DESIGNATED AS VERNAL POOLS. -SEE SHEET B-6, "SITE PLAN, DULA THOROUGHFARE"
2. STREAMSIDE ASSEMBLAGE PLANTING SHALL BE LIMITED TO AN AREA 15' FROM BANKS OF PROPOSED CHANNEL.
3. EXISTING TREE LINE SHALL MARK LIMIT OF PROPOSED PLANTING EXCEPT WHERE EXISTING TREELINE IS TO BE MODIFIED FOR PROPOSED CHANNEL.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS	
1	AS-BUILT - JULY 2007

NORTH CAROLINA PROFESSIONAL SEAL 026951 ENGINEER BRIAN BURNETT
2/26/07

Client: Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

PLANTING PLAN

DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
EBB	JUL 2007

Scale: AS SHOWN

ESC Project No.: 04-212

SHEET

B-L1

Project No.	04-212		Date: MAR 2005
Des. By: JDG	Dwn. By: JDC	Chd. By: DGM	Scale: 1"=10'

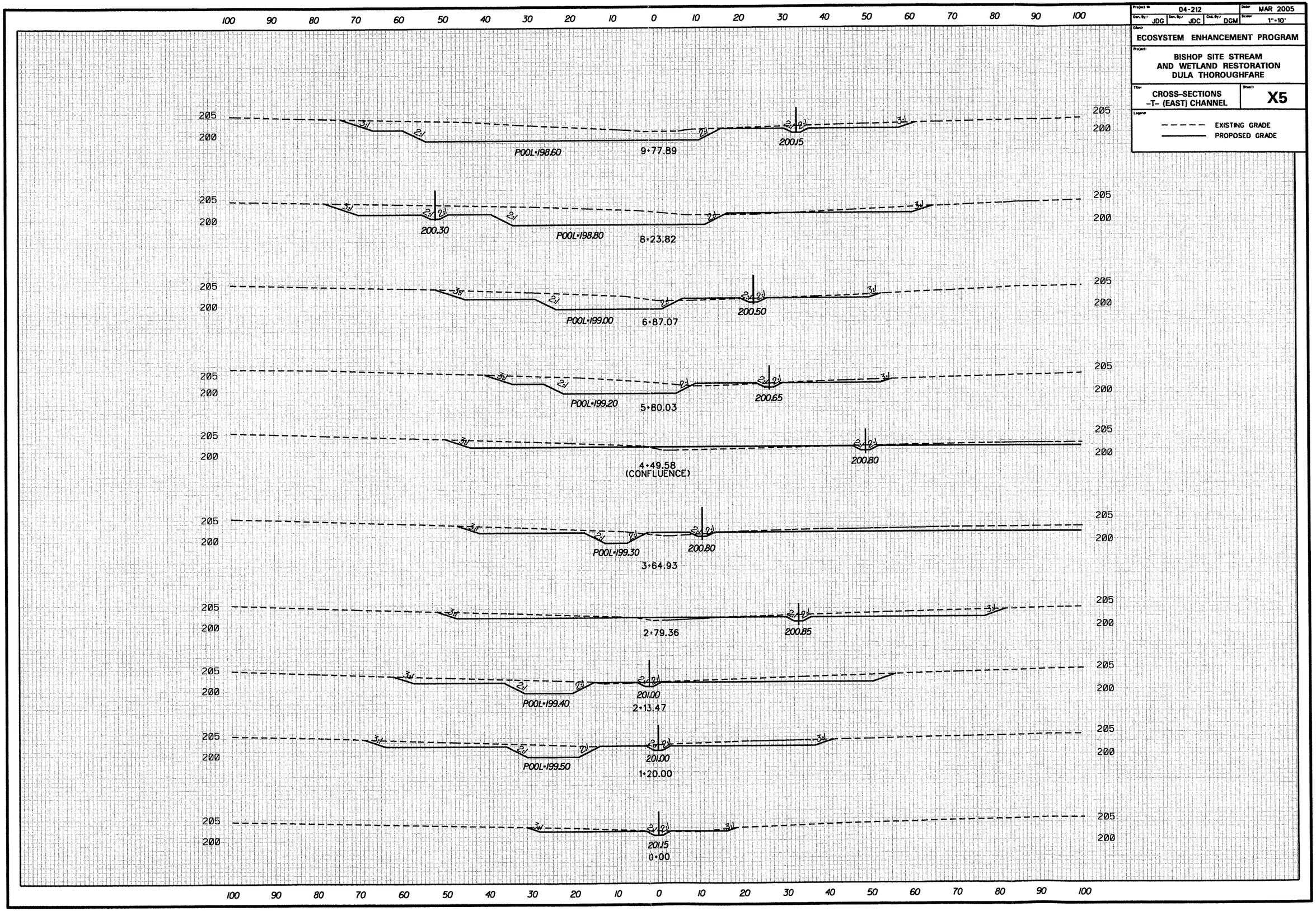
Client:
ECOSYSTEM ENHANCEMENT PROGRAM

Project:
BISHOP SITE STREAM
AND WETLAND RESTORATION
DULA THOROUGHFARE

Title: CROSS-SECTIONS
-T- (EAST) CHANNEL

Sheet: X5

Legend:
- - - - - EXISTING GRADE
——— PROPOSED GRADE



Project #	04-212		Date: MAR 2005
Dsn. By: JDG	Dwn. By: JDC	Chk. By: DGM	Scale: 1"=10'

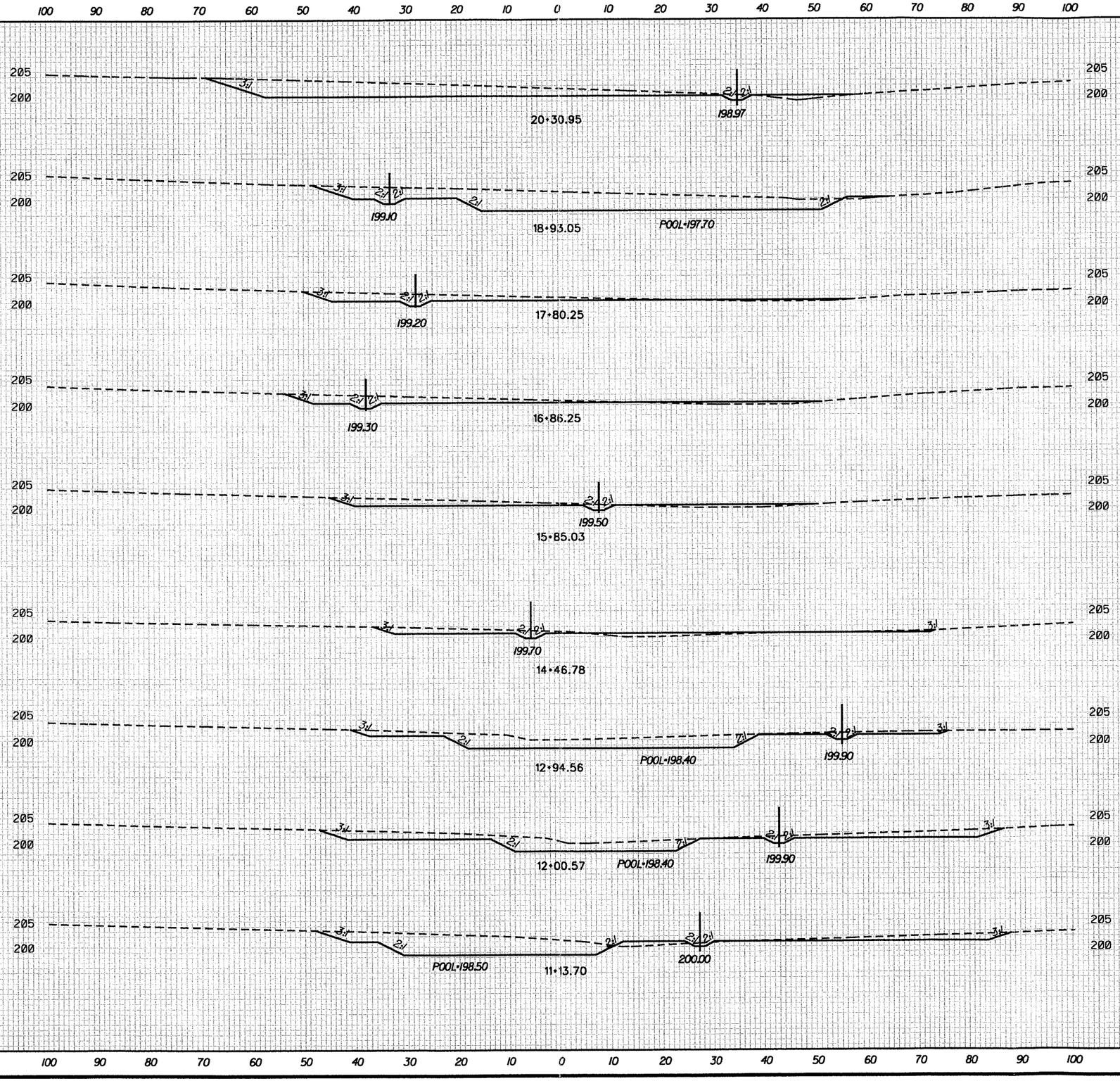
Client:
ECOSYSTEM ENHANCEMENT PROGRAM

Project:
BISHOP SITE STREAM
AND WETLAND RESTORATION
DULA THOROUGHFARE

Title: CROSS-SECTIONS
-T- (EAST) CHANNEL

Sheet: X6

Legend:
- – – – – EXISTING GRADE
- ——— PROPOSED GRADE



Project No. 04-212			Date MAR 2005
Dsn. By: JDC	Drn. By: JDC	Chk. By: DGM	Scale 1"=10'

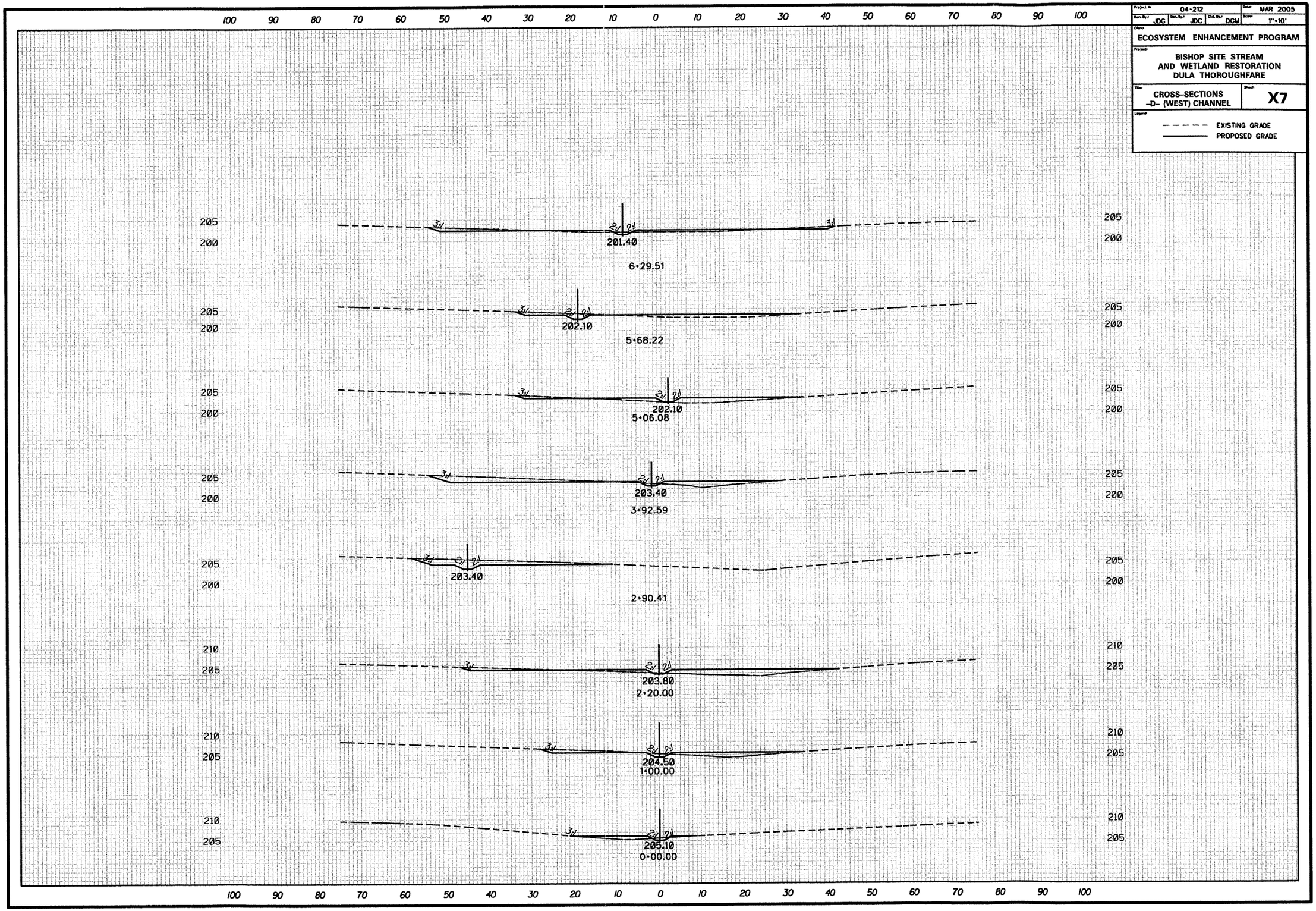
Client
ECOSYSTEM ENHANCEMENT PROGRAM

Project
BISHOP SITE STREAM
AND WETLAND RESTORATION
DULA THOROUGHFARE

Title
CROSS-SECTIONS
-D- (WEST) CHANNEL

Sheet
X7

Legend
- - - - - EXISTING GRADE
——— PROPOSED GRADE



100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100

205
200

(±)19+47

(±)17+84

(±)15+48

(±)12+59

(±) 10+81

(±) 8+01

(±) 5+65

(±) 3+46

(±) 2+70

(±) 1+16

Project No. 04-212			Date JULY 2007
Des. By: JFH	Dr. By: JDC	Ck. By: EBB	Scale 1"=10'

Client: ECOSYSTEM ENHANCEMENT PROGRAM

Project: BISHOP SITE STREAM AND WETLAND RESTORATION DULA THOROUGHFARE

Title: CROSS-SECTIONS -T- (EAST) CHANNEL

Sheet: X5A

Legend: SURVEY AS-BUILT GRADE

The elevation data utilized in the Dula Thoroughfare As-Built Plans was developed by Barry D Davis Surveying, 1503 Old Charlotte Rd., Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384

Project #	04-212		Date: JULY 2007
Des. By: JFH	Dwn. By: JDC	Chk. By: EBB	Scale: 1"=10'

District: ECOSYSTEM ENHANCEMENT PROGRAM

Project: BISHOP SITE STREAM AND WETLAND RESTORATION DULA THOROUGHFARE

Title: CROSS-SECTIONS -D- (WEST) CHANNEL

Sheet: X7A

Legend: SURVEY AS-BUILT GRADE

100 90 80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100

205
200

(±) 6+15

(±) 4+91

(±) 2+82

(±) 1+05

The elevation data utilized in the Dula Thoroughfare As-Built Plans was developed by Barry D Davis Surveying, 1505 Old Charlotte Rd., Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384

PROJECT: BISHOP SITE STREAM AND WETLAND RESTORATION

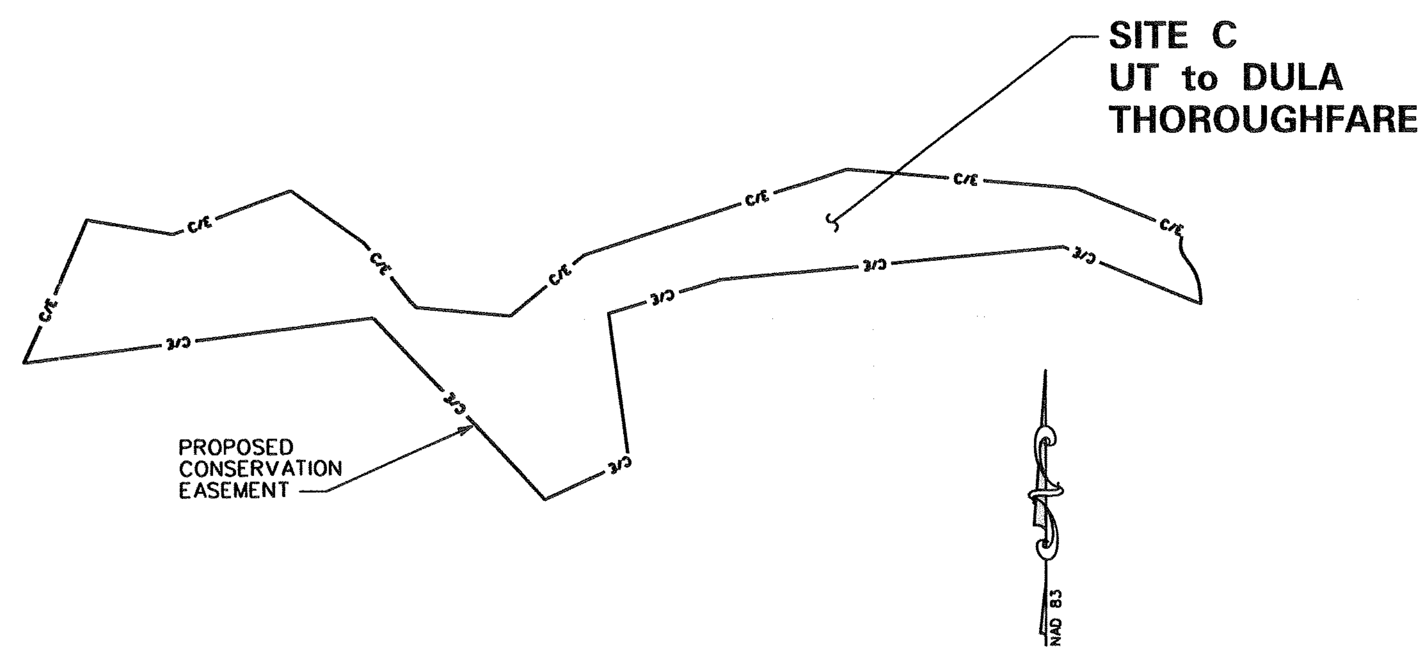
SITE C
UT TO DULA THOROUGHFARE

***TYPE OF WORK:* STREAM AND WETLAND RESTORATION / ENHANCEMENT**

- STREAM ENHANCEMENT
- WETLAND RESTORATION / ENHANCEMENT
- SITE PLANTING

CONSTRUCTION SEQUENCE

1. MOBILIZE EQUIPMENT AND MATERIALS TO THE UT TO DULA THOROUGHFARE SITE.
2. ESTABLISH ACCESS ROADS AND STAGING AREAS AS DEPICTED ON THE PLANS OR AS DIRECTED BY THE PROJECT MANAGER AND MARK CONSTRUCTION EQUIPMENT ACCESS LOCATIONS WITH VISIBLE MARKERS. CONSTRUCTION EQUIPMENT SHALL BE MAINTAINED AND SERVICED WITHIN THE LIMITS OF THE ESTABLISHED STAGING AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL STAGING AREAS IN AN ENVIRONMENTALLY SENSITIVE MANNER.
3. INSTALL IMPROVEMENTS TO SITE ACCESS ROAD(S) IF REQUIRED AND INSTALL TEMPORARY EROSION CONTROL MEASURES (I.E., SILT FENCE, ROCK OUTLETS, ETC.) AS REQUIRED.
4. AT THE END OF EACH DAY OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE TEMPORARY SEED AND MULCH AND APPLY COIR FIBER MATTING, AS APPROPRIATE, TO ALL DISTURBED AREAS. IN ADDITION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL TEMPORARY EROSION CONTROL MEASURES ON A DAILY BASIS THROUGHOUT THE CONSTRUCTION PERIOD.
5. INSTALL PUMP-AROUND OPERATION JUST ABOVE THE UPSTREAM SERIES OF GRADE CONTROL STRUCTURES. CONSTRUCT THE GRADE CONTROL STRUCTURES PER DETAIL AND AS SHOWN ON PLAN SHEET C-2B. THE STRUCTURE ELEVATION AND SPACING SHALL DETERMINED IN THE FIELD BY THE DESIGNER. PROCEED DOWNSTREAM TO THE NEXT SERIES OF GRADE CONTROL STRUCTURES. CONSTRUCT IN LIKE MANNER. PROCEED TO THE FINAL SERIES OF STRUCTURES. CONSTRUCT IN LIKE MANNER.
6. PROCEEDING FROM THE UPSTREAM END OF THE PROPOSED CHANNEL WORK, THE CONTRACTOR SHALL MOVE SPOIL PILES GENERALLY LOCATED BETWEEN THE RELIC STREAM AND THE DUG STREAM TO FILL THE DUG STREAM IN AN EFFORT TO RESTORE THE RELIC STREAM. A SINGLE CONTINOUS STREAM SHALL BE FORMED FROM THE TWO ADJACENT CHANNELS. DUE TO THE MINOR INSTREAM WORK ASSOCIATED WITH THE CONNECTION OF CHANNEL SEGMENTS, THE SIZE OF THE CHANNELS AND THE PROXIMITY OF THE TWO CHANNELS, THIS WORK SHALL BE PERFORMED IN THE WET.
7. THE CONTRACTOR SHALL PLACE THE EXISITING BORROW MATERIAL IN AREAS AT THE DIRECTION OF THE PROJECT MANAGER.
8. CONSTRUCT THE PERMANENT CHANNEL FORD AT THE DOWNSTREAM END OF THE PROJECT AS SHOWN IN THE DETAIL ON SHEET C-2A AND ON PLAN SHEET C-6. THIS WORK SHALL REQUIRE A PUMP-AROUND OPERATION AND SHALL BE CONSTRUCTED IN THE DRY.
9. ONCE CONSTRUCTION IS COMPLETE THE CONTRACTOR SHALL REMOVE ALL CONTRUCTION MATERIALS FROM THE CONSERVATION EASEMENT, DISPOSE OF THEM IN AN APPROVED DUMP SITE AND SCARIFY ANY COMPACTED AREAS AS DIRECTED BY THE PROJECT MANAGER. TO COMPLETE PERMANENT SEEDING AND MULCHING, ALL DISTURBED AREAS SHALL BE DISKED OR PLOWED TO CREATE MICROTOPOGRAPHY TO THE SATISFACTION OF THE PROJECT MANAGER AND PERMANENTLY SEEDED AND MULCHED. IMPROVED ACCESS ROADS, IF ANY, SHALL REMAIN. STONE APPLIED TO ACCESS ROADS, IF ANY, SHALL REMAIN OR BE REMOVED AS INDICATED ON PLAN SHEET 2.



INDEX OF SHEETS

UT TO DULA THOROUGHFARE

C: CONSTRUCTION SEQUENCE
C-1: MORPHOLOGICAL TABLE / STRUCTURE TABLE - NOT APPLICABLE
C-2: TYPICAL SECTIONS
C-2A, C-2B: GENERAL DETAILS
C-3: SUMMARY OF QUANTITIES / SUMMARY OF EARTHWORK
C-4: EXISTING CONDITIONS
C-5: NEW CHANNEL LAYOUT - NOT APPLICABLE
C-6: SITE PLAN
C-7: PROFILE - UT TO DULLA THOROUGHFARE - NOT APPLICABLE
C-EC1: EROSION CONTROL PLAN
C-EC2: EROSION CONTROL DETAILS
C-L1: PLANTING PLAN
X: CROSS-SECTIONS - NOT APPLICABLE

Prepared in the office of:

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1101 Haynes St., Suite 101
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ENGINEER: DAVID G. MODLIN

PROJECT MANAGER: JAMES D. COOPER

SEAL:

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 026951 BRIAN BURKHART

22Oct07

Prepared for:

ECOSYSTEM ENHANCEMENT PROGRAM
Raleigh, North Carolina

No.	Revisions	Date
1	REV'D SHEETS C-2B, C-3	09/29/05 JDG
2	AS-BUILT	JUL 2007

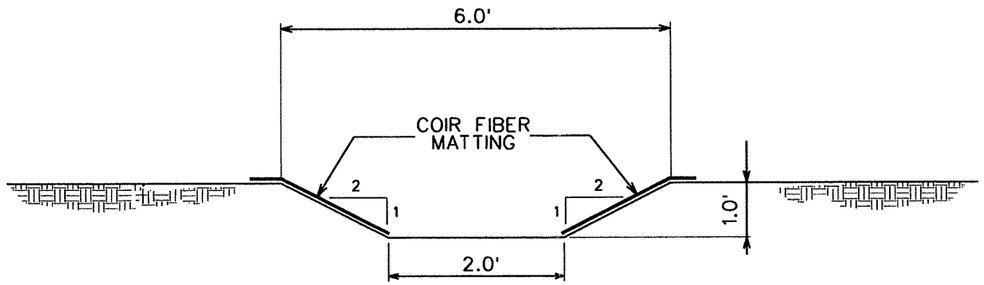
Dsn. By:	Dwn. By:	Ckd. By:
JDC	JDG	EBB

Date: JUL 2007

ESC Project No: 04-212

SHEET

C



TYPICAL CHANNEL CROSS-SECTION

NOTE: USE 6.5-FOOT COIR FIBER EACH SIDE.

NOTE:

1. THE RELIC CHANNEL SHALL NOT BE DISTURBED BUT AS NEEDED. THIS CROSS SECTION IS A GUIDE FOR REQUIRED CHANNEL WORK.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN JR.

Client:

Ecosystem Enhancement PROGRAM

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

TYPICAL SECTIONS

UT TO DULA THOROUGHFARE

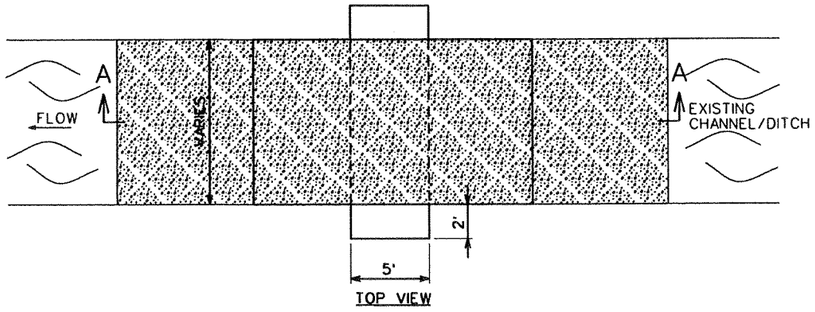
Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET

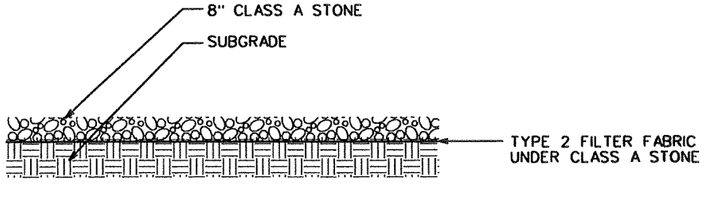
C-2



IMPERVIOUS CHANNEL BLOCK
DULA THOROUGHFARE

NOTE:

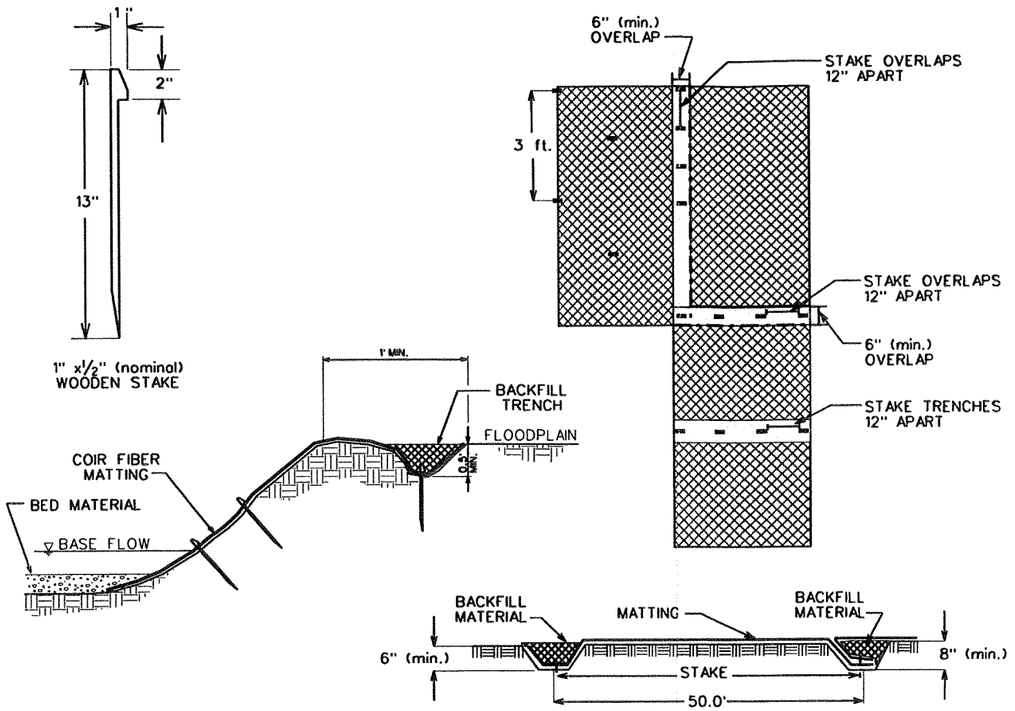
1. CHANNEL PLUG WILL BE INITIALLY FILLED WITH AVAILABLE WASTE AND COMPACTED TO NINETY-FIVE PERCENT STANDARD PROCTOR.
2. THEN A CENTRAL PORTION 5 FEET LONG WILL BE REMOVED AND REPLACED WITH IMPERVIOUS SELECT MATERIAL.
3. THE IMPERVIOUS SELECT MATERIAL WILL BE KEYED INTO THE ORIGINAL BANK A MINIMUM OF 2 FEET AND INTO THE ORIGINAL BED A MINIMUM OF 1 FEET.



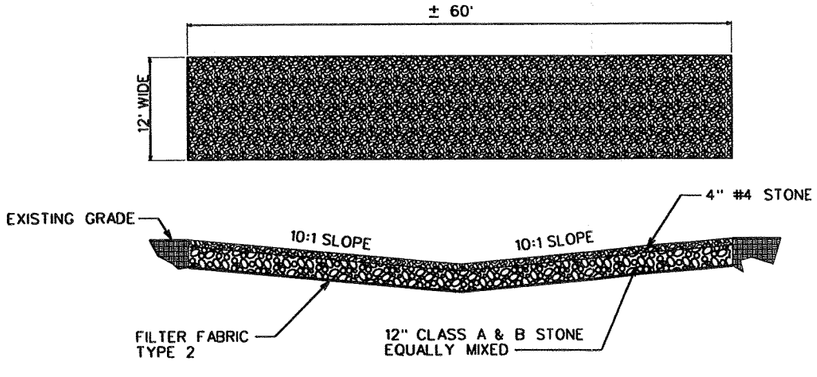
NOTES:

1. THIS IS THE MINIMUM ACCEPTABLE SECTION.

ACCESS ROAD SECTION DETAIL
SUGGESTED OR EQUIVALENT



COIR FIBER MATTING DETAIL



NOTES:

1. CONTRACTOR TO EXCAVATE APPROXIMATELY SIXTEEN INCHES DEEP CHANNEL FOR PERMANENT STREAM CROSSING.
2. LAY FILTER FABRIC ALONG ENTIRE LENGTH OF BED.
3. FILL WITH TWELVE INCHES OF "CLASS A" AND "CLASS B" STONE, EQUALLY MIXED, FOLLOWED BY FOUR INCHES OF #4 STONE TO BRING FINISHED GRADE UP TO LEVEL OF PROPOSED STREAM BED.

PERMANENT CHANNEL FORD

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client:
Ecosystem Enhancement Program

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:
GENERAL DETAILS

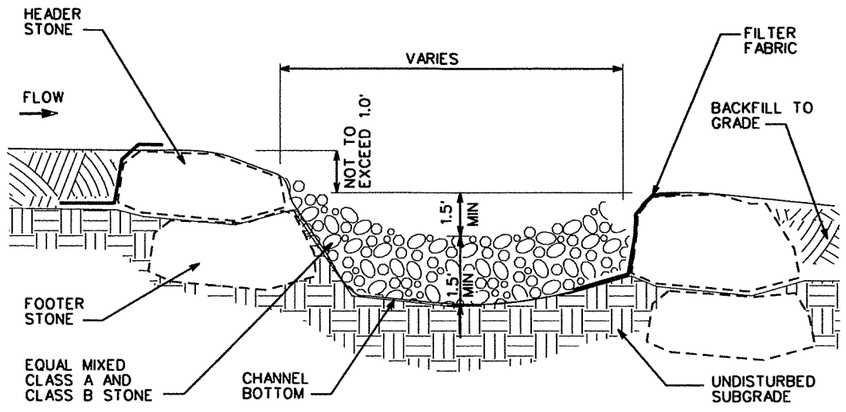
UT TO DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

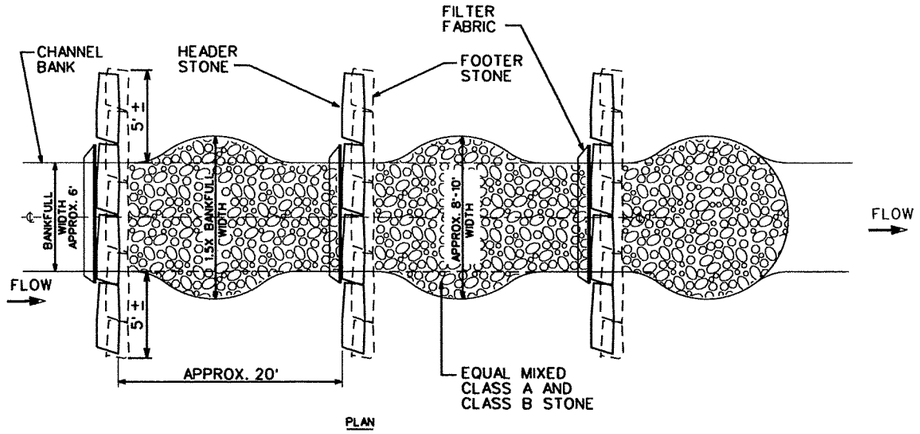
Scale: NO SCALE

ESC Project No.: 04-212

SHEET
C-2A



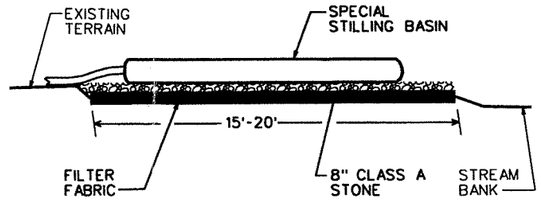
PROFILE



PLAN

TYPICAL ROCK SILL

NOT TO SCALE



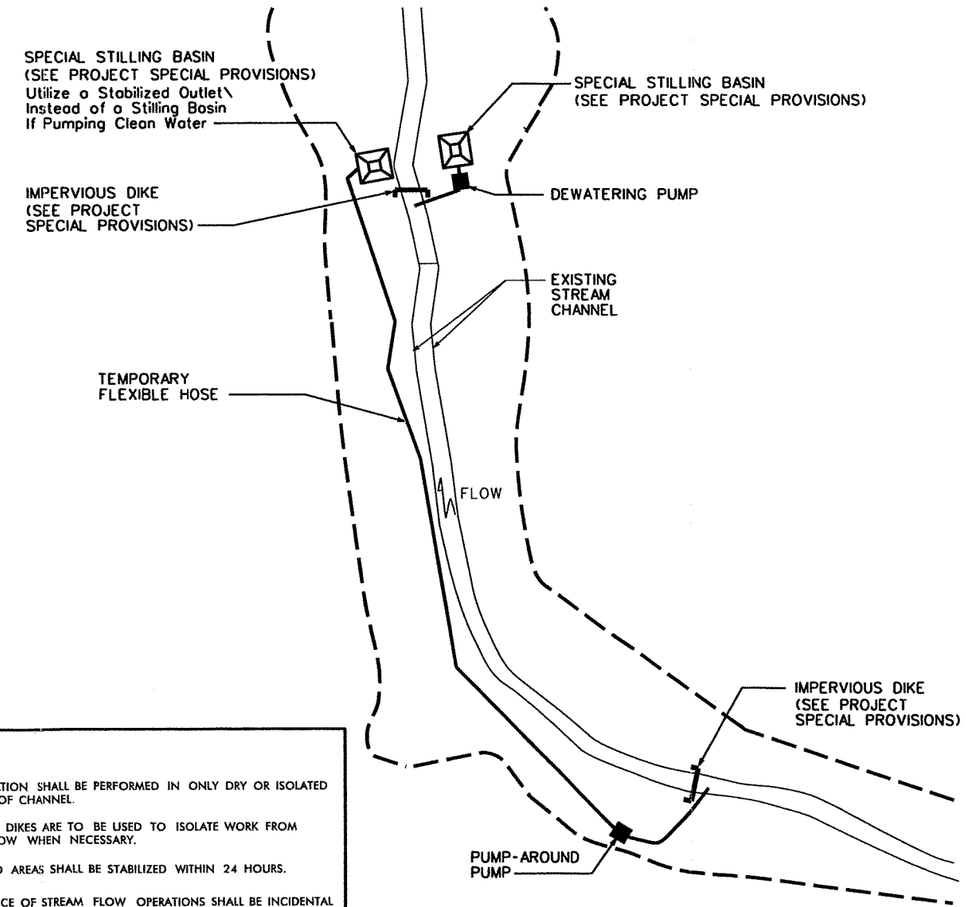
⚠1 NOTE:

1. WHEN PUMPING CLEAN WATER, THE CONTRACTOR MAY PROVIDE A STABILIZED OUTLET BY OMITTING THE SPECIAL STILLING BASIN AND PROVIDING THE ROCK PAD AS SHOWN WITH MINIMUM DIMENSIONS 10 FEET WIDE BY 15 FEET LONG.

SPECIAL STILLING BASIN WITH ROCK PAD

SEQUENCE OF CONSTRUCTION FOR TYPICAL WORK AREA

1. INSTALL SPECIAL STILLING BASIN(S).
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA. AREA TO BE DEWATERED SHALL BE EQUAL TO ONE DAY'S WORK.
5. PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE. (DOWNSTREAM IMPERVIOUS DIKES FIRST).
7. ALL GRADING AND STABILIZATION MUST BE COMPLETED AT THE END OF EACH DAY WITHIN THE PUMP AROUND AREAS BETWEEN THE IMPERVIOUS DIKES. THE IMPERVIOUS DIKE LOCATIONS AS SHOWN ON THIS SHEET ONLY SHOW THE UPPER AND LOWER EXTENT OF WORK FOR EACH STREAM SEGMENT. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF THE IMPERVIOUS DIKE(S) FOR EACH DAY'S WORK.
8. REMOVE SPECIAL STILLING BASIN(S) AND BACKFILL. STABILIZE DISTURBED AREA WITH SEED AND MULCH.



TYPICAL PUMP-AROUND OPERATION

NOTES:

1. ALL EXCAVATION SHALL BE PERFORMED IN ONLY DRY OR ISOLATED SECTIONS OF CHANNEL.
2. IMPERVIOUS DIKES ARE TO BE USED TO ISOLATE WORK FROM STREAM FLOW WHEN NECESSARY.
3. ALL GRADED AREAS SHALL BE STABILIZED WITHIN 24 HOURS.
4. MAINTENANCE OF STREAM FLOW OPERATIONS SHALL BE INCIDENTAL TO THE WORK. THIS INCLUDES POLYETHYLENE SHEETING, DIVERSION PIPES, PUMPS AND HOSES.
5. PUMPS AND HOSES SHALL BE OF SUFFICICIENT SIZE TO DEWATER THE WORK AREA.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS
1 LAND QUALITY COMMENTS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

GENERAL DETAILS

UT TO DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET

C-2B

⚠1 SUMMARY OF QUANTITIES

SUMMARY OF QUANTITIES Bishop Site Stream/Wetland Restoration - UT to Dula Thoroughfare				
ITEM	SPEC	ITEM DESCRIPTION	QUANTITIES	UNIT
53	SP1	Mobilization	1	LS
54	SP2	Construction Surveying	1	LS
55	SP3	Grading	1	LS
56	200	Select Tree Removal	25	EA
57	1056	Filter Fabric, Type 2	6430	SY
58	1605	Temporary Silt Fence	1380	LF
59	SP15	Boulder, Header and Footer	120	TON
60	1610	Stone for Erosion Control, Class A	2400	TON
61	1610	Stone for Erosion Control, Class B	105	TON
62	1610	Stone for Erosion Control, No. 4	14	TON
63	1610	Stone for Erosion Control, No. 57	6	TON
64	1615	Temporary Mulching	4	ACR
65	1620	Seed for Temporary Seeding	260	LB
66	1620	Fertilizer for Temporary Seeding	0.6	TON
67	1630	Silt Excavation	50	CY
68	1660	Permanent Seeding and Mulching	4	ACR
69	SP6	Coir Fiber Matting, 900 gm	1000	SY
70	SP8	Impervious Select Material	40	CY
71	SP9	Pump Around Operation	1	LS
72	SP10	Special Stilling Basin	4	EA
73	SP12	Bare Root Seedlings	16531	EA
74	SP14	Invasive Plant Removal	1	LS
75	SP17	Disking/Scarification	2	ACR

Estimates do include quantities for Class A stone and filter fabric for improved on-site access roads if required by weather conditions. The quantities are approximately 480 T of Class A Stone and 1333 SY filter fabric per 1000 linear feet of 12-foot wide improved access road as shown on the plans. Note that all quantities are estimates for infomation and bid comparison purposes only.

SUMMARY OF EARTHWORK

QUANTITIES IN CUBIC YARDS

UT to DULA THOROUGHFARE

Xsection	Total Cut		EXCAVATION	Total Fill			FILL	BORROW	WASTE
	sq ft	cu ft		sq ft	cu ft	cu ft + %			
0	1.3	0		15.0	0				
991	1.3	1288.3	48	15.0	14865.0	17838	661	613	0
		1288	48		14865		661	613	0
									-613
Project Total			48						-613

APPROXIMATE QUANTITIES ONLY. UNCLASSIFIED EXCAVATION, BORROW EXCAVATION, FINE GRADING AND CLEARING AND GRUBBING WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING." A SHRINKAGE FACTOR OF 1.2 WAS ASSUMED.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS
⚠1 QUANTITIES REVISED

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:
BISHOP SITE STREAM / WETLAND RESTORATION PLAN
ANSON COUNTY, NORTH CAROLINA

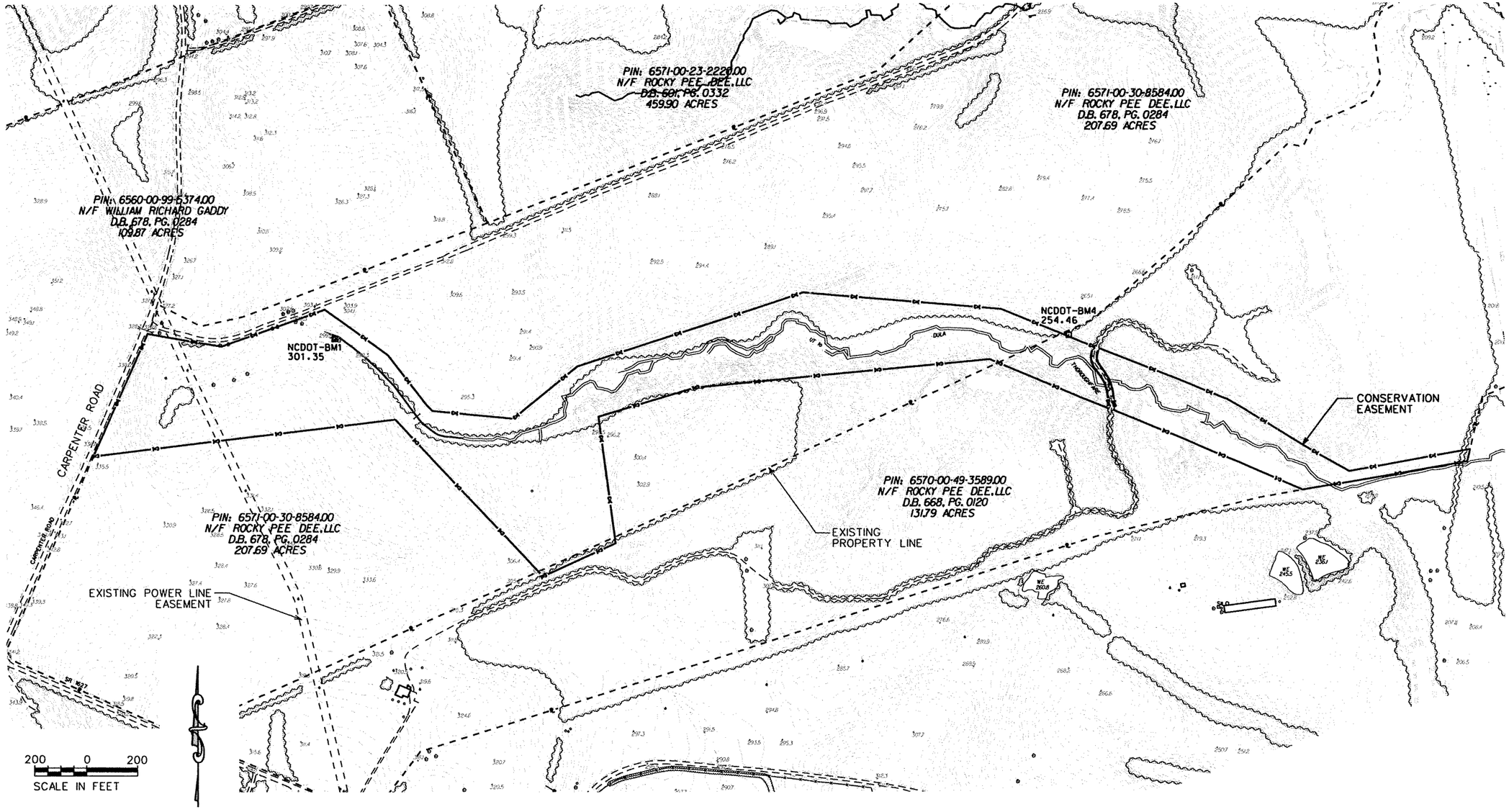
Title:
SUMMARY OF QUANTITIES / SUMMARY OF EARTHWORK
UT TO DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: NO SCALE

ESC Project No.: 04-212

SHEET
C–3



BENCHMARKS

LOCATION	TYPE	EASTING	NORTHING	ELEVATION
NCDOT BM1	RR SPIKE IN TREE	1671382.477	509938.956	301.35
NCDOT BM4	RR SPIKE IN TREE	1674222.110	509949.013	254.46

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement Program

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

EXISTING CONDITIONS

UT TO DULA THOROUGHFARE

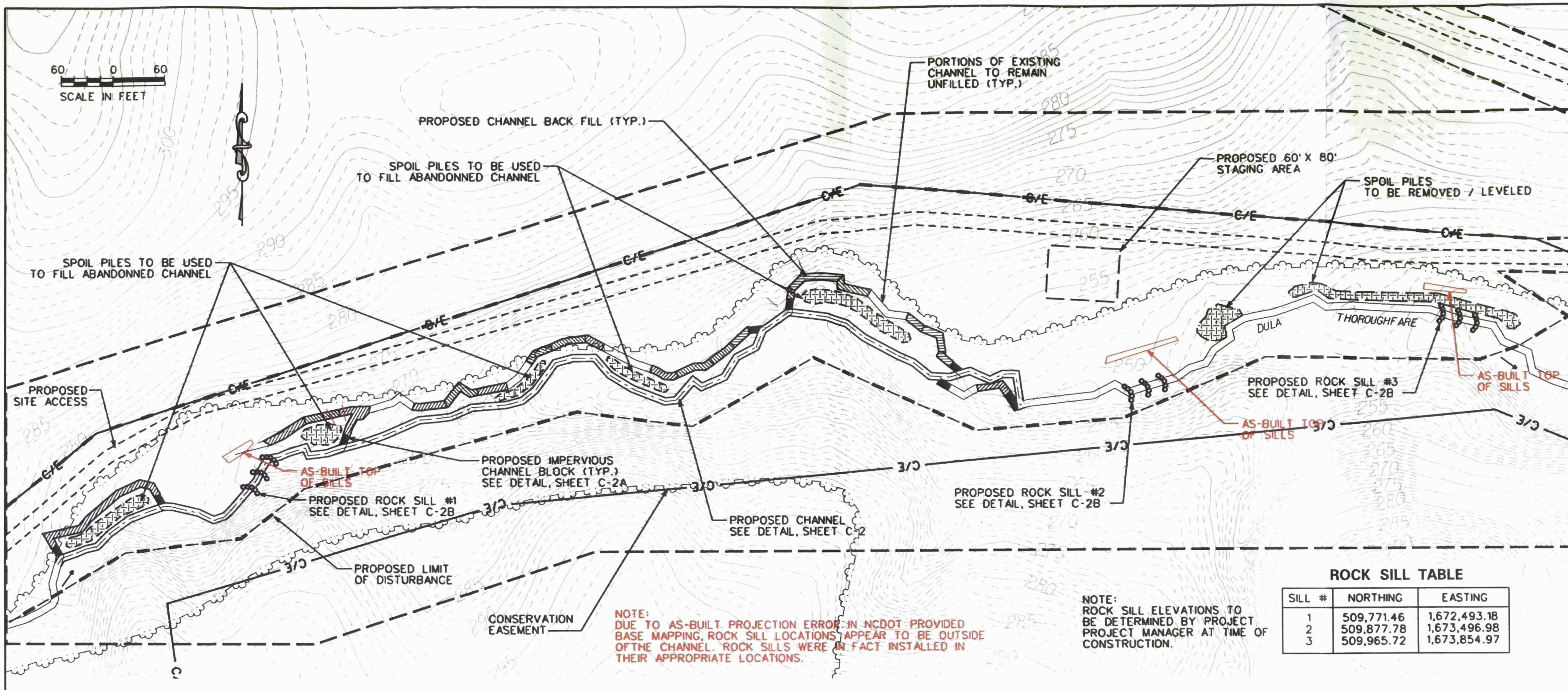
Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: AS SHOWN

ESC Project No.: 04-212

SHEET

C-4

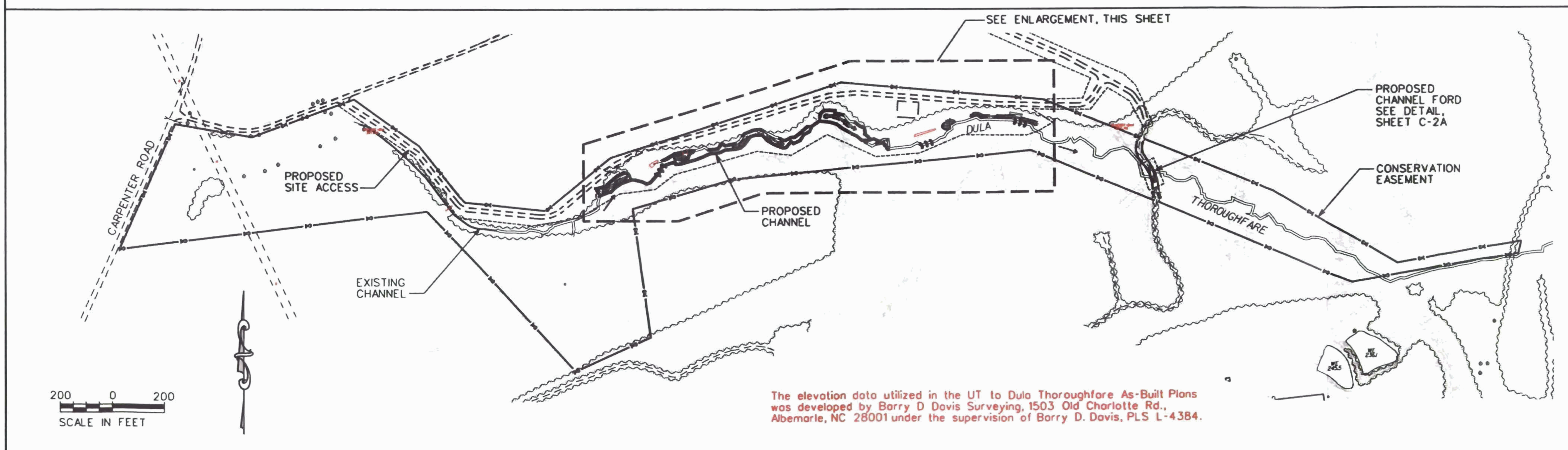


NOTE:
DUE TO AS-BUILT PROJECTION ERROR IN NCDOT PROVIDED BASE MAPPING, ROCK SILL LOCATIONS APPEAR TO BE OUTSIDE OF THE CHANNEL. ROCK SILLS WERE IN FACT INSTALLED IN THEIR APPROPRIATE LOCATIONS.

NOTE:
ROCK SILL ELEVATIONS TO BE DETERMINED BY PROJECT PROJECT MANAGER AT TIME OF CONSTRUCTION.

ROCK SILL TABLE

SILL #	NORTHING	EASTING
1	509,771.46	1,672,493.18
2	509,877.78	1,673,496.98
3	509,965.72	1,673,854.97



The elevation data utilized in the UT to Dula Thoroughfare As-Built Plans was developed by Barry D Davis Surveying, 1503 Old Charlotte Rd., Albemarle, NC 28001 under the supervision of Barry D. Davis, PLS L-4384.

EcoScience Corporation
Raleigh, North Carolina

REVISIONS
1 AS-BUILT - JULY 2007

NORTH CAROLINA PROFESSIONAL SEAL 024...
22Oct07

Client: Ecosystem Enhancement PROGRAM

Project: BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title: SITE PLAN

UT TO DULA THOROUGHFARE

Dsn. By: JDC	Dwn. By: MAF
Ckd. By: EBB	Date: JUL 2007

Scale: AS SHOWN

ESC Project No.: 04-212

SHEET

C-6

60 0 60
SCALE IN FEET

PROPOSED CHANNEL BACK FILL (TYP.)
PROPOSED SITE ACCESS
EXISTING SPOIL PILE (TYP.)
PROPOSED 60' X 80' STAGING AREA
PROPOSED SILT FENCE (TYP.) SEE DETAIL, SHEET C-EC2
PROPOSED ROCK SILL (TYP.) SEE SHEET C-6 FOR EXACT LOCATIONS
PROPOSED CHANNEL
PROPOSED IMPERVIOUS CHANNEL BLOCK (TYP.)
PROPOSED STONE OUTLET (TYP.) SEE DETAIL, SHEET C-EC2
LIMITS OF DISTURBANCE
CONSERVATION EASEMENT
DULA
THOROUGHFARE
C/E
3/O

SEE ENLARGEMENT, THIS SHEET
CARPENTER ROAD
PROPOSED SITE ACCESS
EXISTING CHANNEL
NEW CHANNEL LOCATION
PROPOSED CHANNEL FORD SEE DETAIL SHEET C-2A
CONSERVATION EASEMENT
DULA
THOROUGHFARE

200 0 200
SCALE IN FEET

EcoScience Corporation
Raleigh, North Carolina

REVISIONS

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

Client: Ecosystem Enhancement PROGRAM

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

EROSION CONTROL PLAN

UT TO DULA THOROUGHFARE

Dsn. By:	Dwn. By:
JDC	MAF
Ckd. By:	Date:
DGM	JUN 2005

Scale: AS SHOWN

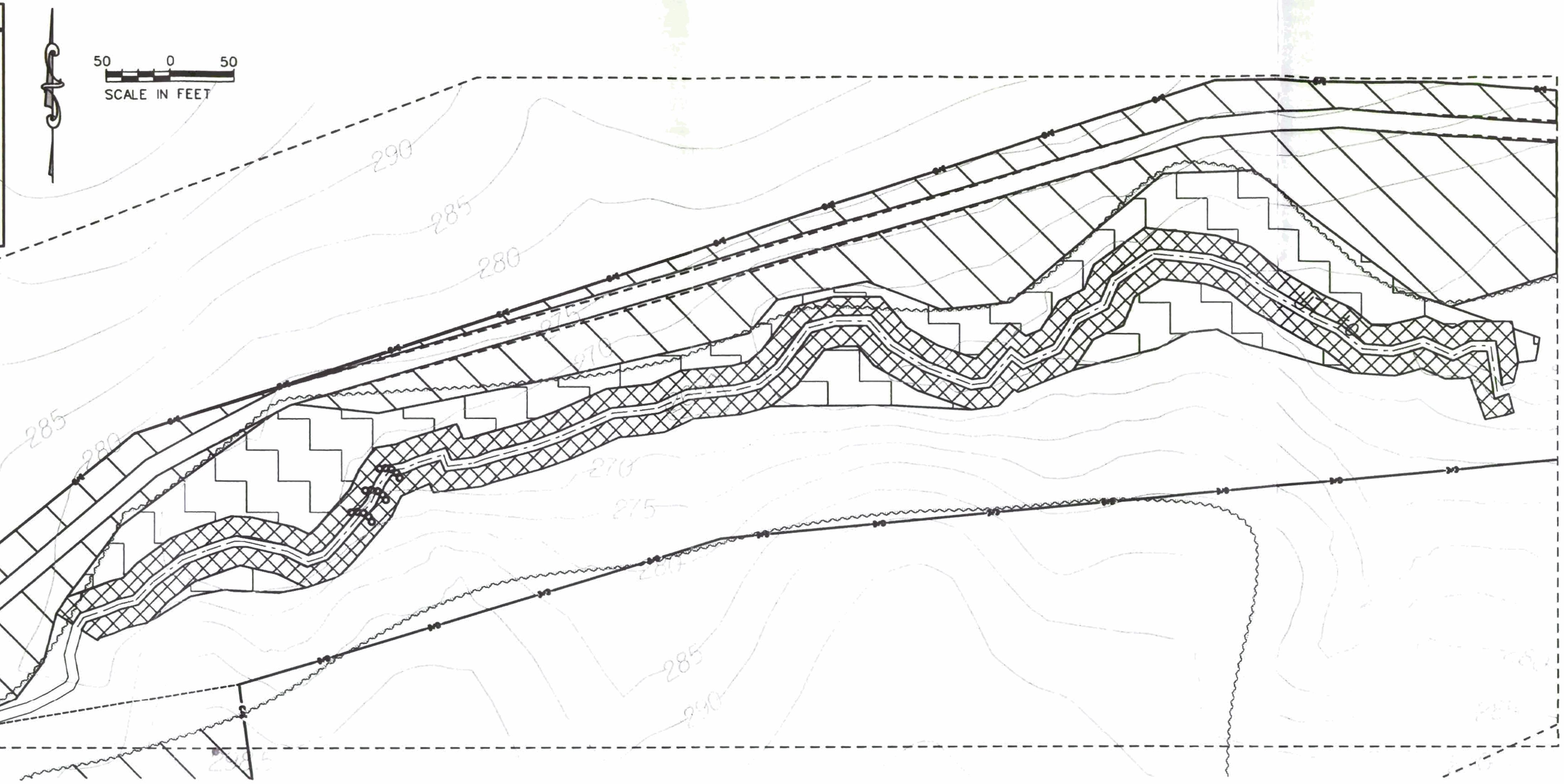
ESC Project No.: 04-212

SHEET

C-EC1

PLANT COMMUNITIES

STREAMSIDE ASSEMBLAGE (15' EACH SIDE OF CHANNEL)	0.9 ACRES
MESIC MIXED HARDWOOD FOREST	17.6 ACRES
BOTTOMLAND HARDWOOD FOREST	3.1 ACRES
TOTAL:	21.6 ACRES

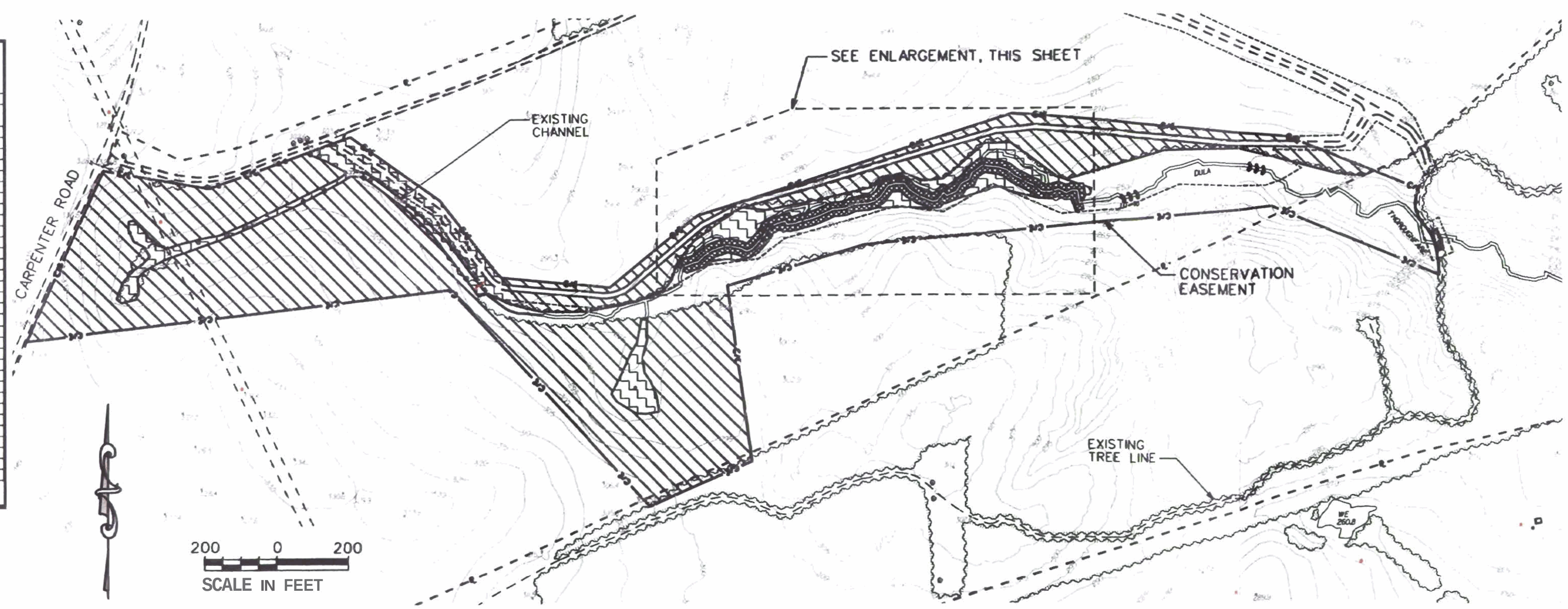


PLANTING TABLE

Vegetation Association		Bottomland Hardwood Forest		Stream-side Assemblage		Mesic Mixed Hardwood Forest		Total	Total
Stems/Acre (Spacing)		680 (8 feet x 8-feet)		2720 (4 feet x 4-feet)		680 (8-feet x 8-feet)			
Planted Area (acres)		3.1		0.9		17.6		21.6	
Species[1]	Common Name	Number Planted	% of Total	Number Planted	% of Total	Number Planted	% of Total	Number Planted	Number Planted
Quercus michauxii	swamp chestnut oak	190	9					190	200
Ulmus americana	American elm	148	7					148	200
Celtis laevigata	sugarberry	148	7					148	200
Fraxinus pennsylvanica	green ash	148	7					148	400
Carya ovata	shagbark hickory	148	7					148	200
Quercus phellos	willow oak	190	9					190	200
Nyssa biflora	swamp tupelo	148	7					148	400
Platanus occidentalis	sycamore	148	7					148	200
Quercus nigra	water oak	148	7					148	400
Carya cordiformis	bitter-nut hickory	148	7					148	
Quercus pagoda	cherrybark oak	148	7					148	200
Carpinus caroliniana	musclewood	148	7					148	
Asimina triloba	pawpaw	126	6					126	200
Ilex opaca	American holly	126	6			957	8	1083	
Arundinaria gigantea	giant cane			196	8			196	
Betula nigra	river birch			294	12			294	1100
Cornus amomum	silky dogwood			245	10			245	900
Salix nigra[2]	black willow			245	10			245	
Alnus serrulata	tag alder			245	10			245	
Cephalanthus occidentalis	buttonbush			245	10			245	900
Sambucus canadensis	elderberry			245	10			245	
Viburnum dentatum	arrow-wood			245	10			245	
Viburnum nudum	possum-haw			245	10			245	
Vaccinium corymbosum	highbush blueberry			245	10			245	
Fagus grandifolia	American beech					1676	14	1676	1700
Carya tomentosa	mockernut hickory					1436	12	1436	1500
Carya glabra	sweet pignut hickory					1436	12	1436	1500
Quercus alba	white oak					1915	16	1915	2000
Quercus rubra	northern red oak					1676	14	1676	1700
Quercus falcata	southern red oak					1676	14	1676	1700
Cornus florida	dogwood					1197	10	1197	1200
Total		**2112**	**100**	**2450**	**100**	**11969**	**100**	**16531**	**17000**

[1] All stems are to be bare-root seedlings except where noted

[2] Live stakes are acceptable for black willow individuals if bare-root seedlings are unavailable



EcoScience Corporation
Raleigh, North Carolina

REVISIONS	
1	AS-BUILT - JULY 2007

NORTH CAROLINA PROFESSIONAL SEAL 028351 ENGINEER

22oct07

Client:

Ecosystem Enhancement PROGRAM

Project:

BISHOP SITE STREAM / WETLAND RESTORATION PLAN

ANSON COUNTY, NORTH CAROLINA

Title:

PLANTING PLAN

UT TO DULA THOROUGHFARE

Dsn. By: JDC	Dwn. By: MAF
Ckd. By: EBB	Date: JUL 2007
Scale: AS SHOWN	
ESC Project No.: 04-212	

SHEET

C–L1