UT to Little Coharie Creek
(Roseboro Site)
Stream Restoration Project
Sampson County
North Carolina

CU: 030030006
SCO# 040634201A
EEP Project No. 314

Monitoring Year 2 of 5
Data Collection: June through October 2010
Submission Date: March 31, 2011

Prepared for:

North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
2728 Capital Boulevard, Suite 1H-103
Raleigh, NC 27606

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Prepared by:

Rummel, Klepper & Kahl, LLP
900 Ridgefield Drive
Suite 350
Raleigh, NC 27609

2.0 Table of Contents

3.0 Executive Summary/Project Abstract

Project goals and objectives for the UT to Little Coharie Stream Restoration Project included:

Goal – Improve Water Quality

i. Objective – Reduce nutrients entering the stream from livestock by fencing the conservation easement.
ii. Objective – Reduce nutrient loads by planting a native riparian buffer.
iii. Objective – Reduce water quality impacts from the adjacent aging sewer line by relocating the line and manholes away from the restored stream channel.

Goal - Improve Aquatic and Terrestrial Habitat

i. Objective – Enhance instream habitat with woody debris and deep pools.
ii. Objective – Construct a stable stream system that adequately conveys water and sediment.
iii. Objective – Restore the riparian buffer by planting native species.

Goal – Reduce Erosion and Sedimentation

i. Objective – Construct a stable stream system that adequately conveys water and sediment.
ii. Objective – Restore the riparian buffer.
iii. Objective – Establishment of a fenced conservation easement so that livestock does not enter the stream or the repaired riparian buffer.

Seven (7) permanent vegetation plots were established and used in annual vegetation monitoring. Overall, the site is not meeting the minimum success requirements. The vegetative success criteria based on the US Army Corps of Engineers Stream Mitigation Guidelines (USACE, 2003) will require the survival of 260 5-year old planted woody stems per acre at the end of the year 5 monitoring period. Monitoring for 2010 revealed that vegetation plots VP1, VP2, VP5, and VP7 fall below the minimum success requirements. Vegetation plots VP3, VP4, and VP6 meet or exceed minimum success requirements. For 2010, MY2, the vegetation monitoring resulted in stem counts below the minimum success requirements yielding an average of 234 trees per acre. Vegetation plot locations are identified in Appendix C. Invasive vegetation species Chinese privet (*Ligustrum sinense*), mimosa (*Mimosa sp.*), and Asiatic dayflower (*Commelina communis*) have been identified onsite and the location of each are depicted in Figure 2. Multiflora rose (*Rosa multiflora*) and fescue (*Festuca sp.*) have also been identified onsite.

Overall, the stream is functioning well and holding grade, however, the stream has areas that are of concern. Channel dimension and pattern are similar to as-built conditions and currently meeting monitoring minimum success requirement thresholds. The Main Reach channel profile appears to be holding grade and maintaining some bedform features. The Northern Reach channel profile has areas that appear to have sediment deposition. This sediment deposition may be cause by vegetation growing within the bankfull channel. Since project construction, North Carolina has been in a moderate to severe drought. The drought has caused low flow periods resulting in vegetation growing within the stream channel. Asiatic daylily and cattail are growing within the stream bed and is causing disruption of sediment transport on parts of the project. Fencing along the ford crossings have trapped debris and may cause stream widening (Photo Station 6). It is recommended that fencing along the ford crossings be maintained annually to prevent additional damage.

Wetland restoration or enhancement was not a part of the UT to Little Coharie Stream Restoration Site therefore no wetland monitoring is required.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

4.0 Methodology

Vegetative sample plots were quantitatively monitored during the growing season. Seven (7) $100m^2$ plots were established for site monitoring. Species composition, density, vigor and survival were all monitored. Each plot corner is permanently located with rebar. Year 2 vegetation monitoring was completed in October 2010 utilizing the Carolina Vegetation Survey (CVS) – EEP protocol Level 1 (version 4.1).

Stream monitoring was completed by utilizing total station survey along with Rosgen Level II techniques to determine stream stability and performance. The annual cross-sectional survey included points surveyed at breaks in slope, including bankfull, inner berm, edge of water, and thalweg, if features were present. Longitudinal profile survey was conducted for the entire length of the restored channel for stream reaches. Measurements included thalweg, water surface, and bankfull. Existing onsite benchmarks were used for survey control.

Photo monitoring was conducted by walking each stream reach and taking photos at each predetermined photo point location using a digital camera.

5.0 References

Harrelson, C.C., C.L. Rawlins and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. United States Department of Agriculture, Fort Collins, CO.

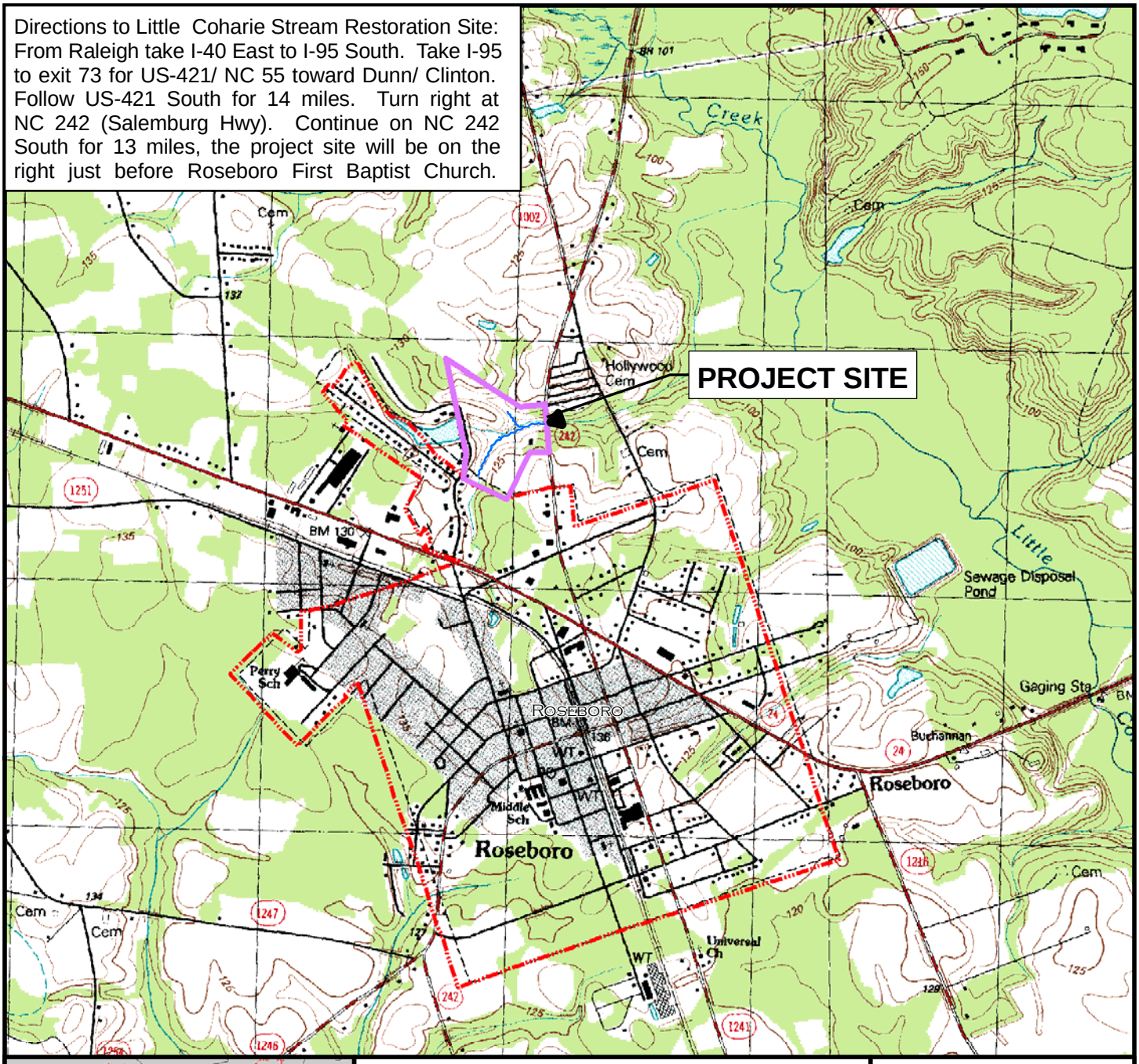
NCEEP. 2006. Content, Format and Data Requirements for EEP Monitoring Reports. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 1.2 November 16, 2006.

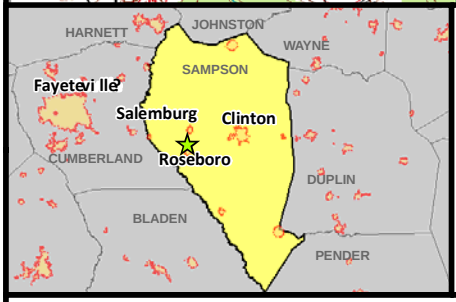
Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

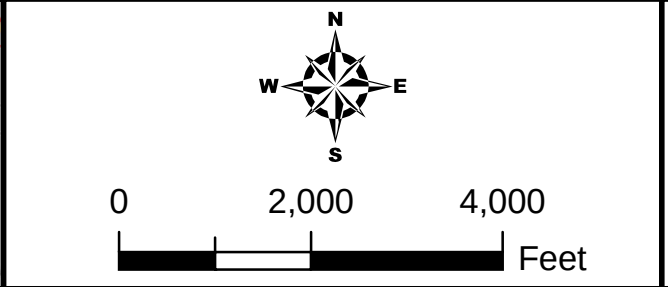
6.0 Appendices for Project Background, Condition and Performance Data

APPENDIX A

Directions to Little Coharie Stream Restoration Site: From Raleigh take I-40 East to I-95 South. Take I-95 to exit 73 for US-421/ NC 55 toward Dunn/ Clinton. Follow US-421 South for 14 miles. Turn right at NC 242 (Salemburg Hwy). Continue on NC 242 South for 13 miles, the project site will be on the right just before Roseboro First Baptist Church.







Ecosystem Enhancement Program

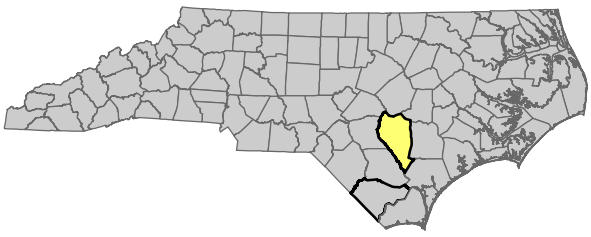


FIGURE 1

Site Location Map

UT to Little Coharie Stream Restoration Project
EEP No. 341
Sampson County, North Carolina
November 2010

Table 1. Project Components and Mitigation Credits
UT to Little Coharie (Roseboro Site) Stream Restoration Project - EEP Project No. 314

Mitigation Credits

	Stream (LF)		Riparian Wetland (acres)		Non-Riparian Wetland (acres)		Buffer (acres)	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	1,590*	466.6							

Project Components

Project Component	Stationing/Location	Existing Footage/Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
Main	10+00 to 23+00		Priority 1	1300 LF		1:1
North	10+00 to 13+30		Priority 1	330LF		1:1
North	700 feet upstream of 10+00 ending at 10+00		Stream Enhancement Level 1	700 LF		1.5:1

Component Summation

Restoration Level	Stream (Linear Feet)	Riparian Wetland (acres)	Non-riparian Wetland (acres)	Buffer (acres)	Upland (acres)
Restoration	1,630				
Stream Enhancement Level 1	700				

*Forty (40) LF removed from mitigation credits due to ford stream crossings.

Table 2. Project Activity and Reporting History
UT to Little Coharie (Roseboro Site) Stream Restoration Project - EEP Project No. 314

Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	May 2005	June 2005
Final Design - 90%	NA	May 2005
Construction	NA	4/26/07 to 4/3/08
Temporary S&E mix applied to entire project area	NA	FEB 2008
Permanent seed mix applied to entire project area	NA	FEB 2008
Containerized and B&B plantings	NA	FEB 2008
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	Dec 2009	March 2010
Year 1 Monitoring	August 2009	March 1, 2010
Year 2 Monitoring	Oct 2010	Nov 2010
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

Table 3. Project Contacts Table UT to Little Coharie (Roseboro Site) Stream Restoration Project (EEP #314)	
Designer Primary project design POC	HSMM, Inc. 1305 Navaho Drive Raleigh, NC 27609 NA
Construction Contractor Construction contractor POC	Shamrock Environmental Corp. 6106 Corprate Park Drive Browns Summit, NC 27214 NA
Planting Contractor Planting POC	Habitat Assessment and Restoration Program, Inc. 9305-D Monroe Road Charlotte, NC 28270 NA
Seeding Contractor Planting POC Seed Mix Sources Nursery Stock Suppliers	Seal Brothers Contracting, LLC 3618 West Pine Street. Mount Airy, NC 27030 NA Contact Shamrock Environmental Corp. Contact Shamrock Environmental Corp.
Monitoring Performers (MY1, MY2)	Rummel, Klepper, and Kahl, LLP. 900 Ridgefield Drive Suite 350 Raleigh, NC 27609
Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	Pete Stafford (919)878-9560 Pete Stafford (919)878-9560 NA

Table 4. Project Baseline Information and Attributes UT to Little Coharie Stream (Roseboro Site) Restoration Project - EEP Project No. 314			
Project Information			
Project Name	UT to Little Coharie		
Project County	Sampson		
Project Area	N/A		
Project Coordinates (Lat and Long)	34.963423,-78.514199		
Project Watershed Summary Information			
Physiographic Region	Coastal Plain		
River Basin	Cape Fear		
USGS HUC 8 Digit 03030006	USGS HUC 14 Digit 03030006080030		
NCDWQ Subbasin	03-06-19		
Project Drainage Area	0.19 sq. miles		
Project Drainage impervious cover estimate (%)	< 5 percent		
CGIA Land Use Classification			
Reach Summary Information			
Parameters	Main Reach	Northern Reach	
Length of Reach	1300	1030	
Valley Classification			
Drainage Area	0.7	0.12	
NCDWQ Stream Identification Score			
NCDWQ Water Quality Classification	C, SW	C, SW	
Morphological Description (stream type)	C5	C5	
Evolutionary Trend			
Underlying Mapped Soils	Aycock, Bibb, and Johnston		
Drainage Class	Moderately drained to poorly drained		
Soil Hydric Status	Aycock – No, Bibb – Yes, Johnston - Yes		
Slope	0.7	0.86	
FEMA Classification			
Native Vegetation Community			
Percent Composition Exotic Invasive Vegetation			
Wetland Summary Information			
There are no delineated or restored wetlands as part of this project.			
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Yes	Upon Request
Waters of the United States – Section 401	Yes	Yes	Upon Request
Endangered Species Act	Yes	Yes	Upon Request
Historic Preservation Act	Yes	Yes	Upon Request
Coastal Zone Management Act (CZMA) Coastal Area Management Act (CAMA)	No		
FEMA Floodplain Compliance	Yes	Yes	Upon Request
Essential Fisheries Habitat	No		

APPENDIX B

FIGURE 2

Current Conditions Plan View

UT to Little Coharie
(Roseboro Site)
Stream Restoration Project
EEP No. 314
Sampson County, North Carolina

Legend

- Original Stream Thalweg
- Restored Stream Thalweg
- Cross Section
- Location of Chinese privet
- Location of mimosa
- Log Vane (Bank Stability)
- Log Cross Vane (Grade Control)
- Rootwad
- Photo Station (PS)

Vegetation Monitoring Counts

- Less Than 320 Stems per Acre
- More Than 320 Stems per Acre

N W E S

0 50 100 200 300 Feet

Ecosystem Enhancement Program

January 2011

Cattail and Asiatic Daylily

**Multiflora rose and fescue have been identified onsite, these species will be located during 2011 MY3 monitoring year and included in the 2011 MY3 monitoring report.

Ford Crossing
VP 7
VP 6
PS 10
XS-12-B
XS-11-B
XS-12-A
PS 11
XS-11-A
XS-10-B
XS-10-A
XS-8-B
XS-9-A
XS-9-B
XS-8-A
PS 12
XS-6-A
XS-5-A
VP 5
XS-4-A
PS 6
PS 5
PS 7
XS-7-A
VP 1
PS 8
XS-7-B
Ford Crossing
VP 2
PS 4
XS-6-B
PS 3
XS-4-B
XS-5-B
Ford Crossing
VP 3
XS-3-A
XS-3-B
XS-2-B
XS-2-A
VP 4
XS-1-B
XS-1-A
PS 2
PS 1
N East St
Roseboro

Table 5 - Visual Stream Morphological Stability Assessment
Reach ID - Main
Assessed Length – 1630 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Sediment Deposition			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	23	26			88%			
	3. Meander Pool Condition	1. Depth	23	26			88%			
		2. Length	23	26			88%			
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA			NA			
		2. Thalweg centering at downstream of meander	NA	NA			NA			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging			0	0	100%			100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%			100%
				Totals	0	0	100%			100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	14	14			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	0	0			0%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	0	0			0%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	14	14			100%			
	4. Habitat	Pool forming structures maintaining – Max Pool Depth: Mean Bankfull Depth Ratio $\geq$ 1.6 Rootwads/logs providing some cover at base flow.	0	0			0%			

Table 5 - Visual Stream Morphological Stability Assessment
Reach ID - North
Assessed Length – 700 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Sediment Deposition			1	100	85.71%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	7	10			70%			
	3. Meander Pool Condition	1. Depth	7	10			70%			
		2. Length	7	10			70%			
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA			NA			
		2. Thalweg centering at downstream of meander	NA	NA			NA			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging			0	0	100%			100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%			100%
				Totals	0	0	100%			100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	7	7			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	0	0			0%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	7	7			100%			
	4. Habitat	Pool forming structures maintaining – Max Pool Depth: Mean Bankfull Depth Ratio $\geq$ 1.6 Rootwads/logs providing some cover at base flow.	4	4			100%			

Table 6 – Vegetation Condition Assessment

Planted Acreage – 5 acres

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very Limited Cover of both woody and herbaceous material	No bare areas located onsite	NA	NA	NA	No bare areas located onsite
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria	100 m^2 0.0247 acre	RED	4	.1 acre	2%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year	100 m^2 0.0247 acre	RED	4	.1 acre	2%

Easement Acreage – 5 acres

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons on map scale)	Individual Stems GPS located	See CCPV Legend	NA	Individual Stems GPS located – See CCPV	Individual Stems GPS located – See CCPV
2. Easement Encroachment Areas	Areas or points (if too small to render as polygons on map scale)	none	See CCPV Legend	NA	NA	NA

Stream Problem Areas UT to Little Coharie Stream Restoration Project - EEP No. 314			
Feature Issue	**Station Number**	**Suspected Cause**	**Photo Number**
Aggradation	Northern 11+40 to 12+40	Trapped Sediment/Low Flow	Figure 2

Vegetation Problem Areas UT to Little Coharie Stream Restoration Project - EEP No. 314			
Feature Category	**Station Number**	**Suspected Cause**	**Photo Number**
Cattail	Throughout	Low Flow Conditions	Figure 2
Invasive Vegetation	Various, Refer to Figure to for Location	Offsite seed source	VPA1

Stream Photo Station Photos (all photos recorded on November 11, 2010)

1 - Main Reach Station 0+50 – Looking upstream

2 - Main Reach Station 0+50 – Looking downstream

3 - Main Reach Station 6+50 – Looking upstream

4 - Main Reach Station 6+50 – Looking downstream

5 - Main Reach Station 9+00 – Looking to Northern Reach confluence

6 - Main Reach Station 10+50 – Stream Crossing

7 - Main Reach Station 10+50 – Looking Downstream

8 - Main Reach Station 12+50 – Looking upstream

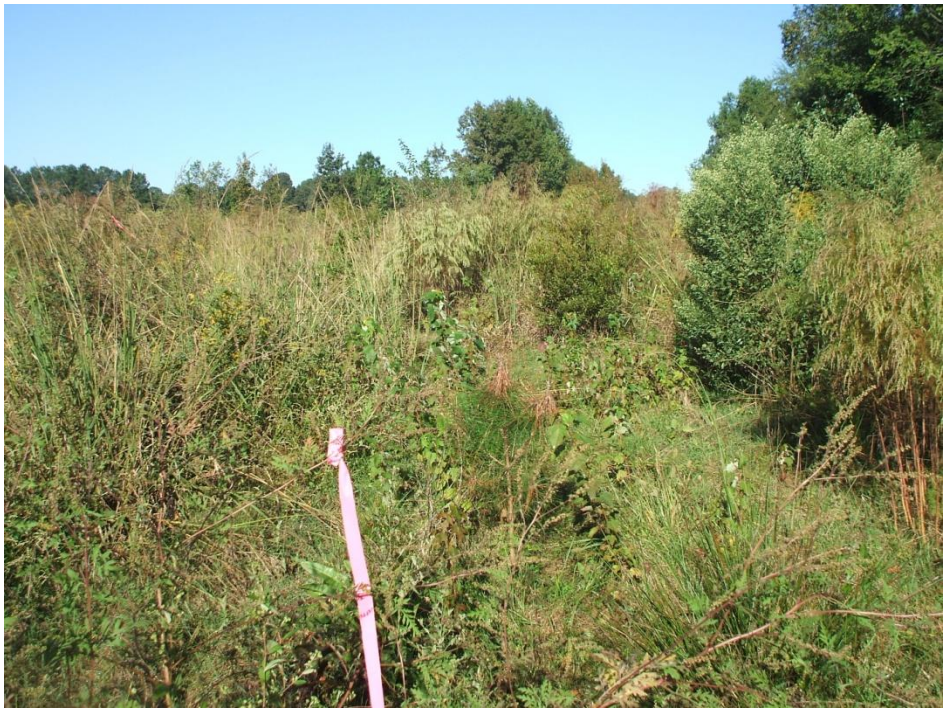
9 - Main Reach Station 12+50 – Looking downstream (End of Main Reach)

10 - Northern Reach Station 0+50 – Looking upstream

11 - Northern Reach Station 0+50 – Looking downstream

12 - Northern Reach Station 2+00 – Looking downstream

Vegetation Monitoring Plot Photos (all photos recorded on October 6, 2010)



Vegetation Plot 1

Vegetation Plot 2

Vegetation Plot 3

Vegetation Plot 4

Vegetation Plot 5

Vegetation Plot 6

Vegetation Plot 7

Vegetation Problem Areas Photos

VPA1 – Chinese privet and mimosa

APPENDIX C

Table 8. CVS Vegetation Plot Metadata UT to Little Coharie Stream Restoration Project – EEP No. 314	
Report Prepared By	William (Pete) Stafford
Date Prepared	11/4/2010 10:49
Database Name	UTLittleCoharie-2009-A_Backup.mdb
Database Location	C:\Documents and Settings\pstafford\Desktop\CVS Veg Data
Computer Name	STAFFORDP
Description 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	314
Project Name	UT to Little Coharie
Description	Stream Restoration Project
River Basin	Cape Fear
Length(ft)	2330
Stream-to-edge width (ft)	
Area (sq m)	
Required Plots (calculated)	

Table 7. Vegetation Plot Criteria Attainment UT to Little Coharie Stream Restoration Project – EEP No. 314			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
Reach 2	VP1	N	43%
Reach 2	VP2	N	
Reach 2	VP3	Y	
Reach 2	VP4	Y	
Reach 1	VP5	Y	
Reach 1	VP6	N	
Reach 1	VP7	N	

Table 9 - Total and Planted Counts (Species by Plot with Annual Means)

CURRENT DATA (MY2 2010)																	ANNUAL MEANS					
			Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Current Mean		MY1 (2009)		AB (2008)	
Scientific Name	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Alnus serrulata	Tag Alder	Shrub	*	1	*		*		*		*		*		*		*	1	*	3	*	*
Callicarpa americana	Beautyberry	Shrub	*		*		*	2	*	4	*	1	*	3	*	2	*	12	*	5	*	*
Liriodendron tulipifera	Tulip Poplar	Tree	*		*		*		*		*		*	2	*		*	2	*	3	*	*
Myrica	Wax Myrtle	Shrub	*	2	*		*	2	*	1	*	3	*		*	3	*	11	*	11	*	*
Quercus lyrata	Overcup Oak	Tree	*		*		*		*	2	*		*		*		*	2	*	5	*	*
Quercus michauxii	Sw Chestnut Oak	Tree	*		*		*	2	*		*		*	1	*		*	3	*	1	*	*
Quercus phellos	Willow Oak	Tree	*		*		*	1	*	1	*		*		*		*	2	*	1	*	*
Quercus stellata	Post Oak	Tree	*	2	*		*		*	2	*		*	2	*	1	*	7	*	4	*	*
Nyssa biflora	Black gum	Tree	*		*		*	1	*		*		*		*		*	1	*		*	
		Plot Area (acres)	0.025		0.025		0.025		0.025		0.025		0.025		0.025							
*No baseline data for this project		Species Count		3		0		5		5		2		4		3		9		8		
Type = Tree or Shrub		Stem Count		5		0		8		10		4		8		6		41		33		
P = Planted, T = Total		Stems/Acre		200		0		320		400		160		320		240		234.286		190		

APPENDIX D

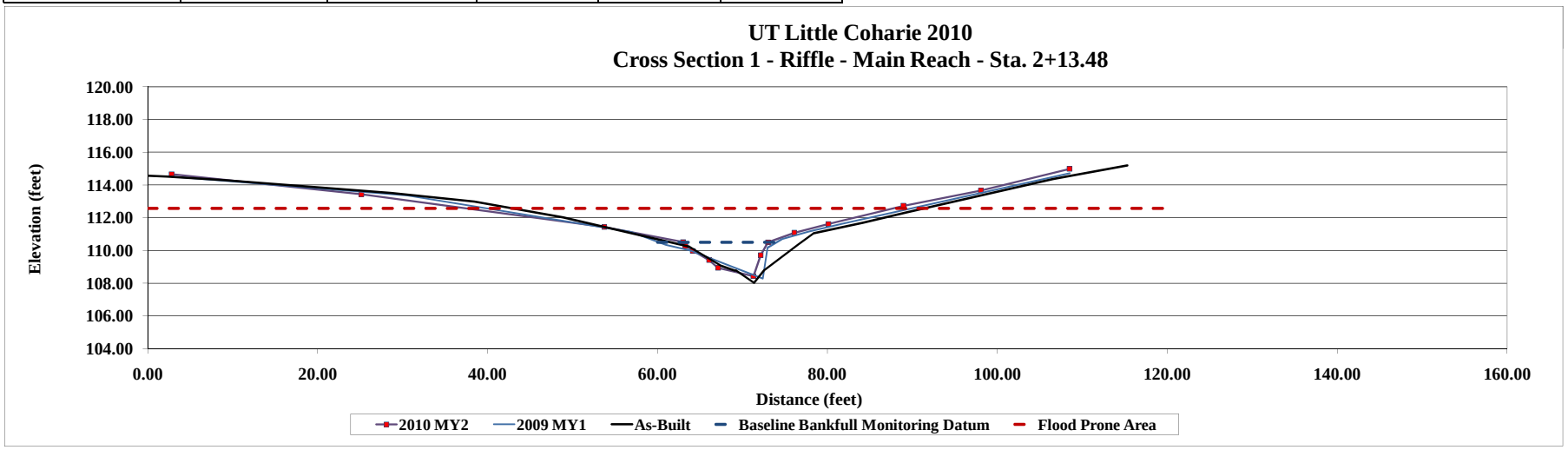
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 1
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 1 - Riffle - Looking Downstream

Picture Taken November 13 2010

As-Built Survey As-Built Survey			2009 2009 MY1			2010 2010 MY2			2011 2011 MY3			2012 2012 MY4			2013 2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	114.56		2.80	114.52		2.80	114.65										
2.24	114.51		30.56	113.36		25.13	113.43										
9.04	114.30		56.86	111.14		53.74	111.44										
28.64	113.51		61.01	110.34		63.01	110.51										
38.45	112.98		63.86	110.00		63.29	110.27										
48.90	112.02		72.39	108.28		64.15	109.97										
63.73	110.23		72.94	110.17		66.07	109.41										
64.59	109.97		74.64	110.69		67.12	108.93										
67.49	109.05		77.79	111.15		71.28	108.43										
69.04	108.78		81.70	111.63		72.14	109.71										
69.25	108.77		108.53	114.71		72.99	110.50										
71.33	108.03					76.10	111.08										
71.36	108.02					80.11	111.62										
71.36	108.02					88.94	112.73										
72.55	108.79					98.05	113.66										
76.57	110.38					108.50	114.99										
78.39	111.05																
84.18	111.70																
89.29	112.32																
106.54	114.36																
115.31	115.20																
117.62	115.42																
121.08	115.92																

Summary Data	
Bankfull Elv.	110.5
BF Area	12.4
BF Width	10
Flood Prone Elv.	112.57
Flood Prone Width	50.2
Max Depth	2.1
Mean Depth	1.2
W/D Ratio	8
ER	5
Bank Height Ratio	
Stream Type	C5



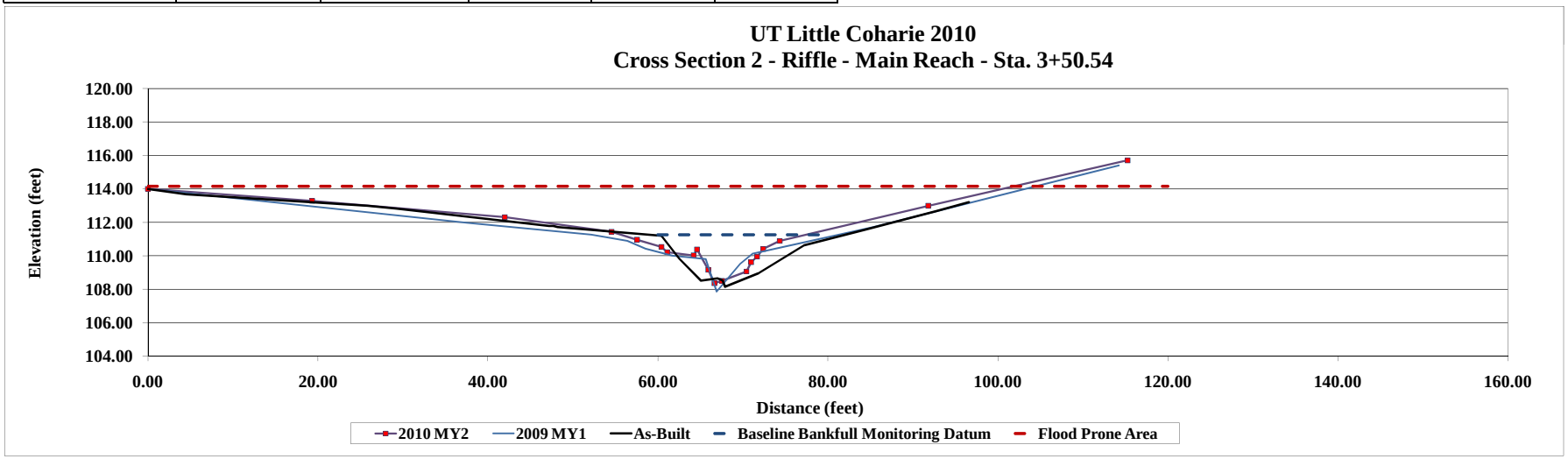
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 2
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 2 - Looking Downstream

Picture Taken November 13 2010

As-Built Survey As-Built Survey			2009 2009 MY1			2010 2010 MY2			2011 2011 MY3			2012 2012 MY4			2013 2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.0	114.00		0.00	114.00		0.00	114.00										
4.5	113.68		37.64	111.97		19.32	113.28										
25.9	113.00		52.18	111.26		42.00	112.31										
29.2	112.82		56.38	110.89		54.54	111.44										
47.2	111.78		58.55	110.43		57.55	110.96										
47.7	111.78		61.70	110.01		60.41	110.53										
48.2	111.71		65.62	109.80		61.09	110.22										
60.4	111.20		66.90	107.87		64.21	110.02										
62.5	109.83		69.68	109.52		64.61	110.38										
65.1	108.52		71.13	110.13		65.93	109.16										
67.0	108.64		85.33	111.72		66.64	108.35										
67.6	108.53		114.24	115.40		67.56	108.51										
67.9	108.15					70.43	109.06										
67.9	108.15					70.97	109.62										
71.8	108.94					71.68	109.95										
71.8	108.95					72.40	110.41										
71.9	108.98					74.33	110.89										
77.2	110.63					91.81	112.99										
84.3	111.55					115.26	115.71										
92.6	112.66																
96.6	113.21																
98.8	113.43																
104.1	114.01																
113.5	114.93																
117.3	115.30																
121.1	115.65																
132.3	116.65																

Summary Data	
Bankfull Elv.	111.25
BF Area	24.2
BF Width	21.6
Flood Prone Elv.	114.15
Flood Prone Width	101.8
Max Depth	2.9
Mean Depth	1.1
W/D Ratio	19.3
ER	4.7
Bank Height Ratio	
Stream Type	C5



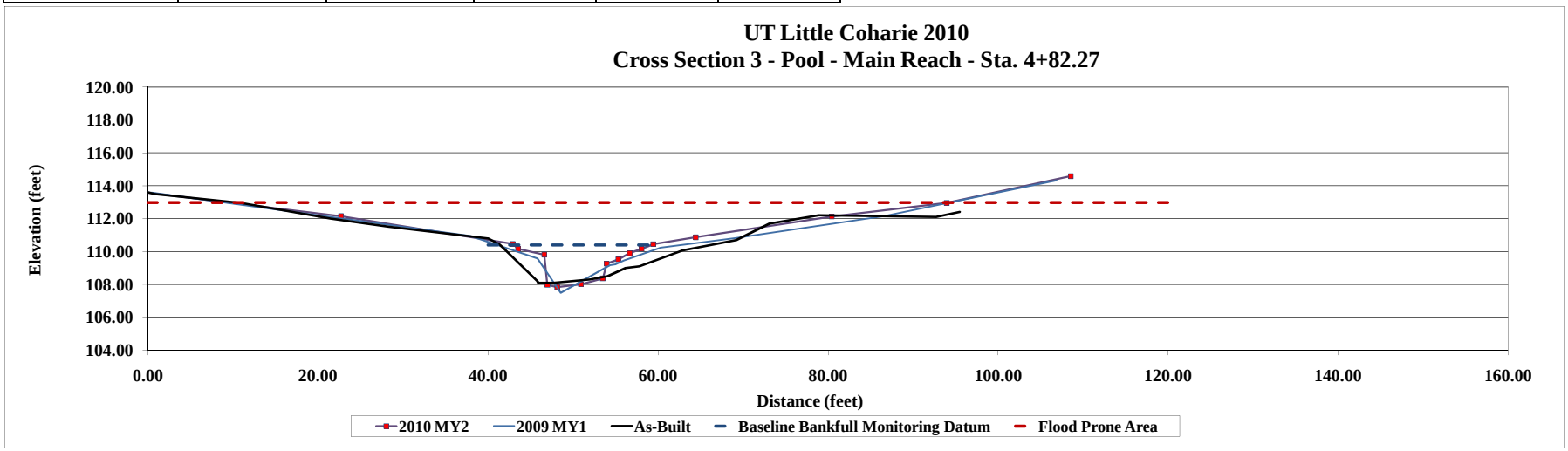
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 3
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 3 - Looking Downstream

Picture Taken November 13 2010

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	113.60		-8.00	113.71		-8.00	114.08										
0.80	113.50		0.48	113.58		22.71	112.15										
11.00	112.95		37.90	110.94		42.91	110.46										
21.50	112.00		45.84	109.57		43.55	110.15										
28.30	111.50		48.56	107.48		46.61	109.81										
40.00	110.80		54.35	109.16		46.99	107.97										
41.40	110.40		54.98	109.22		48.14	107.83										
45.80	108.20		55.99	109.46		50.91	108.00										
45.90	108.10		60.32	110.24		53.50	108.36										
47.70	108.10		69.02	110.81		53.96	109.26										
47.70	108.10		86.59	112.15		55.33	109.52										
52.00	108.30		106.87	114.32		56.68	109.90										
54.10	108.50					58.07	110.15										
56.20	109.00					59.44	110.44										
57.80	109.10					64.45	110.87										
62.90	110.06					80.43	112.13										
69.20	110.70					93.96	112.95										
73.10	111.70					108.56	114.58										
78.90	112.20																
92.70	112.10																
95.50	112.40																
103.20	113.30																
111.50	114.10																
118.80	114.40																
122.70	114.50																

Summary Data	
Bankfull Elv.	110.4
BF Area	21.1
BF Width	16.2
Flood Prone Elv.	112.97
Flood Prone Width	84.2
Max Depth	2.6
Mean Depth	1.3
W/D Ratio	12.4
ER	5.2
Bank Height Ratio	
Stream Type	C5



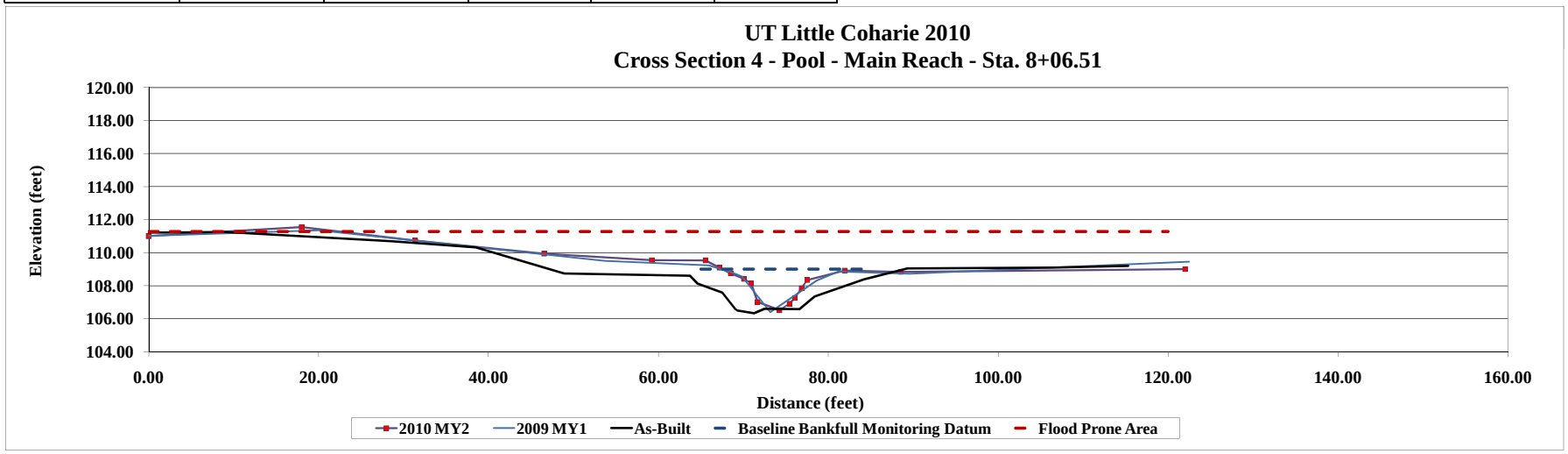
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 4
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 4 - Looking Downstream

Picture Taken November 13 2010

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	111.21		0.00	111.01		0.00	111.00										
2.20	111.22		20.00	111.36		18.00	111.55										
9.00	111.26		53.69	109.51		31.38	110.74										
28.60	110.69		65.91	109.23		46.54	109.94										
38.50	110.31		68.53	108.83		59.22	109.54										
48.90	108.74		69.83	108.56		65.54	109.53										
63.70	108.60		73.19	106.40		67.19	109.09										
64.60	108.13		78.72	108.34		68.52	108.75										
67.50	107.59		81.19	108.85		70.07	108.42										
69.00	106.61		89.56	108.72		70.92	108.14										
69.30	106.49		97.78	108.91		71.67	107.01										
71.30	106.33		122.45	109.46		74.24	106.52										
71.40	106.37					75.43	106.91										
71.40	106.37					76.07	107.25										
72.50	106.60					76.85	107.85										
76.60	106.59					77.51	108.35										
78.40	107.34					81.93	108.91										
84.20	108.38					88.53	108.83										
89.30	109.04					122.00	109.00										
106.50	109.10																
115.30	109.19																
117.60	109.55																
121.10	109.73																
125.80	110.05																
126.70	110.13																

Summary Data	
Bankfull Elv.	109
BF Area	14.8
BF Width	33.5
Flood Prone Elv.	111.28
Flood Prone Width	108.7
Max Depth	2.4
Mean Depth	0.4
W/D Ratio	75.9
ER	3.2
Bank Height Ratio	
Stream Type	C5



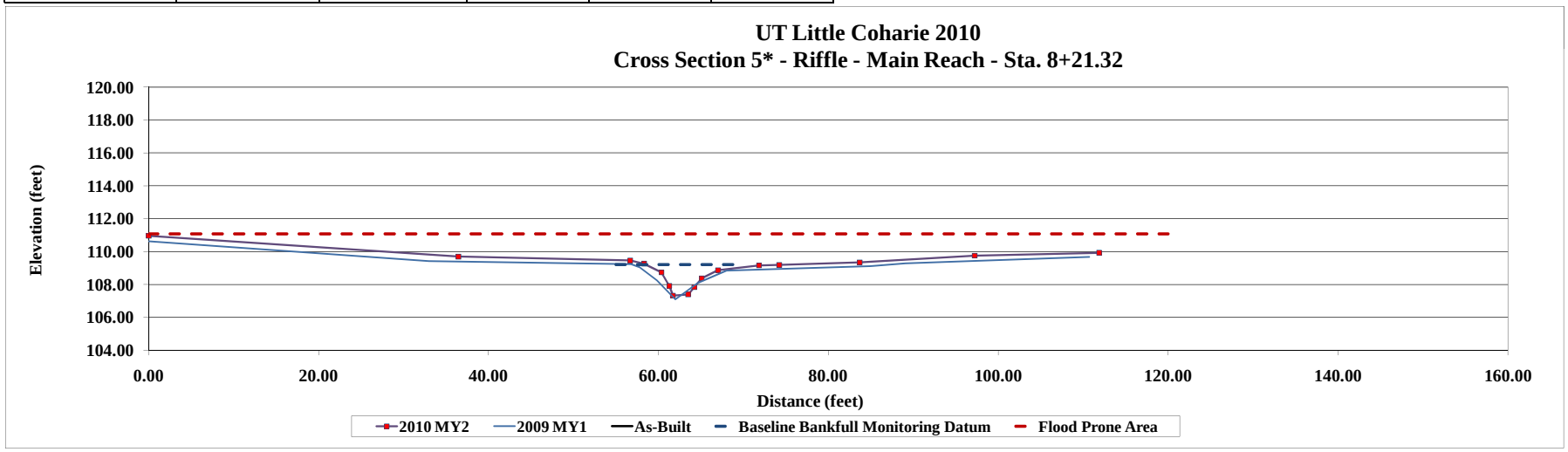
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 5
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 5 - Looking Downstream

Picture Taken November 13 2010

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
			0.00	110.63		0.00	110.96										
			32.97	109.42		36.45	109.69										
			56.80	109.23		56.68	109.45										
			57.80	109.04		58.31	109.26										
			59.83	108.25		60.37	108.73										
			61.99	107.10		61.28	107.92										
			64.65	108.09		61.70	107.32										
			67.99	108.84		63.51	107.39										
			84.97	109.11		64.22	107.83										
			89.07	109.29		65.09	108.37										
			110.69	109.68		67.02	108.87										
						71.84	109.16										
						74.22	109.18										
						83.68	109.34										
						97.23	109.75										
						111.86	109.92										

Summary Data	
Bankfull Elv.	109.2
BF Area	9.4
BF Width	16.9
Flood Prone Elv.	111.08
Flood Prone Width	111.9
Max Depth	1.9
Mean Depth	0.6
W/D Ratio	30.2
ER	6.6
Bank Height Ratio	
Stream Type	C5



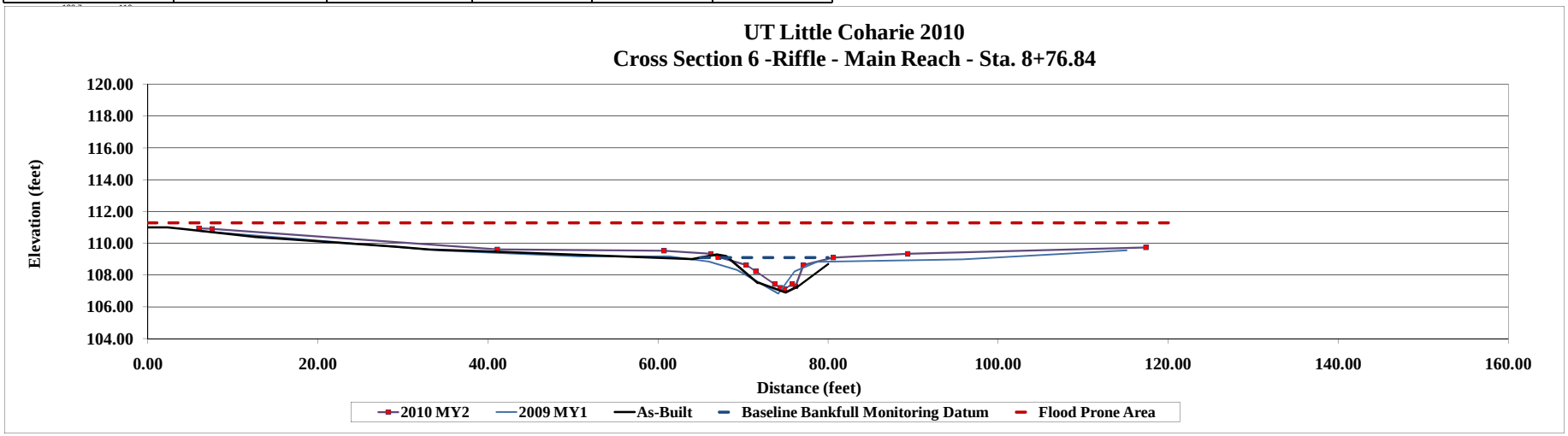
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 6
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 6 - Looking Downstream

Picture Taken November 13 2010

As-Built Survey As-Built Survey			2009 2009 MY1			2010 2010 MY2			2011 2011 MY3			2012 2012 MY4			2013 2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	111.00		6.00	110.77		6.00	110.94										
2.30	111.00		34.64	109.53		7.56	110.90										
4.20	110.90		50.74	109.18		41.11	109.61										
12.60	110.40		61.29	109.17		60.70	109.53										
28.90	109.80		65.96	108.84		66.22	109.34										
33.10	109.60		69.32	108.31		67.06	109.15										
39.30	109.50		74.14	106.84		70.36	108.63										
64.00	109.00		76.05	108.23		71.49	108.23										
66.90	109.30		78.70	108.83		73.72	107.43										
68.00	109.20		95.81	108.98		74.37	107.20										
71.70	107.50		115.09	109.56		74.87	107.12										
71.90	107.50					75.77	107.44										
72.40	107.40					76.17	107.29										
75.00	106.90					77.08	108.63										
75.00	106.90					80.60	109.10										
75.00	106.90					89.36	109.33										
75.00	106.90					117.36	109.74										
75.00	106.90																
75.00	106.90																
76.50	107.30																
80.00	108.70																
80.60	108.80																
89.60	109.10																
90.20	109.10																
90.50	109.10																
91.80	109.20																
92.20	109.20																
116.00	109.30																
119.40	110.00																

Summary Data	
Bankfull Elv.	109.1
BF Area	12.2
BF Width	17.6
Flood Prone Elv.	111.28
Flood Prone Width	111.4
Max Depth	2.1
Mean Depth	0.7
W/D Ratio	25.4
ER	6.3
Bank Height Ratio	
Stream Type	C5



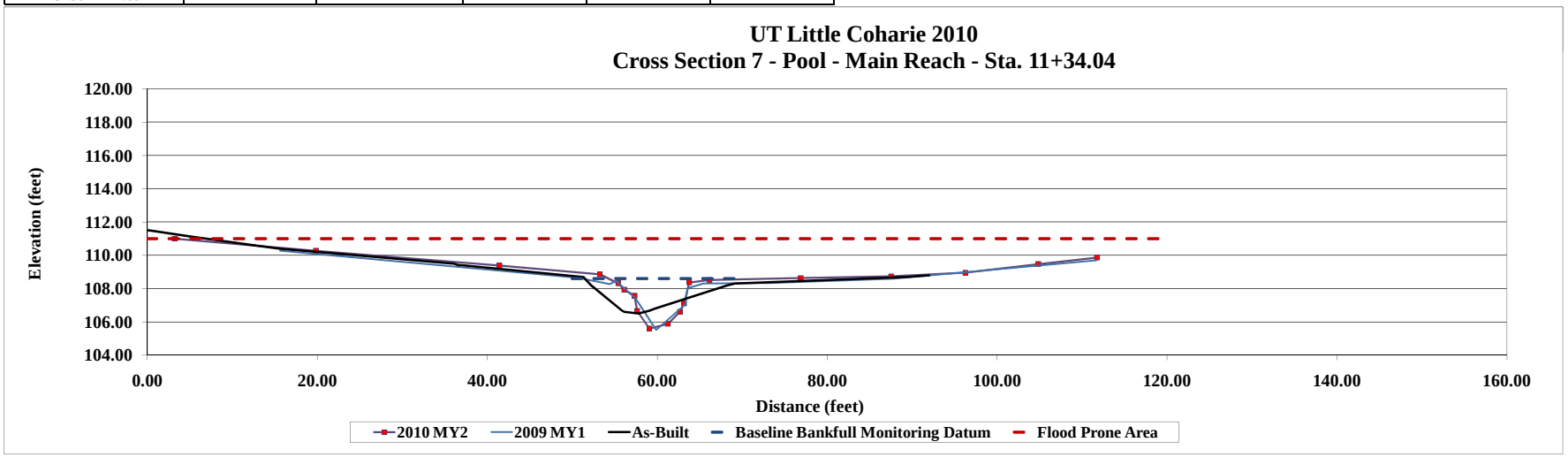
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 7
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 7 - Looking Downstream

Picture Taken November 13 2010

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	111.50		15.6	110.3		3.20	111.00										
0.20	111.50		50.72	108.7		19.84	110.27										
4.90	111.14		54.39	108.3		41.43	109.38										
12.60	110.60		55.18	108.5		53.25	108.86										
15.60	110.40		57.5	107.4		55.42	108.32										
36.10	109.50		59.9	105.5		56.11	107.93										
36.60	109.40		63.32	107.1		57.32	107.57										
36.90	109.40		63.56	108		57.64	106.65										
51.30	108.70		65.41	108.3		59.08	105.60										
52.20	108.20		73.5	108.3		61.26	105.89										
55.80	106.70		87.8	108.6		62.68	106.61										
56.10	106.60		111.7	109.7		63.17	107.10										
57.80	106.50					63.77	108.37										
57.80	106.50					66.16	108.52										
57.80	106.50					76.89	108.63										
59.10	106.68					87.54	108.74										
59.70	106.80					96.27	108.95										
68.30	108.20					104.84	109.48										
69.10	108.30					111.75	109.87										
89.30	108.70																
92.00	108.80																
92.80	108.90																
94.40	109.00																
96.20	109.00																
109.30	110.10																
111.30	110.30																
127.40	111.00																
128.10	110.90																
131.30	111.00																

Summary Data	
Bankfull Elv.	108.6
BF Area	13.8
BF Width	8.3
Flood Prone Elv.	111
Flood Prone Width	108.6
Max Depth	2.7
Mean Depth	1.7
W/D Ratio	5
ER	13.1
Bank Height Ratio	
Stream Type	C5



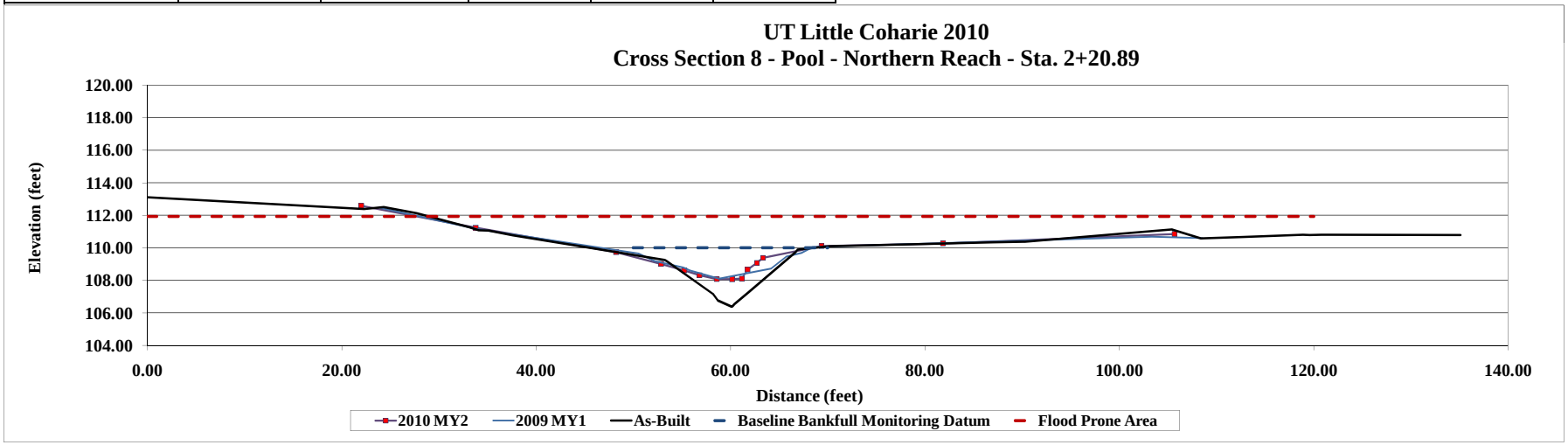
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 8
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 8 - Looking Downstream

Picture Taken November 13 2010

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	113.11		24.00	112.46		22.00	112.58										
22.30	112.38		33.99	111.15		33.77	111.24										
24.30	112.50		50.51	109.65		48.22	109.73										
27.70	112.12		52.19	109.19		52.85	109.01										
33.10	111.27		55.13	108.79		55.24	108.62										
34.10	111.07		55.85	108.60		56.80	108.32										
35.10	111.06		58.82	108.11		58.58	108.08										
37.60	110.76		64.17	108.72		60.16	108.07										
53.20	109.25		65.75	109.46		61.17	108.11										
53.40	109.19		67.30	109.68		61.76	108.66										
58.20	107.16		68.44	110.05		62.71	109.08										
58.70	106.76		103.37	110.69		63.35	109.38										
60.10	106.39		108.50	110.60		69.36	110.11										
60.10	106.40					81.85	110.27										
60.10	106.40					105.68	110.85										
60.20	106.40																
60.40	106.53																
61.80	107.24																
66.70	109.73																
66.90	109.89																
70.20	110.10																
78.80	110.21																
87.00	110.33																
90.10	110.37																
90.30	110.38																
105.40	111.13																
105.50	111.11																
108.40	110.58																
112.70	110.66																

Summary Data	
Bankfull Elv.	110
BF Area	20.8
BF Width	22.8
Flood Prone Elv.	111.93
Flood Prone Width	78
Max Depth	1.9
Mean Depth	0.9
W/D Ratio	25.1
ER	3.4
Bank Height Ratio	
Stream Type	C5



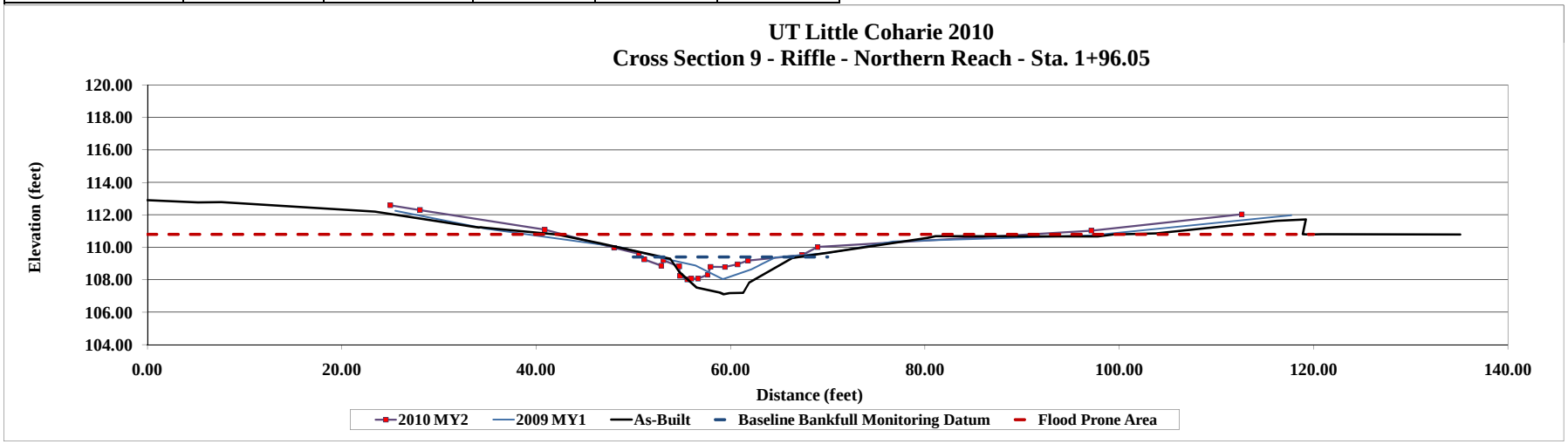
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 9
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 9 - Looking Downstream

Picture Taken November 13 2010

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	112.90		25.50	112.24		25.00	112.58										
5.20	112.77		34.82	111.15		28.03	112.30										
7.60	112.78		48.75	110.00		40.89	111.08										
23.40	112.20		53.00	109.32		48.03	109.97										
33.50	111.27		56.38	108.88		50.58	109.59										
34.10	111.21		59.21	108.03		51.13	109.24										
34.30	111.23		62.15	108.64		52.88	108.87										
34.50	111.21		62.78	108.83		53.11	109.19										
34.80	111.20		63.20	108.96		54.72	108.82										
42.10	110.78		64.62	109.37		54.81	108.24										
46.50	110.26		70.09	109.65		55.55	108.01										
53.80	109.28		76.76	110.36		55.98	108.07										
54.70	108.49		97.27	110.74		56.67	108.07										
56.50	107.52		117.71	111.98		57.64	108.30										
58.90	107.20					57.96	108.80										
59.30	107.11					59.43	108.78										
59.30	107.11					60.73	108.95										
59.90	107.18					61.79	109.18										
61.30	107.19					67.38	109.52										
61.90	107.81					68.96	110.01										
66.40	109.34					97.13	111.02										
80.30	110.57					112.61	112.03										
81.10	110.68																
97.80	110.67																
99.40	110.78																
103.80	110.86																
111.20	111.32																
116.20	111.63																
119.20	111.72																

Summary Data	
Bankfull Elv.	109.4
BF Area	7.7
BF Width	14.5
Flood Prone Elv.	110.79
Flood Prone Width	48
Max Depth	1.5
Mean Depth	0.5
W/D Ratio	27.5
ER	3.3
Bank Height Ratio	
Stream Type	C5



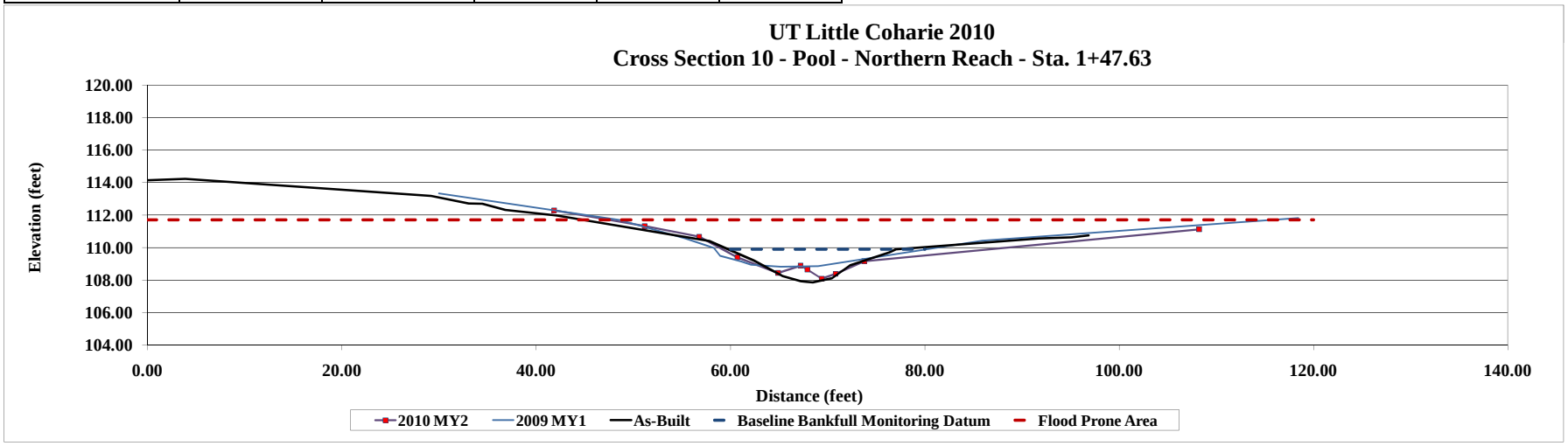
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 10
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 10 - Looking Downstream

Picture Taken November 13 2010

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.0	114.15		30.00	113.33		41.86	112.29										
3.9	114.22		48.61	111.69		51.16	111.32										
29.2	113.17		55.37	110.55		56.79	110.67										
33.1	112.71		58.31	109.98		60.71	109.40										
34.5	112.69		58.93	109.50		64.89	108.44										
36.8	112.32		61.10	109.15		67.22	108.89										
42.1	111.97		62.14	108.94		67.92	108.65										
57.8	110.41		65.15	108.82		69.39	108.09										
62.4	109.20		69.01	108.86		70.82	108.38										
65.3	108.25		85.91	110.43		73.76	109.17										
67.3	107.93		118.44	111.81		108.24	111.12										
67.8	107.89																
67.8	107.89																
68.5	107.85																
70.5	108.11																
72.3	108.90																
76.4	109.71																
77.0	109.88																
91.8	110.56																
95.1	110.63																
96.9	110.74																
113.4	111.82																
122.6	112.18																
124.0	111.99																

Summary Data	
Bankfull Elv.	109.9
BF Area	20.8
BF Width	27.5
Flood Prone Elv.	111.71
Flood Prone Width	60.8
Max Depth	1.8
Mean Depth	28
W/D Ratio	36.4
ER	2.2
Bank Height Ratio	
Stream Type	C5



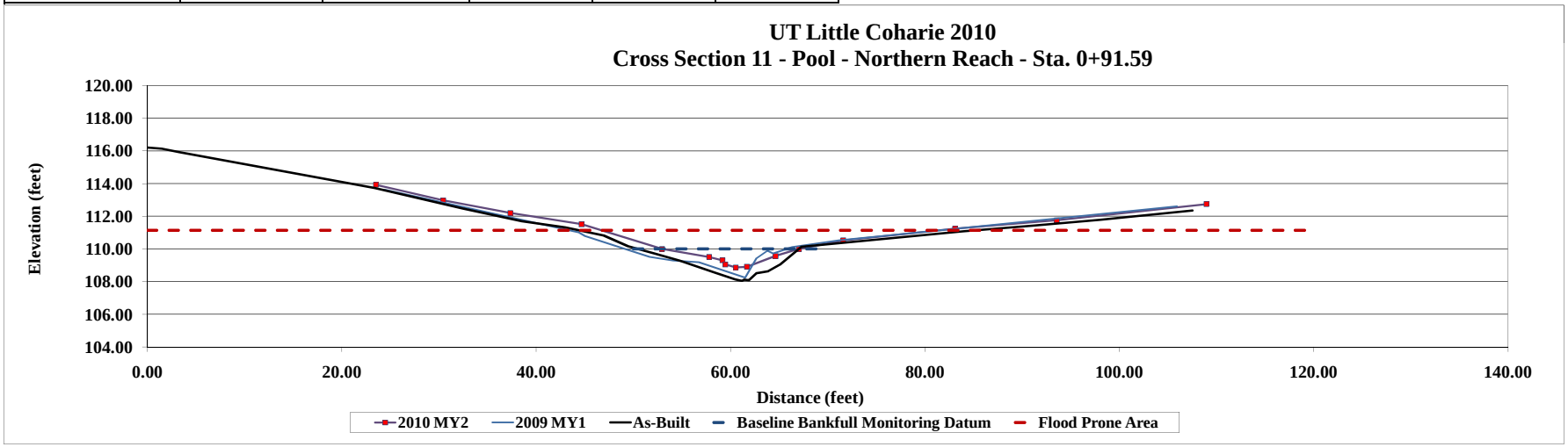
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 11
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

Photo of Cross-Section 11 - Looking Downstream

Picture Taken November 13 2010

As-Built Survey			2009			2010			2011			2012			2013		
As-Built Survey			2009 MY1			2010 MY2			2011 MY3			2012 MY4			2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	116.20		24.40	113.62		23.50	113.92										
1.49	116.14		44.41	111.00		30.42	112.98										
3.21	115.93		45.03	110.78		37.33	112.20										
23.38	113.72		48.17	110.18		44.67	111.51										
32.44	112.48		51.66	109.51		52.96	110.00										
38.49	111.70		54.06	109.29		57.79	109.51										
43.00	111.32		56.72	109.19		59.17	109.30										
46.95	110.82		61.51	108.24		59.46	109.05										
49.44	110.16		62.67	109.42		60.54	108.87										
52.29	109.70		63.79	109.88		61.68	108.91										
54.81	109.28		64.37	109.72		64.63	109.57										
58.39	108.54		66.35	110.12		67.03	110.00										
60.48	108.13		71.14	110.52		71.60	110.53										
61.09	108.04		81.66	111.14		83.10	111.24										
61.21	108.05		105.93	112.61		93.57	111.76										
61.42	108.12					108.95	112.74										
61.42	108.12																
61.89	108.09																
62.67	108.52																
63.03	108.56																
63.89	108.64																
65.06	109.04																
67.29	110.13																
83.95	111.08																
91.07	111.43																
98.03	111.78																
107.52	112.34																

Summary Data	
Bankfull Elv.	110
BF Area	7.4
BF Width	14.1
Flood Prone Elv.	111.13
Flood Prone Width	34.6
Max Depth	1.1
Mean Depth	0.5
W/D Ratio	26.8
ER	2.5
Bank Height Ratio	
Stream Type	C5



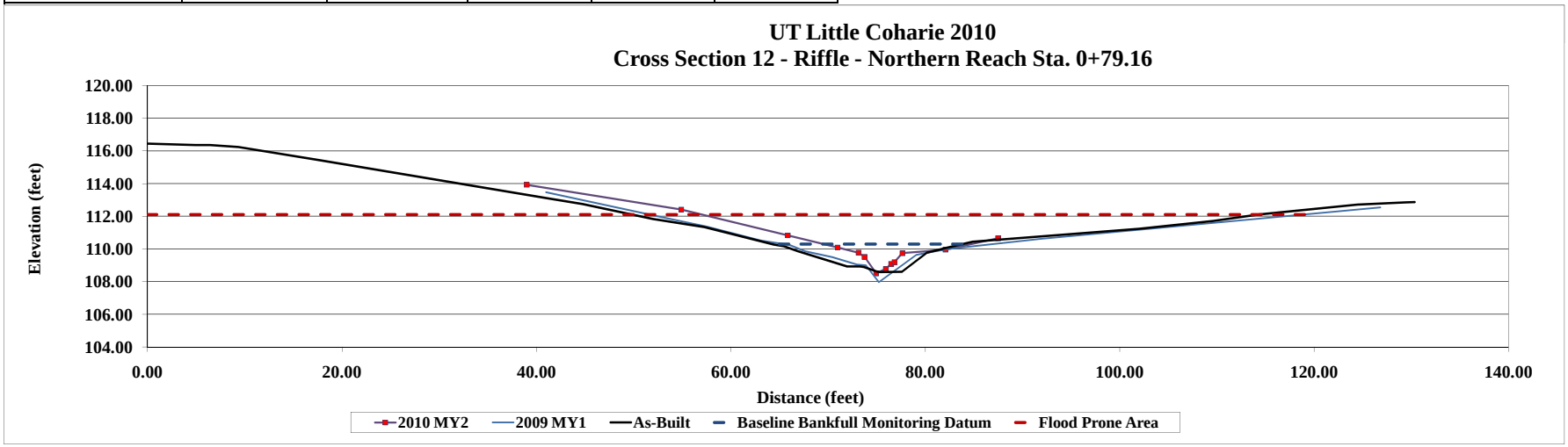
Project Name UT to Little Coharie, MY2
Watershed
Cross Section 12
Drainage Area NA
Date Jun-10
Crew Tutt, Stafford

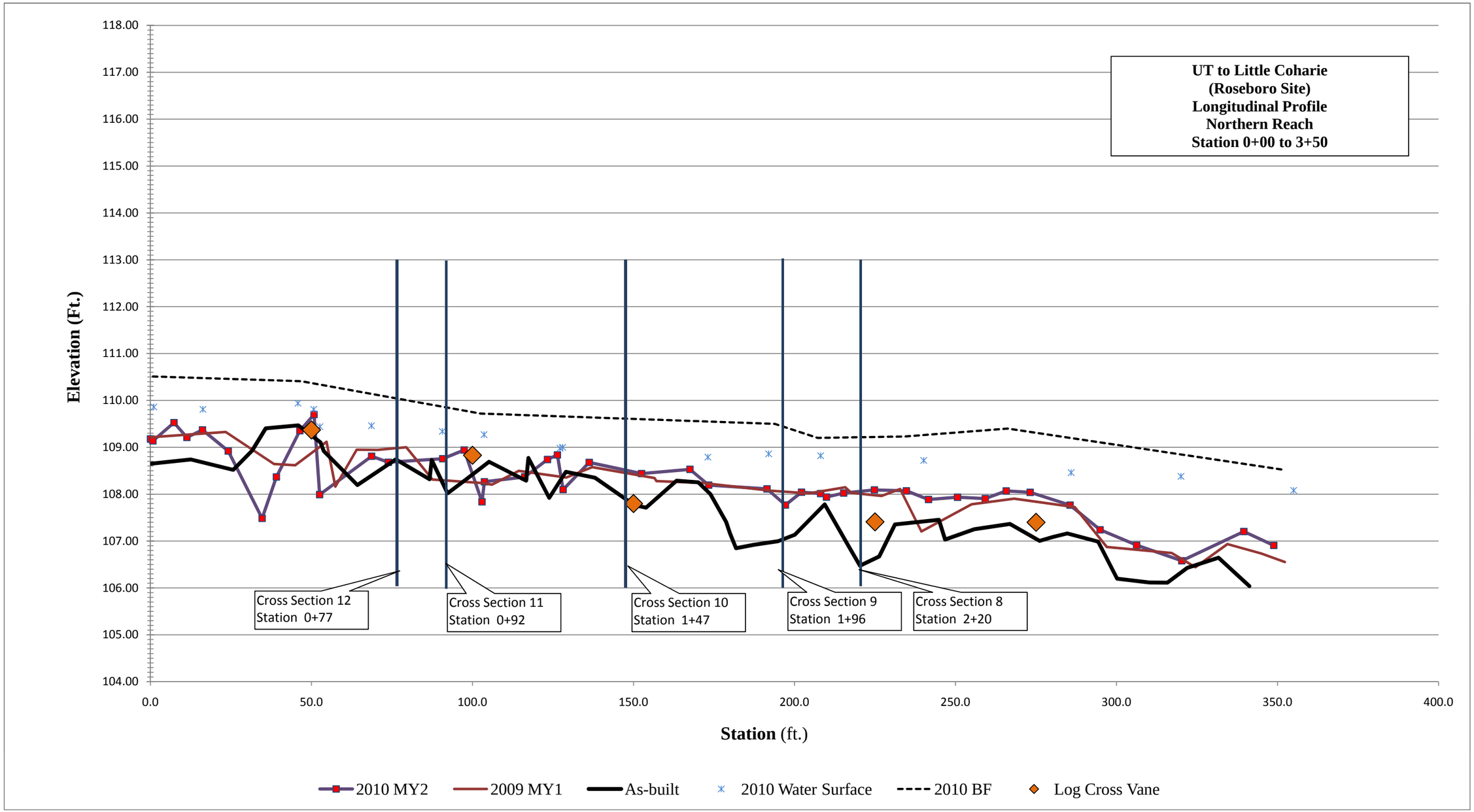
Photo of Cross-Section 12 - Looking Downstream

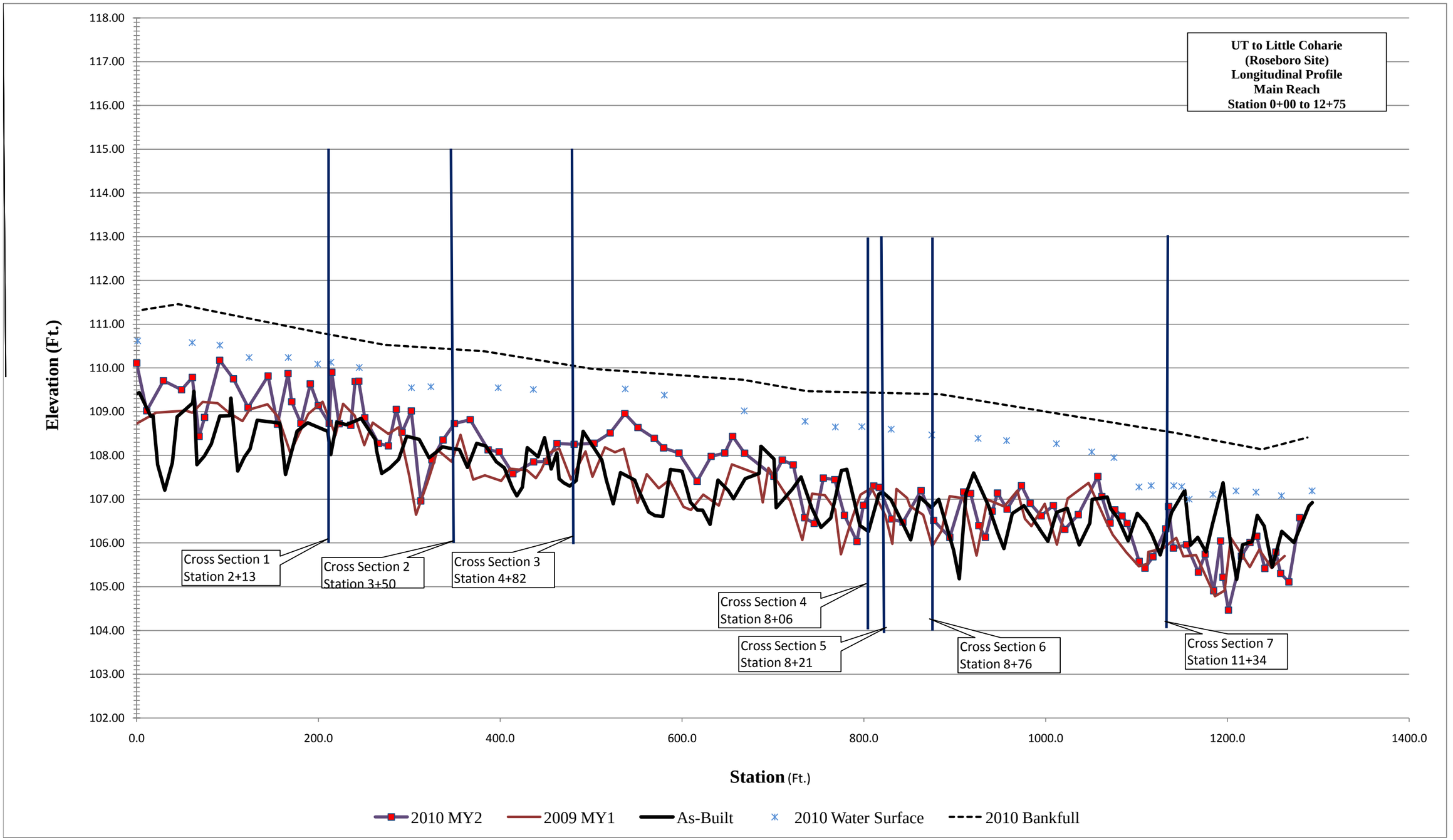
Picture Taken November 13 2010

As-Built Survey As-Built Survey			2009 2009 MY1			2010 2010 MY2			2011 2011 MY3			2012 2012 MY4			2013 2013 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
0.00	116.44		41.00	113.47		39.00	113.92										
4.93	116.36		52.81	111.96		54.90	112.41										
6.44	116.36		57.48	111.36		65.87	110.83										
9.35	116.23		63.11	110.50		70.99	110.09										
17.71	115.43		65.99	110.25		73.14	109.77										
41.05	113.11		67.64	109.86		73.74	109.52										
44.76	112.75		70.46	109.50		74.95	108.50										
51.96	111.84		72.94	109.05		75.95	108.78										
57.30	111.33		73.88	109.00		76.49	109.09										
64.39	110.28		75.23	107.96		76.83	109.19										
65.43	110.17		79.08	109.64		77.65	109.74										
66.93	109.86		80.19	109.76		82.08	109.96										
71.94	108.93		82.34	110.00		87.49	110.65										
72.48	108.93		91.83	110.62													
73.32	108.93		126.80	112.55													
73.70	108.90																
75.00	108.62																
75.00	108.62																
75.33	108.59																
77.59	108.60																
80.18	109.77																
82.28	110.08																
84.87	110.44																
101.97	111.23																
109.64	111.72																
114.33	112.11																
124.44	112.71																
129.45	112.85																
130.32	112.87																

Summary Data	
Bankfull Elv.	110.3
BF Area	8.8
BF Width	15.2
Flood Prone Elv.	112.1
Flood Prone Width	30.4
Max Depth	1.8
Mean Depth	0.6
W/D Ratio	26.2
ER	2
Bank Height Ratio	
Stream Type	C5

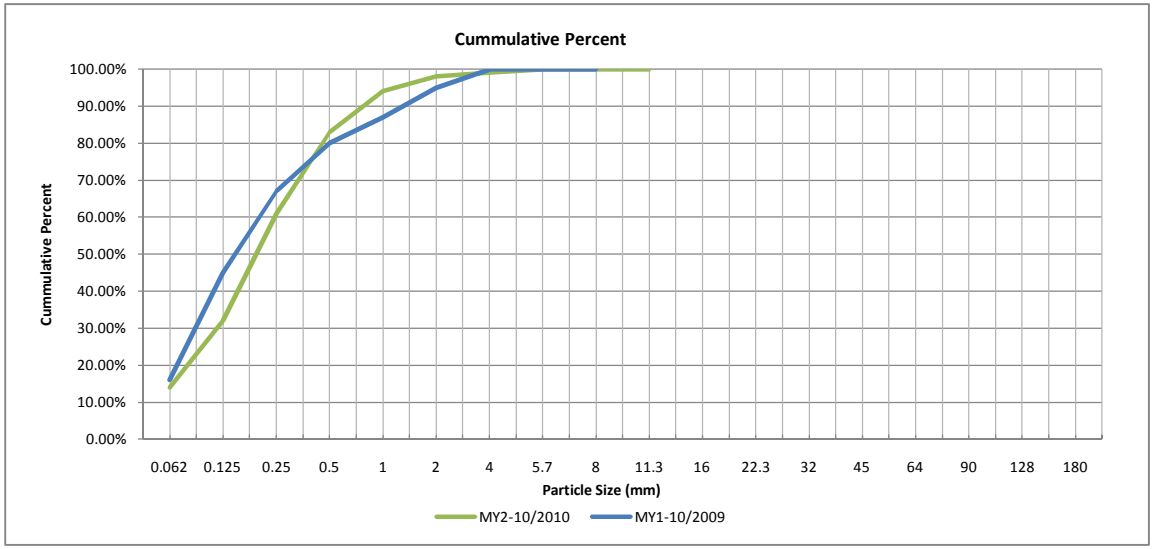


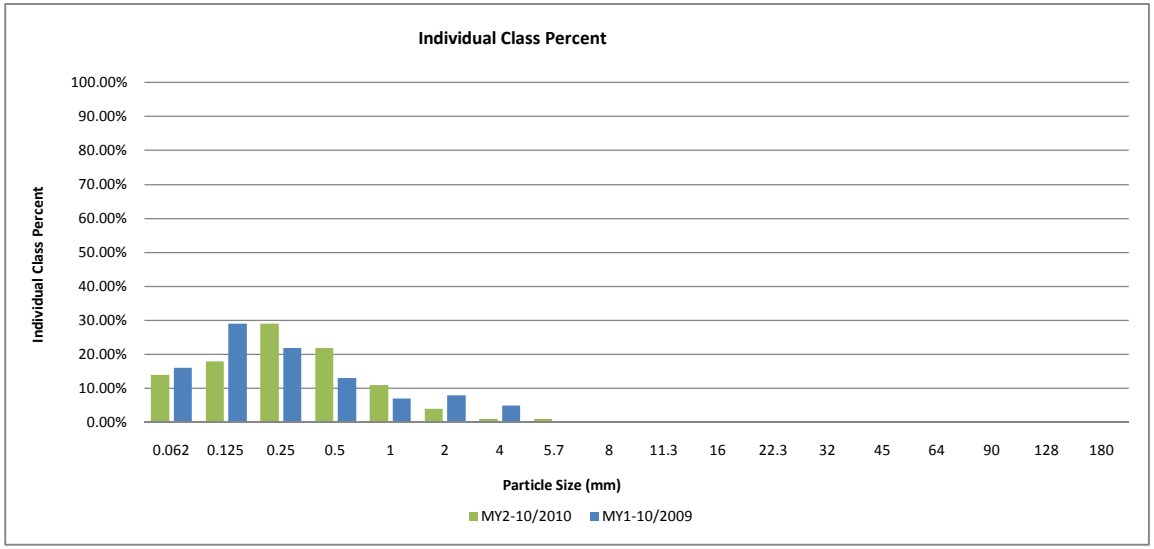

UT to Little Coharie
(Roseboro Site)
Longitudinal Profile
Northern Reach
Station 0+00 to 3+50
Elevation (Ft.)
118.00
117.00
116.00
115.00
114.00
113.00
112.00
111.00
110.00
109.00
108.00
107.00
106.00
105.00
104.00
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Station (ft.)
Cross Section 12
Station 0+77
Cross Section 11
Station 0+92
Cross Section 10
Station 1+47
Cross Section 9
Station 1+96
Cross Section 8
Station 2+20
2010 MY2
2009 MY1
As-built
2010 Water Surface
2010 BF
Log Cross Vane


UT to Little Coharie
(Roseboro Site)
Longitudinal Profile
Main Reach
Station 0+00 to 12+75
Elevation (Ft.)
118.00
117.00
116.00
115.00
114.00
113.00
112.00
111.00
110.00
109.00
108.00
107.00
106.00
105.00
104.00
103.00
102.00
0.0
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
Station (Ft.)
Cross Section 1
Station 2+13
Cross Section 2
Station 3+50
Cross Section 3
Station 4+82
Cross Section 4
Station 8+06
Cross Section 5
Station 8+21
Cross Section 6
Station 8+76
Cross Section 7
Station 11+34
2010 MY2
2009 MY1
As-Built
2010 Water Surface
2010 Bankfull

Project Name: UT to Little Coharie Cross Section 1 - Main Reach Monitoring Year 2 - 2010					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	14	14.00%	14.00%
	very fine sand	0.125	18	18.00%	32.00%
	fine sand	0.25	29	29.00%	61.00%
	medium sand	0.5	22	22.00%	83.00%
	coarse sand	1	11	11.00%	94.00%
	very coarse sand	2	4	4.00%	98.00%
GRAVEL	very fine gravel	4	1	1.00%	99.00%
	fine gravel	5.7	1	1.00%	100.00%
	fine gravel	8		0.00%	100.00%
	medium gravel	11.3		0.00%	100.00%
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

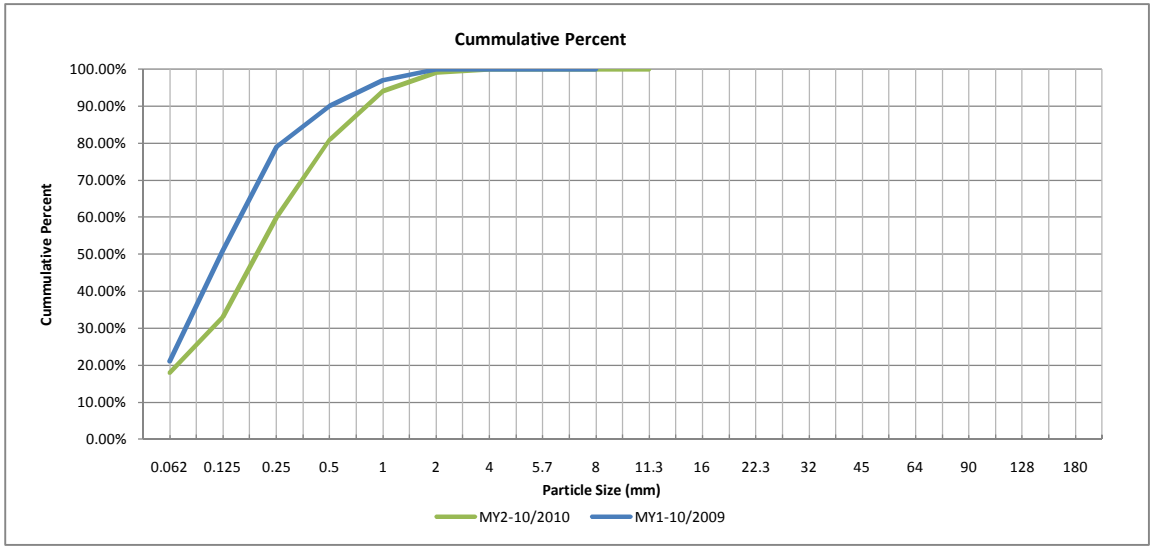
Sumamry Data	
D50	0.19
D84	0.53
D95	1.2

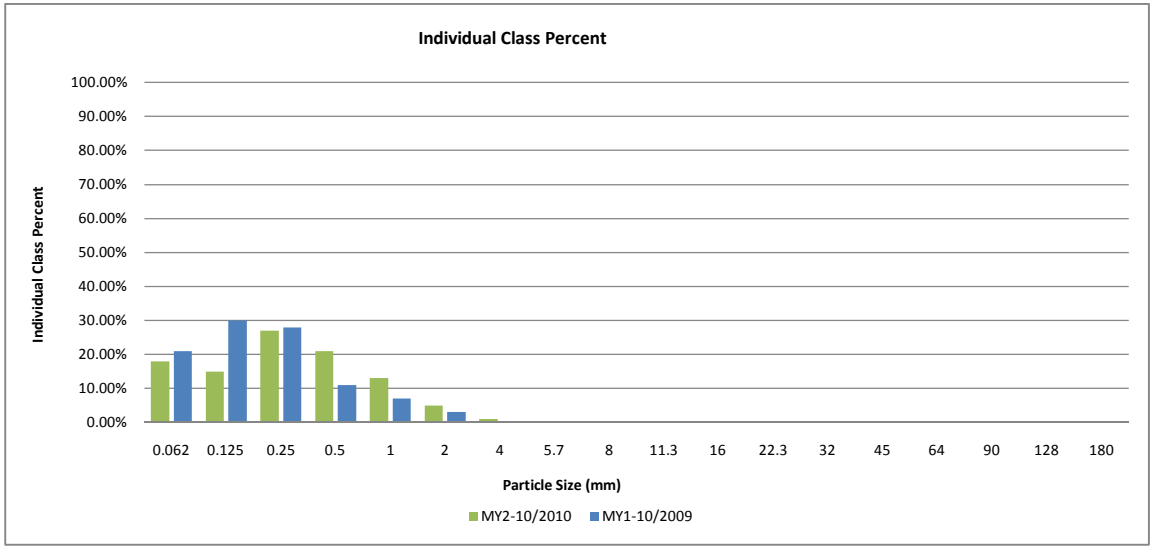




Project Name: UT to Little Coharie Cross Section 3 - Main Reach Monitoring Year 2 - 2010					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	18	18.00%	18.00%
	very fine sand	0.125	15	15.00%	33.00%
	fine sand	0.25	27	27.00%	60.00%
	medium sand	0.5	21	21.00%	81.00%
	coarse sand	1	13	13.00%	94.00%
	very coarse sand	2	5	5.00%	99.00%
GRAVEL	very fine gravel	4	1	1.00%	100.00%
	fine gravel	5.7		0.00%	100.00%
	fine gravel	8		0.00%	100.00%
	medium gravel	11.3		0.00%	100.00%
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

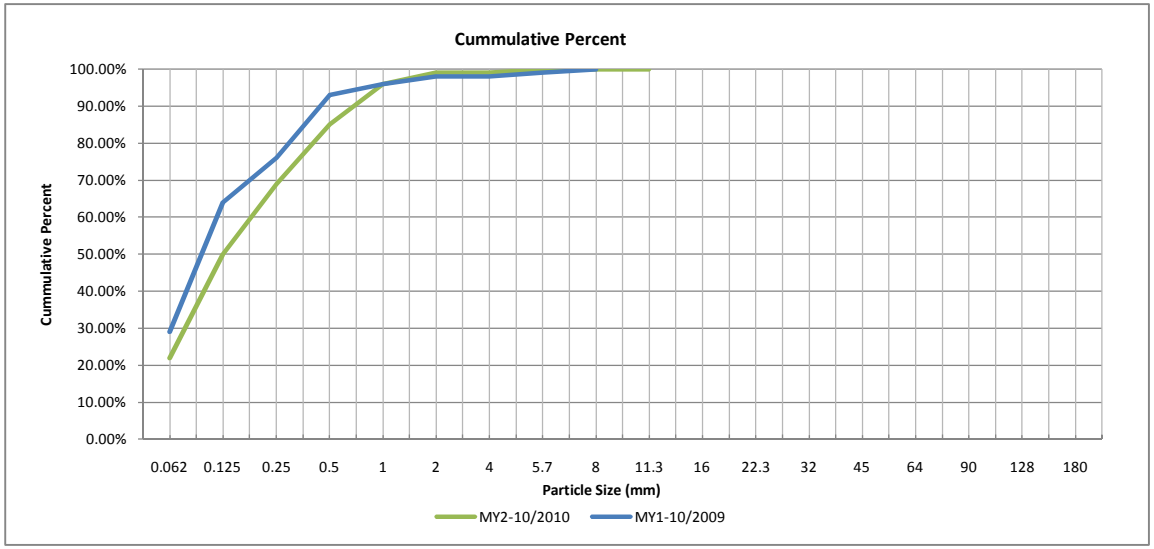
Sumamry Data	
D50	0.19
D84	0.59
D95	1.1

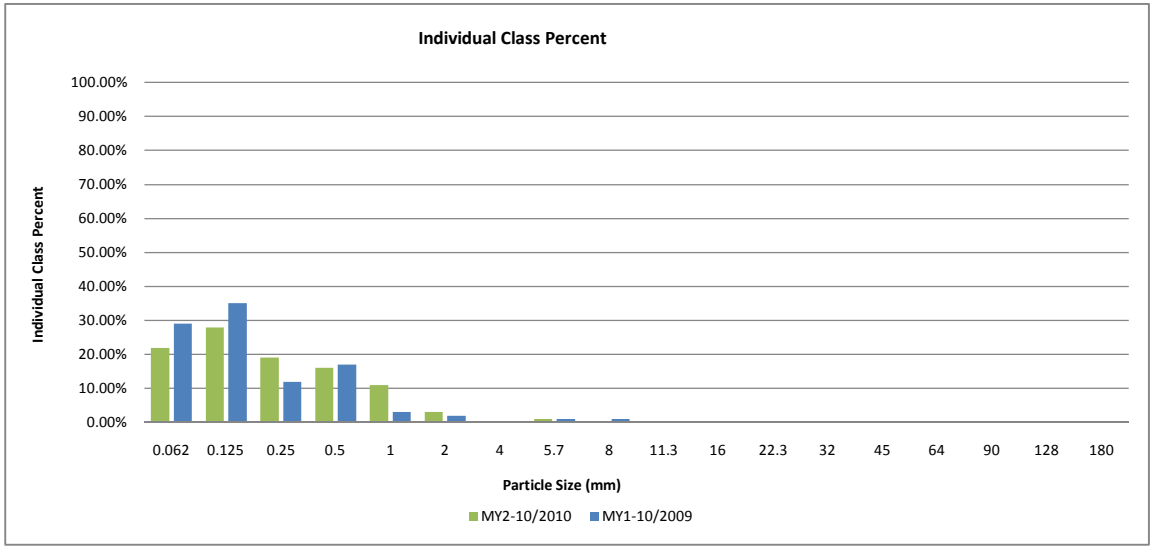




Project Name: UT to Little Coharie Cross Section 6 - Main Reach Monitoring Year 2 - 2010					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	22	22.00%	22.00%
	very fine sand	0.125	28	28.00%	50.00%
	fine sand	0.25	19	19.00%	69.00%
	medium sand	0.5	16	16.00%	85.00%
	coarse sand	1	11	11.00%	96.00%
	very coarse sand	2	3	3.00%	99.00%
GRAVEL	very fine gravel	4		0.00%	99.00%
	fine gravel	5.7	1	1.00%	100.00%
	fine gravel	8		0.00%	100.00%
	medium gravel	11.3		0.00%	100.00%
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

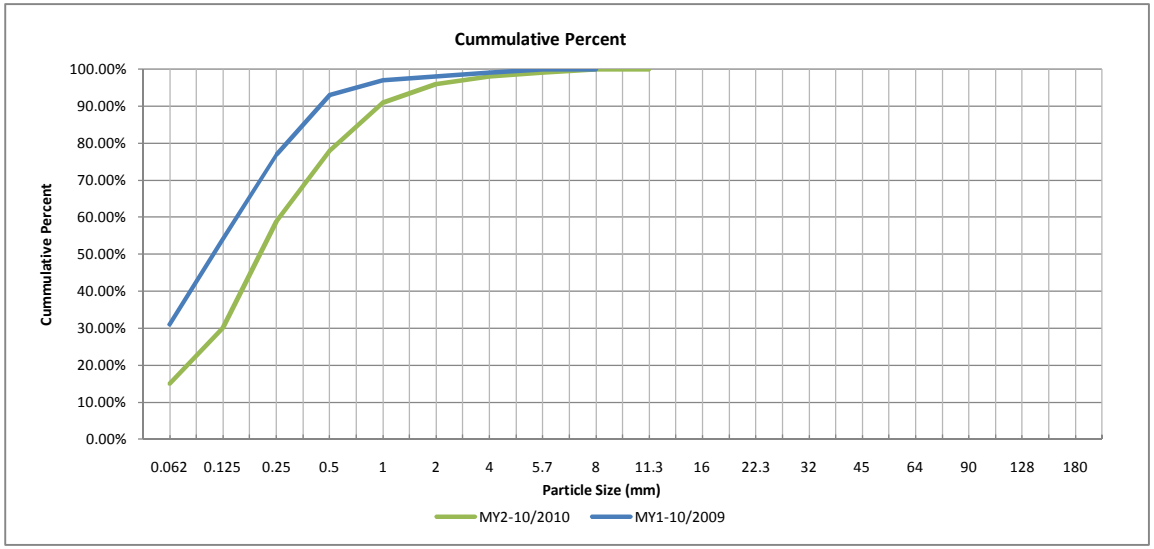
Sumamry Data	
D50	0.13
D84	0.48
D95	0.94

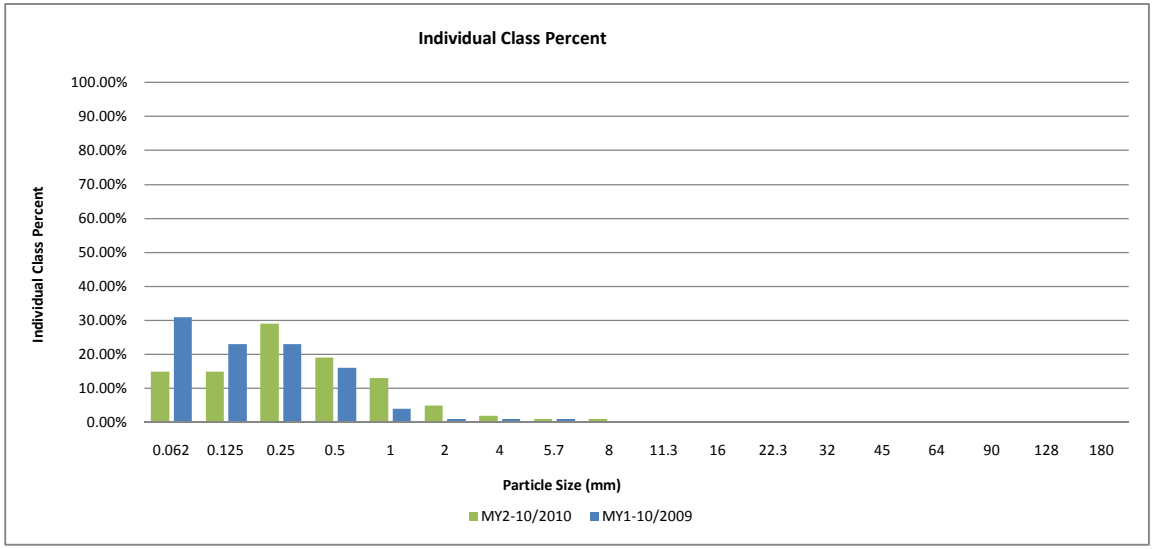




Project Name: UT to Little Coharie Cross Section 7 - Main Reach Monitoring Year 2 - 2010					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	15	15.00%	15.00%
	very fine sand	0.125	15	15.00%	30.00%
	fine sand	0.25	29	29.00%	59.00%
	medium sand	0.5	19	19.00%	78.00%
	coarse sand	1	13	13.00%	91.00%
	very coarse sand	2	5	5.00%	96.00%
GRAVEL	very fine gravel	4	2	2.00%	98.00%
	fine gravel	5.7	1	1.00%	99.00%
	fine gravel	8	1	1.00%	100.00%
	medium gravel	11.3		0.00%	100.00%
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

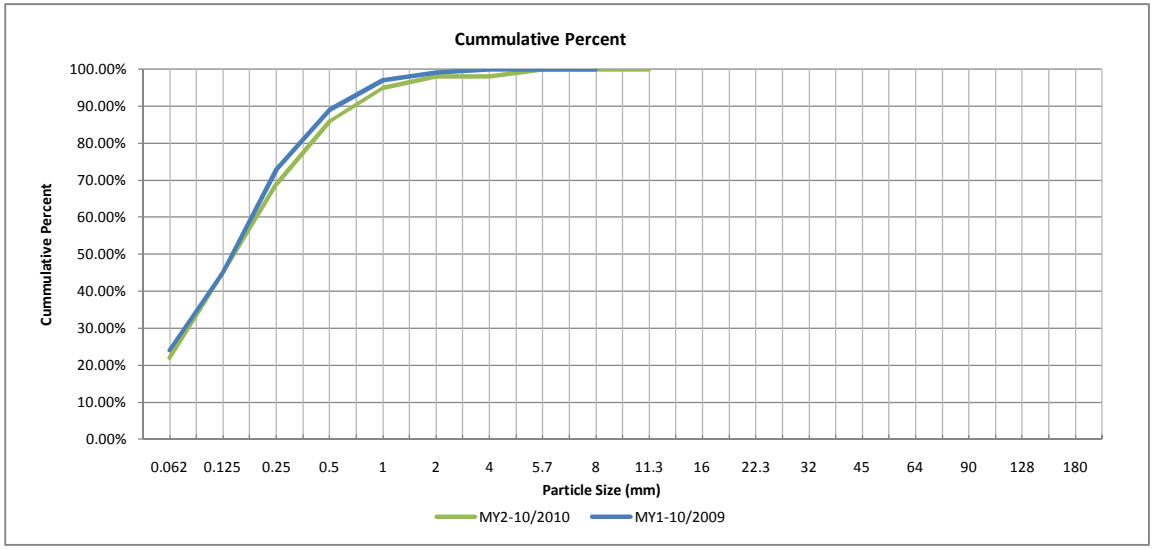
Sumamry Data	
D50	0.2
D84	0.69
D95	1.7

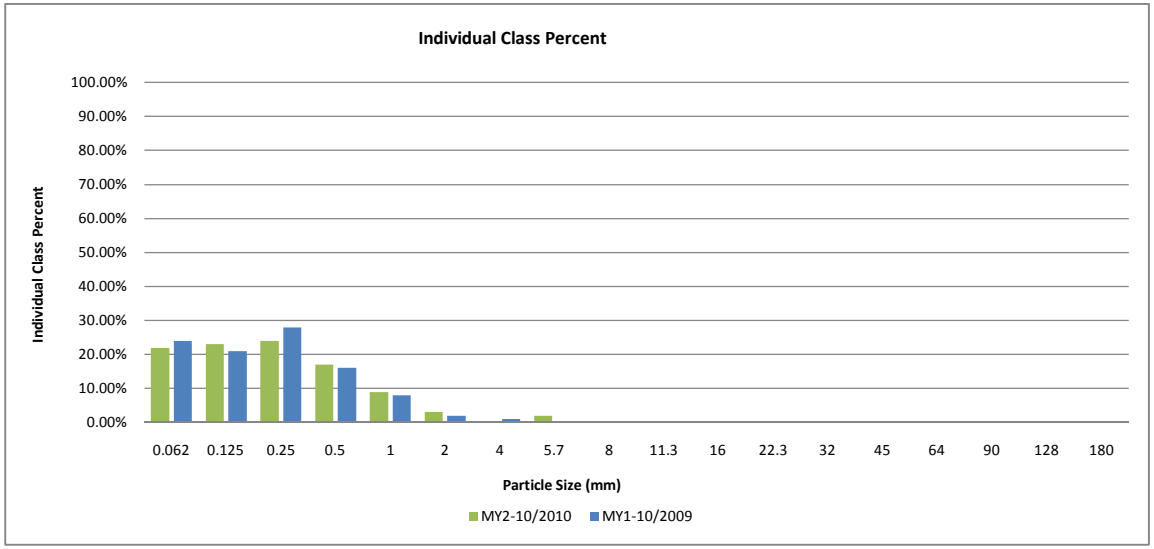




Project Name: UT to Little Coharie Cross Section 8 - Northern Reach Monitoring Year 2 - 2010					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	22	22.00%	22.00%
	very fine sand	0.125	23	23.00%	45.00%
	fine sand	0.25	24	24.00%	69.00%
	medium sand	0.5	17	17.00%	86.00%
	coarse sand	1	9	9.00%	95.00%
	very coarse sand	2	3	3.00%	98.00%
GRAVEL	very fine gravel	4	0	0.00%	98.00%
	fine gravel	5.7	2	2.00%	100.00%
	fine gravel	8		0.00%	100.00%
	medium gravel	11.3		0.00%	100.00%
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

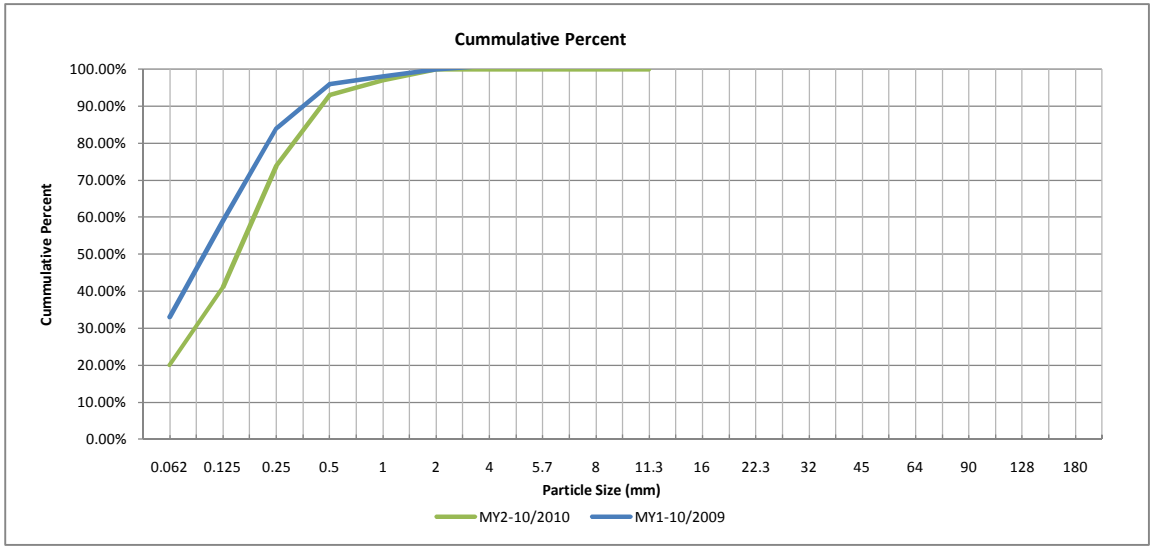
Sumamry Data	
D50	0.14
D84	0.46
D95	1





Project Name: UT to Little Coharie Cross Section 12 - Northern Reach Monitoring Year 2 - 2010					
Desc.	**Material**	**Size (MM)**	**Count**	**% of Total**	**Cumulative %**
SAND	silt/clay	0.062	20	20.00%	20.00%
	very fine sand	0.125	21	21.00%	41.00%
	fine sand	0.25	33	33.00%	74.00%
	medium sand	0.5	19	19.00%	93.00%
	coarse sand	1	4	4.00%	97.00%
	very coarse sand	2	3	3.00%	100.00%
GRAVEL	very fine gravel	4		0.00%	100.00%
	fine gravel	5.7		0.00%	100.00%
	fine gravel	8		0.00%	100.00%
	medium gravel	11.3		0.00%	100.00%
	medium gravel	16			
	coarse gravel	22.3			
	coarse gravel	32			
	very coarse gravel	45			
	very coarse gravel	64			
COBBLE	small cobble	90			
	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
TOTAL % of whole count:			**100**	**100%**	**100%**

Sumamry Data	
D50	0.15
D84	0.36
D95	0.71



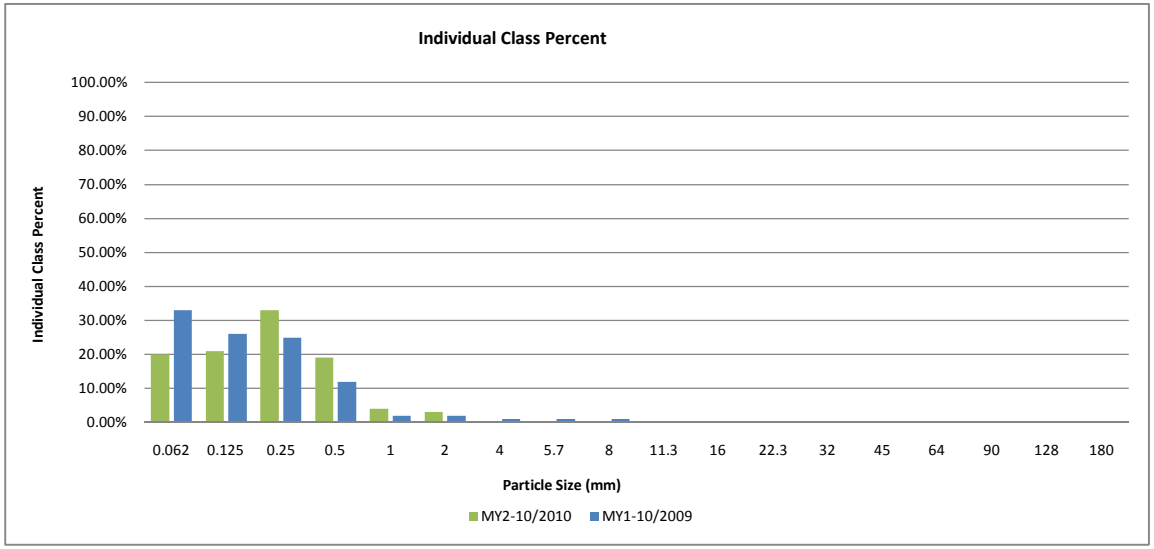


Table 10a. Baseline Stream Data Summary
UT to Little Coharie Stream Restoration Project - EEP No. 314 (2330 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)							5.6						4.9												
Floodprone Width (ft)							50						16				25	27.5	30						
Bankfull Mean Depth (ft)							1.9						0.4					0.88							
[1]Bankfull Max Depth (ft)							3.3						0.7					1.4							
Bankfull Cross Sectional Area (ft^2)							10.7						18					10							
Width/Depth Ratio							2.9						13.3					13							
Entrenchment Ratio													3.3				2.2	2.4	2.6						
[1]Bank Height Ratio																									
Profile																									
Riffle Length (ft)																									
Riffle Slope (ft/ft)																									
Pool Length (ft)					4.5	4		6.1			0.4		1	1.3			1.5	1.75	2						
Pool Max depth (ft)																									
Pool Spacing (ft)							30						23				46		57						
Pattern																									
Channel Beltwidth (ft)							30						35					30							
Radius of Curvature (ft)																									
Rc:Bankfull width (ft/ft)																									
Meander Wavelength (ft)																									
Meander Width Ratio																									

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	G5	C5	C5		
Bankfull Velocity (fps)					
Bankfull Discharge (cfs)					
Valley length (ft)					
Channel Thalweg length (ft)					
Sinuosity (ft)	1.02	1.05	1.1		
Water Surface Slope (Channel) (ft/ft)	0.0028	0.0144	0.0017		
BF slope (ft/ft)					
[3]Bankfull Floodplain Area (acres)					
[4]% of Reach with Eroding Banks					
Channel Stability or Habitat Metric					
Biological or Other					

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

UT to Little Coharie Stream Restoration Project - EEP No. 314 Segment/Reach: Main Reach

	Cross Section 1*							Cross Section 2*							Cross Section 3*							Cross Section 4*							Cross Section 5*						
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+
Record elevation (datum) used	110.5		110.5					111.3		111.3					110.4		110.4					109		109							109.2				
Bankfull Width (ft)	12.7	11.3	10					24.9	15.9	21.6					14.5	10.6	16.2					19.7	35.1	33.5						30.1	16.9				
Floodprone Width (ft)	46.8	42.3	50.2					129.8	64.6	101.8					102.8	50.9	84.2					115.2	101.3	108.7						110.7	111.9				
Bankfull Mean Depth (ft)	1.1	0.9	1.2					1.8	0.9	1.1					1.5	1	1.3					0.8	0.5	0.4						0.5	0.6				
Bankfull Max Depth (ft)	2.2	2	2.1					3.3	3.1	2.4					2.3	2.1	2.6					2.1	2.2	2.4						2.1	1.9				
Bankfull Cross Sectional Area (ft^2)	13.5	10.2	12.4					43.6	14.4	24.2					21.5	10.6	21.1					15.7	15.9	14.8						15.1	9.4				
Bankfull Width/Depth Ratio	11.9	12.5	8					14.2	17.4	19.3					9.7	10.6	12.4					24.7	77.8	75.9						60.1	30.2				
Bankfull Entrenchment Ratio	3.7	3.7	5					5.2	4.1	4.7					7.1	4.8	5.2					5.8	2.9	3.2						3.7	6.6				
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)		0.15	0.19													0.12	0.19																		

	Cross Section 6*							Cross Section 7*							Cross Section 8							Cross Section 9							Cross Section 10						
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+
Record elevation (datum) used	109.1		109.1					108.6		108.6																									
Bankfull Width (ft)	19.6	28	17.6					17.1	10.3	8.3																									
Floodprone Width (ft)	135.1	109.1	111.4					86.9	96.1	108.6																									
Bankfull Mean Depth (ft)	0.8	0.5	0.7					1	1.2	1.7																									
Bankfull Max Depth (ft)	2.1	2.1	2.1					1.8	2.8	2.7																									
Bankfull Cross Sectional Area (ft^2)	15.7	12.6	12.2					16.6	12.6	13.8																									
Bankfull Width/Depth Ratio	24.4	62.1	25.4					17.6	8.4	5																									
Bankfull Entrenchment Ratio	6.9	3.9	6.3					5.1	9.3	13.1																									
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)		0.13	0.13						0.062	0.2																									

*It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary.

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

UT to Little Coharie Stream Restoration Project - EEP No. 314 Segment/Reach: Northern

	Cross Section 8*							Cross Section 9*							Cross Section 10*							Cross Section 11*							Cross Section 12*						
Based on fixed baseline bankfull elevation	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+
Record elevation (datum) used	110		110					109.4		109.4					109.9		109.9					110		110					110.3		110.3				
Bankfull Width (ft)	23.2	21.6	22.8					14.2	12.8	14.5					17.7	22.4	27.5					16.6	15	14.1					12.9	12.9	15.2				
Floodprone Width (ft)	135.1	80.2	78					89.3	58.5	48					74.4	48.8	60.8					64.5	47.6	34.6					26.6	101.3	30.4				
Bankfull Mean Depth (ft)	0.8	0.5	0.9					1.3	0.6	0.5					1.1	0.7	0.8					1	0.7	0.5					0.8	0.7	0.6				
Bankfull Max Depth (ft)	2.1	2.1	1.9					2.3	1.4	1.5					2.1	1.1	1.8					2	1.7	1.1					1.6	2	1.8				
Bankfull Cross Sectional Area (ft^2)	15.7	12.6	20.8					18.2	7.8	7.7					19.2	16.3	20.8					17	10.5	7.4					10.1	9	8.8				
Bankfull Width/Depth Ratio	24.4	62.1	25.1					11.1	20.8	27.5					16.3	30.7	36.4					16.2	21.2	26.8					16.6	18.3	26.2				
Bankfull Entrenchment Ratio	6.9	3.9	3.4					6.3	4.6	3.3					4.2	2.2	2.2					3.9	3.2	2.5					2.1	7.9	2				
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)		0.13	0.14																										0.062	0.15					

	Cross Section 13							Cross Section 14							Cross Section 15							Cross Section 16							Cross Section 17						
Based on fixed baseline bankfull elevation	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+
Record elevation (datum) used																																			
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)																																			

*It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary.

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
UT to Little Coharie EEP No. 314

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	12.7		18.8	24.9									8.3		21.7	35.1																				
Floodprone Width (ft)	26		80.55	135.1									26.6		80.85	135.1																				
Bankfull Mean Depth (ft)	0.77		1.26	1.75									0.4		1.1	1.8																				
[1]Bankfull Max Depth (ft)	1.6		2.6	3.6									1.1		2.2	3.3																				
Bankfull Cross Sectional Area (ft[2])	10.11		26.855	43.6									7.4		25.5	43.6																				
Width/Depth Ratio	9.7		17.15	24.6									5		41.4	77.8																				
Entrenchment Ratio	2		4.55	7.1									2		7.55	13.1																				
[1]Bank Height Ratio																																				
Profile																																				
Riffle Length (ft)	12		18.5	25									8		13.9	19.8																				
Riffle Slope (ft/ft)															0.64																					
Pool Length (ft)	14		24.5	35									9		37.75	66.5																				
Pool Max depth (ft)													0.04		1.37	2.7																				
Pool Spacing (ft)			50										4		42	80																				
Pattern																																				
Channel Beltwidth (ft)	22		25.5	29																																
Radius of Curvature (ft)	24		28.5	33																																
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)	68		84.5	101																																
Meander Width Ratio			2.3																																	
Additional Reach Parameters																																				
Rosgen Classification	C5												C5																							
Channel Thalweg length (ft)	1630												1630																							
Sinuosity (ft)	1.2												1.2																							
Water Surface Slope (Channel) (ft/ft)	0.16												0.0024																							
BF slope (ft/ft)													0.0021																							
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

APPENDIX E

Table 12. Verification of Bankfull Events			
Date of Data Collection	Date of Occurrence	Method	Photo #
November 13, 2010	September 2010	Photographed on-site (Wrack Line)	Stream Photo 6