UT to South Fork Creek (Stephens)
Baseline/Year 1 Monitoring Report

Alamance County
EEP Project No. 405
Design Firm: Dewberry & Davis, Inc.

May 2010

Prepared for:

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1. Executive Summary

The North Carolina Ecosystem Enhancement Program (EEP) completed a stream and wetland restoration project along UT to South Fork Creek (UTSFC) in Alamance County, North Carolina in 2007; the official EEP project name is UT to South Fork Creek (Stephens) (Figure 1). The project is within USGS Cataloging Unit (CU) 03030002-05-0050 (NCDWQ Sub-basin 03-06-04) of the Cape Fear River Basin. This CU (Cane Creek Watershed) has been identified as a Targeted Local Watershed (TLW) in EEP's *Cape Fear River Basin Priorities Plan 2009*. The project goals are to improve water quality, create wildlife habitat within the riparian zone, improve aquatic habitat, exclude cattle from the stream, reduce nutrient loading through a filtration buffer, increase stream access to the floodplain, and reduce erosion and sedimentation into UTSFC. The entire project is protected by a permanent conservation easement of 22 acres held by the State of North Carolina. The project was constructed between March 19, 2007 and June 15, 2007. Planting of trees and shrubs was completed on December 15 of 2007.

The project originally contained only a stream restoration component. Post construction monitoring efforts were underway when wetlands were identified throughout the conservation easement. In coordination with EEP, wetland delineations were performed to account for the wetland assets of the project, resulting in a total of 0.93 acre of wetlands. 0.14 acre of these wetlands is pre-existing wetlands that have been planted with mesophytic and bottomland woody tree species. 0.77 acre was restored through hydrological regime restoration and the re-establishment of wetland vegetation. A stream preservation component that was not accounted for in the restoration plan but was noted in the original As-built surveys was delineated. The stream preservation length totals 2,764 lf, with 7 acres of stream buffer preservation (Figure 2).

Priority I and II stream restoration was performed along 4003 lf of UTSFC. Stream preservation of 2,764 lf of a perennial unnamed tributary (UT) to UTSFC was obtained by establishing cattle fencing along the existing stream buffer. In the floodplain of UTSFC, 0.77 acre of riparian wetlands was restored. An additional 0.14 acre of riparian wetlands was enhanced. As-built data were collected upon completion of the project, however monitoring features (i.e. groundwater gauges, vegetation plots, cross sections, and a longitudinal profile) were not established for the Baseline/Year 1 Monitoring Report until April of 2009 (Figure 2).

The stream is divided into three reaches for future monitoring purposes: Reach A, B, and C.

- Reach A is comprised of 150 lf of Priority Level II stream restoration from stream station 6+00 to 7+50, and 1,125 lf Priority Level I stream restoration from stream station 7+50 to 18+75. This reach includes four permanent riffle cross sections for future monitoring.
- Reach B begins at the confluence of UT to UTSFC extending for 625 lf from stream station 18+75 to 25+00. This reach includes two permanent riffle cross sections and the constructed roadway crossing. The designed channel dimensions

and bankfull discharge increase within this reach. Stream Station 18+75 to 21+80 contains 305 lf of Priority Level I stream restoration. Stream station 21+80 to 25+00 contains 320 lf of Priority Level II stream restoration.

- Reach C is comprised of 1,100 lf of Priority Level II stream restoration from stream station 29+00 to 40+00. This stream segment begins at its upstream limit at the second stream ford within the conservation easement and includes three riffle permanent cross sections.

Wetland restoration was performed on 0.77 acre of UTSFC riparian buffer though the re-establishment of wetland vegetation and returning the hydrologic regime to within 12 inches of the ground surface. The majority of the restoration lies within the pre-construction channel alignment. Wetland enhancement of 0.14 acre was accomplished by planting wetland vegetation within a pre-existing wetland although not as part of the design plan. Four groundwater gauges were installed within the restored wetlands and a reference gauge was installed in the enhanced wetland. Throughout the entire project reach, electric fencing was established along the riparian corridor to prevent further cattle access. The conservation easement encompasses 15 acres along UTSFC and 7 acres along the UT to UTSFC.

The CVS-EEP protocol was used to establish the baseline data. Seven vegetation monitoring plots were established in April 2009. Level I of the CVS-EEP protocol was followed for baseline data collection, which is a tally of planted stems only. Level II, which includes planted and natural stems, will be used for the five year monitoring period. Currently the baseline vegetation data reflects 335 stems/acre for planted stems only, and 1,589 stems/acre for both planted and natural stems combined. Invasive exotics have already become established within the conservation easement, including tall fescue (*Schedonurus arundinaceus*), multiflora rose (*Rosa multiflora*), Tree of Heaven (*Ailanthus altissim*a), Chinese privet (*Ligustrum sinense*), and Japanese stiltgrass (*Microstegium vimineum*).

2. Project Goals, Background and Attributes

2.1. Location and Setting

The project is located north of Siler City in Alamance County, North Carolina, in the Cape Fear River 03030002 Cataloging Unit (CU) and North Carolina Division of Water Quality Subbasin 03-06-04. This CU (Cane Creek Watershed) has been identified as a Targeted Local Watershed (TLW) in EEP's *Cape Fear River Basin Priorities Plan 2009*. UTSFC is a tributary of the Haw River Basin and is located within a rural setting in the North Carolina Slate Belt. The project site, surrounded by pastureland, is located south of Old Dam Road (SR 2370) and west of Snow Camp Road (SR 1346). The property is owned by the Stephen's Family.

Site Directions: From Raleigh, head south on US 1 to US 64. Take US 64 west to Pittsboro and exit onto NC 87. Head North onto NC 87 about 4 miles and turn left onto Silk Hope Gum Springs Rd (SR 1003). Go approximately 12 miles to turn right onto Snow Camp Rd (SR 1004). Go approximately 3.5 miles to turn left onto Old Dam Road. Go 1.4 miles to turn left onto Stephens Trail. The conservation easement is located about ½ mile south at the UTSFC crossing.

2.2. Project Goals and Objectives

The project goals for UTSFC include:

- Improving water quality to the receiving watershed through:
    - Cattle exclusion from the easement
    - Planting a native riparian buffer
    - Reduction of bank derived sediment losses through stabilization via:
        - Construction of a channel with a stable dimension, pattern and profile
        - Protection of banks from hoof shear
        - Integration of a stabilizing root mass as part of planting a native riparian buffer
- Providing wildlife habitat through the creation of a riparian zone
- Improving aquatic habitat with the use of natural material stabilization structures and a riparian buffer
- Increasing stream access to the floodplain
- Reducing erosion and sedimentation

UTSFC is a third order stream that flows generally from southwest to northeast. UTSFC has a drainage area of approximately 770 acres as it enters the Stephen's property and approximately 850 acres at the point at which it leaves the property. The conservation easement area is approximately 22 acres total. Prior to restoration, cattle had full access to the stream resulting in bank erosion, vegetation degradation, and reduced water quality. The channel was classified as a F4 channel type prior to construction. The portion of UTSFC upstream of the confluence with UT to UTSFC was classified as a G4c. UTSFC Stream and Wetland Restoration Site assets are discussed below:

Stream Restoration: Priority Level I restoration was performed on approximately 1,400 lf from station 7+35 to 21+35. Priority Level II restoration was performed on two reaches of the UTSFC totaling 2,650 lf of the main channel. Reach A, B, and C resulted in a restored E4 channel type. The pattern, dimension, and profile were restored throughout the project site. Boulder structures and root wads were installed to provide further stability to the stream as well as to enhance aquatic wildlife habitat. Fencing was installed to mark the conservation easement boundaries and to prevent cattle access to the stream and riparian buffers. Streambanks, the floodplain, and upland areas within the easement were all planted with native vegetation to stabilize the channel and provide shade, food, and habitat, as well as a vegetated buffer to treat surrounding overland flows.

Stream Buffer: The conservation easement consists of 15 acres of riparian buffer which is delineated with electric fencing to prevent cattle access.

Stream Preservation: A riparian buffer was fenced along UT to UTSFC resulting in 2,764 lf of stream preservation and 7 acres of buffer preservation.

Wetland Restoration and Enhancement: Wetland restoration was performed on 0.77 acre of UTSFC riparian buffer though the re-establishment of wetland vegetation and returning the hydrologic regime to within 12 inches of the ground surface. Wetland enhancement of 0.14 acre was accomplished by the planting wetland vegetation.

2.3. Project Structure, Restoration Type and Approach

2.3.1. *Project Structure*

UTSFC Stream and Wetland Restoration Site components include 4,003 lf of stream restoration, 2,764 lf of stream preservation, 0.77 acre of wetland restoration, and 0.14 acre of wetland enhancement. The target natural plant community within the conservation easement is a Piedmont Alluvial Forest with a seasonally to intermittently flooded hydrological regime. The planting plan incorporates a mix of bottomland and mesophytic canopy and tree species as well as a mix of herbaceous species typical of the this community (Appendix C).

2.3.2. *Restoration Type and Approach*

Prior to restoration, the project site had been used as pasture; all reaches of UTSFC and UT to UTSFC were impacted because cattle had full access to the stream. The banks were eroding and collapsing. The stream designer classified two distinct stream types for UTSFC, separated by the UT to UTSFC. Upstream of the confluence with UT to UTSFC the stream was classified as a G4c stream type and downstream of the UT to UTSFC confluence it was classified as a F4 stream type.

The restoration approach broke the channel into three reaches based on priority level. The stream channel was modified based on the location of UT to UTSFC. The design channel dimension increases significantly downstream of the confluence. Priority Level I and II restoration occurred upstream of the confluence. The Priority Level II reach extends

from station 0+00 to station 7+50. The Priority Level I restoration extends for approximately 1,430 lf from station 7+50 to 21+80. Downstream of the confluence, UTSFC was constructed with a Priority Level I approach for 305 feet to stream station 21+80. The remaining project stream length between station 21+80 and 40+03 was constructed with a Priority Level II restoration approach and designed as an E4 stream type.

2.4. Project History, Contacts, and Attribute Data

In 2003, NCEEP and Natural Resources Conservation Service (NRCS) identified a portion of the UT to South Fork Creek watershed as a potential stream and riparian buffer restoration site. A Restoration Plan for the restoration of 4,050 lf of stream was prepared for EEP in September 2004. The UTSFC watershed lies with the North Carolina Unified Watershed Assessment 8 Digit Cataloging Category 03030002, which is a "Category 1 Basin", meaning a basin with high priority restoration needs. The UTSFC watershed is an agriculture based watershed subject to streambank erosion and habitat degradation. For more information see Tables 2-4.

3. Success Criteria

3.1. Morphologic Parameters and Channel Stability

3.1.1. *Dimension*

The stream dimension should not demonstrate trends of enlargement either through downcutting or widening, however, year to year variation (oscillation) in channel elevation or width demonstrating maintenance around baseline is acceptable. In addition, stream design includes uncertainty and restored streams typically adjust or shift to some extent after their exposure to flow, that is, the design geometries are never a perfect match for the watershed hydrologic and sediment regimes. Therefore it is often observed that there is some shift/adjustment in the channel parameters in the first year or 2 following construction after exposure to flows. Stability can also be demonstrated under this scenario assuming the adjustment/shift does not represent a significant divergence from design parameters and maintains healthy levels of key parameters of stable stream types (e.g. W/D and entrenchment ratios) with subsequent demonstration of dynamic stability as described above. Riffle depths should maintain a low bank height ratio (<1.2).

3.1.2. *Pattern and Profile*

The channels bed/profile should exhibit maintenance or dynamic maintenance such that no systemic trends of aggradation or degradation are evident. As with dimension, while the absence of any obvious change will indicate stability, it is not a pre-requisite or absolute requirement. Oscillation of the bed around baseline or localized, temporary occurrences of aggradation or degradation associated with import and export of bedload in response to storm events is an expected condition of dynamic stability. However, systemic trends of aggradation or degradation concomitant with systemic reductions in bedform, channel incision or widening will represent failures potentially requiring remediation.

3.1.3. *Substrate*

The substrate should maintain or progress towards the design distribution.

3.1.4. *Sediment Transport*

Success in parameters 3.1.1 – 3.1.3 will generally indicate sediment transport equilibrium. However, while stream projects are designed to transport bedload in equilibrium and carry overall sediment loads at bankfull, fines can be transported even at low discharges and upstream instability beyond design projections can also lead to widespread deposition as storm events recede in portions of the drainage network of higher energy dissipation (e.g. restoration reaches). This can have the effect of obscuring bedform and fining of riffles especially in the first few years after the implementation of a stream project. In many cases subsequent narrowing and reduction of W/D ratios as a project develops and stabilizes can then increase transport efficiency and return bedform to intended distribution, but some tendency for modest filling of pools/glides and fining in riffles may persist given developing perturbations in the contributing watershed.

3.1.5. *Vegetation*

The success criteria of the planted woody species will be the survival of 320 stems/acre after monitoring year three (MY3). A mortality rate of ten percent will be allowed after MY4 (288 stems/acre), with another ten percent mortality rate allowed after MY5 (260 stems/acre).

3.1.6. *Hydrology*

3.1.6.1. Streams

Two bankfull storm events must be recorded during the standard 5-year monitoring period. For the monitoring to be completed, these events must occur in separate monitoring years.

3.1.6.2. Wetlands

Currently there are five Remote Data Systems (RDS) groundwater gauges (1-5) within wetlands in the conservation easement. Wetland 1 is the only pre-existing wetland system and was not incorporated as part of the restoration design plan. However, this wetland was planted with woody stems typical of a Piedmont Alluvial Forest resulting in 0.14 acre of wetland enhancement. The gauges record data daily and will be downloaded on a bi-monthly basis. Gauges were installed according to the specifications of Technical Note HY-1A-3.1 (USACE 1993). Groundwater levels are monitored to determine if groundwater levels are within 12 inches of the soil surface for at least 5% of the growing season. These areas will be considered wetlands if the groundwater is within 12 inches for at least 5% of the growing season, the area supports hydrophytic vegetation, and meets the hydric soil requirements. Precipitation data for the Snow Camp area will be provided by the State Climate Office and will be provided for comparison in the Monitoring Year 1 report.

4. Monitoring Plan Guidelines

4.1. Hydrology

4.1.1. Stream

A crest gage was installed on the site to document bankfull events. The gauge will be checked and reset during each site visit. Flow levels will be cross referenced with local precipitation data provided by the NC State Climate Office.

4.1.2. Wetland

Five groundwater gauges were installed within five different wetlands in the conservation easement in order to characterize the degree of hydrological attainment of each wetland. Gauge 1 is located with Wetland 1, a pre-existing wetland system, although not part of the restoration design plan, was enhanced with wetland vegetation establishment. Wetland 1 will be used as the on-site reference wetland. The gauges shall be downloaded on a bi-monthly basis to ensure proper gauge function and to avoid data gaps in case of gauge failure.

4.2. Stream Channel Stabilty and Geomorphology

As-built drawings were created after construction in January of 2008. These as-built drawings included sixteen (16) cross sections throughout the site. Dimension data from the as-built sections are summarized in Tables 5a-A though 5a-C. Data from individual sections are listed in Tables 8A through 8C. The approximate locations of these sections are shown in Appendix D. Permanent cross sections were not established in the field at any of these cross section locations and therefore were not available for use in the Baseline/Year 1 Monitoring Report or future monitoring.

The restoration plan divided the project into three reaches based on restoration priority level. As-built data were collected and separated based on these three reaches. For the Baseline/Year 1 Monitoring Report, the entire stream length was surveyed and seventeen (17) cross sections were established based on changes in channel length parameters of dimension and slope as evaluated in the field. The surveyed stream length and data was discussed with NCEEP to determine the appropriate reach length and cross sections to be included in the Baseline/Year 1 Monitoring Report and for future monitoring use. The outcome of this meeting resulted in three reaches, A, B, and C, being selected to evaluate the stream restoration project through future monitoring efforts. All of the collected 17 cross sections have been included in Appendix B along with the entire longitudinal survey. All of the original cross section pins set in the field will remain however only the nine (9) cross sections selected for monitoring will remain flagged in the field for future monitoring use (Figure 2). Coordinates have been provided on the cross section sheets for future location of the pins if needed.

The As-built baseline cross-sections were collected soon after construction by the construction surveyor in December 2007, and provided the distributions in table 5. The cross-sections provided in table 7 for year 1 were collected by the monitoring firm in April 2009, and are not the same exact cross-sections as those collected immediately after

construction due to non-permanent monumenting of those features on the part of the contractor, however the distributions will provide useful comparisons as the locations are very similar even though they will not permit an exact spatial match for direct overlay.

Reach A extends 1,275 lf to the confluence of UT to UTSFC between stream station 6+00 to stream station 18+75. The priority level I and II restoration approach was used for this reach. Channel dimensions for this reach are smaller than Reach B and C. Priority Level I restoration was implemented from stream station 7+50 to station 18+75 with a 150 foot length of Priority Level II restoration from stream station 6+00 to 7+50. This reach includes four permanent riffle cross sections for future monitoring.

Reach B is 625 lf of channel located just downstream of the UT to UTSFC confluence extending from stream station 18+75 to 25+00. This stream reach will represent the larger stream channel found at this location carrying a larger discharge with a steeper channel slope. Reach B is comprised of 305 lf of Priority Level I at the upper end of the reach (station 18+75 to station 21+80) and 320 lf of Priority Level II for the remainder of the reach. This reach includes two permanent riffle cross sections and the constructed roadway crossing.

Reach C is 1,100 lf of channel located with its upper limits beginning at the ford crossing downstream of the constructed roadway crossing. The reach extends from stream station 29+00 through station 40+00. This stream reach will represent the larger stream channel found below the confluence of UT to UTSFC which returns to a slope that is similar to Reach A of the project. Reach C was constructed as a Priority Level II restoration and includes three riffle permanent cross sections.

Nine permanent cross sections were chosen out of the original 17, all riffles, to serve as the permanent monitoring cross-sections. The reaches and cross sections are as follows:

- Reach A: Station 6+00-18+75
  - Cross Section 1: Station 8+39
  - Cross Section 2: Station 11+51
  - Cross Section 3: Station 14+05
  - Cross Section 4: Station 17+04
- Reach B: Station 18+75-25+00
  - Cross Section 5: Station 17+73
  - Cross Section 6: Station 19+73
- Reach C: Station 29+00-40+00
  - Cross Section 7: Station 27+22 (lies upstream of Reach 3)
  - Cross Section 8: Station 30+12
  - Cross Section 9: Station 37+55

4.2.1. *Dimension*

The permanent cross sections should be surveyed annually during the monitoring period. These sections shall be overlaid to allow for comparison. Dimension parameters shall be calculated from the surveyed cross sections and compared to previous monitoring

periods. The MY-00 dimension data is summarized in additional tables 7A through 7C in this report. These tables were added because additional data based on cross sections provided on the as-built drawings were summarized in Tables 5a-A though 5a-C.

4.2.2. *Profile and Pattern*

The entire length of the restoration site was surveyed for this Baseline/Year 1 Monitoring Report. However, as described in Section 3.2, the site was divided into three reaches (Figure 2). The MY-00 profile data for each reach is summarized in Tables 7A-C. For subsequent monitoring years, Reaches A, B, and C described herein shall be surveyed and the profiles overlaid for comparison. Pattern data shall be extracted and compared for each reach during the monitoring period.

4.2.3. *Visual Assessment*

An annual visual assessment shall be conducted during each monitoring year per EEP morphometric monitoring guidelines.

4.2.4. *Bank Stability Assessment*

Bank stability assessment (BEHI and NBS) shall be assessed during monitoring year 5.

4.2.5. *Vegetation*

Seven vegetation plots were established on April 8, 2009 (Figure 2). Level I of the CVS-EEP protocol, which includes only planted stems, was followed for the baseline data collection. See Appendix C for Vegetation Plot Photos.

4.3. Maintenance and Contingency Plan

EEP will be responsible for the maintenance and monitoring of this project for a minimum of five years or until the project goals have been accomplished. During the monitoring period, the monitoring contractor will notify EEP of any need for immediate corrective action or repair to ensure project success. Any repairs necessary to accomplish project success will be made by EEP.

5. Documenting the As-built Condition (Baseline)

The original As-built drawings do not contain any vegetation plots, wetlands locations, wetland groundwater gauges, or stream crest gauge. These monitoring features as well as nine cross sectional monitoring stations that will be used for the monitoring period are depicted in Figure 2. See Appendix D for the original As-built drawings.

6. References

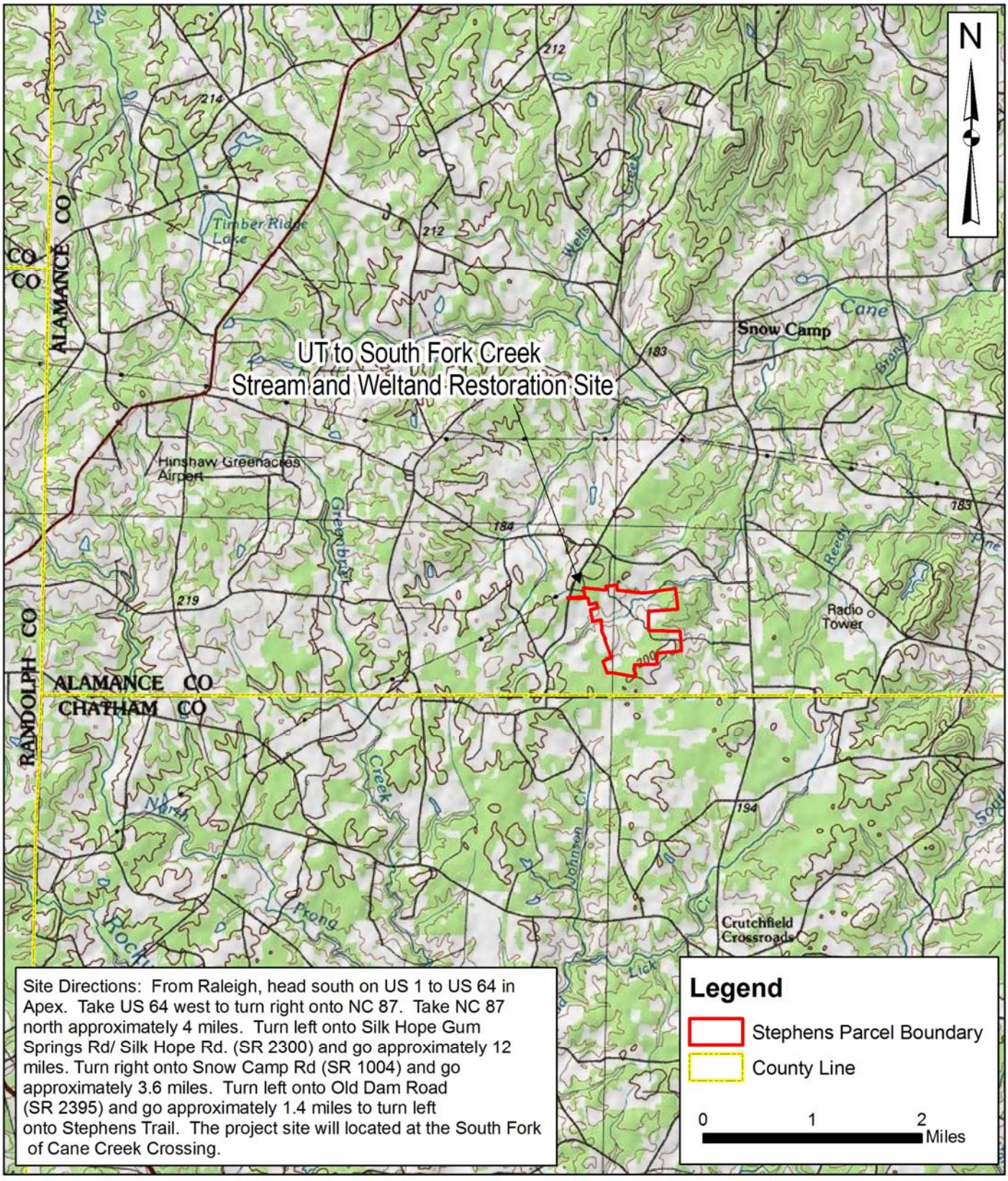
Lee, Michael T. Peet, Robert K. Roberts, Steven D., Wentworth, Thomas R. (2006). *CVS-EEP Protocol for Recording Vegetation Version 4.0.*

SPCA, 1973. "Sedimentation Pollution Control Act of 1973." (1973, c. 392, s. 1.)

Weakley, Alan (2007). *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas*. http://www.herbarium.unc.edu/flora.htm.

Appendix A

Figures and Tables

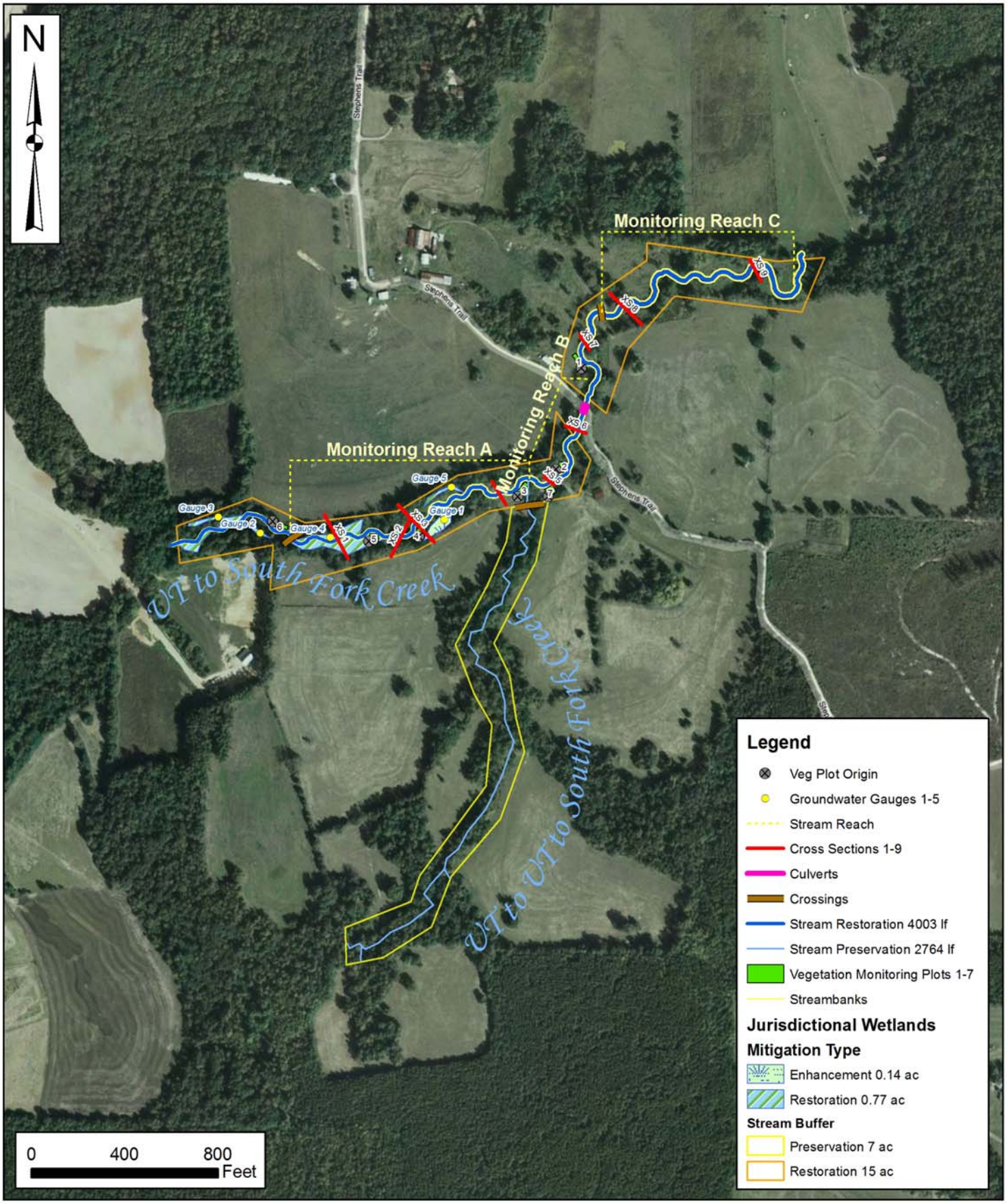


The Catena Group

UT to South Fork Creek
Stream and Wetland Restoration Site
Site Location Map
Alamance County, North Carolina

Date: May 2010
Scale: As Shown
EEP Project No. 405

Figure 1



The Catena Group

UT to South Fork Creek
Stream and Wetland Restoration Site

Project Asset Map

Alamance County, North Carolina

Aerial Orthophotography
Source: Microsoft Virtual Earth

Date: May 2010

Scale: As Shown

EEP Project No. 405

Figure 2

Table 1a. Project Components: UT to South Fork Creek/Project No. 405

Project Segment/Reach I.D.	Existing Feet/Feet²	Mitigation Type	Approach	Linear Feet/Feet²	Buffer Acres	Stations	Comments
UT to South Fork Creek	735	Restoration	Priority 2	735	2.93	0+00-7+35	Instream Structure and Vegetated Buffers
UT to South Fork Creek	1445	Restoration	Priority 1	1445	5.23	7+35-21+80	Instream Structure and Vegetated Buffers
UT to South Fork Creek	1823	Restoration	Priority 2	1823	6.84	21+80 to 40+03	Instream Structure and Vegetated Buffers
UT to UT to South Fork Creek	2764	Preservation	Cattle Fencing	2764	7	0+00 to 27+64	Cattle Fence Installed
Wetlands	0.77	Restoration	Water table restored	0.77	-	0+00-15+50	Pre-construction channel location
Wetlands	0.14	Enhancement	Hardwood Plantings	0.14	-	13+00	Pre-construction wetland

Table 1b. Component Summations: UT to South Fork Creek/Project No. 405

Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	4003	0.77					
Enhancement		0.14					
Enhancement I							
Enhancement II							
Creation							
Preservation	2764						
HQ Preservation							
		0.91	0				
Totals	**6767**	**0.91**		**0**	**0**	**0**	**Count**
	Non-Applicable						

Table 2. Project Activity and Reporting History: South Fork of Cane Creek/Project No. 405

Activity or Reporting	Scheduled Completion	Data Collection Complete	Actual Completion Date
Restoration Plan	NA	NA	September 2004
Final Design-90%	NA	NA	NA
Construction	2007	2007	2007
Temporary S&E mix applied to entire project area	2007	2007	2007
Permanent seed mix applied to entire project area	2007	2007	2007
Containerized, B&B, and livestake planting	2007	2007	Dec 2007
Monitoring Baseline Year 0/1	2008	April 2009	June 2009
Year 2 Monitoring	November 2009	November 2009	December 2009
Year 3 Monitoring	NA	NA	NA
Year 4 Monitoring	NA	NA	NA
Year 5 Monitoring	NA	NA	NA

Table 3. Project Contact Table: UT to South Fork Creek/Project No. 405

Designer POC	Dewberry & Davis, Inc. 2301 Rexwoods Dr Ste 200 Raleigh, NC , 27607-3366 Phone: 919-881-9939
Construction Contractor	Contact EEP
Planting Contractor POC	Contact EEP
Seeding Contractor POC	Contact EEP
Seed Mix Sources	Contact EEP
Nursery Stock Suppliers	Coastal Plain Conservation Nursery, Inc. 3067 Conners Drive Edenton, NC 27932 Phone (252)-482-5707
Monitoring Performers	
Stream Monitoring	Ward Consulting Engineers 8368 Six Forks Road Suite 104 Raleigh, NC 27615-5083 Ph: 919-870-0526
Vegetation and Wetland Monitoring	The Catena Group 410-B Millstone Drive Hillsborough, NC 27278 Ph: (919) 732-1300

Table 4. Project Background Table: UT to South Fork Creek/Project No. 405	
Project County	Alamance
Drainage Area	
UT to South Fork Creek	1.33 sq mi
Drainage impervious surface cover estimate (%)	< 5%
Stream Order	
UT to South Fork Creek	2nd
Physiographic Region	Piedmont
Ecoregion	Carolina Slate Belt
Rosgen Classification of As-Built	E4
Cowardin Classification	Riverine
Dominant Soil Types	Herndon, Orange, Appling, and Colifax silty loams
Reference Site ID	UT to the UT to South Fork Creek
USGS HUC for Project	03030002
USGS HUC for Reference	UT to the UT to South Fork Creek (03030002)
NCDWQ Sub-basin for Project	030604
NCDWQ Sub-basin for Reference Reach	UT to UT to South Fork Creek (030604)
NCDWQ Classification for Project	No classification; Haw River (C, NSW)
NCDWQ Classification for Reference	No classification; Haw River (C, NSW)
Is any portion of any project segment 303D listed?	No
Is any portion of any project segment upstream of a 303D listed segment?	Yes
Reasons for 303D listing or stressor	High pH
% of project easement fenced	100

Appendix B

Morphological Summary Data and Plots

Table 5

As-Built Stream Data Summary Tables 5a (A-C)

Tables 5b (Substrate Distribution)

Exhibit Table 5a-C. As-Built Baseline Stream Data Summary[1]
UT to South Fork Creek (Stephens) No. 405 - Reach: Downstream of Tributary, Priority 2: Station 18+80-40+50

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			As-built / Baseline					
Dimension and Substrate - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)						11.4						11.6						12		16.98	18.44	18.19	20.19	1.39	7
Floodprone Width (ft)						14.9						41.3						≥ 36		80	103.11	100.9	134.45	22.9	7
Bankfull Mean Depth (ft)						1.3						1						1.2		2.84	3.27	3.18	3.77	0.36	7
[1]Bankfull Max Depth (ft)						1.6						1.4						1.9		2.86	3.36	3.18	4	0.42	7
Bankfull Cross Sectional Area (ft^2)						14.8						11.6						14.7		28.16	38.51	37.44	49.25	7.24	7
Width/Depth Ratio						8.7						11.6						9.8		4.8	5.55	5.46	6.83	0.8	7
Entrenchment Ratio						1.3						3.6						≥ 3.0		3.96	5.67	5.51	7.92	1.57	7
[1]Bank Height Ratio						**2.7**						**1**						**1**		**1**	**1.05**	**1.05**	**1.13**	**0.05**	**7**
Profile																									
Riffle Length (ft)					1.1			37.2			4			38.9			12		12						
Riffle Slope (ft/ft)																	2.1		9.3						
Pool Length (ft)					5			26.2			14.8			42.8			24		24						
Pool Max depth (ft)																									
Pool Spacing (ft)					19			509			17			159			31		50						
Pattern																									
Channel Beltwidth (ft)					2			36			19.1			41.2			25		40						
Radius of Curvature (ft)					3.7			69.4			9.4			81.2			40		100						
Rc:Bankfull width (ft/ft)					**0.3**			**6.1**			**0.8**			**7**			**3.3**		**8.3**						
Meander Wavelength (ft)					30			247			43.3			46.2			90		130						
Meander Width Ratio					2.6			21.7			3.7			4			7.5		10.8						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2																									
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification								G4c						E4b				E4							
Bankfull Velocity (fps)								3.1						4.3				2.7							
Bankfull Discharge (cfs)								45						50											
Valley length (ft)														424.4											
Channel Thalweg length (ft)														459.5											
Sinuosity (ft)								1.17						1.08											
Water Surface Slope (Channel) (ft/ft)								0.0031						0.022											
BF slope (ft/ft)								**0.0043**						**0.023**											
[3]Bankfull Floodplain Area (acres)																									
[4]Proportion over wide (%)																									
Channel Stability or Habitat Metric																									
Biological or Other																									

1. This data was provided by the designer from their As-built survey. The designer broke this project out into different reaches than this mitigation plan.
The dimension data was taken from cross sections surveyed after construction. That cross section data can be seen in Tables 8A-8C.

Exhibit Table 5a-A. As-Built Baseline Stream Data Summary[1]
UT to South Fork Creek (Stephens) No. 405 - Reach: Upstream of Tributary, Priority 2: Station 0+00-7+75

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			As-built / Baseline					
Dimension and Substrate - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)						11.4						11.6						12		13.37	15.76	15.76	18.15	2.75	4
Floodprone Width (ft)						14.9						41.3						≥ 36		78.21	106.5	113.64	120.5	19.27	4
Bankfull Mean Depth (ft)						1.3						1						1.2		2.07	2.54	2.67	2.77	0.32	4
[1]Bankfull Max Depth (ft)						1.6						1.4						1.9		2.07	2.57	2.7	2.81	0.34	4
Bankfull Cross Sectional Area (ft^2)						14.8						11.6						14.7		15.35	23.67	25.01	29.31	5.92	4
Width/Depth Ratio						8.7						11.6						9.8		4.76	6.17	6.55	6.79	0.95	4
Entrenchment Ratio						1.3						3.6						≥ 3.0		5.85	6.8	6.53	8.29	1.05	4
[1]Bank Height Ratio						**2.7**						**1**						**1**		**1**	**1.02**	**1.02**	**1.03**	**0.01**	**4**
Profile																									
Riffle Length (ft)					1.1			37.2			4			38.9			10		10						
Riffle Slope (ft/ft)																									
Pool Length (ft)					5			26.2			14.8			42.8			20		20						
Pool Max depth (ft)																									
Pool Spacing (ft)					19			509			17			159			30		55						
Pattern																									
Channel Beltwidth (ft)					2			36			19.1			41.2			25		65						
Radius of Curvature (ft)					3.7			69.4			9.4			81.2			40		60						
Rc:Bankfull width (ft/ft)					**0.3**			**6.1**			**0.8**			**7**			**3.3**		**5**						
Meander Wavelength (ft)					30			247			43.3			46.2			85		150						
Meander Width Ratio					2.6			21.7			3.7			4			7.1		12.5						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2																									
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification						G4c						E4b						E4							
Bankfull Velocity (fps)						3.1						4.3						3.1							
Bankfull Discharge (cfs)						45						50													
Valley length (ft)												424.4													
Channel Thalweg length (ft)												459.5													
Sinuosity (ft)						1.17						1.08						0.09							
Water Surface Slope (Channel) (ft/ft)						0.0031						0.022						0.0039							
BF slope (ft/ft)						**0.0043**						**0.023**						**0.0043**							
[3]Bankfull Floodplain Area (acres)																									
[4]Proportion over wide (%)																									
Channel Stability or Habitat Metric																									
Biological or Other																									

1. This data was provided by the designer from their As-built survey. The designer broke this project out into different reaches than this mitigation plan.
The dimension data was taken from cross sections surveyed after construction. That cross section data can be seen in Tables 8A-8C.

Exhibit Table 5a-B. As-Built Baseline Stream Data Summary[1]
UT to South Fork Creek (Stephens) No. 405 - Reach: Upstream of Tributary, Priority 1: Station 7+75-18+80

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			As-built / Baseline					
Dimension and Substrate - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)						11.4						11.6						12		14.6	18.56	14.9	29.84	7.53	4
Floodprone Width (ft)						14.9						41.3						≥ 36		49.52	78.82	76.33	113.09	29.43	4
Bankfull Mean Depth (ft)						1.3						1						1.2		2.01	2.65	2.69	3.19	0.5	4
[1]Bankfull Max Depth (ft)						1.6						1.4						1.9		2.04	2.74	2.8	3.32	0.54	4
Bankfull Cross Sectional Area (ft^2)						14.8						11.6						14.7		21.85	30.41	27.39	45.01	10.15	4
Width/Depth Ratio						8.7						11.6						9.8		4.4	6.87	6.48	10.12	2.49	4
Entrenchment Ratio						1.3						3.6						≥ 3.0		3.12	4.55	3.67	7.75	2.17	4
[1]Bank Height Ratio						**2.7**						**1**						**1**		**1.03**	**1.07**	**1.08**	**1.09**	**0.03**	**4**
Profile																									
Riffle Length (ft)					1.1			37.2			4			38.9			10		10						
Riffle Slope (ft/ft)																									
Pool Length (ft)					5			26.2			14.5			42.8			20		20						
Pool Max depth (ft)																									
Pool Spacing (ft)					19			509			17			154			30		55						
Pattern																									
Channel Beltwidth (ft)					2			36			19.1			41.2			25		40						
Radius of Curvature (ft)					3.7			69.4			9.4			81.2			40		100						
Rc:Bankfull width (ft/ft)					**0.3**			**6.1**			**0.8**			**7**			**3.3**		**8.3**						
Meander Wavelength (ft)					30			247			43.3			46.2			90		130						
Meander Width Ratio					2.6			21.7			3.7			4			7.5		10.8						
Transport parameters																									
Reach Shear Stress (competency) lb/f^2																									
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification								G4c						E4b				E4							
Bankfull Velocity (fps)								3.1						4.3				3.1							
Bankfull Discharge (cfs)								45						50											
Valley length (ft)														424.4											
Channel Thalweg length (ft)														459.5											
Sinuosity (ft)								1.17						1.08				0.09							
Water Surface Slope (Channel) (ft/ft)								0.0031						0.022				0.0039							
BF slope (ft/ft)								**0.0043**						**0.023**				**0.0043**							
[3]Bankfull Floodplain Area (acres)																									
[4]Proportion over wide (%)																									
Channel Stability or Habitat Metric																									
Biological or Other																									

1. This data was provided by the designer from their As-built survey. The designer broke this project out into different reaches than this mitigation plan.
The dimension data was taken from cross sections surveyed after construction. That cross section data can be seen in Tables 8A-8C.

Exhibit Table 5b. As-Built Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)[1]
UT to South Fork Creek (Stephens) No. 405 Entire Reach (4050 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
Ri% / Ru% / P% / G% / S%																													
SC% / Sa% / G% / C% / B% / Be%																													
d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	silt		4	22.6				silt		4	128																		
Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																													
Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																													
BEHI VL% / L% / M% / H% / VH% / E%																													

1. This data was provided by the designer.

Table 6

Dimensional Morphology Summary Tables 6(A-C)

Exhibit Table 6A. MY-00 Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)[1]

UT to South Fork Creek (Stephens) No. 405 Reach A-Sta. 6+00-18+75 (1275 feet)

	Cross Section 1 (Riffle)							Cross Section 2 (Riffle)							Cross Section 3 (Riffle)							Cross Section 4 (Riffle)													
Based on fixed baseline bankfull elevation[2]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)		11.38							13.50							19.70							17.01													
Floodprone Width (ft)		146.51							170.00							190.00							160.00													
Bankfull Mean Depth (ft)		1.30							0.99							0.86							1.03													
Bankfull Max Depth (ft)		2.26							1.94							2.51							2.19													
Bankfull Cross Sectional Area (ft^2)		14.81							13.34							17.02							17.45													
Bankfull Width/Depth Ratio		8.74							13.68							22.79							16.59													
Bankfull Entrenchment Ratio		12.88							12.59							9.65							9.40													
Bankfull Bank Height Ratio		1.00							1.00							0.94							0.99													
Based on current/developing bankfull feature[2]																																				
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft^2)																																				
Bankfull Width/Depth Ratio																																				
Bankfull Entrenchment Ratio																																				
Bankfull Bank Height Ratio																																				
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				
Based on fixed baseline bankfull elevation[2]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft^2)																																				
Bankfull Width/Depth Ratio																																				
Bankfull Entrenchment Ratio																																				
Bankfull Bank Height Ratio																																				
Based on current/developing bankfull feature[2]																																				
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft^2)																																				
Bankfull Width/Depth Ratio																																				
Bankfull Entrenchment Ratio																																				
Bankfull Bank Height Ratio																																				
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

1. This data was taken from the permanent sections established for this mitgation plan. These sections were surveyed over 1 year after the project was completed but are being treated as MY-00. See Tables 7A-7C for summarized MY-00 morphological data.

Exhibit Table 6B. MY-00 Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)[1]

UT to South Fork Creek (Stephens) No. 405 Reach: B (625 feet)

	Cross Section 5 (Riffle)							Cross Section 6 (Riffle)																							
Based on fixed baseline bankfull elevation[2]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)		18.12							18.34																									
Floodprone Width (ft)		170.00							83.54																									
Bankfull Mean Depth (ft)		1.23							1.54																									
Bankfull Max Depth (ft)		2.22							2.81																									
Bankfull Cross Sectional Area (ft^2)		22.23							28.17																									
Bankfull Width/Depth Ratio		14.78							11.95																									
Bankfull Entrenchment Ratio		9.38							4.55																									
Bankfull Bank Height Ratio		1.00							1.00																									
Based on current/developing bankfull features[3]																																		
Bankfull Width (ft)																																		
Floodprone Width (ft)																																		
Bankfull Mean Depth (ft)																																		
Bankfull Max Depth (ft)																																		
Bankfull Cross Sectional Area (ft^2)																																		
Bankfull Width/Depth Ratio																																		
Bankfull Entrenchment Ratio																																		
Bankfull Bank Height Ratio																																		
Cross Sectional Area between end pins (ft^2)																																		
d50 (mm)																																		
Based on fixed baseline bankfull elevation[2]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)																																		
Floodprone Width (ft)																																		
Bankfull Mean Depth (ft)																																		
Bankfull Max Depth (ft)																																		
Bankfull Cross Sectional Area (ft^2)																																		
Bankfull Width/Depth Ratio																																		
Bankfull Entrenchment Ratio																																		
Bankfull Bank Height Ratio																																		
Based on current/developing bankfull features[3]																																		
Bankfull Width (ft)																																		
Floodprone Width (ft)																																		
Bankfull Mean Depth (ft)																																		
Bankfull Max Depth (ft)																																		
Bankfull Cross Sectional Area (ft^2)																																		
Bankfull Width/Depth Ratio																																		
Bankfull Entrenchment Ratio																																		
Bankfull Bank Height Ratio																																		
Cross Sectional Area between end pins (ft^2)																																		
d50 (mm)																																		

1. This data was taken from the permanent sections established for this mitgation plan. These sections were surveyed over 1 year after the project was completed but are being treated as MY-00. See Table 7 for summarized MY-00 morphological data.

Exhibit Table 6C. MY-00 Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)[1]

UT to South Fork Creek (Stephens) No. 405 Reach C-Sta. 29+00-40+00 (1100 feet)

	Cross Section 7 (Riffle)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)																									
Based on fixed baseline bankfull elevation[2]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)		17.71							17.97							24.18																								
Floodprone Width (ft)		190.00							200.00							135.00																								
Bankfull Mean Depth (ft)		1.63							1.57							1.14																								
Bankfull Max Depth (ft)		2.71							2.77							2.54																								
Bankfull Cross Sectional Area (ft^2)		28.79							28.21							27.58																								
Bankfull Width/Depth Ratio		10.90							11.44							21.20																								
Bankfull Entrenchment Ratio		10.73							11.13							5.58																								
Bankfull Bank Height Ratio		1.00							0.98							1.00																								
Based on current/developing bankfull features[2]																																								
Bankfull Width (ft)																																								
Floodprone Width (ft)																																								
Bankfull Mean Depth (ft)																																								
Bankfull Max Depth (ft)																																								
Bankfull Cross Sectional Area (ft^2)																																								
Bankfull Width/Depth Ratio																																								
Bankfull Entrenchment Ratio																																								
Bankfull Bank Height Ratio																																								
Cross Sectional Area between end pins (ft^2)																																								
d50 (mm)																																								

	Cross Section 7 (Riffle)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)																													
Based on fixed baseline bankfull elevation[2]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)																																								
Floodprone Width (ft)																																								
Bankfull Mean Depth (ft)																																								
Bankfull Max Depth (ft)																																								
Bankfull Cross Sectional Area (ft^2)																																								
Bankfull Width/Depth Ratio																																								
Bankfull Entrenchment Ratio																																								
Bankfull Bank Height Ratio																																								
Based on current/developing bankfull features[2]																																								
Bankfull Width (ft)																																								
Floodprone Width (ft)																																								
Bankfull Mean Depth (ft)																																								
Bankfull Max Depth (ft)																																								
Bankfull Cross Sectional Area (ft^2)																																								
Bankfull Width/Depth Ratio																																								
Bankfull Entrenchment Ratio																																								
Bankfull Bank Height Ratio																																								
Cross Sectional Area between end pins (ft^2)																																								
d50 (mm)																																								

1. This data was taken from the permanent sections established for this mitgation plan. These sections were surveyed over 1 year after the project was completed but are being treated as MY-00. See Table 7 for summarized MY-00 morphological data.

Table 7

Dimensional Morphology Summary Tables 7(A-C)

Exhibit Table 7A. MY-00 Morphology Summary1
UT to South Fork Creek (Stephens) No. 405 Reach A-Sta. 6+00-18+75 (1275 feet)

Parameter	Cross Section 1 Station 8+39-Riffle						Cross Section 2 Station 11+51-Riffle						Cross Section 3 Station 14+05-Riffle						Cross Section 4 Station 17+04-Riffle					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)		11.4						13.5						19.7						17				
Floodprone Width (ft)		147						170						190						160				
Bankfull Mean Depth (ft)		1.3						0.99						0.86						1.03				
Bankfull Max Depth (ft)		2.26						1.94						2.51						2.19				
Bankfull Cross Sectional Area (ft2)		14.8						13.3						17						17.5				
Bankfull Width/Depth Ratio		8.74						13.7						22.8						16.6				
Bankfull Entrenchment Ratio		12.9						12.6						9.65						9.4				
Bankfull Bank Height Ratio		1						1						0.94						0.99				
Wetted Perimeter (ft)		12.5						14.1						20.7						18.1				
Hydraulic Radius (ft)		1.18						0.94						0.82						0.96				
Substrate																								
d50 (mm)		0.45						6.75						0.22						36.3				
d84 (mm)		6.13						14.2						3.14						88.5				

Parameter	MY-00 (2009)			MY-01 (2010)			MY-02 (2011)			MY-03 (2012)			MY-04 (2013)			MY-05 (2014)			MY5 (2015)			MY+ (2016)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)				33	67	47																		
Radius of Curvature (ft)				29	64.7	40.1																		
Meander Wavelength (ft)				90	140	109																		
Meander Width Ratio				1.65	3.35	2.35																		
Profile																								
Riffle length (ft)				11.6	95.9	34.4																		
Riffle slope (ft/ft)				0.01	0.02	0.00																		
Pool length (ft)				12.1	66.9	36.8																		
Pool spacing (ft)				24.0	154	70.8																		
Additional Reach parameters																								
Valley Length (ft)				1070																				
Channel Length (ft)				1275																				
Sinuosity				1.19																				
Water Surface Slope (ft/ft)				0.0044																				
BF Slope (ft/ft)				0.0041																				
Rosgen Classification																								
Habitat Index*																								
Macrobenthos*																								

1. This table was added as a supplement to summarize the MY-00 morphological data that was collected for this mitigation plan.

Exhibit Table 7A. MY-00 Morphology Summary1
UT to South Fork Creek (Stephens) No. 405 Reach A-Sta. 6+00-18+75 (1275 feet)

Parameter	Cross Section 5 Station 19+73-Riffle						Cross Section 6 Station 22+78-Riffle																	
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5												
Bankfull Width (ft)		18.1						18.3																
Floodprone Width (ft)		170						83.5																
Bankfull Mean Depth (ft)		1.23						1.54																
Bankfull Max Depth (ft)		2.22						2.81																
Bankfull Cross Sectional Area (ft2)		22.2						28.2																
Bankfull Width/Depth Ratio		14.8						11.9																
Bankfull Entrenchment Ratio		9.38						4.55																
Bankfull Bank Height Ratio		1						1																
Wetted Perimeter (ft)		18.8						19.5																
Hydraulic Radius (ft)		1.18						1.44																
Substrate																								
d50 (mm)		2						21.3																
d84 (mm)		8.02						102																

Parameter	MY-00 (2009)			MY-01 (2010)			MY-02 (2011)			MY-03 (2012)			MY-04 (2013)			MY-05 (2014)			MY5 (2015)			MY+ (2016)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)				33.2	70.2	54																		
Radius of Curvature (ft)				34.6	40.5	37.1																		
Meander Wavelength (ft)				120	150	136																		
Meander Width Ratio				1.82	3.86	2.96																		
Profile																								
Riffle length (ft)				12.2	32.1	19.3																		
Riffle slope (ft/ft)				0.01	0.04	0.02																		
Pool length (ft)				10.7	53.8	27.4																		
Pool spacing (ft)				54.0	118	77.3																		
Additional Reach parameters																								
Valley Length (ft)				580																				
Channel Length (ft)				625																				
Sinuosity				1.08																				
Water Surface Slope (ft/ft)				0.0057																				
BF Slope (ft/ft)				0.0049																				
Rosgen Classification																								
Habitat Index*																								
Macrobenthos*																								

1. This table was added as a supplement to summarize the MY-00 morphological data that was collected for this mitigation plan.

Exhibit Table 7A. MY-00 Morphology Summary1
UT to South Fork Creek (Stephens) No. 405 Reach A-Sta. 6+00-18+75 (1275 feet)

Parameter	Cross Section 7 Station 27+22-Riffle						Cross Section 8 Station 30+12-Riffle						Cross Section 9 Station 37+55-Riffle											
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5						
Bankfull Width (ft)		17.7						18						24.2										
Floodprone Width (ft)		190						200						135										
Bankfull Mean Depth (ft)		1.63						1.57						1.14										
Bankfull Max Depth (ft)		2.71						2.77						2.54										
Bankfull Cross Sectional Area (ft2)		28.8						28.2						27.6										
Bankfull Width/Depth Ratio		10.9						11.4						21.2										
Bankfull Entrenchment Ratio		10.7						11.1						5.58										
Bankfull Bank Height Ratio		1						0.98						1										
Wetted Perimeter (ft)		18.9						19.2						25.4										
Hydraulic Radius (ft)		1.52						1.47						1.09										
Substrate																								
d50 (mm)		0.93						1.27						17.1										
d84 (mm)		14.9						6.52						77.8										

Parameter	MY-00 (2009)			MY-01 (2010)			MY-02 (2011)			MY-03 (2012)			MY-04 (2013)			MY-05 (2014)			MY5 (2015)			MY+ (2016)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)				46	115	68.2																		
Radius of Curvature (ft)				35.8	58.1	47.4																		
Meander Wavelength (ft)				105	170	148																		
Meander Width Ratio				2.3	5.76	3.41																		
Profile																								
Riffle length (ft)				8.8	51.8	25.7																		
Riffle slope (ft/ft)				0.00	0.05	0.01																		
Pool length (ft)				27.0	92.0	49.8																		
Pool spacing (ft)				20.0	148	78.0																		
Additional Reach parameters																								
Valley Length (ft)				745																				
Channel Length (ft)				1100																				
Sinuosity				1.48																				
Water Surface Slope (ft/ft)				0.0023																				
BF Slope (ft/ft)				0.0025																				
Rosgen Classification																								
Habitat Index*																								
Macrobenthos*																								

1. This table was added as a supplement to summarize the MY-00 morphological data that was collected for this mitigation plan.

Table 8

As Built Morphology Summary Tables 8(A-C)

Exhibit Table 8A. As-Built Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)[1]

UT to South Fork Creek (Stephens) No. 405 - Reach: Upstream of Tributary, Priority 2: Station 0+00-7+75

	Cross Section 1:0+90.34 (Riffle)							Cross Section 2:1+15.84 (Pool)							Cross Section 3:5+22.23 (Pool)							Cross Section 4:5+55.23 (Pool)													
Based on fixed baseline bankfull elevation[2]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	15.12							14.6							29.84							14.67													
Floodprone Width (ft)	49.52							113.10							92.96							59.70													
Bankfull Mean Depth (ft)	2.01							3.19							2.86							2.53													
Bankfull Max Depth (ft)	2.04							3.32							2.95							2.64													
Bankfull Cross Sectional Area (ft^2)	21.85							28.87							45.01							25.91													
Bankfull Width/Depth Ratio	7.41							4.40							10.12							5.56													
Bankfull Entrenchment Ratio	3.28							7.75							3.12							4.07													
Bankfull Bank Height Ratio	1.03							1.08							1.07							1.09													
Based on current/developing bankfull feature[2]																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			
Based on fixed baseline bankfull elevation[2]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Based on current/developing bankfull feature[2]																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

1: This dimension data was provided by the designer and is based on the as-built survey. Approximate location of these cross sections is show in the plan view.

Exhibit Table 8B. As-Built Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)[1]

UT to South Fork Creek (Stephens) No. 405 - Reach: Upstream of Tributary, Priority 1: Station 7+75-18+80

	Cross Section 5:8+93.99 (Riffle)							Cross Section 6:9+23.87 (Riffle)							Cross Section 7:14+91.83 (Riffle)							Cross Section 8:5+55.23 (Riffle)													
Based on fixed baseline bankfull elevation[2]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	13.38							18.15							29.84							14.67													
Floodprone Width (ft)	110.90							120.50							92.96							59.70													
Bankfull Mean Depth (ft)	2.77							2.7							2.86							2.53													
Bankfull Max Depth (ft)	2.81							2.73							2.95							2.64													
Bankfull Cross Sectional Area (ft^2)	24.49							29.31							45.01							25.91													
Bankfull Width/Depth Ratio	4.76							6.65							10.12							5.56													
Bankfull Entrenchment Ratio	8.29							6.64							3.12							4.07													
Bankfull Bank Height Ratio	1.03							1.02							1.07							1.09													
Based on current/developing bankfull feature[2]																																				
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft^2)																																				
Bankfull Width/Depth Ratio																																				
Bankfull Entrenchment Ratio																																				
Bankfull Bank Height Ratio																																				
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				
Based on fixed baseline bankfull elevation[2]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft^2)																																				
Bankfull Width/Depth Ratio																																				
Bankfull Entrenchment Ratio																																				
Bankfull Bank Height Ratio																																				
Based on current/developing bankfull feature[2]																																				
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft^2)																																				
Bankfull Width/Depth Ratio																																				
Bankfull Entrenchment Ratio																																				
Bankfull Bank Height Ratio																																				
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

1: This dimension data was provided by the designer and is based on the as-built survey. Approximate location of these cross sections is show in the plan view.

Exhibit Table 8C. As-Built Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)[1]

UT to South Fork Creek (Stephens) No. 405 - Reach: Downstream of Tributary, Priority 2: Station 18+80-40+50

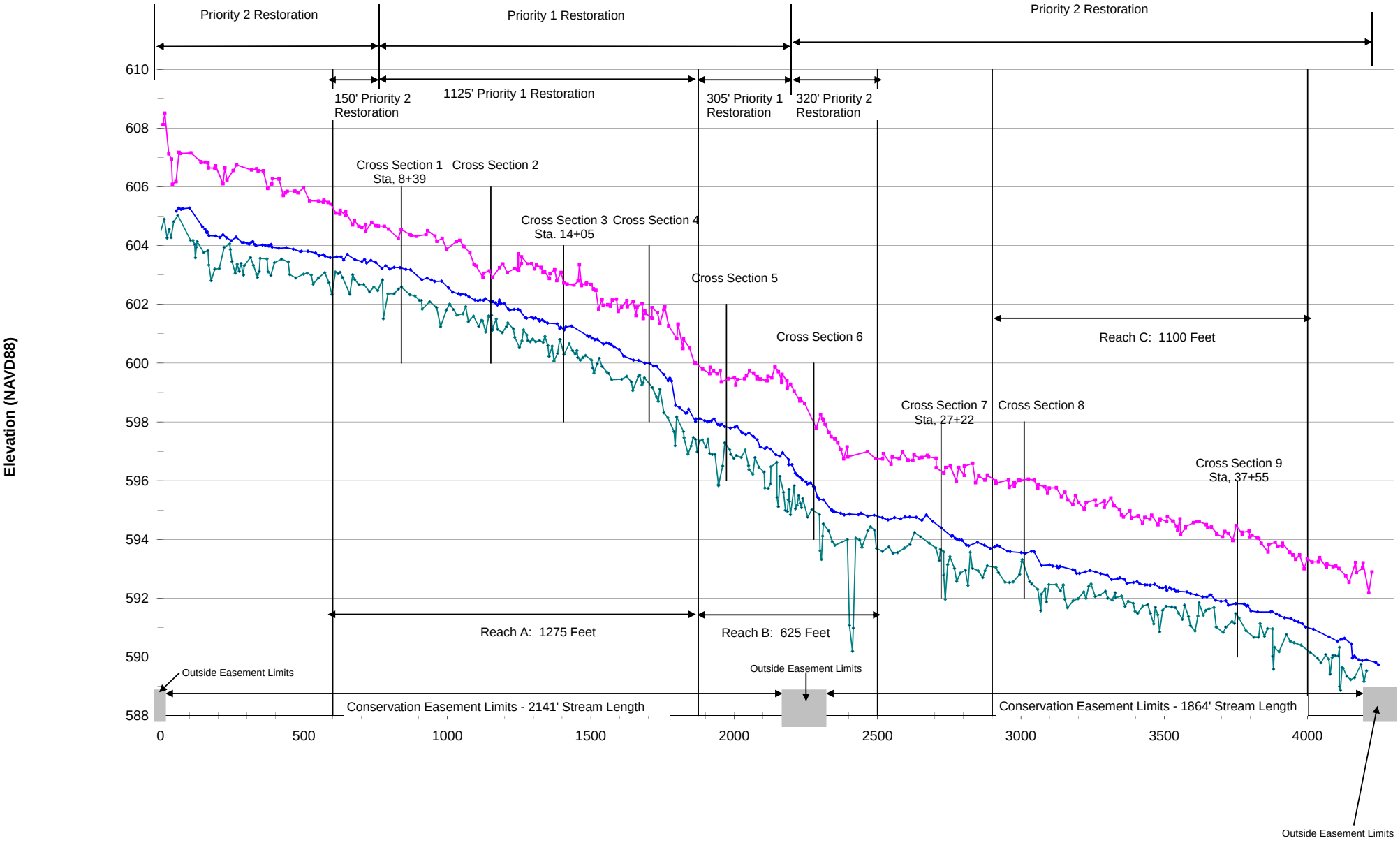
	Cross Section 9:21+91.67 (Pool)							Cross Section 10:22+11.45 (Riffle)							Cross Section 11:24+19.91 (Riffle)							Cross Section 12:24+75.89 (Transition)							Cross Section 13:27+57.34 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	20.19							19.52							17.02							19.86							17.35						
Floodprone Width (ft)	80.00							85.00							100.90							109.50							130.9						
Bankfull Mean Depth (ft)	3.16							2.84							2.92							3.77							3.18						
Bankfull Max Depth (ft)	3.17							2.86							3							4							3.18						
Bankfull Cross Sectional Area (ft^2)	34.03							35.3							28.16							49.25							37.44						
Bankfull Width/Depth Ratio	6.37							6.83							5.67							4.97							5.46						
Bankfull Entrenchment Ratio	3.96							4.35							5.93							5.51							7.54						
Bankfull Bank Height Ratio	1.01							1.02							1.06							1.13							1						
Based on current/developing bankfull features[2]																																				
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft^2)																																				
Bankfull Width/Depth Ratio																																				
Bankfull Entrenchment Ratio																																				
Bankfull Bank Height Ratio																																				
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

	Cross Section 15:35+55.59 (Riffle)							Cross Section 16:35+86.49 (Riffle)																													
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	18.19							16.98																												
Floodprone Width (ft)	81.06							134.5																												
Bankfull Mean Depth (ft)	3.7							3.36																												
Bankfull Max Depth (ft)	3.79							3.54																												
Bankfull Cross Sectional Area (ft^2)	46.29							39.13																												
Bankfull Width/Depth Ratio	4.8							4.8																												
Bankfull Entrenchment Ratio	4.46							7.92																												
Bankfull Bank Height Ratio	1.05							1.11																												
Based on current/developing bankfull features[2]																																				
Bankfull Width (ft)																																				
Floodprone Width (ft)																																				
Bankfull Mean Depth (ft)																																				
Bankfull Max Depth (ft)																																				
Bankfull Cross Sectional Area (ft^2)																																				
Bankfull Width/Depth Ratio																																				
Bankfull Entrenchment Ratio																																				
Bankfull Bank Height Ratio																																				
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

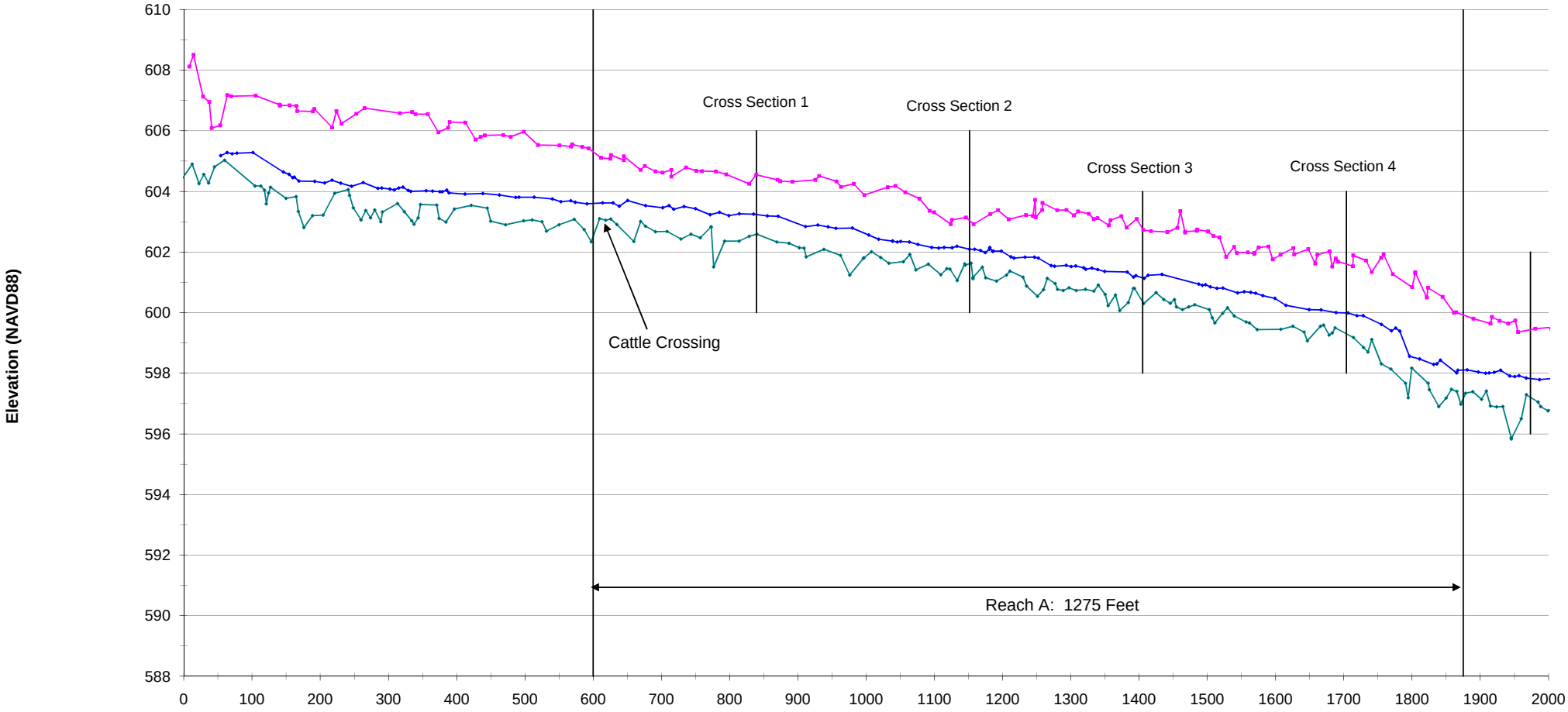
1: This dimension data was provided by the designer and is based on the as-built survey. Approximate location of these cross sections is show in the plan view.

Longitudinal Profiles

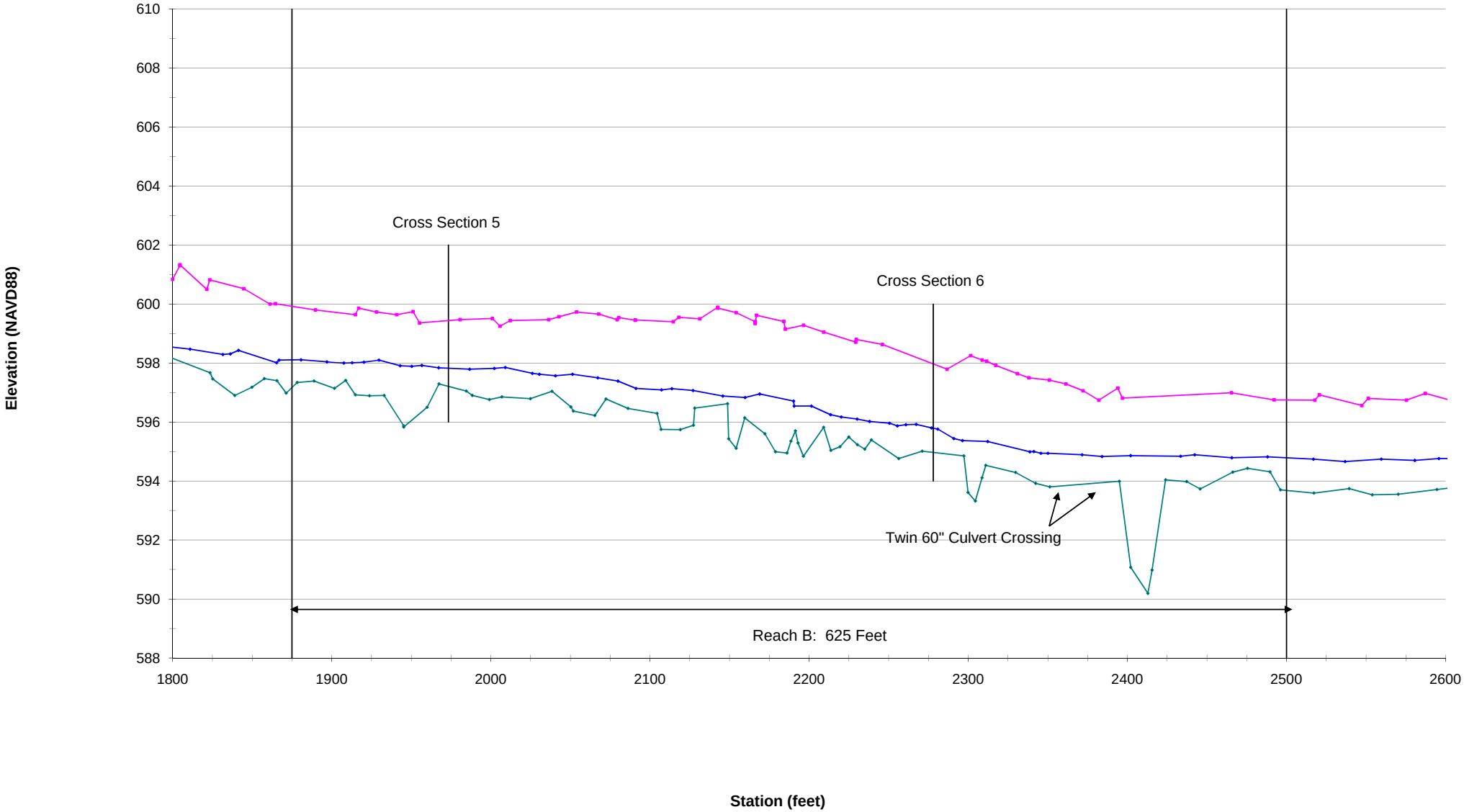
UT to South Fork Creek Longitudinal Profile MY-00



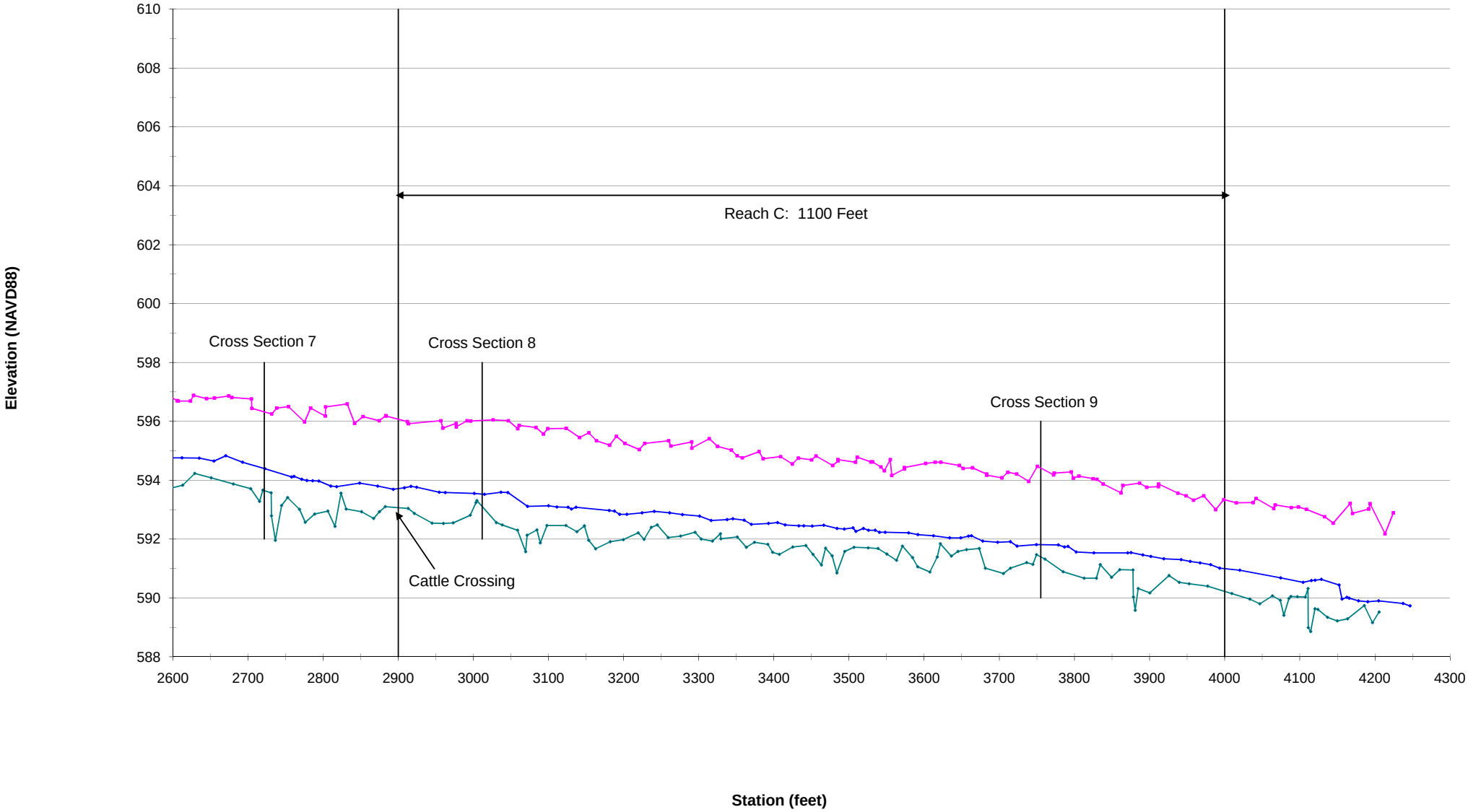
UT toSouth Fork Creek Longitudinal Profile Reach A
Station 6+00-18+75



UT toSouth Fork Creek Longitudinal Profile Reach B
Station 18+75-25+00



UT toSouth Fork Creek Longitudinal Profile Reach C
Station 29+00-40+00



Monitoring Cross Sectional Profiles

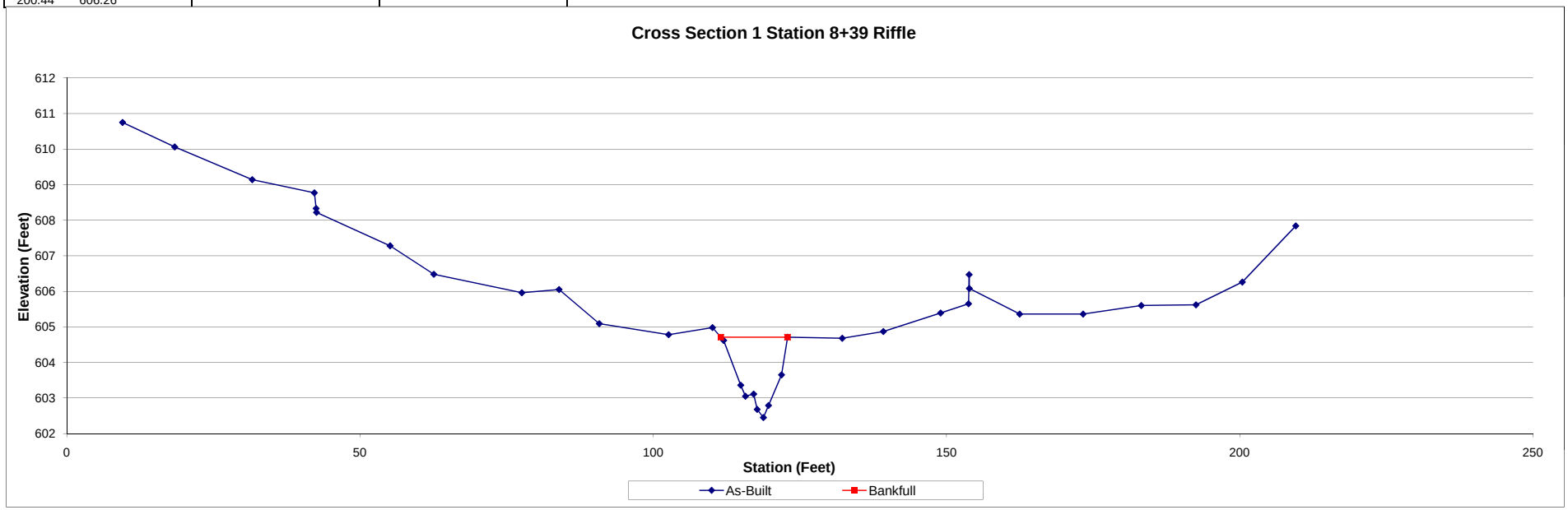
(1-9)

Project:	UT to South Fork Creek (Stephens)
Cross Section 1	
Feature	Riffle
Station:	8+36
Date:	22-Apr-09
Crew:	RL, JW, SV

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	14.8		
W (BKF)	11.4		
Max d	2.3		
Mean d	1.3		
W/D	8.7		

MY0-2009			MY1-2010			MY2-2011		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
9.52	610.75							
18.41	610.06							
31.63	609.14							
42.22	608.77	LP						
42.52	608.33							
42.59	608.22							
55.13	607.28							
62.59	606.48							
77.60	605.96							
83.94	606.05							
90.80	605.09							
102.62	604.78							
110.10	604.98	Bankfull						
112.00	604.62							
114.92	603.36							
115.72	603.05							
117.1	603.11							
117.7	602.68							
118.8	602.45	TW						
119.65	602.79							
121.87	603.65							
122.9	604.71	Bankfull						
132.23	604.68							
139.24	604.87							
149	605.39							
153.76	605.65							
153.86	606.47							
153.89	606.08	RP						
162.47	605.36							
173.29	605.36							
183.21	605.6							
192.54	605.62							
200.44	606.26							

Photo of XS-1, looking in the downstream direction

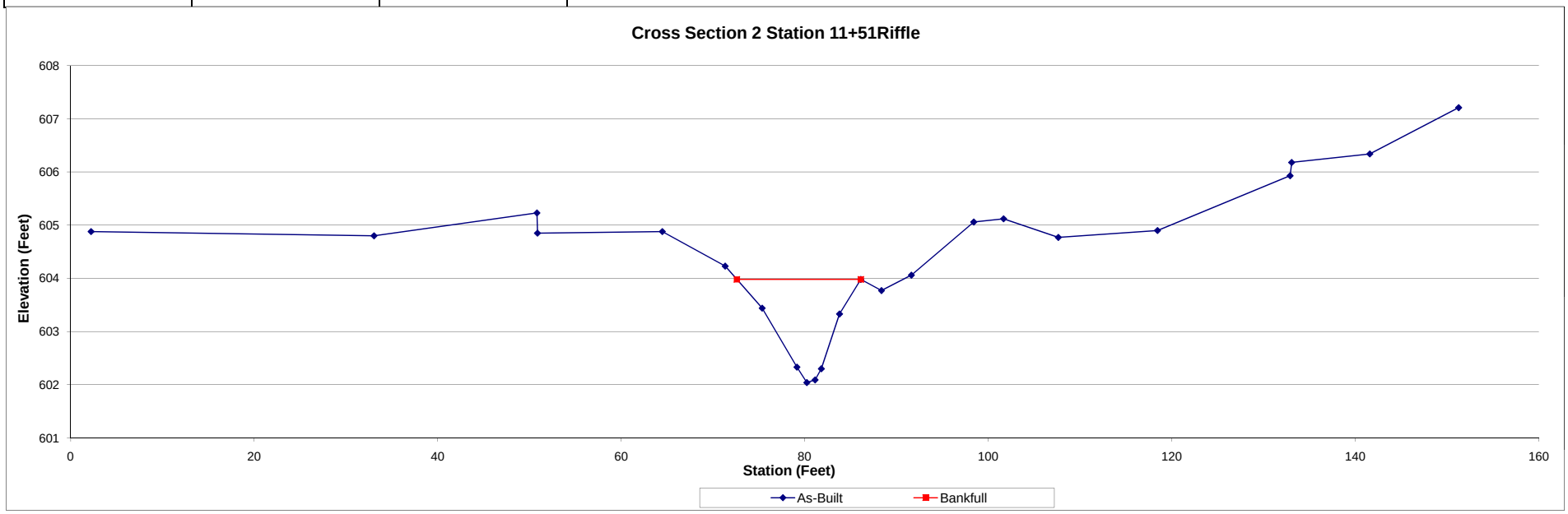


Project:	UT to South Fork Creek
Cross Section 2	
Feature	Riffle
Station:	11+51
Date:	22-Apr-09
Crew:	RL, JW, SV

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	13.3		
W (BKF)	13.5		
Max d	1.9		
Mean d	1.0		
W/D	13.7		

MY0-2009			MY1-2010			MY2-2011		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
2.23	604.88							
33.06	604.80							
50.82	605.23	LP						
50.87	604.85							
64.48	604.88							
71.33	604.23	Bankfull						
75.36	603.44							
79.15	602.33							
80.23	602.04	TW						
81.13	602.09							
81.81	602.30							
83.79	603.33							
86.11	603.98	Bankfull						
88.36	603.77							
91.62	604.06							
98.42	605.06							
101.7	605.12							
107.6	604.77							
118.4	604.9							
132.89	605.93							
133.06	606.18	RP						
141.58	606.34							
151.26	607.21							

Photo of XS-2, looking in the downstream direction

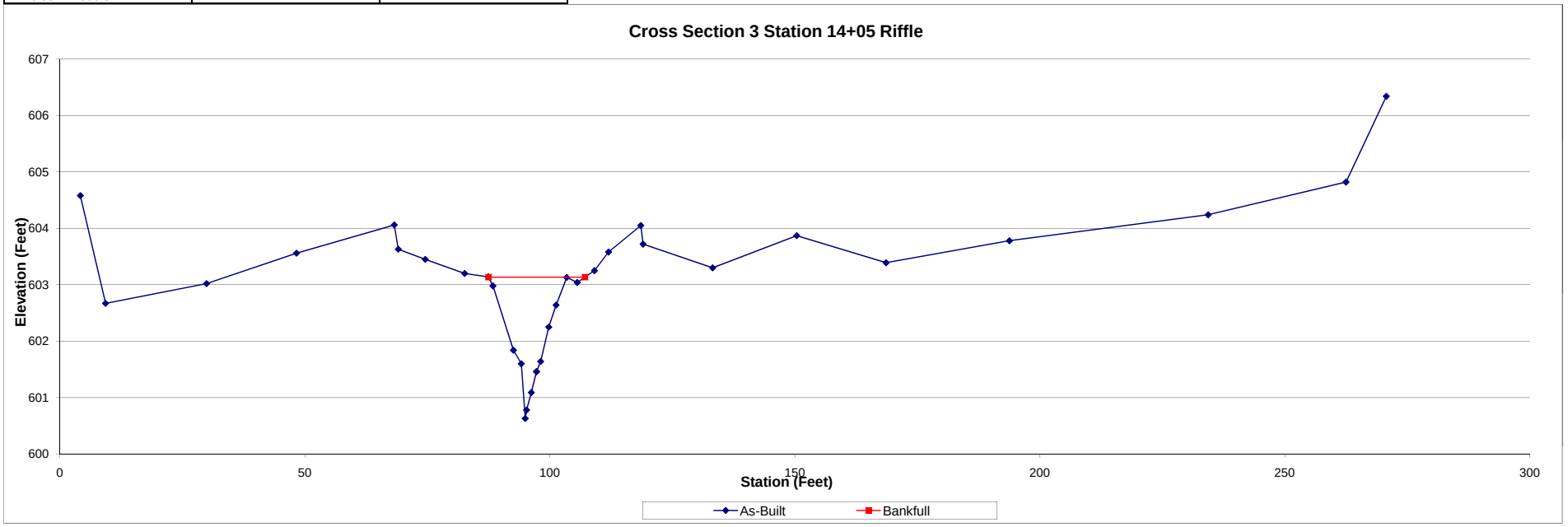


Project:	UT to South Fork Creek
Cross Section	3
Feature	Riffle
Station:	14+05
Date:	22-Apr-09
Crew:	RL, JW, SV

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	17.0		
W (BKF)	19.7		
Max d	2.5		
Mean d	0.9		
W/D	22.8		

MY0-2009			MY1-2010			MY2-2011		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
4.16	604.58							
9.3	602.67							
29.92	603.02							
48.27	603.56							
68.23	604.06	LP						
69.05	603.63							
74.55	603.45							
82.6	603.20							
87.43	603.14	Bankfull						
88.36	602.98							
92.55	601.84							
94.15	601.60							
94.95	600.63							
95.22	600.78	TW						
96.2	601.09							
97.26	601.46							
97.25	601.46							
98.1	601.64							
99.76	602.25							
101.26	602.64							
103.42	603.13	Bankfull						
105.57	603.04							
109.08	603.25							
111.96	603.58							
118.54	604.05	RP						
119	603.72							
133.21	603.3							
150.35	603.87							
168.6	603.39							
193.77	603.78							
234.33	604.24							
262.46	604.82							
270.69	606.34							

Photo of XS-3, looking in the downstream direction

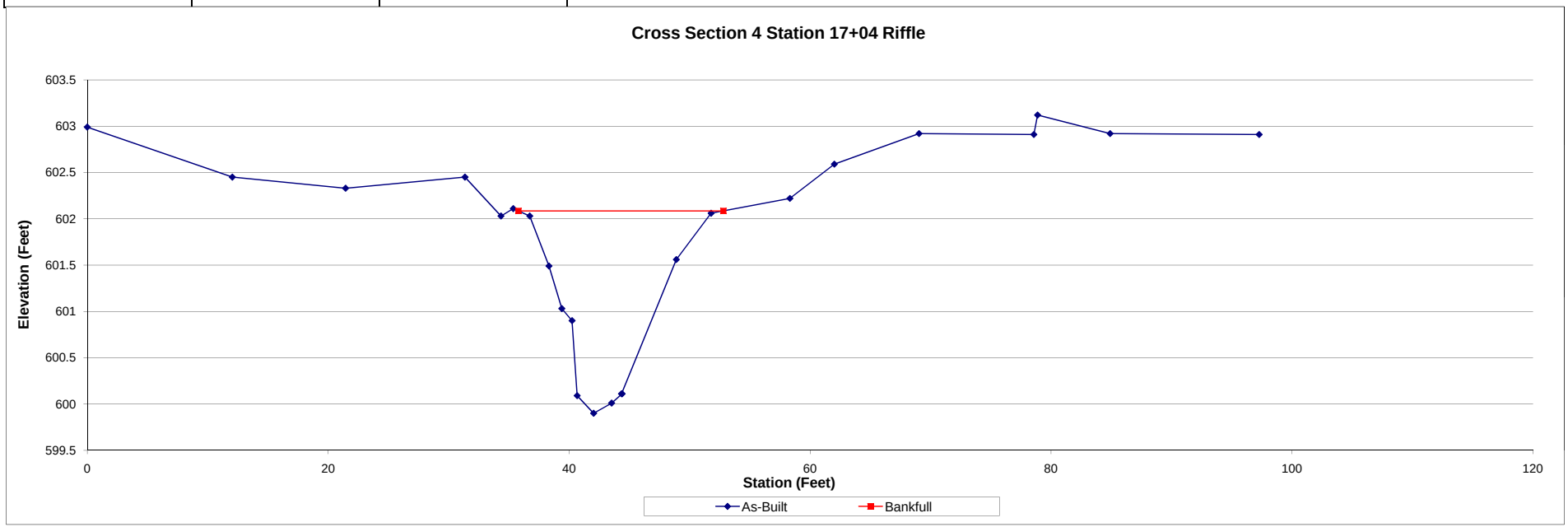


Project:	UT to South Fork Creek
Cross Section 4	
Feature	Riffle
Station:	17+04
Date:	22-Apr-09
Crew:	RL, JW, SV

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	17.5		
W (BKF)	17.0		
Max d	2.2		
Mean d	1.0		
W/D	16.6		

MY0-2009			MY1-2010			MY2-2011		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0	602.99							
12.04	602.45							
21.44	602.33							
31.35	602.45							
34.34	602.03							
35.36	602.11	Bankfull						
36.73	602.03							
38.32	601.49							
39.39	601.03							
40.24	600.9							
40.66	600.09							
42.03	599.9	TW						
43.52	600.01							
44.4	600.11							
44.34	600.11							
48.89	601.56							
51.78	602.06	Bankfull						
58.32	602.22							
62.01	602.59							
69.04	602.92							
78.57	602.91							
78.88	603.12	RP						
84.9	602.92							
97.27	602.91							

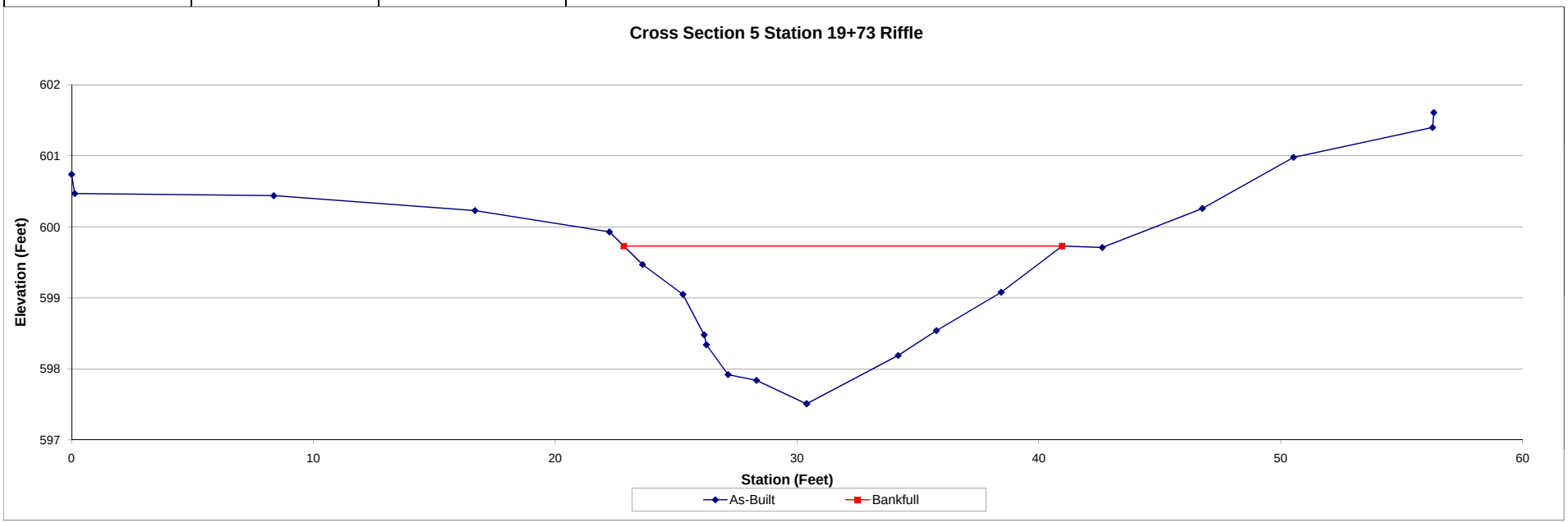
Photo of XS-4, looking in the downstream direction



Project:	UT to South Fork Creek				Summary (bankfull)				
Cross Section 5						MY0	MY1	MY2	
Feature	Riffle				A (BKF)	22.2			
Station:	19+73				W (BKF)	18.1			
Date:	22-Apr-09				Max d	2.2			
Crew:	RL, JW, SV				Mean d	1.2			
					W/D	14.8			

MY0-2009			MY1-2010			MY2-2011		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0	600.74	CS 10 RP						
0.13	600.47	CS 10						
8.36	600.44	CS 10						
16.68	600.23	CS 10						
22.24	599.93	CS 10 Bankfull Left TOBL						
23.61	599.47	CS 10						
25.28	599.05	CS 10						
26.16	598.48	CS 10						
26.25	598.34	CS 10						
27.15	597.92	CS 10 TOE L						
28.32	597.84	CS 10						
30.39	597.51	CS 10 TW						
30.4	597.51	CS 10						
34.18	598.19	CS 10 Toe R						
35.76	598.54	CS 10						
38.44	599.08	CS 10						
40.96	599.73	CS 10 Bankfull Right TOBR						
42.62	599.71	CS 10						
46.76	600.26	CS 10						
50.53	600.98	CS 10						
56.28	601.4	CS 10						
56.33	601.61	CS 10 RP						

Photo of XS-5, looking in the downstream direction

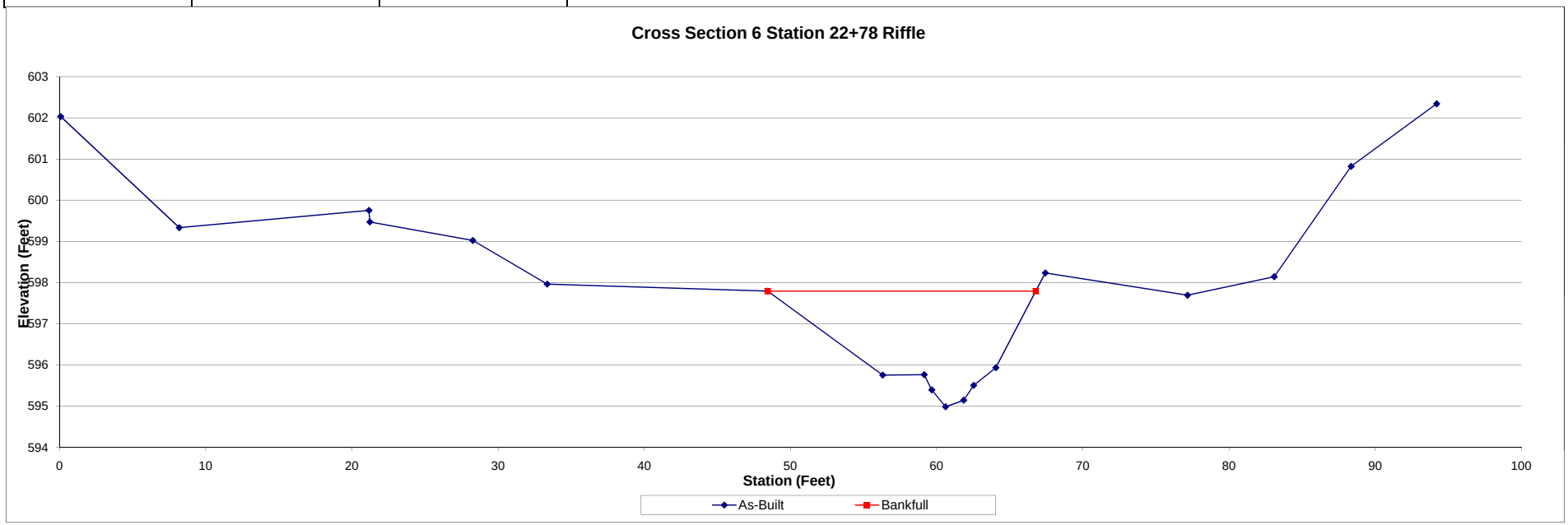


Project:	UT to South Fork Creek
Cross Section 6	
Feature	Riffle
Station:	22+78
Date:	22-Apr-09
Crew:	RL, JW, SV

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	28.2		
W (BKF)	18.3		
Max d	2.8		
Mean d	1.5		
W/D	11.9		

MY0-2009			MY1-2010			MY2-2011		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.08	602.03							
8.19	599.33							
21.17	599.75	LP						
21.23	599.47							
28.27	599.02							
33.36	597.96							
48.44	597.79	Bankfull						
56.31	595.75							
59.15	595.76							
59.67	595.39							
60.61	594.98	TW						
61.85	595.14							
62.53	595.5							
64.05	595.93							
67.43	598.23	Bankfull						
77.16	597.69							
83.09	598.14							
88.35	600.82	RP						
94.2	602.34							

Photo of XS-6, looking in the downstream direction

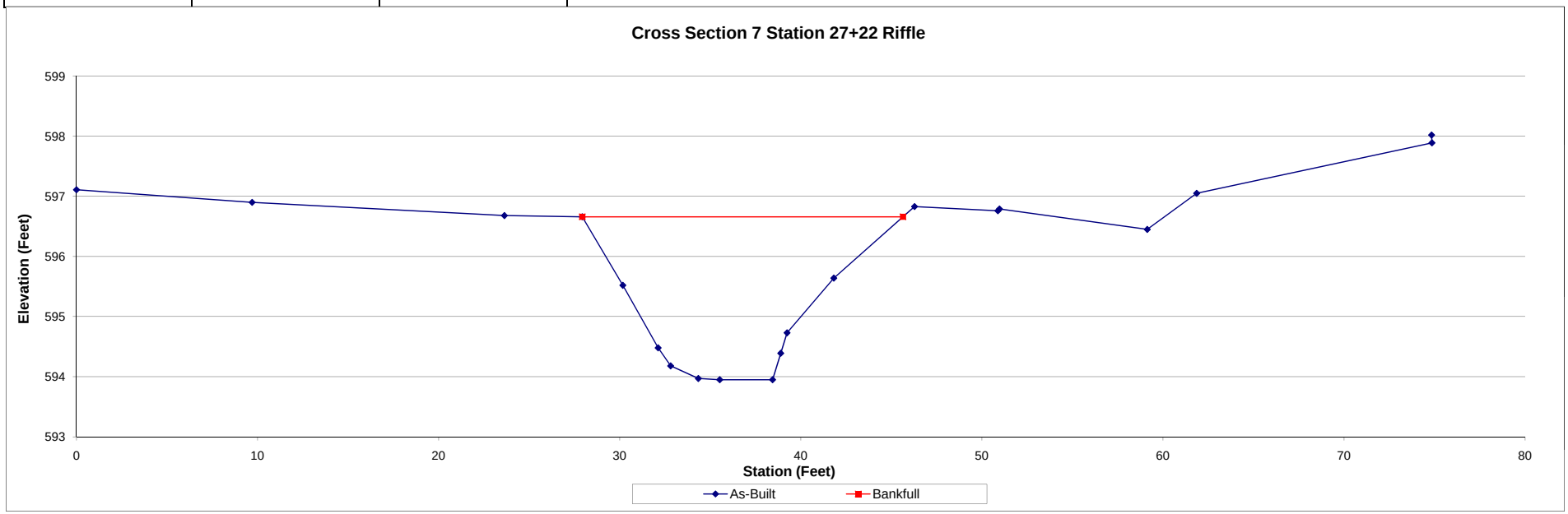


Project: UT to South Fork Creek
Cross Section 7
Feature Riffle
Station: 27+22
Date: 22-Apr-09
Crew: RL, JW, SV

Summary (bankfull)	MY0	MY1	MY2
A (BKF)	28.8		
W (BKF)	17.7		
Max d	2.7		
Mean d	1.6		
W/D	10.9		

MY0-2006*			MY1-2007			MY2-2008		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0	597.11	LP						
9.7	596.9							
23.63	596.68							
27.93	596.66	Bankfull						
30.17	595.52							
32.12	594.48							
32.81	594.18							
34.34	593.97							
35.52	593.95	TW						
38.44	593.95							
38.89	594.39							
39.24	594.73							
41.82	595.64							
46.28	596.83	Bankfull						
50.88	596.76							
50.97	596.79							
59.13	596.45							
61.86	597.05							
74.85	597.89	RP						
74.83	598.02							

Photo of XS-7, looking in the downstream direction

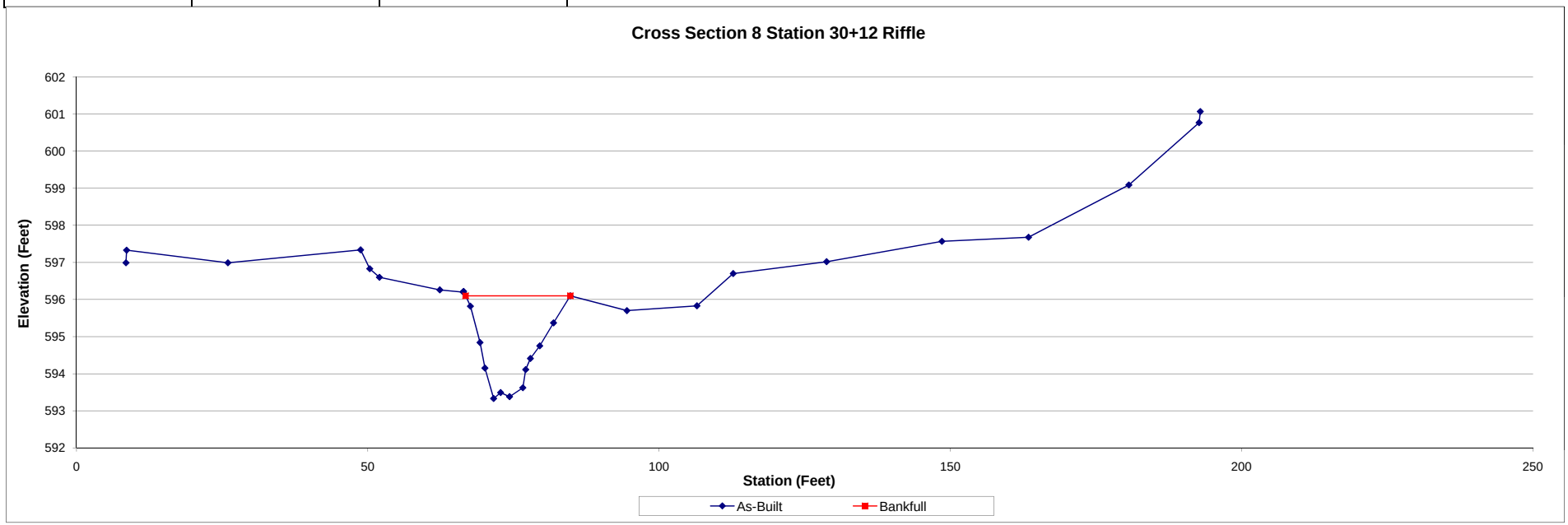


Project: UT to South Fork Creek
Cross Section 8
Feature Riffle
Station: 30+12
Date: 22-Apr-09
Crew: RL, JW, SV

Summary (bankfull)	MY0	MY1	MY2
A (BKF)	28.2		
W (BKF)	18.0		
Max d	2.8		
Mean d	1.6		
W/D	11.4		

MY0-2006*			MY1-2007			MY2-2008		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
8.49	596.99							
8.59	597.33	LP						
25.99	596.99							
48.76	597.34							
50.33	596.83							
51.99	596.6							
62.36	596.26							
66.38	596.2	Bankfull						
66.44	596.22							
67.61	595.82							
69.26	594.84							
70.1	594.15							
71.59	593.33							
72.8	593.49							
74.33	593.38	TW						
76.61	593.62							
77.1	594.11							
77.91	594.41							
79.51	594.75							
81.88	595.37							
84.76	596.1	Bankfull						
94.48	595.7							
106.5	595.83							
112.72	596.7							
128.76	597.02							
148.55	597.57							
163.42	597.68							
180.64	599.09							
192.69	600.77							
192.9	601.07	RP						

Photo of XS-8, looking in the downstream direction

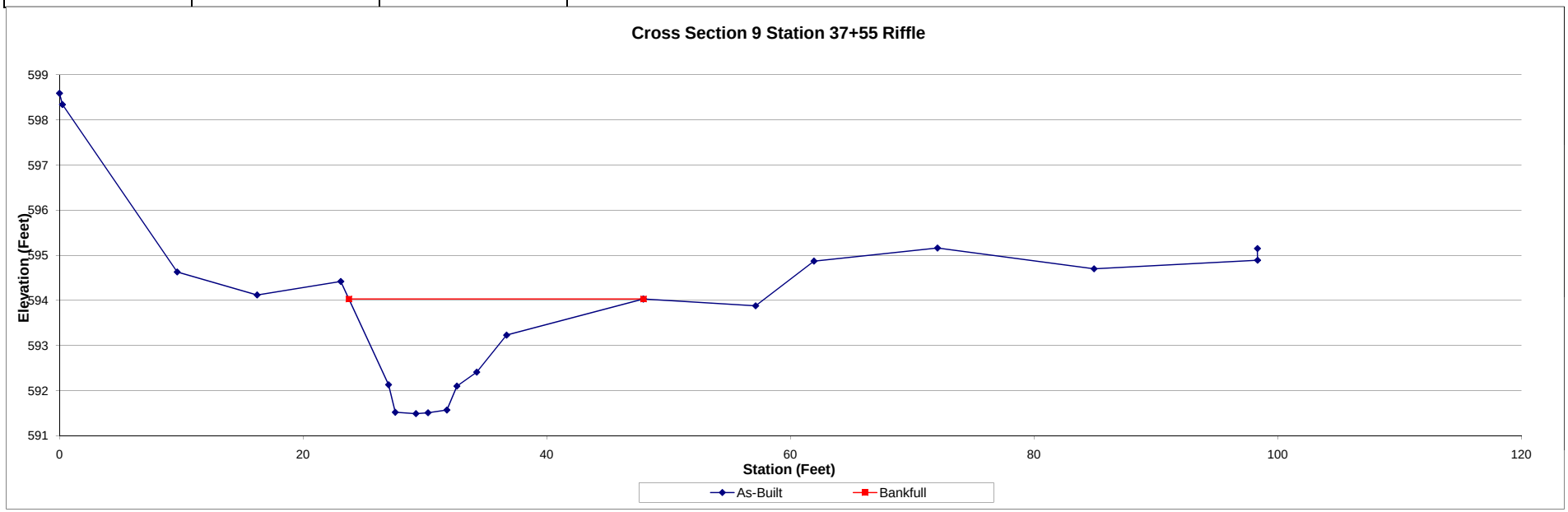


Project: UT to South Fork Creek
Cross Section 9
Feature Riffle
Station: 37+55
Date: 22-Apr-09
Crew: RL, JW, SV

Summary (bankfull)	MY0	MY1	MY2
A (BKF)	27.6		
W (BKF)	24.2		
Max d	2.5		
Mean d	1.1		
W/D	21.2		

MY0-2006*			MY1-2007			MY2-2008		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0	598.59	LP						
0.24	598.34							
9.66	594.63							
16.22	594.12							
23.09	594.42	Bankfull						
27.01	592.13							
27.56	591.52							
29.26	591.49	TW						
30.25	591.51							
31.8	591.57							
32.62	592.1							
34.25	592.41							
36.7	593.23							
47.94	594.03	Bankfull						
47.9	594.03							
57.14	593.88							
61.93	594.87							
72.07	595.16							
84.92	594.7							
98.34	594.89							
98.33	595.15	RP						

Photo of XS-9, looking in the downstream direction

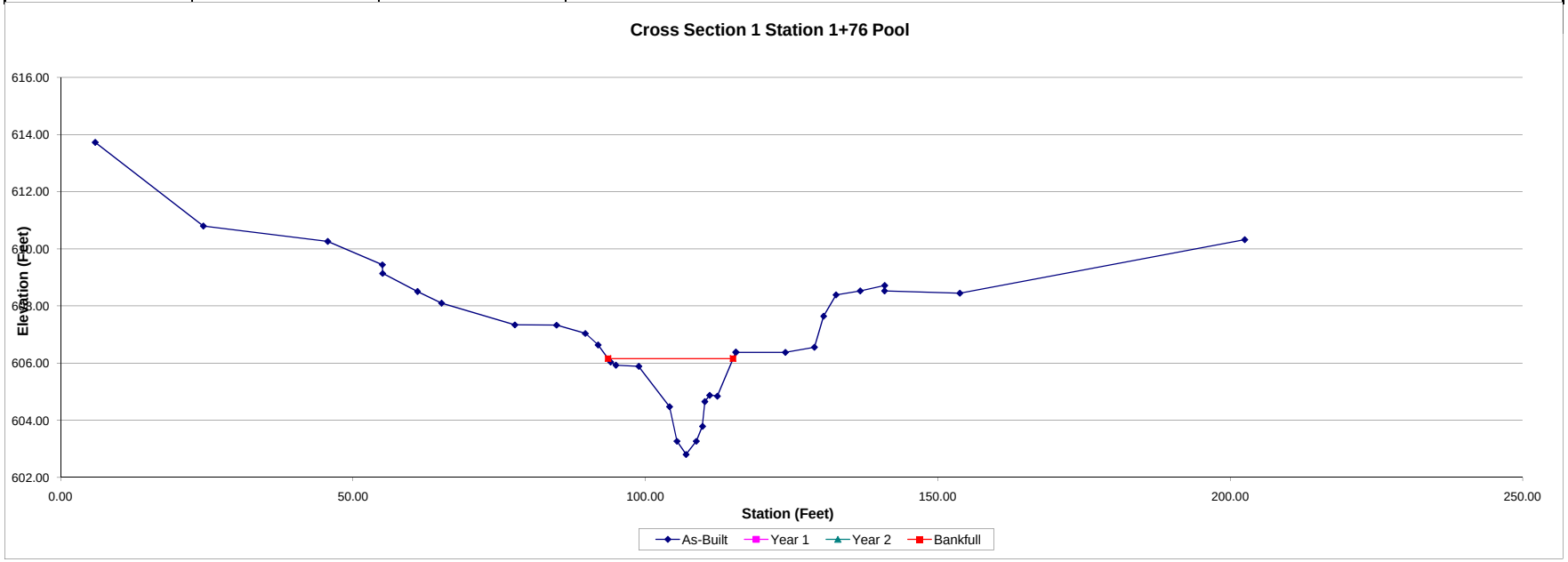


Original Cross Sectional Profiles (1-17)

Project:	UT to South Fork Creek MY-00			Summary (bankfull)				
Cross Section:	1				MY0	MY1	MY2	
Feature				A (BKF)	27.7			
Station:	1+76			W (BKF)	21.4			
Date:	22-Apr-09			Max d	3.4			
Crew:	BW, SV, RL, JW, BW			Mean d	1.3			
				W/D	16.5			

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
5.91	613.72	CS 1						
24.39	610.80	CS 1						
45.67	610.26	CS 1						
54.99	609.44	CS 1 LP						
55.04	609.14	CS 1						
61.01	608.51	CS 1						
65.13	608.10	CS 1						
77.65	607.34	CS 1						
84.79	607.33	CS 1						
89.70	607.04	CS 1						
91.89	606.64	CS 1						
94.04	606.04	CS 1						
94.93	605.93	Bankfull Left TOBL						
98.83	605.89	CS 1						
104.10	604.48	CS 1						
105.36	603.27	CS 1 TOE L						
106.9	602.81	CS 1 TW						
108.7	603.27	CS 1 TOE R						
109.7	603.79	CS 1						
110.15	604.66	CS 1						
110.97	604.88	CS 1						
112.28	604.85	CS 1						
115.45	606.39	Bankfull Right TOBR						
115.46	606.38	CS 1						
123.9	606.38	CS 1						
128.89	606.56	CS 1						
130.45	607.64	CS 1						
132.59	608.39	CS 1						
136.71	608.53	CS 1						
140.88	608.72	CS 1 RP						
140.87	608.53	CS 1						
153.76	608.45	CS 1						
202.44	610.32	CS 1						

Photo of XS-1, looking in the downstream direction

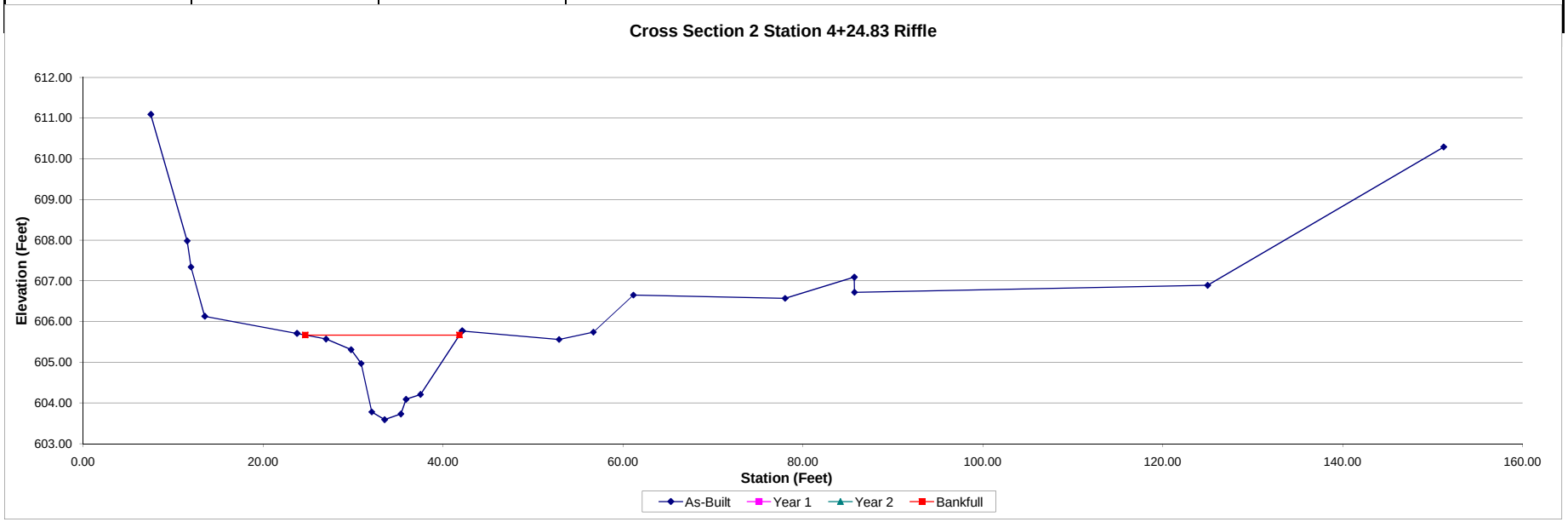


Project: UT to South Fork Creek MY-00
Cross Section: 2
Feature
Station: 4+25
Date: 22-Apr-09
Crew: BW, SV, RL, JW, BW

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	16.1		
W (BKF)	17.1		
Max d	2.1		
Mean d	0.9		
W/D	18.2		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
7.52	611.09	CS 2						
11.55	607.98	CS 2 LP						
11.98	607.34	CS 2						
13.51	606.13	CS 2						
23.76	605.71	CS 2						
26.98	605.57	CS 2 Bankfull Left TOBL						
29.77	605.31	CS 2						
30.89	604.97	CS 3						
32.07	603.78	CS 2 TOE L						
33.50	603.59	CS TW						
35.31	603.73	CS 2 TOE R						
35.88	604.09	CS 2						
37.48	604.21	CS 2						
42.12	605.77	CS 2 Bankfull Right TOBR						
42.12	605.77	CS 2						
52.89	605.56	CS 2						
56.7	605.74	CS 2						
61.1	606.65	CS 2						
78.0	606.57	CS 2						
85.7	607.09	CS 2 RP						
85.71	606.72	CS 2						
124.97	606.89	CS 2						
151.2	610.29	CS 2						

Photo of XS-2, looking in the downstream direction

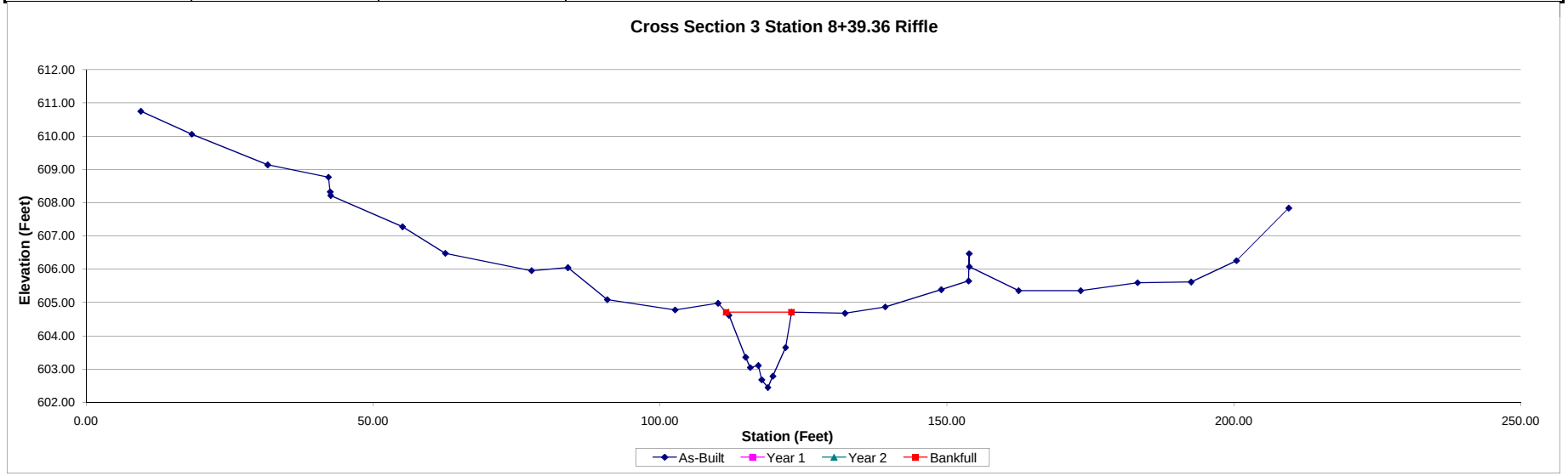


Project: UT to South Fork Creek MY-00
Cross Section: 3-Now cross section 1
Feature
Station: 8+39
Date: 22-Apr-09
Crew: BW, SV, RL, JW, BW

Summary (bankfull)	MY0	MY1	MY2
A (BKF)	14.8		
W (BKF)	11.4		
Max d	2.3		
Mean d	1.3		
W/D	8.7		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
9.52	610.75	CS 2						
18.41	610.06	CS 2						
31.63	609.14	CS 2						
42.22	608.77	CS 2 LP						
42.52	608.33	CS 2						
42.59	608.22	CS 2						
55.13	607.28	CS 2						
62.59	606.48	CS 2						
77.60	605.96	CS 2						
83.94	606.05	CS 2						
90.80	605.09	CS 2						
102.62	604.78	CS 2						
110.10	604.98	CS 2 Bankfull Left TOBL						
112.00	604.62	CS 2						
114.92	603.36	CS 2						
115.72	603.05	CS 2						
117.1	603.11	CS 2						
117.7	602.68	CS 2 TOE L						
118.8	602.45	CS 2 TW						
119.65	602.79	CS 2 TOE R						
121.87	603.65	CS 2						
122.9	604.71	CS 2 Bankfull Right TOBR						
132.23	604.68	CS2						
139.24	604.87	CS 2						
149	605.39	CS 2						
153.76	605.65	CS 2						
153.86	606.47	CS 2						
153.89	606.08	CS 2 RP						
162.47	605.36	CS 2						
173.29	605.36	CS 2						
183.21	605.6	CS 2						
192.54	605.62	CS 2						
200.44	606.26	CS 2						

Photo of XS-3, looking in the downstream direction

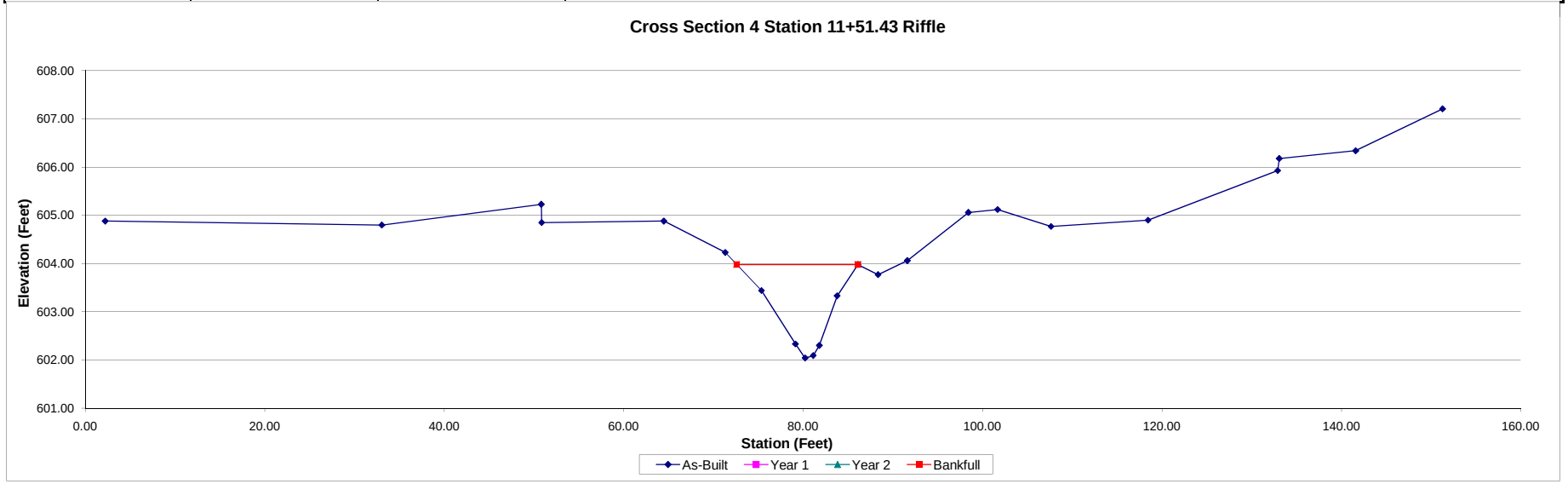


Project:	UT to South Fork Creek MY-00
Cross Section:	4-Now cross section 2
Feature	
Station:	11+51
Date:	22-Apr-09
Crew:	BW, SV, RL, JW, BW

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	13.3		
W (BKF)	13.5		
Max d	1.9		
Mean d	1.0		
W/D	13.7		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
2.23	604.88	CS 4						
33.06	604.80	CS 4						
50.82	605.23	CS 4 LP						
50.87	604.85	CS 4						
64.48	604.88	CS 4						
71.33	604.23	CS 4 Bankfull Left TOBL						
75.36	603.44	CS 4						
79.15	602.33	CS 4						
80.23	602.04	CS 4 TW						
81.13	602.09	CS 4						
81.81	602.30	CS 4 TOE R						
83.79	603.33	CS 4						
86.11	603.98	CS 4 Bankfull Right TOBR						
88.36	603.77	CS 4						
91.62	604.06	CS 4						
98.42	605.06	CS 4						
101.7	605.12	CS 4						
107.6	604.77	CS 4						
118.4	604.9	CS 4						
132.89	605.93	CS 4						
133.06	606.18	CS 4 RP						
141.58	606.34	CS 4						
151.26	607.21	CS 4						

Photo of XS-4, looking in the downstream direction



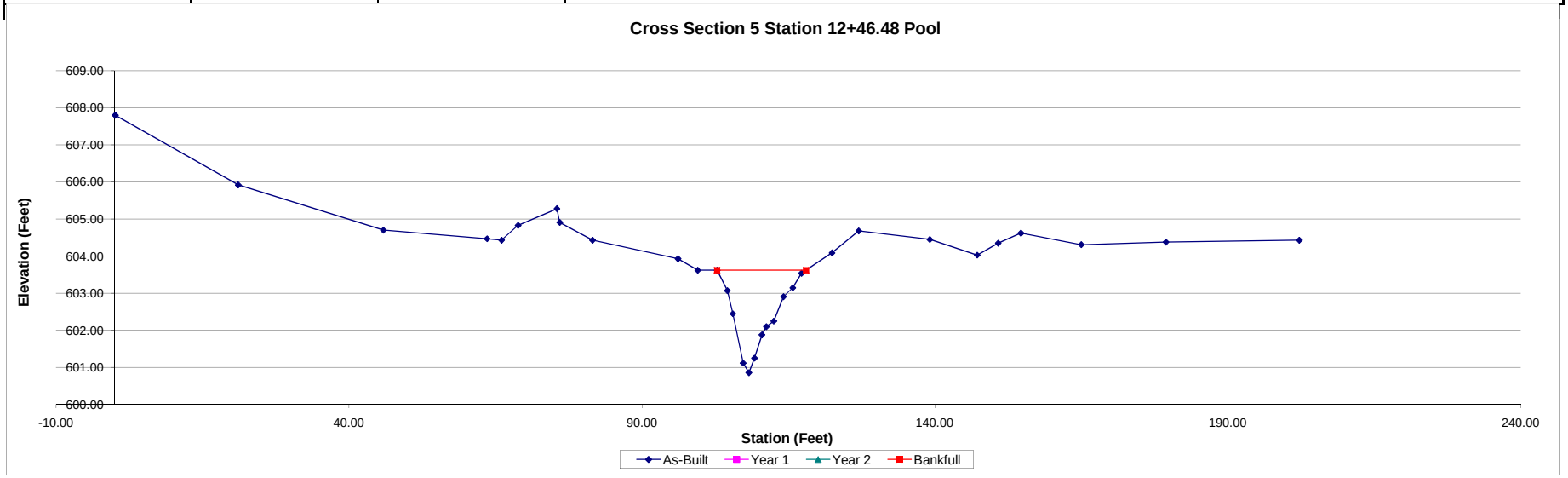
Project:	UT to South Fork Creek MY-00
Cross Section:	5
Feature	
Station:	12+46
Date:	22-Apr-09
Crew:	BW, SV, RL, JW, BW

Summary (bankfull)

	MY0	MY1	MY2
A (BKF)	18.3		
W (BKF)	15.2		
Max d	2.8		
Mean d	1.2		
W/D	12.6		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.12	607.80	CS 5						
0.10	607.80	CS 5						
21.09	605.92	CS 5						
45.86	604.70	CS 5						
63.56	604.47	CS 5						
66.04	604.43	CS 5						
68.85	604.83	CS 5						
75.47	605.28	CS 5 LP						
75.96	604.91	CS 5						
81.55	604.43	CS 5						
96.14	603.93	CS 5						
99.51	603.62	CS 5						
102.82	603.62	CS 5 Bankfull Left TOBL						
104.57	603.07	CS 5						
105.50	602.45	CS 5						
107.26	601.12	CS 5 TOE L						
108.2	600.86	CS 5 TW						
109.2	601.25	CS 5 TOE R						
110.5	601.88	CS 5						
111.23	602.1	CS 5						
112.49	602.25	CS 5						
114.15	602.91	CS 5						
115.73	603.15	CS 5						
117.24	603.54	CS 5						
122.43	604.09	CS 5						
126.99	604.68	CS 5						
139.11	604.45	CS 5						
147.21	604.03	CS 5						
150.78	604.35	CS 5						
154.67	604.62	CS 5 RP						
164.96	604.31	CS 5						
179.42	604.38	CS 5						
202.17	604.43	CS 5						

Photo of XS-5, looking in the downstream direction

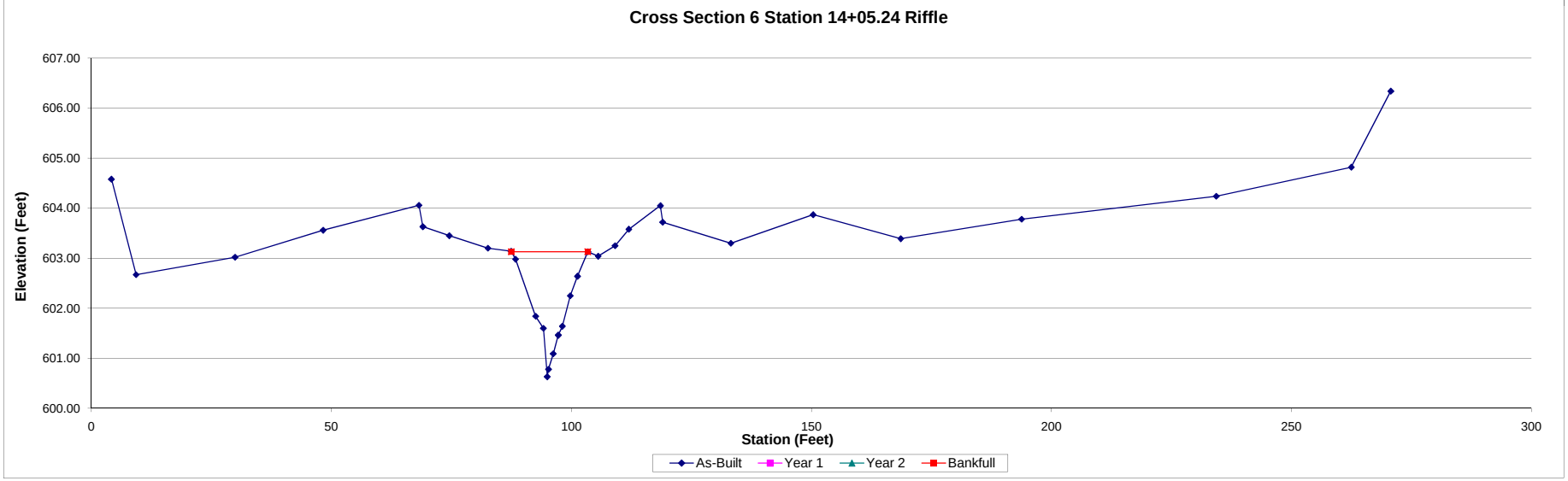


Project: UT to South Fork Creek MY-00
Cross Section: 6- Now cross section 3
Feature
Station: 14+05
Date: 22-Apr-09
Crew: BW, SV, RL, JW, BW

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	16.8		
W (BKF)	15.9		
Max d	2.5		
Mean d	1.1		
W/D	15.1		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
4.16	604.58	CS 6						
9.3	602.67	CS 6						
29.92	603.02	CS 6						
48.27	603.56	CS 6						
68.23	604.06	CS 6 LP						
69.05	603.63	CS 6						
74.55	603.45	CS 6						
82.6	603.20	CS 6						
87.43	603.14	CS 6						
88.36	602.98	CS 6						
92.55	601.84	CS 6						
94.15	601.60	CS 6						
94.95	600.63	CS 6 TOE L						
95.22	600.78	CS 6 TW						
96.2	601.09	CS 6 TOE R						
97.26	601.46	CS 6						
97.25	601.46	CS 6						
98.1	601.64	CS 6						
99.76	602.25	CS 6						
101.26	602.64	CS 6						
103.42	603.13	CS 6 Bankfull R TOBR						
105.57	603.04	CS 6						
109.08	603.25	CS 6						
111.96	603.58	CS 6						
118.54	604.05	CS 6 Rp						
119	603.72	CS 6						
133.21	603.3	CS 6						
150.35	603.87	CS 6						
168.6	603.39	CS 6						
193.77	603.78	CS 6						
234.33	604.24	CS 6						
262.46	604.82	CS 6						
270.69	606.34	CS 6						

Photo of XS-6, looking in the downstream direction

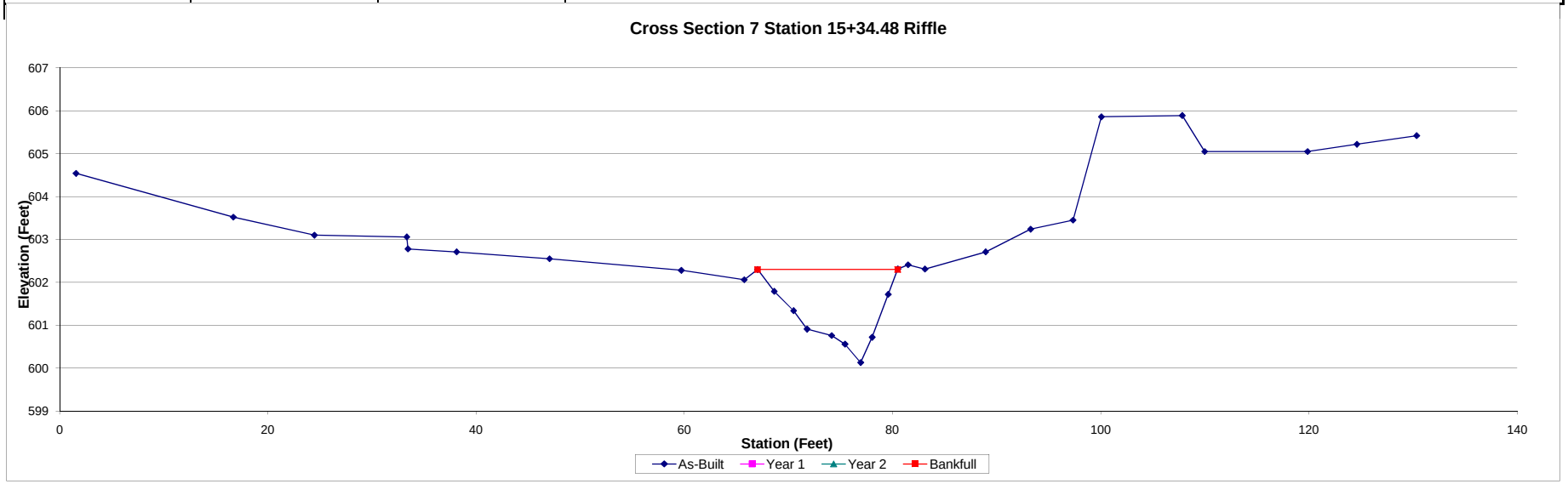


Project: UT to South Fork Creek MY-00
Cross Section: 7
Feature 15+34
Station:
Date: 22-Apr-09
Crew: BW, SV, RL, JW, BW

Summary (bankfull)	MY0	MY1	MY2
A (BKF)	15.8		
W (BKF)	13.5		
Max d	2.2		
Mean d	1.2		
W/D	11.5		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
1.59	604.54	CS 7						
16.7	603.52	CS 7						
24.48	603.1	CS 7						
33.36	603.06	CS 7 LP						
33.47	602.78	CS 7						
38.14	602.71	CS 7						
47.06	602.55	CS 7						
59.72	602.28	CS 7						
65.76	602.06	CS 7						
67.04	602.3	CS 7 Bankfull Left TOBL						
68.65	601.79	CS 7						
70.5	601.34	CS 7						
71.8	600.91	CS 7 TOE L						
74.16	600.76	CS 7						
75.44	600.56	CS 7						
76.95	600.13	CS 7 TW						
78.05	600.72	CS 7 TOE R						
79.59	601.72	CS 7						
80.51	602.31	CS 7						
81.5	602.41	CS 7 Bankfull Right TOB R						
83.12	602.31	CS 7						
88.95	602.71	CS 7						
93.27	603.24	CS 7						
97.34	603.45	CS 7						
100.07	605.86	CS 7						
107.83	605.89	CS 7						
109.98	605.05	CS 7						
119.86	605.05	CS 7						
124.6	605.22	CS 7						
130.34	605.42	CS 7 RP						

Photo of XS-7, looking in the downstream direction



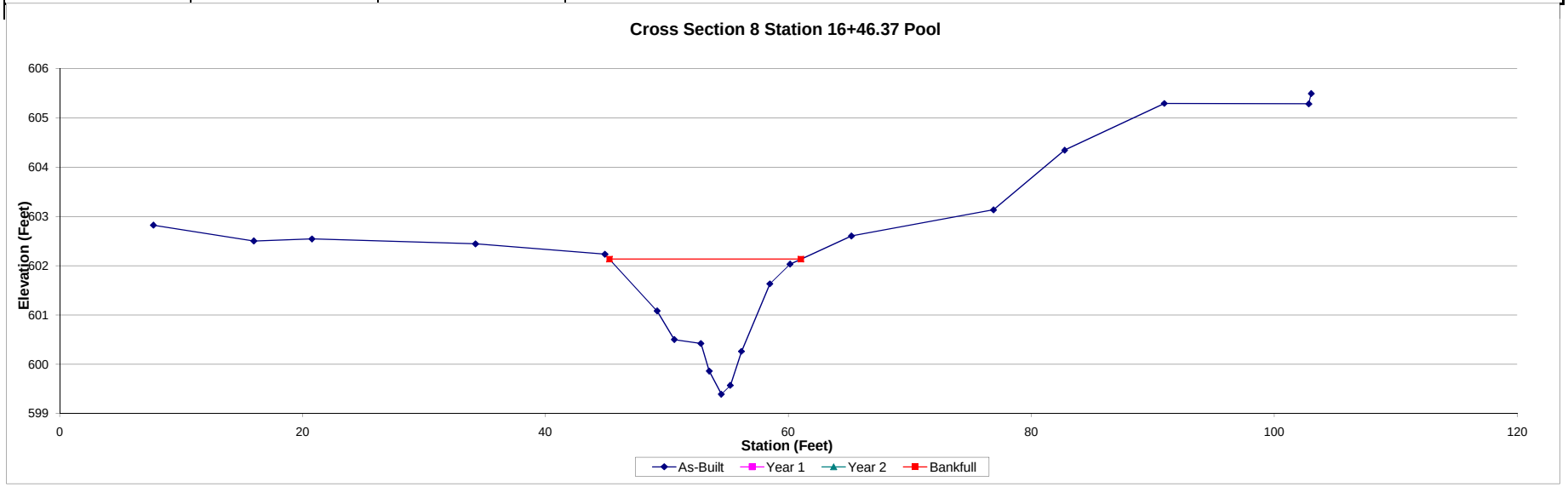
Project:	UT to South Fork Creek MY-00
Cross Section:	8
Feature	
Station:	16+46
Date:	22-Apr-09
Crew:	BW, SV, RL, JW, BW

Summary (bankfull)

	MY0	MY1	MY2
A (BKF)	19.2		
W (BKF)	15.8		
Max d	2.7		
Mean d	1.2		
W/D	12.9		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
7.73	602.82	CS 8						
16	602.5	CS 8						
20.78	602.54	CS 8						
34.25	602.44	CS 8						
44.9	602.23	CS 8 Bankfull L TOBL						
49.2	601.08	CS 8						
50.61	600.5	CS 8						
52.8	600.42	CS 8						
53.49	599.86	CS 8 TOE L						
54.48	599.39	CS 8 TW						
55.22	599.57	CS 8 TOE R						
56.14	600.26	CS 8						
58.48	601.63	CS 8						
60.14	602.03	CS 8 Bankfull Right TOBR						
65.2	602.6	CS 8						
76.89	603.13	CS 8						
82.75	604.34	CS 8						
90.95	605.29	CS 8						
102.85	605.28	CS 8						
103.05	605.49	CS 8 RP						

Photo of XS-8, looking in the downstream direction

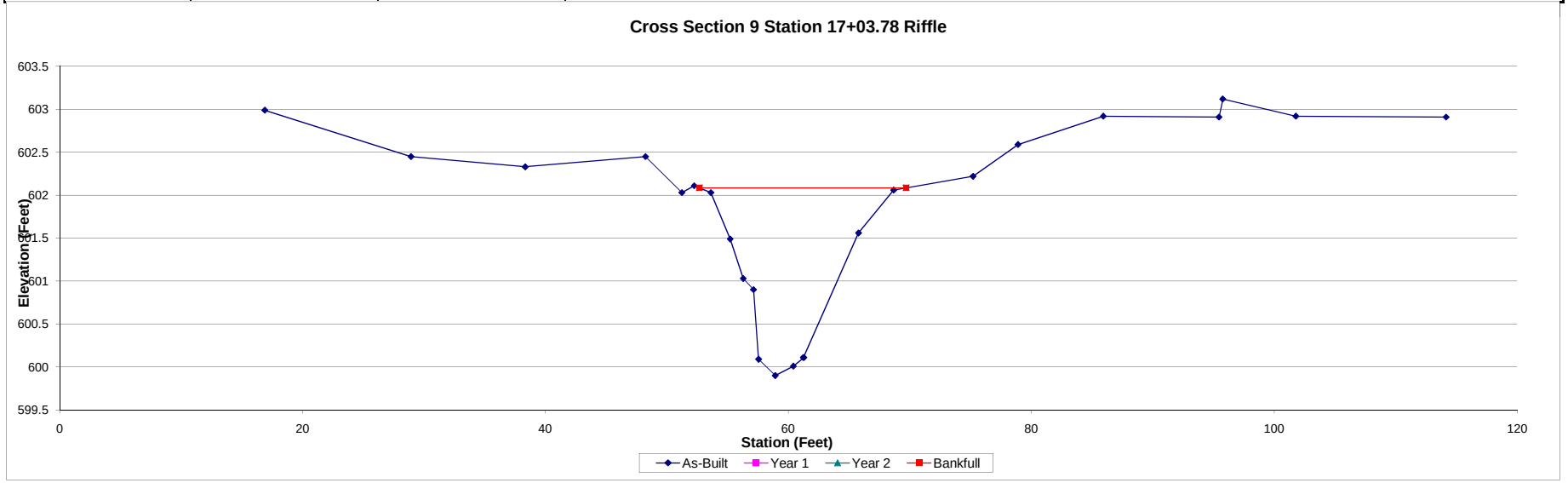


Project:	UT to South Fork Creek MY-00
Cross Section:	9-Now cross section 4
Feature	
Station:	17+04
Date:	22-Apr-09
Crew:	BW, SV, RL, JW, BW

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	17.5		
W (BKF)	17.0		
Max d	2.2		
Mean d	1.0		
W/D	16.6		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
16.89	602.99	0						
28.93	602.45	CS 9						
38.33	602.33	CS 9						
48.24	602.45	CS 9						
51.23	602.03	CS 9						
52.25	602.11	CS 9 Bankfull Left TOBL						
53.62	602.03	CS 9						
55.21	601.49	CS 9						
56.28	601.03	CS 9						
57.13	600.9	CS 9						
57.55	600.09	CS 9 TOE L						
58.92	599.9	CS 9 TW						
60.41	600.01	CS 9						
61.29	600.11	CS 9						
61.23	600.11	CS 9 TOE R						
65.78	601.56	CS 9						
68.67	602.06	CS 9 Bankfull Right TOBR						
75.21	602.22	CS 9						
78.91	602.59	CS 9						
85.94	602.92	CS 9						
95.46	602.91	CS 9						
95.77	603.12	CS 9 RP						
101.79	602.92	CS 9						
114.16	602.91	CS 9						

Photo of XS-9, looking in the downstream direction

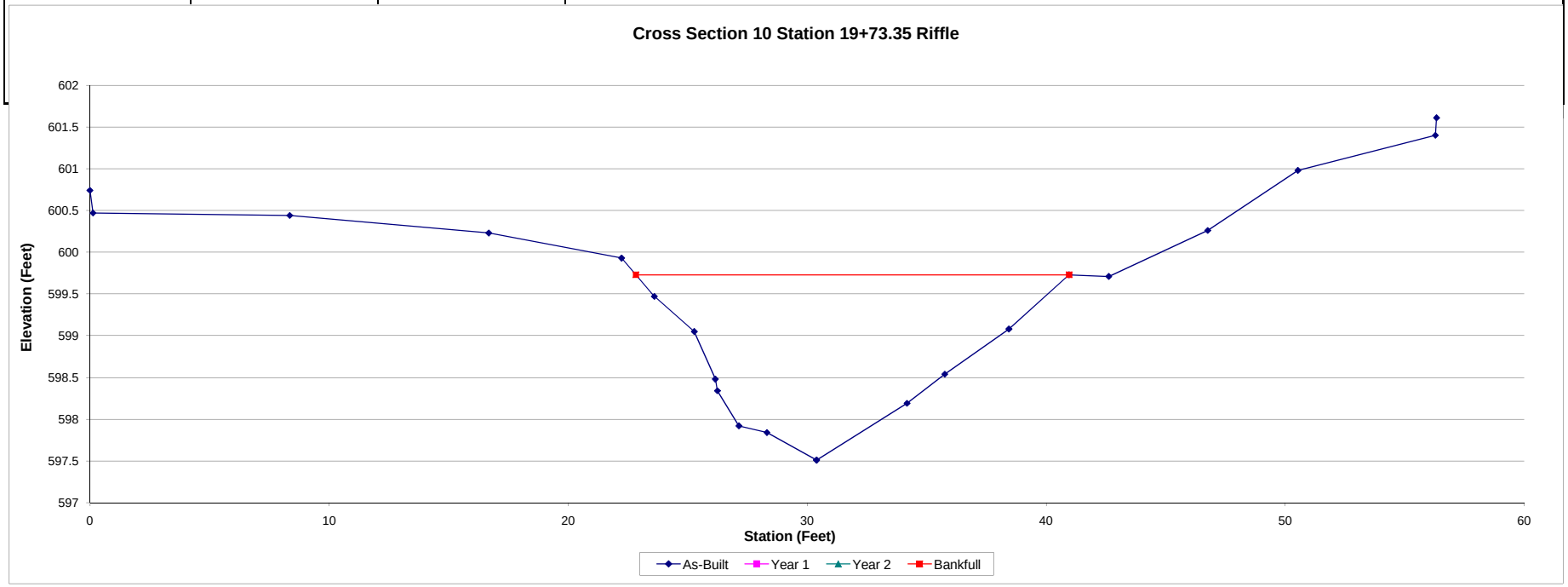


Project:	UT to South Fork Creek MY-00
Cross Section:	10-Now cross section 5
Feature	
Station:	19+74
Date:	22-Apr-09
Crew:	BW, SV, RL, JW, BW

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	22.2		
W (BKF)	18.1		
Max d	2.2		
Mean d	1.2		
W/D	14.8		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0	600.74	CS 10 RP						
0.13	600.47	CS 10						
8.36	600.44	CS 10						
16.68	600.23	CS 10						
22.24	599.93	CS 10 Bankfull Left TOBL						
23.61	599.47	CS 10						
25.28	599.05	CS 10						
26.16	598.48	CS 10						
26.25	598.34	CS 10						
27.15	597.92	CS 10 TOE L						
28.32	597.84	CS 10						
30.39	597.51	CS 10 TW						
30.4	597.51	CS 10						
34.18	598.19	CS 10 Toe R						
35.76	598.54	CS 10						
38.44	599.08	CS 10						
40.96	599.73	CS 10 Bankfull Right TOBR						
42.62	599.71	CS 10						
46.76	600.26	CS 10						
50.53	600.98	CS 10						
56.28	601.4	CS 10						
56.33	601.61	CS 10 RP						

Photo of XS-10, looking in the downstream direction

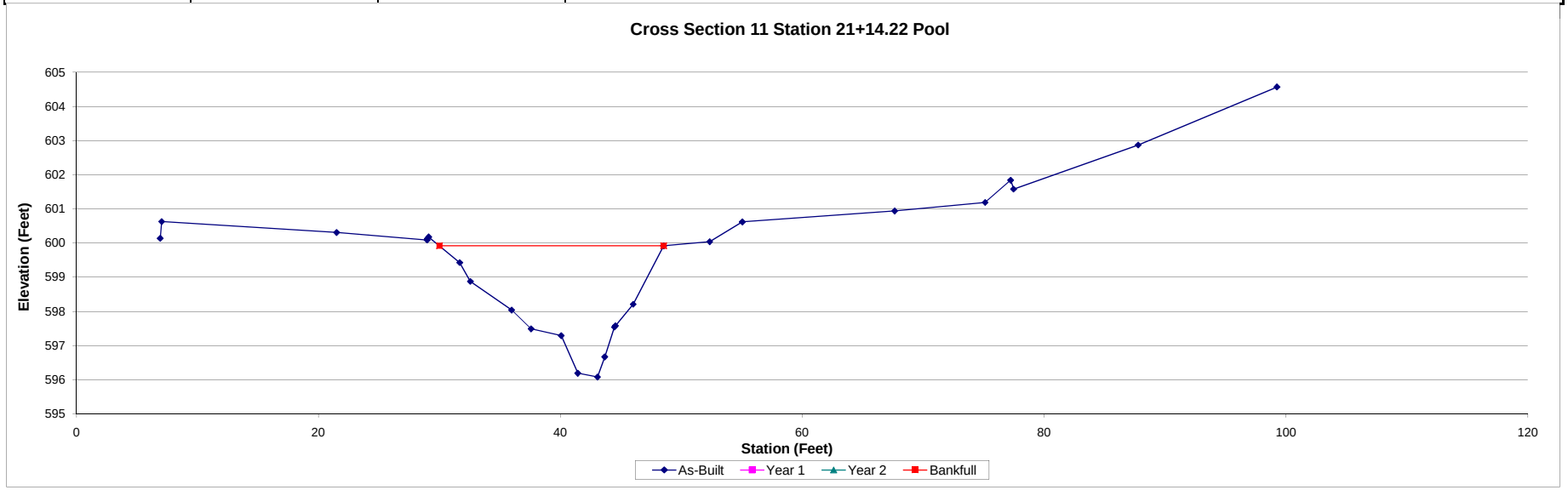


Project: UT to South Fork Creek MY-00
Cross Section: 11
Feature
Station: 21+14
Date: 22-Apr-09
Crew: BW, SV, RL, JW, BW

Summary (bankfull)	MY0	MY1	MY2
A (BKF)	36.3		
W (BKF)	18.5		
Max d	3.8		
Mean d	2.0		
W/D	9.5		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
6.92	600.14	CS 11						
7.04	600.63	CS 11 LP						
21.51	600.31	CS 11						
28.99	600.09	CS 11 Bankfull Left TOBL						
29	600.13	CS 11						
29.12	600.18	CS 11						
31.69	599.43	CS 11						
32.57	598.88	CS 11						
35.98	598.04	CS 11						
37.59	597.49	CS 11						
40.08	597.29	CS 11						
41.45	596.19	CS 11 TOE L						
43.08	596.08	CS 11 TW						
43.68	596.67	CS 11 TOE R						
44.48	597.54	CS 11						
44.56	597.58	CS 11						
46.03	598.21	CS 11						
48.55	599.92	CS 11 Bankfull Right TOBR						
48.55	599.92	CS 11						
52.36	600.04	CS 11						
55.06	600.62	CS 11						
67.66	600.94	CS 11						
75.14	601.19	CS 11						
77.25	601.84	CS 11 RP						
77.49	601.58	CS 11						
87.79	602.87	CS 11						
99.27	604.57	CS 11						

Photo of XS-11, looking in the downstream direction

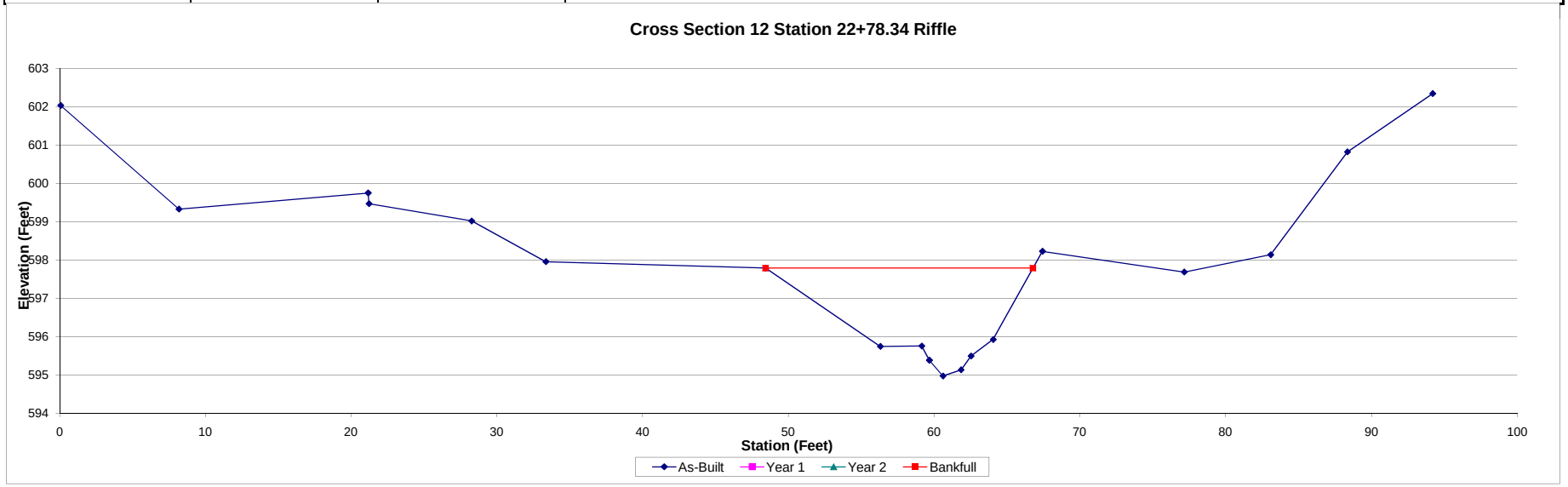


Project:	UT to South Fork Creek MY-00
Cross Section:	12-Now cross section 6
Feature	
Station:	22+78
Date:	22-Apr-09
Crew:	BW, SV, RL, JW, BW

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	28.2		
W (BKF)	18.3		
Max d	2.8		
Mean d	1.5		
W/D	11.9		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.08	602.03	CS 12						
8.19	599.33	CS 12						
21.17	599.75	CS 12 LP						
21.23	599.47	CS 12						
28.27	599.02	CS 12						
33.36	597.96	CS 12						
48.44	597.79	CS 12 Bankfull Left TOBL						
56.31	595.75	CS 12 TOE L						
59.15	595.76	CS 12						
59.67	595.39	CS 12						
60.61	594.98	CS 12 TW						
61.85	595.14	CS 12						
62.53	595.5	CS 12						
64.05	595.93	CS 12 TOE R						
67.43	598.23	CS 12 Bankfull Right TOBR						
77.16	597.69	CS 12						
83.09	598.14	CS 12						
88.35	600.82	CS 12 RP						
94.2	602.34	CS 12						

Photo of XS-12, looking in the downstream direction



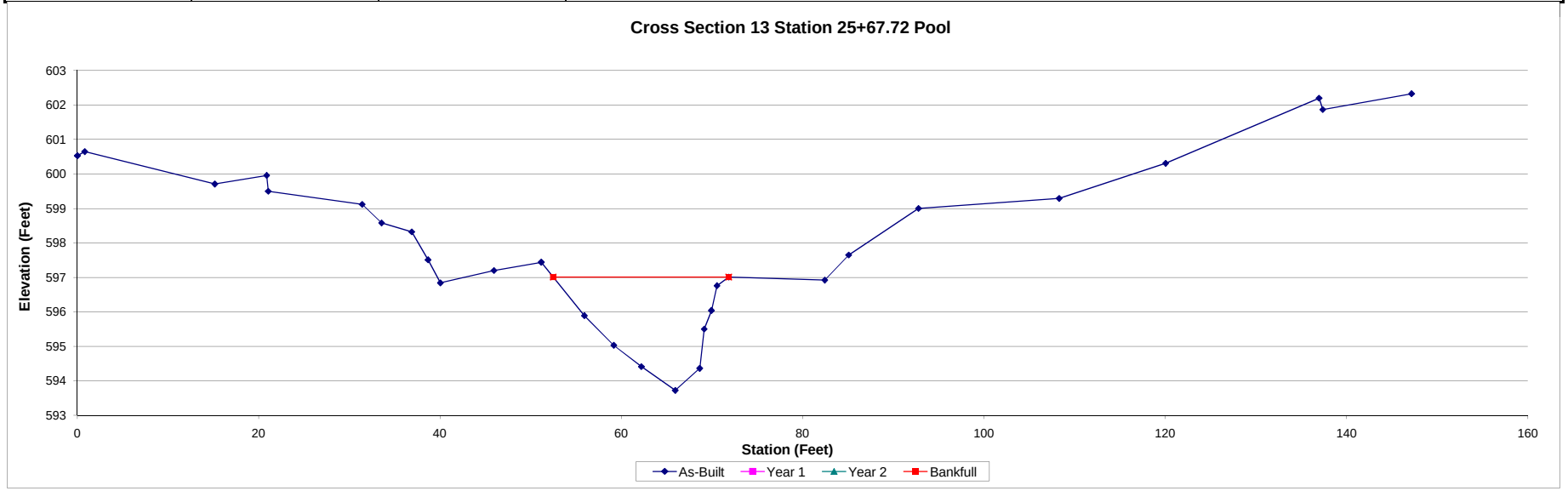
Project: UT to South Fork Creek MY-00
Cross Section: 13
Feature
Station: 25+68
Date: 22-Apr-09
Crew: BW, SV, RL, JW, BW

Summary (bankfull)

	MY0	MY1	MY2
A (BKF)	35.2		
W (BKF)	19.4		
Max d	3.3		
Mean d	1.8		
W/D	10.7		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.01	600.53	CS 13						
0.82	600.65	CS 13						
15.17	599.71	CS 13						
20.89	599.96	CS 13 LP						
21.06	599.5	CS 13						
31.42	599.12	CS 13						
33.57	598.58	CS 13						
36.89	598.32	CS 13						
38.69	597.51	CS 13						
40.05	596.84	CS 13						
45.96	597.2	CS 13						
51.18	597.44	CS 13 Banfull Left TOB L						
55.94	595.89	CS 13						
59.18	595.03	CS 13 TOE L						
62.23	594.41	CS 13						
65.96	593.72	CS 13 TW						
68.66	594.36	CS 13 TOE R						
69.15	595.5	CS 13						
69.95	596.04	CS 13						
70.57	596.76	CS 13						
71.86	597.01	CS 13 Bankfull Right TOBR						
82.46	596.92	CS 13						
85.09	597.65	CS 13						
92.8	599	CS 13						
108.31	599.29	CS 13						
120.06	600.31	CS 13						
136.98	602.2	CS 13 RP						
137.39	601.87	CS 13						
147.19	602.33	CS 13						

Photo of XS-13, looking in the downstream direction



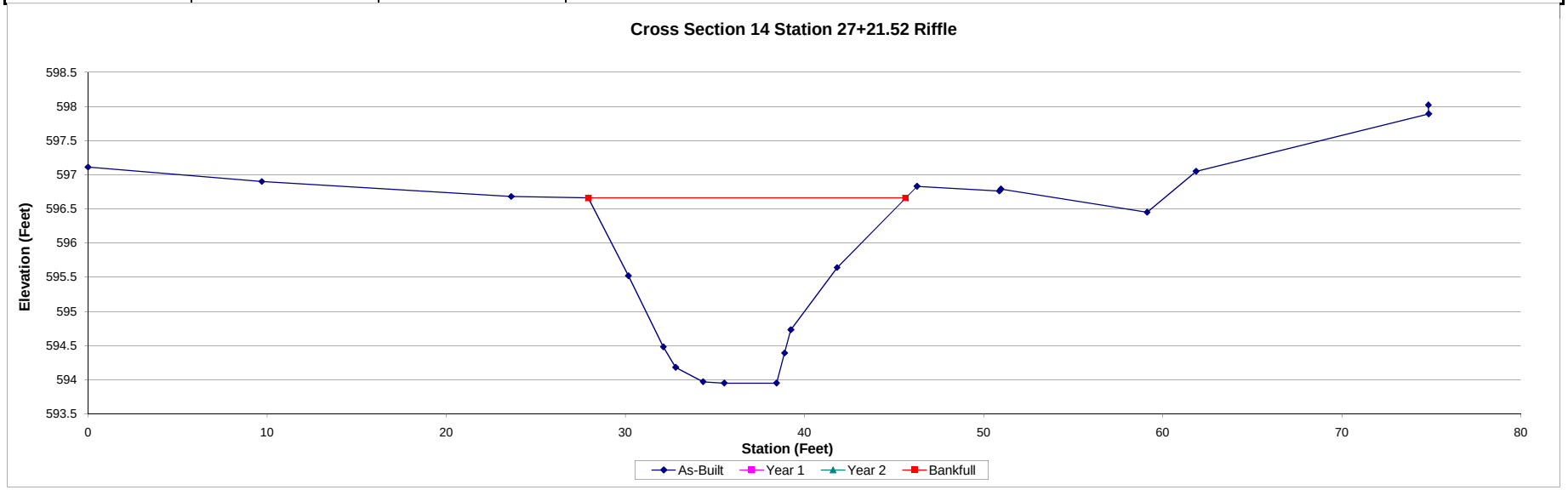
Project:	UT to South Fork Creek MY-00
Cross Section:	14-Now cross section 7
Feature	
Station:	27+22
Date:	22-Apr-09
Crew:	BW, SV, RL, JW, BW

Summary (bankfull)

	MY0	MY1	MY2
A (BKF)	28.8		
W (BKF)	17.7		
Max d	2.7		
Mean d	1.6		
W/D	10.9		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0	597.11	CS 14 LP						
9.7	596.9	CS 14						
23.63	596.68	CS 14						
27.93	596.66	CS 14 Bankfull Left TOBL						
30.17	595.52	CS 14						
32.12	594.48	CS 14						
32.81	594.18	CS 14 TOE L						
34.34	593.97	CS 14						
35.52	593.95	CS 14 TW						
38.44	593.95	CS 14						
38.89	594.39	CS 14 TOE R						
39.24	594.73	CS 14						
41.82	595.64	CS 14						
46.28	596.83	CS 14 Bankfull Right TOBR						
50.88	596.76	CS 14						
50.97	596.79	CS 14						
59.13	596.45	CS 14						
61.86	597.05	CS 14						
74.85	597.89	CS 14 RP						
74.83	598.02	CS 14						

Photo of XS-14, looking in the downstream direction

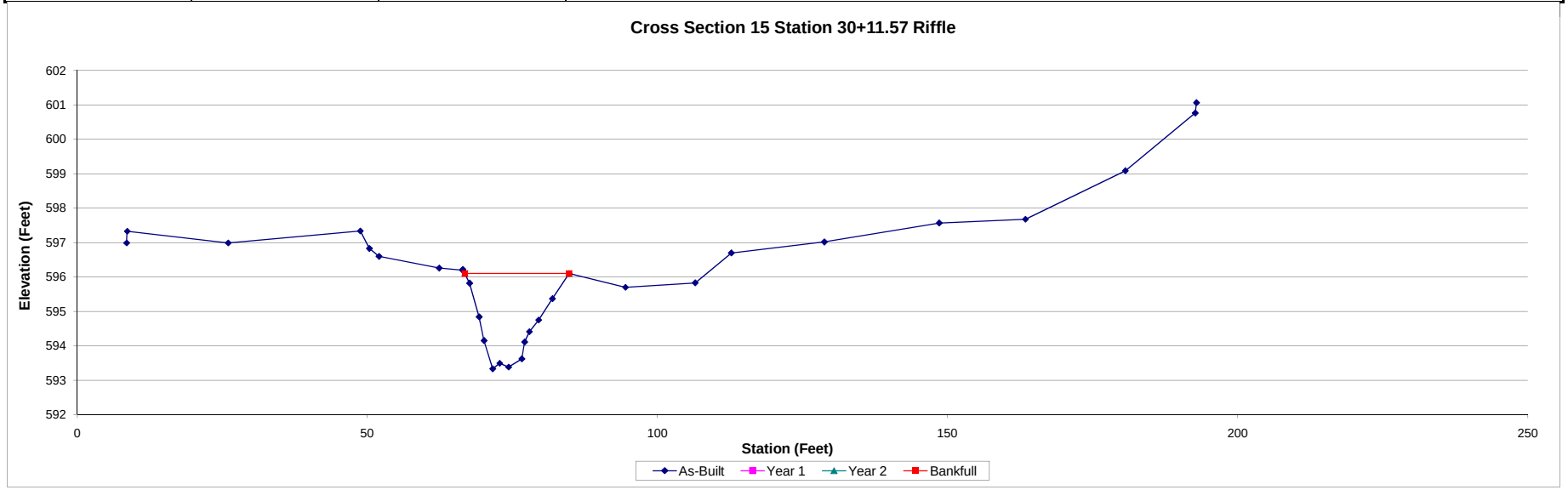


Project:	UT to South Fork Creek MY-00
Cross Section:	15-Now cross section 8
Feature	
Station:	30+12
Date:	22-Apr-09
Crew:	BW, SV, RL, JW, BW

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	28.2		
W (BKF)	18.0		
Max d	2.8		
Mean d	1.6		
W/D	11.4		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
8.49	596.99	CS 15						
8.59	597.33	CS 15 LP						
25.99	596.99	CS 15						
48.76	597.34	CS 15						
50.33	596.83	CS 15						
51.99	596.6	CS 15						
62.36	596.26	CS 15						
66.38	596.2	CS 15 Bankfull Left TOBL						
66.44	596.22	CS 15						
67.61	595.82	CS 15						
69.26	594.84	CS 15						
70.1	594.15	CS 15						
71.59	593.33	CS 15 TOE L						
72.8	593.49	CS 15						
74.33	593.38	CS 15 TW						
76.61	593.62	CS 15 TOE R						
77.1	594.11	CS 15						
77.91	594.41	CS 15						
79.51	594.75	CS 15						
81.88	595.37	CS 15						
84.76	596.1	CS 15 Bankfull Right TOBR						
94.48	595.7	CS 15						
106.5	595.83	CS 15						
112.72	596.7	CS 15						
128.76	597.02	CS 15						
148.55	597.57	CS 15						
163.42	597.68	CS 15						
180.64	599.09	CS 15						
192.69	600.77	CS 15						
192.9	601.07	CS 15 RP						

Photo of XS-15, looking in the downstream direction

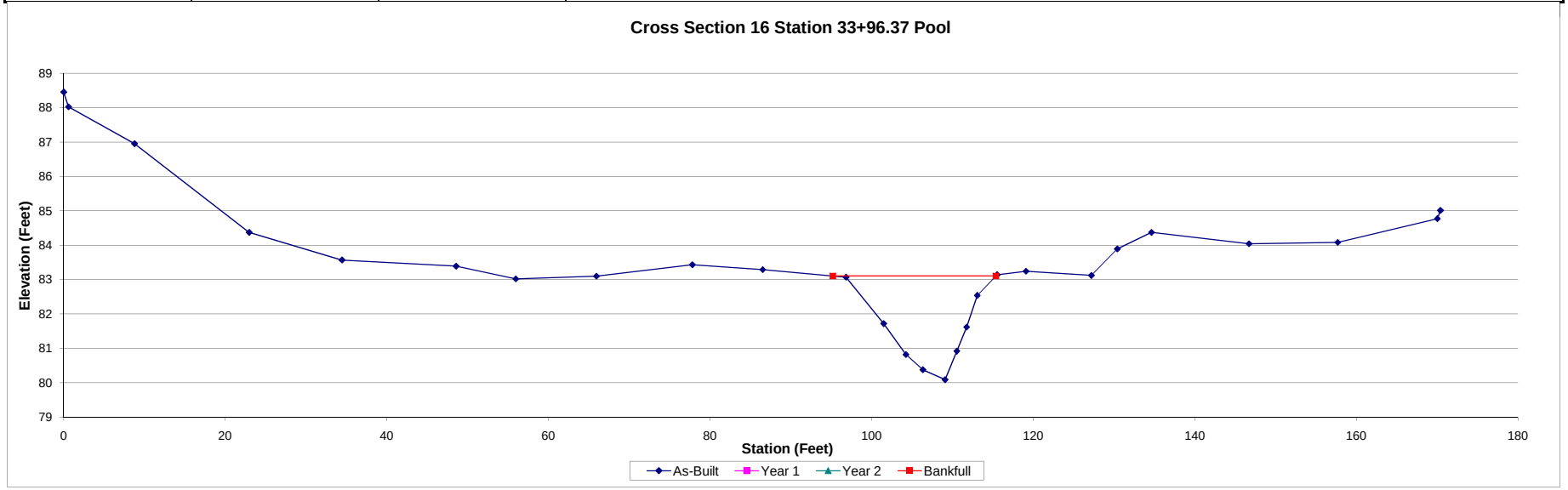


Project: UT to South Fork Creek MY-00
Cross Section: 16
Feature
Station: 33+96
Date: 22-Apr-09
Crew: BW, SV, RL, JW, BW

Summary (bankfull)	MY0	MY1	MY2
A (BKF)	30.6		
W (BKF)	20.2		
Max d	3.0		
Mean d	1.5		
W/D	13.3		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0	88.45	CS 16 LP						
0.59	88.02	CS 16						
8.76	86.95	CS 16						
22.95	84.37	CS 16						
34.44	83.57	CS 16						
48.56	83.39	CS 16						
55.94	83.02	CS 16						
65.93	83.1	CS 16						
77.8	83.43	CS 16						
86.51	83.29	CS 16						
96.83	83.07	CS 16 Bankfull Left TOBL						
101.48	81.72	CS 16						
104.24	80.82	CS 16 TOE L						
106.33	80.38	CS 16						
109.08	80.09	CS 16 TW						
110.53	80.92	CS 16 TOE R						
111.75	81.62	CS 16						
113.06	82.54	CS 16						
115.53	83.14	CS 16 Bankfull Right TOBR						
119.09	83.24	CS 16						
127.19	83.12	CS 16						
130.4	83.89	CS 16						
134.63	84.37	CS 16						
146.7	84.04	CS 16						
157.68	84.08	CS 16						
170.01	84.77	CS 16						
170.39	85.01	CS 16 RP						

Photo of XS-16, looking in the downstream direction

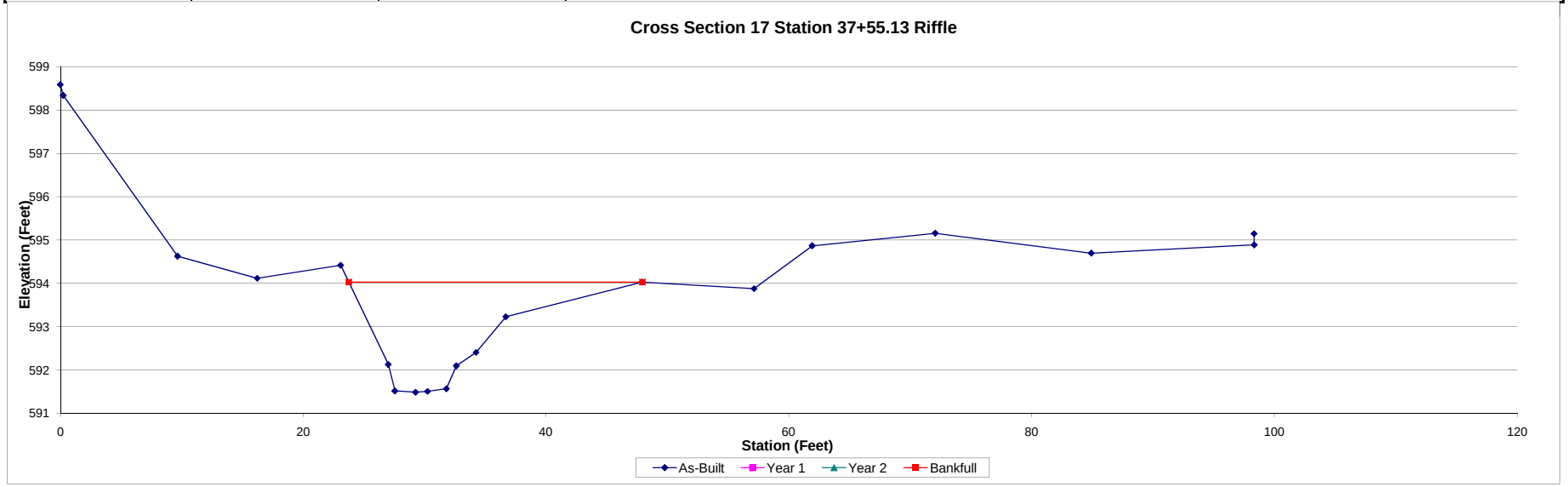


Project:	UT to South Fork Creek MY-00
Cross Section:	17-Now cross section 9
Feature	
Station:	37+55
Date:	22-Apr-09
Crew:	BW, SV, RL, JW, BW

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	27.6		
W (BKF)	24.2		
Max d	2.5		
Mean d	1.1		
W/D	21.2		

MY0-2009			MY1-2009			MY2-2010		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0	598.59	CS 17 LP						
0.24	598.34	CS 17						
9.66	594.63	CS 17						
16.22	594.12	CS 17						
23.09	594.42	CS 17 Bankfull Left TOBL						
27.01	592.13	CS 17						
27.56	591.52	CS 17 TOE L						
29.26	591.49	CS 17 TW						
30.25	591.51	CS 17						
31.8	591.57	CS 17 TOE R						
32.62	592.1	CS 17						
34.25	592.41	CS 17						
36.7	593.23	CS 17						
47.94	594.03	CS 17 Bankfull Right TOBR						
47.9	594.03	CS 17						
57.14	593.88	CS 17						
61.93	594.87	CS 17						
72.07	595.16	CS 17						
84.92	594.7	CS 17						
98.34	594.89	CS 17						
98.33	595.15	CS 17 RP						

Photo of XS-17, looking in the downstream direction



Appendix C

Vegetation Data

Table 7. Vegetation Plot Attribute Data: UT to South Fork Creek/Project No. 405

Plot ID	Community Type	Planting Zone ID	Reach ID	Associated Gauges	CVS Level
1	Piedmont Alluvial Forest	Zone 1 and 2	C	None	1
2	Piedmont Alluvial Forest	Zone 2	C	None	1
3	Piedmont Alluvial Forest	Zone 2	B	Gauge 1	1
4	Piedmont Alluvial Forest	Zone 2	B	None	1
5	Piedmont Alluvial Forest	Zone 2	A	None	1
6	Piedmont Alluvial Forest	Zone 1 and 2	A	None	1
7	Piedmont Alluvial Forest	Zone 2	C	None	1

Zone 1-Streambank
Zone 2-Floodplain

CVS OUTPUT TABLES

Report Prepared By	**The Catena Group**
database name	**UTSFC cvs-eep-entrytool-v2.2.6.mdb**
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	**Description of database file, the report worksheets, and a summary of project(s) and project data.**
Proj, planted	**Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.**
Proj, total stems	**Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.**
Plots	**List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).**
Vigor	**Frequency distribution of vigor classes for stems for all plots.**
Vigor by Spp	**Frequency distribution of vigor classes listed by species.**
Damage	**List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.**
Damage by Spp	**Damage values tallied by type for each species.**
Damage by Plot	**Damage values tallied by type for each plot.**
Planted Stems by Plot and Spp	**A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.**

PROJECT SUMMARY----------	
Project Code	**UTSFC**
project Name	**UT to South Fork Creek EEP # 405**
Description	**UT to South Fork Creek in Alamance County EEP Project # 405.**
River Basin	**Cape Fear**
length(ft)	**4151**
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	**7**

Living planted stems, excluding live stakes, per acre: Negative (red) numbers indicate the project failed to reach requirements in a particular year.

Project Code	***Project Name***	***River Basin***	***Year 0 (baseline)***
UTSFC	UT to South Fork Creek EEP # 405	Cape Fear	283.28

Total stems, including planted stems of all kinds (including live stakes) and natural/volunteer stems:

Project Code	***Project Name***	***River Basin***	***Year 0 (baseline)***
UTSFC	UT to South Fork Creek EEP # 405	Cape Fear	283.2799501

plot	Plot Level	Year	Date Sampled	Planted Living Stems	Planted Living Stems EXCLUDING Live Stakes	Dead/Missing Stems	Total Living Stems	Total Living Stems EXCLUDING Live Stakes	Planted Living Stems per ACRE	Planted Living Stems EXCLUDING Live Stakes PER ACRE	Total Living Stems PER ACRE	Total Living Stems EXCLUDING Live Stakes PER ACRE	# species
UTSFC -01-0001	1	0	4/8/2009	11	11	1	11	11	445.1542073	445.1542073	445.1542073	445.1542073	4
UTSFC -01-0002	1	0	4/8/2009	12	12	0	12	12	485.6227716	485.6227716	485.6227716	485.6227716	7
UTSFC -01-0003	1	0	4/8/2009	8	8	0	8	8	323.7485144	323.7485144	323.7485144	323.7485144	5
UTSFC -01-0004	1	0	4/8/2009	3	3	0	3	3	121.4056929	121.4056929	121.4056929	121.4056929	3
UTSFC -01-0005	1	0	4/8/2009	5	5	0	5	5	202.3428215	202.3428215	202.3428215	202.3428215	4
UTSFC -01-0006	1	0	4/8/2009	3	3	2	3	3	121.4056929	121.4056929	121.4056929	121.4056929	2
UTSFC -01-0007	1	0	4/8/2009	7	7	0	7	7	283.2799501	283.2799501	283.2799501	283.2799501	5

vigor	Count	Percent
0	3	5.8
2	6	11.5
3	34	65.4
4	9	17.3

	Species	4	3	2	1	0	Missing	Unknown
	Betula nigra	**2**						
	Callicarpa americana		**2**	**1**		**2**		
	Carya ovata		**1**					
	Cercis canadensis var. canadensis		**1**	**1**				
	Cornus amomum		**6**	**1**				
	Corylus americana	**1**	**4**					
	Diospyros virginiana		**2**					
	Fraxinus pennsylvanica	**1**	**6**					
	Liriodendron tulipifera var. tulipifera		**2**					
	Platanus occidentalis var. occidentalis	**2**	**3**					
	Quercus michauxii	**1**		**1**				
	Morus rubra	**1**	**1**	**1**				
	Ulmus	**1**	**6**	**1**				
	Unknown					**1**		
TOT:	**14**	**9**	**34**	**6**		**3**		

Damage	***Count***	***Percent Of Stems***
Deer	40	76.9
(no damage)	11	21.2
Flood	1	1.9

	Species	All Damage Categories	(no damage)	Deer	Flood
	Betula nigra	**2**	**2**		
	Callicarpa americana	**5**	**2**	**2**	**1**
	Carya ovata	**1**	**1**		
	Cercis canadensis var. canadensis	**2**		**2**	
	Cornus amomum	**7**		**7**	
	Corylus americana	**5**		**5**	
	Diospyros virginiana	**2**		**2**	
	Fraxinus pennsylvanica	**7**		**7**	
	Liriodendron tulipifera var. tulipifera	**2**		**2**	
	Morus rubra	**3**		**3**	
	Platanus occidentalis var. occidentalis	**5**	**1**	**4**	
	Quercus michauxii	**2**	**1**	**1**	
	Ulmus	**8**	**3**	**5**	
	Unknown	**1**	**1**		
TOT:	**14**	**52**	**11**	**40**	**1**

	plot	*All Damage Categories*	*(no damage)*	*Deer*	*Flood*
	UTSFC -01-0001	12	2	10	
	UTSFC -01-0002	12	3	9	
	UTSFC -01-0003	8	1	7	
	UTSFC -01-0004	3	1	2	
	UTSFC -01-0005	5	2	3	
	UTSFC -01-0006	5	2	2	1
	UTSFC -01-0007	7		7	
TOT:	**7**	**52**	**11**	**40**	**1**

	Species	Total Planted Stems	# plots	avg# stems	plot UTSFC-01-0001	plot UTSFC-01-0002	plot UTSFC-01-0003	plot UTSFC-01-0004	plot UTSFC-01-0005	plot UTSFC-01-0006	plot UTSFC-01-0007
	Betula nigra	**2**	**2**	**1**				**1**	**1**		
	Callicarpa americana	**3**	**2**	**1.5**		**1**				**2**	
	Carya ovata	**1**	**1**	**1**		**1**					
	Cercis canadensis var. canadensis	**2**	**2**	**1**			**1**				**1**
	Cornus amomum	**7**	**2**	**3.5**	**6**					**1**	
	Corylus americana	**5**	**3**	**1.67**	**2**			**1**	**2**		
	Diospyros virginiana	**2**	**1**	**2**		**2**					
	Fraxinus pennsylvanica	**7**	**4**	**1.75**	**2**	**1**	**1**				**3**
	Liriodendron tulipifera var. tulipifera	**2**	**2**	**1**		**1**			**1**		
	Morus rubra	**3**	**3**	**1**		**1**		**1**			**1**
	Platanus occidentalis var. occidentalis	**5**	**2**	**2.5**			**4**				**1**
	Quercus michauxii	**2**	**2**	**1**	**1**		**1**				
	Ulmus	**8**	**4**	**2**		**5**	**1**		**1**		**1**
TOT:	**13**	**49**	**13**		**11**	**12**	**8**	**3**	**5**	**3**	**7**

UT to South Fork Cane Creek (Stephens) Planting Plan

Overstory (Large) Trees

Species	Size	Qty to Plant	Qty Ordered	Supplier	Planting Zone
Liriodendron tulipifera	bare root	300	300	Aborgen	Floodplain
Platanus occidentalis	bare root	300	300	Aborgen	Floodplain
Fraxinus pennsylvanica	bare root	400	400	Aborgen	Floodplain
Betula nigra	bare root	500	500	Aborgen	Streambanks
Quercus michauxii	bare root	300	300	Aborgen	Floodplain
Nyssa sylvatica	bare root	300	300	Aborgen	Floodplain
Carya ovata	bare root	300	300	Arborgen	Floodplain
		2,400	2,400		

Understory (Small) Trees and Shrubs

Small Tree Species	Size	Qty to Plant	Qty Ordered	Supplier	Planting Zone
*Magnolia virginiana**	bare root	425	425	Arborgen	Floodplain
Asimina triloba	bare root	500	500	Aborgen	Floodplain
Morus rubra	bare root	513	1,000	Aborgen	Floodplain
Cercis canadensis	bare root	512	1,000	Arborgen	Floodplain
		1,950	2,925		

Small Tree Species	Size	Qty to Plant	Qty Ordered	Supplier	
Callicarpa americana	bare root	415	1,000	Arborgen	Floodplain
Cephalanthus occidentalis	bare root	425	500	Aborgen	Floodplain
Corylus americana	bare root	425	1,000	Aborgen	Floodplain
*Cornus ammomum***	bare root	425	425	Aborgen	Floodplain
*Malus angustifolia***	bare root	400	500	Arborgen	Floodplain
		2,090	2,925		

Herbcaceous Plants

Spec: Herbaceous plants shall be plugs. Plat a min of 4 spp with with at least 10 % but no more than 25% of any spp.

Species	Size	Qty	%	Supplier	Planting Zone
Chasmanthium latifolium	lg plug	1,055	20%	CPCN	ALL
Panicum clandestinum	lg plug	1,411	27%	CPCN	ALL
Panicum virgatum	lg plug	1,413	27%	CPCN	ALL
Panicum anceps	lg plug	1,411	27%	CPCN	ALL
		5,290	100%		

Streambank Assemblage

Species	Size	Qty to Plant	Qty Ordered	Supplier	Planting Zone
Cornus amomum	tubeling	500	500	Mellow Marsh	Streambanks
Salix nigra	live stake	500	500	CPCN	Streambanks
Salix sericea	live stake	500	500	CPCN	Streambanks

Itea virginica	tubeling	500	500	Mellow Marsh	Streambanks
		2,000	2,000		

Specimen Trees

Species	Size	Qty to Plant	Qty Ordered	Supplier	Planting Zone
Diospyros virginiana	bare root	20	100	IP	Floodplains
Corylus americana	bare root	20	See understory	IP	Floodplains
		40			

Plants Delivered to & Planted at SF Cane Creek 12/17/07

*The nursery was only able to provide 425 *Magnolia virginiana* and as such the stems of the other species had to be increased slightly.

****Cornus ammomum*** was originally specified for this project but the nursery was sold out. It was replaced with *Rhus copallinum*. However, when the *Rhus* were lifted, they did not meet EEP size requirements so the nursery subsitituted 425 *Cornus ammomum* and 500 *Malus angustifolia* (southern crabapple) to replace the 1,000 *Rhus* that had initally been ordered.

Permanent Seed Mixture

Common Name	Scientific Name	% of Mix	lbs./acre
Orchardgrass	*Dactylis glomerata*	5	1.5
Bluestem	*Andropogon glomeratus*	5	1.5
Woolgrass	Scirpus cyperinus	5	1.5
Virginia wildrye	*Elymus virginicus*	5	1.5
Indian Grass	*Sorghastrum nutans*	10	3
River oats	*Chasmanthium latifolium*	10	3
Deertongue	*Panicum clandestinum*	30	9
Switchgrass	*Panicum virgatum*	30	9
TOTALS		**100**	**30**

Vegetation Plot 1

Vegetation Plot 2

Vegetation Plot 3

Vegetation Plot 4

Vegetation Plot 5

Vegetation Plot 6

Vegetation Plot 7

Representative Wetland Photos

Wetland 2

Wetland 3

Wetland 4

Appendix D

As-Built Plan Sheets

V-CHANNEL

Vchannel Added at Stream Start

PRC = 0+07.87

PT = 0+16.57

PC = 0+25.12

Cross vane 1

PRC = 0+80.94

PT = 1+35.58

PC = 1+42.22

PRC = 2+19.55

PT = 2+65.76

PC = 2+68.11

PT = 3+00.22

PC = 3+20.87

V-CHANNEL

PRC = 3+49.73

PT = 4+04.96

PC = 4+14.08

PT = 4+73.38

PC = 4+98.57

CATTLE CROSSING

PT = 5+37.60

PRC = 5+57.34

PC = 5+76.16

PRC = 6+78.86

PT = 7+36.45

X-SECT 1 0+90.34

X-SECT 2 1+15.84

AS-BUILT FLOOD PLANE ELEVATIONS

X-SECT 3 5+22.23

X-SECT 4 5+55.01

Crossvane moved upstream to match bedrock formation

Bedrock on left and right bank of floodplain

leave existing tree on right bank

Cross vane pool filled with sediment (TYP)

Pools aggraded with sediment (TYP)

CROSS VANE 1

CROSS VANE

V-CHANNEL

CATTLE CROSSING

DATUM ELEV 586.00

Channel Depth

Bank 607.1 605.0 606.6 606.4 606.5 604.2 606.4 606.3 606.2 606.2 606.1 605.9 605.9 605.8 605.7 605.7 605.6 605.6 605.5 605.4 605.3 605.3 605.1 605.0 604.3 604.9 604.9 604.8 604.8 604.7 604.7 604.5 604.5 604.4 603.9 604.3 604.2 604.1 604.0 603.9

Bed 604.8 604.4 604.7 604.3 604.1 603.8 603.6 603.7 604.1 603.6 603.6 603.5 603.6 603.5 603.1 603.7 603.5 603.2 603.1 603.0 603.0 603.0 603.0 602.8 602.7 602.4 602.3 602.4 602.2 602.3 602.3 602.1 602.0 601.9 601.8 601.7

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

FINAL AS-BUILT
PLAN VIEW, PROFILE, AND CROSSVANES
SHEET 1 OF 8
FOR
SOUTH FORK OF CANE CREEK
RESTORATION
NC ECOSYSTEM ENHANCEMENT PROGRAM

BACKWATER ENVIRONMENTAL
TOWN OF LIBERTY ~ ALAMANCE COUNTY ~ NORTH CAROLINA

AUGUST 1, 2007 SCALE : 1 INCH = 20 FEET
DATUM NAD 83 AS PROVIDED BY ENGINEER
PREPARED BY
LAND SERVICES
CHARLES ODELL ELASON, PLS ~ 3599
132 NORTH CHATHAM AVENUE, SILER CITY, N.C. 27344
(919)663-2708

NORTH CAROLINA PROFESSIONAL SEAL L-3599 LAND SURVEYOR CHARLES ELASON

CONTROL POINT DATA – PROJECT DATUM:

NORTHING	EASTING	ELEVATION
765929.2518	1865822.6701	607.32'
766900.9498	1868541.1448	602.07'

UNITS IN US FEET
POINTS WERE ESTABLISHED BY ENGINEER BY STATIC GPS OBSERVATIONS AND PROCESSED BY OPUS.

30 0 15 30 60
1 INCH = 30 FEET

DESIGN BANK FULL
AS-BUILT RIGHT BANK FULL
AS-BUILT LEFT BANK FULL
DESIGN INVERT
AS-BUILT INVERT

ALSM JOB # 070502

P.C. = 7+67.79

PRC = 8+32.07

PRC = 8+93.99

X-SECT 5 8+93.99

PRC = 9+55.79

X-SECT 6 9+23.87

PRC = 10+22.93

V-CHANNEL

PRC = 10+75.18

PRC = 11+14.77

PRC = 12+40.99

PRC = 12+95.34

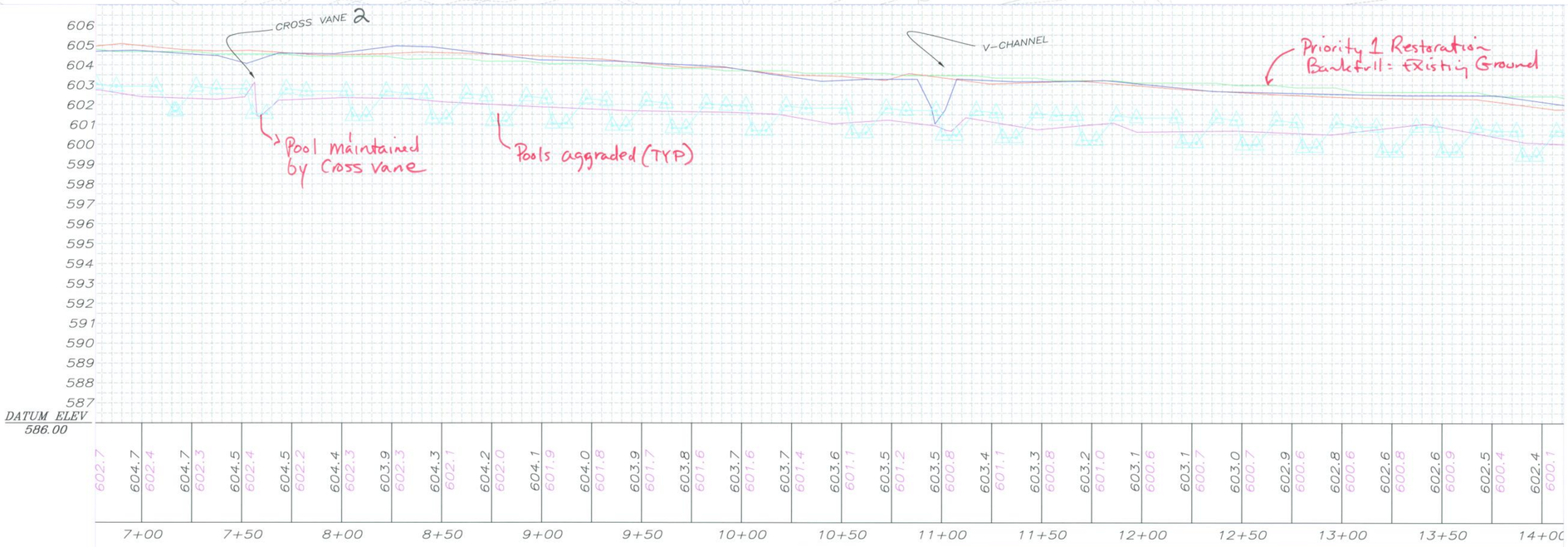
PRC = 11+88.51

P.T. = 7+36.45

PRC = 6+78.89

CROSS VANE 2

AS-BUILT FLOOD PLAIN ELEVATIONS, TYPICAL



FINAL AS-BUILT
PLAN VIEW, PROFILE, AND CROSSVANES
SHEET 2 OF 8
FOR
SOUTH FORK OF CANE CREEK RESTORATION
NC ECOSYSTEM ENHANCEMENT PROGRAM

BACKWATER ENVIRONMENTAL
TOWN OF LIBERTY ~ ALAMANCE COUNTY ~ NORTH CAROLINA

20 0 10 20 40 80

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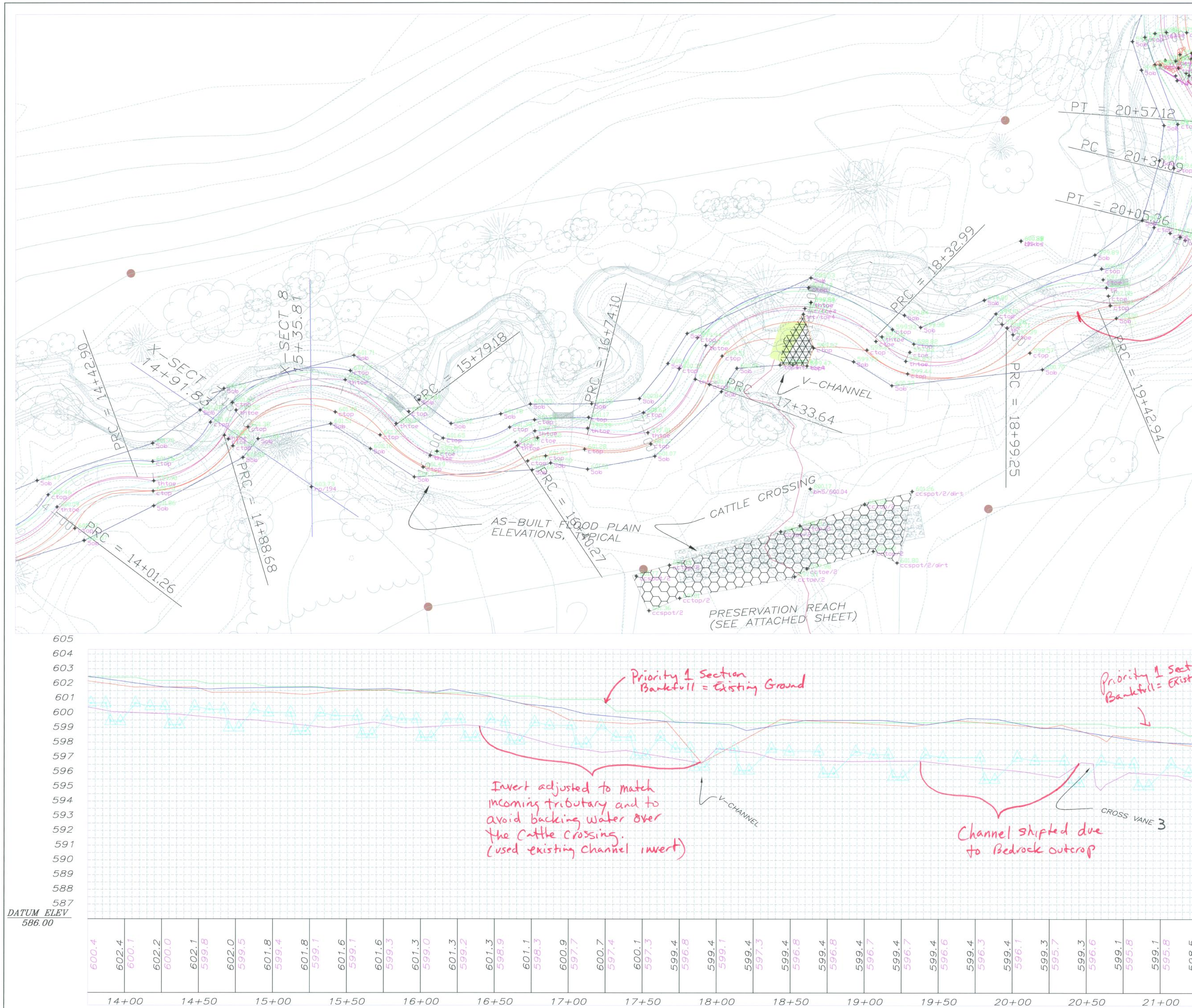
30 0 15 30 60

1 INCH = 30 FEET

NORTH CAROLINA PROFESSIONAL SEAL L-3599 LAND SURVEYOR CHARLES O. ELIASON 01/04/2008

DESIGN BANK FULL
AS-BUILT RIGHT BANK FULL
AS-BUILT LEFT BANK FULL
DESIGN INVERT
AS-BUILT INVERT


CROSS VANE 3
Cross Vane shifted upstream during review with designer
PT = 20+57.12
PC = 20+30.09
PT = 20+05.36
PRC = 18+32.99
PRC = 19+42.94
PRC = 18+99.25
PRC = 17+33.64
V-CHANNEL
Channel Shifted due to Bedrock outcrop
PRC = 16+74.10
PRC = 15+79.18
PRC = 16+00.27
X-SECT 8
15+35.81
X-SECT 7
14+91.83
PRC = 14+42.90
PRC = 14+88.68
PRC = 14+01.26
AS-BUILT FLOOD PLAIN ELEVATIONS, TYPICAL
CATTLE CROSSING
PRESERVATION REACH (SEE ATTACHED SHEET)
Priority 1 Section Bankfull = Existing Ground
Invert adjusted to match incoming tributary and to avoid backing water over the cattle crossing. (used existing channel invert)
V-CHANNEL
Channel shifted due to Bedrock outcrop
CROSS VANE 3
DATUM ELEV 586.00
14+00
14+50
15+00
15+50
16+00
16+50
17+00
17+50
18+00
18+50
19+00
19+50
20+00
20+50
21+00

FINAL AS-BUILT

PLAN VIEW, PROFILE, AND CROSSVANES
SHEET 3 OF 8
FOR
SOUTH FORK OF CANE CREEK RESTORATION

NC ECOSYSTEM ENHANCEMENT PROGRAM

BACKWATER ENVIRONMENTAL
TOWN OF LIBERTY ~ ALAMANCE COUNTY ~ NORTH CAROLINA

20 0 10 20 40 80

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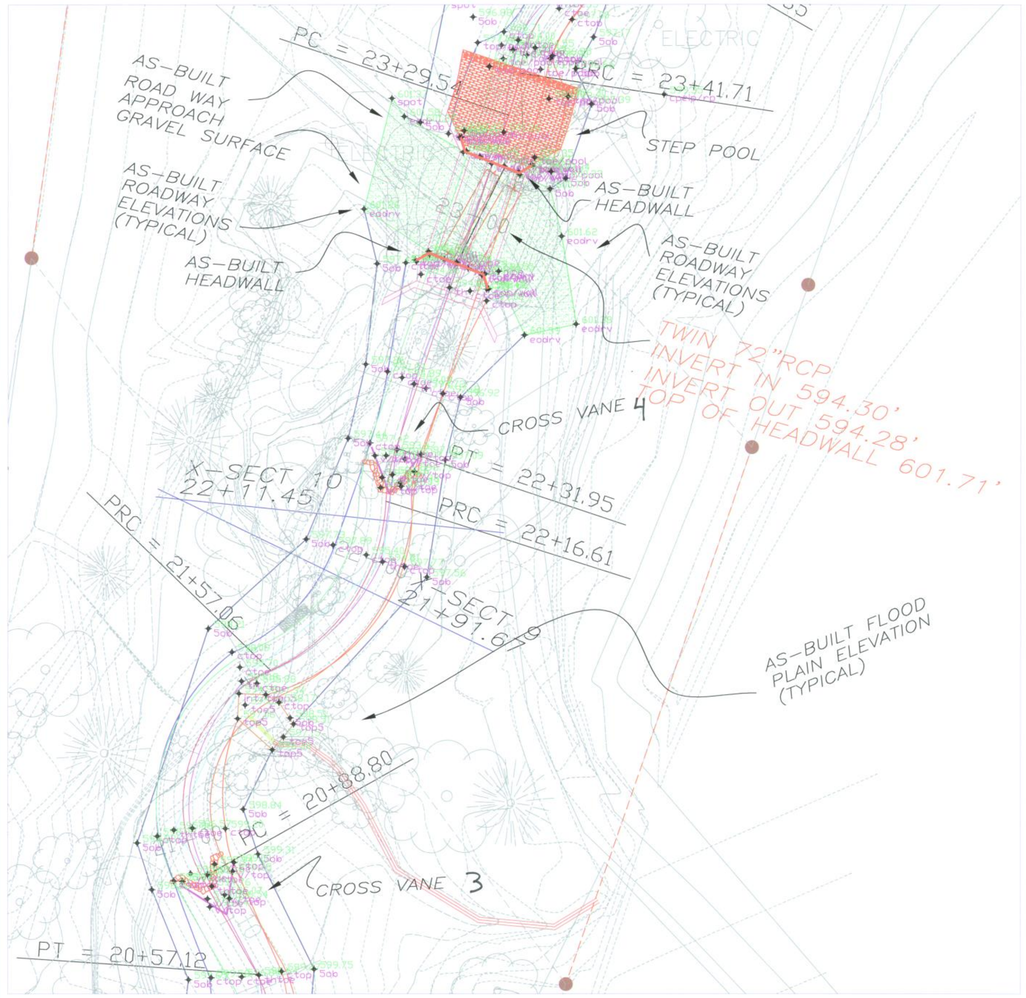
NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-3599 CHARLES O. ELIASON
01/10/2008

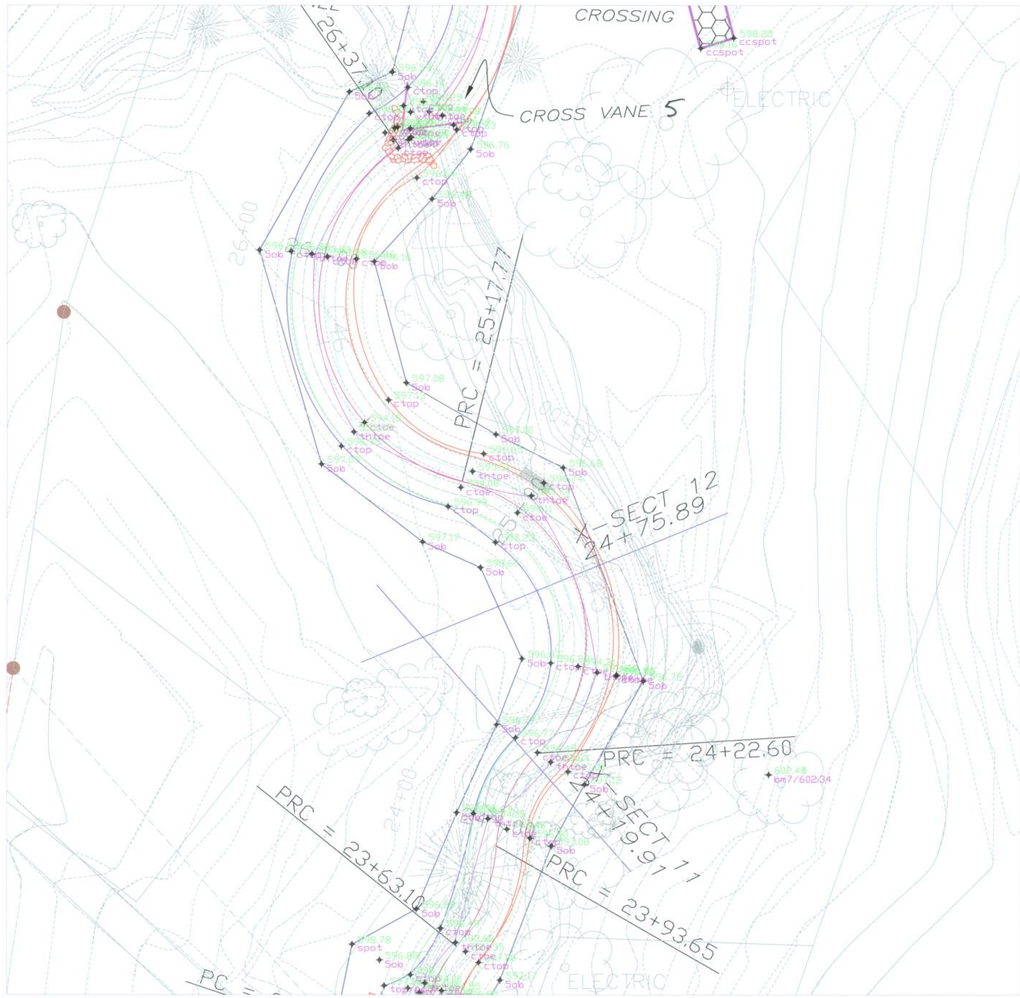
30 0 15 30 60

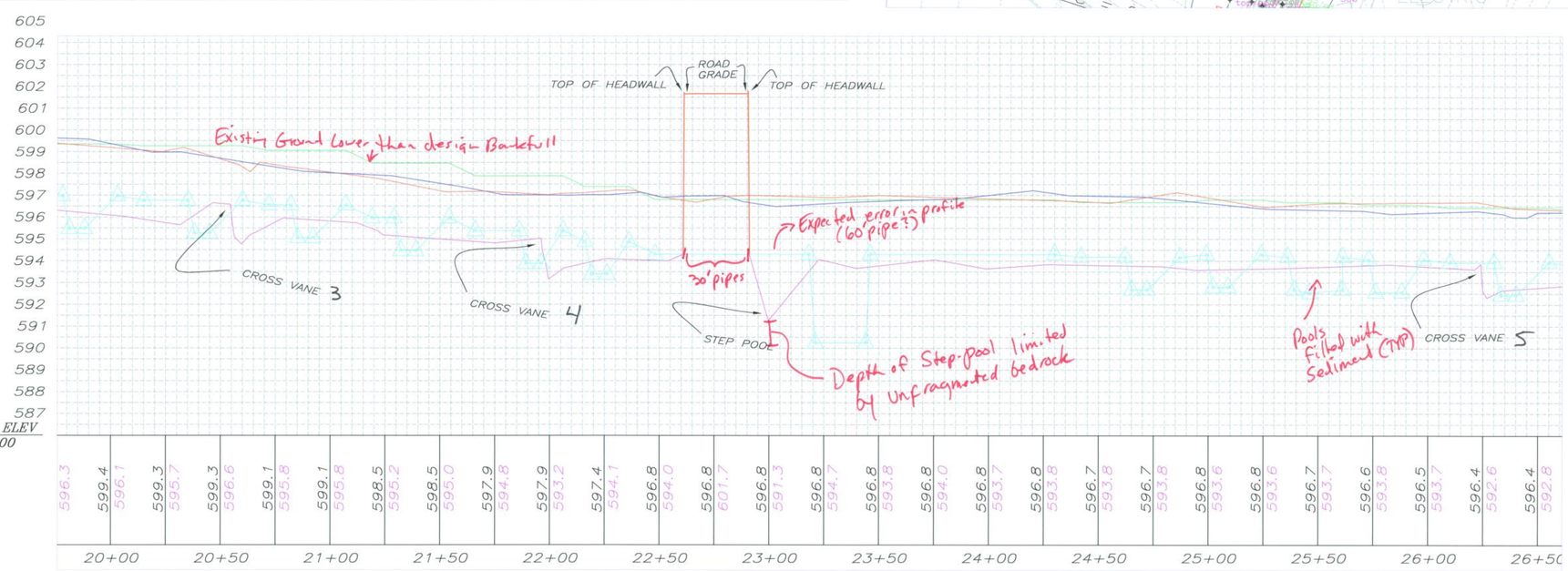
1 INCH = 30 FEET

DESIGN BANK FULL
AS-BUILT RIGHT BANK FULL
AS-BUILT LEFT BANK FULL
DESIGN INVERT
AS-BUILT INVERT

ALSM JOB # 070302







FINAL AS-BUILT
PLAN VIEW, PROFILE, AND CROSSVANES
SHEET 4 OF 8
FOR
SOUTH FORK OF CANE CREEK RESTORATION
NC ECOSYSTEM ENHANCEMENT PROGRAM

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TOWN OF LIBERTY ~ ALAMANCE COUNTY ~ NORTH CAROLINA

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132 NORTH CHATHAM AVENUE, SILER CITY, N.C. 27344
(919)663-2708

CONTROL POINT DATA - PROJECT DATUM:

NORTHING	EASTING	ELEVATION
765929.2518	1865822.6701	607.32'
766900.9498	1868541.1448	602.07'

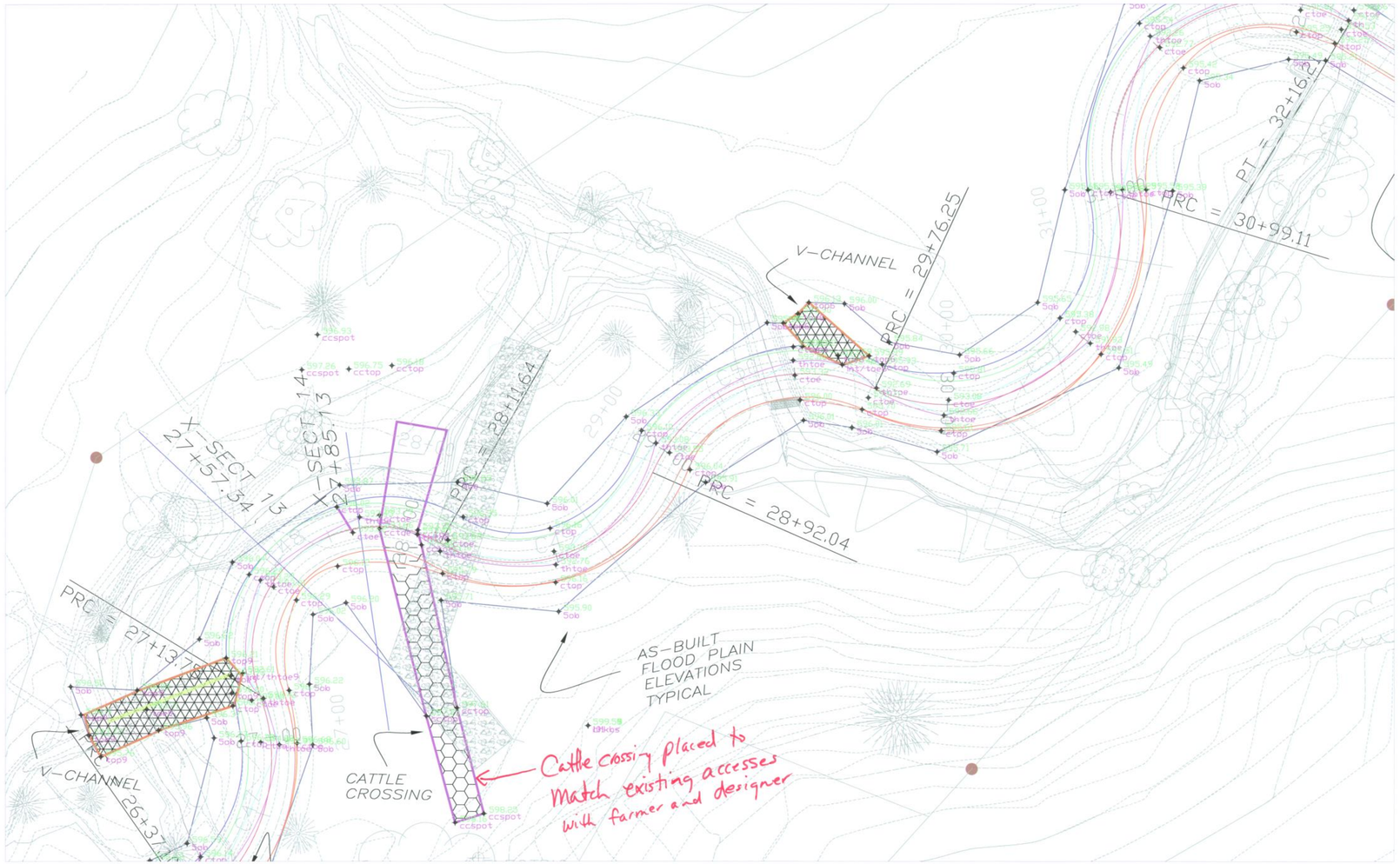
UNITS IN US FEET
POINTS WERE ESTABLISHED BY ENGINEER BY STATIC GPS OBSERVATIONS AND PROCESSED BY OPUS.

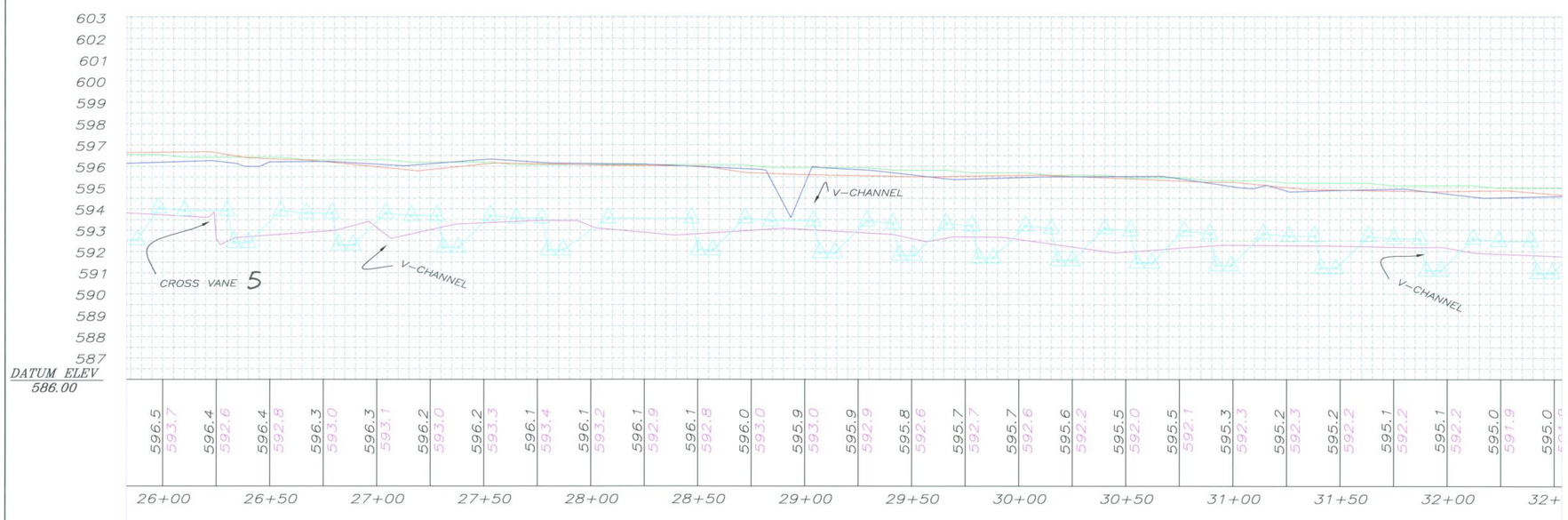
1 INCH = 30 FEET

NORTH CAROLINA PROFESSIONAL SEAL 3599 LAND SURVEYOR CHARLES O. ELIASON
01/01/2009

DESIGN BANK FULL
AS-BUILT RIGHT BANK FULL
AS-BUILT LEFT BANK FULL
DESIGN INVERT
AS-BUILT INVERT

ALSM JOB # 070302





FINAL AS-BUILT
PLAN VIEW, PROFILE, AND CROSSVANES
SHEET 5 OF 8
FOR
SOUTH FORK OF CANE CREEK
RESTORATION
NC ECOSYSTEM ENHANCEMENT PROGRAM

BACKWATER ENVIRONMENTAL
TOWN OF LIBERTY ~ ALAMANCE COUNTY ~ NORTH CAROLINA

20 0 10 20 40 80

AUGUST 1, 2007 SCALE : 1 INCH = 20 FEET
DATUM NAD 83 AS PROVIDED BY ENGINEER

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CHARLES ODELL ELIASON, PLS - 3599
132 NORTH CHATHAM AVENUE, SILER CITY, N.C. 27344
(919)663-2708

CONTROL POINT DATA - PROJECT DATUM:

NORTHING	EASTING	ELEVATION
765929.2518	1865822.6701	607.32'
766900.9498	1868541.1448	602.07'

UNITS IN US FEET
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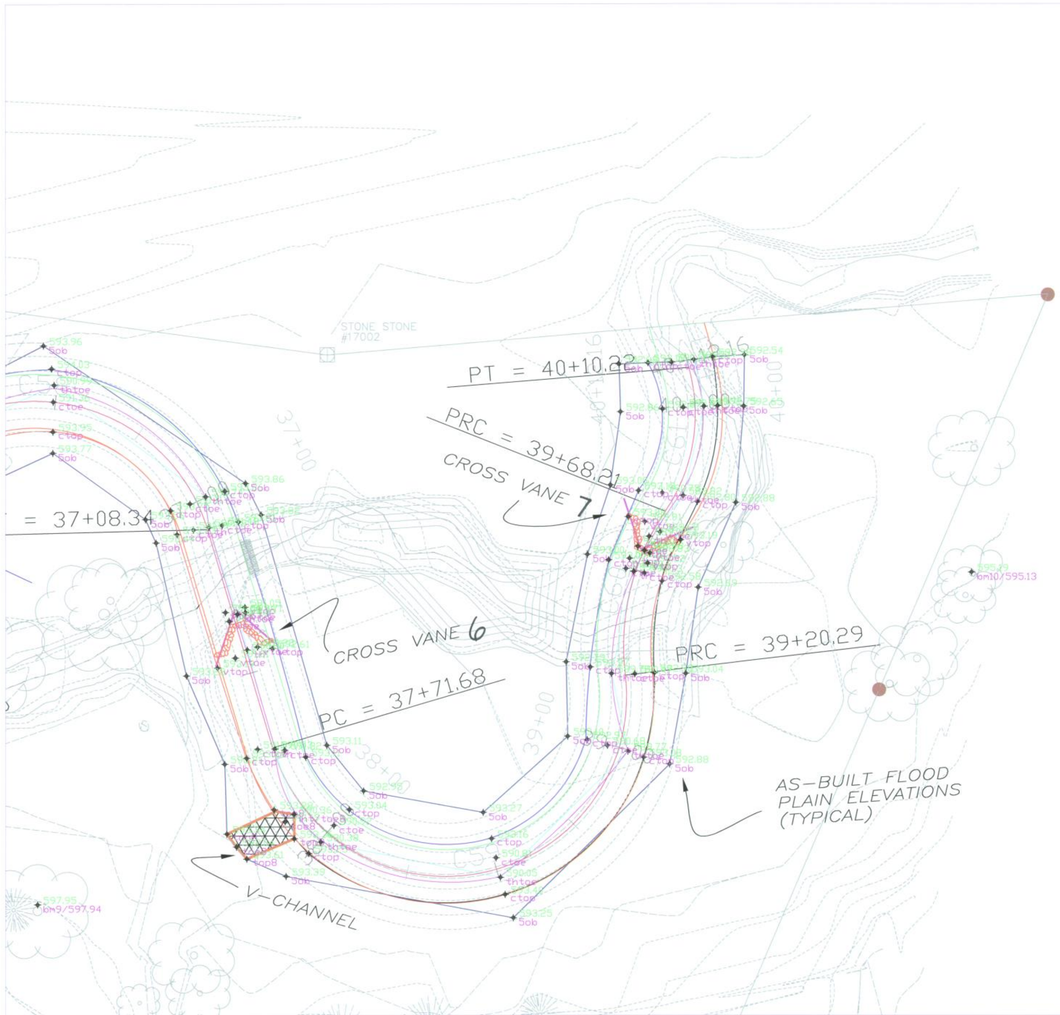
NORTH CAROLINA PROFESSIONAL SEAL L-3599 LAND SURVEYOR CHARLES O. ELIASON
01/07/2008

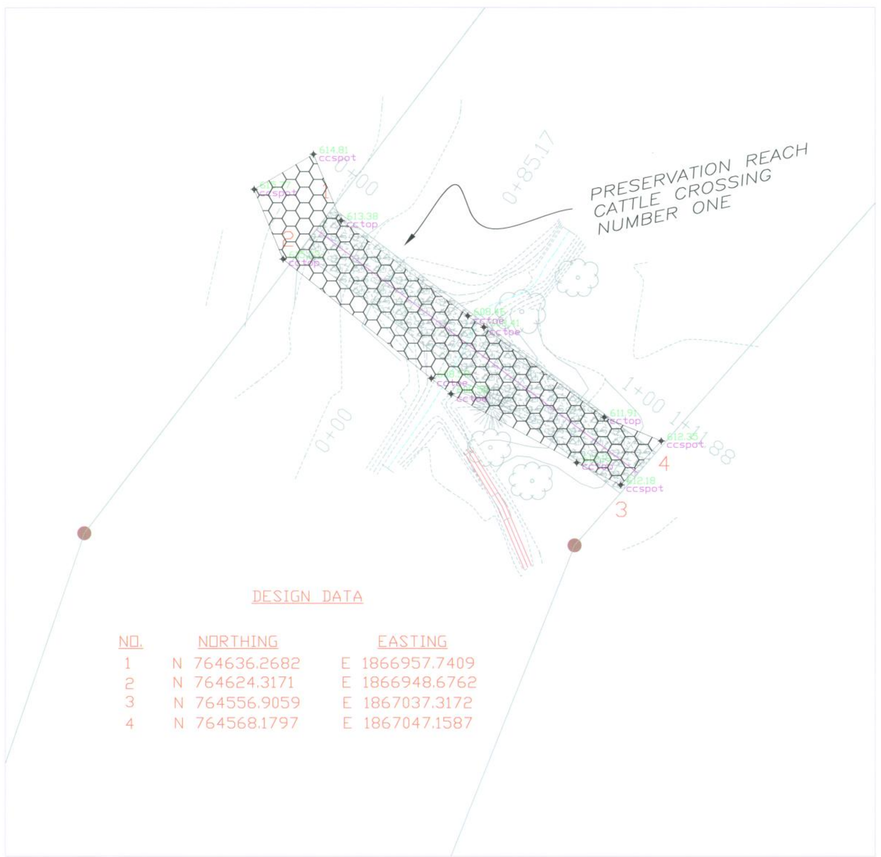
30 0 15 30 60

1 INCH = 30 FEET

DESIGN BANK FULL
AS-BUILT RIGHT BANK FULL
AS-BUILT LEFT BANK FULL
DESIGN INVERT
AS-BUILT INVERT

ALSW JOB # 070302





DESIGN DATA

NO.	NORTHING	EASTING
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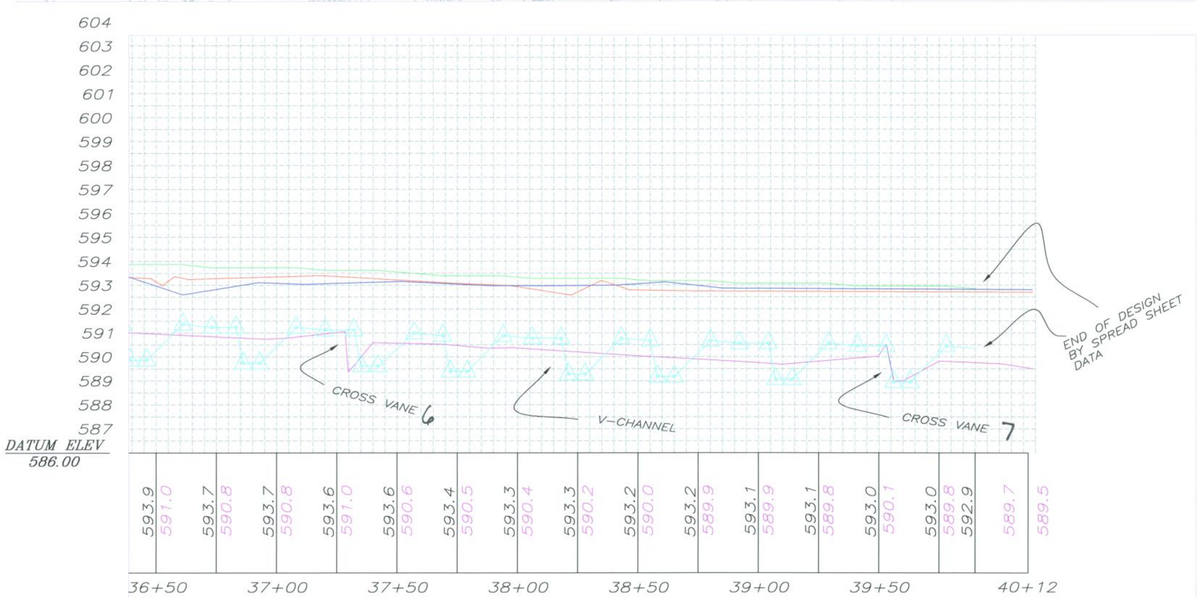
2	N 764624.3171	E 1866948.6762
3	N 764556.9059	E 1867037.3172
4	N 764568.1797	E 1867047.1587



FINAL AS-BUILT
PLAN VIEW, PROFILE, AND CROSSVANES
SHEET 7 OF 8
FOR
SOUTH FORK OF CANE CREEK
RESTORATION
NC ECOSYSTEM ENHANCEMENT PROGRAM

BACKWATER ENVIRONMENTAL
TOWN OF LIBERTY ~ ALAMANCE COUNTY ~ NORTH CAROLINA

20 0 10 20 40 80

AUGUST 1, 2007 SCALE : 1 INCH = 20 FEET
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132 NORTH CHATHAM AVENUE, SILER CITY, N.C. 27344
(919)663-2708

30 0 15 30 60

1 INCH = 30 FEET

NORTH CAROLINA PROFESSIONAL SEAL 3599 LAND SURVEYOR CHARLES O. ELIASON

01/01/2008

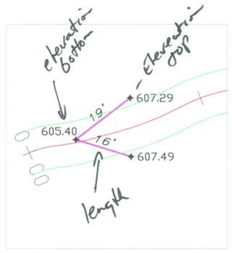
CONTROL POINT DATA - PROJECT DATUM:

NORTHING	EASTING	ELEVATION
765929.2518	1865822.6701	607.32'
766900.9498	1868541.1448	602.07'

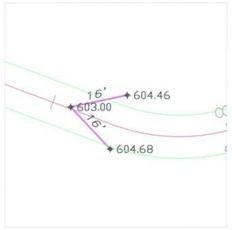
UNITS IN US FEET
POINTS WERE ESTABLISHED BY ENGINEER BY STATIC GPS OBSERVATIONS AND PROCESSED BY OPUS.

DESIGN BANK FULL
AS-BUILT RIGHT BANK FULL
AS-BUILT LEFT BANK FULL
DESIGN INVERT
AS-BUILT INVERT

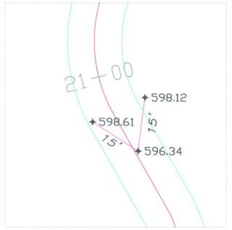
ALSM JOB # 070302



CROSS VANE ONE

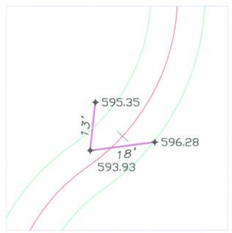


CROSS VANE TWO



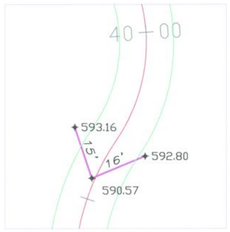
CROSS VANE THREE

CROSS VANE FOUR



CROSS VANE FIVE

CROSS VANE SIX



CROSS VANE SEVEN

FINAL AS-BUILT
PLAN VIEW DETAIL CROSSVANES
SHEET 8 OF 8
FOR
SOUTH FORK OF CANE CREEK
RESTORATION
NC ECOSYSTEM ENHANCEMENT PROGRAM

BACKWATER ENVIRONMENTAL
TOWN OF LIBERTY ~ ALAMANCE COUNTY ~ NORTH CAROLINA

20 0 10 20 40 80

AUGUST 1, 2007 SCALE : 1 INCH = 20 FEET

PREPARED BY
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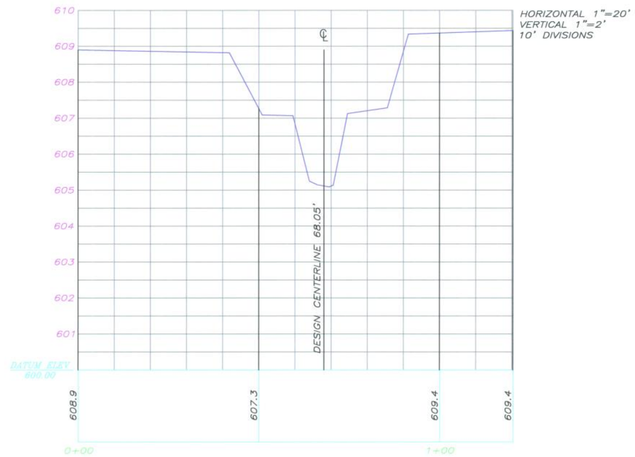
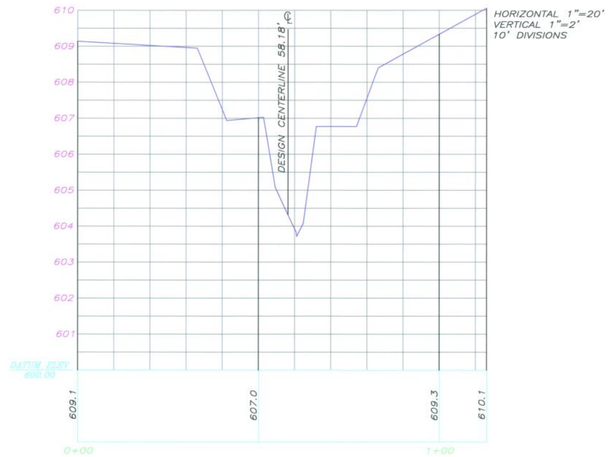
CHARLES ODELL ELIASON, PLS - 3599
132 NORTH CHATHAM AVENUE, SILER CITY, N.C. 27344
(919)663-2708

ALSM JOB # 070302



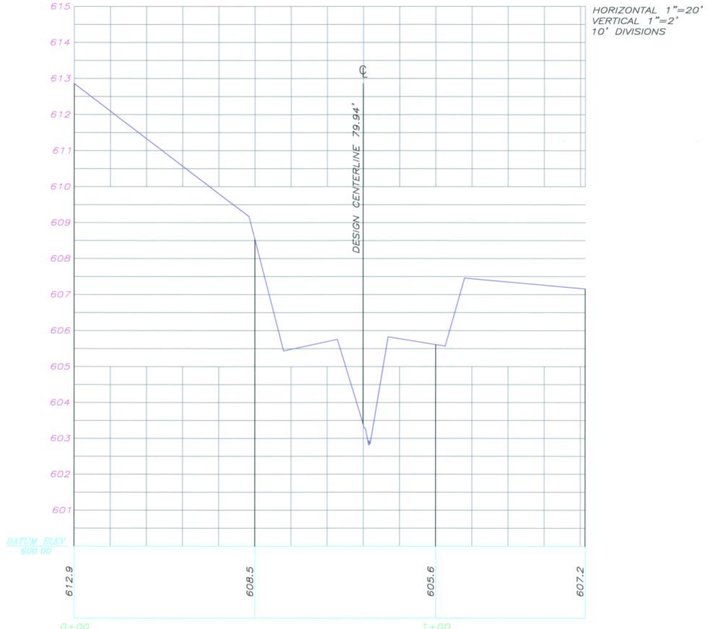
CROSS SECTION ONE, STATION 0+90.34

Point	Station	Offset	Elevation	Northing	Easting
6064	0.00	0.00	608.90	766016.5040	1865914.9910
6065	41.87	0.08	608.82	765974.8600	1865910.6120
6066	50.95	−0.07	607.09	765965.8180	1865909.8280
6067	59.44	−0.34	607.07	765957.3410	1865909.2270
6068	64.00	−0.27	605.25	765952.8180	1865908.6920
6069	70.62	−0.49	605.14	765946.2030	1865908.2280
6070	74.56	−0.98	607.13	765942.2370	1865908.3140
6071	85.59	−0.37	607.29	765931.3260	1865906.5770
6072	91.39	−0.53	609.34	765925.5450	1865906.141
6073	120.43	−0.00	609.44	765896.7120	1865902.6330
6343	66.15	−0.18	605.15	765950.6800	1865908.3800
6345	69.48	0.14	605.09	765947.4080	1865907.7250



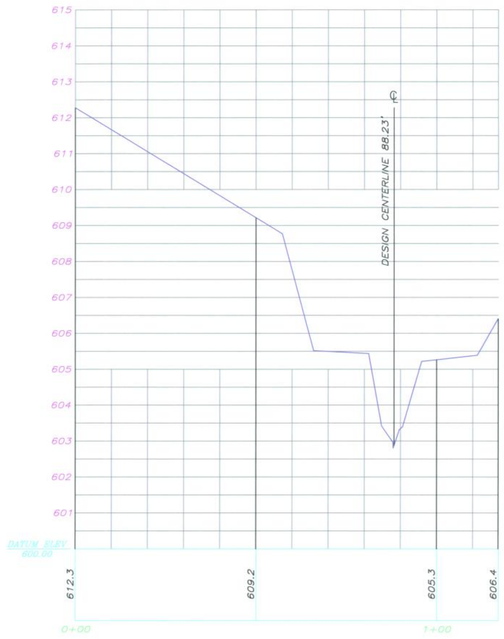
CROSS SECTION TWO, STATION 1+15.84

6063	0.00	0.00	609.14	766004.3620	1865902.2040
6062	33.10	0.67	608.95	765975.7120	1865918.7880
6061	41.22	0.92	606.94	765968.6420	1865922.7900
6060	51.39	0.81	607.03	765959.9980	1865928.1530
6059	54.63	1.55	605.09	765956.8460	1865929.2040
6058	58.89	1.55	604.16	765953.1980	1865931.4120
6057	62.39	0.87	604.07	765950.5640	1865933.8030
6056	65.99	0.46	606.77	765947.7010	1865936.0280
6055	77.07	0.31	606.77	765938.2970	1865941.8960
6054	83.09	0.43	608.40	765933.0950	1865944.9210
6053	113.09	0.00	610.06	765907.6580	1865960.84
6346	60.41	1.56	603.84	765951.9000	1865932.1940
6020	60.56	1.66	603.71	765951.7140	1865932.1870



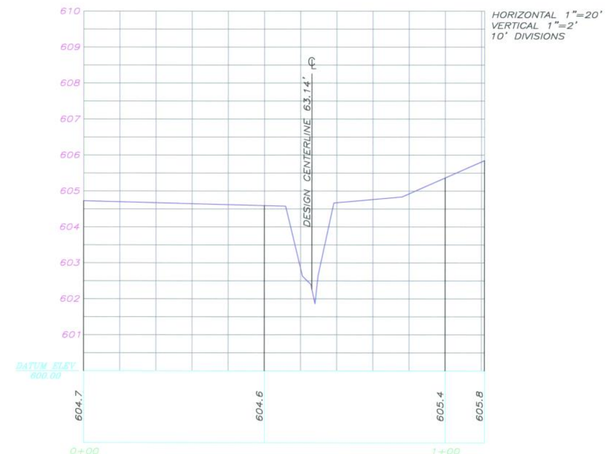
CROSS SECTION THREE, STATION 5+22.23

6145	0.00	0.00	612.86	766069.6270	1866300.7100
6146	48.37	0.07	609.17	766024.3640	1866283.6590
6147	57.94	−0.35	605.44	766015.2580	1866280.6920
6148	72.79	−0.42	605.76	766001.3210	1866275.5450
6149	80.17	−0.05	603.32	765994.5440	1866272.6120
6150	81.61	−0.13	602.94	765993.1660	1866272.1790
6152	86.85	−0.21	605.83	765988.2340	1866270.4120
6153	102.63	0.11	605.57	765973.5680	1866264.5750
6154	107.96	0.26	607.46	765968.6340	1866262.5580
6155	141.33	0.00	607.16	765937.2920	1866251.0880
6349	79.38	−0.06	603.60	765995.2790	1866272.8960
6347	80.68	−0.41	603.25	765993.9410	1866272.7630
6041	81.49	−0.33	602.81	765993.2050	1866272.4100
6348	81.86	−0.44	602.84	765992.8220	1866272.3750



CROSS SECTION FOUR, STATION 5+55.01

6165	0.00	0.00	612.28	766074.4420	1866274.6240
6164	57.31	0.41	608.77	766020.5100	1866294.0250
6163	65.96	0.52	605.52	766012.3570	1866296.9030
6162	81.19	0.15	605.44	765998.1940	1866302.5120
6161	84.77	−0.19	603.42	765994.9480	1866304.0670
6160	90.58	−0.03	603.40	765989.4380	1866305.9210
6159	95.86	−0.25	605.22	765984.5600	1866307.9510
6158	111.27	−0.00	605.39	765970.0110	1866313.0360
6157	117.06	−0.00	606.41	765964.5780	1866315.0340
6352	89.70	−0.30	603.32	765990.3620	1866305.8670
6351	87.91	−0.11	602.97	765991.9710	1866305.0720
6042	87.96	−0.43	602.80	765992.0360	1866305.3940



CROSS SECTION FIVE, STATION 8+93.99

Point	Station	Offset	Elevation	Northing	Easting
6178	0.00	0.00	604.73	766024.3360	1866641.0780
6181	55.85	0.73	604.58	765980.5560	1866606.3950
6353	60.53	0.67	602.63	765976.8080	1866603.5910
6182	62.85	0.77	602.40	765975.0390	1866602.0920
6354	64.00	0.77	601.86	765974.1250	1866601.3930
6183	64.87	0.78	602.65	765973.4340	1866600.8500
6187	69.19	0.61	604.67	765969.9170	1866598.3450
6188	88.10	0.95	604.84	765955.1420	1866586.5300
6189	110.86	0.00	605.85	765936.5450	1866573.3870

CONTROL POINT DATA – PROJECT DATUM

NORTHING	EASTING	ELEVATION
765929.2518	1865822.6701	607.32
766900.9498	1868541.1448	602.07

UNITS IN US FEET
POINTS WERE ESTABLISHED BY ENGINEER BY STATIC GPS OBSERVATIONS AND PROCESSED BY OPUS.

FINAL AS–BUILT
CROSS SECTIONAL PROFILE
SHEET 1 OF 3
FOR
SOUTH FORK OF CANE CREEK RESTORATION

NC ECOSYSTEM ENHANCEMENT PROGRAM

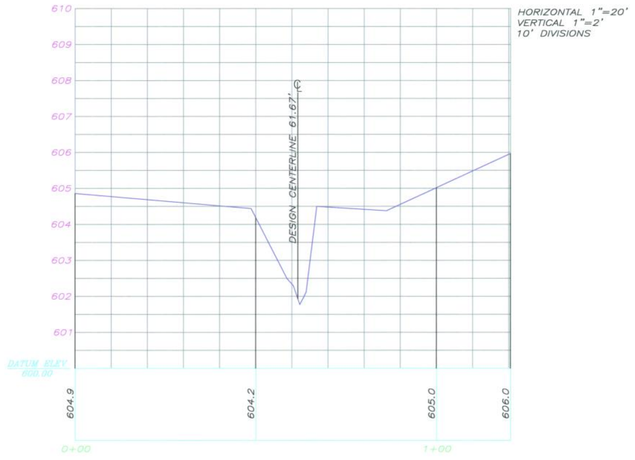
BACKWATER ENVIRONMENTAL
TOWN OF LIBERTY ~ ALAMANCE COUNTY ~ NORTH CAROLINA

20 0 10 20 40 80

AUGUST 1, 2007 SCALE 1"=20'
DATUM NAD 83 AS PROVIDED BY ENGINEER
PREPARED BY

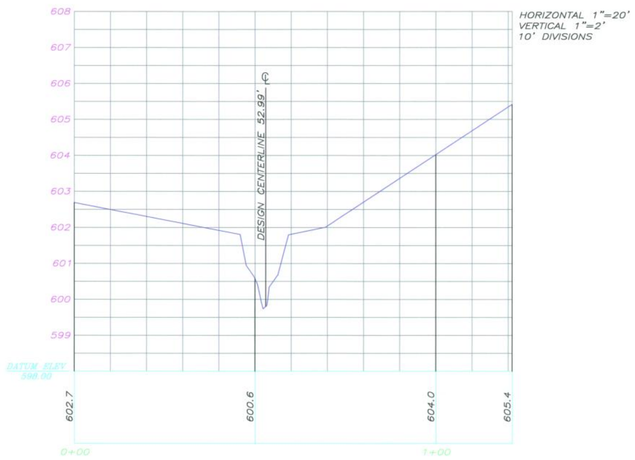
LAND SERVICES
CHARLES ODELL ELIASON, PLS – 3599
(919)663–2708
MAILING ADDRESS ~ 132 NORTH CHATHAM AVENUE, SILER CITY, N.C. 27344

ALSM JOB # 070302



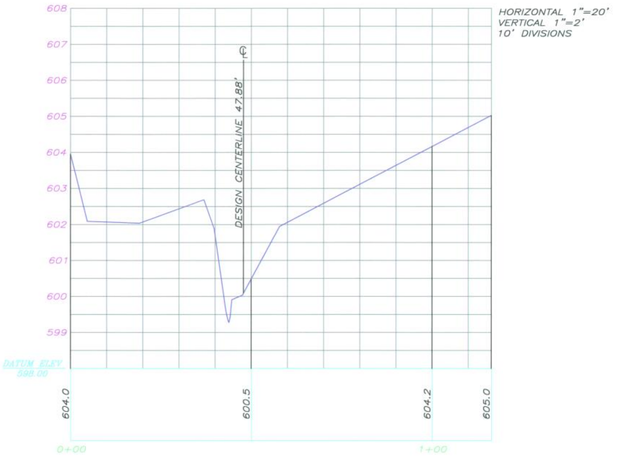
CROSS SECTION SIX, 9+23.87

Point	Station	Offset	Elevation	Northing	Easting
6179	0.00	0.00	604.86	766027.5070	1866625.9820
6180	48.73	−1.08	604.44	765979.0060	1866630.8480
6355	58.70	−1.03	602.49	765969.0620	1866631.5760
6184	60.40	−1.12	602.30	765967.3780	1866631.8040
6356	62.20	−1.05	601.77	765965.5740	1866631.8690
6185	63.25	−1.27	601.97	765964.5460	1866632.1740
6357	63.96	−1.13	602.12	765963.8330	1866632.0870
6186	66.88	−1.58	604.50	765960.9560	1866632.7680
6191	86.23	−0.93	604.38	765941.6110	1866633.6200
6190	120.50	−0.00	605.97	765907.3760	1866635.3620



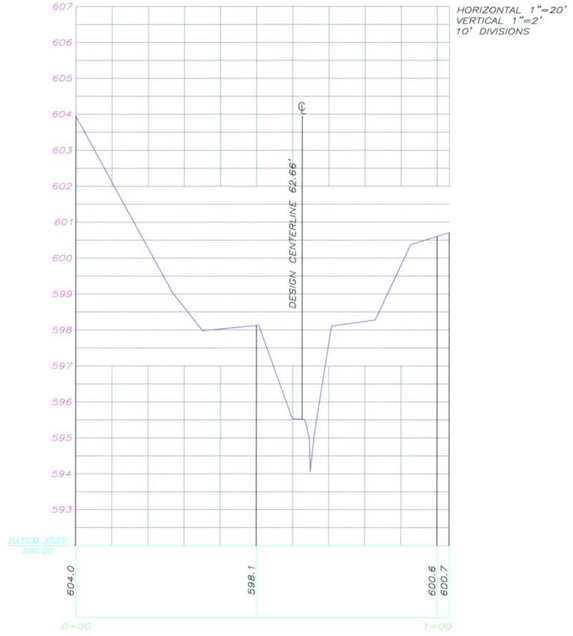
CROSS SECTION SEVEN, STATION 14+91.93

Point	Station	Offset	Elevation	Northing	Easting
6220	45.91	0.48	601.81	766161.2440	1867092.0240
6360	47.57	−0.78	600.95	766161.3480	1867094.0960
6217	49.91	0.42	600.61	766159.0390	1867095.3620
6361	50.75	−0.38	600.40	766159.2340	1867096.5060
6364	51.80	−0.32	599.90	766158.5900	1867097.3400
6362	52.25	−0.27	599.74	766158.2980	1867097.6860
6365	53.30	−0.11	599.84	766157.5780	1867098.4620
6363	53.91	−0.48	600.34	766157.5400	1867099.1810
6218	56.30	0.28	600.68	766155.5620	1867100.7280
6219	59.28	0.21	601.80	766153.9480	1867103.2280
6212	69.52	0.45	602.01	766147.9950	1867111.5690
6210	124.12	0.00	605.42	766117.6760	1867156.9720



CROSS SECTION EIGHT, STATION 15+35.81

6224	0.00	0.00	603.96	766225.1070	1867135.1630
6223	4.63	−0.30	602.09	766220.4770	1867135.5040
6222	19.06	−0.41	602.04	766206.0560	1867135.7550
6221	39.72	−0.15	601.89	766185.3860	1867135.6840
6216	43.01	0.10	599.60	766182.1030	1867135.4730
6366	43.59	−0.52	599.33	766181.5220	1867136.0990
6207	43.83	0.01	599.28	766181.2790	1867135.5690
6367	44.21	−0.45	599.45	766180.9030	1867136.0310
6368	44.63	−0.55	599.91	766180.4880	1867136.1380
6215	47.61	0.02	600.04	766177.5020	1867135.5900
6214	57.86	−0.26	601.95	766167.2490	1867135.9670
6225	36.90	81.19	602.69	766187.4440	1867054.3210
6211	116.41	−0.00	605.03	766108.7050	1867136.2640



CROSS SECTION NINE, STATION 21+91.67

6285	0.00	0.00	603.95	766431.6690	1867511.3150
6289	26.78	−2.70	599.04	766422.3770	1867536.5750
6290	35.11	−2.63	597.98	766418.6660	1867544.0390
6291	50.59	−2.02	598.13	766411.3420	1867557.6910
6292	59.94	−1.85	595.54	766407.0970	1867566.0230
6372	63.38	−1.54	595.51	766405.3120	1867568.9780
6374	64.65	−1.45	595.01	766404.6720	1867570.0790
6373	64.91	−1.32	594.96	766404.4470	1867570.2590
6293	66.00	−1.47	595.10	766404.1040	1867571.2970
6294	70.78	−1.43	598.11	766401.9790	1867575.5830
6295	82.90	−1.06	598.28	766396.3340	1867586.3200
6296	92.70	−0.40	600.38	766391.4540	1867594.8430
6297	103.36	−0.00	600.71	766386.4320	1867604.2450

CROSS SECTION TEN, STATION 22+11.45

6287	0.00	0.00	603.94	766429.4550	1867510.7290
6288	12.25	−0.68	599.12	766428.8630	1867522.9800
6282	27.87	−1.90	599.12	766428.4640	1867538.6510
6281	38.48	−1.21	597.69	766426.6770	1867549.1310
6280	53.48	−0.98	597.67	766424.8960	1867564.0260
6370	60.07	−0.97	595.70	766424.2070	1867570.5790
6279	61.09	−0.87	595.06	766424.0040	1867571.5820
6371	63.83	−0.50	594.86	766423.3510	1867574.2710
6267	64.83	−0.55	594.78	766423.2960	1867575.2730
6278	66.47	−0.68	594.82	766423.2630	1867576.9110
6277	73.00	−0.44	597.72	766422.3460	1867583.3850
6276	86.25	−0.08	597.59	766420.6170	1867596.5280
6275	96.75	0.00	601.59	766419.4520	1867606.9600

CONTROL POINT DATA – PROJECT DATUM

NORTHING	EASTING	ELEVATION
765929.2518	1865822.6701	607.32
766900.9498	1868541.1448	602.07

UNITS IN US FEET
POINTS WERE ESTABLISHED BY ENGINEER BY STATIC GPS OBSERVATIONS AND PROCESSED BY OPUS.

FINAL AS-BUILT
CROSS SECTIONAL PROFILE
SHEET 2 OF 3
FOR
SOUTH FORK OF CANE CREEK RESTORATION

NC ECOSYSTEM ENHANCEMENT PROGRAM

BACKWATER ENVIRONMENTAL
TOWN OF LIBERTY ~ ALAMANCE COUNTY ~ NORTH CAROLINA

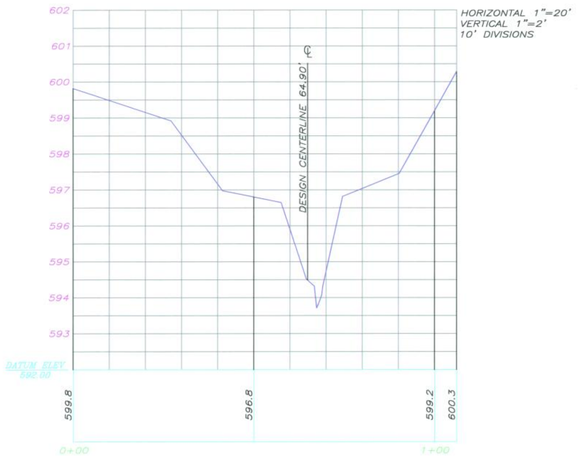
20 0 10 20 40 80

AUGUST 1, 2007 SCALE 1"=20'
DATUM NAD 83 AS PROVIDED BY ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL L-3599 LAND SURVEYOR CHARLES O. ELIASON
01/07/2008

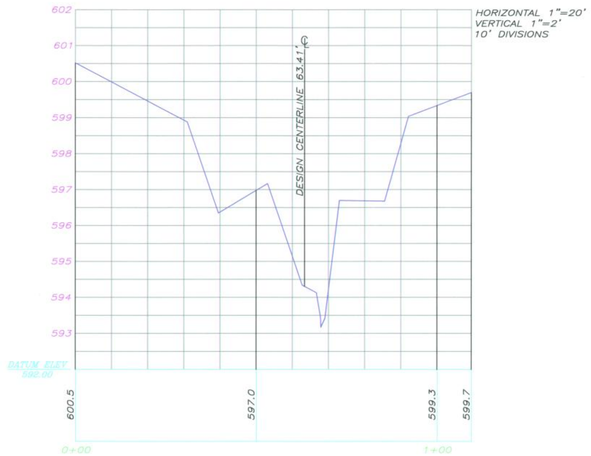
PREPARED BY
LAND SERVICES
CHARLES ODELL ELIASON, PLS ~ 3599
(919)663-2708
MAILING ADDRESS ~ 132 NORTH CHATHAM AVENUE, SILER CITY, N.C. 27344

ALSW JOB # 070302



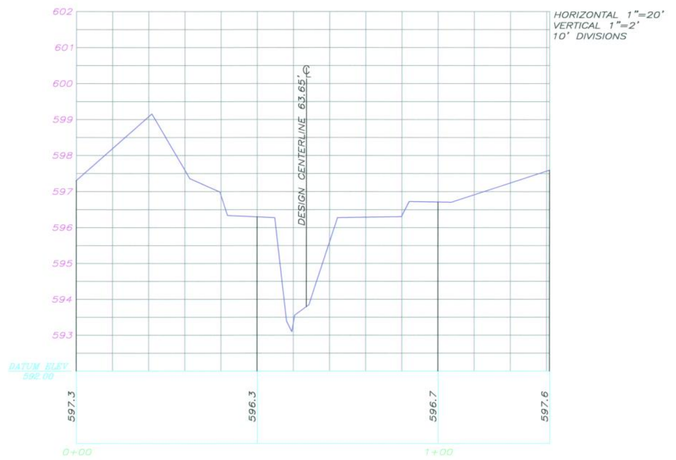
CROSS SECTION ELEVEN, STATION 24+19.91

6484	0.00	0.00	599.82	766667.1450	1867597.6390
6483	27.09	0.22	598.92	766646.7080	1867615.4240
6482	41.35	0.38	596.98	766635.9220	1867624.7500
6481	57.55	0.52	596.65	766623.6920	1867635.3720
6480	64.52	0.65	594.52	766618.3860	1867639.8990
6479	66.77	0.55	594.32	766616.7630	1867641.4650
6477	67.40	0.39	593.71	766616.3980	1867642.0020
6476	67.89	0.09	593.82	766616.2300	1867642.5460
6478	68.78	0.24	594.07	766615.4630	1867643.0210
6475	69.07	0.22	594.30	766615.2650	1867643.2320
6474	69.52	0.50	594.52	766614.7340	1867643.3230
6473	74.57	0.47	596.82	766610.9740	1867646.6900
6472	90.27	−0.16	597.46	766599.6340	1867657.5580
6471	106.15	0.00	600.29	766587.6300	1867667.9600



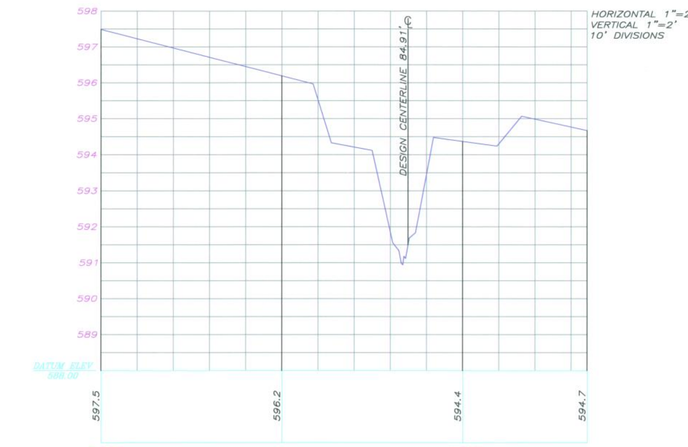
CROSS SECTION TWELVE, STATION 24+75.89

6485	0.00	0.00	600.52	766645.7680	1867593.3070
6486	30.97	−0.77	598.88	766658.2230	1867621.669
6487	39.55	−0.33	596.35	766661.0780	1867629.7770
6488	53.18	−0.32	597.17	766666.2380	1867642.3900
6489	62.72	−0.18	594.34	766669.7210	1867651.2720
6490	66.67	−0.51	594.13	766671.5280	1867654.7970
6491	67.82	−0.33	593.43	766671.8030	1867655.9320
6462	67.90	−0.41	593.17	766671.9000	1867655.9780
6492	69.02	−0.08	593.42	766672.0240	1867657.1350
6493	73.04	−0.40	596.70	766673.8460	1867660.7390
6494	85.54	−0.33	596.68	766678.5220	1867672.3250
6495	92.09	0.16	599.04	766680.5480	1867678.5810
6496	109.51	0.00	599.70	766687.3070	1867694.6340



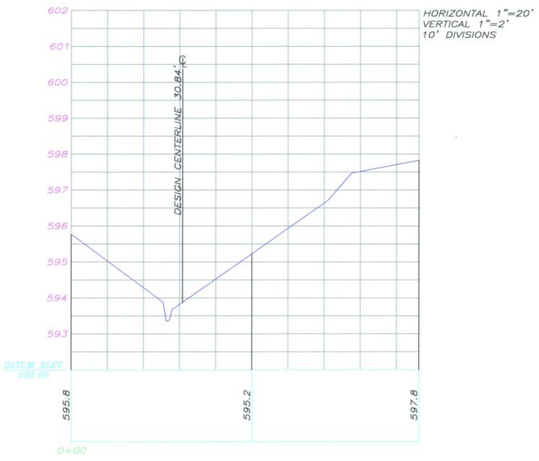
CROSS SECTION THIRTEEN, STATION 27+57.34

6506	0.00	0.00	597.31	766941.6000	1867586.3840
6507	20.88	−0.25	599.16	766927.4400	1867601.7290
6508	31.40	−0.55	597.36	766920.4350	1867609.5820
6509	39.73	−0.73	596.99	766914.8420	1867615.7590
6510	41.82	−0.76	596.34	766913.4250	1867617.3000
6511	54.87	−1.11	596.28	766904.7210	1867627.0260
6512	58.15	−1.39	593.40	766902.6690	1867629.6030
6513	59.61	−1.44	593.10	766901.6990	1867630.6990
6514	60.41	−1.46	593.56	766901.1700	1867631.2920
6515	64.35	−1.23	593.85	766898.2950	1867634.0040
6516	72.22	−1.15	596.28	766892.8320	1867639.6610
6517	89.95	−1.44	596.31	766880.8610	1867652.7470
6518	92.05	−1.37	596.73	766879.3750	1867654.2290
6519	103.73	−0.85	596.71	766870.9720	1867662.3640
6520	130.86	−0.00	597.60	766851.7220	1867681.4920



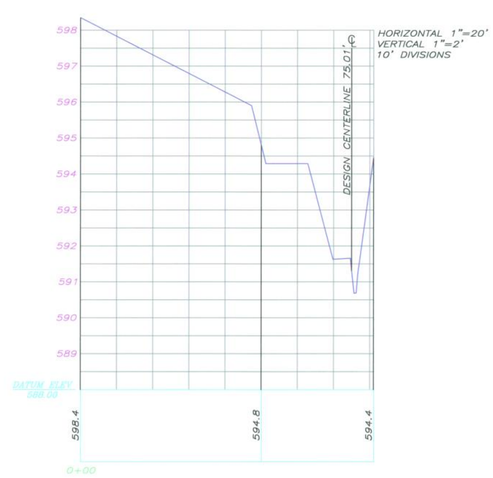
CROSS SECTION SIXTEEN, STATION 35+86.49

6641	0.00	0.00	597.49	767123.1451	1868226.2594
6640	58.65	0.20	595.97	767097.8395	1868279.1652
6639	63.68	0.55	594.33	767095.3662	1868283.5600
6637	74.96	0.47	594.12	767090.6062	1868293.7914
6636	80.67	0.58	591.56	767088.0535	1868298.8968
6635	82.37	0.52	591.34	767087.3800	1868300.4652
6638	83.08	1.12	590.98	767086.5314	1868300.8485
6624	83.49	0.10	590.94	767087.2807	1868301.6542
6634	83.77	0.94	591.18	767086.4015	1868301.5447
6633	84.24	0.68	591.12	767086.4385	1868302.0828
6632	85.25	0.81	591.69	767085.8855	1868302.9423
6631	86.98	0.49	591.84	767085.4370	1868304.6418
6630	91.94	0.42	594.48	767083.3781	1868309.1503
6629	109.50	0.33	594.24	767075.9315	1868325.0624
6628	116.35	0.60	595.07	767072.7465	1868331.1336
6627	134.45	−0.00	594.67	767065.5357	1868347.7458



CROSS SECTION FOURTEEN, STATION 27+85.13

6505	0.00	0.00	595.77	766941.2860	1867652.2590
6504	25.47	0.42	593.88	766916.0150	1867655.4620
6503	26.30	0.33	593.36	766915.2050	1867655.6730
6448	26.90	0.03	593.36	766914.6600	1867656.0550
6502	27.33	−0.51	593.41	766914.3030	1867656.6440
6501	27.87	−0.43	593.67	766913.7620	1867656.6450
6519	71.04	−0.01	596.71	766870.9720	1867662.3640
6499	77.60	0.01	597.47	766864.4720	1867663.2760
6498	96.25	0.00	597.83	766846.0150	1867665.9380



CROSS SECTION FIFTEEN, STATION 35+55.59

6642	0.00	0.00	598.35	767130.2351	1868247.0061
6643	47.31	0.52	595.90	767088.2093	1868268.7337
6644	51.27	0.31	594.29	767084.8094	1868270.7851
6645	62.87	0.27	594.29	767074.5843	1868276.2560
6646	69.82	0.25	591.63	767068.4543	1868279.5409
6647	74.63	0.49	591.66	767064.0952	1868281.5757
6648	75.34	0.43	591.00	767063.4951	1868281.9701
6649	75.65	0.51	590.68	767063.1865	1868282.0440
6622	76.27	0.22	590.69	767062.7705	1868282.5860
6650	76.65	−0.05	591.19	767062.5599	1868283.0053
6651	81.06	−0.00	594.47	767058.6458	1868285.0291

CONTROL POINT DATA – PROJECT DATUM

NORTHING	EASTING	ELEVATION
765929.2518	1865822.6701	607.32
766900.9498	1868541.1448	602.07

UNITS IN US FEET
POINTS WERE ESTABLISHED BY ENGINEER BY CONVENTIONAL GPS OBSERVATIONS AND PROCESSED BY OPUS

NORTH CAROLINA PROFESSIONAL SEAL L-3599 LAND SURVEYOR CHARLES O. ELIASON
01/10/2008

FINAL AS-BUILT
CROSS SECTIONAL PROFILE
SHEET 3 OF 3
FOR
SOUTH FORK OF CANE CREEK RESTORATION
NC ECOSYSTEM ENHANCEMENT PROGRAM

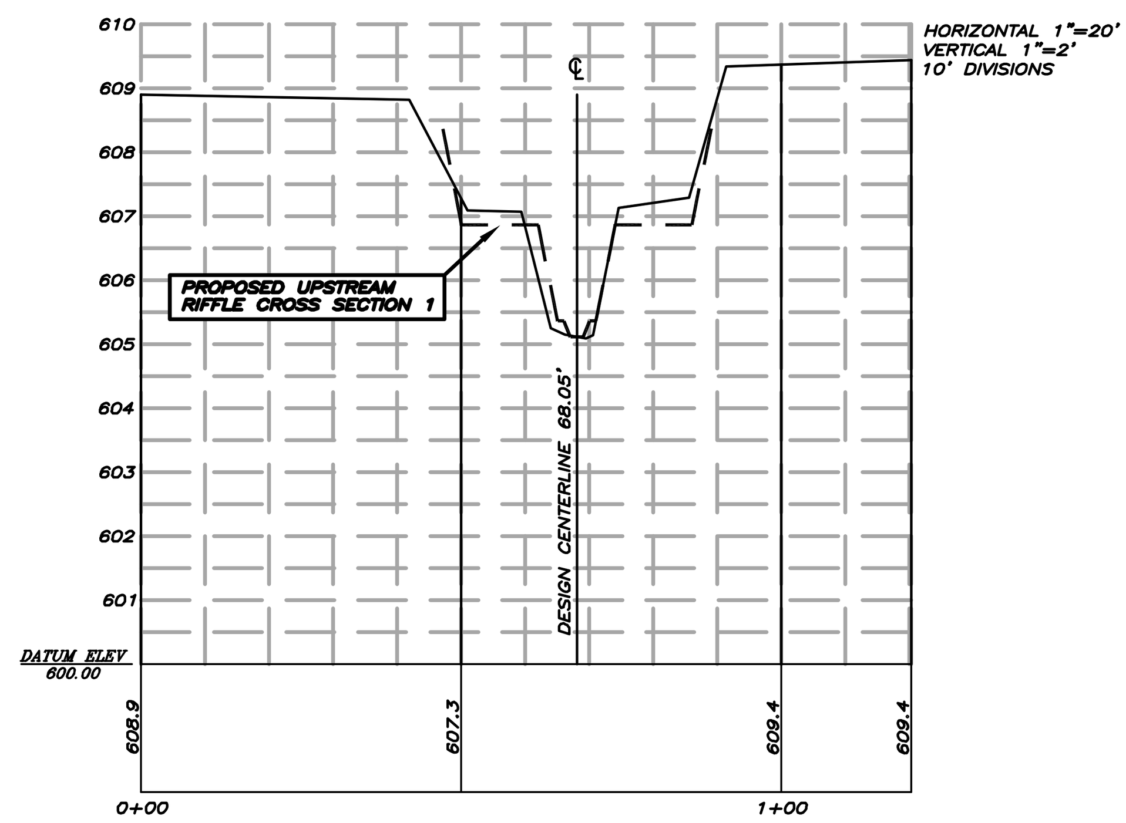
BACKWATER ENVIRONMENTAL
TOWN OF LIBERTY ~ ALAMANCE COUNTY ~ NORTH CAROLINA

20 0 10 20 40 80

AUGUST 1, 2007 SCALE 1"=20'
DATUM NAD 83 AS PROVIDED BY ENGINEER

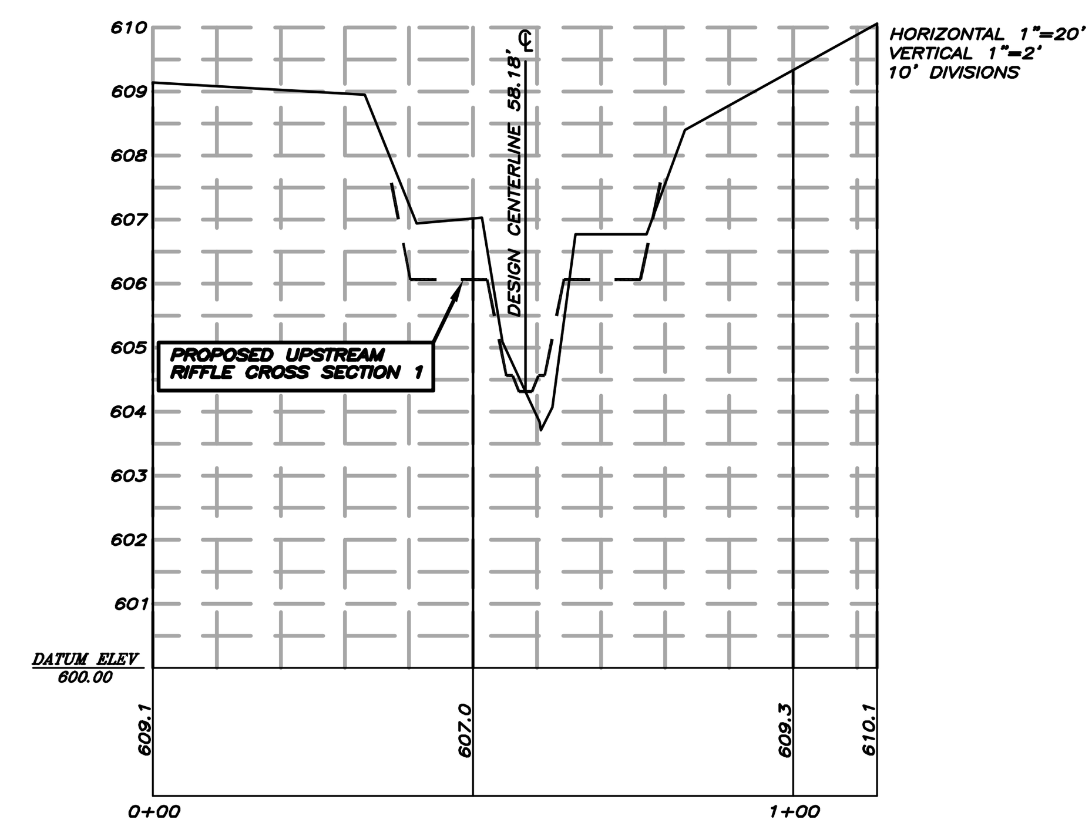
PREPARED BY:
LAND SERVICES
CHARLES ODELL ELIASON, PLS – 3599
(919)663-2708
MAILING ADDRESS ~ 132 NORTH CHATHAM AVENUE, SILER CITY, N.C. 27344

ALSM JOB # 070302



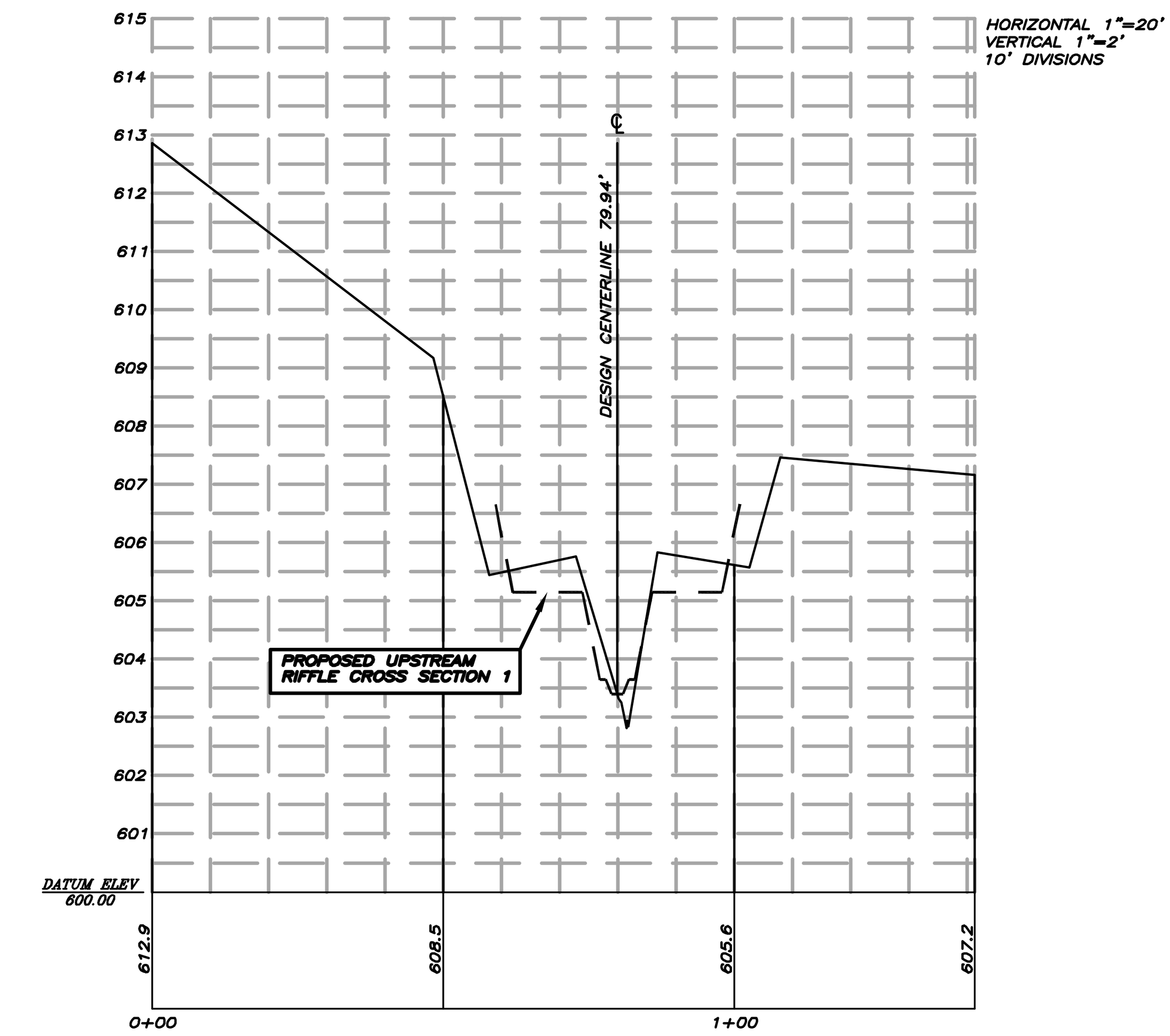
CROSS SECTION ONE, STATION 0+90.34

Point	Station	Offset	Elevation	Northing	Easting
6064	0.00	0.00	608.90	766016.5040	1865914.9910
6065	41.87	0.08	608.82	765974.8600	1865910.6120
6066	50.95	−0.07	607.09	765965.8180	1865909.8280
6067	59.44	−0.34	607.07	765957.3410	1865909.2270
6068	64.00	−0.27	605.25	765952.8180	1865908.6920
6069	70.62	−0.49	605.14	765946.2030	1865908.2280
6070	74.56	−0.98	607.13	765942.2370	1865908.3140
6071	85.59	−0.37	607.29	765931.3260	1865906.5770
6072	91.39	−0.53	609.34	765925.5450	1865906.141
6073	120.43	−0.00	609.44	765896.7120	1865902.6330
6343	66.15	−0.18	605.15	765950.6800	1865908.3800
6345	69.48	0.14	605.09	765947.4080	1865907.7250



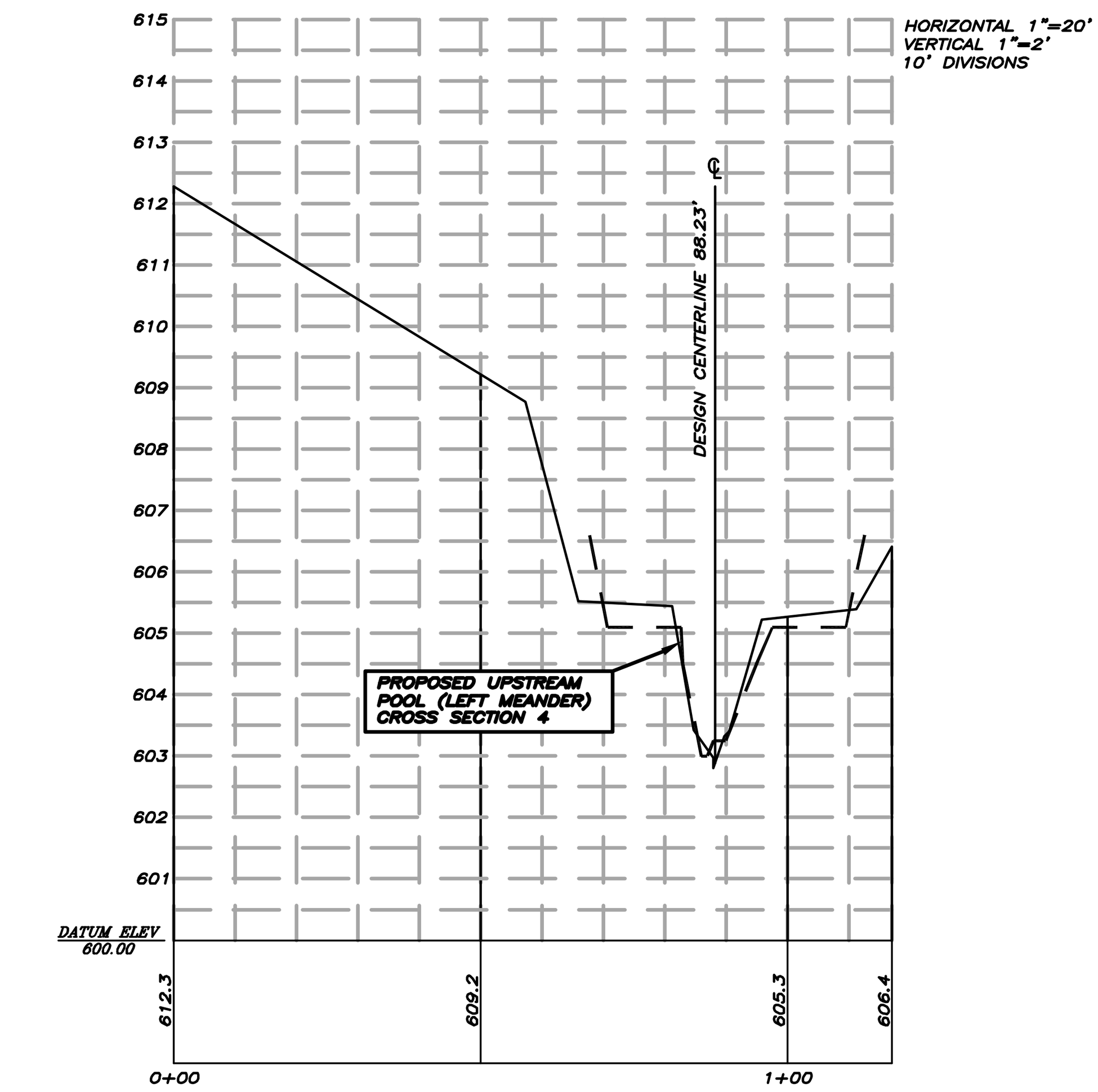
CROSS SECTION TWO, STATION 1+15.84

6063	0.00	0.00	609.14	766004.3620	1865902.2040
6062	33.10	0.67	608.95	765975.7120	1865918.7880
6061	41.22	0.92	606.94	765968.6420	1865922.7900
6060	51.39	0.81	607.03	765959.9980	1865928.1530
6059	54.63	1.55	605.09	765956.8460	1865929.2040
6058	58.89	1.55	604.16	765953.1980	1865931.4120
6057	62.39	0.87	604.07	765950.5640	1865933.8030
6056	65.99	0.46	606.77	765947.7010	1865936.0280
6055	77.07	0.31	606.77	765938.2970	1865941.8960
6054	83.09	0.43	608.40	765933.0950	1865944.9210
6053	113.09	0.00	610.06	765907.6580	1865960.84
6346	60.41	1.56	603.84	765951.9000	1865932.1940
6020	60.56	1.66	603.71	765951.7140	1865932.1870



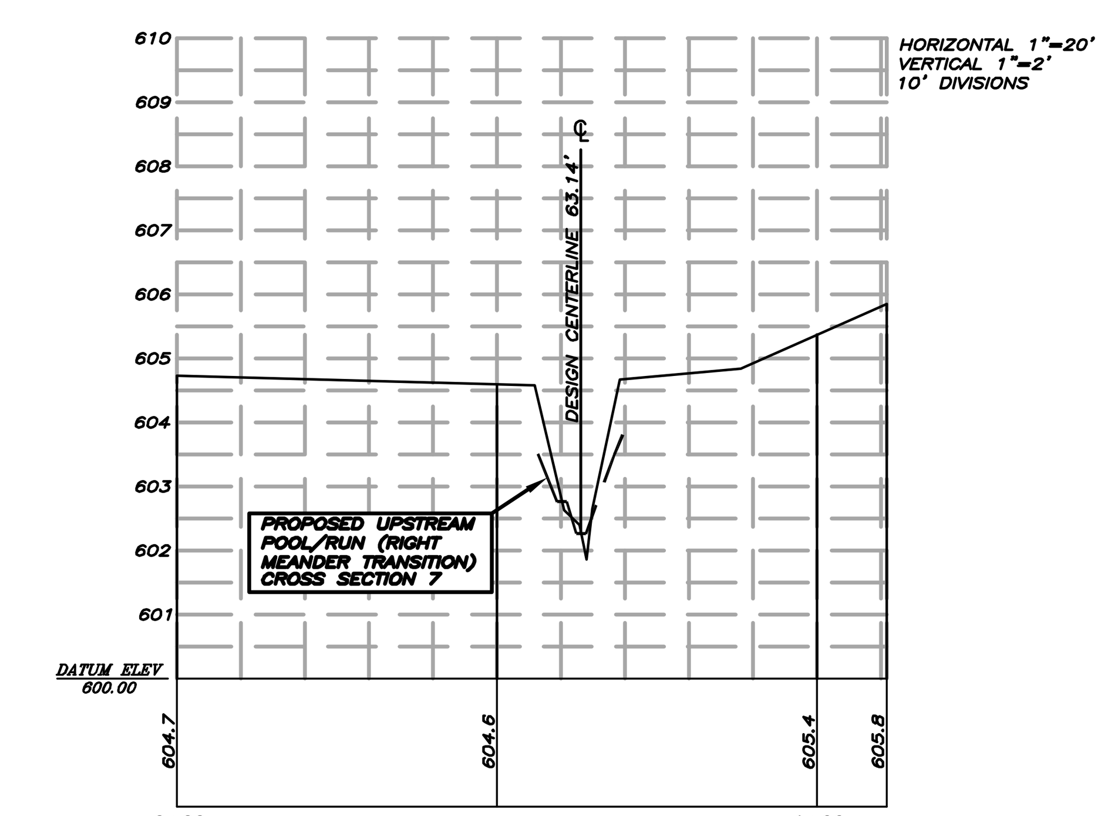
CROSS SECTION THREE, STATION 5+22.23

6145	0.00	0.00	612.86	766069.6270	1866300.7100
6146	48.37	0.07	609.17	766024.3640	1866283.6590
6147	57.94	−0.35	605.44	766015.2580	1866280.6920
6148	72.79	−0.42	605.76	766001.3210	1866275.5450
6149	80.17	−0.05	603.32	765994.5440	1866272.6120
6150	81.61	−0.13	602.94	765993.1660	1866272.1790
6152	86.85	−0.21	605.83	765988.2340	1866270.4120
6153	102.63	0.11	605.57	765973.5680	1866264.5750
6154	107.96	0.26	607.46	765968.6340	1866262.5580
6155	141.33	0.00	607.16	765937.2920	1866251.0880
6349	79.38	−0.06	603.60	765995.2790	1866272.8960
6347	80.68	−0.41	603.25	765993.9410	1866272.7630
6041	81.49	−0.33	602.81	765993.2050	1866272.4100
6348	81.86	−0.44	602.84	765992.8220	1866272.3750



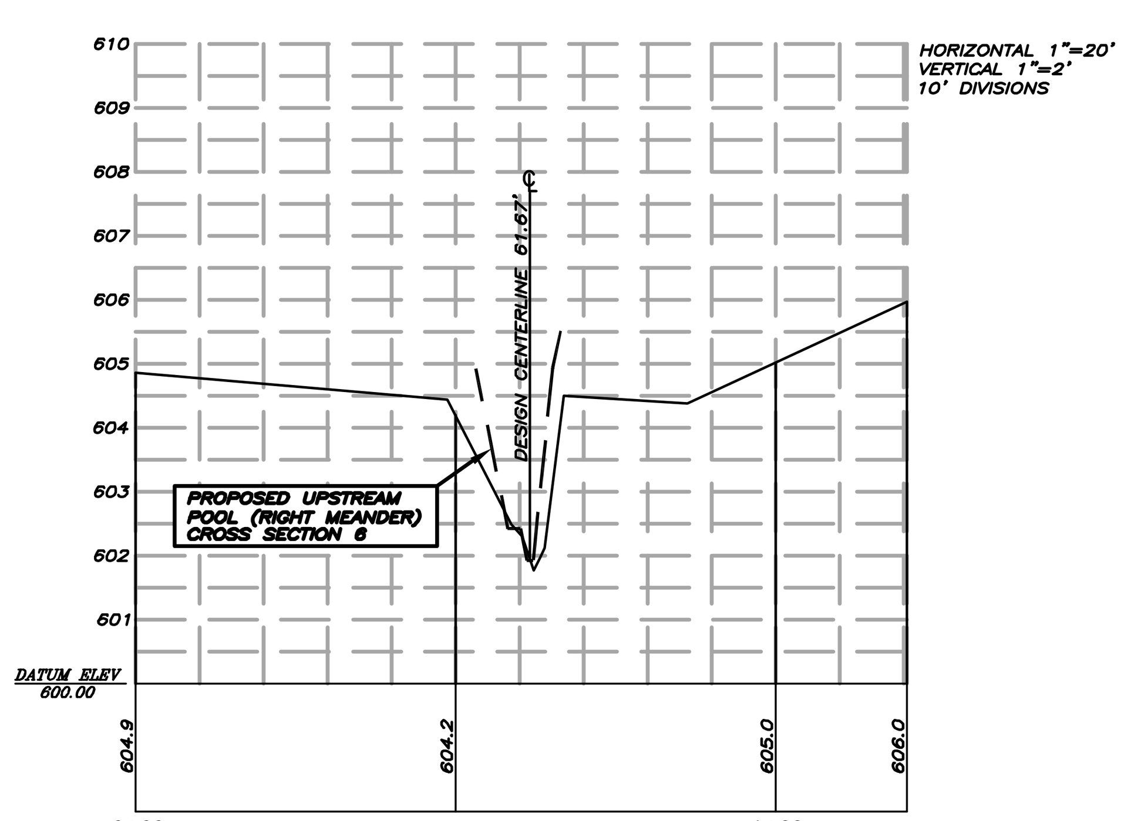
CROSS SECTION FOUR, STATION 5+55.01

6165	0.00	0.00	612.28	766074.4420	1866274.6240
6164	57.31	0.41	608.77	766020.5100	1866294.0250
6163	65.96	0.52	605.52	766012.3570	1866296.9030
6162	81.19	0.15	605.44	765998.1940	1866302.5120
6161	84.77	−0.19	603.42	765994.9480	1866304.0670
6160	90.58	−0.03	603.40	765989.4380	1866305.9210
6159	95.86	−0.25	605.22	765984.5600	1866307.9510
6158	111.27	−0.00	605.39	765970.0110	1866313.0360
6157	117.06	−0.00	606.41	765964.5780	1866315.0340
6352	89.70	−0.30	603.32	765990.3620	1866305.8670
6351	87.91	−0.11	602.97	765991.9710	1866305.0720
6042	87.96	−0.43	602.80	765992.0360	1866305.3940



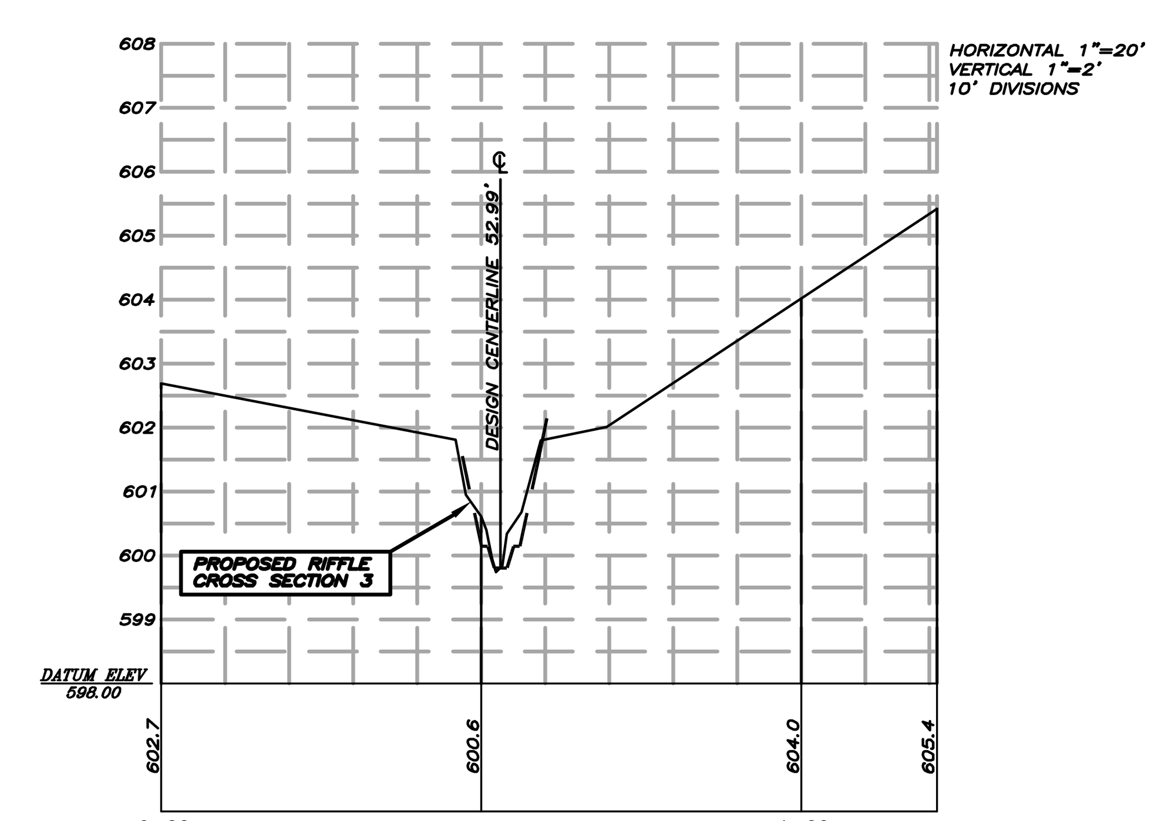
CROSS SECTION FIVE, STATION 8+93.99

Point	Station	Offset	Elevation	Northing	Easting
6178	0.00	0.00	604.73	766024.3360	1866641.0780
6181	55.85	0.73	604.58	765980.5560	1866606.3950
6353	60.53	0.67	602.63	765976.8080	1866603.5910
6182	62.85	0.77	602.40	765975.0390	1866602.0920
6354	64.00	0.77	601.86	765974.1250	1866601.3930
6183	64.87	0.78	602.65	765973.4340	1866600.8500
6187	69.19	0.61	604.67	765969.9170	1866598.3450
6188	88.10	0.95	604.84	765955.1420	1866586.5300
6189	110.86	0.00	605.85	765936.5450	1866573.3870



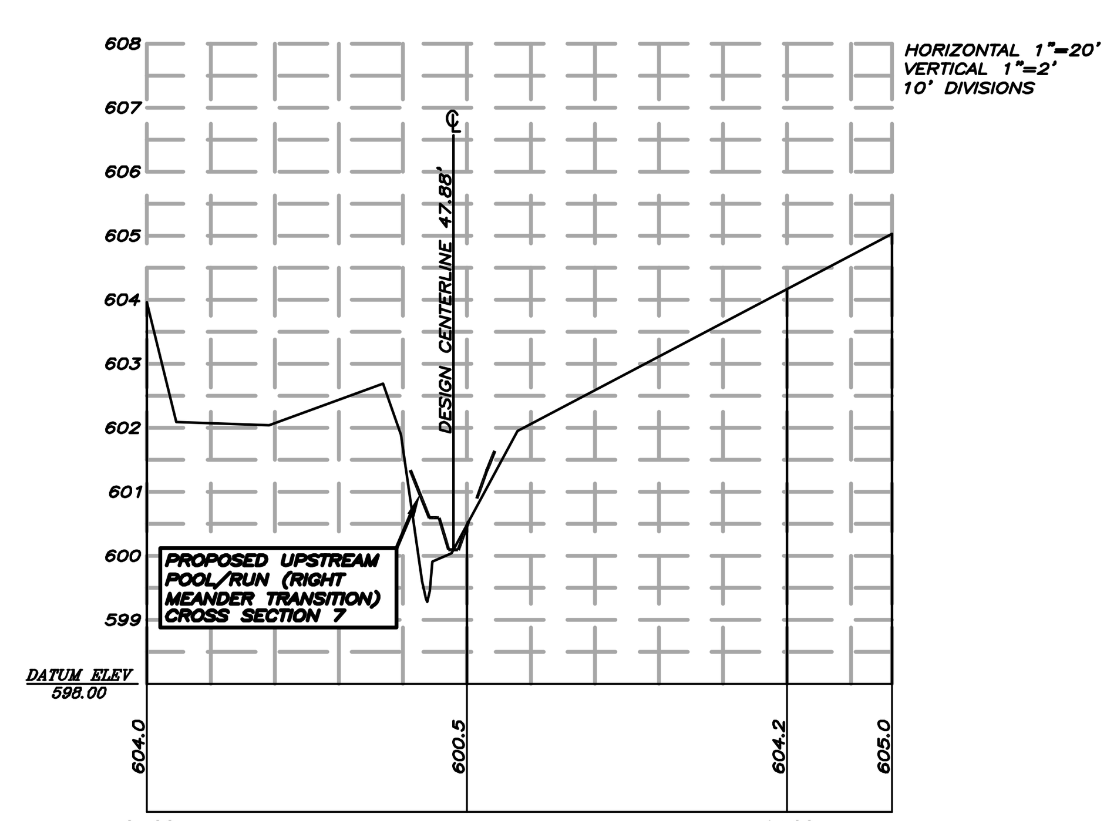
CROSS SECTION SIX, 9+23.87

Point	Station	Offset	Elevation	Northing	Easting
6179	0.00	0.00	604.86	766027.5070	1866625.9820
6180	48.73	−1.08	604.44	765979.0060	1866630.8480
6355	58.70	−1.03	602.49	765969.0620	1866631.5760
6184	60.40	−1.12	602.30	765967.3780	1866631.8040
6356	62.20	−1.05	601.77	765965.5740	1866631.8690
6185	63.25	−1.27	601.97	765964.5460	1866632.1740
6357	63.96	−1.13	602.12	765963.8330	1866632.0870
6186	66.88	−1.58	604.50	765960.9560	1866632.7680
6191	86.23	−0.93	604.38	765941.6110	1866633.6200
6190	120.50	−0.00	605.97	765907.3760	1866635.3620



CROSS SECTION SEVEN, STATION 14+91.93

Point	Station	Offset	Elevation	Northing	Easting
6220	45.91	0.48	601.81	766161.2440	1867092.0240
6360	47.57	−0.78	600.95	766161.3480	1867094.0960
6217	49.91	0.42	600.61	766159.0390	1867095.3620
6361	50.75	−0.38	600.40	766159.2340	1867096.5060
6364	51.80	−0.32	599.90	766158.5900	1867097.3400
6362	52.25	−0.27	599.74	766158.2980	1867097.6860
6365	53.30	−0.11	599.84	766157.5780	1867098.4620
6363	53.91	−0.48	600.34	766157.5400	1867099.1810
6218	56.30	0.28	600.68	766155.5620	1867100.7280
6219	59.28	0.21	601.80	766153.9480	1867103.2280
6212	69.52	0.45	602.01	766147.9950	1867111.5690
6210	124.12	0.00	605.42	766117.6760	1867156.9720



CROSS SECTION EIGHT, STATION 15+35.81

6224	0.00	0.00	603.96	766225.1070	1867135.1630
6223	4.63	−0.30	602.09	766220.4770	1867135.5040
6222	19.06	−0.41	602.04	766206.0560	1867135.7550
6221	39.72	−0.15	601.89	766185.3860	1867135.6840
6216	43.01	0.10	599.60	766182.1030	1867135.4730
6366	43.59	−0.52	599.33	766181.5220	1867136.0990
6207	43.83	0.01	599.28	766181.2790	1867135.5690
6367	44.21	−0.45	599.45	766180.9030	1867136.0310
6368	44.63	−0.55	599.91	766180.4880	1867136.1380
6215	47.61	0.02	600.04	766177.5020	1867135.5900
6214	57.86	−0.26	601.95	766167.2490	1867135.9670
6225	36.90	81.19	602.69	766187.4440	1867054.3210
6211	116.41	−0.00	605.03	766108.7050	1867136.2640

20 0 10 20 40 80

AUGUST 1, 2007 SCALE 1"=20'
DATUM NAD 83 AS PROVIDED BY ENGINEER

ALL AS-BUILT SURVEY INFORMATION PROVIDED TO DEWBERRY & DAVIS, INC. AS SIGNED AND SEALED DOCUMENTS BY:

PREPARED BY
LAND SERVICES
CHARLES ODELL ELIASON, PLS – 3599
(919)663-2708
MAILING ADDRESS ~ 132 NORTH CHATHAM AVENUE, SILER CITY, N.C. 27344

CONTROL POINT DATA – PROJECT DATUM

NORTHING	EASTING	ELEVATION
765929.2518	1865822.6701	607.32
766900.9498	1868541.1448	602.07

UNITS IN US FEET
POINTS WERE ESTABLISHED BY ENGINEER BY STATIC GPS OBSERVATIONS AND PROCESSED BY OPUS.

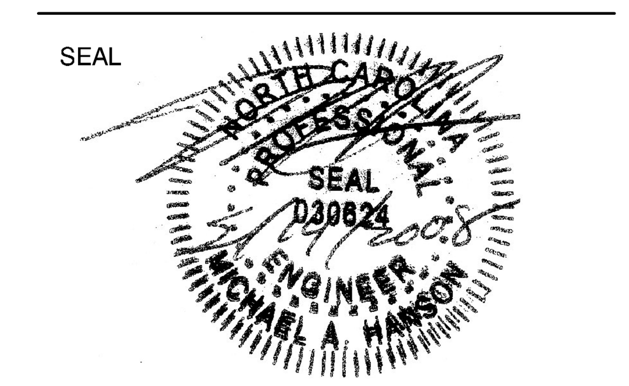
Dewberry

Dewberry & Davis, Inc.
2301 REXWOODS DRIVE
SUITE 200
RALEIGH, NC 27607-3366
PHONE: 919.881.9939
FAX: 919.881.9923

SOUTHFORK OF CANE CREEK RESTORATION

ECOSYSTEM ENHANCEMENT PROGRAM
LIBERTY, NORTH CAROLINA

SEAL



NOTES:

INFORMATION PRESENTED REPRESENTS AN OVERLAY OF DESIGN TYPICAL CROSS SECTIONS GENERALLY CORRESPONDING TO THE LOCATION OF THE AS-BUILT SURVEY DATA.

No.	DATE	BY	Description

REVISIONS

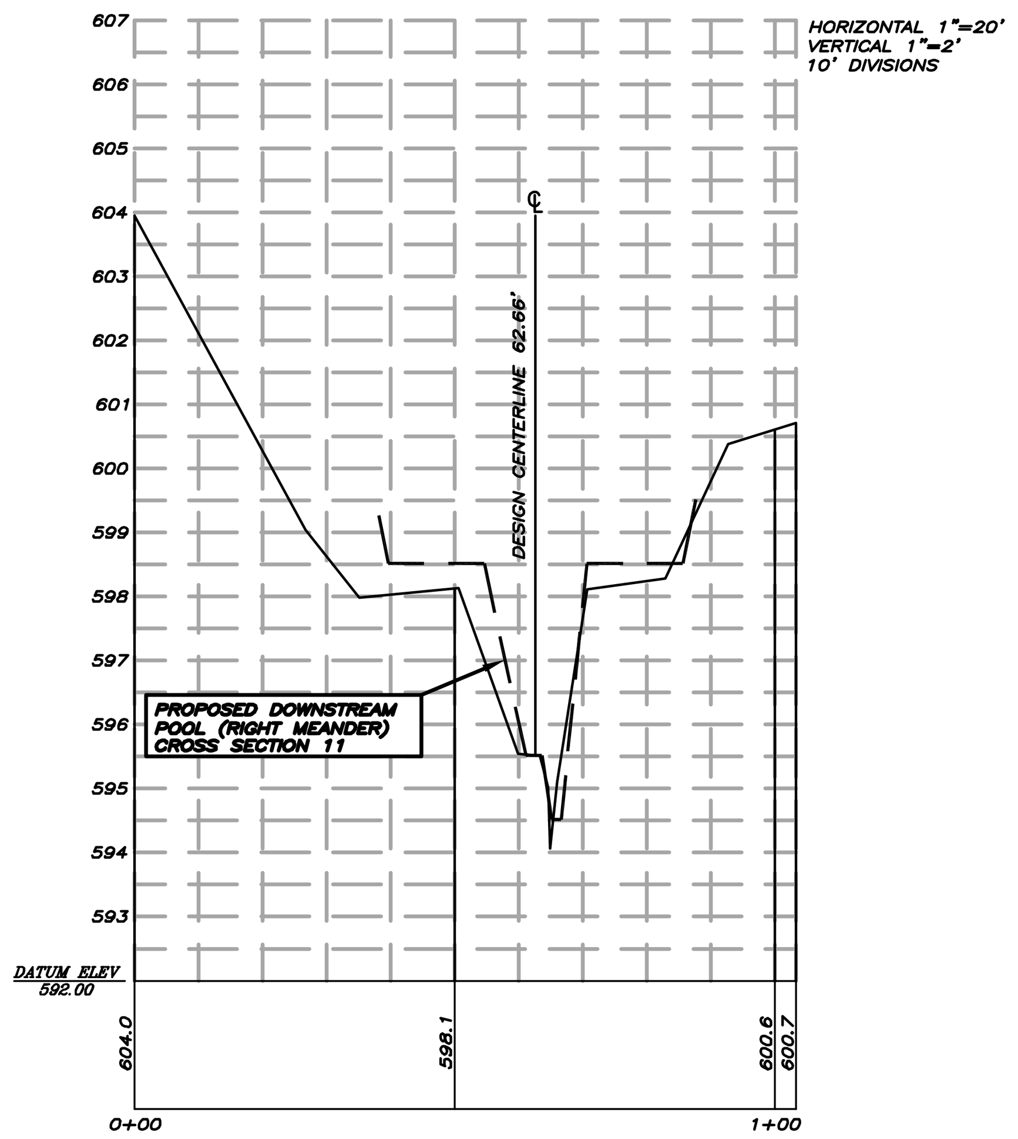
DRAWN BY CRC
APPROVED BY MAH
CHECKED BY MAH
DATE MAY 15, 2008

TITLE

AS-BUILT SECTIONS COMPARISON

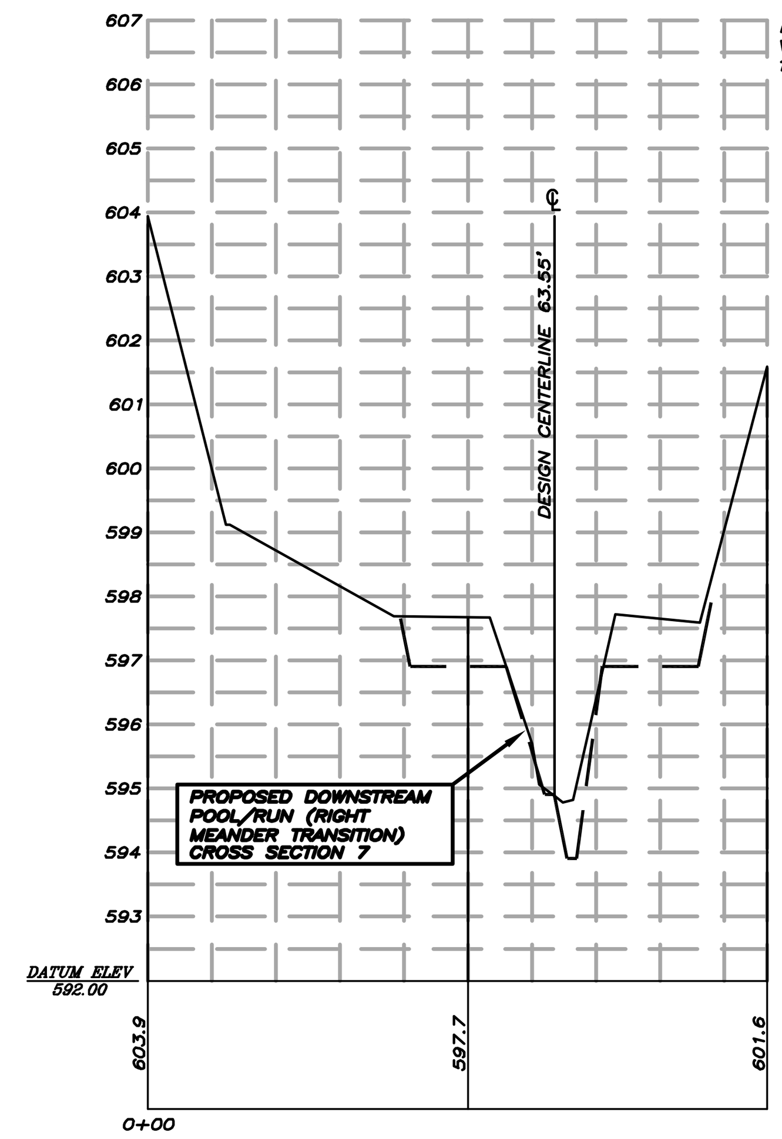
PROJECT NO. 73104900

SHEET NO. OF



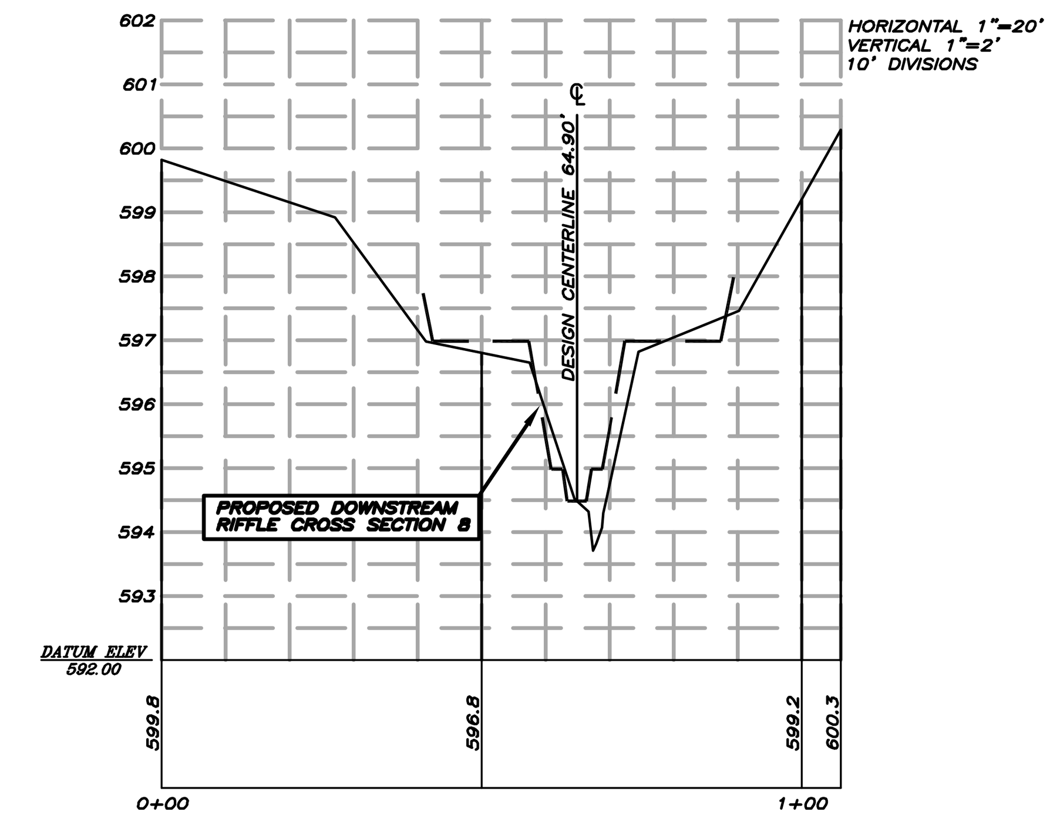
CROSS SECTION NINE, STATION 21+91.67

6285	0.00	0.00	603.95	766431.6690	1867511.3150
6289	26.78	−2.70	599.04	766422.3770	1867536.5750
6290	35.11	−2.63	597.98	766418.6660	1867544.0390
6291	50.59	−2.02	598.13	766411.3420	1867557.6910
6292	59.94	−1.85	595.54	766407.0970	1867566.0230
6372	63.38	−1.54	595.51	766405.3120	1867568.9780
6374	64.65	−1.45	595.01	766404.6720	1867570.0790
6373	64.91	−1.32	594.96	766404.4470	1867570.2590
6293	66.00	−1.47	595.10	766404.1040	1867571.2970
6294	70.78	−1.43	598.11	766401.9790	1867575.5830
6295	82.90	−1.06	598.28	766396.3340	1867586.3200
6296	92.70	−0.40	600.38	766391.4540	1867594.8430
6297	103.36	−0.00	600.71	766386.4320	1867604.2450



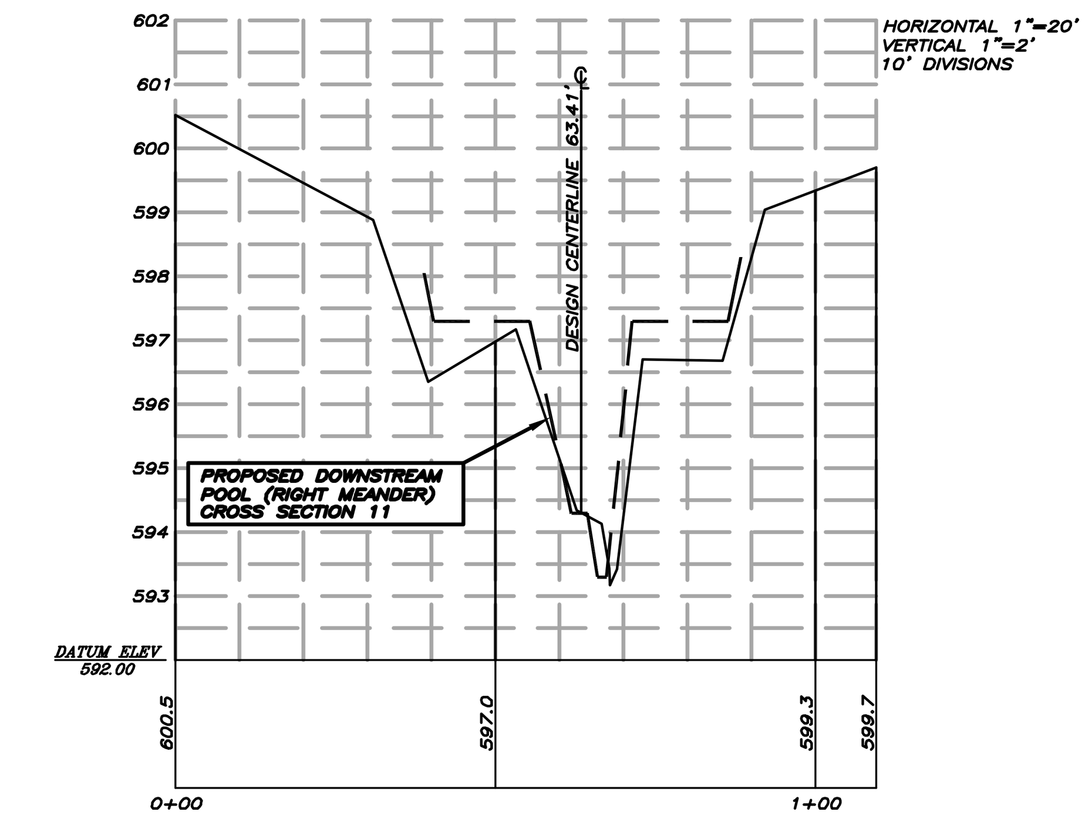
CROSS SECTION TEN, STATION 22+11.45

6287	0.00	0.00	603.94	766429.4550	1867510.7290
6288	12.25	−0.68	599.12	766428.8630	1867522.9800
6282	27.87	−1.90	599.12	766428.4640	1867538.6510
6281	38.48	−1.21	597.69	766426.6770	1867549.1310
6280	53.48	−0.98	597.67	766424.8960	1867564.0260
6370	60.07	−0.97	595.70	766424.2070	1867570.5790
6279	61.09	−0.87	595.06	766424.0040	1867571.5820
6371	63.83	−0.50	594.86	766423.3510	1867574.2710
6267	64.83	−0.55	594.78	766423.2960	1867575.2730
6278	66.47	−0.68	594.82	766423.2630	1867576.9110
6277	73.00	−0.44	597.72	766422.3460	1867583.3850
6276	86.25	−0.08	597.59	766420.6170	1867596.5280
6275	96.75	0.00	601.59	766419.4520	1867606.9600



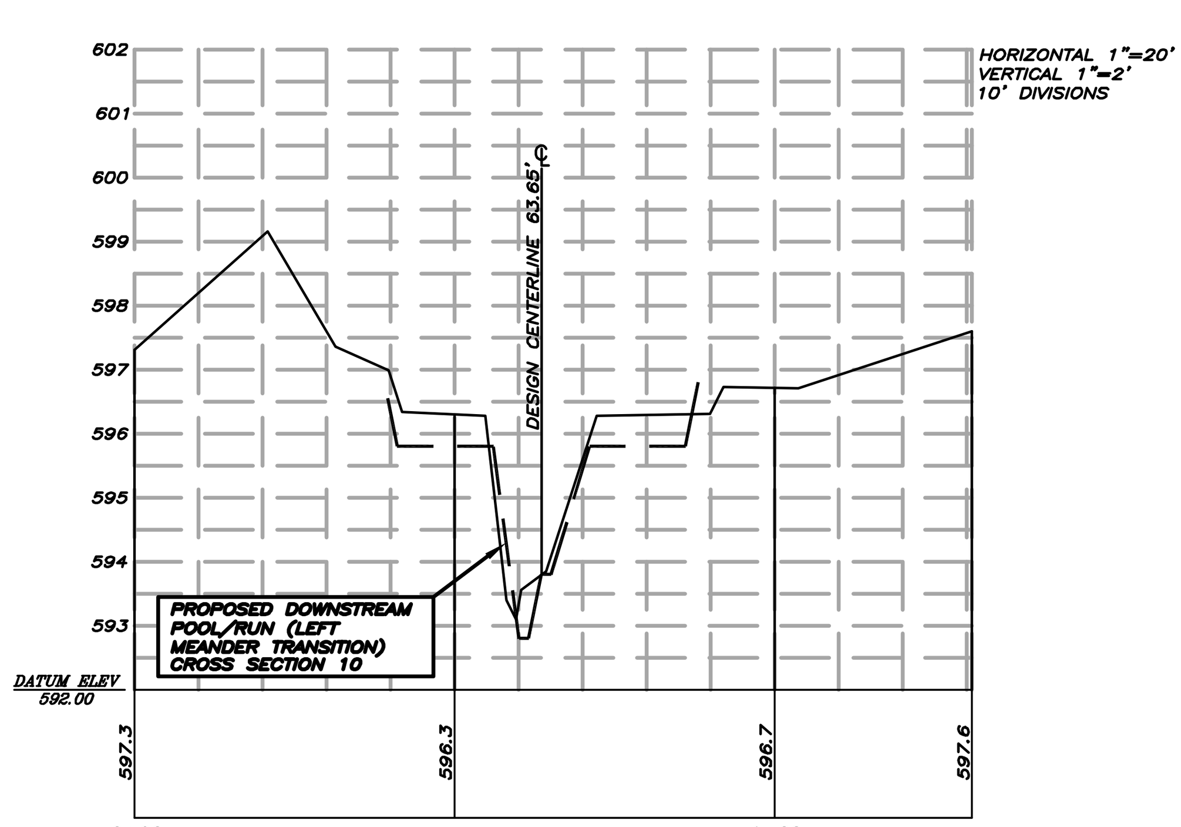
CROSS SECTION ELEVEN, STATION 24+19.91

6484	0.00	0.00	599.82	766667.1450	1867597.6390
6483	27.09	0.22	598.92	766646.7080	1867615.4240
6482	41.35	0.38	596.98	766635.9220	1867624.7500
6481	57.55	0.52	596.65	766623.6920	1867635.3720
6480	64.52	0.65	594.52	766618.3860	1867639.8990
6479	66.77	0.55	594.32	766616.7630	1867641.4650
6477	67.40	0.39	593.71	766616.3980	1867642.0020
6476	67.89	0.09	593.82	766616.2300	1867642.5460
6478	68.78	0.24	594.07	766615.4630	1867643.0210
6475	69.07	0.22	594.30	766615.2650	1867643.2320
6474	69.52	0.50	594.52	766614.7340	1867643.3230
6473	74.57	0.47	596.82	766610.9740	1867646.6900
6472	90.27	−0.16	597.46	766599.6340	1867657.5580
6471	106.15	0.00	600.29	766587.6300	1867667.9600



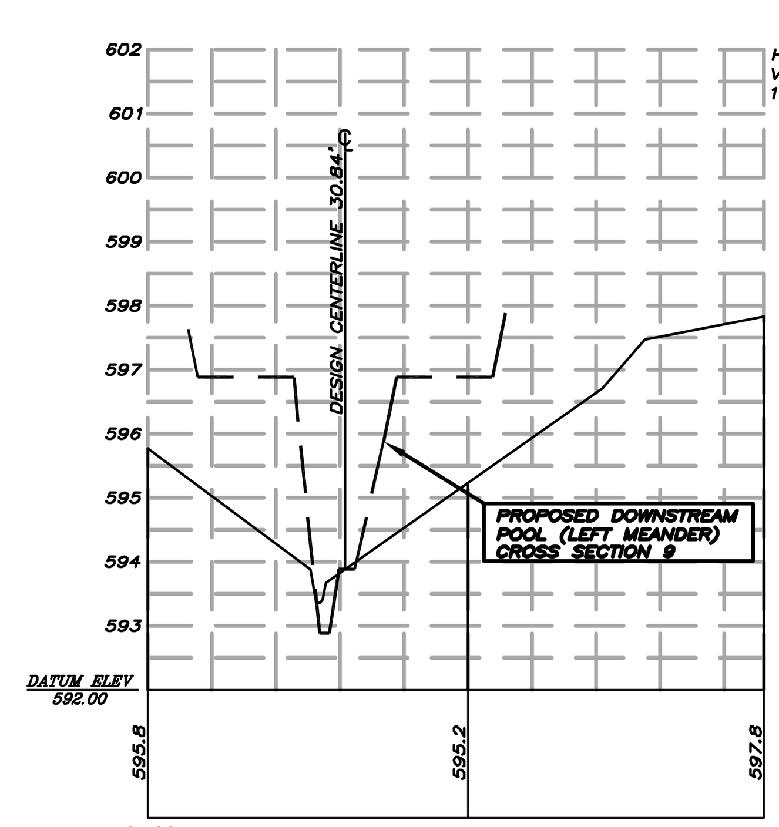
CROSS SECTION TWELVE, STATION 24+75.89

6485	0.00	0.00	600.52	766645.7680	1867593.3070
6486	30.97	−0.77	598.88	766658.2230	1867621.669
6487	39.55	−0.33	596.35	766661.0780	1867629.7770
6488	53.18	−0.32	597.17	766666.2380	1867642.3900
6489	62.72	−0.18	594.34	766669.7210	1867651.2720
6490	66.67	−0.51	594.13	766671.5280	1867654.7970
6491	67.82	−0.33	593.43	766671.8030	1867655.9320
6462	67.90	−0.41	593.17	766671.9000	1867655.9780
6492	69.02	−0.08	593.42	766672.0240	1867657.1350
6493	73.04	−0.40	596.70	766673.8460	1867660.7390
6494	85.54	−0.33	596.68	766678.5220	1867672.3250
6495	92.09	0.16	599.04	766680.5480	1867678.5810
6496	109.51	0.00	599.70	766687.3070	1867694.6340



CROSS SECTION THIRTEEN, STATION 27+57.34

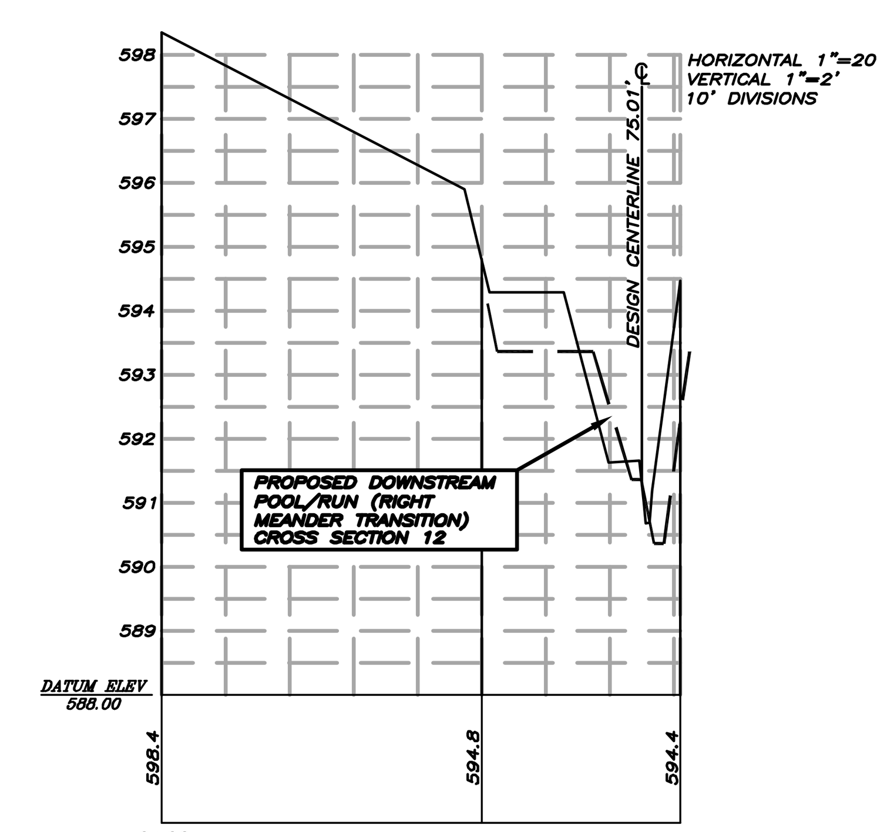
6506	0.00	0.00	597.31	766941.6000	1867586.3840
6507	20.88	−0.25	599.16	766927.4400	1867601.7290
6508	31.40	−0.55	597.36	766920.4350	1867609.5820
6509	39.73	−0.73	596.99	766914.8420	1867615.7590
6510	41.82	−0.76	596.34	766913.4250	1867617.3000
6511	54.87	−1.11	596.28	766904.7210	1867627.0260
6512	58.15	−1.39	593.40	766902.6690	1867629.6030
6513	59.61	−1.44	593.10	766901.6990	1867630.6990
6514	60.41	−1.46	593.56	766901.1700	1867631.2920
6515	64.35	−1.23	593.85	766898.2950	1867634.0040
6516	72.22	−1.15	596.28	766892.8320	1867639.6610
6517	89.95	−1.44	596.31	766880.8610	1867652.7470
6518	92.05	−1.37	596.73	766879.3750	1867654.2290
6519	103.73	−0.85	596.71	766870.9720	1867662.3640
6520	130.86	−0.00	597.60	766851.7220	1867681.4920



NOTE: AS-BUILT SECTION TAKEN NEAR TRANSITION FROM CULVERT STILLING BASIN.

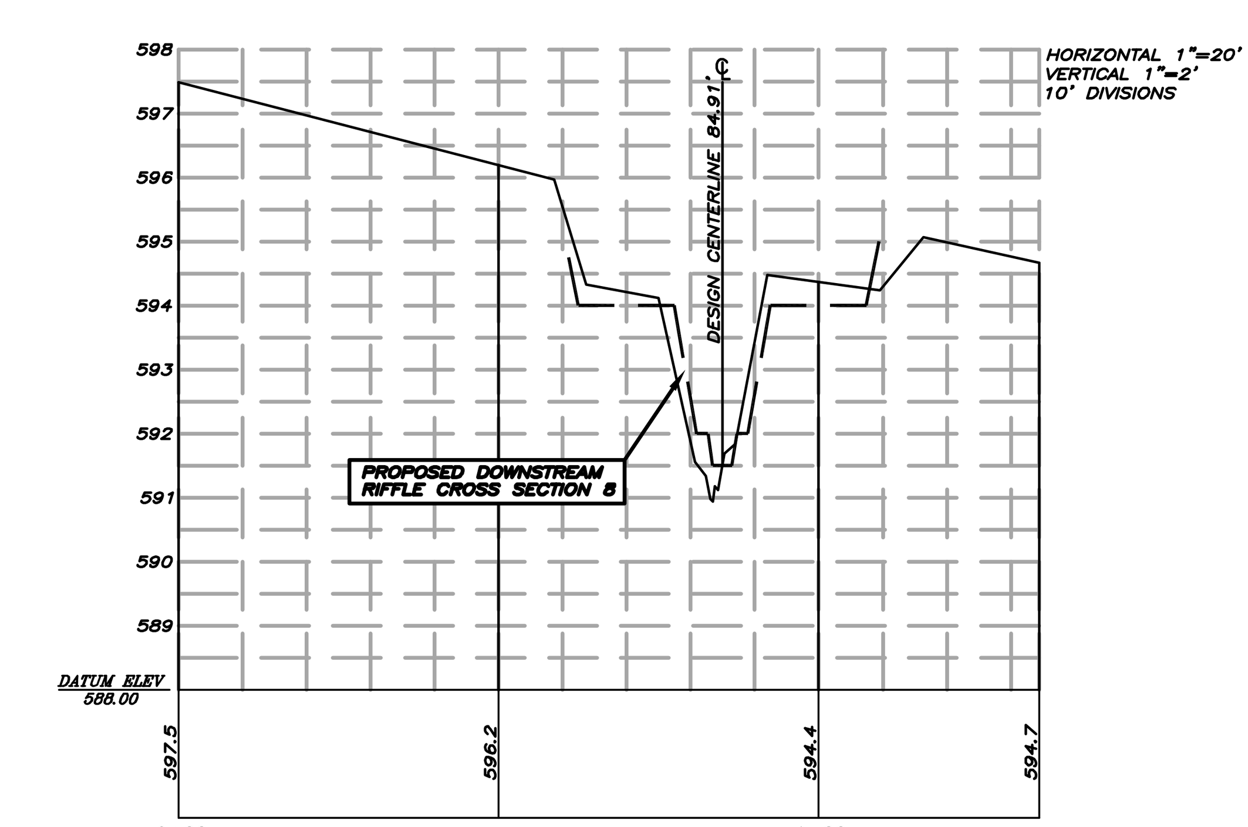
CROSS SECTION FOURTEEN, STATION 27+85.13

6505	0.00	0.00	595.77	766941.2860	1867652.2590
6504	25.47	0.42	593.88	766916.0150	1867655.4620
6503	26.30	0.33	593.36	766915.2050	1867655.6730
6448	26.90	0.03	593.36	766914.6600	1867656.0550
6502	27.33	−0.51	593.41	766914.3030	1867656.6440
6501	27.87	−0.43	593.67	766913.7620	1867656.6450
6519	71.04	−0.01	596.71	766870.9720	1867662.3640
6499	77.60	0.01	597.47	766864.4720	1867663.2760
6498	96.25	0.00	597.83	766846.0150	1867665.9380



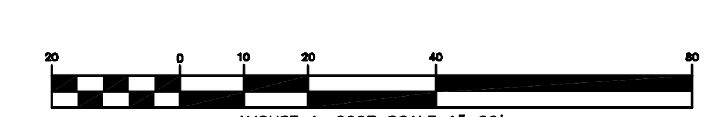
CROSS SECTION FIFTEEN, STATION 35+55.59

6642	0.00	0.00	598.35	767130.2351	1868247.0061
6643	47.31	0.52	595.90	767088.2093	1868268.7337
6644	51.27	0.31	594.29	767084.8094	1868270.7851
6645	62.87	0.27	594.29	767074.5843	1868276.2560
6646	69.82	0.25	591.63	767068.4543	1868279.5409
6647	74.63	0.49	591.66	767064.0952	1868281.5757
6648	75.34	0.43	591.00	767063.4951	1868281.9701
6649	75.65	0.51	590.68	767063.1865	1868282.0440
6622	76.27	0.22	590.69	767062.7705	1868282.5860
6650	76.65	−0.05	591.19	767062.5599	1868283.0053
6651	81.06	−0.00	594.47	767058.6458	1868285.0291



CROSS SECTION SIXTEEN, STATION 35+86.49

6641	0.00	0.00	597.49	767123.1451	1868226.2594
6640	58.65	0.20	595.97	767097.8395	1868279.1652
6639	63.68	0.55	594.33	767095.3662	1868283.5600
6637	74.96	0.47	594.12	767090.6062	1868293.7914
6636	80.67	0.58	591.56	767088.0535	1868298.8968
6635	82.37	0.52	591.34	767087.3800	1868300.4652
6638	83.08	1.12	590.98	767086.5314	1868300.8485
6624	83.49	0.10	590.94	767087.2807	1868301.6542
6634	83.77	0.94	591.18	767086.4015	1868301.5447
6633	84.24	0.68	591.12	767086.4385	1868302.0828
6632	85.25	0.81	591.69	767085.8855	1868302.9423
6631	86.98	0.49	591.84	767085.4370	1868304.6418
6630	91.94	0.42	594.48	767083.3781	1868309.1503
6629	109.50	0.33	594.24	767075.9315	1868325.0624
6628	116.35	0.60	595.07	767072.7465	1868331.1336
6627	134.45	−0.00	594.67	767065.5357	1868347.7458



ALL AS-BUILT SURVEY INFORMATION PROVIDED TO DEWBERRY & DAVIS, INC. AS SIGNED AND SEALED DOCUMENTS BY:

PREPARED BY
LAND SERVICES
CHARLES ODELL ELIASON, PLS – 3599
(919)663-2708
MAILING ADDRESS ~ 132 NORTH CHATHAM AVENUE, SILER CITY, N.C. 27344

CONTROL POINT DATA – PROJECT DATUM

NORTHING	EASTING	ELEVATION
765929.2518	1865822.6701	607.32
766900.9498	1868541.1448	602.07

UNITS IN US FEET
POINTS WERE ESTABLISHED BY ENGINEER BY STATIC GPS OBSERVATIONS AND PROCESSED BY OPUS.

Dewberry

Dewberry & Davis, Inc.
2301 REXWOODS DRIVE
SUITE 200
RALEIGH, NC 27607-3366
PHONE: 919.881.9939
FAX: 919.881.9923

SOUTHFORK OF CANE CREEK RESTORATION

ECOSYSTEM ENHANCEMENT PROGRAM
LIBERTY, NORTH CAROLINA

SEAL

NOTES:

INFORMATION PRESENTED REPRESENTS AN OVERLAY OF DESIGN TYPICAL CROSS SECTIONS GENERALLY CORRESPONDING TO THE LOCATION OF THE AS-BUILT SURVEY DATA.

No.	DATE	BY	Description

REVISIONS

DRAWN BY CRC
APPROVED BY MAH
CHECKED BY MAH
DATE MAY 15, 2008

TITLE

AS-BUILT SECTIONS COMPARISON

PROJECT NO. 73104900

SHEET NO. OF