UT TO SOUTH FORK
FINAL MONITORING REPORT
YEAR 1 OF 5
2006

EEP Project # 435
Alamance County, North Carolina

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Submitted to:

NCDENR-EEP
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Executive Summary

The North Carolina Ecosystem Enhancement Program (EEP) restored the UT to South Fork in 2004. This project is located in the southern portion of Alamance County, NC. The different reaches flow through former pasture areas and wooded sections. Prior to restoration, cattle had unlimited access to the stream channels which created areas of severe bank erosion and loss of vegetation. Since the restoration has been completed, the livestock have been fenced out of the stream with the exception of a few crossings that are used throughout the year to move the cattle from one field to another.

There were several goals for this stream and buffer restoration project. Goals of the stream project included: reducing the bank erosion; reducing nutrient runoff on the site; stabilizing stream channel banks by planting vegetation; and, helping the stream reach its equilibrium though the proper design ratios for dimension, pattern, and profile.

This report documents the data collected for Year 1 monitoring. Monitoring benchmarks were installed for cross-sections and vegetation plots in three reaches along the restored channel. The data in this report includes geomorphic and vegetative components. The geomorphic data collected includes: longitudinal profiles, cross-sections, pebble counts and photo points along all three reaches. The vegetation data collected includes: stem count species and numbers for all of the vegetative plots throughout the project. The geomorphic data collected for Year 1 provides a baseline for future monitoring years to be compared to. At this time, the data cannot be used to conclude problem areas for the stream; however, visually, some areas are facing aggradation, and some structures are believed to be installed too high. Future monitoring in Year 2 will aid in determining if the aggradation is a problem that needs to be addressed, and the structures noted for problems will need to be repaired.

As for the vegetation component, there is concern with the plots meeting the quantitative goal of 260 stems/acre. The number of stems/acre in VP #1, 2, 4 and 5 are already below the Year 5 goal of 260 stems/acre. The stem/acre for VP #3 is 280 stems/acre. The other plots have good stems/acre count.

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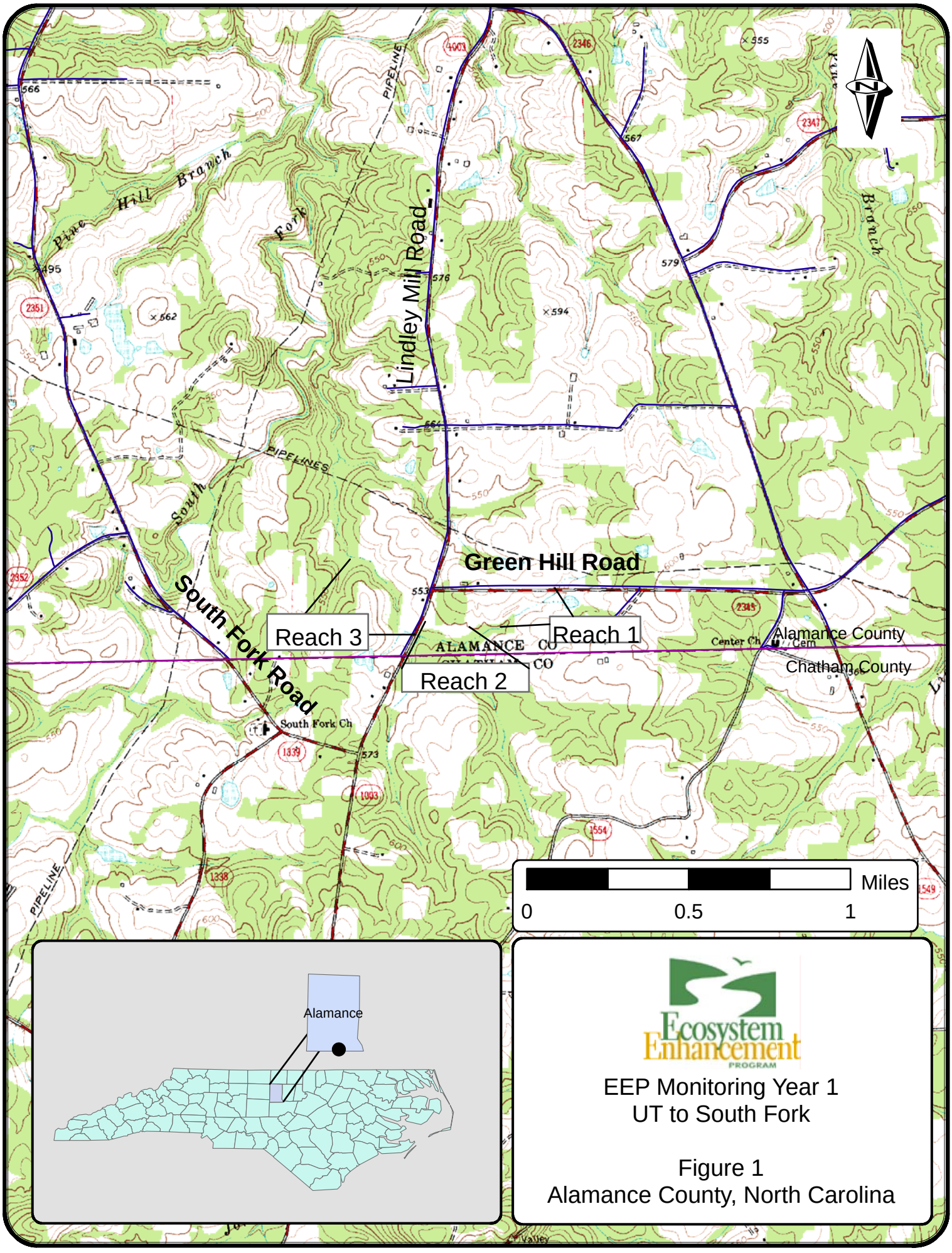
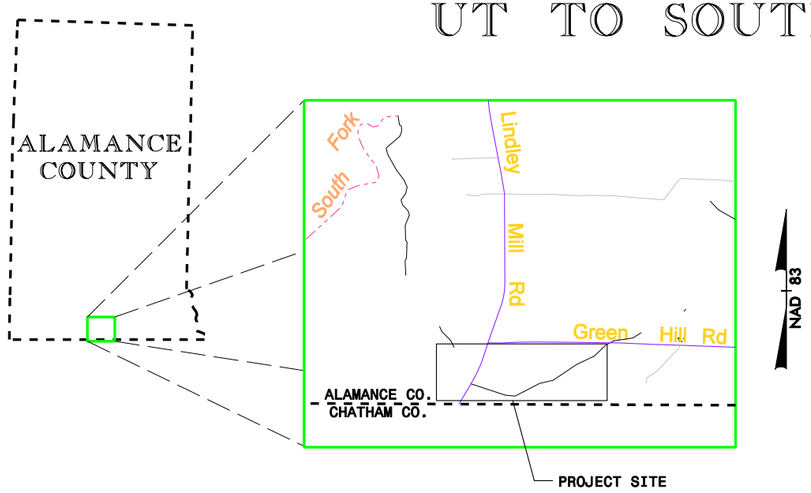


EEP Monitoring Year 1
UT to South Fork

Figure 1
Alamance County, North Carolina

UT TO SOUTH FORK



REACH 3

LINDLEY MILL RD.

REACH 2

FLOW

GREEN HILL RD.

REACH 1

UT TO SOUTH FORK
FIGURE 2

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Ecosystem Enhancement PROGRAM

LOCATION:	UT TO SOUTH FORK STREAM MONITORING - YEAR 2
PROJ #:	435
COUNTY:	ALAMANCE
PREPARED BY:	WDY
CHECKED BY:	ATW
DATE:	11/17/06

1.0 PROJECT BACKGROUND

1.1 Project Location

This project is near Snow Camp, North Carolina in south-central Alamance County. To reach the site from Raleigh, go west on US 64 towards Siler City. Take the exit for NC 87 and turn right, heading north. Take a left onto Chapel Hill-Greensboro Road. At the intersection with Lindley Mill Road take a left towards the community of Sutphin. The site is near the intersection with Green Hill Road before the Chatham County line. To access Reach 1, turn left onto Green Hill Road, you will cross the beginning of that reach. Reach 2 and 3 can be accessed off of Lindley Mill Road. Figure 1 shows the location of the site, and Figure 2 shows the location of each reach surveyed.

1.2 Project Setting

The project lies in a mostly open, abandoned agricultural field where cattle once had unlimited access to the stream. Since restoration, the stream has been fenced off, and cattle do not have access to the channel. The surrounding pastures are used for cattle grazing or crop production (hay). Less than 25% of the stream restoration area lies within a sparsely forested buffer area. The surrounding topography is gentle rolling hills.

1.3 Project Objectives

The goal of this stream restoration project is to improve water quality in the Cape Fear River Basin. The UT to South Fork is typical of other streams in this area, exhibiting instability and degradation in response to current and historical land use practices. The goal of improving water quality will be accomplished by re-establishing a stable dimension, pattern, and profile to the stream. Stabilization of the streambed and banks will reduce the amount of sediment entering the river basin. In addition, re-establishment of a permanent vegetated riparian buffer (consisting of native species) will help decrease nutrient input. This buffer will provide shading for wildlife habitat within the stream and along the stream buffer.

Table I. Project Mitigation Structure and Objectives Table				
UT to South Fork/EEP Project Number 435				
Project Segment or Reach ID	**Mitigation Type**	**Approach***	**Linear Footage or Acreage Stationing***	**Comment**
Subreach 1	Restoration	P I	10+00 to 26+03	New channel construction
Subreach 2	Restoration	P I	26+03 to 33+13	Modified pattern, dimension & profile
Subreach 3	Enhancement Level I	P II, P III	33+13 to 42+00	Modified dimension & profile
Subreach 4	Restoration	P I, P II	42+00-to 70+37	Modified pattern, dimension & profile

Note: "P" refers to Priority Level.
"*" – determinations made from the Restoration Design Report for the project.

1.4 History and Background

Table II. Project Activity and Reporting History			
UT to South Fork/EEP Project Number 435			
Activity or Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan			September 2002
Final Design - 90%	Raw data being acquired by EEP and will be included in the 2007 monitoring report for the site.		
Construction			
Temporary S&E mix applies to entire project area			
Permanent seed mix applies to reach/segments 1&2			
Containerized and B&B plantings for reach/segments 1&2			
Mitigation Plan/ As-built (Year 0 Monitoring - baseline)			
Year 1 monitoring	December 1, 2006	June 1, 2006	November 2006
Year 2 monitoring	December 1, 2007		
Year 3 monitoring	December 1, 2008		
Year 4 monitoring	December 1, 2009		
Year 5 monitoring	December 1, 2010		
Year 5+ monitoring			

Table III. Project Contract Table	
UT to South Fork/EEP Project Number 445	
Designer	ARCADIS G&M 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607
Construction Contractor	*
Planting Contractor	*
Seeding Contractor	*
Monitoring Performers	SEPI Engineering Group 2300 Rexwoods Drive, Suite 370 Raleigh, NC 27607
Stream Monitoring POC	Amanda Todd (919) 789-9977
Vegetation Monitoring POC	Phillip Todd (919) 789-9977
Wetland Monitoring POC	N/A

"*" denotes raw data being acquired by EEP and will be included in the 2007 monitoring report for the site

Table IV. Project Background Table	
UT to South Fork/EEP Project Number 445	
Project County	Alamance County, NC
Drainage impervious cover estimate (%)	5
Stream Order	1
Physiographic Region	Piedmont
Ecoregion	Carolina Slate Belt
Rosgen Classification of As-built	E
Cowardin Classification	N/A
Dominant soil types	Georgeville-Heron-Alamance & Orange-Efland-Herndon
Reference site ID	UT Wells Creek & UT Varnal Creek
USGS HUC for Project and Reference	03030002 Haw River
NCDWQ Sub-basin for Project and Reference	03-04-06
NCDWQ classification for Project and Reference	C, NSW
Any portion of any project segment 303d listed?	no
Any portion of any project segment upstream of a 303d listed segment?	no
Reasons for 303d listing or stressor	no
% of project easement fenced	50%

2.0 PROJECT MONITORING METHODOLOGY

2.1 Vegetation Methodology

The following methodology was used for the stem count. The configuration of the vegetation plots was marked out with tape to measure 10 meters by 10 meters (or equivalent to 100 square meters) depending on buffer width. The planted material in the plot was marked with flagging. The targeted vegetation was then identified by species, and the number of each species was recorded in a field book.

2.2 Stream Methodology

The project monitoring for the stream channel included a longitudinal survey, cross-sectional surveys, pebble counts and photo documentation. These measurements were taken at each reach. The stationing was based on thalweg. The methodology for each portion of the stream monitoring is described in detail below.

2.2.1 Longitudinal Profile

The longitudinal profile of the restored stream was surveyed for each reach. The heads of features, such as riffles, runs, pools, maximum pool, and glide, were surveyed in the longitudinal profile. At the head of each feature, thalweg, water surface, edge of water, left and right bankfull, and left and right top of bank were surveyed. The average water-surface slope for each feature, pool length, and pool to pool spacing were calculated from this survey. The surveyed features assisted in drawing out the plan view of the restored stream. Stream pattern data (i.e., meander length, radius of curvature, belt width, and sinuosity) were also measured from the plan view.

The pools that were constructed downstream of the cross vanes were surveyed in the longitudinal profile. These pools were grouped in to calculate the pool-to-pool spacing and the pool-to-pool spacing to bankfull width ratio calculations.

2.2.2 Permanent Cross Sections

Four permanent cross sections (two riffles and two pools) were surveyed at Reach 1. Two permanent cross sections (one riffle and one pool) were surveyed at Reach 2 and six permanent cross sections (3 riffles and 3 pools) at Reach 3. The beginning and end of each permanent cross section was originally marked with a wooden stake and metal conduit. Cross sections were installed perpendicular to the stream flow. The survey noted all changes in slopes, tops of both banks, left and right bankfull, edges of water, thalweg and water surface. The bankfull cross sectional areas were calculated for each cross section based on the drainage area and compared to the design parameters. The cross sections were plotted and graphed. The bankfull mean depth, cross sectional area, width-to-depth ratios and entrenchment ratios were also calculated.

2.2.3 Pebble Counts

A modified Wolman pebble count (Rosgen 1993) consisting of 50 samples conducted at each permanent cross section. The cumulative percent was graphed, and the d50 and d84 calculated.

2.3 Photo Documentation

Photo points were taken from one corner at each vegetation plot. The chosen corner varies from each vegetation plot, and its location was documented on the plan view sheets. Permanent photo points were established during Year 1 monitoring with metal conduit. Photographs were taken at these points during the field surveys. Photos were taken in the direction indicated on the monitoring plan view sheets.

3.0 PROJECT CONDITIONS AND RESULTS

3.1 Vegetation

3.1.1 Soils Data

Table V. Preliminary Soil Data

Series	Max Depth (in.)	% Clay on Surface	K	T	OM %
Chewacla (Cd)	80	5.0 - 20.0	0.48	*	1.0 - 4.0
Efland (EaB2)	86	<<<<<<< Information unavailable >>>>>>>			
Georgeville (GaB2)	63	5.0 - 27.0	0.48	*	0.5 - 2.0
Georgeville (GbD3)	63	27.0 - 35.0	0.35	*	0.5 - 2.0
Herndon (HdB2)	68	5.0 - 27.0	0.48	*	0.5 - 1.0
Local Alluvial (Lc)		<<<<<<< High variability of data >>>>>>>			
Orange (ObB2)	55	10.0 - 27.0	0.44	*	1.0 - 3.0
Orange (ObC2)	55	10.0 - 27.0	0.44	*	1.0 - 3.0

* The soils information was not available from the Natural Resources Conservation Service (NRCS)

3.1.2 Vegetative Problem Area Plan View

There is good herbaceous vegetation growth along all of the monitored stream reach. In many areas, fescue was prevalent, preventing the establishment of the planted bare root trees. This was particularly noted in Vegetation Plot (VP) #2 where no bare roots were noted. In VP #4, only a single bare root of green ashe was located. In VP #9 and #10, fescue dominates portions of the plot, but not all of the plots. The vegetative plots and problem areas are shown on the plan view sheets in Appendix C.

Although not considered to be problem now, Japanese honeysuckle was noted in several areas. It was noted in VP #1, #4, #5, #6, and #7 (the side of the plot opposite the stream). These are "watch" areas.

Other areas to "watch" are a pokeberry clump near VP #2, privette located outside of VP #5 and rose near VP #6.

Hedge morning glory (*Convolvulus sepium*) has entered VP #7. This species, although a native, appears to be wrapping itself around many of the planted bare roots.

Table VI. Vegetative Problem Areas

Feature/Issue	Station # / Range	Probable Cause	Photo #
Bare Flood Plain	13+20 - Reach 2 Right Bank	Seed wash and compact ground	3
Invasive/Exotic Populations		species migration from upland off of property	4

3.1.3 Stem Counts

The planted bare root stems in Reach 1 are a concern. No stems were located in VP #2, one stem in VP #4 and few stems were located in VP #1, 3, and 5. The number of stems/acre in VP #1, 2, 4 and 5 are already below the Year 5 goal of 260 stems/acre. VP #3 is a "watch" area as the stem/acre was 280. It was noted that outside of the vegetation plots for Reach 1, as you travel downstream, and VP# 5 in Reach 2, the number of bare root stems increased substantially.

3.2 Stream

At this time, it is not possible to compare the data collected for the longitudinal survey or cross-sections. Monitoring in 2006 represented the first year of monitoring when everything was "set-up" and installed. Comparisons can and will be made in Year 2 (2007) back to this data. From this year's data, the problem areas that were observed in the field were marked on the plan sheets in Appendix C.

3.2.1 Longitudinal Profile

The longitudinal profile for Year 1 monitoring in this report sets-up the "base line" data for future monitoring comparisons. No conclusions can be made at this time from the longitudinal profile. The longitudinal profile is shown in Appendix B5.

3.2.2 Permanent Cross Sections

The permanent cross-sections installed for this monitoring data set establishes the "base line" data for future comparisons to be made to. No conclusions can be made at this time. The cross-section graphs are located in Appendix B4.

3.2.3 Pebble Counts

Since this is Year 1 monitoring, no comparisons of the pebble count data can be made at this time. Currently, the site is a sand bed channel. Over time the bed material should coarsen up. The pebble count data is located in Appendix B6.

3.3 Photo Documentation

Photos taken of the vegetation problem areas are found in Appendix A1, and photos of the vegetation plots are in Appendix A2. The photographs taken at the marked photo point locations and at the cross-sections are provided in Appendix B2. Problem area photographs are also provided in Appendix B1.

3.4 Stream Problem Areas

Table X for each reach located in Appendix B3, describes the problem areas, station numbers, and respective probable causes. A majority of the problems appear to be from vegetation growing in the channel. The vegetation appears to be forcing the channel to narrow up and/or changing the bed elevation and slope. It appears that livestock have had access to the channel since construction of the stream project. This access may have caused some of the initial in-stream bank slumping and bar formation. The bank slumping appears to be stabilizing; however, the mid-channel vegetated bars are still prevalent throughout some portions of the channel. Another problem with the stream is that several structures are "up" out of the current water flow at the time of survey and piping is occurring around others.

4.0 RECOMMENDATIONS AND CONCLUSIONS

Since this is Year 1 monitoring, no conclusions from comparisons over time can be made at this time for the stream. There are several areas with stream problems, especially at the lower end of Reach 1, where structures are failing. The water level was low at the time of survey. Several of the structures seemed "too high" with water flowing under the structures, not over them, and/or with water piping around the structures After Year 2 monitoring data is collected, any changes will be discussed at that time in more detail.

There are several concern areas with regard to the vegetation plots. The number of stems/acre in VP #1, 2, 4 and 5 are already below the Year 5 goal of 260 stems/acre. The stem/acre for VP #3 is 280 stems/acre.

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APPENDIX A1

PHOTOLOG VEGETATION PROBLEM AREAS

APPENDIX A1
PHOTOLOG VEGETATION PROBLEM AREAS UT TO SOUTH FORK


Photo 1: Fescue dominates left side of plot


Photo 2: Lack of Bare Roots along Reach 1


Photo 3: Bare area in floodplain


Photo 4: Morning Glory wraps around sycamore tree

APPENDIX A2

PHOTOLOG VEGETATION PLOTS

APPENDIX A2 PHOTOLOG UT to South Fork
VEGETATION PLOTS


Vegetation Plot 1


Vegetation Plot 4


Vegetation Plot 2


Vegetation Plot 5


Vegetation Plot 3


Vegetation Plot 6

Vegetation Plot 7

Vegetation Plot 10

Vegetation Plot 8

Vegetation Plot 11

Vegetation Plot 9

Vegetation Plot 12

APPENDIX A3

VEGETATION DATA TABLES

UTSF

Table VII. Stem counts for each species arranged by plot

Species	Plots												Initial Totals*	Year 1 Totals	Survival %**
	1	2	3	4	5	6	7	8	9	10	11	12			
Shrubs															
Cephalanthus occidentalis															
Cornus ammomum									1	11					
Salix nigra							1								
Trees															
Acer negundo															
Acer rubrum				7 11											
Betula nigra							1111	11	1	7 7 11	111	7 111			
Carpinus caroliniana												11			
Diospyros virginiana						1	7	1111	11	111	1	11			
Fraxinus pennsylvanica	111		1111	1	111		7 7 111	7 11	7 111	7 7 1	11	111			
Hypericum sp.			111							1					
Juglans nigra								1	7 1	7	7	7 11			
Platanus occidentalis						7 7	7 7 111	11	11		11	111			
Sambucus canandensis					11	111									
Quercus michauxii								1	1	7 1	11	1111			
Quercus sp.							1								
Quercus alba						11		7 1		11					
Ulmus americana							11				1				
Total including live stake															
Stems per acre															
Total exluding live stake															
Stems per acre															

C.O

C.A.

S.N

LS

Table VII. Stem counts for each species arranged by plot

Species	Plots												Initial Totals*	Year 1 Totals	Survival %**
	1	2	3	4	5	6	7	8	9	10	11	12			
Shrubs															
Cephalanthus occidentalis															
Cornus ammomum						(LS 15)			1 (LS 1)	2 (LS 5)	(LS 5)	(LS 5)		3 (LS 31)	
Salix nigra							1								
Trees															
Acer negundo											1			1	
Acer rubrum				7										7	
Betula nigra							4	2	1	13	3	8		31	
Carpinus caroliniana												2		2	
Diospyros virginiana						1	5	4	2	3	1	2		18	
Fraxinus pennsylvanica	3		4	1	3		13	12	13	16	2	3		70	
Hypericum sp.			3							1				4	
Juglans nigra								1	10	5	4	7		27	
Platanus occidentalis						10	13	2	2		2	3		32	
Sambucus canandensis					2	3								5	
Quercus michauxii								1	1	6	2	4		14	
Quercus sp.							1							1	
Quercus alba						2		6		2				10	
Ulmus americana							2				1			3	
Total including live stake	3	0	7	8	5	31	39	28	31	53	21	34		259	
Stems per acre	120	0	280	320	200	1240	1560	1120	1240	2120	840	1360			
Total exluding live stake	3	0	7	8	5	15	39	28	30	48	16	29		228	
Stems per acre	120	0	280	320	200	600	1560	1120	1200	1920	640	1160			

* Initial totals were not collected. Arcadis was not informed of the vegetation installation. The initial totals are unknown.

** Survival percentage for Year 1 cannot be computed because there is no initial total.

APPENDIX B1

PHOTOLOG STREAM PROBLEM AREAS

APPENDIX B1
REPRESENTATIVE STREAM PROBLEM AREAS

REACH 1

Aggradation below first cross-vane

REACH 3

Narrowing of channel/grass slump

REACH 2

Cattails growing in channel

REACH 3

Toe Erosion along left bank (photo taken looking upstream)

APPENDIX B2

PHOTOLOG OF CROSS-SECTIONS AND PHOTO POINTS

APPENDIX B2
PHOTOLOG REACH 2


Cross-Section 5: Looking Downstream


Cross-Section 5: Looking Upstream


Cross-Section 6: Looking Downstream


Cross-Section 6: Looking Upstream

Photo point 1: Looking Downstream

Photo point 2: Looking Downstream

Photo point 1: Looking Upstream

Photo point 2: Looking Upstream

Photo point 1: Looking at Channel

Photo point 2: Looking at Channel

Photo point 3: Looking Downstream

Photo point 4: Looking Downstream

Photo point 3: Looking Upstream

Photo point 4: Looking Upstream

Photo point 3: Looking at Channel

Photo point 4: Looking at Channel

Photo point 5: Looking Downstream

Photo point 6: Looking Downstream

Photo point 5: Looking Upstream

Photo point 6: Looking Upstream

Photo point 5: Looking at Channel

Photo point 6: Looking at Channel

Photo point 7: Looking Downstream

Photo point 7: Looking Upstream

Photo point 7: Looking at Channel

APPENDIX B2
PHOTOLOG REACH 1


Cross-Section 1: Looking Downstream


Cross-Section 1: Looking Upstream


Cross-Section 2: Looking Downstream


Cross-Section 2: Looking Upstream


Cross-Section 3: Looking Downstream


Cross-Section 3: Looking Upstream

Cross-Section 4: Looking Downstream

Cross-Section 4: Looking Upstream

Photo point 1: Looking at Channel

Photo point 2: Looking Downstream

Photo point 1: Looking Downstream

Photo point 2: Looking Upstream

Photo point 1: Looking Upstream

Photo point 2: Looking at Channel

Photo point 3: Looking Downstream

Photo point 4: Looking Downstream

Photo point 3: Looking Upstream

Photo point 4: Looking Upstream

Photo point 3: Looking at Channel

Photo point 4: Looking at Channel

Photo point 5: Looking Downstream

Photo point 6: Looking Downstream

Photo point 5: Looking Upstream

Photo point 6: Looking Upstream

Photo point 7: Looking Downstream

Photo point 7: Looking Upstream

Photo point 8: Looking Upstream

APPENDIX B2
PHOTOLOG REACH 3


Cross-Section 7: Looking Downstream


Cross-Section 7: Looking Upstream


Cross-Section 8: Looking Downstream


Cross-Section 8: Looking Upstream


Cross-Section 9: Looking Downstream


Cross-Section 9: Looking Upstream

Cross-Section 10: Looking Downstream

Cross-Section 10: Looking Upstream

Cross-Section 11: Looking Downstream

Cross-Section 11: Looking Upstream

Cross-Section 12: Looking Downstream

Cross-Section 12: Looking Upstream

Photo point 1: looking downstream

Photo point 2: looking downstream

Photo point 1: looking upstream

Photo point 2: looking upstream

Photo point 1: looking at channel

Photo point 2: looking at channel

Photo point 3: looking downstream

Photo point 4: looking downstream

Photo point 3: looking upstream

Photo point 4: looking upstream

Photo point 3: looking at channel

Photo point 4: looking at channel

Photo point 5: looking downstream

Photo point 5: looking upstream

Photo point 5: looking at channel

APPENDIX B3

STREAM DATA TABLES

Appendix B3
UT to South Fork

Table VIII. Verification of Bankfull Events - UT to South Fork

Date of Data Collection	Date of Occurrence	Method	Photo # (if available)
1/10/2007	Unknown	Crest Stage Gauge measurement of approximately 7" on stick (bottom of stick at bkf)	

Table B2. Visual Morphological Stability Assessment						
UT to South Fork						
Segment/Reach: 1 (1152 feet)						
Feature Category	**Metric (per As-built and reference baselines)**	**(#Stable) Number Performing as Intended**	**Total Number per As-built**	**Total Number / feet in unstable state**	**% Performing in Stable Condition**	**Feature Performance Mean or Total**
A. Riffles	1. Present	23	28	NA	82%	
	2. Armor stable	22	28	NA	79%	
	3. Facet grade appears stable	23	28	NA	82%	
	4. Minimal evidence of embedding/fining	22	28	NA	79%	
	5. Length appropriate	22	28	NA	79%	**80%**
B. Pools	1. Present	29	29	NA	100%	
	2. Sufficiently deep	21	29	NA	72%	
	3. Length appropriate	20	29	NA	69%	**80%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	11	13	NA	85%	
	2. Downstream of meander (glide/inflection) centering	11	13	NA	85%	**85%**
D. Meanders	1. Outer bend in state of limited/controlled erosion	9	13	NA	69%	
	2. Of those eroding, # w/concomitant point bar formation	3	3	NA	100%	
	3. Apparent Rc within specifications	11	13	NA	85%	
	4. Sufficient floodplain access and relief	12	13	NA	92%	**87%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	16/180	84%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting	NA	NA	0/0	100%	**92%**
F. Bank Condition	1. Actively eroding, wasting, or slumping bank	NA	NA	3/15	98%	**98%**
G. Vanes / J Hooks etc.	1. Free of back or arm scour	29	50	NA	58%	
	2. Height appropriate	29	50	NA	58%	
	3. Angle and geometry appear appropriate	29	50	NA	58%	
	4. Free of piping or other structural failures	29	50	NA	58%	**58%**
H. Wads and Boulders	1. Free of scour	4	8	NA	50%	
	2. Footing stable	4	8	NA	50%	**50%**

Table B2. Visual Morphological Stability Assessment						
UT to South Fork						
Segment/Reach: 2 (1030 feet)						
Feature Category	**Metric (per As-built and reference baselines)**	**(#Stable) Number Performing as Intended**	**Total Number per As-built**	**Total Number / feet in unstable state**	**% Performing in Stable Condition**	**Feature Performance Mean or Total**
A. Riffles	1. Present	13	13	NA	100%	
	2. Armor stable	13	13	NA	100%	
	3. Facet grade appears stable	13	13	NA	100%	
	4. Minimal evidence of embedding/fining	10	13	NA	77%	
	5. Length appropriate	10	13	NA	77%	**91%**
B. Pools	1. Present	14	14	NA	100%	
	2. Sufficiently deep	12	14	NA	86%	
	3. Length appropriate	12	14	NA	86%	**90%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	7	8	NA	88%	
	2. Downstream of meander (glide/inflection) centering	7	7	NA	100%	**94%**
D. Meanders	1. Outer bend in state of limited/controlled erosion	13	16	NA	81%	
	2. Of those eroding, # w/concomitant point bar formation	2	3	NA	67%	
	3. Apparent Rc within specifications	14	16	NA	88%	
	4. Sufficient floodplain access and relief	13	16	NA	81%	**79%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	13/282	73%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting	NA	NA	0/0	100%	**87%**
F. Bank Condition	1. Actively eroding, wasting, or slumping bank	NA	NA	3/18	98%	**98%**
G. Vanes / J Hooks etc.	1. Free of back or arm scour	20	28	NA	71%	
	2. Height appropriate	20	28	NA	71%	
	3. Angle and geometry appear appropriate	20	28	NA	71%	
	4. Free of piping or other structural failures	20	28	NA	71%	**71%**
H. Wads and Boulders	1. Free of scour	3	11	NA	27%	
	2. Footing stable	3	11	NA	27%	**27%**

Table B2. Visual Morphological Stability Assessment						
UT to South Fork						
Segment/Reach: 3 (1021 feet)						
Feature Category	**Metric (per As-built and reference baselines)**	**(#Stable) Number Performing as Intended**	**Total Number per As-built**	**Total Number / feet in unstable state**	**% Performing in Stable Condition**	**Feature Performance Mean or Total**
A. Riffles	1. Present	16	16	NA	100%	
	2. Armor stable	14	16	NA	88%	
	3. Facet grade appears stable	14	16	NA	88%	
	4. Minimal evidence of embedding/fining	14	16	NA	88%	
	5. Length appropriate	14	16	NA	88%	**90%**
B. Pools	1. Present	19	19	NA	100%	
	2. Sufficiently deep	19	19	NA	100%	
	3. Length appropriate	14	19	NA	74%	**91%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	7	8	NA	88%	
	2. Downstream of meander (glide/inflection) centering	7	8	NA	88%	**88%**
D. Meanders	1. Outer bend in state of limited/controlled erosion	12	16	NA	75%	
	2. Of those eroding, # w/concomitant point bar formation	3	4	NA	75%	
	3. Apparent Rc within specifications	11	16	NA	69%	
	4. Sufficient floodplain access and relief	13	16	NA	81%	**75%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	12/234	77%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting	NA	NA	0/0	100%	**89%**
F. Bank Condition	1. Actively eroding, wasting, or slumping bank	NA	NA	5/72	93%	**93%**
G. Vanes / J Hooks etc.	1. Free of back or arm scour	30	30	NA	100%	
	2. Height appropriate	30	30	NA	100%	
	3. Angle and geometry appear appropriate	30	30	NA	100%	
	4. Free of piping or other structural failures	30	30	NA	100%	**100%**
H. Wads and Boulders	1. Free of scour	9	10	NA	90%	
	2. Footing stable	9	10	NA	90%	**90%**

Table X. Stream Problem Areas

UT to South Fork, Reach 1

Feature Issue	Station numbers	Suspected Cause
Aggradation (grass)	10+11.51	
	10+18.53	Channel is narrowing
J-Hook	10+17+21	Angle or position of structure
Aggradation (grass)	10+32.59	
	10+34.03	Channel is narrowing
J-Hook	10+52.24	Piping around structure
J-Hook	10+72.00	Missing center rock
J-Hook	10+95.76	Angle or position of structure
J-Hook	11+16.53	Loose rock
Aggradation (grass)	11+43.31	
	11+50.29	Channel is narrowing
J-Hook	11+51.86	Angle or position of structure
Bank Erosion (right bank)	11+60.15	
	11+63.81	Direction of flow onto bank. Reach makes sharp turn.
Aggradation (grass)	11+79.20	
	11+87.56	Channel is narrowing
Aggradation (grass)	12+07.44	
	12+16.35	Channel is narrowing
Aggradation (grass)	12+78.02	
	12+83.73	Channel is narrowing
Aggradation (grass)	13+05.06	
	13+13.43	Channel was perhaps built too wide and is trying to narrow itself up
Aggradation (grass)	14+15.78	
	14+22.23	Channel is narrowing
J-Hook	14+22.72	Piping around structure
Aggradation (grass)	14+89.59	
	14+92.80	Channel is narrowing
J-Hook	14+91.73	Piping around structure
Aggradation (grass)	15+01.22	
	15+03.15	Channel is narrowing
Rootwad	15+55.23	Structure exposed up out of water (appears to have installed to high.
Aggradation (grass)	15+28.96	
	15+81.01	Channel is narrowing
J-Hook	15+82.13	Piping around structure
Rootwad	15+93.31	Angle or position of structure
Rootwad	15+95.14	Angle or position of structure
Aggradation (grass)	15+98.02	
	16+34.45	Channel was perhaps built too wide and is trying to narrow itself up
J-Hook	16+51.87	Angle or position of structure
J-Hook	16+87.51	Angle or position of structure
Aggradation (grass)	16+97.16	
	17+04.96	Channel is narrowing
J-Hook	17+27.10	Missing center rock
Aggradation (grass)	17+35.64	
	17+47.62	Channel is narrowing
J-Hook	17+67.30	Angle or position of structure
Bank Erosion (right bank)	17+70.60	
	17+75.04	Direction of flow onto bank from J-hook upstream
Cross-Vane	18+49.27	Piping around structure
J-Hook	18+66.60	Structure exposed up out of water (appears to have installed to high.
J-Hook	18+84.08	Structure exposed up out of water (appears to have installed to high.
Aggradation (grass)	18+95.86	
	19+04.12	Channel is narrowing
Bank Erosion (left bank)	19+05.52	Flow directed onto bank. Perhaps structure immediately downstream should have
	19+06.83	been placed immediately upstream.
J-Hook	19+08.05	Structure exposed up out of water (appears to have installed to high.
J-Hook	19+20.79	Structure exposed up out of water (appears to have installed to high.
J-Hook	19+58.78	Structure exposed up out of water (appears to have installed to high.
Aggradation (grass)	20+19.57	
	20+22.37	Channel is narrowing
J-Hook	20+22.97	Structure exposed up out of water (appears to have installed to high.
Rootwad	20+39.28	Structure exposed up out of water (appears to have installed to high.
J-Hook	21+41.26	Structure exposed up out of water (appears to have installed to high.

Table X. Stream Problem Areas

UT to South Fork, Reach 2

Feature Issue	Station numbers	Suspected Cause
Rootwad	10+38.5	Angle and position of structure
Cross-Vane	10+48.96	
Aggradation (cattails)	10+82.48	
	11+06.33	Channel was perhaps built too wide and is trying to narrow itself up
Rootwad	11+11.59	Angle and position of structure
Aggradation	11+13.96	
	11+18.68	Channel is narrowing
Cross-Vane	11+19.36	Piping around structure
Aggradation	11+24.87	
	11+27.42	Channel is narrowing
J-Hook	11+38.59	Angle and position of structure
Rootwad	11+49.63	Structure exposed up out of water (appears to have installed to high).
Aggradation	11+67.35	
	12+19.12	Channel was perhaps built too wide and is trying to narrow itself up
J-Hook	11+71.26	Structure exposed up out of water (appears to have installed to high).
Rootwad	11+80.28	Structure exposed up out of water (appears to have installed to high).
Aggradation (willows)	12+32.28	
	12+37.43	Channel was perhaps built too wide and is trying to narrow itself up
Aggradation (cattails)	12+40.57	
	12+62.66	Channel is narrowing
J-Hook	12+96.40	Angle and position of structure
Bank Erosion (right bank)	13+03.79	
	13+05.03	Flow directed onto bank from structure immediately upstream
Rootwad	13+03.79	Structure exposed up out of water (appears to have installed to high).
Aggradation (cattails)	13+35.56	
	13+48.86	Channel is narrowing
Rootwad	14+26.22	Angle and position of structure
Cross-Vane	14+54.12	Piping around structure
Rootwad	15+04.20	Angle and position of structure
Bank Erosion (right bank)	15+04.62	
	15+08.00	Flow directed onto bank. Lack of protection by rootwads.
Rootwad	15+08.00	Angle and position of structure
Aggradation (grass)	15+45.44	
	15+52.24	Channel is narrowing
Aggradation (grass)	16+30.93	
	16+40.76	Channel was perhaps built too wide and is trying to narrow itself up
Aggradation (grass)	16+59.06	
	17+75.32	Channel is narrowing
Bank Erosion (left bank)	17+55.60	
	17+60.89	Soil type or lack of vegetation. Perhaps built too wide and is trying to narrow up
Aggradation (cattails)	18+22.45	
	18+33.19	Channel is narrowing
Cross-Vane	18+62.65	Missing center rock
Aggradation (cattails)	18+63.72	
	18+73.72	Channel was perhaps built too wide and is trying to narrow itself up
Aggradation (cattails)	19+35.46	
	19+39.27	Channel is narrowing
Cross-Vane	20+28.46	Piping around structure

Table X. Stream Problem Areas		
UT to South Fork, Reach 3		
Feature Issue	**Station numbers**	**Suspected Cause**
Aggradation (Cattails)	10+83.62	
	11+12.38	Channel is narrowing
Bank Erosion (right bank)	11+31.25	
	11+35.86	Soil type or lack of vegetation. Perhaps built too wide and is narrowing.
Rootwad	11+66.74	Angle and position of structure
Bank Erosion (left bank)	11+66.74	
	11+72.50	Back eddying due to rootwad directly upstream
Aggradation (Cattails)	11+82.20	
	11+89.10	Channel was perhaps built too wide and is trying to narrow itself up
Aggradation (grass)	12+10.90	
	12+30.32	Channel is narrowing
Aggradation (Cattails)	13+00.30	
	13+16.31	Channel was perhaps built too wide and is trying to narrow itself up
Bank Erosion (left bank)	13+05.62	
	13+23.49	Flow directed onto bank from structure upstream. Soil type and lack of vegetation may also be
Aggradation (grass)	13+53.07	
	13+56.82	Channel is narrowing
Aggradation (Cattails)	13+74.82	
	13+80.16	Channel was perhaps built too wide and is trying to narrow itself up
Aggradation (Cattails)	13+95.61	
	14+04.02	Channel was perhaps built too wide and is trying to narrow itself up
Aggradation (grass)	15+24.18	
	16+13.18	Channel was perhaps built too wide and is trying to narrow itself up
Aggradation (Cattails)	15+39.05	
	15+46.91	Channel is narrowing
Aggradation (Cattails)	16+05.77	
	16+18.89	Channel was perhaps built too wide and is trying to narrow itself up
Aggradation (Cattails)	17+87.11	
	17+92.13	Channel was perhaps built too wide and is trying to narrow itself up
Bank Erosion (left bank)	17+94.24	
	18+05.67	Soil type or lack of vegetation. Perhaps built too wide and is narrowing.
Aggradation (grass)	18+22.74	
	18+33.86	Channel is narrowing
Aggradation (grass)	18+76.41	
	18+85.75	Channel is narrowing
Aggradation (grass)	18+97.77	
	19+21.03	Channel is narrowing
Bank Erosion (left bank)	19+14.41	
	19+39.76	Flow directed onto bank. Also soil type or lack of vegetation

Table B1. Categorical Stream Feature Visual Stability Assessment						
UT to South Fork						
Segment/Reach: 1 (1166 linear feet)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
A. Riffles		80%				
B. Pools		80%				
C. Thalweg		85%				
D. Meanders		87%				
E. Bed General		92%				
F. Bank Condition		98%				
G. Vanes / J Hooks etc.		58%				
H. Wads and Boulders		50%				

Table B1. Categorical Stream Feature Visual Stability Assessment						
UT to South Fork						
Segment/Reach: 2 (1029 linear feet)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
A. Riffles		91%				
B. Pools		90%				
C. Thalweg		94%				
D. Meanders		79%				
E. Bed General		87%				
F. Bank Condition		98%				
G. Vanes / J Hooks etc.		71%				
H. Wads and Boulders		27%				

Table B1. Categorical Stream Feature Visual Stability Assessment						
UT to South Fork						
Segment/Reach: 3 (1020 linear feet)						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
A. Riffles		90%				
B. Pools		91%				
C. Thalweg		88%				
D. Meanders		75%				
E. Bed General		89%				
F. Bank Condition		93%				
G. Vanes / J Hooks etc.		100%				
H. Wads and Boulders		90%				

Appendix B3
UT to South Fork

Table XII Baseline Morphology and Hydraulic Summary

UT to South Fork (Subreach 1)

Project Number 435

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Dimension																		
BF Width (ft)	**28.00**	**30.00**	**29.00**				**3.00**	**3.40**	**3.20**	**6.50**	**10.00**	**8.00**	**N/A**	**N/A**	**9.40**			
Floodprone Width (ft)	**40.00**	**100.00**	**70.00**				**N/A**	**N/A**	**10.00**	**16.00**	**22.00**	**18.80**	**N/A**	**N/A**	**>33**			
BFCross Sectional Area (ft)	**58.60**	**58.90**	**58.80**				**2.90**	**3.60**	**3.20**	**3.90**	**6.30**	**5.30**	**N/A**	**N/A**	**5.90**			
BF Mean Depth (ft)	**2.00**	**2.10**	**2.00**				**1.00**	**1.10**	**1.00**	**0.40**	**1.00**	**0.70**	**N/A**	**N/A**	**0.60**			
Max Depth (ft)	**2.70**	**3.00**	**2.90**				**1.00**	**1.80**	**1.40**	**0.90**	**1.40**	**1.10**	**0.80**	**1.30**	**1.00**			
Width/Depth Ratio	**13.00**	**15.00**	**14.00**				**N/A**	**N/A**	**3.00**	**7.00**	**26.00**	**13.50**	**N/A**	**N/A**	**15.00**			
Entrenchment Ratio	**1.30**	**3.60**	**2.40**				**2.90**	**3.30**	**3.10**	**2.00**	**3.40**	**2.40**	**N/A**	**N/A**	**>2.2**			
Bank Height Ratio	**N/A**	**N/A**	**N/A**				**0.60**	**3.10**	**1.80**	**1.40**	**2.50**	**1.80**	**N/A**	**N/A**	**1.00**			
Wetted Perimeter (ft)	**32.00**	**34.20**	**33.00**				**5.00**	**5.60**	**5.20**	**7.30**	**12.00**	**9.40**	**N/A**	**N/A**	**10.60**			
Hydraulic radius (ft)	**1.83**	**1.72**	**1.78**				**0.58**	**0.64**	**0.62**	**0.53**	**0.53**	**0.56**	**N/A**	**N/A**	**0.56**			
Pattern																		
Channel Beltwidth (ft)	**N/A**	**N/A**	**N/A**				**22.00**	**122.00**	**48.90**	**10.00**	**35.00**	**20.90**	**12.20**	**41.40**	**24.50**			
Radius of Curvature (ft)	**N/A**	**N/A**	**N/A**				**7.00**	**100.00**	**26.10**	**2.30**	**31.80**	**13.50**	**2.80**	**37.60**	**15.10**			
Meander Wavelenght (ft)	**N/A**	**N/A**	**N/A**				**21.00**	**282.00**	**136.70**	**35.00**	**70.00**	**50.00**	**41.40**	**82.80**	**59.30**			
Meander Width Ratio	**N/A**	**N/A**	**N/A**				**6.90**	**38.10**	**15.30**	**1.30**	**4.40**	**2.60**	**1.30**	**4.40**	**2.60**			
Profile																		
Riffle length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Riffle slope (ft/ft)	**N/A**	**N/A**	**N/A**				**0.01**	**0.03**	**0.02**	**0.02**	**0.08**	**0.04**	**0.01**	**0.04**	**0.02**			
Pool length (ft)	**N/A**	**N/A**	**N/A**				**3.80**	**27.60**	**11.70**	**7.00**	**27.00**	**14.50**	**8.50**	**32.00**	**16.90**			
Pool spacing (ft)	**N/A**	**N/A**	**N/A**				**23.20**	**165.60**	**75.40**	**17.00**	**63.00**	**36.50**	**19.80**	**74.30**	**43.30**			
Substrate																		
d50 (mm)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**13.00**	**N/A**	**N/A**	**4.50**	**N/A**	**N/A**	**N/A**			
d84 (mm)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**44.00**	**N/A**	**N/A**	**33.00**	**N/A**	**N/A**	**N/A**			
Additional Reach Parameters																		
Valley Length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Channel Length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Sinuosity	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**1.22**	**N/A**	**N/A**	**1.40**	**N/A**	**N/A**	**1.26**			
Water Surface Slope (ft/ft)	**N/A**	**N/A**	**0.01**				**N/A**	**N/A**	**0.01**	**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.01**			
BF slope (ft/ft)	**N/A**	**N/A**	**0.01**				**N/A**	**N/A**	**0.01**	**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.01**			
Rosgen Classification	**N/A**	**N/A**	**B/C**				**N/A**	**N/A**	**E 4/1**	**N/A**	**N/A**	**C/E 4/1**	**N/A**	**N/A**	**C/E 4/1**			
*Habitat Index																		
*Macrobenthos																		

Table XII Baseline Morphology and Hydraulic Summary

UT to South Fork (Subreach 2)

Project Number 435

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Dimension																		
BF Width (ft)	**28.00**	**30.00**	**29.00**				**N/A**	**N/A**	**9.00**	**6.50**	**10.00**	**8.00**	**N/A**	**N/A**	**12.20**			
Floodprone Width (ft)	**40.00**	**100.00**	**70.00**				**N/A**	**N/A**	**68.00**	**16.00**	**22.00**	**18.80**	**N/A**	**N/A**	**>26.8**			
BFCross Sectional Area (ft)	**58.60**	**58.90**	**58.80**				**N/A**	**N/A**	**10.20**	**3.90**	**6.30**	**5.30**	**N/A**	**N/A**	**10.00**			
BF Mean Depth (ft)	**2.00**	**2.10**	**2.00**				**N/A**	**N/A**	**1.10**	**0.40**	**1.00**	**0.70**	**N/A**	**N/A**	**0.80**			
Max Depth (ft)	**2.70**	**3.00**	**2.90**				**1.00**	**2.10**	**1.50**	**0.90**	**1.40**	**1.10**	**1.00**	**1.60**	**1.30**			
Width/Depth Ratio	**13.00**	**15.00**	**14.00**				**N/A**	**N/A**	**8.00**	**7.00**	**26.00**	**13.50**	**N/A**	**N/A**	**15.00**			
Entrenchment Ratio	**1.30**	**3.60**	**2.40**				**N/A**	**N/A**	**7.60**	**2.00**	**3.40**	**2.40**	**N/A**	**N/A**	**>2.2**			
Bank Height Ratio	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**1.70**	**1.40**	**2.50**	**1.80**	**N/A**	**N/A**	**1.00**			
Wetted Perimeter (ft)	**32.00**	**34.20**	**33.00**				**N/A**	**N/A**	**11.20**	**7.30**	**12.00**	**9.40**	**N/A**	**N/A**	**13.80**			
Hydraulic radious (ft)	**1.83**	**1.72**	**1.78**				**N/A**	**N/A**	**0.91**	**0.53**	**0.53**	**0.56**	**N/A**	**N/A**	**0.72**			
Pattern																		
Channel Beltwidth (ft)	**N/A**	**N/A**	**N/A**				**12.00**	**114.00**	**45.70**	**10.00**	**35.00**	**20.90**	**15.90**	**53.90**	**31.80**			
Radius of Curvature (ft)	**N/A**	**N/A**	**N/A**				**5.00**	**140.00**	**28.00**	**2.30**	**31.80**	**13.50**	**3.70**	**49.00**	**19.60**			
Meander Wavelenght (ft)	**N/A**	**N/A**	**N/A**				**40.00**	**172.00**	**87.90**	**35.00**	**70.00**	**50.00**	**53.90**	**107.80**	**77.20**			
Meander Width Ratio	**N/A**	**N/A**	**N/A**				**1.30**	**12.70**	**5.10**	**1.30**	**4.40**	**2.60**	**1.30**	**4.40**	**2.60**			
Profile																		
Riffle length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Riffle slope (ft/ft)	**N/A**	**N/A**	**N/A**				**0.00**	**0.08**	**0.03**	**0.02**	**0.08**	**0.04**	**0.01**	**0.05**	**0.03**			
Pool length (ft)	**N/A**	**N/A**	**N/A**				**3.80**	**27.60**	**12.40**	**7.00**	**27.00**	**14.50**	**11.00**	**41.60**	**22.00**			
Pool spacing (ft)	**N/A**	**N/A**	**N/A**				**12.90**	**75.90**	**35.40**	**17.00**	**63.00**	**36.50**	**25.70**	**96.80**	**56.30**			
Substrate																		
d50 (mm)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**13.00**	**N/A**	**N/A**	**4.50**	**N/A**	**N/A**	**N/A**			
d84 (mm)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**44.00**	**N/A**	**N/A**	**53.00**	**N/A**	**N/A**	**N/A**			
Additional Reach Parameters																		
Valley Length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Channel Length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Sinuosity	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**1.27**	**N/A**	**N/A**	**1.40**	**N/A**	**N/A**	**1.58**			
Water Surface Slope (ft/ft)	**N/A**	**N/A**	**0.00**				**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.01**			
BF slope (ft/ft)	**N/A**	**N/A**	**0.00**				**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.01**			
Rosgen Classification	**N/A**	**N/A**	**B/C**				**N/A**	**N/A**	**E 4/1**	**N/A**	**N/A**	**C/E 4/1**	**N/A**	**N/A**	**C/E 4/1**			
*Habitat Index																		
*Macrobenthos																		

Table XII Baseline Morphology and Hydraulic Summary

UT to South Fork (Subreach 3)

Project Number 435

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Dimension															
BF Width (ft)	**28.00**	**30.00**	**29.00**				**N/A**	**N/A**	**12.00**	**6.50**	**10.00**	**8.00**	**N/A**	**N/A**	**14.00**
Floodprone Width (ft)	**40.00**	**100.00**	**70.00**				**N/A**	**N/A**	**25.00**	**16.00**	**22.00**	**18.80**	**N/A**	**N/A**	**>30.8**
BFCross Sectional Area (ft)	**58.60**	**58.90**	**58.80**				**N/A**	**N/A**	**12.10**	**3.90**	**6.30**	**5.30**	**N/A**	**N/A**	**15.00**
BF Mean Depth (ft)	**2.00**	**2.10**	**2.00**				**N/A**	**N/A**	**1.00**	**0.40**	**1.00**	**0.70**	**N/A**	**N/A**	**1.10**
Max Depth (ft)	**2.70**	**3.00**	**2.90**				**1.20**	**3.20**	**1.80**	**0.90**	**1.40**	**1.10**	**1.40**	**2.20**	**1.80**
Width/Depth Ratio	**13.00**	**15.00**	**14.00**				**N/A**	**N/A**	**12.00**	**7.00**	**26.00**	**13.50**	**N/A**	**N/A**	**13.00**
Entrenchment Ratio	**1.30**	**3.60**	**2.40**				**N/A**	**N/A**	**2.10**	**2.00**	**3.40**	**2.40**	**N/A**	**N/A**	**>2.2**
Bank Height Ratio	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**2.40**	**1.40**	**2.50**	**1.80**	**N/A**	**N/A**	**1.00**
Wetted Perimeter (ft)	**32.00**	**34.20**	**33.00**				**N/A**	**N/A**	**14.00**	**7.30**	**12.00**	**9.40**	**N/A**	**N/A**	**16.20**
Hydraulic radious (ft)	**1.83**	**1.72**	**1.78**				**N/A**	**N/A**	**0.86**	**0.53**	**0.53**	**0.56**	**N/A**	**N/A**	**0.93**
Pattern															
Channel Beltwidth (ft)	**N/A**	**N/A**	**N/A**				**19.00**	**77.00**	**39.70**	**10.00**	**35.00**	**20.90**	**4.00**	**56.00**	**22.00**
Radius of Curvature (ft)	**N/A**	**N/A**	**N/A**				**11.00**	**46.00**	**22.20**	**2.30**	**31.80**	**13.50**	**4.00**	**56.00**	**22.00**
Meander Wavelenght (ft)	**N/A**	**N/A**	**N/A**				**60.00**	**109.00**	**80.40**	**35.00**	**70.00**	**50.00**	**62.00**	**123.00**	**88.00**
Meander Width Ratio	**N/A**	**N/A**	**N/A**				**1.60**	**6.40**	**3.30**	**1.30**	**4.40**	**2.60**	**1.30**	**4.40**	**2.60**
Profile															
Riffle length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Riffle slope (ft/ft)	**N/A**	**N/A**	**N/A**				**0.00**	**0.05**	**0.02**	**0.02**	**0.08**	**0.04**	**0.00**	**0.02**	**0.01**
Pool length (ft)	**N/A**	**N/A**	**N/A**				**9.40**	**59.20**	**35.30**	**7.00**	**27.00**	**14.50**	**13.00**	**48.00**	**25.00**
Pool spacing (ft)	**N/A**	**N/A**	**N/A**				**37.80**	**103.90**	**73.20**	**17.00**	**63.00**	**36.50**	**29.00**	**111.00**	**64.00**
Substrate															
d50 (mm)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**13.00**	**N/A**	**N/A**	**4.50**	**N/A**	**N/A**	**N/A**
d84 (mm)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**45.00**	**N/A**	**N/A**	**53.00**	**N/A**	**N/A**	**N/A**
Additional Reach Parameters															
Valley Length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Channel Length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Sinuosity	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**1.16**	**N/A**	**N/A**	**1.40**	**N/A**	**N/A**	**1.16**
Water Surface Slope (ft/ft)	**N/A**	**N/A**	**0.00**				**N/A**	**N/A**	**0.01**	**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.01**
BF slope (ft/ft)	**N/A**	**N/A**	**0.00**				**N/A**	**N/A**	**0.01**	**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.01**
Rosgen Classification	**N/A**	**N/A**	**B/C**				**N/A**	**N/A**	**E 4/1**	**N/A**	**N/A**	**C/E 4/1**	**N/A**	**N/A**	**C/E 4/1**
*Habitat Index															
*Macrobenthos															

As-built		
Min	Max	Med

Appendix B3
UT to South Fork

Table XIII. Morphology and Hydraulic Monitoring Summary

UT to South Fork Creek

Segment/Reach: 1 (1166 linear feet)

Parameter	Cross Section 1 Riffle						Cross Section 2 Pool						Cross Section 3 Riffle						Cross Section 4 Pool					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	12.1						12.6						13.8						11.8					
Floodporne Width (ft)	99						NA						>40						NA					
BFCross Sectional Area (ft)	8.2						12.3						8.1						13.7					
BF Mean Depth (ft)	0.7						1						0.6						1.2					
Width/Depth Ratio	17.9						NA						23.6						NA					
Entrenchment Ratio	8.5						NA						>3.0						NA					
Wetted Perimeter (ft)	50.5						13.6						14.9						12.3					
Hydraulic radious (ft)	0.4						0.9						0.5						1.1					
Substrate																								
d50 (mm)	sand						sand						sand						sand					
d84 (mm)	sand						sand						sand						sand					

Parameter	MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	8.9	51.8	20.7															
Radius of Curvature (ft)	9.1	39.1	14.4															
Meander Wavelenght (ft)	46.4	95.8	62.9															
Meander Width Ratio	3.6	7.4	4.9															
Profile																		
Riffle length (ft)	2.56	61.09	14.2															
Riffle slope (ft/ft)	0	0.08	0.02															
Pool length (ft)	4.43	71.01	19.32															
Pool spacing (ft)	8.5	126.5	40.4															
Additional Reach Parameters																		
Valley Length (ft)	925.9																	
Channel Length (ft)	1166																	
Sinuosity	0.8																	
Water Surface Slope (ft/ft)	0.0098																	
BF slope (ft/ft)	0.0094																	
Rosgen Classification	C																	
*Habitat Index	NA																	
*Macrobenthos	NA																	

Appendix B3
UT to South Fork

Table XIII. Morphology and Hydraulic Monitoring Summary

UT to South Fork Creek

Segment/Reach: 2 (1029 linear feet)

Parameter	Cross Section 1 Pool						Cross Section 2 Riffle					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	10.5						10.4					
Floodporne Width (ft)	NA						>50					
BFCross Sectional Area (ft)	11.4						12.1					
BF Mean Depth (ft)	1.1						1.2					
Width/Depth Ratio	NA						9					
Entrenchment Ratio	NA						>4.8					
Wetted Perimeter (ft)	39						12.3					
Hydraulic radious (ft)	0.6						1					
Substrate												
d50 (mm)	sand						sand					
d84 (mm)	sand						sand					

Parameter	MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	14.3	64.2	27.5															
Radius of Curvature (ft)	7.9	45.5	24.8															
Meander Wavelenght (ft)	56.6	116.7	73.4															
Meander Width Ratio	5.4	11.2	7.1															
Profile																		
Riffle length (ft)	1.25	30.1	9.8															
Riffle slope (ft/ft)	0	0.38	0.08															
Pool length (ft)	7	53	25															
Pool spacing (ft)	22	188	73															
Additional Reach Parameters																		
Valley Length (ft)	906.9																	
Channel Length (ft)	1029																	
Sinuosity	0.9																	
Water Surface Slope (ft/ft)	0.0081																	
BF slope (ft/ft)	0.0073																	
Rosgen Classification	C																	
*Habitat Index	NA																	
*Macrobenthos	NA																	

Appendix B3
UT to South Fork

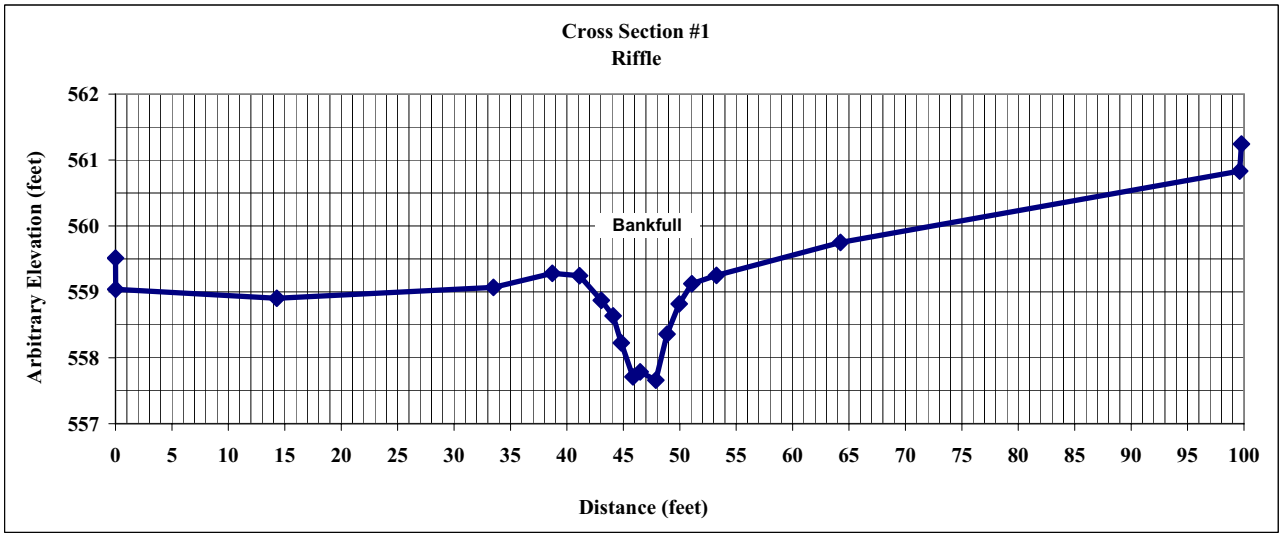
Table XIII. Morphology and Hydraulic Monitoring Summary
UT to South Fork Creek
Segment/Reach: 3 (1020 linear feet)

Parameter	Cross Section 1 Pool						Cross Section 2 Riffle						Cross Section 3 Riffle						Cross Section 4 Pool						Cross Section 5 Pool						Cross Section 6 Riffle					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	12.4						12.2						15.3						15						11.2						15.9					
Floodporne Width (ft)	NA						>50						>45						NA						NA						>45					
BFCross Sectional Area (ft)	20.4						14						21.4						26.6						21						21.6					
BF Mean Depth (ft)	1.6						1.2						1.4						1.8						1.9						1.4					
Width/Depth Ratio	NA						10.6						11						NA						NA						11.7					
Entrenchment Ratio	NA						>3.2						>3.2						NA						NA						>3.2					
Wetted Perimeter (ft)	14.4						13.4						16.5						16.3						14.2						17.6					
Hydraulic radious (ft)	1.4						1						1.3						1.4						1.6						1.3					
Substrate																																				
d50 (mm)	sand						sand						sand						sand						sand						sand					
d84 (mm)	sand						sand						sand						sand						sand						sand					

Parameter	MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	13.8	68.7	37.1															
Radius of Curvature (ft)	16.8	107.9	30.9															
Meander Wavelenght (ft)	79.3	151.6	125.3															
Meander Width Ratio	5.2	10	8.3															
Profile																		
Riffle length (ft)	2.13	40.9	16.4															
Riffle slope (ft/ft)	0	0.14	0.02															
Pool length (ft)	7	84	34															
Pool spacing (ft)	21	101	51															
Additional Reach Parameters																		
Valley Length (ft)	862.4																	
Channel Length (ft)	1020																	
Sinuosity	0.8																	
Water Surface Slope (ft/ft)	0.0046																	
BF slope (ft/ft)	0.0036																	
Rosgen Classification	C																	
*Habitat Index	NA																	
*Macrobenthos	NA																	

APPENDIX B4

STREAM CROSS-SECTIONS


Cross Section #1
Riffle
Arbitrary Elevation (feet)
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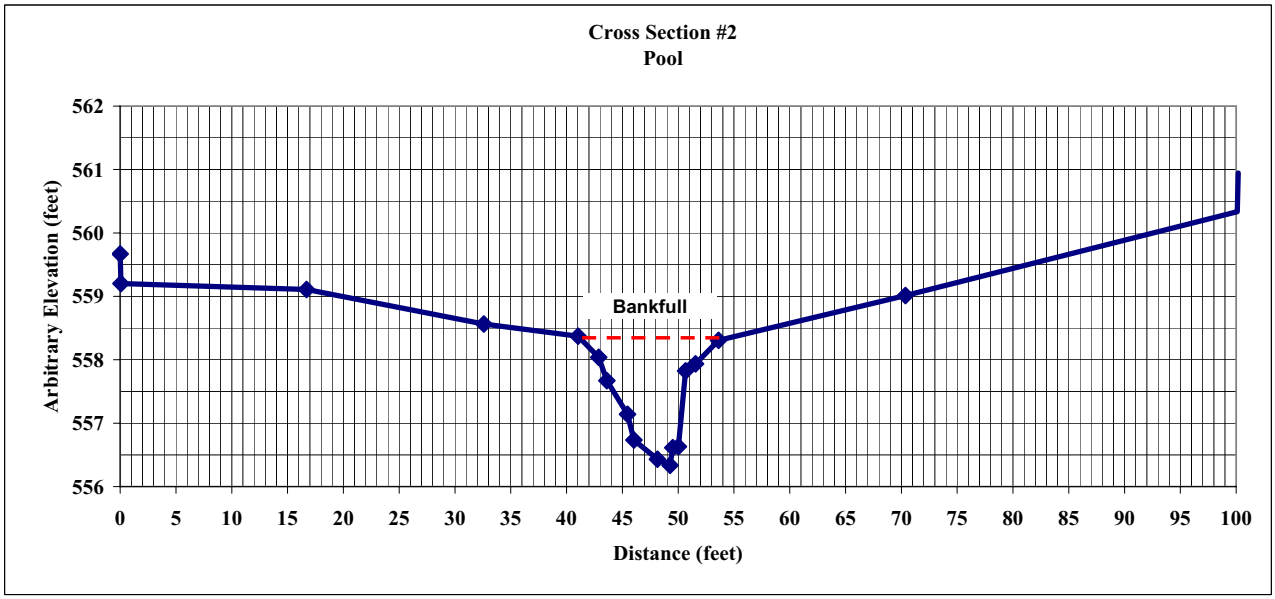
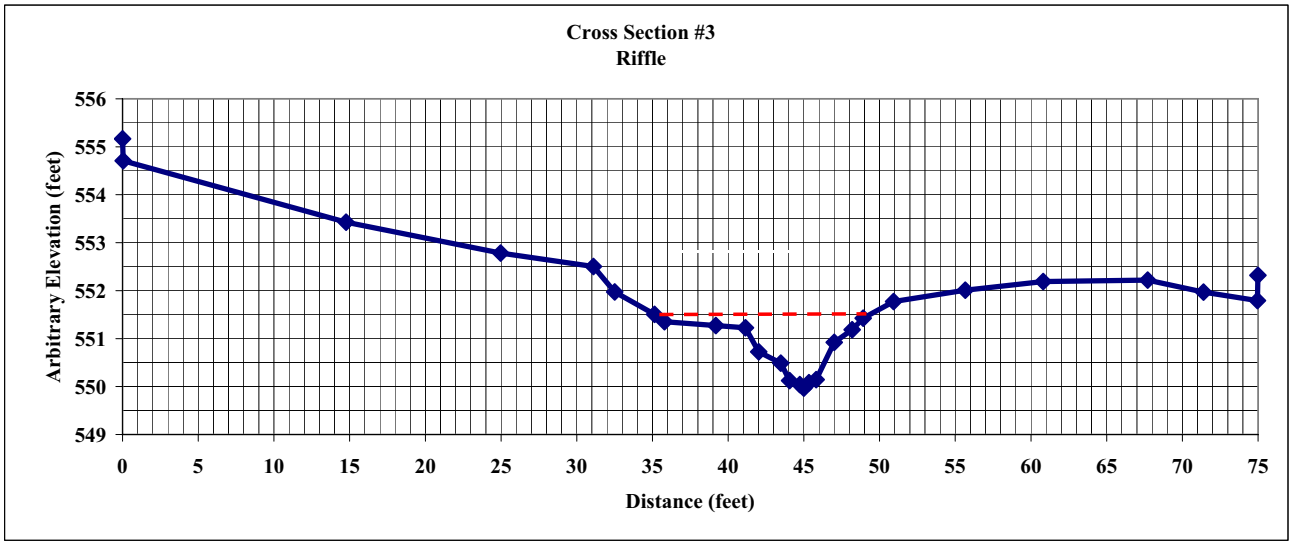
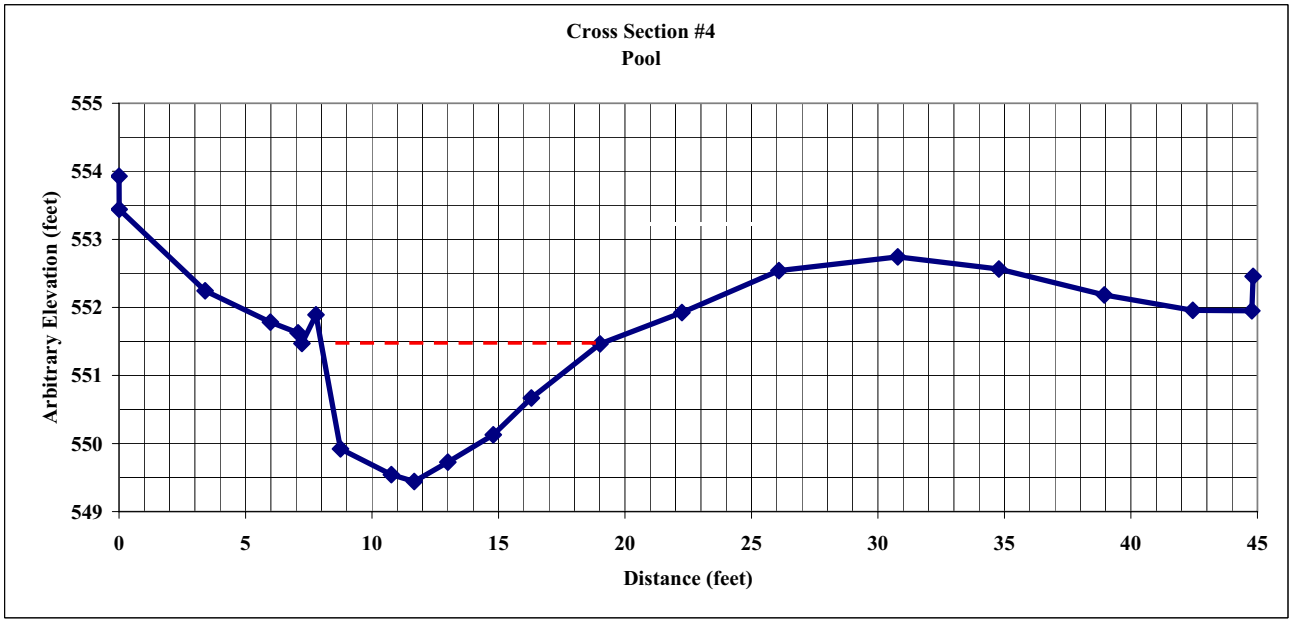
561
560
559
558
557
Bankfull
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Distance (feet)


Cross Section #2
Pool
Arbitrary Elevation (feet)
562
561
560
559
558
557
556
Bankfull
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Distance (feet)


Cross Section #3
Riffle
Arbitrary Elevation (feet)
556
555
554
553
552
551
550
549
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Distance (feet)


Cross Section #4
Pool
Arbitrary Elevation (feet)
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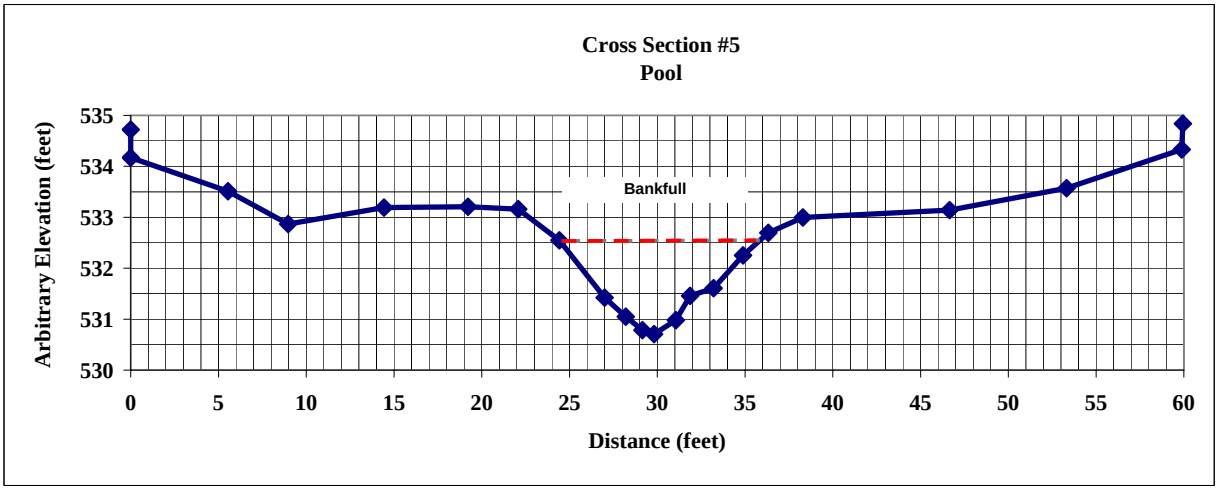
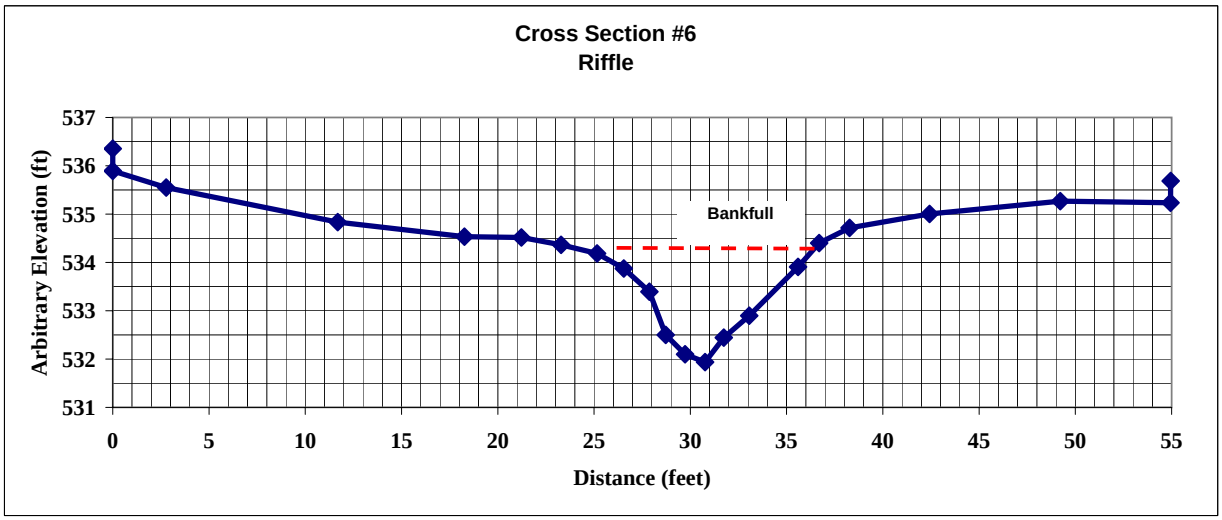
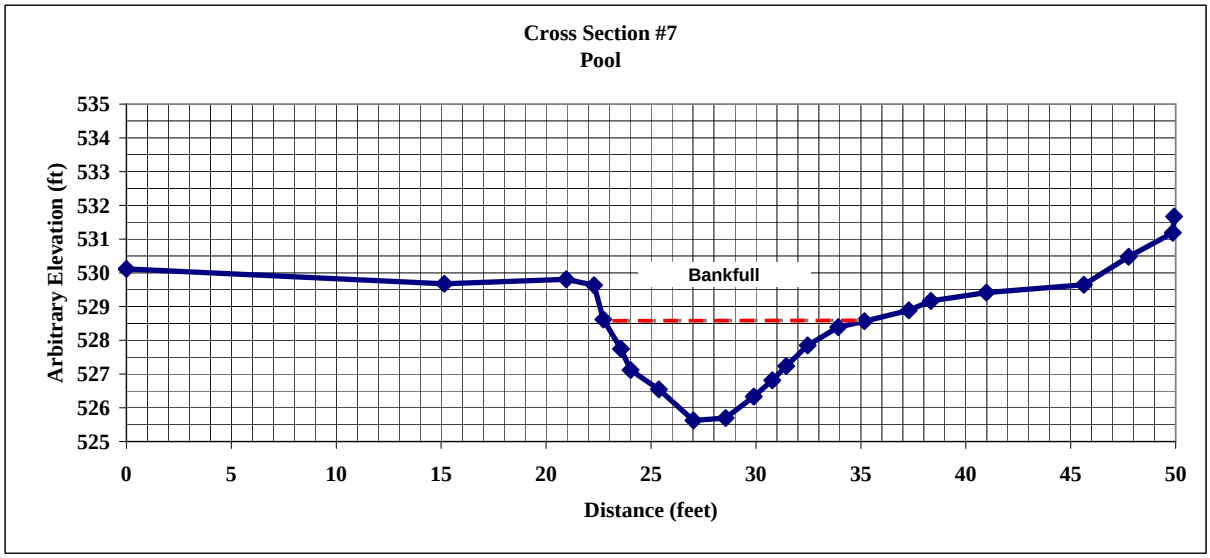
554
553
552
551
550
549
0
5
10
15
20
25
30
35
40
45
Distance (feet)


Cross Section #5
Pool
Arbitrary Elevation (feet)
535
534
533
532
531
530
Bankfull
0
5
10
15
20
25
30
35
40
45
50
55
60
Distance (feet)


Cross Section #6
Riffle
Arbitrary Elevation (ft)
537
536
535
534
533
532
531
Bankfull
0
5
10
15
20
25
30
35
40
45
50
55
Distance (feet)


Cross Section #7
Pool
Arbitrary Elevation (ft)
535
534
533
532
531
530
529
528
527
526
525
Bankfull
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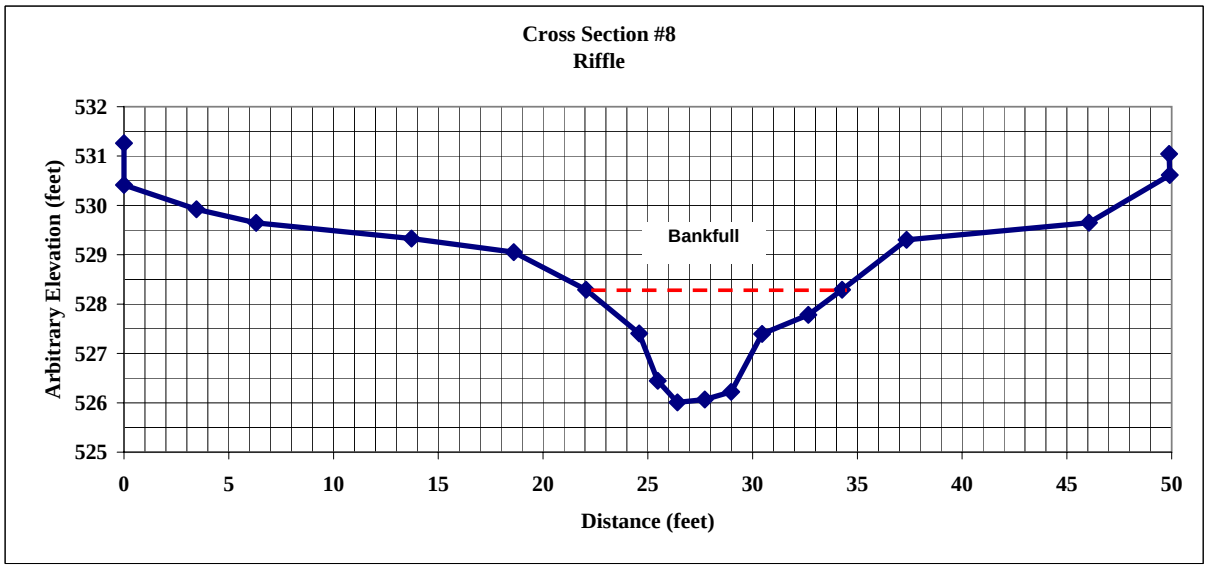
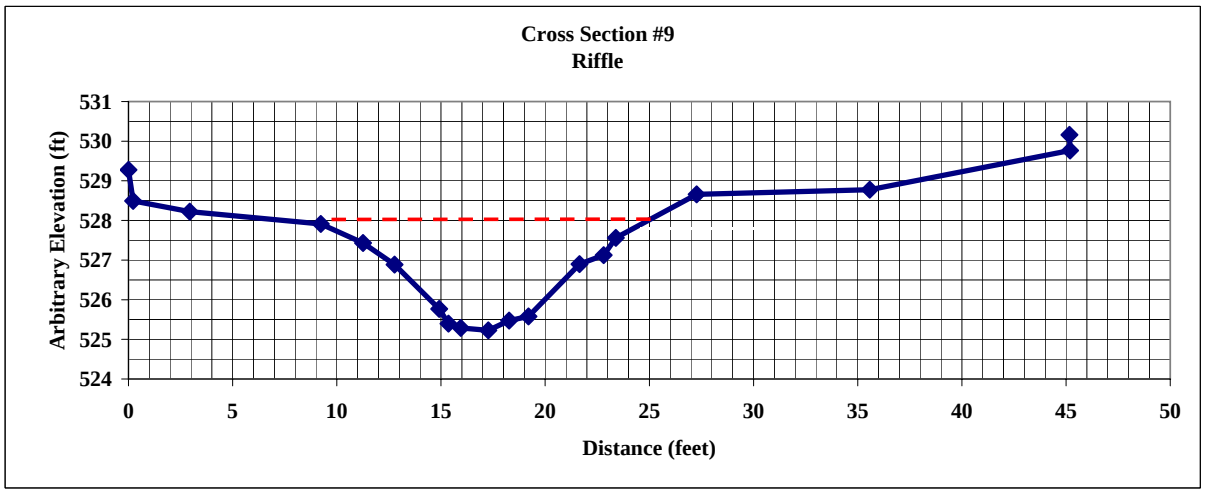
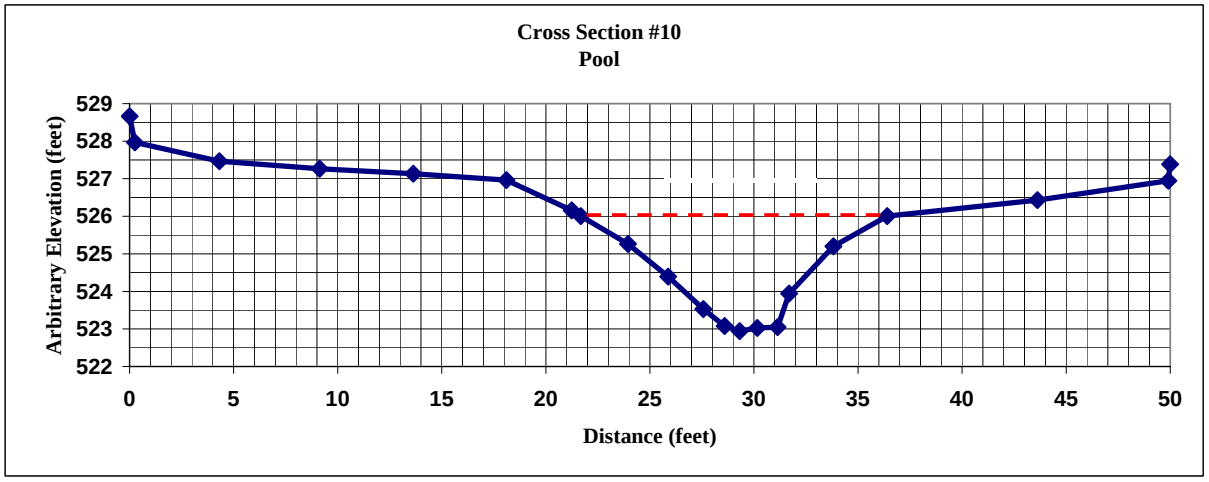
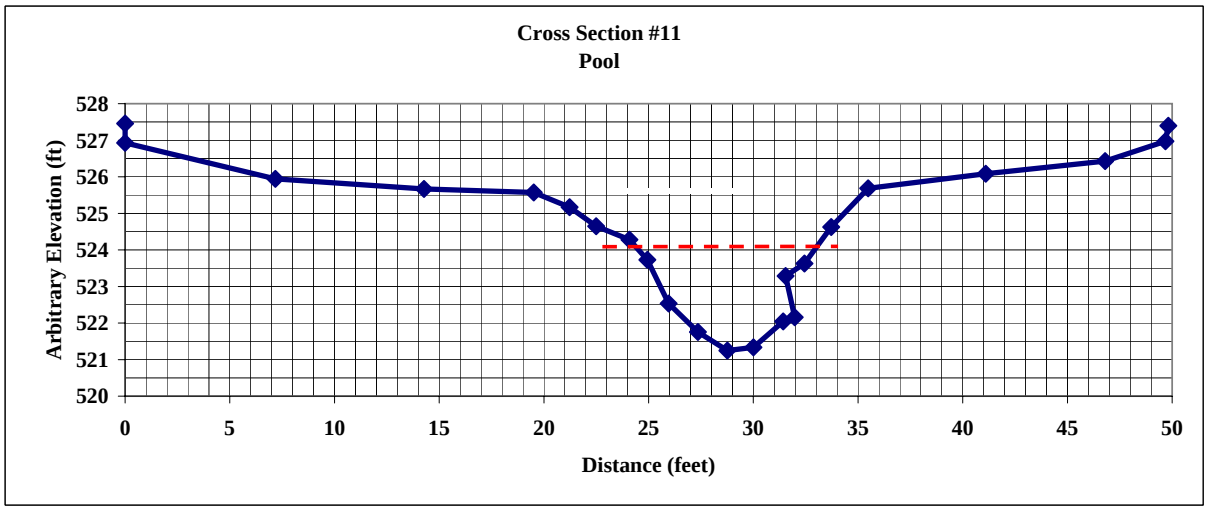
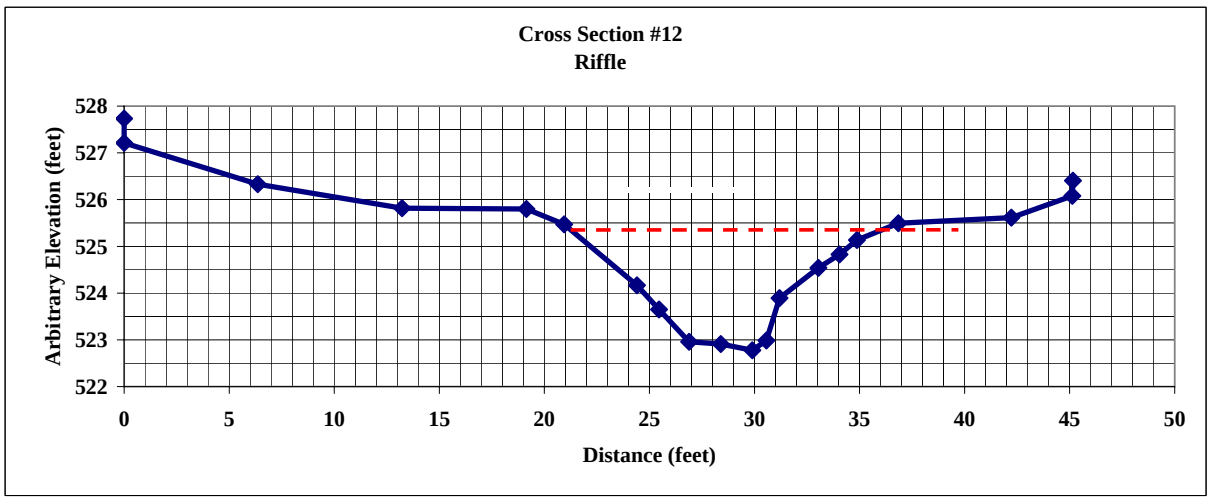
5
10
15
20
25
30
35
40
45
50
Distance (feet)


Cross Section #8
Riffle
Arbitrary Elevation (feet)
532
531
530
529
528
527
526
525
Bankfull
0
5
10
15
20
25
30
35
40
45
50
Distance (feet)


Cross Section #9
Riffle
Arbitrary Elevation (ft)
531
530
529
528
527
526
525
524
0
5
10
15
20
25
30
35
40
45
50
Distance (feet)

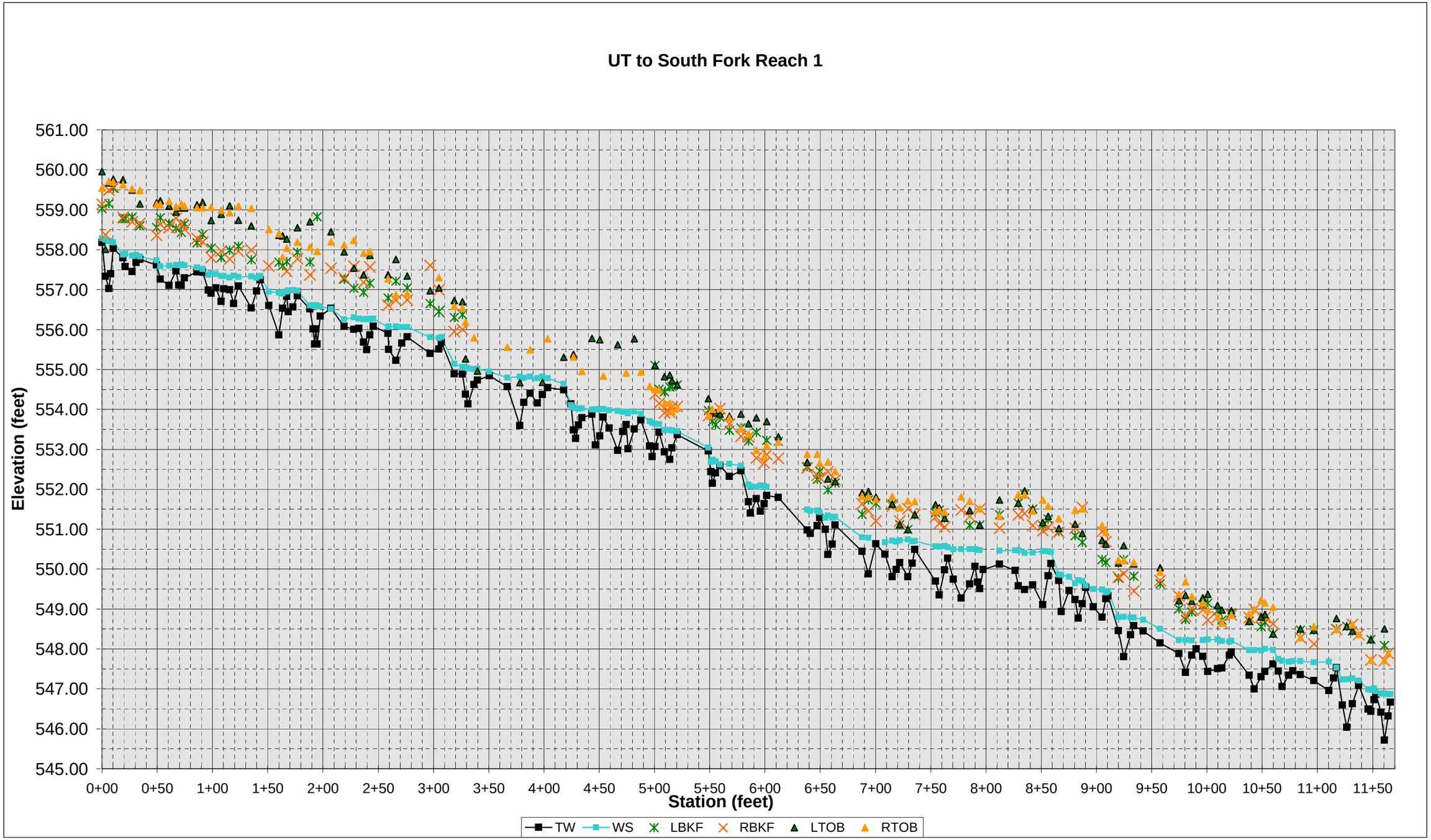

Cross Section #10
Pool
Arbitrary Elevation (feet)
529
528
527
526
525
524
523
522
0
5
10
15
20
25
30
35
40
45
50
Distance (feet)

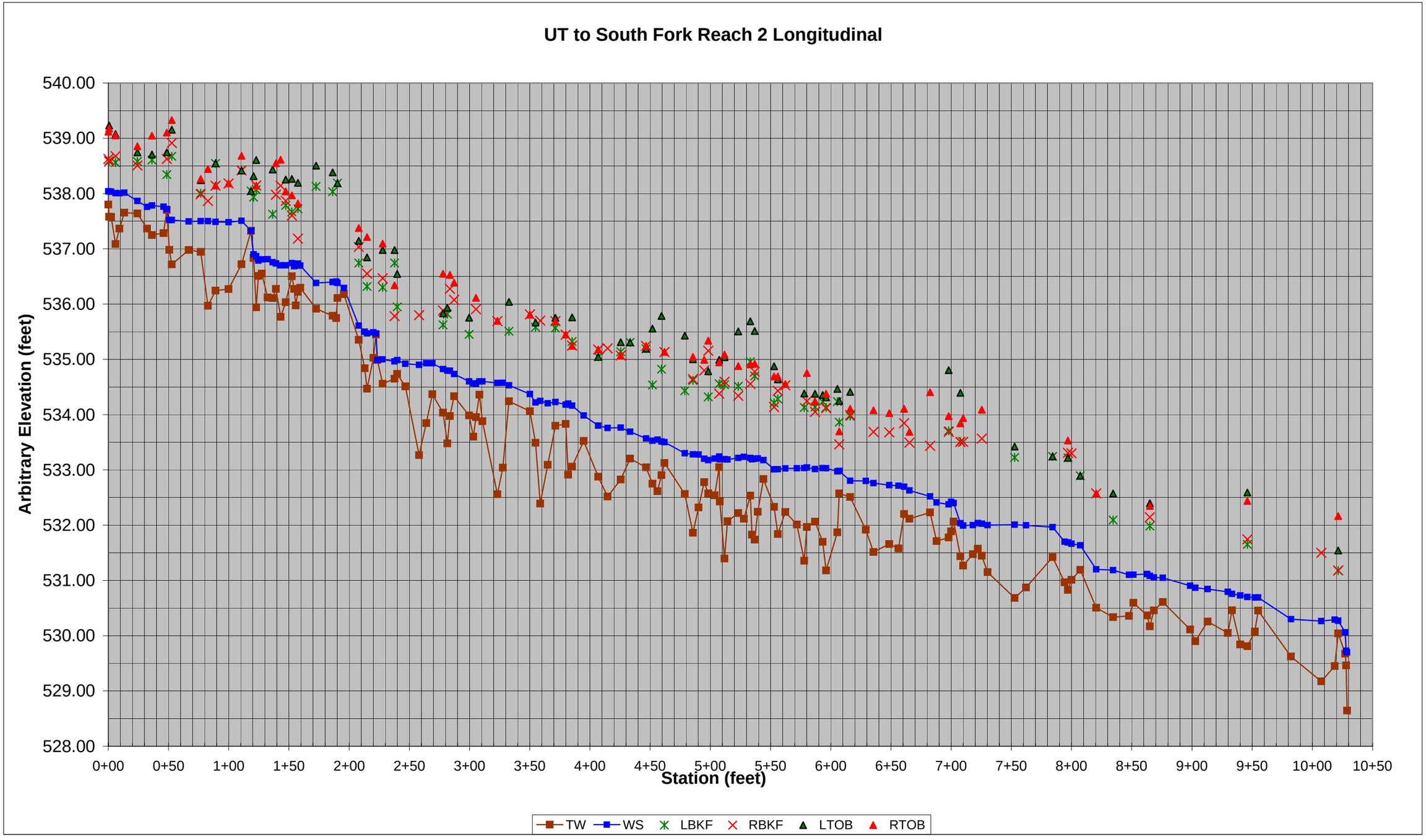

Cross Section #11
Pool
Arbitrary Elevation (ft)
528
527
526
525
524
523
522
521
520
0
5
10
15
20
25
30
35
40
45
50
Distance (feet)

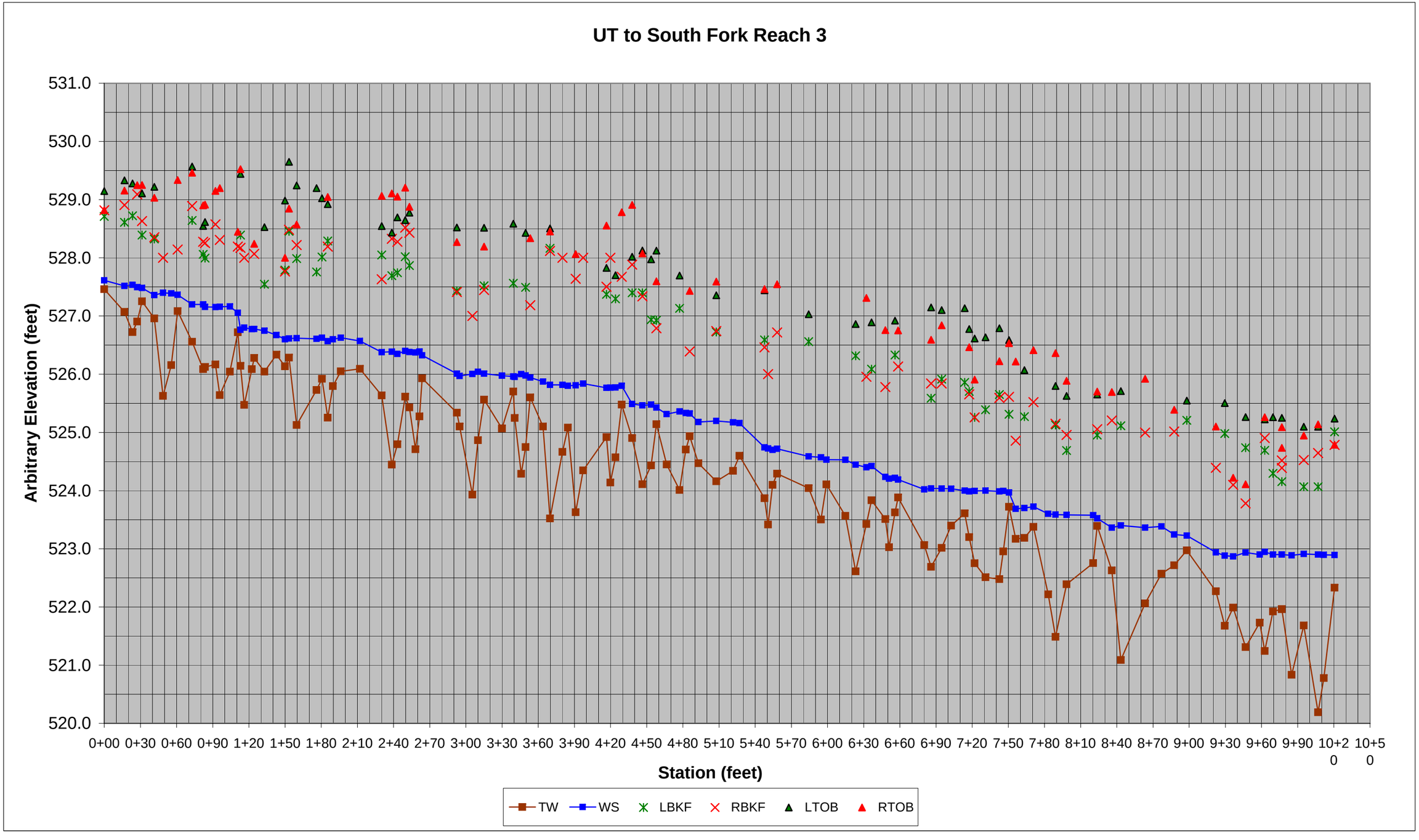

Cross Section #12
Riffle
Arbitrary Elevation (feet)
528
527
526
525
524
523
522
0
5
10
15
20
25
30
35
40
45
50
Distance (feet)

APPENDIX B5

STREAM LONGITUDINAL PROFILE


UT to South Fork Reach 1
Elevation (feet)
561.00
560.00
559.00
558.00
557.00
556.00
555.00
554.00
553.00
552.00
551.00
550.00
549.00
548.00
547.00
546.00
545.00
0+00
0+50
1+00
1+50
2+00
2+50
3+00
3+50
4+00
4+50
5+00
5+50
6+00
6+50
7+00
7+50
8+00
8+50
9+00
9+50
10+00
10+50
11+00
11+50
Station (feet)
TW
WS
LBKF
RBKF
LTOB
RTOB


UT to South Fork Reach 2 Longitudinal
Arbitrary Elevation (feet)
540.00
539.00
538.00
537.00
536.00
535.00
534.00
533.00
532.00
531.00
530.00
529.00
528.00
0+00
0+50
1+00
1+50
2+00
2+50
3+00
3+50
4+00
4+50
5+00
5+50
6+00
6+50
7+00
7+50
8+00
8+50
9+00
9+50
10+00
10+50
Station (feet)
TW
WS
LBKF
RBKF
LTOB
RTOB


UT to South Fork Reach 3
Arbitrary Elevation (feet)
531.0
530.0
529.0
528.0
527.0
526.0
525.0
524.0
523.0
522.0
521.0
520.0
0+00 0+30 0+60 0+90 1+20 1+50 1+80 2+10 2+40 2+70 3+00 3+30 3+60 3+90 4+20 4+50 4+80 5+10 5+40 5+70 6+00 6+30 6+60 6+90 7+20 7+50 7+80 8+10 8+40 8+70 9+00 9+30 9+60 9+90 10+20 10+50
Station (feet)
TW
WS
LBKF
RBKF
LTOB
RTOB

APPENDIX B6

STREAM PEBBLE COUNTS

PEBBLE COUNT

Site: UT to South Fork

Party: ATW and WDY

Date: Apr-06

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		Reach: SR1 CS1	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	28	28	28%	28%
	Very Fine	.062-.125	SAND	32	32	32%	60%
	Fine	.125-.25		18	18	18%	78%
	Medium	.25-.50		9	9	9%	87%
	Coarse	.50-1.0		13	13	13%	100%
.04-.08	Very Coarse	1.0-2		0	0	0%	0%
.08-.16	Very Fine	2.0-4.0	GRAVEL	0	0	0%	0%
.16-.22	Fine	4-5.7		0	0	0%	0%
.22-.31	Fine	5.7-8		0	0	0%	0%
.31-.44	Medium	8-11.3		0	0	0%	0%
.44-.63	Medium	11.3-16		0	0	0%	0%
.63-.89	Coarse	16-22.6		0	0	0%	0%
.89-1.26	Coarse	22.6-32		0	0	0%	0%
1.26-1.77	Very Coarse	32-45		0	0	0%	0%
1.77-2.5	Very Coarse	45-64		0	0	0%	0%
2.5-3.5	Small	64-90	COBBLE	0	0	0%	0%
3.5-5.0	Small	90-128		0	0	0%	0%
5.0-7.1	Large	128-180		0	0	0%	0%
7.1-10.1	Large	180-256		0	0	0%	0%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	0%
14.3-20	Small	362-512		0	0	0%	0%
20-40	Medium	512-1024		0	0	0%	0%
40-80	Large	1024-2048		0	0	0%	0%
	Bedrock		**BDRK**	0	0	0%	0%
					100	100%	

PEBBLE COUNT

Site: UT to South Fork

Party: ATW and WDY

Date: Apr-06

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		Reach: SR1 CS2	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	18	18	18%	18%
	Very Fine	.062-.125	SAND	15	15	15%	33%
	Fine	.125-.25	SAND	22	22	22%	55%
	Medium	.25-.50	SAND	25	25	25%	80%
	Coarse	.50-1.0	SAND	20	20	20%	100%
.04-.08	Very Coarse	1.0-2	SAND	0	0	0%	0%
.08-.16	Very Fine	2.0-4.0	GRAVEL	0	0	0%	0%
.16-.22	Fine	4-5.7	GRAVEL	0	0	0%	0%
.22-.31	Fine	5.7-8	GRAVEL	0	0	0%	0%
.31-.44	Medium	8-11.3	GRAVEL	0	0	0%	0%
.44-.63	Medium	11.3-16	GRAVEL	0	0	0%	0%
.63-.89	Coarse	16-22.6	GRAVEL	0	0	0%	0%
.89-1.26	Coarse	22.6-32	GRAVEL	0	0	0%	0%
1.26-1.77	Very Coarse	32-45	GRAVEL	0	0	0%	0%
1.77-2.5	Very Coarse	45-64	GRAVEL	0	0	0%	0%
2.5-3.5	Small	64-90	COBBLE	0	0	0%	0%
3.5-5.0	Small	90-128	COBBLE	0	0	0%	0%
5.0-7.1	Large	128-180	COBBLE	0	0	0%	0%
7.1-10.1	Large	180-256	COBBLE	0	0	0%	0%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	0%
14.3-20	Small	362-512	BOULDER	0	0	0%	0%
20-40	Medium	512-1024	BOULDER	0	0	0%	0%
40-80	Large	1024-2048	BOULDER	0	0	0%	0%
	Bedrock		**BDRK**	0	0	0%	0%
					100	100%	

PEBBLE COUNT

Site: UT to South Fork

Party: ATW and WDY

Date: Apr-06

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		Reach: 1 CS 3	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	34	34	34%	34%
	Very Fine	.062-.125	SAND	20	20	20%	53%
	Fine	.125-.25		14	14	14%	67%
	Medium	.25-.50		18	18	18%	85%
	Coarse	.50-1.0		15	15	15%	100%
.04-.08	Very Coarse	1.0-2		0	0	0%	0%
.08-.16	Very Fine	2.0-4.0	GRAVEL	0	0	0%	0%
.16-.22	Fine	4-5.7		0	0	0%	0%
.22-.31	Fine	5.7-8		0	0	0%	0%
.31-.44	Medium	8-11.3		0	0	0%	0%
.44-.63	Medium	11.3-16		0	0	0%	0%
.63-.89	Coarse	16-22.6		0	0	0%	0%
.89-1.26	Coarse	22.6-32		0	0	0%	0%
1.26-1.77	Very Coarse	32-45		0	0	0%	0%
1.77-2.5	Very Coarse	45-64		0	0	0%	0%
2.5-3.5	Small	64-90	COBBLE	0	0	0%	0%
3.5-5.0	Small	90-128		0	0	0%	0%
5.0-7.1	Large	128-180		0	0	0%	0%
7.1-10.1	Large	180-256		0	0	0%	0%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	0%
14.3-20	Small	362-512		0	0	0%	0%
20-40	Medium	512-1024		0	0	0%	0%
40-80	Large	1024-2048		0	0	0%	0%
	Bedrock		**BDRK**	0	0	0%	0%
					101	100%	

PEBBLE COUNT

Site: UT to South Fork

Party: ATW and WDY

Date: Apr-06

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		Reach: SR1 Cross-Section 4	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	53	53	53%	53%
	Very Fine	.062-.125	SAND	32	32	32%	85%
	Fine	.125-.25		8	8	8%	93%
	Medium	.25-.50		7	7	7%	100%
	Coarse	.50-1.0		0	0	0%	100%
.04-.08	Very Coarse	1.0-2		0	0	0%	0%
.08-.16	Very Fine	2.0-4.0	GRAVEL	0	0	0%	0%
.16-.22	Fine	4-5.7		0	0	0%	0%
.22-.31	Fine	5.7-8		0	0	0%	0%
.31-.44	Medium	8-11.3		0	0	0%	0%
.44-.63	Medium	11.3-16		0	0	0%	0%
.63-.89	Coarse	16-22.6		0	0	0%	0%
.89-1.26	Coarse	22.6-32		0	0	0%	0%
1.26-1.77	Very Coarse	32-45		0	0	0%	0%
1.77-2.5	Very Coarse	45-64		0	0	0%	0%
2.5-3.5	Small	64-90	COBBLE	0	0	0%	0%
3.5-5.0	Small	90-128		0	0	0%	0%
5.0-7.1	Large	128-180		0	0	0%	0%
7.1-10.1	Large	180-256		0	0	0%	0%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	0%
14.3-20	Small	362-512		0	0	0%	0%
20-40	Medium	512-1024		0	0	0%	0%
40-80	Large	1024-2048		0	0	0%	0%
	Bedrock		**BDRK**	0	0	0%	0%
					100	100%	

PEBBLE COUNT

Site: UT to South Fork

Party: ATW and WDY

Date: Apr-06

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		Subreach 2 Cross-Section 5	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	43	43	43%	43%
	Very Fine	.062-.125	SAND	46	46	46%	89%
	Fine	.125-.25		7	7	7%	96%
	Medium	.25-.50		4	4	4%	100%
	Coarse	.50-1.0		0	0	0%	100%
.04-.08	Very Coarse	1.0-2		0	0	0%	0%
.08-.16	Very Fine	2.0-4.0	GRAVEL	0	0	0%	0%
.16-.22	Fine	4-5.7		0	0	0%	0%
.22-.31	Fine	5.7-8		0	0	0%	0%
.31-.44	Medium	8-11.3		0	0	0%	0%
.44-.63	Medium	11.3-16		0	0	0%	0%
.63-.89	Coarse	16-22.6		0	0	0%	0%
.89-1.26	Coarse	22.6-32		0	0	0%	0%
1.26-1.77	Very Coarse	32-45		0	0	0%	0%
1.77-2.5	Very Coarse	45-64		0	0	0%	0%
2.5-3.5	Small	64-90	COBBLE	0	0	0%	0%
3.5-5.0	Small	90-128		0	0	0%	0%
5.0-7.1	Large	128-180		0	0	0%	0%
7.1-10.1	Large	180-256		0	0	0%	0%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	0%
14.3-20	Small	362-512		0	0	0%	0%
20-40	Medium	512-1024		0	0	0%	0%
40-80	Large	1024-2048		0	0	0%	0%
	Bedrock		**BDRK**	0	0	0%	0%
					100	100%	

PEBBLE COUNT

Site: UT to South Fork

Party: ATW and WDY

Date: Apr-06

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		Subreach 2 Cross-Section 6	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	24	24	24%	24%
	Very Fine	.062-.125	SAND	12	12	12%	36%
	Fine	.125-.25	SAND	5	5	5%	41%
	Medium	.25-.50	SAND	8	8	8%	49%
	Coarse	.50-1.0	SAND	31	31	31%	81%
.04-.08	Very Coarse	1.0-2	SAND	0	0	0%	81%
.08-.16	Very Fine	2.0-4.0	GRAVEL	9	9	9%	90%
.16-.22	Fine	4-5.7	GRAVEL	5	5	5%	95%
.22-.31	Fine	5.7-8	GRAVEL	1	1	1%	96%
.31-.44	Medium	8-11.3	GRAVEL	1	1	1%	97%
.44-.63	Medium	11.3-16	GRAVEL	3	3	3%	100%
.63-.89	Coarse	16-22.6	GRAVEL	0	0	0%	100%
.89-1.26	Coarse	22.6-32	GRAVEL	0	0	0%	100%
1.26-1.77	Very Coarse	32-45	GRAVEL	0	0	0%	100%
1.77-2.5	Very Coarse	45-64	GRAVEL	0	0	0%	100%
2.5-3.5	Small	64-90	COBBLE	0	0	0%	100%
3.5-5.0	Small	90-128	COBBLE	0	0	0%	100%
5.0-7.1	Large	128-180	COBBLE	0	0	0%	100%
7.1-10.1	Large	180-256	COBBLE	0	0	0%	100%
10.1-14.3	Small	256-362	BOULDER	0	0	0%	100%
14.3-20	Small	362-512	BOULDER	0	0	0%	100%
20-40	Medium	512-1024	BOULDER	0	0	0%	100%
40-80	Large	1024-2048	BOULDER	0	0	0%	100%
	Bedrock		**BDRK**	0	0	0%	100%
					99	100%	

PEBBLE COUNT

Site: UT to South Fork

Party: ATW and WDY

Date: Apr-06

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		Reach: SR3 Cross-Section 7	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	18	18	0.1782	0.1782
	Very Fine	.062-.125	SAND	16	16	0.1584	0.3366
	Fine	.125-.25		14	14	0.1386	0.4752
	Medium	.25-.50		9	9	0.0891	0.5644
	Coarse	.50-1.0		16	16	0.1584	0.7228
.04-.08	Very Coarse	1.0-2		8	8	0.0792	0
.08-.16	Very Fine	2.0-4.0	GRAVEL	2	2	0.0198	0.0198
.16-.22	Fine	4-5.7		1	1	0.0099	0.0297
.22-.31	Fine	5.7-8		5	5	0.0495	0.0792
.31-.44	Medium	8-11.3		0	0	0	0.0792
.44-.63	Medium	11.3-16		3	3	0.0297	0.1089
.63-.89	Coarse	16-22.6		0	0	0	0.1089
.89-1.26	Coarse	22.6-32		5	5	0.0495	0.1584
1.26-1.77	Very Coarse	32-45		0	0	0	0.1584
1.77-2.5	Very Coarse	45-64		1	1	0.0099	0.1683
2.5-3.5	Small	64-90	COBBLE	2	2	0.0198	0.1881
3.5-5.0	Small	90-128		0	0	0	0.1881
5.0-7.1	Large	128-180		1	1	0.0099	0.198
7.1-10.1	Large	180-256		0	0	0	0.198
10.1-14.3	Small	256-362	BOULDER	0	0	0	0.198
14.3-20	Small	362-512		0	0	0	0.198
20-40	Medium	512-1024		0	0	0	0.198
40-80	Large	1024-2048		0	0	0	0.198
	Bedrock		**BDRK**		0	0	0.198
					101	1	

PEBBLE COUNT

Site: UT to South Fork

Party: ATW and WDY

Date: Apr-06

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		Subreach 2 Cross-Section 8	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	15	15	0.15	0.15
	Very Fine	.062-.125	SAND	17	17	0.17	0.32
	Fine	.125-.25		12	12	0.12	0.44
	Medium	.25-.50		9	9	0.09	0.53
	Coarse	.50-1.0		14	14	0.14	0.67
.04-.08	Very Coarse	1.0-2		8	8	0.08	0
.08-.16	Very Fine	2.0-4.0	GRAVEL	2	2	0.02	0.02
.16-.22	Fine	4-5.7		3	3	0.03	0.05
.22-.31	Fine	5.7-8		5	5	0.05	0.1
.31-.44	Medium	8-11.3		2	2	0.02	0.12
.44-.63	Medium	11.3-16		3	3	0.03	0.15
.63-.89	Coarse	16-22.6		1	1	0.01	0.16
.89-1.26	Coarse	22.6-32		5	5	0.05	0.21
1.26-1.77	Very Coarse	32-45		0	0	0	0.21
1.77-2.5	Very Coarse	45-64		1	1	0.01	0.22
2.5-3.5	Small	64-90	COBBLE	2	2	0.02	0.24
3.5-5.0	Small	90-128		0	0	0	0.24
5.0-7.1	Large	128-180		1	1	0.01	0.25
7.1-10.1	Large	180-256		0	0	0	0.25
10.1-14.3	Small	256-362	BOULDER	0	0	0	0.25
14.3-20	Small	362-512		0	0	0	0.25
20-40	Medium	512-1024		0	0	0	0.25
40-80	Large	1024-2048		0	0	0	0.25
	Bedrock		**BDRK**		0	0	0.25
					100	1	

PEBBLE COUNT

Site: UT to South Fork

Party: ATW and WDY

Date: Apr-06

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		Subreach 3 Cross-Section 9	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	11	11	0.11	0.11
	Very Fine	.062-.125	SAND	8	8	0.08	0.19
	Fine	.125-.25		17	17	0.17	0.36
	Medium	.25-.50		5	5	0.05	0.41
	Coarse	.50-1.0		14	14	0.14	0.55
.04-.08	Very Coarse	1.0-2		4	4	0.04	0
.08-.16	Very Fine	2.0-4.0	GRAVEL	6	6	0.06	0.06
.16-.22	Fine	4-5.7		7	7	0.07	0.13
.22-.31	Fine	5.7-8		5	5	0.05	0.18
.31-.44	Medium	8-11.3		9	9	0.09	0.27
.44-.63	Medium	11.3-16		3	3	0.03	0.3
.63-.89	Coarse	16-22.6		1	1	0.01	0.31
.89-1.26	Coarse	22.6-32		5	5	0.05	0.36
1.26-1.77	Very Coarse	32-45		0	0	0	0.36
1.77-2.5	Very Coarse	45-64		2	2	0.02	0.38
2.5-3.5	Small	64-90	COBBLE	2	2	0.02	0.4
3.5-5.0	Small	90-128		0	0	0	0.4
5.0-7.1	Large	128-180		1	1	0.01	0.41
7.1-10.1	Large	180-256		0	0	0	0.41
10.1-14.3	Small	256-362	BOULDER	0	0	0	0.41
14.3-20	Small	362-512		0	0	0	0.41
20-40	Medium	512-1024		0	0	0	0.41
40-80	Large	1024-2048		0	0	0	0.41
	Bedrock		**BDRK**		0	0	0.41
					100	1	

PEBBLE COUNT

Site: UT to South Fork

Party: ATW and WDY

Date: Apr-06

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		Subreach 3 Cross-Section 10	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	12	12	0.1188	0.1188
	Very Fine	.062-.125	SAND	8	8	0.0792	0.198
	Fine	.125-.25		17	17	0.1683	0.3663
	Medium	.25-.50		5	5	0.0495	0.4158
	Coarse	.50-1.0		14	14	0.1386	0.5545
.04-.08	Very Coarse	1.0-2		4	4	0.0396	0
.08-.16	Very Fine	2.0-4.0	GRAVEL	6	6	0.0594	0.0594
.16-.22	Fine	4-5.7		7	7	0.0693	0.1287
.22-.31	Fine	5.7-8		5	5	0.0495	0.1782
.31-.44	Medium	8-11.3		9	9	0.0891	0.2673
.44-.63	Medium	11.3-16		3	3	0.0297	0.297
.63-.89	Coarse	16-22.6		1	1	0.0099	0.3069
.89-1.26	Coarse	22.6-32		5	5	0.0495	0.3564
1.26-1.77	Very Coarse	32-45		0	0	0	0.3564
1.77-2.5	Very Coarse	45-64		2	2	0.0198	0.3762
2.5-3.5	Small	64-90	COBBLE	2	2	0.0198	0.396
3.5-5.0	Small	90-128		0	0	0	0.396
5.0-7.1	Large	128-180		1	1	0.0099	0.4059
7.1-10.1	Large	180-256		0	0	0	0.4059
10.1-14.3	Small	256-362	BOULDER	0	0	0	0.4059
14.3-20	Small	362-512		0	0	0	0.4059
20-40	Medium	512-1024		0	0	0	0.4059
40-80	Large	1024-2048		0	0	0	0.4059
	Bedrock		**BDRK**		0	0	0.4059
					101	1	

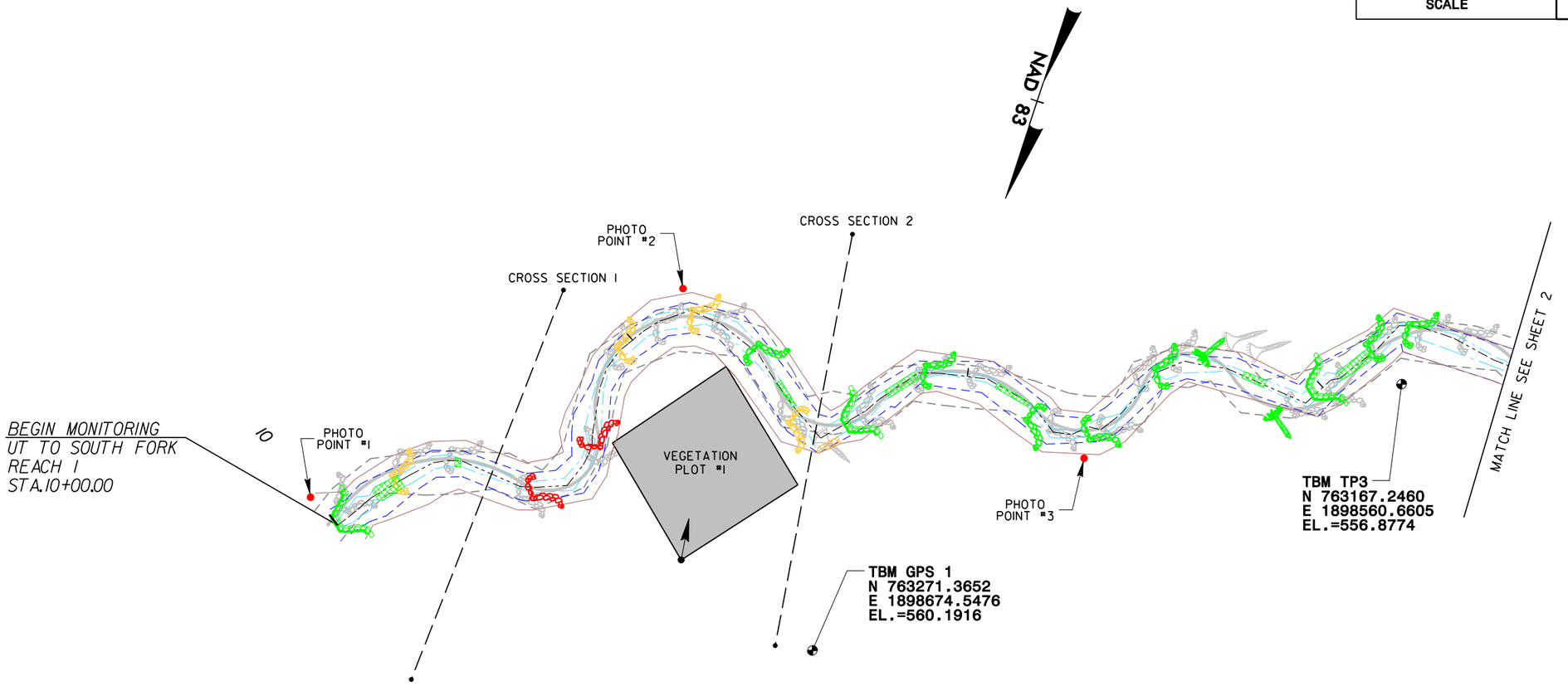
APPENDIX C

PLAN VIEW SHEETS

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
435	1
PROJECT ENGINEER	

10 0 30
SCALE



CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 1 LEFT	763207.9909	1898757.6600	559.5123
XSC 1 RIGHT	763307.6006	1898763.3135	561.2426
XSC 2 LEFT	763173.9086	1898696.2853	559.6677
XSC 2 RIGHT	763272.9699	1898683.3090	560.9459

UT TO SOUTH FORK REACH 1

LEGEND

- PROPOSED THALWEG 2003
- BANKFULL 2003
- THALWEG 2006
- EDGE OF WATER 2006
- BANKFULL 2006
- TOP OF BANK 2006
- CROSS-SECTIONS
- PHOTO POINT

- BANK EROSION
- SEVERE BANK EROSION
- AGGRADATION (GRASSES)
- AGGRADATON (CATTAILS)
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STRUCTURE TYPES
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- ROCK VANE

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Ecosystem Enhancement PROGRAM

LOCATION:
UT TO SOUTH FORK CREEK
STREAM MONITORING - YEAR 1

PROJ #:	COUNTY:
435	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06

SEPI ENGINEERING GROUP
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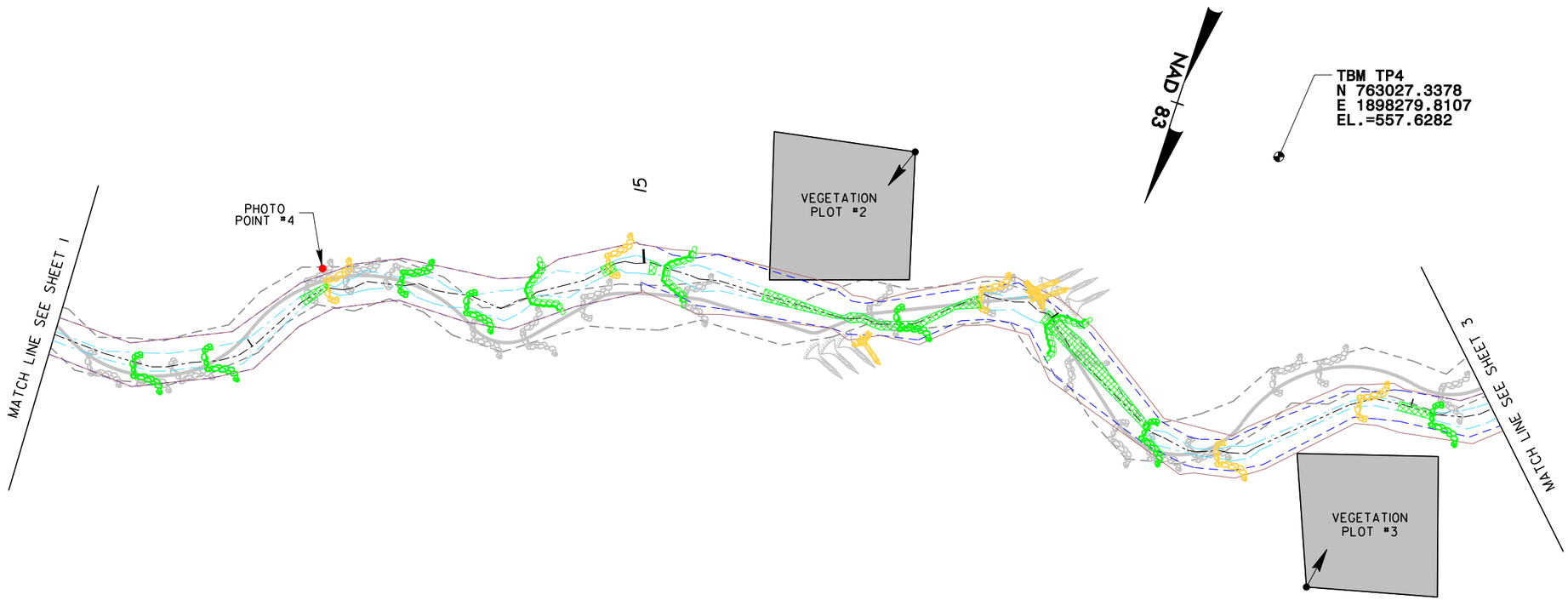
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
435	2
PROJECT ENGINEER	

10 0 30
SCALE



UT TO SOUTH FORK REACH 1

LEGEND

- PROPOSED THALWEG 2003
- BANKFULL 2003
- THALWEG 2006
- EDGE OF WATER 2006
- BANKFULL 2006
- TOP OF BANK 2006
- CROSS-SECTIONS
- PHOTO POINT

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Ecosystem Enhancement PROGRAM

LOCATION:
UT TO SOUTH FORK CREEK
STREAM MONITORING - YEAR 1

PROJ #:	COUNTY:
435	ALAMANCE
PREPARED BY:	
WDY	
CHECKED BY:	DATE:
ATW	11/17/06

SEPI ENGINEERING GROUP
1025 WADE AVENUE
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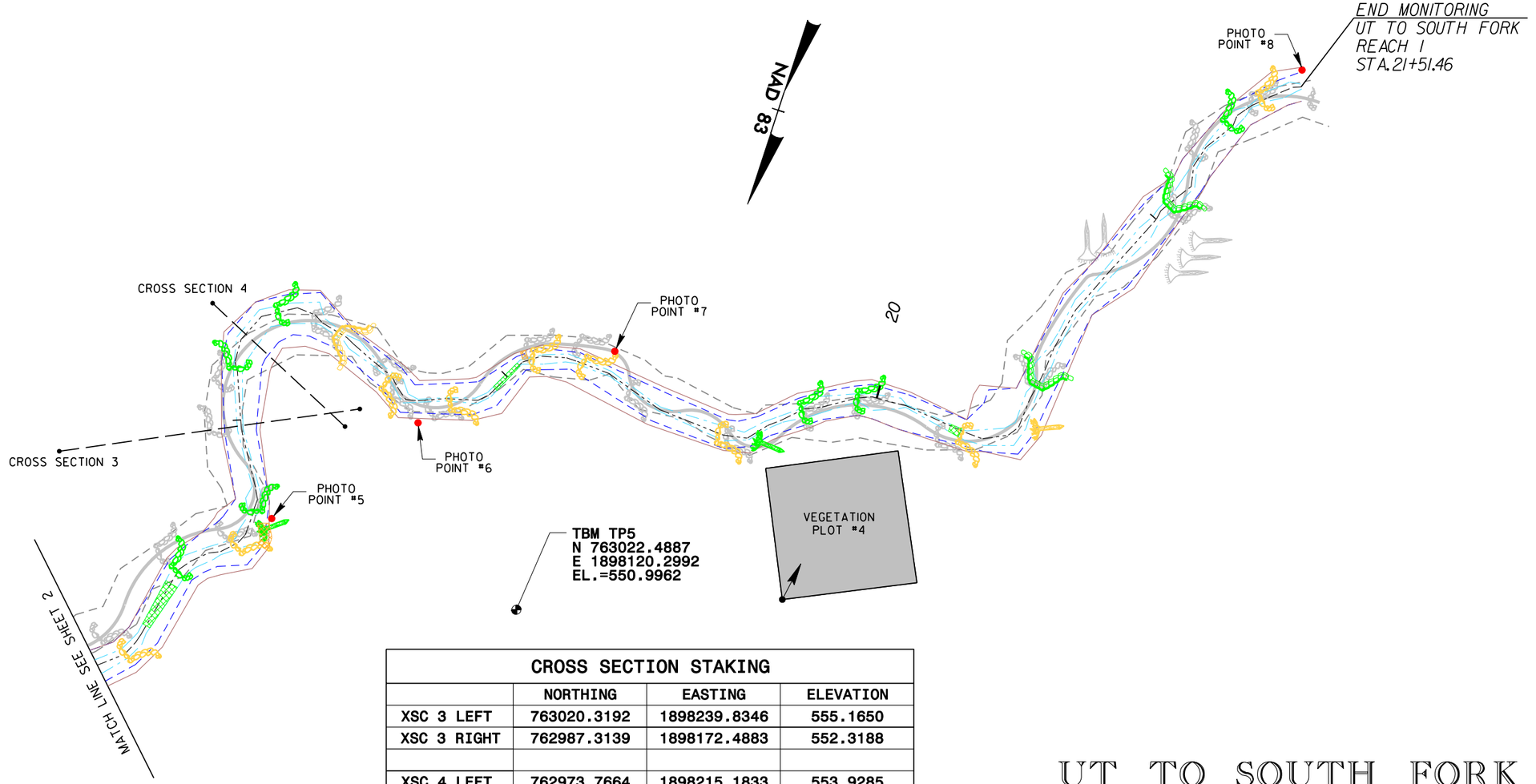
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
435	3
PROJECT ENGINEER	

10 0 30
SCALE



CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 3 LEFT	763020.3192	1898239.8346	555.1650
XSC 3 RIGHT	762987.3139	1898172.4883	552.3188
XSC 4 LEFT	762973.7664	1898215.1833	553.9285
XSC 4 RIGHT	762992.5881	1898174.6097	552.4553

UT TO SOUTH FORK REACH 1

LEGEND

- PROPOSED THALWEG 2003
- BANKFULL 2003
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Ecosystem Enhancement PROGRAM

LOCATION:
UT TO SOUTH FORK CREEK
STREAM MONITORING - YEAR 1

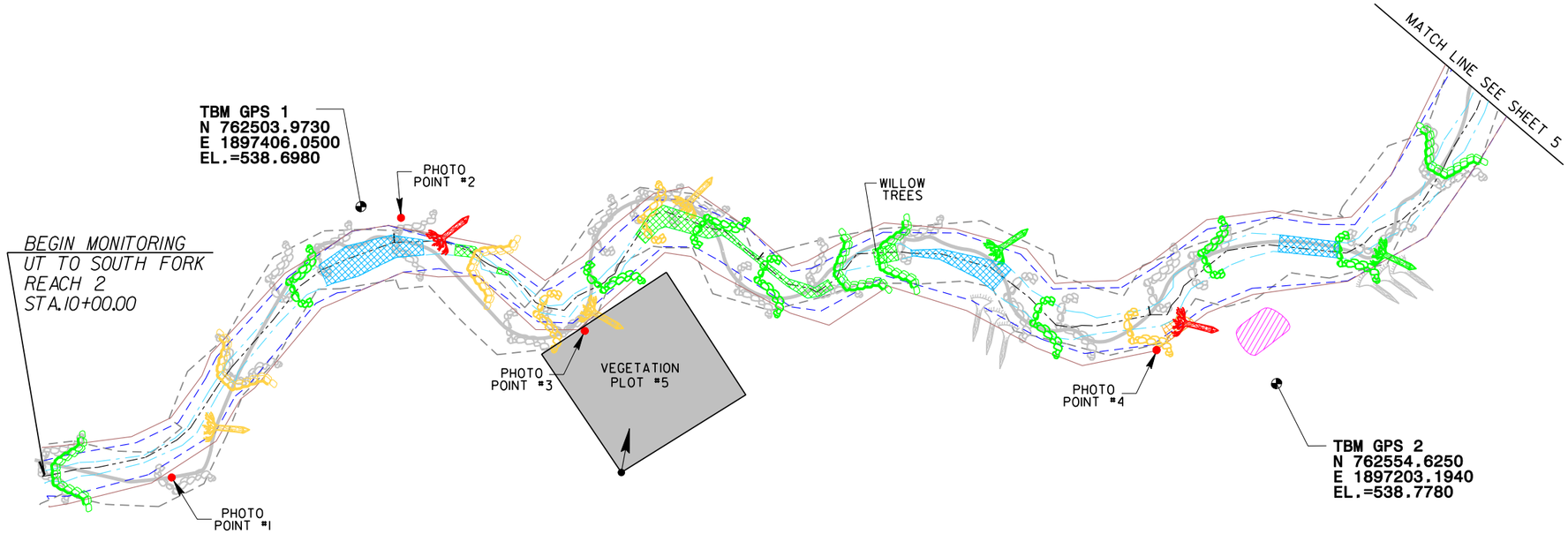
PROJ #:	COUNTY:
435	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
435	4
PROJECT ENGINEER	

10 0 30
SCALE

NAD 83



UT TO SOUTH FORK REACH 2

LEGEND

- PROPOSED THALWEG 2003
- BANKFULL 2003
- THALWEG 2006
- EDGE OF WATER 2006
- BANKFULL 2006
- TOP OF BANK 2006
- CROSS-SECTIONS
- PHOTO POINT

- BANK EROSION
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- AGGRADATON (CATTAILS)
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Ecosystem Enhancement PROGRAM

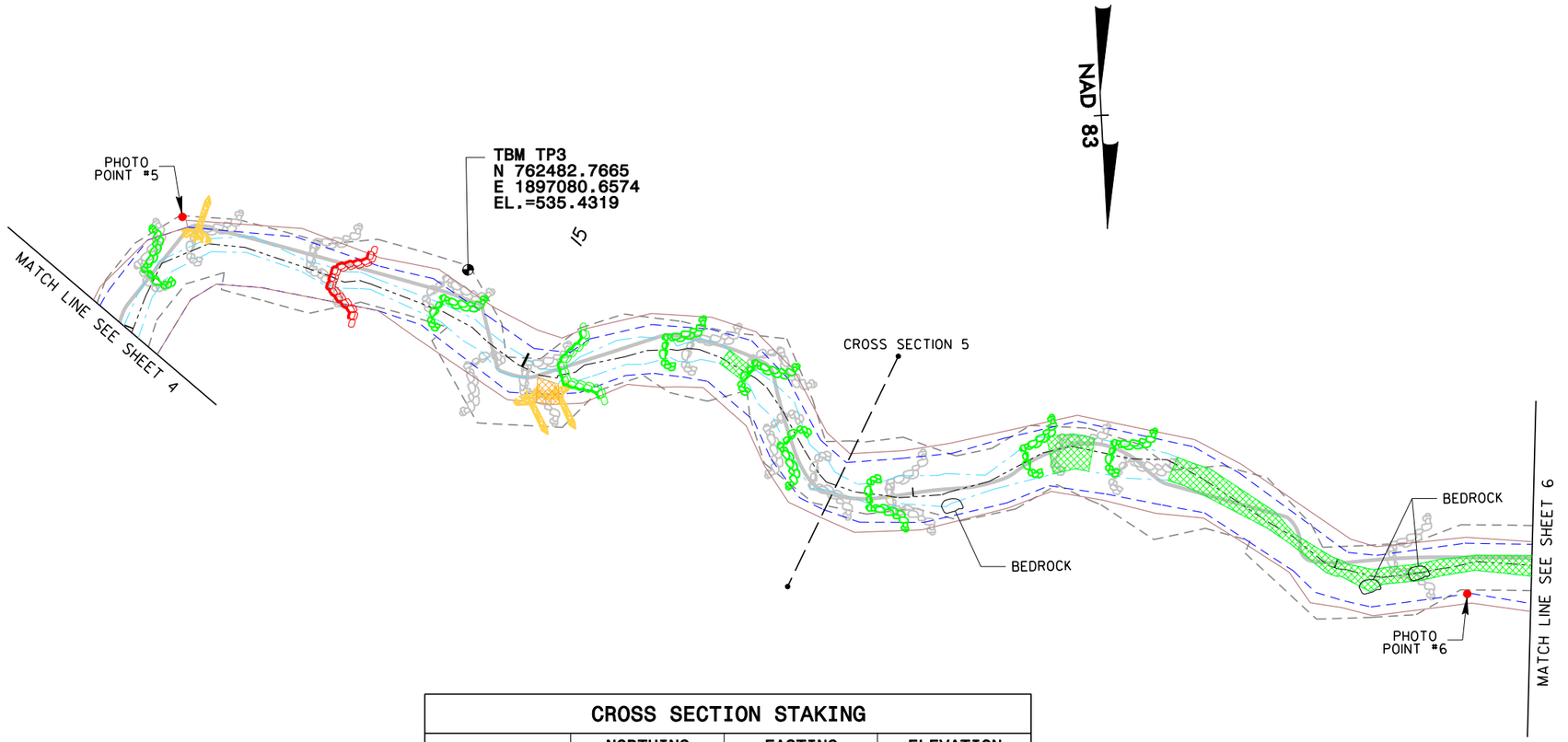
LOCATION:
UT TO SOUTH FORK CREEK
STREAM MONITORING - YEAR 1

PROJ #:	COUNTY:
435	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
435	5
PROJECT ENGINEER	

10 0 30
SCALE



CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 5 LEFT	762506.3940	1896989.2978	536.3557
XSC 5 RIGHT	762554.5778	1897015.7169	535.6841

UT TO SOUTH FORK REACH 2

LEGEND

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Ecosystem Enhancement PROGRAM

LOCATION:
UT TO SOUTH FORK CREEK
STREAM MONITORING - YEAR 1

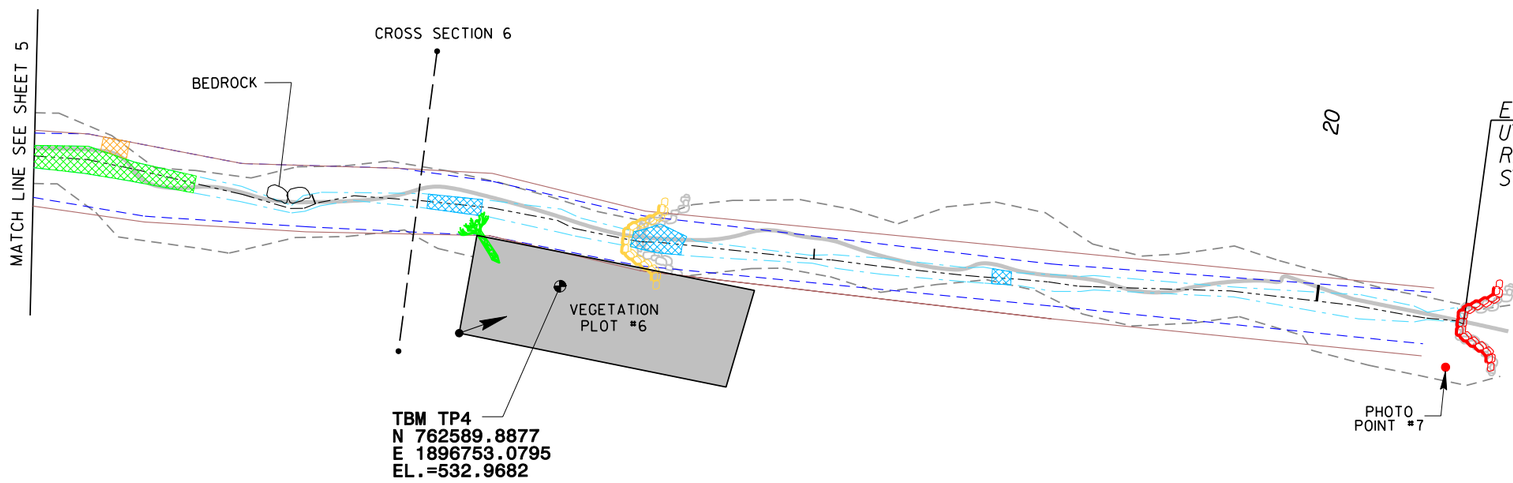
PROJ #:	COUNTY:
435	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
435	6
PROJECT ENGINEER	

10 0 30
SCALE

NAD 83



CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 6 LEFT	762542.1251	1896774.9056	534.7193
XSC 6 RIGHT	762601.0118	1896785.7229	534.8382

UT TO SOUTH FORK REACH 2

LEGEND

- PROPOSED THALWEG 2003
- BANKFULL 2003
- THALWEG 2006
- EDGE OF WATER 2006
- BANKFULL 2006
- TOP OF BANK 2006
- CROSS-SECTIONS
- PHOTO POINT

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Ecosystem Enhancement PROGRAM

LOCATION:
UT TO SOUTH FORK CREEK
STREAM MONITORING - YEAR 1

PROJ #:	COUNTY:
435	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06

SEPI ENGINEERING GROUP
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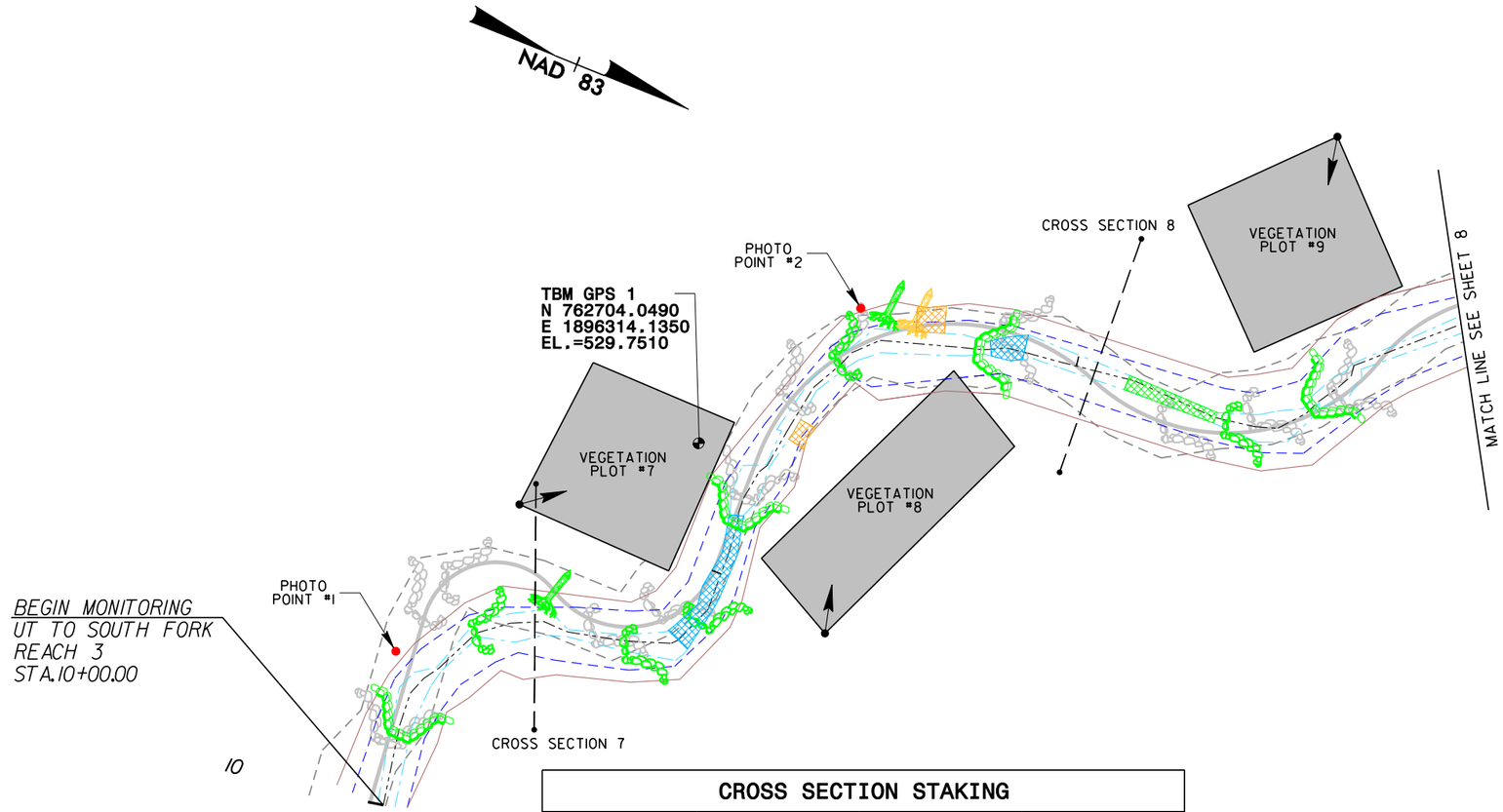
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
435	7
PROJECT ENGINEER	

10 0 30
SCALE



CROSS SECTION STAKING

	NORTHING	EASTING	ELEVATION
XSC 7 LEFT	762676.4689	1896334.1190	530.1153
XSC 7 RIGHT	762694.7446	1896380.6050	531.6672
XSC 8 LEFT	762771.9483	1896242.1450	531.2732
XSC 8 RIGHT	762774.2250	1896292.2990	531.0435

UT TO SOUTH FORK REACH 3

LEGEND

- PROPOSED THALWEG 2003
- BANKFULL 2003
- THALWEG 2006
- EDGE OF WATER 2006
- BANKFULL 2006
- TOP OF BANK 2006
- CROSS-SECTIONS
- PHOTO POINT

- BANK EROSION
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Ecosystem Enhancement PROGRAM

LOCATION:
UT TO SOUTH FORK CREEK
STREAM MONITORING - YEAR 1

PROJ #:	COUNTY:
435	ALAMANCE
PREPARED BY: WDY	
CHECKED BY: ATW	DATE: 11/17/06

SEPI ENGINEERING GROUP
1025 WADE AVENUE
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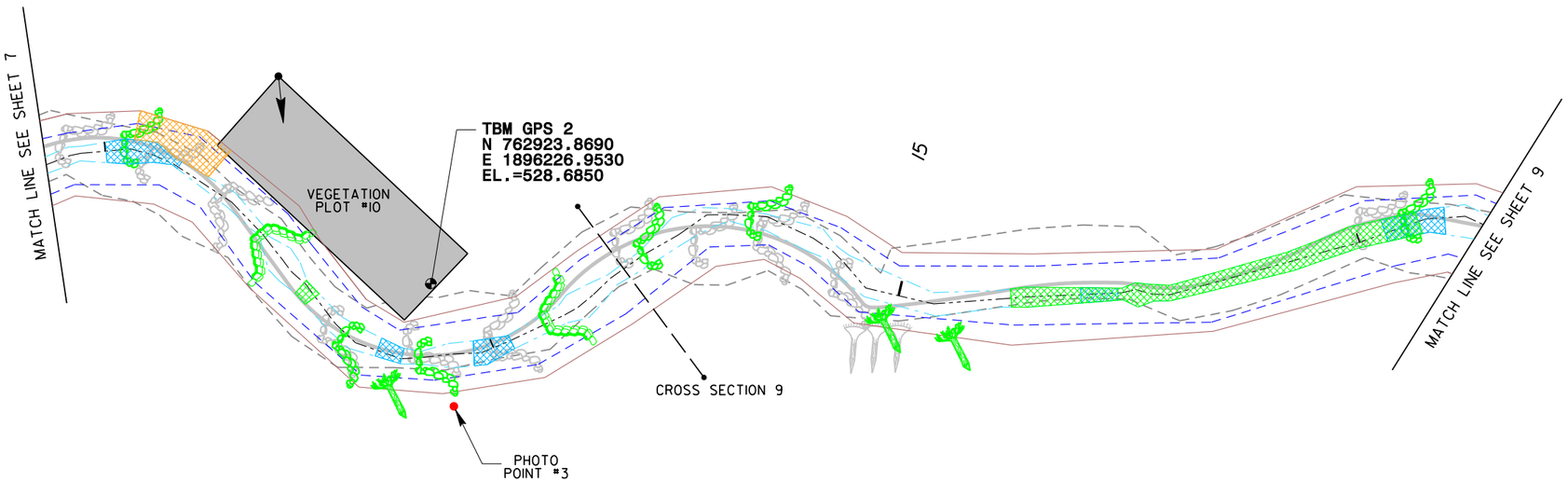
PROJECT REFERENCE NO.	SHEET NO.
435	8
PROJECT ENGINEER	

10 0 30
SCALE

NAD 83



CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 9 LEFT	762946.7210	1896200.1180	529.2745
XSC 9 RIGHT	762985.1716	1896223.8140	530.1599

UT TO SOUTH FORK REACH 3

LEGEND

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- BANKFULL 2003
- THALWEG 2006
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Ecosystem Enhancement PROGRAM

LOCATION:
UT TO SOUTH FORK CREEK
STREAM MONITORING - YEAR 1

PROJ #:	COUNTY:
435	ALAMANCE
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CHECKED BY: ATW	DATE: 11/17/06

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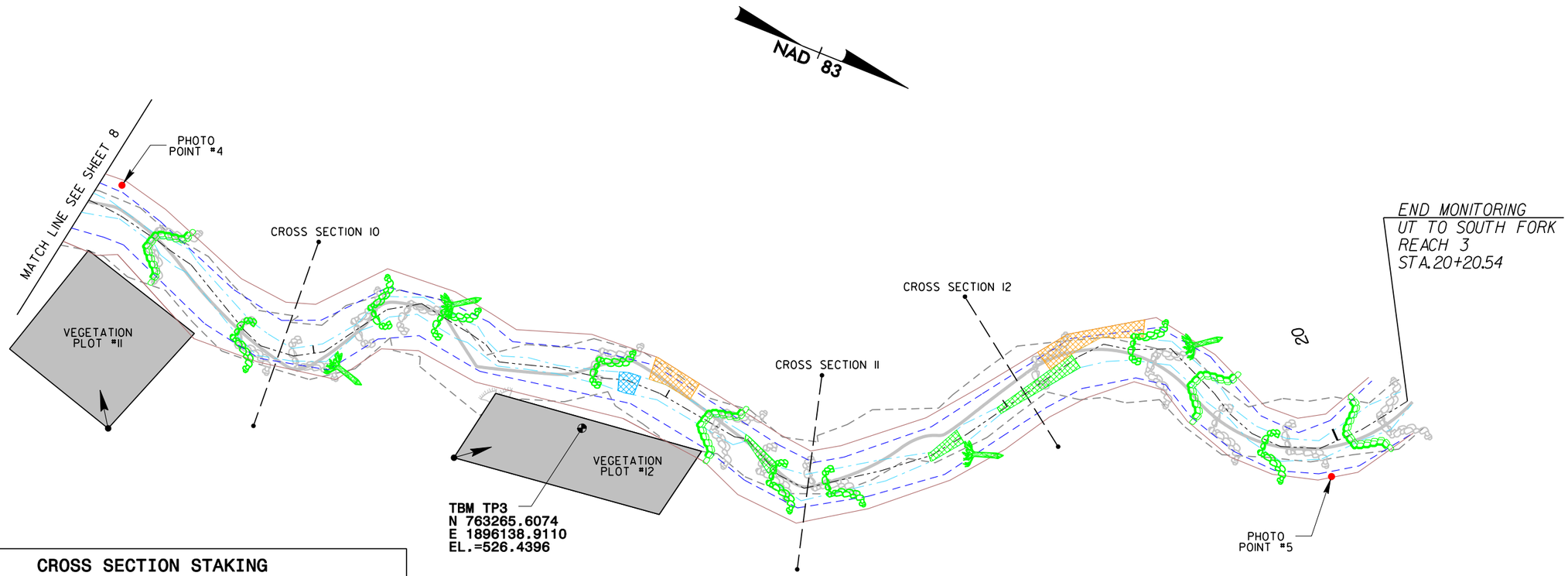
PROJECT REFERENCE NO.	SHEET NO.
435	9
PROJECT ENGINEER	

10 0 30
SCALE



CROSS SECTION STAKING

	NORTHING	EASTING	ELEVATION
XSC 10 LEFT	763185.3049	1896119.8830	528.6611
XSC 10 RIGHT	763187.3395	1896169.7620	527.3895
XSC 11 LEFT	763317.5403	1896103.5160	527.4576
XSC 11 RIGHT	763330.1768	1896151.9130	527.3963
XSC 12 LEFT	763344.0200	1896071.2010	527.7327
XSC 12 RIGHT	763380.4412	1896097.9050	526.4052

UT TO SOUTH FORK REACH 3

LEGEND

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Ecosystem Enhancement PROGRAM

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435	ALAMANCE
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WDY	
CHECKED BY:	DATE:
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