Little Grassy Creek Project
Mitigation Plan Report
Granville County, North Carolina

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Date Submitted:	March 2008

EXECUTIVE SUMMARY

The Little Grassy Creek site was preserved and enhanced through an On-call contract with the North Carolina Ecosystem Enhancement Program (NCEEP). This report documents the completion of the stream enhancement construction and presents base-line as-built monitoring data for the five-year monitoring period. Table 1 summarizes site conditions before and after enhancement as well as the conditions predicted in the previously completed site restoration plan. The monitoring plan and as-built baseline data are discussed in detail in Sections 2.1 through 2.5 of this report.

Table 1
Background Information

Preconstruction Site Conditions			
Site			
Location	Granville County, NC (Exhibit 1), southwest of the town of Stovall		
USGS Hydro Unit	03010103		
NCDWQ Sub-basin	03-02-06		
Contract Mitigation Units	Not Applicable		
Stream			
Reach	**Length**	**Condition**	**Drainage Area**
UT1	2,643 LF	Downstream-Lateral Instability, & Degraded C6/1-E6	0.24 Mi^2
Little Grassy Creek	12,624 LF	Moderately stable E4	8.1 Mi^2
Restoration Plan			
Stream			
Reach	**Restoration/Enhancement Type**		**Length (LF)**
UT1	Stream & Riparian Buffer Preservation Stream Enhancement		2,174 469
Little Grassy Creek	Stream & Riparian Buffer Preservation Stream Enhancement		12,524 100
Post-Construction Site Conditions			
Stream			
Reach	**Restoration/Enhancement/Preservation Type**	**Length (LF)**	**SMU**
UT1	Preservation	164	33
UT1	Enhancement	2,464	985
Little Grassy Creek	Preservation	12,546	2,509
Little Grassy Creek	Enhancement	75	30
Riparian Buffer Acreage			
Planted Riparian Buffer Acreage	5.2 Ac		
Controlling Invasive Species Acreage	7.5 Ac		

Ecological Benefits	
Water Quality	Nutrient removal; erosion reduction; increased dissolved oxygen concentrations; and improved stream bank stability.
Water Quantity/Flood Attenuation	Improved hydrologic connections.
Aquatic and Terrestrial Habitat	Improved substrate and in-stream cover; reduced water temperature by increasing shading; enhancing terrestrial habitat; improved aesthetics.
Monitoring Plan	
Success Criteria	Success is measured with permanent cross-sections, vegetation plots, and photographic documentation conducted annually for a period of five years.
Methodology	Cross-sections will be surveyed annually and tied to a common benchmark. Each tree within the 100-square-meter vegetation plots are flagged and identified. Measurements of height and diameter are also taken and annual survival rates are recorded. Photos will be taken of cross-sections, vegetation plots, and of the in-stream structure.
Remedial Action	N/A

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Tables and Exhibits

Appendices

1.0 Background Information

The Little Grassy Creek Restoration site is located in Granville County, NC (Exhibit 1), two miles southwest of the town of Stovall on Gela Road, which is off NC Highway 15 north of the City of Oxford. The site lies in the Roanoke River Basin within North Carolina Division of Water Quality sub-basin 03-02-06 and targeted local watershed 03010102 (Exhibit 1). The project area is approximately five miles downstream of the headwaters of Little Grassy Creek.

Land use on the site consists primarily of agriculture with limited forested areas around the perimeter. Overall, Little Grassy Creek has a stable pattern and the downstream portion of the site has a greater diversity of bedform in terms of riffle and pool sequences. The upstream portion of the site had natural bedrock grade control above Gela Road. UT1 drains a small, agricultural/forested watershed and is classified as a C5 stream type upstream, transitioning to an E5 stream type downstream.

The project involved the preservation of 12,710 linear feet (LF) of stream and 2,539 linear feet of stream enhancement. Table 1 summarizes site conditions before and after enhancement as well as the conditions predicted in the previously completed site restoration plan. Exhibit 2 summarizes the conservation easement areas on the project site. Selected site photographs are shown in Appendix A. A total of 55.5 acres of stream and riparian buffer are protected through a permanent conservation easement. Exhibit 3 summarizes the watershed areas on the project site.

Table 1
Background Information

Preconstruction Site Conditions			
Site			
Location	Granville County, NC (Exhibit 1), southwest of the town of Stovall		
USGS Hydro Unit	03010103		
NCDWQ Sub-basin	03-02-06		
Contract Mitigation Units	Not Applicable		
Stream			
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Post-Construction Site Conditions			
Stream			
Reach	**Restoration/Enhancement/Preservation Type**	**Length (LF)**	**SMU**
UT1	Preservation	164	33

Table 1 Background Information			
UT1	Enhancement	2,464	985
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Little Grassy Creek	Enhancement	75	30
Riparian Buffer Acreage			
Planted Riparian Buffer Acreage	5.2 Ac		
Controlling Invasive Species Acreage	7.5 Ac		

Ecological Benefits	
Water Quality	Nutrient removal; erosion reduction; increased dissolved oxygen concentrations; and improved stream bank stability.
Water Quantity/Flood Attenuation	Improved hydrologic connections.
Aquatic and Terrestrial Habitat	Improved substrate and in-stream cover; reduced water temperature by increasing shading; enhancing terrestrial habitat; improved aesthetics.
Monitoring Plan	
Success Criteria	Success is measured with permanent cross-sections, vegetation plots, and photographic documentation conducted annually for a period of five years.
Methodology	Cross-sections will be surveyed annually and tied to a common benchmark. Each tree within the 100-square-meter vegetation plots are flagged and identified. Measurements of height and diameter are also taken and annual survival rates are recorded. Photos will be taken of cross-sections, vegetation plots, and of the in-stream structure.
Remedial Action	N/A

1.1 Restoration Summary

Directions to the site are as follows: To access the site, take I-85 North to exit 202 to Oxford, and then take US highway 15 towards Stovall. Turn left onto Gela Road and travel 0.5 mile and then turn right onto Sam Young Road. The site and UT1 are on the left approximately 0.5 mile from the intersection. The site is accessed via a gated driveway.

1.1.1 Mitigation Goals Restoration Approach

The specific goals for the Little Grassy Creek Project were as follows:

- Stabilizing the banks on 469 feet of UT1 and 100 feet on Little Grassy Creek
- Controlling invasive species for 7 acres along UT1
- Enhancing stream buffer on approximately 8.3 acres along UT1 and Little Grassy Creek
- Preserving approximately 14,698 feet of stream along UT1 and Little Grassy Creek
- Establishing native streambank and floodplain vegetation in the permanent conservation easement
- Improving water quality in the Little Grassy Creek watershed by restoring the riparian buffer and reducing bank erosion.

1.1.2 Projection Description and Restoration Approach

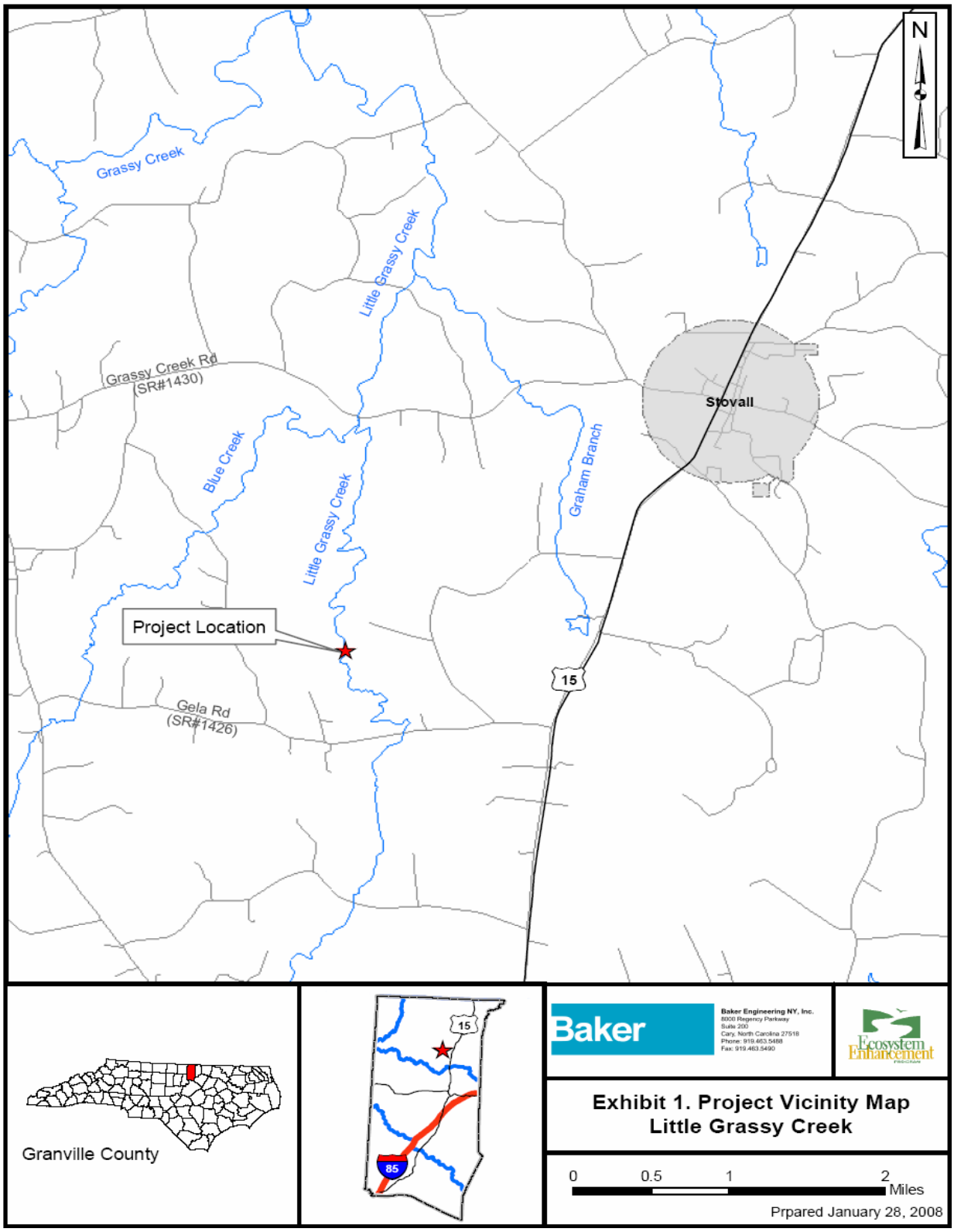
To accomplish project goals, stream bank stabilization structures were added to the lower section of UT1 and an in-stream structure was installed on Little Grassy Creek. Invasive vegetation was removed and native vegetation was re-established.

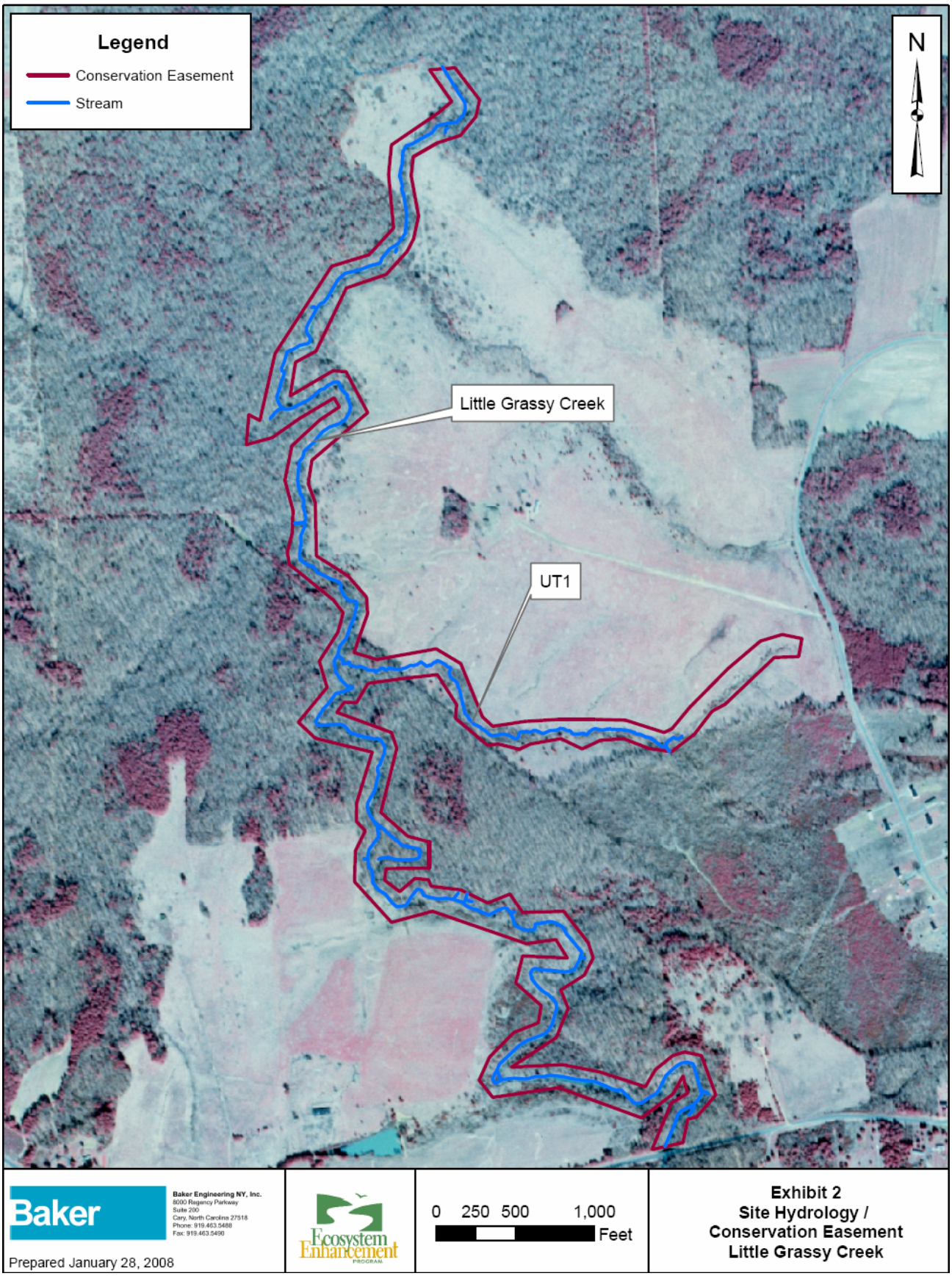
1.1.3 Project Design

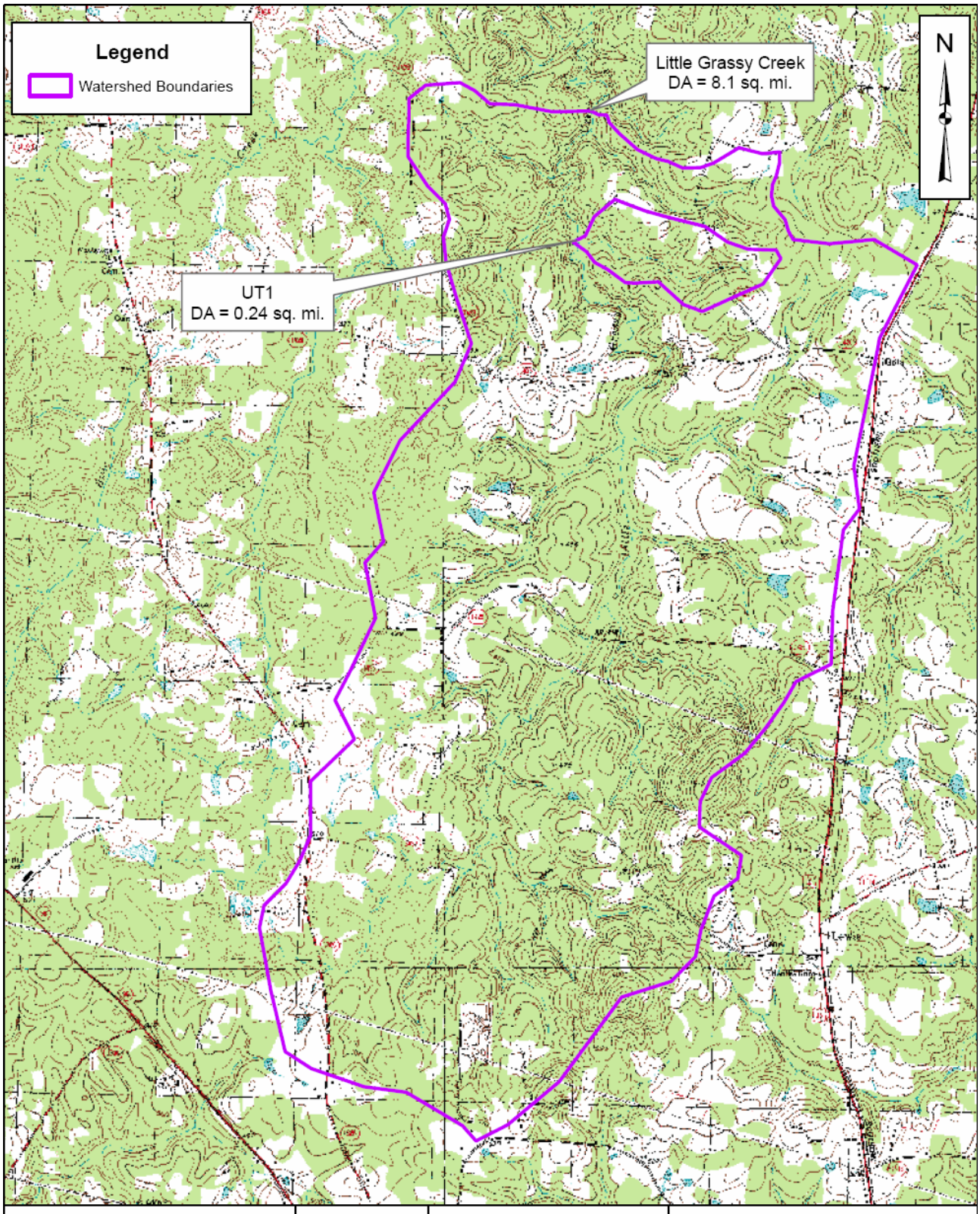
The stream restoration design for UT1 at the confluence with Little Grassy Creek allows stream flows larger than bankfull to spread onto the floodplain, dissipating flow energies and reducing stress on streambanks. In-stream structures on UT1 consisted of root wads which were used to reduce streambank stress, as well as promote bedform sequences and habitat diversity. The restoration design for Little Grassy Creek included the installation of a cross vane at the downstream portion of the site. The cross vane was used to create grade control, as well as reduce streambank stress and create habitat diversity. The ford crossing above the cross vane required the removal of an existing, failed concrete ford crossing, which was replaced with a permanent stone ford crossing. Another ford crossing was reconstructed to provide access to other areas of the site and also provides habitat diversity. By landowner request, a culvert for an unnamed tributary (UT) to Little Grassy Creek was repaired and stabilized in order to provide road access across the UT to other parts of the property. The culvert was outside the conservation easement area.

Streambanks in both areas were stabilized using a combination of erosion control matting, temporary and permanent seeding, bare-root planting. The purpose of the project was to restore stream functions to the impaired reaches at the site. Native vegetation was planted across the site, and the entire site is protected through a permanent conservation easement. Invasive species were cleared on the site during the construction phase and will be monitored for any re-establishment

1.2 Project Maps




Legend
Conservation Easement
Stream
N
Little Grassy Creek
UT1
Baker
Baker Engineering NY, Inc.
8000 Regency Parkway
Suite 200
Cary, North Carolina 27518
Phone: 919.463.5488
Fax: 919.463.5490
Prepared January 28, 2008
Ecosystem Enhancement Program
0 250 500 1,000
Feet
Exhibit 2
Site Hydrology /
Conservation Easement
Little Grassy Creek


Legend
Watershed Boundaries
Little Grassy Creek
DA = 8.1 sq. mi.
UT1
DA = 0.24 sq. mi.
N
Baker
Baker Engineering NY, Inc.
8000 Regency Parkway
Suite 200
Cary, North Carolina 27518
Phone: 919.463.5488
Fax: 919.463.5490
Prepared January 28, 2008
Ecosystem Enhancement Program
0 1,000 2,000 4,000
Feet
Exhibit 3
Watershed Boundaries
Little Grassy Creek

1.3 Construction Summary and Tables

Construction activities, in accordance with the approved restoration plan for the site, began in September 4, 2007 with site preparation, harvesting of root wads, and establishment of access sites and stockpile areas. Materials were stockpiled as needed for the initial stages of construction. Construction stakeout began September 5, 2007. Construction was completed within 14 working days.

Construction of the in-stream structure (cross vane) for enhancement portion of Little Grassy Creek began at approximately 126+00, downstream of a failed concrete ford crossing. Upon completion of the cross vane structure, the banks were seeded, mulched, matted, and livestaked. The concrete ford crossing was removed and replaced with a stone ford crossing. The as-built cross-section and longitudinal profile are shown in Appendix B. Further upstream along Little Grassy Creek, near station 88+00, an existing ford crossing and its sideslopes were reconstructed for stability and an adjacent culvert (outside the conservation easement) was repaired and stabilized on-site as a landowner's requirement.

UT1 construction consisted of fence removal, invasive species removal, riparian buffer planting, bank sloping, and installation of root wads to add bank protection and help stabilize meander bends. The final as-built enhancement stream length for the UT1 project was broken into two areas separated by 164 feet of preservation. The downstream construction consisted of 270 feet of bank sloping, root wad installation, and riparian buffer planting. The as-built cross-sections and longitudinal profile are shown in Appendix B. The upstream construction consisted of 2,464 feet of invasive species removal and riparian buffer planting. The lengths of preservation and enhancement are indicated in Table 2.

Table 2
Summary of As-built Lengths, Mitigation Units, and Restoration Approaches

Reach Name	As-built Length (ft)	Existing Length (ft)	SMU	Restoration Approach
Little Grassy	12,546	12,624	2509	Preservation
Little Grassy	75		30	Enhancement
UT1	164	2,643	33	Preservation
UT1	2,464		985	Enhancement
Total Length	**15,249**	**15,267**		

2.0 Monitoring Plan

The five-year monitoring plan for the Little Grassy site includes criteria to evaluate the success of the vegetation, and stream components of the project. The specific locations of vegetation plots and permanent cross-sections are shown on the as-built drawing sheets. Photo points are located at each of the grade control structures along the enhanced stream channel.

2.1 Stream Monitoring

Geomorphic monitoring of enhanced stream reaches will be conducted for five years to evaluate the effectiveness of the enhancement practices. Monitored stream parameters include stream dimension (cross-sections) and photographic documentation. The methods used and any related success criteria are described below for each parameter.

2.1.1 Cross-sections

Four permanent cross-sections were surveyed and were established with an effort made to include both riffles and pools. Each cross-section was marked on both banks with permanent pins to establish the exact transect used. For monitoring, a common benchmark will be used for cross-sections and consistently used to facilitate the comparison of year-to-year data. The annual cross-section survey will include points measured at all breaks in slope, including top of bank, bankfull, inner berm, edge of water and thalweg and at two-foot intervals between. Calculations will be made of width/depth ratio, entrenchment ratio, and low bank height ratio. Riffle cross-sections will be classified using the Rosgen stream classification system.

There should be little or no change in as-built cross-sections from year to year. If changes do take place they should be evaluated to determine if they represent a movement toward a more unstable condition (e.g., down-cutting, erosion) or are minor changes that represent an increase in stability (e.g., settling, vegetative changes, deposition along the banks, decrease in width/depth ratio and/or cross-sectional area).

2.1.2 Photo Reference Sites

Photographs used to evaluate enhancement sites will be made with a digital camera. There will be one photo reference site per cross-section showing both banks and the stream channel. The cross vane will also be photographed.

Photographs will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal photos should indicate the absences of developing bars within the channel or an excessive increase in channel depth. Lateral photos should not indicate excessive erosion or continuing degradation of the bank over time. A series of photos over time should indicate successional maturation of riparian vegetation. Vegetative succession should include initial herbaceous growth, followed by increasing densities of woody vegetation, and then ultimately a mature overstory with herbaceous understory.

2.1.2.1 Lateral Reference Photos

Reference photo transects will be taken at each permanent cross-section. Photographs will be taken of both banks at each cross-section. The survey tape will be centered in the photographs of the bank. The water line will be located in the lower edge of the frame, and as much of the bank as possible will be included in each photo. Photographers should make an effort to consistently maintain the same area in each photo over time.

2.1.2.2 Structure Photos

A photograph will be taken of the cross vane at the lower end Little Grassy Creek. Photographers should make every effort to consistently maintain the same area in each photo over time. Photographs will be used to evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures subjectively. Lateral photos should not indicate excessive erosion or continuing degradation of the banks. A series of photos over time should indicate successive maturation of riparian vegetation.

2.2 Vegetation Monitoring

All woody vegetation within monitored survival plots will be flagged and evaluated for at least five years to determine survival rates. A total of 7 staked survival plots shall be evaluated. Plots are 33 feet by 33 feet and all flagged stems will be counted within these plots. Invasive species survival rates will be monitored in these plots as well as survival of planted vegetation. Plots should include both live staked and other planted areas. Success of woody vegetation plantings will be defined as 320 stems per acre after five years. When woody vegetation does not survive, a determination will be made as to the need for replacement; in general, if greater than 25 percent die, replacement will be required. The presence of non-native species shall be evaluated on a yearly basis and removal may be required by hand cutting and/or herbicide treatment. Herbaceous vegetation, primarily native grasses, planted at the site shall have at least 95 percent coverage of the seeded/planted area. No bare patches shall exceed 10 square feet. Any herbaceous vegetation not meeting these criteria shall be replaced. At a minimum, at all times ground cover at the project site shall be in compliance with the North Carolina Erosion and Sedimentation Control Ordinance.

2.3 Maintenance and Contingency Plan

Maintenance requirements vary from site to site and are generally driven by the following conditions:

- Projects without established, woody floodplain vegetation are more susceptible to erosion from floods than those with a mature, hardwood forest
- Projects with sandy, non-cohesive soils are more prone to short-term bank erosion than cohesive soils or soils with high gravel and cobble content
- Alluvial valley channels with wide floodplains are less vulnerable than confined channels
- Wet weather during construction can make accurate channel and floodplain excavations difficult
- Extreme and/or frequent flooding can cause floodplain and channel erosion
- Extreme hot, cold, wet, or dry weather during and after construction can limit vegetation growth, particularly temporary and permanent seed
- The presence and aggressiveness of invasive species can affect the extent to which a native buffer can be established.

Maintenance issues and recommended remediation measures will be detailed and documented in the monitoring reports. Factors that may have caused any maintenance needs, including any of the conditions listed above, shall be discussed. NCEEP approval will be obtained prior to any remedial action.

2.4 Monitoring Results – 2008 As-Built Data

The five-year monitoring plan for the Little Grassy site includes criteria to evaluate the success of the vegetation and stream components of the project. The specific locations of vegetation plots, permanent cross-sections are shown on the as-built drawing sheets in Appendix C. A photo point, located on the left top of bank downstream of cross vane along the enhanced section of Little Grassy Creek, is located on the as-built drawing sheet seven in Appendix C.

2.4.1 Morphology

For monitoring stream success criteria, four permanent cross-sections were installed. The permanent cross-sections will be used to monitor channel dimension and bank erosion over time. The permanent cross-section data for the as-built condition are provided in Appendix B. The locations of the permanent cross-sections are shown on the as-built plan sheets in Appendix C.

2.4.1.1 Results and Discussion

No results are available at the submittal of this report. As-built morphology data will be compared with first year monitoring data in the Year 1 Monitoring Report, scheduled for submittal to NCEEP during December 2008.

2.4.2 Vegetation

Based on preliminary analysis and field investigations, riparian buffer enhancement is intended for areas within the property where existing vegetation has been reduced or thinned due to agricultural activities and land clearing. Enhancement of floodplain forest and stream-side habitat allows for development and expansion of characteristic vegetative species across the landscape. Ecotonal changes between community types contribute to habitat diversity and provide secondary benefits, such as enhanced feeding and nesting opportunities for mammals, birds, amphibians, and other wildlife. Planting was performed during January 2008 to allow plants to stabilize during the dormant period and set root during the spring season.

On-site observations and community descriptions from *Classification of the Natural Communities of North Carolina* (Schafale and Weakley 1990) was used to develop the primary plant community associations that would be promoted during community restoration activities. The site includes approximately 5.2 acres of riparian buffer enhancement.

A bottomland hardwood forest is the targeted community for riparian buffer enhancement activities. The vegetation selected for enhancement includes species with high value for habitat, sediment stabilization, rapid growth rates, and the ability to withstand hydraulic forces associated with bankfull flow and overbank flood events that occur near Little Grassy Creek. Certain opportunistic species that may dominate the early successional forests within bottomland hardwood forests have been excluded from riparian buffer restoration efforts with the anticipation that natural regeneration will occur from existing local species. Opportunistic species consist primarily of red maple (*Acer rubrum*), box elder (*Acer negundo*), and Sweetgum (*Liquidambar styraciflua*). These species should also be considered important components of bottomland forests where species diversity has not been jeopardized.

Table 3
Vegetation Species Planted Across the Restoration Site

Scientific Name	Common Name	Percent Planted by Species	Total Number of Stems
Bare Root Trees Species			
Betula nigra	River Birch	9%	275
Acer rubrum	Red maple	6%	183
Fraxinus pennsylvanica	Green Ash	9%	275
Platanus occidentalis	Sycamore	12%	366

Table 3
Vegetation Species Planted Across the Restoration Site

Scientific Name	Common Name	Percent Planted by Species	Total Number of Stems
Quercus phellos	Willow Oak	6%	183
Diospyros virginiana	Persimmon	6%	183
Liriodendron tulipifera	Tulip poplar	12%	366
Carpinus carolinina	Ironwood	6%	183
Cercis canadensis	Redbud	6%	183
Corylus americana	American hazelnut	8%	244
Lindera benzoin	Spicebush	16%	488
Sambucus canadensis	Elderberry	4%	122
Native Herbaceous Species			
Elymus virginicus	Virginia wildrye	15%	N/A
Panicum virgatum	Switchgrass	15%	N/A
Tripsicum dactyloides	Gamma grass	5%	N/A
Polygonum pennsylvanicum	Smartweed	5%	N/A
Juncus effusus	Soft rush	5%	N/A
Schizachyrium scoparium	Little bluestem	5%	N/A
Agrostis alba	Redtop	10%	N/A
Bidens frondosa	Tick seed	10%	N/A
Coreopsis lanceolata	Lance leaf coreopsis	10%	N/A
Panicum clandestinum	Deer tongue	10%	N/A
Andropogon gerardii	Big bluestem	5%	N/A
Sorgastrum nutans	Indian grass	5%	N/A
Woody Vegetation for Live Stakes			
Cornus amomum	Silky Dogwood	40%	400
Physocarpus opulifolius	Ninebark	10%	100
Salix serecia	Silky Willow	40%	400
Sambucus canadensis	Elderberry	10%	100

The restoration plan for the Little Grassy site specifies that the number of quadrants required were based on the species/area curve method, as described in NCEEP monitoring guidance documents, with a minimum of six quadrants. The sizes of individual quadrants are 100 square meters for woody tree species, and 1 square meter for herbaceous vegetation. A total of 7 vegetation plots, each 10 meters by 10 meters in size, were established across the enhanced site. The initial planted density within each of

the vegetation monitoring plots is given in Table 4. The average density of planted bare root stems, based on the data from the 7 monitoring plots, is 705 stems per acre. The locations of the vegetation plots are shown on the as-built plan sheets.

Table 4
Little Grassy Initial Stem Counts for Each Species Arranged by Plot

Scientific Name	Common Name	10 meter X 10 meter plots						
		1	2	3	4	5	6	7
Betula nigra	River Birch	2	2	1	2	2	1	1
Acer rubrum	Red maple	1	1	1	1	1	1	1
Fraxinus pennsylvanica	Green Ash	2	2	1	2	2	1	1
Platanus occidentalis	Sycamore	2	2	2	2	3	2	2
Quercus phellos	Willow Oak	1	1	1	1	1	1	1
Diospyros virginiana	Persimmon	1	1	1	1	1	1	1
Liriodendron tulipifera	Tulip poplar	2	2	2	2	3	2	2
Carpinus carolinina	Ironwood	2	1	1	1	1	1	1
Cercis canadensis	Redbud	1	1	1	1	1	1	1
Corylus americana	American hazelnut	2	2	1	1	2	1	1
Lindera benzoin	Spicebush	3	3	2	3	4	2	2
Sambucus canadensis	Elderberry	1	1	1	1	1	1	1
Totals:		20	19	13	18	24	15	13
Stems / Acre		809	769	526	728	971	607	526

2.4.2.1 Results and Discussion

No results are available at the submittal of this report. As-built data will be compared with first year monitoring data in the Year 1 Monitoring Report, scheduled for submittal to NCEEP during December 2008.

2.5 Areas of Concern

No areas of concern have been identified during the first months following completion of the project.

Appendix A

Selected Project Photographs

Little Grassy Creek Photo Log

Photo Point, Vegetation Plots, and Site Photos

Cross vane Photo Point on Little Grassy Creek

Vegetation Plot 1

Vegetation Plot 2

Vegetation Plot 3

Vegetation Plot 4

Vegetation Plot 5

Vegetation Plot 6

Vegetation Plot 7

Cross vane on Little Grassy Creek during final walk-through

Rootwads along UT1

Rootwads along UT1

Rootwads along UT1

Ford crossing above cross vane on Little Grassy Creek

Ford crossing near the mill on Little Grassy Creek

Invasive species removal – cut and spray

Invasive species removal – Mutliflora Rose cut and sprayed

Invasive species removal – vine cut and painted

Culvert crossing stabilization

Appendix B

As-Built Cross-Sections and Longitudinal Profile

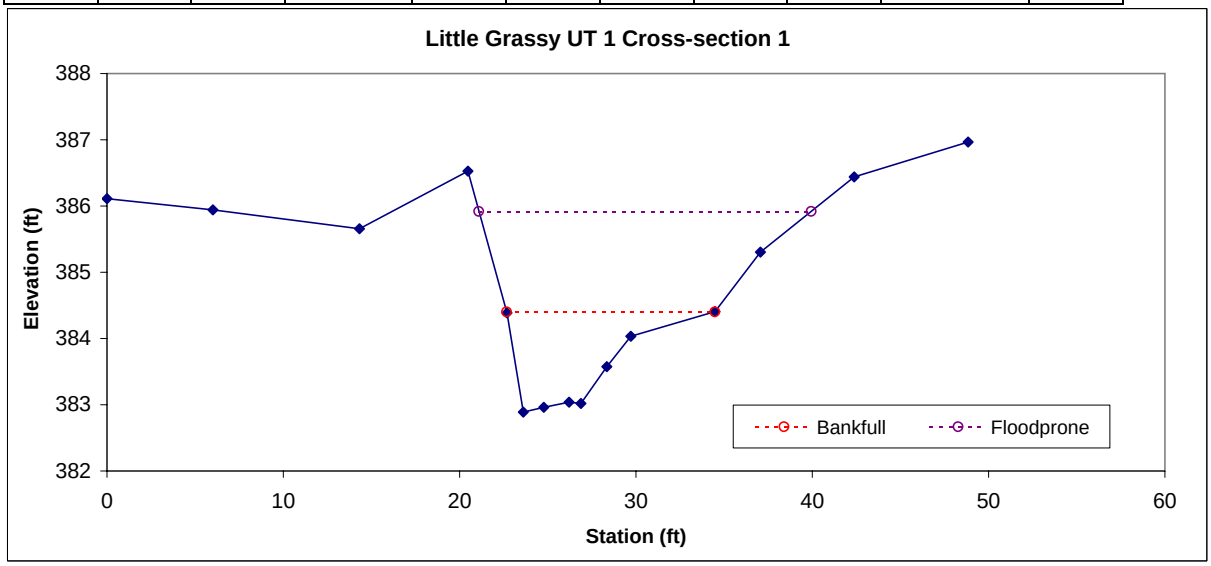
Permanent Cross-section 1

(As-Built Data - collected Sept. 2007)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		8.7	11.82	0.74	1.52	16.05	1.6	1.6	384.4	385.3



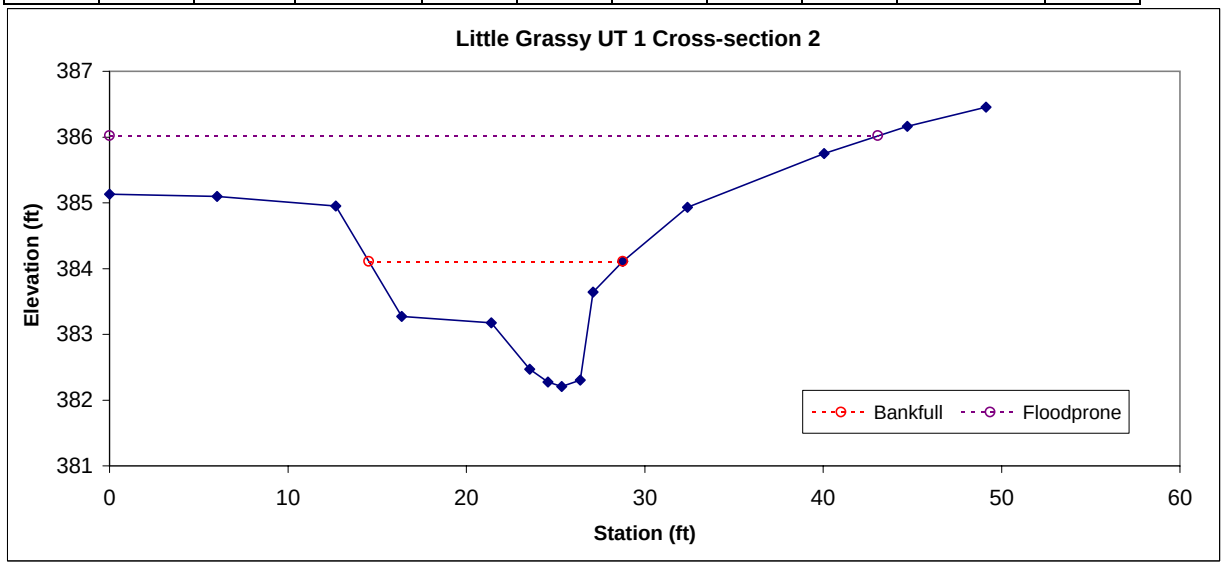
Permanent Cross-section 2

(As-Built Data - collected Sept. 2007)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	Cc	14.4	14.23	1.01	1.91	14.09	1	3	384.11	384.11



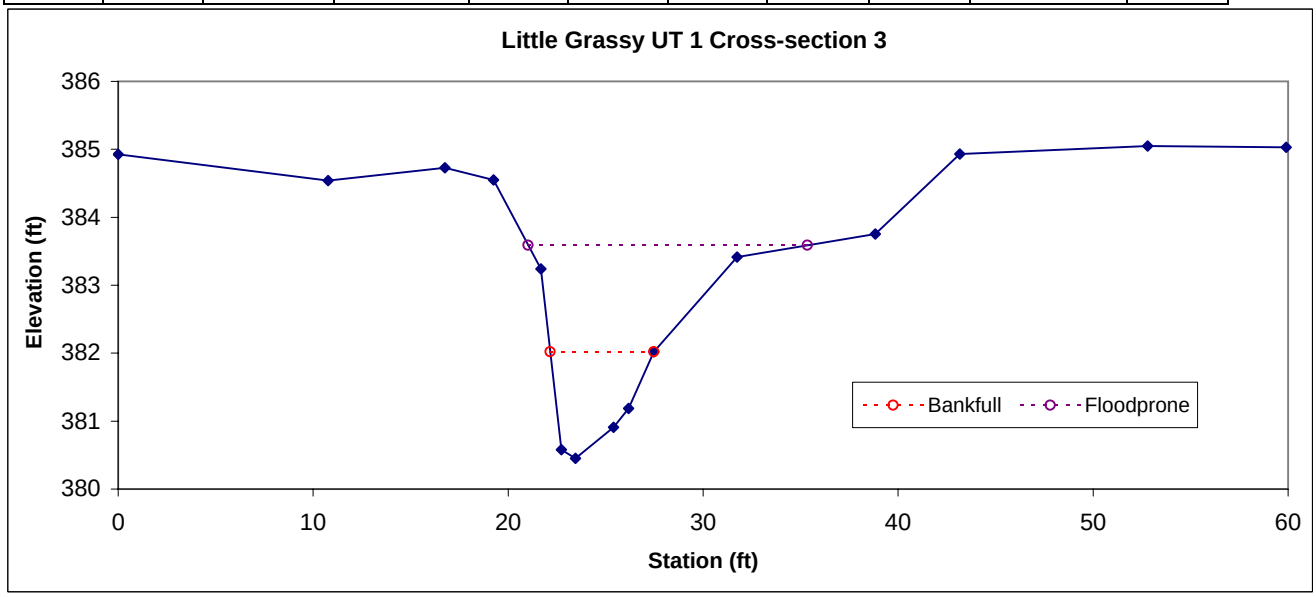
Permanent Cross-section 3

(As-Built Data - collected Sept. 2007)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		5.4	5.32	1.02	1.57	5.24	1.9	2.7	382.02	383.41



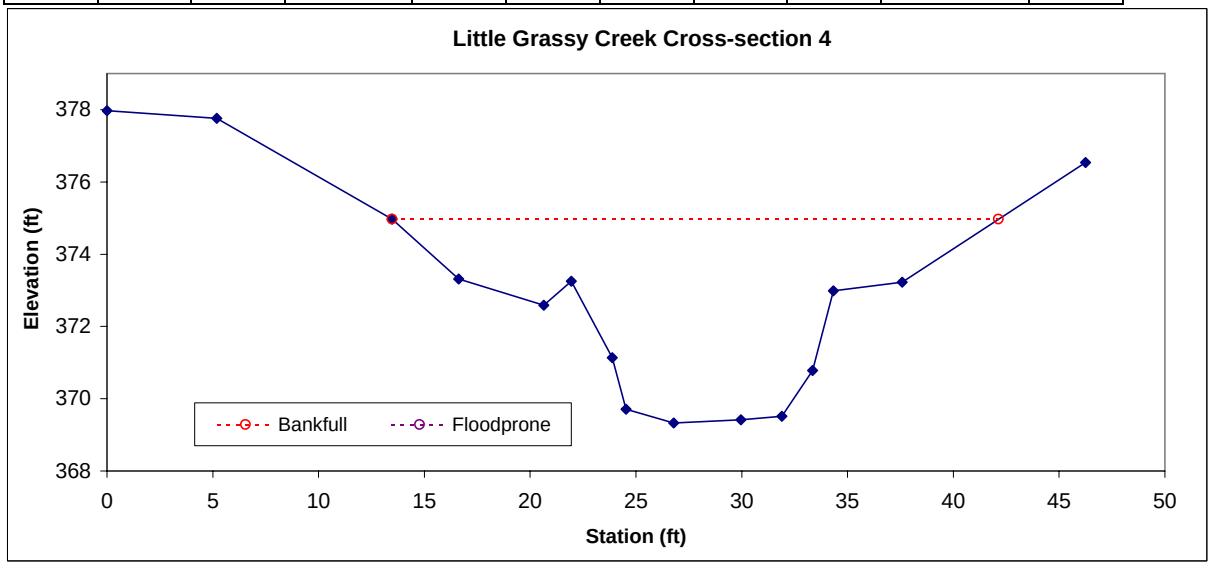
Permanent Cross-section 4

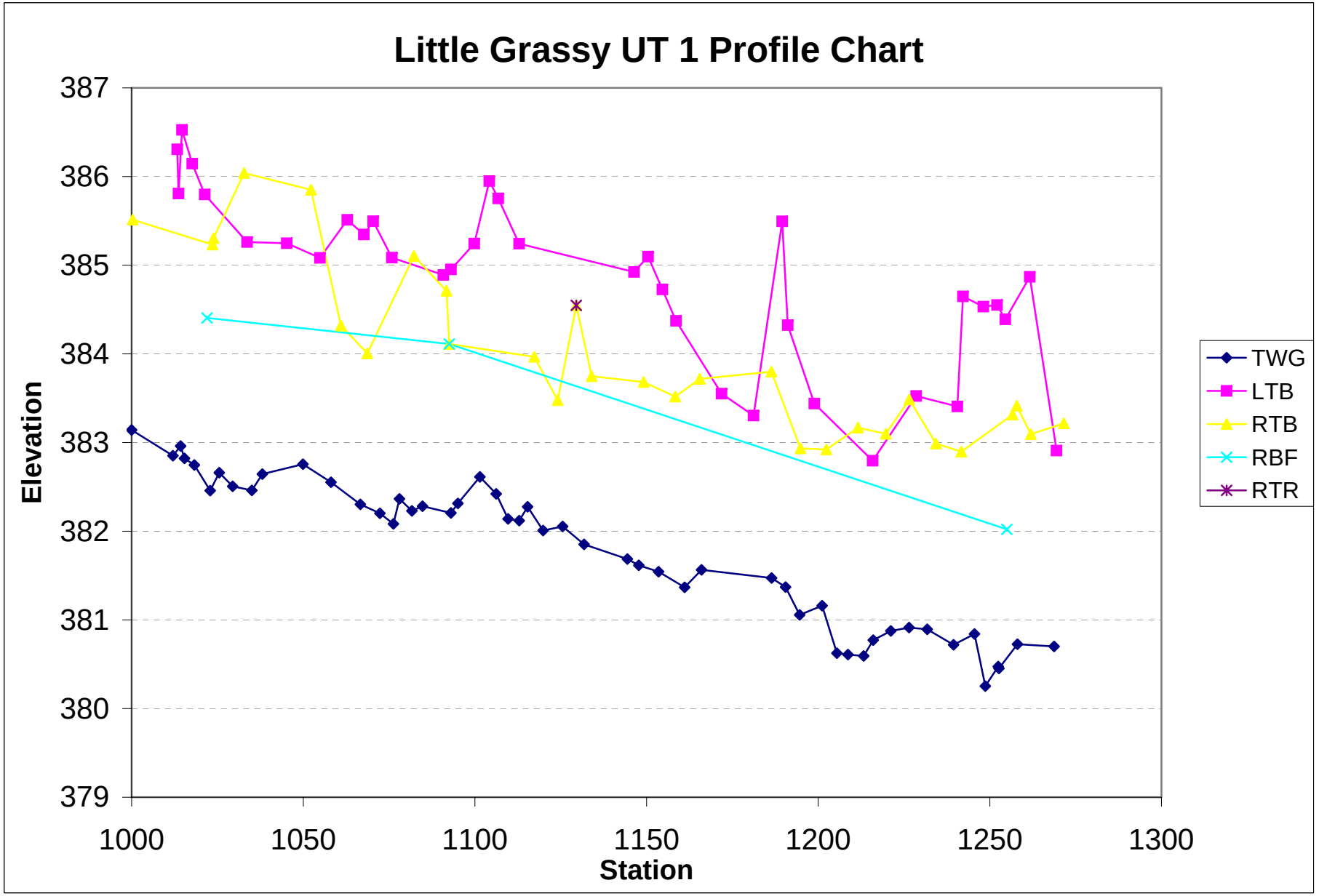
(As-Built Data - collected Sept. 2007)

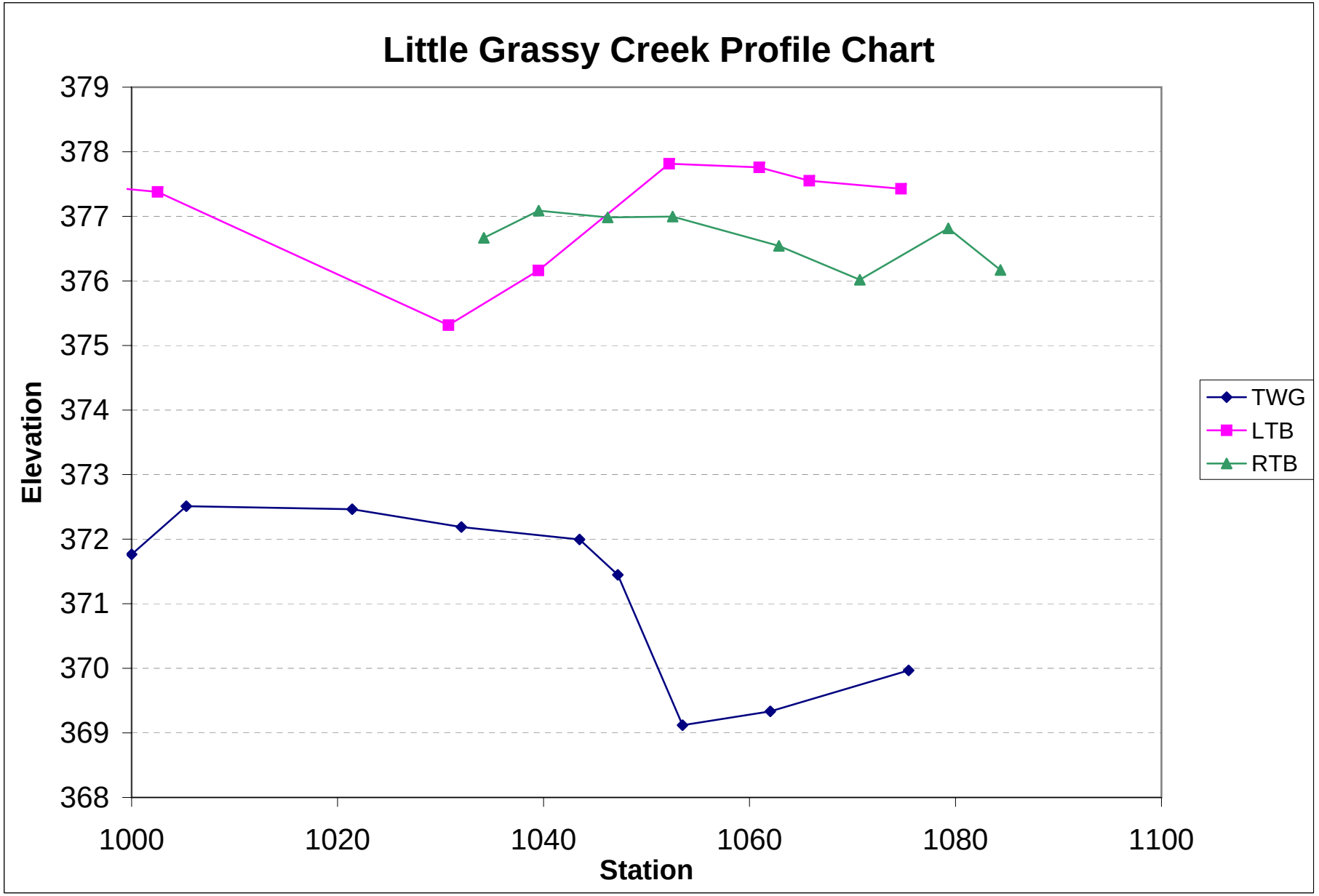
Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		82.5	28.66	2.88	5.64	9.96	1.3	2	374.97	376.54




Little Grassy UT 1 Profile Chart
Elevation
387
386
385
384
383
382
381
380
379
1000
1050
1100
1150
1200
1250
1300
Station
TWG
LTB
RTB
RBF
RTR


Little Grassy Creek Profile Chart
379
378
377
376
375
374
373
372
371
370
369
368
Elevation
1000
1020
1040
1060
1080
1100
Station
TWG
LTB
RTB

Appendix C

As-Built Plan Sheets

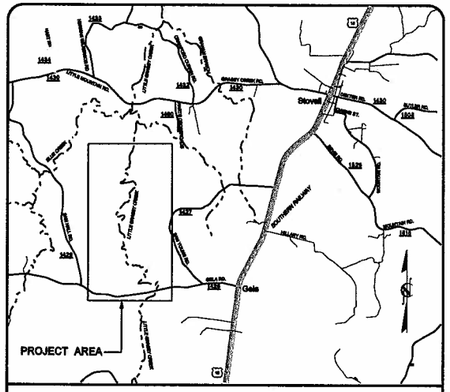
STATE	ESP SCD NO.	SHEET NO.	TOTAL SHEETS
NC	0501661501	1	10

LITTLE GRASSY CREEK PROJECT

GRANVILLE COUNTY

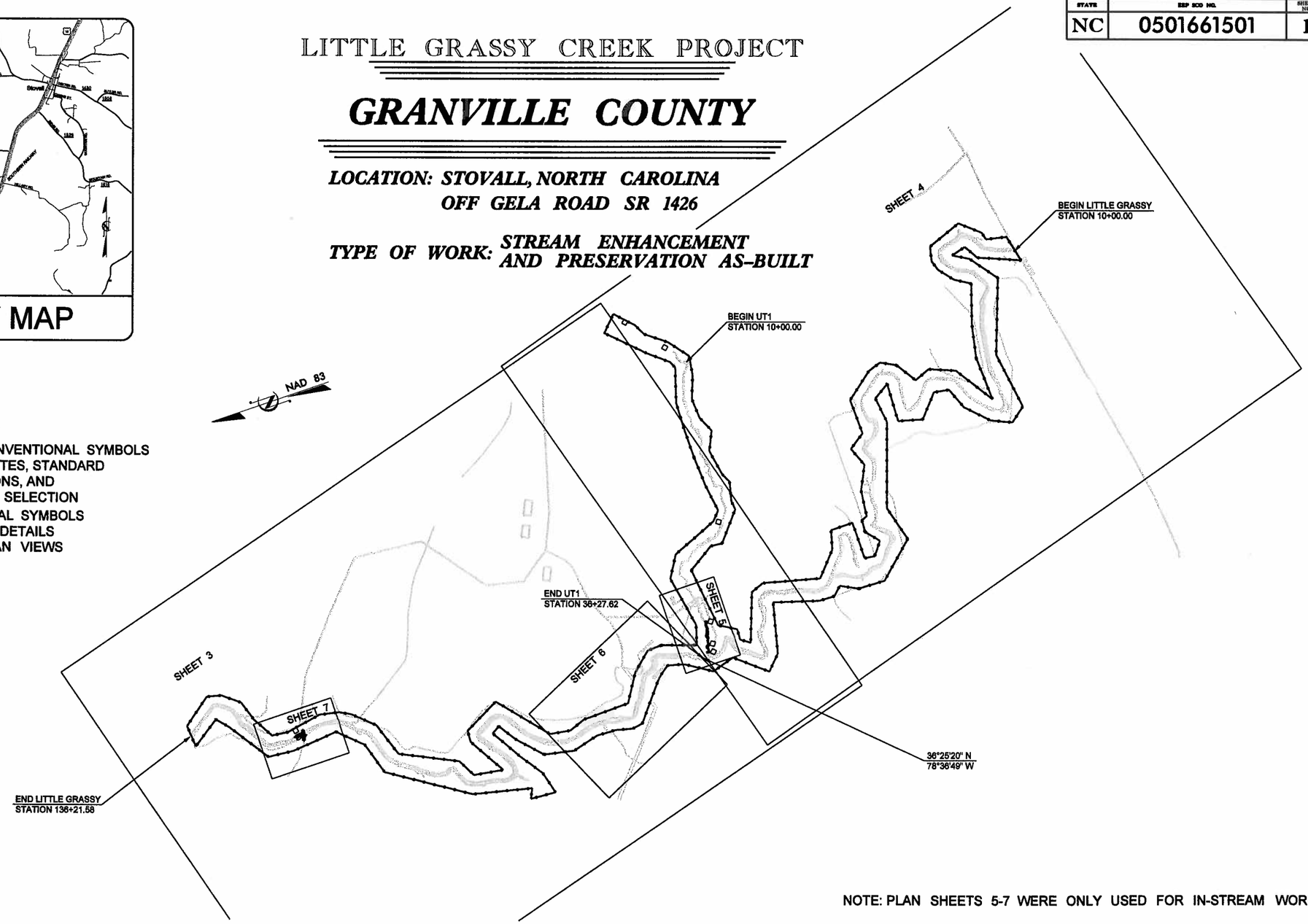
LOCATION: STOVALL, NORTH CAROLINA
OFF GELA ROAD SR 1426

TYPE OF WORK: STREAM ENHANCEMENT AND PRESERVATION AS-BUILT



VICINITY MAP

INDEX OF SHEETS



NOTE: PLAN SHEETS 5-7 WERE ONLY USED FOR IN-STREAM WORK.

PROJECT: 0501661501

GRAPHIC SCALES

PLANS: 40 20 0 40 80
PROFILE (HORIZONTAL): 40 20 0 40 80
PROFILE (VERTICAL): 20 10 0 20 40

PREPARED FOR THE OFFICE OF:
NCDENR – ECOSYSTEM ENHANCEMENT PROGRAM
2728 CAPITAL BLVD, SUITE 1H 103
RALEIGH, NC 27604

Ecosystem Enhancement Program

NCEEP CONTACT: ROBIN DOLIN
CLIENT CONTACT

PROJECT LENGTH

EXISTING STREAM LENGTH	=	15,267 FEET
AS-BUILT ENHANCEMENT STREAM LENGTH	=	2,539 FEET
AS-BUILT PRESERVATION STREAM LENGTH	=	12,710 FEET
LITTLE GRASSY CREEK ENHANCEMENT	=	75 FEET
LITTLE GRASSY CREEK PRESERVATION	=	12,546 FEET
UT1 ENHANCEMENT	=	2,464 FEET
UT1 PRESERVATION	=	164 FEET

PREPARED IN THE OFFICE OF:

Baker
Baker Engineering NY, Inc.
8000 Regency Parkway
Suite 200
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490

MARCH 08
COMPLETION DATE:

JOSHUA WHITE, PG
PROJECT MANAGER

KEVIN TWEEDY, PE
PROJECT DESIGN ENGINEER

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

4-2-08
SIGNATURE: *P.E.*

2/26/03

STREAM CONVENTIONAL SYMBOLS
SUPERCEDES SHEET 1B

- ROCK J-HOOK
- ROCK VANE
- OUTLET PROTECTION
- ROCK CROSS VANE
- DOUBLE DROP ROCK CROSS VANE
- SINGLE WING DEFLECTOR
- DOUBLE WING DEFLECTOR
- TEMPORARY SILT CHECK
- ROOT WAD
- LOG J-HOOK
- LOG VANE
- LOG WEIR
- LOG CROSS VANE
- CONSTRUCTED RIFFLE
- BOULDER CLUSTER
- ROCK STEP POOL
- SAFETY FENCE
- TAPE FENCE
- 100 YEAR FLOOD PLAIN
- CONSERVATION EASEMENT
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- FOOT BRIDGE
- TEMPORARY STREAM CROSSING
- PERMANENT STREAM CROSSING
- TRANSPLANTED VEGETATION
- TREE REMOVAL
- TREE PROTECTION
- TRANSPLANTS

**NOTE: ALL ITEMS ABOVE MAY NOT BE USED ON THIS PROJECT

GENERAL NOTES

1. CONSTRUCTION STARTED AND WAS COMPLETED IN SEPTEMBER 2007.
2. INVASIVE SPECIES REMOVAL WAS DONE IN SEPTEMBER 2007.
3. BARE ROOTS AND LIVESTAKES WERE PLANTED IN JANUARY 2008.

EEP SCO NO.	SHEET NO.
050661501	1-A

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

APPROVED BY:

4-2-08

DATE:

Baker

Baker Engineering NY, Inc.
8000 Regency Parkway
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Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
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STANDARD SPECIFICATIONS

EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL
DECEMBER 1993

6.06 CONSTRUCTION ENTRANCE
6.62 SILT FENCE
6.63 ROCK DAM
6.70 TEMPORARY (FORD) STREAM CROSSING

VEGETATION SELECTION

Planting Species for Little Grassy Buffer Restoration		
Scientific Name	Common Name	Percent
Tree Canopy Species		
Betula nigra	River Birch	15%
Quercus phellos	Willow oak	10%
Diospyros virginiana	Persimmon	10%
Liriodendron tulipifera	Tulip Popular	20%
Platanus occidentalis	Sycamore	20%
Acer rubrum	Red Maple	10%
Fraxinus pennsylvanica	Green Ash	15%
Total		100%
Understory Species		
Lindera benzoin	Spicebush	20%
Alnus serrulata	Tag Alder	20%
Corylus Americana	American Hazelnut	20%
Sambucus canadensis	Elderberry	10%
Cercis canadensis	Red Bud	15%
Carpinus caroliniana	Ironwood	15%
Total		100%
Live Stakes		
Sambucus nigra	Elderberry	20%
Salix sericea	Silky Willow	35%
Cornus amomum	Silky Dogwood	35%
Salix nigra	Black Willow	10%
Total		100%
Notes: Planting density for enhancement is 436 trees per acre (10' on centers).		

Invasive species to be controlled if found within conservation easement		
Scientific Name	Common Name	Suggested Removal Techniques
Ligustrun sinense	Privet	Cut, paint and spray
Elaeagnus umbellata	Autumn Olive	Cut, paint and spray
Lonicera japonica	Japanese Honeysuckle[1]	Spray
Rosa multiflora	Multiflora Rose[2]	Cut, paint and spray
Pyrus calleryana	Callery Pear[2]	Cut, paint and spray
Festuca spp	Tall Fescue[1]	Spray
Paulownia tomentosa	Princess Tree	Cut and paint
Pueraria lobata	Kudzu	Cut, paint and spray

Notes: 1. *Groundcover species found within project boundary.*
2. *Tree/shrub species found within project boundary.*

The following table provides the temporary seed mix for the project site. All disturbed areas will be stabilized using mulch and temporary seed.

Common Name	Rate	Dates
ANNUAL RYE (COOL SEASON)	130 LBS/ACRE	SEPTEMBER TO MARCH
MILLET (WARM SEASON)	40 LBS/ACRE	APRIL TO AUGUST

PERMANENT SEED MIXTURE				
Common Name	Scientific Name	Percent of Mixture	Seeding Density (lbs/acre)	Wetness Tolerance
Redtop	*Agrostis alba*	10	1.5	FACW
Virginia Wildrye	*Elymus virginicus*	15	2.25	FAC
Switch Grass	*Panicum virgatum*	15	2.25	FAC+
Eastern Gamma Grass	*Tripsicum dactyloides*	5	0.75	FAC+
Pennsylvania Smartweed	*Polygonum pennsylvanicum*	5	0.75	FACW
Little Blue Stem	*Schizachyrium scoparium*	5	0.75	FACU
Soft Rush	*Juncus effusus*	5	0.75	FACW+
Beggars Tick	*Bidens frondosa (or aristosa)*	10	1.5	FACW
Lance-Leaved Tick Seed	*Coreopsis lanceolata*	10	1.5	FACU
Tioga Deer Tongue	*Panicum clandestinum*	10	1.5	FAC
Big Blue Stem	*Andropogon gerardii*	5	0.75	FAC
Indian Grass	*Sorgastrum nutans*	5	0.75	FACU

4/2/2008
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2/26/08

EEP SCO NO.	SHEET NO.
050661501	1-B

*S.U.E = SUBSURFACE UTILITY ENGINEER

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CONVENTIONAL SYMBOLS

ROADS & RELATED ITEMS

Edge of Pavement
Curb
Prop. Slope Stakes Cut — C
Prop. Slope Stakes Fill — F
Prop. Woven Wire Fence
Prop. Chain Link Fence
Prop. Barbed Wire Fence
Prop. Wheelchair Ramp — WCR
Curb Cut for Future Wheelchair Ramp — CCFR
Exist. Guardrail
Prop. Guardrail
Equality Symbol
Pavement Removal

RIGHT OF WAY

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

HYDROLOGY

Stream or Body of Water
River Basin Buffer — RBB
Flow Arrow
Disappearing Stream
Spring
Swamp Marsh
Shoreline
Falls, Rapids
Prop Lateral, Tail, Head Ditches — FLOW

STRUCTURES

MAJOR
Bridge, Tunnel, or Box Culvert — CONC
Bridge Wing Wall, Head Wall and End Wall — CONC WW

MINOR
Head & End Wall — CONC HW
Pipe Culvert
Footbridge
Drainage Boxes — CB
Paved Ditch Gutter

UTILITIES

Exist. Pole
Exist. Power Pole
Prop. Power Pole
Exist. Telephone Pole
Prop. Telephone Pole
Exist. Joint Use Pole
Prop. Joint Use Pole
Telephone Pedestal — T
U/G Telephone Cable Hand Hold — HH
Cable TV Pedestal — C
U/G TV Cable Hand Hold — HH
U/G Power Cable Hand Hold — HH
Hydrant
Satellite Dish
Exist. Water Valve
Sewer Clean Out
Power Manhole
Telephone Booth — P
Cellular Telephone Tower
Water Manhole — W
Light Pole
H-Frame Pole
Power Line Tower
Pole with Base
Gas Valve
Gas Meter
Telephone Manhole — T
Power Transformer
Sanitary Sewer Manhole
Storm Sewer Manhole — S
Tank; Water, Gas, Oil
Water Tank With Legs
Traffic Signal Junction Box — S
Fiber Optic Splice Box — F
Television or Radio Tower
Utility Power Line Connects to Traffic Signal Lines Cut Into the Pavement — TS TS

Recorded Water Line — W W
Designated Water Line (S.U.E.*) — W W
Sanitary Sewer — SS SS
Recorded Sanitary Sewer Force Main — FSS FSS
Designated Sanitary Sewer Force Main(S.U.E.*) — FSS FSS
Recorded Gas Line — G G
Designated Gas Line (S.U.E.*) — G G
Storm Sewer — S S
Recorded Power Line — P P
Designated Power Line (S.U.E.*) — P P
Recorded Telephone Cable — T T
Designated Telephone Cable (S.U.E.*) — T T
Recorded U/G Telephone Conduit — TC TC
Designated U/G Telephone Conduit (S.U.E.*) — TC TC
Unknown Utility (S.U.E.*) — PUTL PUTL
Recorded Television Cable — TV TV
Designated Television Cable (S.U.E.*) — TV TV
Recorded Fiber Optics Cable — FO FO
Designated Fiber Optics Cable (S.U.E.*) — FO FO
Exist. Water Meter — 0
U/G Test Hole (S.U.E.*) — TH
Abandoned According to U/G Record — ATTUR
End of Information — E.O.I.

BOUNDARIES & PROPERTIES

State Line
County Line
Township Line
City Line
Reservation Line
Property Line
Property Line Symbol — PL
Exist. Iron Pin — EIP
Property Corner — +
Property Monument — PCM
Property Number — 123
Parcel Number — 6
Fence Line — WW & ISBW
Existing Wetland Boundaries — WLB
High Quality Wetland Boundary — HQ WLB
Medium Quality Wetland Boundaries — MQ WLB
Low Quality Wetland Boundaries — LQ WLB
Proposed Wetland Boundaries — WLB
Existing Endangered Animal Boundaries — EAB
Existing Endangered Plant Boundaries — EPB

BUILDINGS & OTHER CULTURE

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

TOPOGRAPHY

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

VEGETATION

Single Tree
Single Shrub
Hedge
Woods Line
Orchard
Vineyard — VINEYARD

RAILROADS

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

4/24/2008
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EEP SCO NO.	SHEET NO.
050661501	2

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN L. TWEEDY

APPROVED BY:

4-2-08

DATE:

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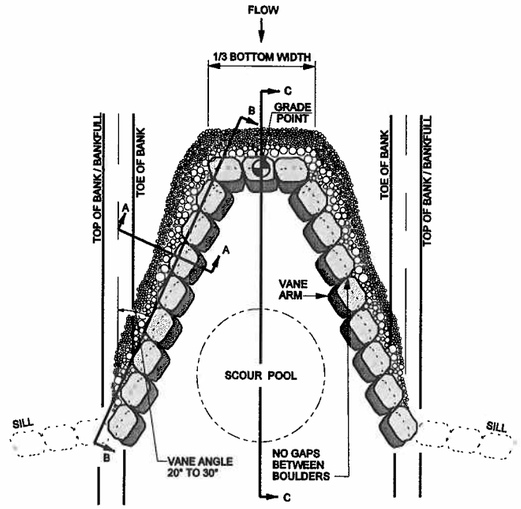
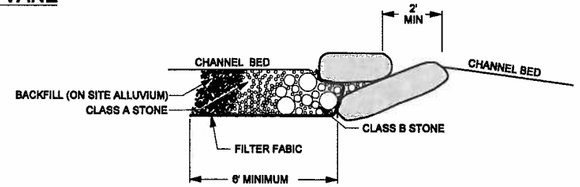
ROCK CROSS VANE



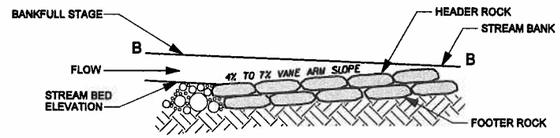
PLAN VIEW

NOTES FOR ALL VANE STRUCTURES:

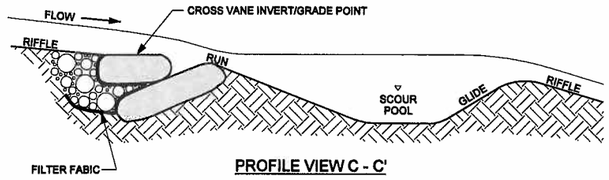
1. BOULDERS MUST BE AT LEAST 4' x 3' x 2'.
2. INSTALL FILTER FABRIC FOR DRAINAGE BEGINNING AT THE MIDDLE OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF SIX FEET.
3. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBANK.
4. CONSTRUCT FOLLOWING ANGLE AND SLOPE SPECIFICATIONS.
5. USE CLASS B STONE TO FILL GAPS ON UPSTREAM SIDE OF BOULDERS, AND CLASS A STONE TO FILL GAPS ON UPSTREAM SIDE OF CLASS B STONE.
6. AFTER ALL STONE HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH ON-SITE ALLUVIUM TO THE ELEVATION OF ONE HALF THE HEADER ROCK.



SECTION A - A'

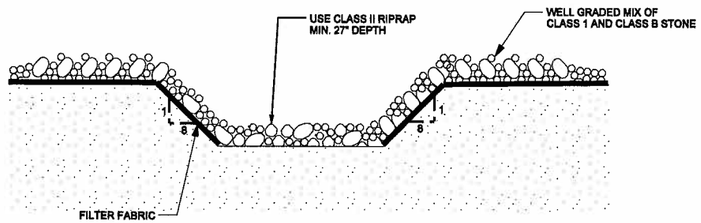


PROFILE VIEW B - B'
VANE ARM



PROFILE VIEW C - C'

FORD STREAM CROSSING



NOTES:

1. CONSTRUCT STREAM CROSSING WHEN FLOW IS LOW.
2. HAVE ALL NECESSARY MATERIALS AND EQUIPMENT ON-SITE BEFORE WORK BEGINS.
3. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM. COMPLETE ONE SIDE BEFORE STARTING ON THE OTHER SIDE.
4. INSTALL STREAM CROSSING AT RIGHT ANGLE TO THE FLOW.
5. GRADE SLOPES TO A 8:1 SLOPE. TRANSPLANT SOD FROM ORIGINAL STREAMBANK ONTO SIDE SLOPES.
6. LINE CROSSING WITH A WELL GRADED MIX OF CLASS 1 AND CLASS B STONE UNDERLAIN WITH FILTER FABRIC.

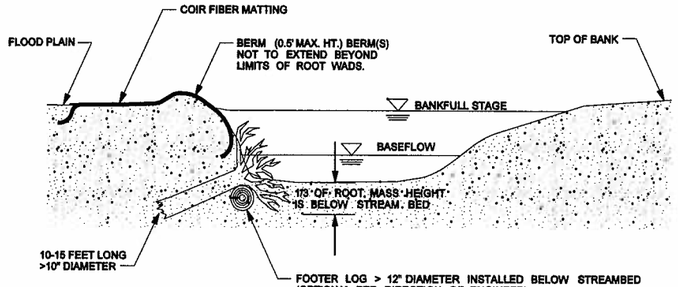
2/26/03

ROOT WADS

ROOT WADS WITHOUT TRANSPLANTS

CROSS SECTION VIEW

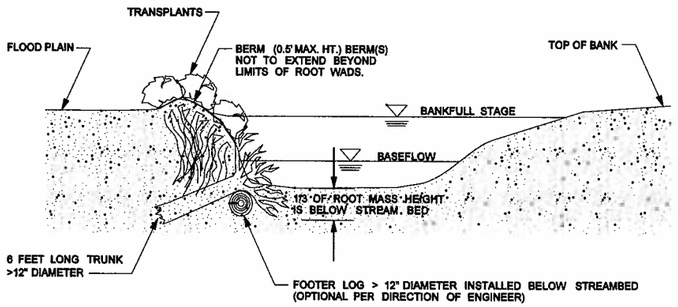
NTS



ROOT WADS WITH TRANSPLANTS

CROSS SECTION VIEW

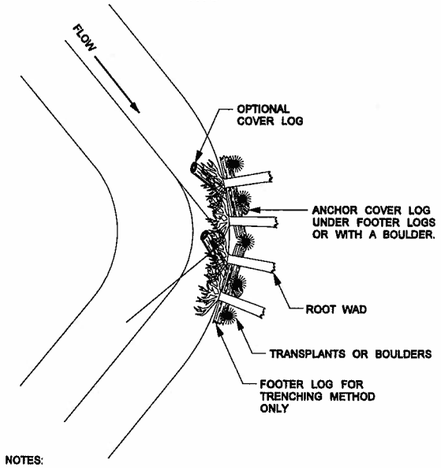
NTS



ROOT WADS

PLAN VIEW

NTS



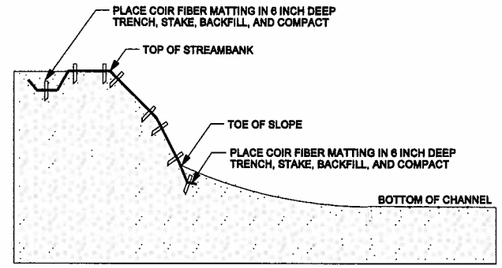
NOTES:

TRENCHING METHOD:
IF THE ROOT WAD CANNOT BE DRIVEN INTO THE BANK OR THE BANK NEEDS TO BE RECONSTRUCTED, THE TRENCHING METHOD SHOULD BE USED. THIS METHOD REQUIRES THAT A TRENCH BE EXCAVATED FOR THE LOG PORTION OF THE ROOT WAD. IN THIS CASE, A FOOTER LOG SHOULD BE INSTALLED UNDERNEATH THE ROOT WAD IN A TRENCH EXCAVATED PARALLEL TO THE BANK AND WELL BELOW THE STREAMBED. ONE-THIRD OF THE ROOT WAD SHOULD REMAIN BELOW NORMAL BASE FLOW CONDITIONS.

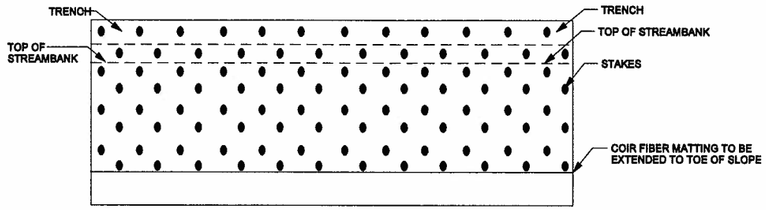
NOTES:

DRIVE POINT METHOD:
SHARPEN THE END OF THE LOG WITH A CHAINSAW BEFORE "DRIVING" IT INTO THE BANK. ORIENT ROOT WADS UPSTREAM SO THAT THE STREAM FLOW MEETS THE ROOT WAD AT A 90-DEGREE ANGLE, DEFLECTING THE WATER AWAY FROM THE BANK. A TRANSPLANT OR BOULDER SHOULD BE PLACED ON THE DOWNSTREAM SIDE OF THE ROOT WAD IF A BACK EDDY IS FORMED BY THE ROOT WAD. THE BOULDER SHALL BE APPROXIMATELY 4'X 3'X 2'.

EROSION CONTROL MATTING



CROSS SECTION VIEW



PLAN VIEW

THE WOOD STAKE SHALL BE THE NORTH AMERICAN GREEN ECO-STAKE OR APPROVED EQUAL WITH THE FOLLOWING DIMENSIONS:

LEG LENGTH	11.00 IN (27.94 CM)
HEAD WIDTH	1.25 IN (3.18 CM)
HEAD THICKNESS	0.40 IN (1.02 CM)
LEG WIDTH	0.60 IN (1.52 CM) (TAPERED TO POINT)
LEG THICKNESS	0.40 IN (1.02 CM)
TOTAL LENGTH	12.00 IN (30.48 CM)

NOTES:

1. BANKS SHOULD BE SEEDED PRIOR TO PLACEMENT OF MATTING.
2. PLACE COIR FIBER MATTING ACCORDING TO MANUFACTURER RECOMMENDATIONS.
3. MATTING STAKES SHOULD BE PLACED IN A DIAMOND SHAPED PATTERN.

1

TYPICAL MATTING STAKE

EEP SCO NO.	SHEET NO.
050661501	2A

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN J. TWEEDY

APPROVED BY:

4-2-08

DATE:

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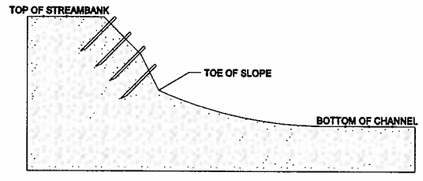
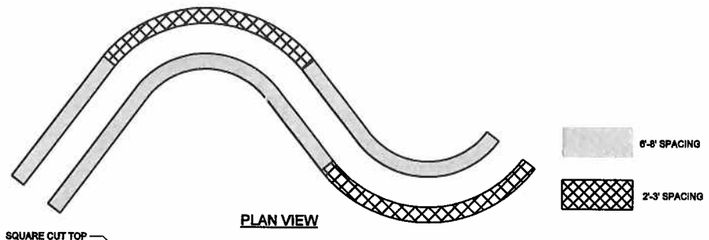
LIVE STAKING SPECIFICATION

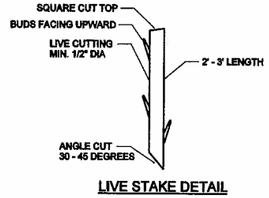


CROSS SECTION VIEW

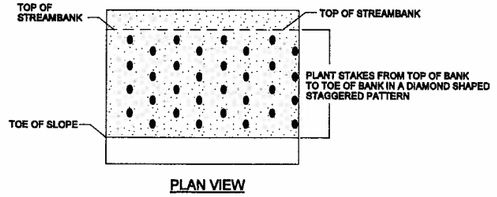
NOTES:
1. STAKES SHOULD BE CUT AND INSTALLED IN THE SAME WEEK.
2. DO NOT INSTALL STAKES THAT HAVE BEEN SPLIT.
3. STAKES MUST BE INSTALLED WITH BUDS POINTING UPWARDS.
4. STAKES SHOULD BE INSTALLED PERPENDICULAR TO BANK.
5. STAKES SHOULD BE 1/2 TO 2 INCHES IN DIAMETER AND 2 TO 3 FT LONG.
6. STAKES SHOULD BE INSTALLED LEAVING 1/5 OF STAKE ABOVE GROUND.



PLAN VIEW

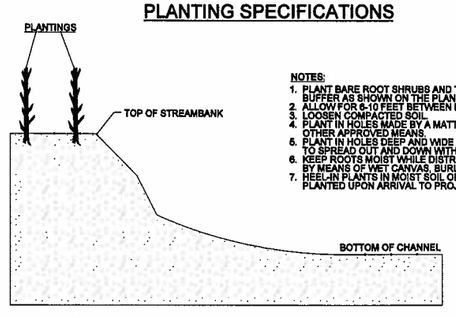


LIVE STAKE DETAIL



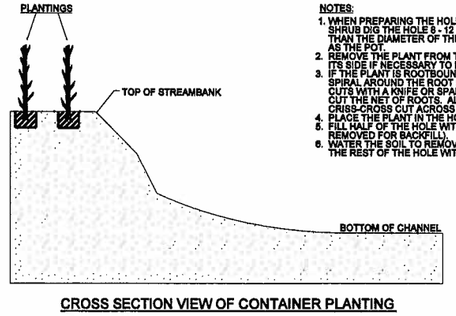
PLAN VIEW

PLANTING SPECIFICATIONS



NOTES:
1. PLANT BARE ROOT SHRUBS AND TREES TO THE WIDTH OF THE BUFFER AS SHOWN ON THE PLANS.
2. ALLOW FOR 8-10 FEET BETWEEN PLANTINGS, DEPENDING ON SIZE.
3. LOOSEN COMPACTED SOIL.
4. PLANT IN HOLES MADE BY A MATTOCK, DIBBLE, PLANTING BAR, OR OTHER APPROVED MEANS.
5. PLANT IN HOLES DEEP AND WIDE ENOUGH TO ALLOW THE ROOTS TO SPREAD OUT AND DOWN WITHOUT J-ROOTING.
6. KEEP ROOTS MOIST WHILE DISTRIBUTING OR WAITING TO PLANT BY MEANS OF WET CANVAS, BURLAP, OR STRAW.
7. HEEL-IN PLANTS IN MOIST SOIL OR SAWDUST IF NOT PROMPTLY PLANTED UPON ARRIVAL TO PROJECT SITE.

CROSS SECTION VIEW OF BARE ROOT PLANTING



NOTES:
1. WHEN PREPARING THE HOLE FOR A POTTED PLANT OR SHRUB DIG THE HOLE 8 - 12 INCHES LARGER THAN THE DIAMETER OF THE POT AND THE SAME DEPTH AS THE POT.
2. REMOVE THE PLANT FROM THE POT. LAY THE PLANT ON ITS SIDE IF NECESSARY TO REMOVE THE POT.
3. IF THE PLANT IS ROOTBOUND (ROOTS GROWING IN A SPIRAL AROUND THE ROOT BALL), MAKE VERTICAL CUTS WITH A KNIFE OR SPADE JUST DEEP ENOUGH TO CUT THE NET OF ROOTS. ALSO MAKE A CRISS-CROSS CUT ACROSS THE BOTTOM OF THE BALL.
4. PLACE THE PLANT IN THE HOLE.
5. FILL HALF OF THE HOLE WITH SOIL (SAME SOIL REMOVED FOR BACKFILL).
6. WATER THE SOIL TO REMOVE AIR POCKETS AND FILL THE REST OF THE HOLE WITH THE REMAINING SOIL.

CROSS SECTION VIEW OF CONTAINER PLANTING

4/2/2008
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2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
050661501	3

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN I TWEEDY

APPROVED BY:

4-2-08

DATE:

Baker

Baker Engineering NY, Inc.
8000 Regency Parkway
Suite 200
Cary, NORTH CAROLINA 27518
Phone: 919.463.5488
Fax: 919.463.5490

NAD 83

CONSERVATION EASEMENT

VEGETATION PLOT # 1

GATE

CONSTRUCTED FORD CROSSING
AS SHOWN ON PLAN SHEET 7

EXISTING BARNS
(APPROXIMATE LOCATIONS)

LITTLE GRASSY CREEK

FLOW DIRECTION

GATE

CONSTRUCTED FORD CROSSING
AS SHOWN ON PLAN SHEET 6

MATCHLINE SHEET 4
STATION 80+64.30

REPAIRED CULVERT CROSSING
AS SHOWN ON PLAN SHEET 6

FARMSTEAD TANK

BUFFER ENHANCEMENT
(SEE VEGETATION SELECTION SHEET 1A)

BUFFER PRESERVATION (NO PLANTING REQUIRED)

AS-BUILT PLAN OVERVIEW/ VEGETATION PLAN LITTLE GRASSY CREEK

160 80 0 160 320

SCALE (FT)

4/2/2008
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BUCK PROJECT REFERENCE NO.	SHEET NO.
050661501	4

PROJECT ENGINEER

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VEGETATION PLOT # 7

VEGETATION PLOT # 6

VEGETATION PLOT # 5

UT1 STATION 10+00 TO 31+74 INVOLVED INVASIVE SPECIES CONTROL RIPARIAN BUFFER PLANTING. SEE VEGETATION SELECTION FOR ADDITIONAL DETAIL.

VEGETATION PLOT # 4

UT1 STATION 31+74 TO 36+27.62 INVOLVED STABILIZATION OF SEVERAL UNSTABLE MEANDER BENDS. SEE PLAN SHEET 5 FOR ADDITIONAL DETAIL.

MATCHLINE SHEET 3 STATION 30+84.30

LITTLE GRASSY CREEK

VEGETATION PLOT # 3

VEGETATION PLOT # 2

NAD 83

CONSERVATION EASEMENT

FLOW DIRECTION

GELA RD

BUFFER ENHANCEMENT
(SEE VEGETATION SELECTION SHEET 1A)

BUFFER PRESERVATION (NO PLANTING REQUIRED)

4/2/2008
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AS-BUILT PLAN OVERVIEW/ VEGETATION PLAN UT1/LITTLE GRASSY CREEK

160 80 0 160 320

SCALE (FT)

EEP SCO NO. 050661501 | SHEET NO. 5
PROJECT ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN I WESTRY
APPROVED BY:
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NAD 83 N

VEGETATION PLOT # 4

REMOVED EXISTING FENCE
WITHIN CONSERVATION EASEMENT

VEGETATION PLOT # 3

END UT1 STATION 36+27.62
LITTLE GRASSY STATION 81+56.11

TOP OF BANK

THALWEG

REGRADED CHANNEL

X1

X2

BE 1327
X=2113954
Y=972945.5
Z=391.56

BE 1489
X=2113790
Y=972927.8
Z=388.37

REGRADED POINT BAR

X3

VEGETATION PLOT # 2

APPROXIMATE
LOCATION
OF EXISTING FENCE

NOTE:

SLOPED, SEEDED, STRAWED,
MATTED, AND LIVE STAKED
ALONG DISTURBED BANKS.

AS-BUILT
PLAN VIEW – UT1

20 0 20 40
SCALE (FT)

2/25/03

4/3/2008
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BUCK PROJECT REFERENCE NO.	SHEET NO.
05066150I	6

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 027337 ENGINEER KEVIN J. TWEEDY

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4-2-08

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NAD 83

APPROXIMATE LOCATION OF STONE MILL STRUCTURE - DO NOT DISTURB

APPROXIMATE LOCATION OF MILL DAM STRUCTURE DO NOT DISTURB

GRADED APPROACHES AND RECONSTRUCTED PERMANENT FORD CROSSING WITH CLASS 2 STONE BASE MIXED WITH CLASS B STONE

REGRADED FARM PATH WITH EXISTING SOIL ONSITE AND ARMORED SIDE SLOPES WITH CLASS 2 STONE

EXISTING FARM PATH

24" CMP

AS-BUILT PLAN VIEW
LITTLE GRASSY CREEK

10 5 0 10 20
SCALE (FT)

4/24/2008
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2/26/03

2/26/08

EEP SCO NO.	SHEET NO.
050661501	7

PROJECT ENGINEER

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4-2-08

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NAD 83

STOCK PILE

VEGETATION PLOT # 1

BE 2785
X=2114023
Y=976008.6
Z=377.04

INSTALLED CROSS VANE

THALWEG

REMOVED CONCRETE WITHIN THE CHANNEL, GRADED APPROACHES AND RECONSTRUCTED PERMANENT FORD CROSSING WITH CLASS 2 STONE BASE MIXED WITH CLASS B STONE.

BE 2756
X=2114003
Y=975830.9
Z=377.81

EDGE OF CHANNEL

PHOTO POINT

X4

TOP OF BANK

REGRADED, SLOPED, SEEDED, AND MATTED FLOODPLAIN

NOTE:

SLOPED, SEEDED, STRAWED, MATTED, AND LIVE STAKED ALONG DISTURBED BANKS.

AS-BUILT PLAN VIEW
LITTLE GRASSY CREEK

20 0 20 40
SCALE (FT)

4/2/2008
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