

# **Mill Branch Stream Restoration Project Columbus County North Carolina**

**EEP Project No. 251  
CU: 03040206  
SCO# 020611301A**

**Year 4 of 5 Monitoring Report  
Data Collection: June through October 2010  
Submission Date: March 31, 2011**



Prepared for:



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

**Mill Branch Stream Restoration Project  
Columbus County  
North Carolina**

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Prepared by:



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

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### 3.0 EXECUTIVE SUMMARY/PROJECT ABSTRACT

Project goals and objectives for the Mill Branch stream restoration project included:

Project goals are:

- Improve water quality and reduce erosion.
- Provide wildlife habitat through the creation of a riparian zone.
- Improve aquatic habitat with the use of natural material stabilization structures and a riparian buffer.
- Exclude cattle from the stream.
- Reduce nutrient loads from entering the stream via the buffer acting as a filter exclusion of cattle.

While project objectives included:

- Restore approximately 3,507.5 LF of stream.
- Restore the stream's access to its floodplain;
- Reduce erosion and sedimentation; and
- Protect floral and biotic diversity via preservation.

Four (4) permanent vegetation plots were initially established and used in annual vegetation monitoring. For 2010, five (5) additional random transect plots were added (Figure 2-2e). Overall, the site is exceeding the minimum success requirements yielding a site average of 307 stems per acre. The vegetative success criteria is based on the US Army Corps of Engineers Stream Mitigation Guidelines (USACE, 2003). As per the mitigation plan, the vegetative success criteria will be the survival of 290 planted woody stems per acre at the end of the year 4 monitoring period. Monitoring for 2010 revealed that vegetation plots VP2, VP3, RT1, and RT3 fall below the minimum success requirements. Vegetation plots VP1, VP4, RT2, RT4, and RT5 meet or exceed minimum success requirements. Vegetation plot and Random Transect Plots are identified in Figure 2b-2e. Supplemental planting for areas with low woody stem densities have been put under contract by EEP.

The majority of the stream is functioning well and holding grade, however, the stream has areas of concern that may require repair. Overall the project is performing adequately. Channel dimension and pattern are similar to as-built conditions. The channel profile appears to be holding grade and maintaining some bedform features. Since project construction, North Carolina has experienced a moderate to severe drought. Although conditions have improved over the past growing season, the drought has caused low flow periods resulting in vegetation growing within the stream channel. The western reach has constricted water flow due to substantial amount of rooted vegetation within the constructed channel. This condition is a result of long periods of low to zero flow conditions. The vegetation has caused disruption of sediment transport resulting in areas of sediment deposition on parts of the project.

Wetland restoration or enhancement was not a part of the Mill Branch 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

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 all breaks in slope, bankfull, inner berm, edge of water, and thalweg, if the 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.

Vegetative sample plots were quantitatively monitored during the growing season. Four 100m<sup>2</sup> plots were established for site monitoring. Species composition, density, vigor and survival were all monitored. Each plot corner is permanently located with rebar. For 2010, five (5) additional random transect plots were added to vegetation monitoring. The random transect plot origin corner was selected utilizing an XY random scatter utility in GIS software then a frisbee was thrown to determine a random bearing for plot direction. Once the plot location and bearing was determined, a measured plot of 100m<sup>2</sup> was established and GPS located (plot layout alternated between 2x50 meter or 5x20 meter). A stem count was then conducted within the plot limits to ascertain trees per acre. Year 4 vegetation monitoring was completed in October 2010 utilizing the Carolina Vegetation Survey (CVS) – EEP protocol Level 1 (version 4.1) and random plot sampling as described.

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

USACOE (2003). *Stream Mitigation Guidelines*. USACOE, USEPA, NCWRC, NCDENR-DWQ.

USACOE (1987). *Corps of Engineers Wetlands Delineation Manual*. Tech report Y-87-1. AD/A176.

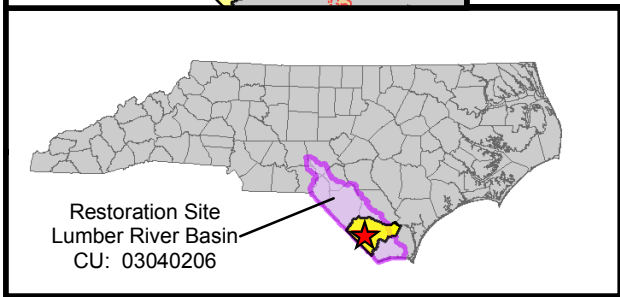
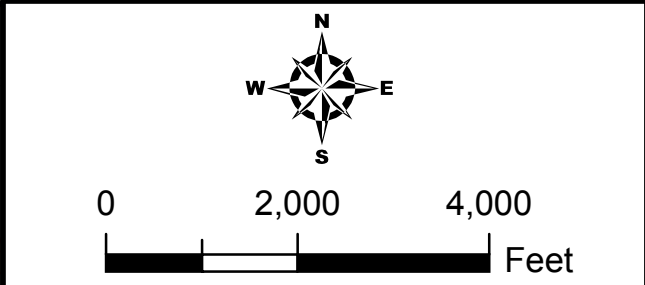
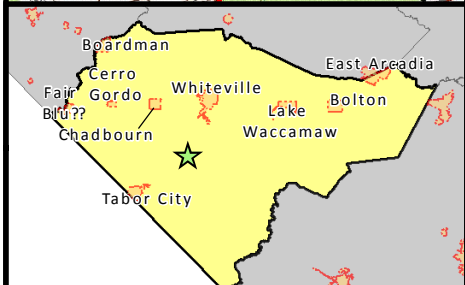
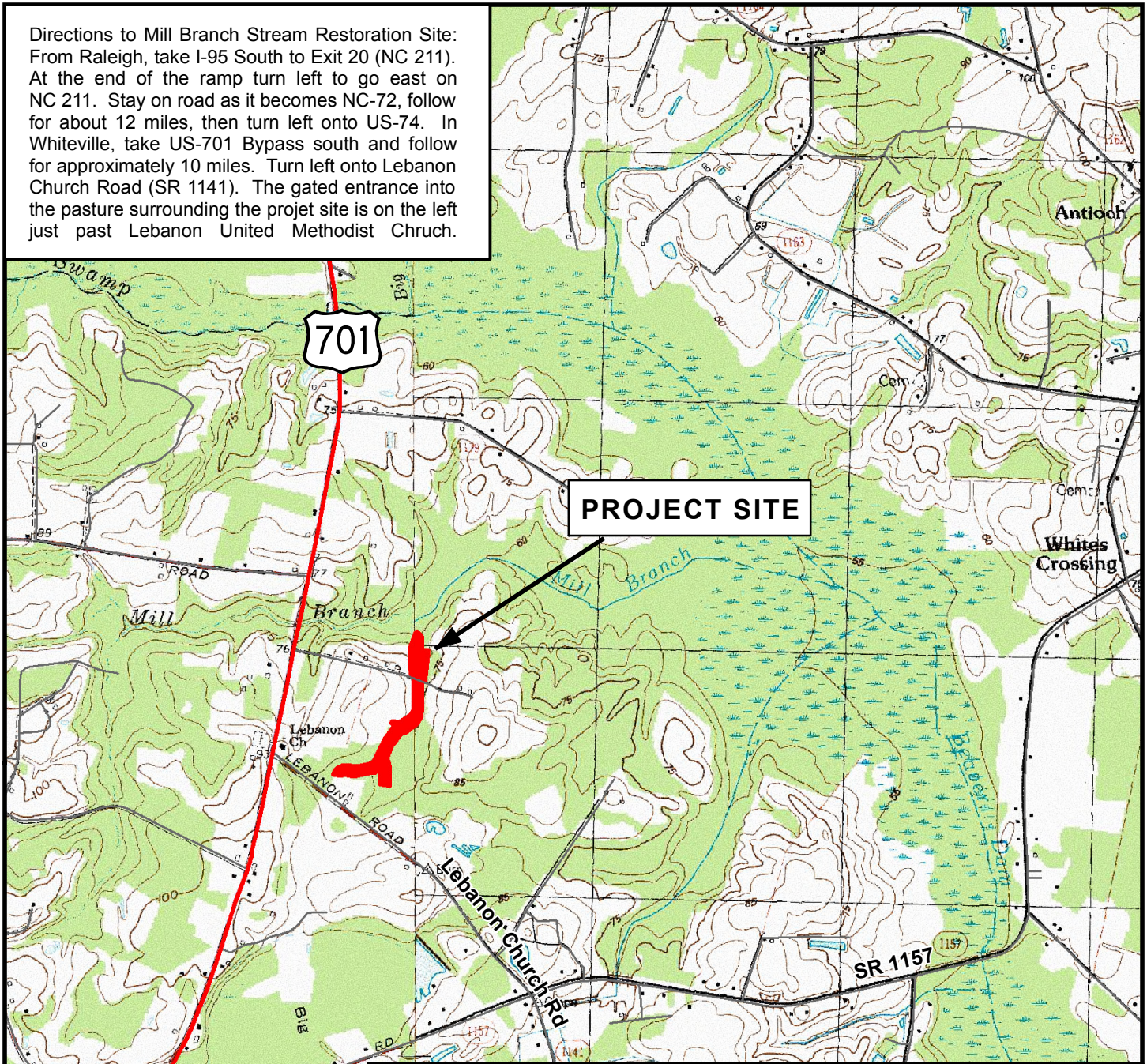
Rosgen, D.L. (1996) *Applied River Morphology*. Wildland Hydrology books, Pagosa Springs, CO.

Lee, M.T., R.K. Peet, S.D. Roberts, T.R. Wentworth. (2006). CVS-EEP Protocol for Recording Vegetation Version 4.0

#### 6.0 Project Condition and Monitoring Data Appendices

# *APPENDIX A*

Directions to Mill Branch Stream Restoration Site:  
From Raleigh, take I-95 South to Exit 20 (NC 211). At the end of the ramp turn left to go east on NC 211. Stay on road as it becomes NC-72, follow for about 12 miles, then turn left onto US-74. In Whiteville, take US-701 Bypass south and follow for approximately 10 miles. Turn left onto Lebanon Church Road (SR 1141). The gated entrance into the pasture surrounding the project site is on the left just past Lebanon United Methodist Church.



**FIGURE 1**  
Site Location Map  
Mill Branch Stream Restoration Project  
EEP No. 0251  
Columbus County, North Carolina

**Table 1. Project Components and Mitigation Credits  
Mill Branch Stream Restoration Site, EEP No. 251**

<b>Mitigation Credits</b>									
Type	Stream (LF)		Riparian Wetland (acres)		Non-Riparian Wetland (acres)		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
	R	RE	R	RE	R	RE			
Totals	3327*	350		7.463		0.22			
<b>Project Components</b>									
Project Component	Stationing/Location	Existing Footage/Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio			
Western Reach	10+00 to 17+65.2	660	Priority 2		765.2	1:1			
Upper Reach	10+00.0 to 14+39.2	340	Priority 2		439.2	1:1			
Middle Reach	10+00.0 to 25+55.3	1265	Priority 2		1555.3	1:1			
Lower Reach	10+00.0 to 17+47.8	670	Priority 2		747.8	1:1			
Mill Branch		1750	Preservation	350.0		5:1			
Riparian Wetland		35.8	Preservation	7.16		5:1			
Non-Riparian Wetland		1.5	Preservation	0.3		5:1			
<b>Component Summation</b>									
Restoration Level	Stream (Linear Feet)	Riparian Wetland (acres)	Non-riparian Wetland (acres)	Buffer (acres)	Upland (acres)				
Restoration and Preservation	3632	7.463	0.22						

\*180 LF deduction from the total stream restoration credits due to the three (3) potential stream crossings.

**Table 2. Project Activity and Reporting History  
Mill Branch Stream Restoration Site, EEP No. 251**

<b>Activity or Report</b>	<b>Data Collection Complete</b>	<b>Actual Completion or Delivery</b>
Restoration Plan	NA	Jan 2005
Final Design - 90%	NA	Sept 2005
Construction	Jan 2007	Jan 2007
Temporary S&E mix applied to entire project area	Jan 2007	Jan 2007
Permanent seed mix applied to entire project area	Jan 2007	Jan 2007
Containerized and B&B plantings	Jan 2007	Jan 2007
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	April 2007	June 2007
Year 1 Monitoring	Nov 2007	Dec 2007
Year 2 Monitoring	Nov 2008	Jan 2009
Year 3 Monitoring	Nov 2009	Nov 2009
Year 4 Monitoring	Oct 2010	Nov 2010
Year 5 Monitoring	NA	NA



**Table 3. Project Contacts Table  
Mill Branch Stream Restoration Site, EEP No. 251**

<b>Designer</b>	Stantec Consulting Services, Inc. 801 Jones Franklin Road Suite 300 Raleigh, NC 27606 Brad Fairley, (919) 851-6866
Primary project design POC	
<b>Construction Contractor</b>	North State Environmental, Inc 2889 Lowery St. Suite B Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2405
Construction contractor POC	
<b>Planting Contractor</b>	North State Environmental, Inc 2889 Lowery St. Suite B Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2405
Planting Contractor POC	
<b>Seeding Contractor</b>	North State Environmental, Inc 2889 Lowery St. Suite B Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2405
Seeding Contractor POC	
Seed Mix Sources	Contact North State Environmental, Inc
Nursery Stock Suppliers	Dykes & Son Nursery 825 Maude Etter Rd McMinnville, TN 37110  North State Environmental, Inc 2889 Lowery St. Suite B Winston-Salem, NC 27101 Stephen C. Joyce (336) 725-2405
<b>Monitoring Performers</b> (MY2, MY3, MY4)	Rummel, Klepper, and Kahl, LLP 900 Ridgefield Drive Suite 250 Raleigh, NC 27609
Stream Monitoring POC	Pete Stafford (919)878-9560
Vegetation Monitoring POC	Pete Stafford (919)878-9560
Wetland Monitoring POC	NA

**Table 4. Project Baseline Information and Attributes  
Mill Branch Stream Restoration Site, EEP No. 251**

<b>Project Information</b>				
Project Name	Mill Branch Stream Restoration Project			
Project County	Columbus			
Project Area	N/A			
Project Coordinates (Lat and Long)	34.219130, -78.751094			
<b>Project Watershed Summary Information</b>				
Physiographic Region	Coastal Plain			
River Basin	Lumber			
USGS HUC 8 Digit 03040206	USGS HUC 14 Digit 03040206060020			
NCDWQ Subbasin	03-07-57			
Project Drainage Area	178 acres			
Project Drainage impervious cover estimate (%)	< 1 percent			
CGIA Land Use Classification				
<b>Reach Summary Information</b>				
Parameters	Western	Upper	Middle	Lower
Length of Reach	765.2	439.2	1,555.3	747.8
Valley Classification				
Drainage Area				178 acres
NCDWQ Stream Identification Score				
NCDWQ Water Quality Classification	C, SW	C	SW	C
Morphological Description (stream type)	C			
Evolutionary Trend	N/A			
Underlying Mapped Soils	Muckalee	Goldsboro , Wagram	Muckalee	Muckalee
Drainage Class	Poorly Drained	Moderately Drained	Poorly Drained	Poorly Drained
Soil Hydric Status	Hydric A	Hydric B	Hydric A	Hydric A
Slope				
FEMA Classification				
Native Vegetation Community				
Percent Composition Exotic Invasive Vegetation				
<b>Wetland Summary Information</b>				
37.3 acres of wetlands preserved as part of this project. Preservation information available by request from EEP.				
<b>Regulatory Considerations</b>				
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			

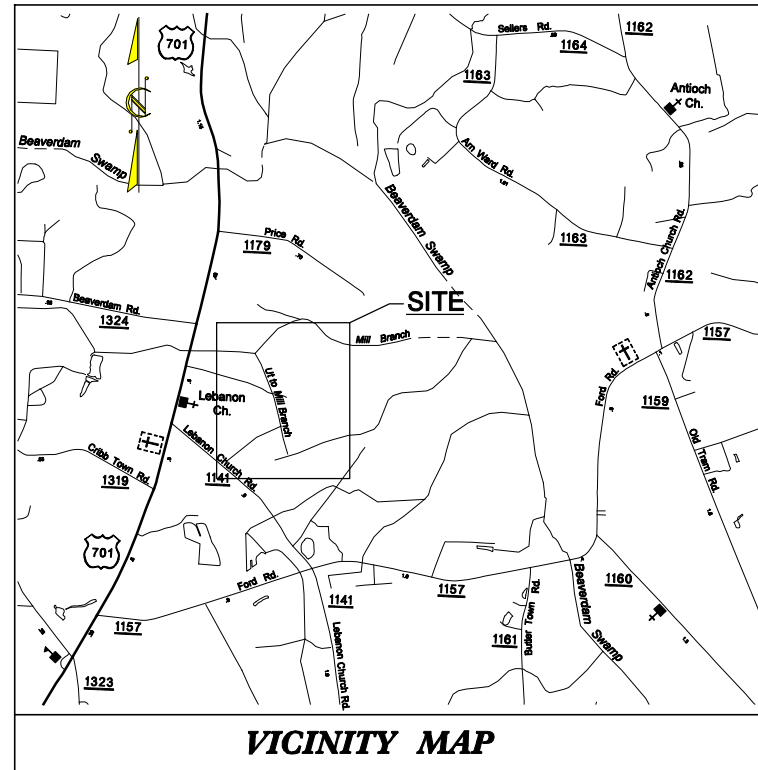
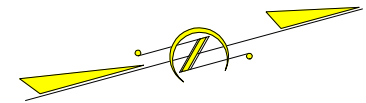
## ***APPENDIX B***

STATE OF NORTH CAROLINA  
ECOSYSTEM ENHANCEMENT PROGRAM

STATE	REP SCO# NO.	SHEET NO.	TOTAL SHEETS
N.C.	02-06113-01A	1	7

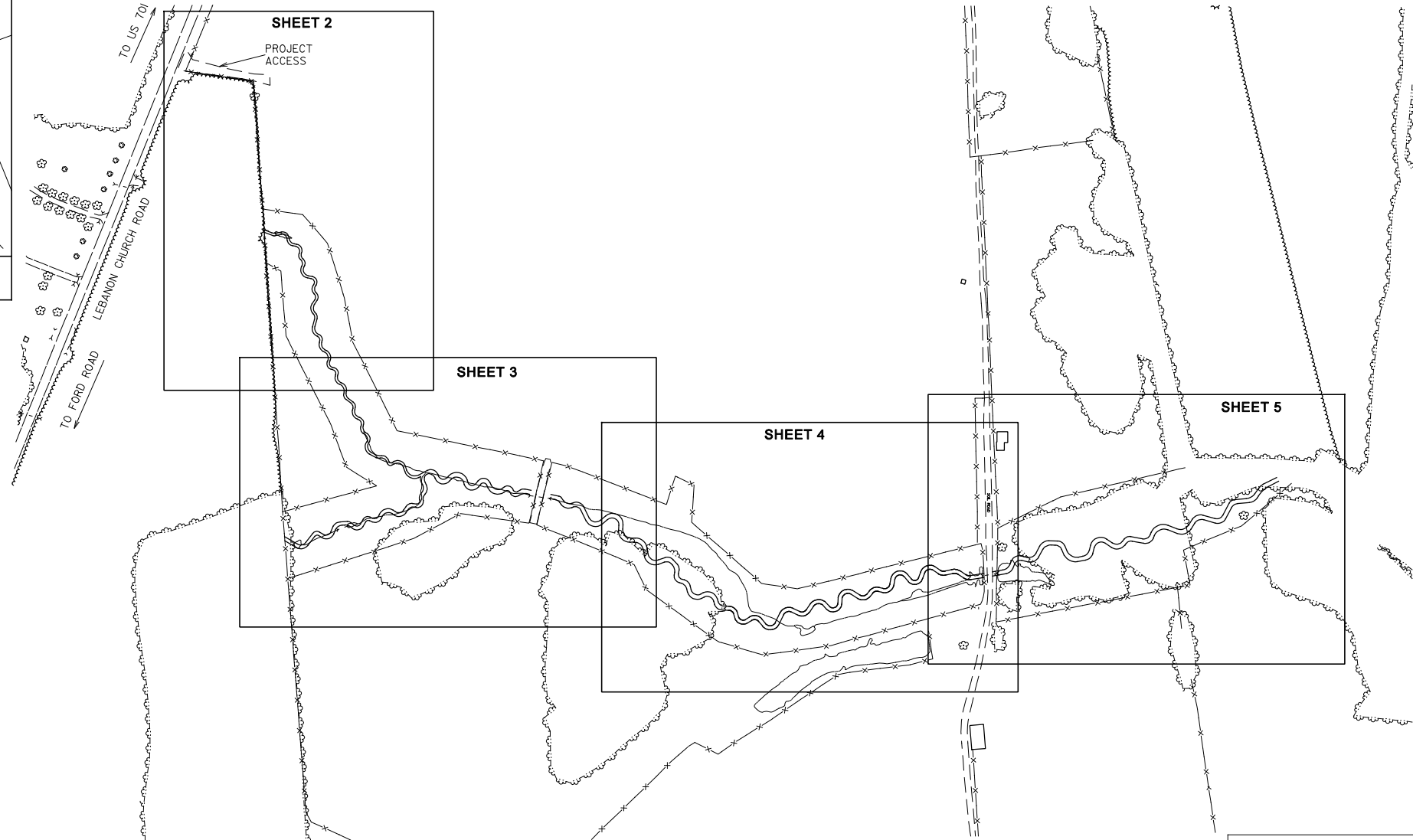
**UNNAMED TRIBUTARY TO MILL BRANCH**

**LOCATION: COLUMBUS COUNTY, NORTH CAROLINA**  
**TYPE OF WORK: AS-BUILT DRAWINGS**  
**SCO# 02-06113-01A**



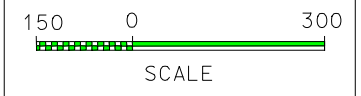
**VICINITY MAP**

Columbus County, NC

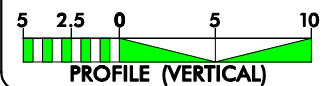
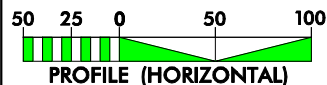
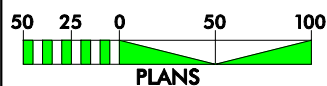


**INDEX OF SHEETS**

TITLE SHEET.....	1
PLAN SHEETS.....	2-5



**GRAPHIC SCALES**



**PROJECT: 170300983**

6/25/2007 10:09:09 AM U:\170300983\cam\design\plan\asbuilt\asbuilt.dwg N:\170300983\cam\design\plan\asbuilt\asbuilt.dwg N:\170300983\cam\design\plan\asbuilt\asbuilt.dwg

Prepared in the Office of:  
Stantec Consulting Services Inc.  
Suite 300, 801 Jones Franklin Road  
Raleigh, NC 27606  
Tel: 919.851.6666 Fax: 919.851.7024  
www.stantec.com

SIGNATURE \_\_\_\_\_

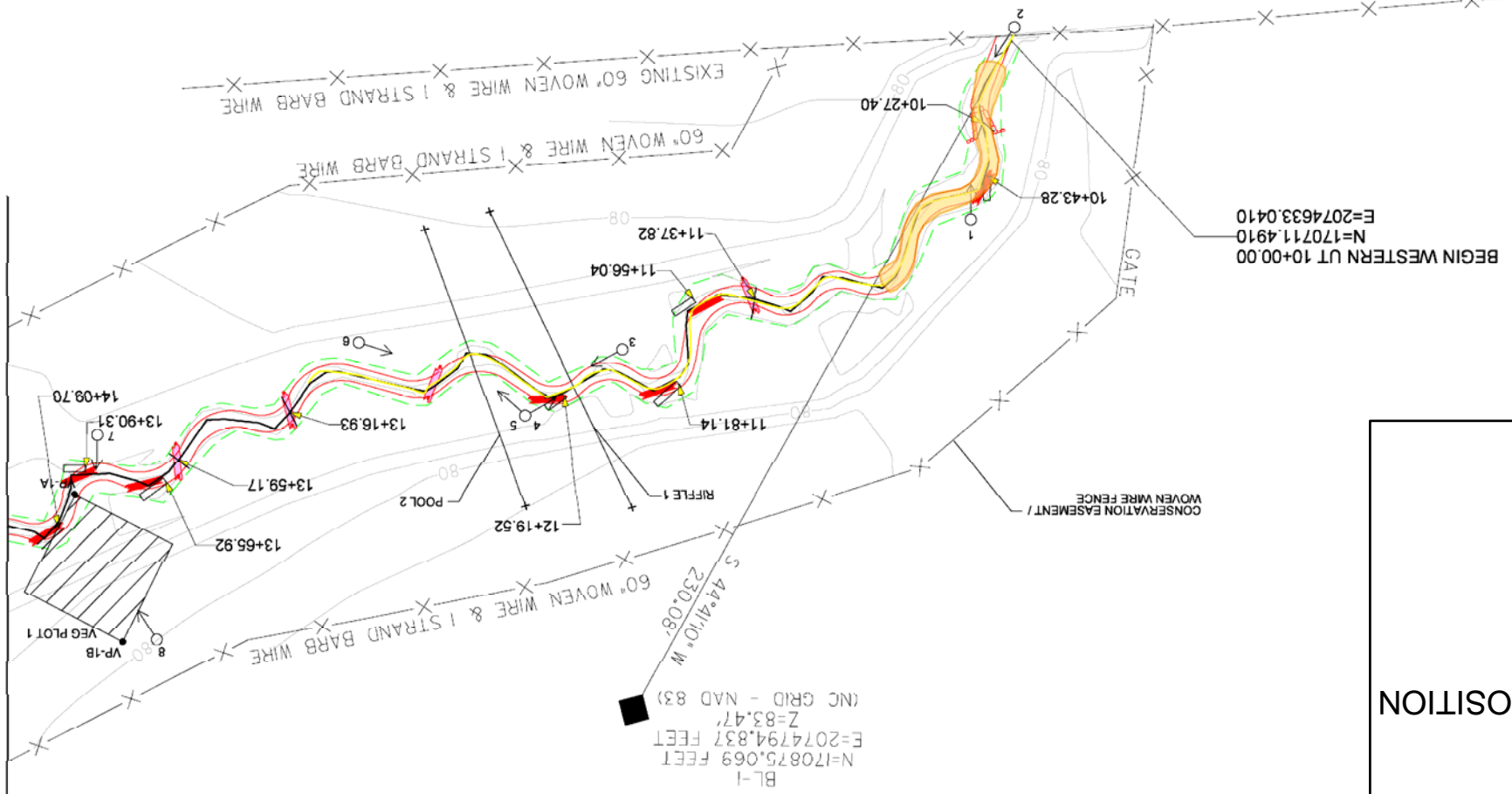
DATE	06/15/2021
DRAWN BY	CGM
PROJECT NO.	SCO# 02-06113-01A
COUNTY	COLUMBUS
LOCATION	SITE LOCATED OFF HIGHWAY 701 AND LEBANON CHURCH ROAD SOUTH OF WHITEVILLE



### LEGEND

DESIGN ROCK CROSS VANE		AS-BUILT ROCK CROSS VANE	
DESIGN LOG VANE		AS-BUILT LOG VANE WITH ROCK SILL	
DESIGN LOG SILL		AS-BUILT LOG SILL	
FENCE LINE		AS-BUILT LOG VANE	
LIMITS OF DISTURBANCE		AS-BUILT THALWEG	
VEG PLOT PINS		AS-BUILT BANKFULL	
VEG PLOTS		DESIGN BANKFULL	
CROSS-SECTIONS		MONITORING LONGITUDINAL PROFILE	
PHOTO POINTS			

MATCH LINE - SEE SHEET 3



### Problem Areas

	RILL EROSION
	BARE GROUND
	CATTAILS
	SEDIMENT DEPOSITION

NOTE: ALL STATIONS REFERENCE THALWEG LOCATED FOR AS-BUILT SURVEY

CROSS-SECTION	CROSS-SECTION COORDINATES			
	LEFT	RIGHT		
RIFLE 1	2074779.4700	170816.2415	2074797.4519	170719.8073
POOL 2	2074810.1552	170807.4965	2074817.6790	170719.7804

VEG PLOT PIN COORDINATES			
PIN	X	2074939.6552	170768.7832
VP-1A		2074937.5346	170819.1209

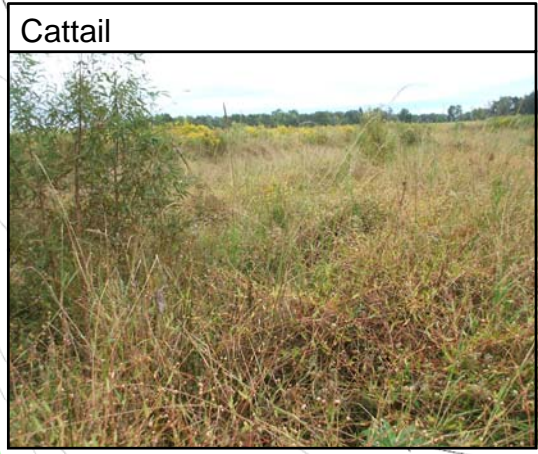
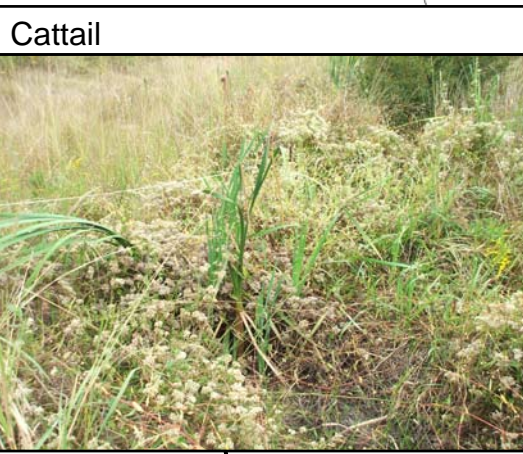


<b>FIGURE 2b</b>	
Mill Branch Stream Restoration Site	
PROJECT NO.	SCO# 02-06113-01A
SHEET NO.	2

**FIGURE 2c**  
Mill Branch  
Stream Restoration Site

MATCH LINE - SEE SHEET 2

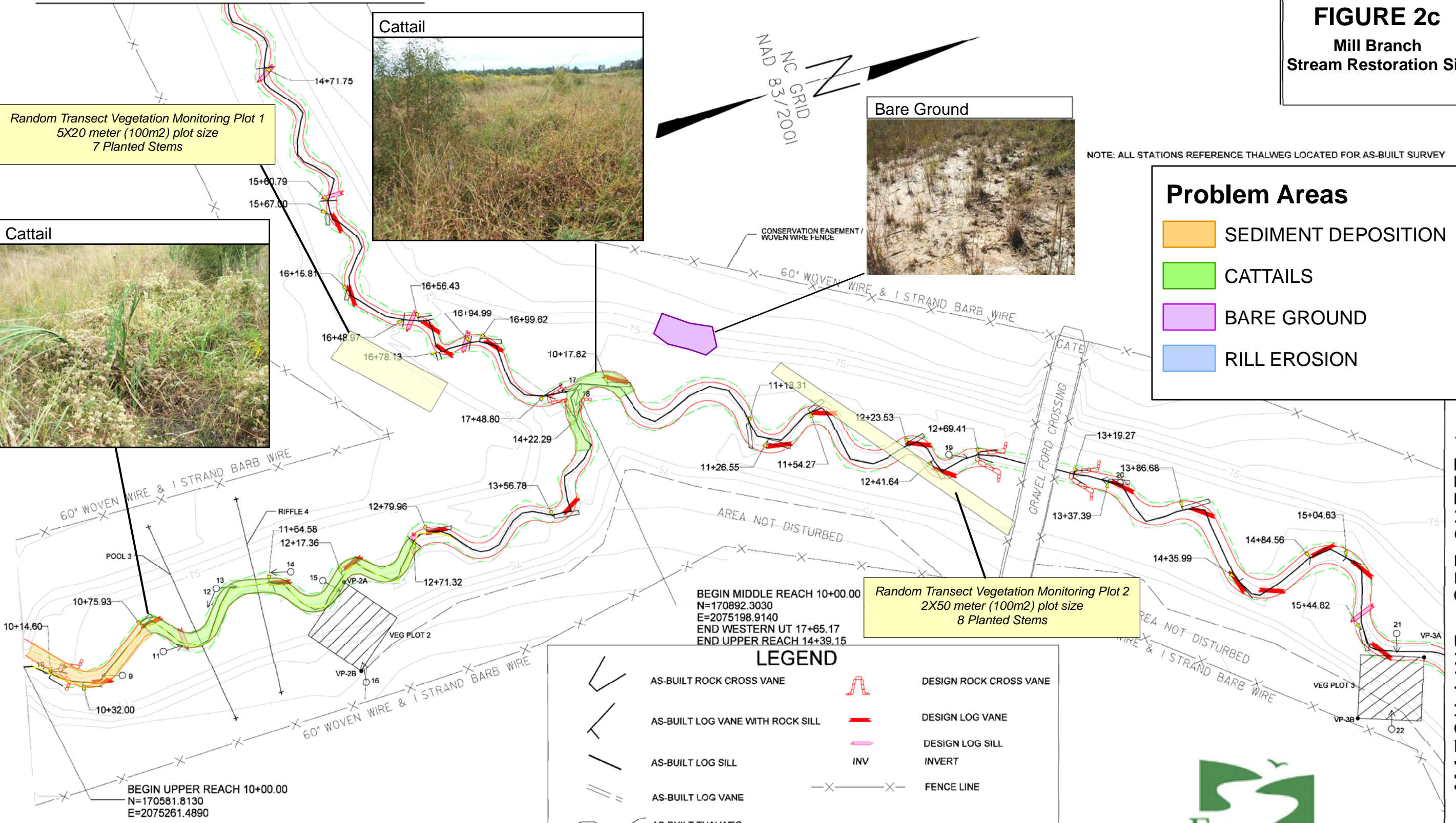
Random Transect Vegetation Monitoring Plot 1  
5X20 meter (100m2) plot size  
7 Planted Stems



NOTE: ALL STATIONS REFERENCE THALWEG LOCATED FOR AS-BUILT SURVEY

**Problem Areas**

- SEDIMENT DEPOSITION
- CATTAILS
- BARE GROUND
- RILL EROSION



BEGIN UPPER REACH 10+00.00  
N=170581.8130  
E=2075261.4890

BEGIN MIDDLE REACH 10+00.00  
N=170892.3030  
E=2075198.9140  
END WESTERN UT 17+65.17  
END UPPER REACH 14+39.15

Random Transect Vegetation Monitoring Plot 2  
2X50 meter (100m2) plot size  
8 Planted Stems

PIN	X	Y
VP-2A	2075262.6162	170751.6045
VP-2B	2075308.8812	170748.2524

CROSS-SECTION	LEFT		RIGHT	
	X	Y	X	Y
POOL 3	2075209.2535	170662.4179	2075315.2216	170679.9107
RIFFLE 4	2075207.3409	170709.5291	2075308.6113	170705.9736

**LEGEND**

	AS-BUILT ROCK CROSS VANE		DESIGN ROCK CROSS VANE
	AS-BUILT LOG VANE WITH ROCK SILL		DESIGN LOG VANE
	AS-BUILT LOG SILL		DESIGN LOG SILL
	AS-BUILT LOG VANE		INV
	AS-BUILT THALWEG		FENCE LINE
	AS-BUILT BANKFULL		LIMITS OF DISTURBANCE
	DESIGN BANKFULL		VEG PLOT PINS
	MONITORING LONGITUDINAL PROFILE		VEG PLOTS
			CROSS-SECTIONS
			PHOTO POINTS



LOCATION: SITE LOCATED OFF HIGHWAY 701 AND LEBANON CHURCH ROAD SOUTH OF WHITEVILLE  
 PROJECT NO. SCO# 02-06113-01A COUNTY: COLUMBUS  
 DESIGNED BY: CGM  
 CHECKED BY: NEJ DATE:

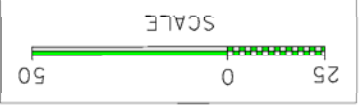
MATCH LINE - SEE SHEET 4

02/28/2011  
 UNITS: METERS  
 PROJECT: MILL BRANCH STREAM RESTORATION  
 SHEET: 3 OF 4  
 DATE: 02/28/2011

**Problem Areas**

- SEDIMENT DEPOSITION
- CATTAILS
- BARE GROUND
- RILL EROSION

NOTE: ALL STATIONS REFERENCE THALWEG LOCATED FOR AS-BUILT SURVEY



PROJECT NO. 02-06113-01A  
 SHEET NO. 4  
 DATE: 02-28-2011  
 DRAWN BY: CGM  
 CHECKED BY: NEJ  
 LOCATION: SITE LOCATED OFF HIGHWAY 701 AND LEBANON CHURCH ROAD SOUTH OF WHITEVILLE



MATCH LINE - SEE SHEET 5

MATCH LINE - SEE SHEET 3

Random Transect Vegetation Monitoring Plot 3  
 5x20 meter (100m<sup>2</sup>) plot size  
 7 Planted Stems



**LEGEND**

<ul style="list-style-type: none"> <li> DESIGN ROCK CROSS VANE</li> <li> AS-BUILT LOG VANE WITH ROCK SILL</li> <li> DESIGN LOG SILL</li> <li> INVERT</li> <li> FENCE LINE</li> <li> LIMITS OF DISTURBANCE</li> <li> VEG PLOT PINS</li> <li> VEG PLOTS</li> <li> CROSS-SECTIONS</li> <li> PHOTO POINTS</li> </ul>	<ul style="list-style-type: none"> <li> AS-BUILT ROCK CROSS VANE</li> <li> AS-BUILT LOG VANE</li> <li> AS-BUILT THALWEG</li> <li> AS-BUILT BANKFULL</li> <li> DESIGN BANKFULL</li> <li> MONITORING LONGITUDINAL PROFILE</li> </ul>
--	--

CROSS-SECTION COORDINATES

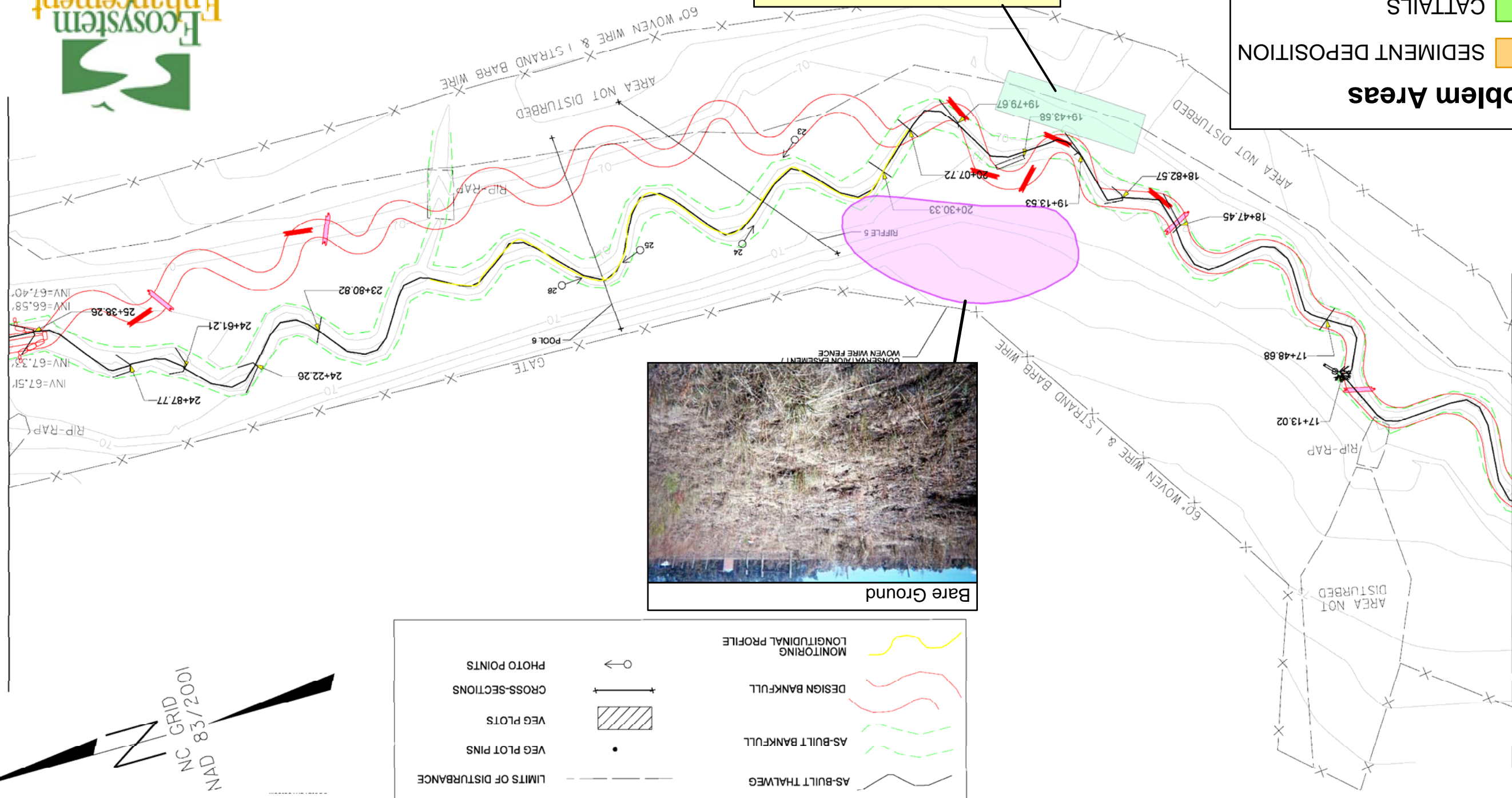
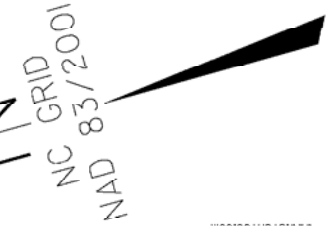
CROSS-SECTION	LEFT	RIGHT
RIFFLC 5	2075697.4170	171554.0230
POOL 6	2075830.4130	171658.7970
	171652.4420	2075730.5940
		171666.2110

VEG PLOT PIN COORDINATES

PIN	X	Y
VP-3A	2075466.5710	171234.5650
VP-3B	2075445.3470	171275.3682

**FIGURE 2d**  
Mill Branch Stream Restoration Site

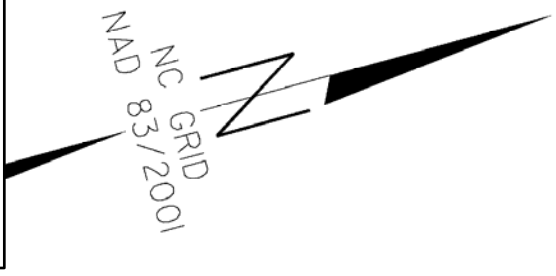
PROJECT NO.	02-06113-01A
SHEET NO.	4



**FIGURE 2e**  
Mill Branch  
Stream Restoration Site

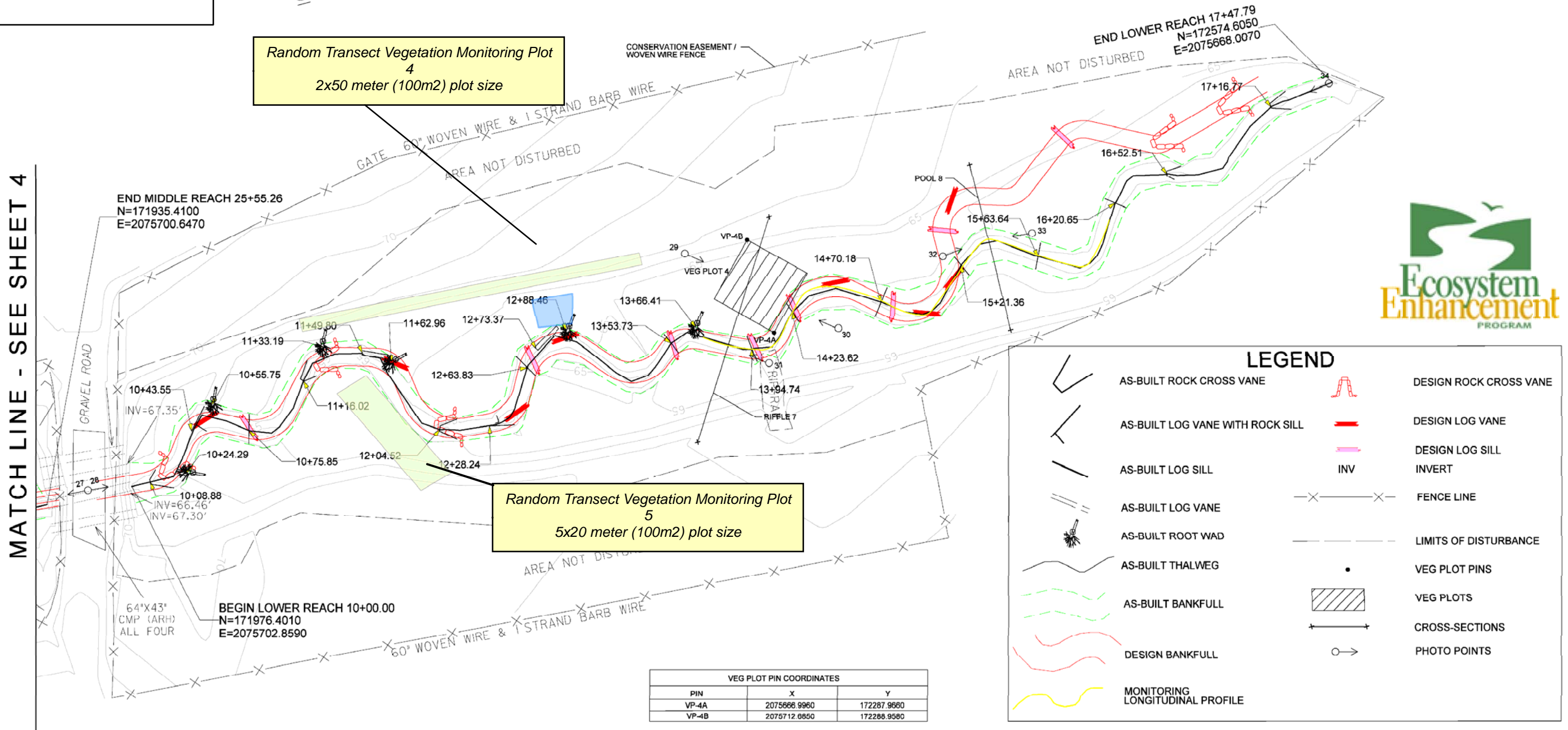
### Problem Areas

- SEDIMENT DEPOSITION
- CATTAILS
- BARE GROUND
- RILL EROSION



NOTE: ALL STATIONS REFERENCE THALWEG LOCATED FOR AS-BUILT SURVEY

FIG. 212.03 (1/12/21)  
www.stantec.com



Random Transect Vegetation Monitoring Plot  
4  
2x50 meter (100m<sup>2</sup>) plot size

Random Transect Vegetation Monitoring Plot  
5  
5x20 meter (100m<sup>2</sup>) plot size

MATCH LINE - SEE SHEET 4

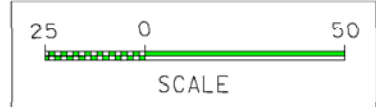


### LEGEND

	AS-BUILT ROCK CROSS VANE		DESIGN ROCK CROSS VANE
	AS-BUILT LOG VANE WITH ROCK SILL		DESIGN LOG VANE
	AS-BUILT LOG SILL		DESIGN LOG SILL
	AS-BUILT LOG VANE		INVERT
	AS-BUILT ROOT WAD		FENCE LINE
	AS-BUILT THALWEG		LIMITS OF DISTURBANCE
	AS-BUILT BANKFULL		VEG PLOT PINS
	DESIGN BANKFULL		VEG PLOTS
	MONITORING LONGITUDINAL PROFILE		CROSS-SECTIONS
			PHOTO POINTS

VEG PLOT PIN COORDINATES		
PIN	X	Y
VP-4A	2075666.9960	172287.9600
VP-4B	2075712.0550	172288.9580

CROSS-SECTION	CROSS-SECTION COORDINATES			
	LEFT		RIGHT	
	X	Y	X	Y
RIFFLE 7	2075659.3700	172300.0220	2075753.1770	172240.1770
POOL 8	2075660.5760	172399.0200	2075740.8880	172397.2830



LOCATION:  
SITE LOCATED OFF HIGHWAY 701  
AND LEBANON CHURCH ROAD  
SOUTH OF WHITEVILLE

PROJECT NO. COUNTY:  
SCO# 02-06113-01A COLUMBUS

DESIGNED BY: CGM  
DRAWN BY:  
CHECKED BY: NEJ DATE:



**Table 5a - Visual Stream Morphological Stability Assessment**  
**Reach ID - Western**  
**Assessed Length – 765.2 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
<b>1. Bed</b>	1. Vertical Stability (Riffle and Run Units)	1. Aggradation			1	050	93.5%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	12	13			92%			
	3. Meander Pool Condition	1. Depth	11	12			92%			
		2. Length	11	12			92%			
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA			NA			
2. Thalweg centering at downstream of meander		NA	NA			NA				
<b>2. Bank</b>	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion			0	0	100%	NA	NA	100%
	2. Undercut	Banks undercut/overhanging			0	0	100%	NA	NA	100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	NA	NA	100%
				<b>Totals</b>	0	0	100%	NA	NA	100%
<b>3. Engineered Structures</b>	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	2	2			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	N/A	N/A			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.	N/A	N/A			NA			

**Table 5b - Visual Stream Morphological Stability Assessment**  
**Reach ID - Upper**  
**Assessed Length – 439.2 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
<b>1. Bed</b>	1. Vertical Stability (Riffle and Run Units)	1. Aggradation			2	75	83%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	6	8			75%			
	3. Meander Pool Condition	1. Depth	8	10			80%			
		2. Length	8	10			80%			
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA			NA			
2. Thalweg centering at downstream of meander		NA	NA			NA				
<b>2. Bank</b>	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion			0	0	100%	NA	NA	100%
	2. Undercut	Banks undercut/overhanging			0	0	100%	NA	NA	100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	NA	NA	100%
				<b>Totals</b>	0	0	100%	NA	NA	100%
<b>3. Engineered Structures</b>	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	3	3			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	3	3			100%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	3	3			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.	NA	NA			NA			

**Table 5c - Visual Stream Morphological Stability Assessment**  
**Reach ID - Middle**  
**Assessed Length – 1555.3 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
<b>1. Bed</b>	1. Vertical Stability (Riffle and Run Units)	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	8	8		100%				
	3. Meander Pool Condition	1. Depth	7	7		100%				
		2. Length	7	7		100%				
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA		NA				
2. Thalweg centering at downstream of meander		NA	NA	NA						
<b>2. Bank</b>	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion				0	0	100%	NA	NA
	2. Undercut	Banks undercut/overhanging			0	0	100%	NA	NA	100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	NA	NA	100%
				<b>Totals</b>	0	0	NA	NA	NA	100%
<b>3. Engineered Structures</b>	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	2	2			100%			
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	NA	NA			NA			
	4. Habitat	Pool forming structures maintaining – Max Pool Depth: Mean Bankfull Depth Ratio $\geq$ 1.6 Rootwads/logs providing some cover at base flow.	NA	NA			NA			

**Table 5d - Visual Stream Morphological Stability Assessment**  
**Reach ID - Lower**  
**Assessed Length – 747.8 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
<b>1. Bed</b>	1. Vertical Stability (Riffle and Run Units)	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	3	3		100%				
	3. Meander Pool Condition	1. Depth	4	4		100%				
		2. Length	4	4		100%				
	4. Thalweg Condition	1. Thalweg at upstream of meander bend	NA	NA		NA				
2. Thalweg centering at downstream of meander		NA	NA	NA						
<b>2. Bank</b>	1. Scoured/Eroding	Bank lacking vegetative cover from poor growth and/or scour and erosion				0	0	100%	NA	NA
	2. Undercut	Banks undercut/overhanging			0	0	100%	NA	NA	100%
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	NA	NA	100%
				<b>Totals</b>	0	0	100%	NA	NA	100%
<b>3. Engineered Structures</b>	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	5	5		100%				
	2. Grade Control	Grade Control exhibiting maintenance of grade across the sill	5	5		100%				
	2a. Piping	Structures Lacking any substantial flow underneath sills or arms	5	5		100%				
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	NA	NA		NA				
	4. Habitat	Pool forming structures maintaining – Max Pool Depth: Mean Bankfull Depth Ratio $\geq 1.6$ Rootwads/logs providing some cover at base flow.	NA	NA		NA				

**Table 6 – Vegetation Condition Assessment  
Planted Acreage - NA**

<b>Vegetation Category</b>	<b>Definitions</b>	<b>Mapping Threshold</b>	<b>CCPV Depiction</b>	<b>Number of Polygons</b>	<b>Combined Acreage</b>	<b>% of Planted Acreage</b>
<b>1. Bare Areas</b>	Very Limited Cover of both woody and herbaceous material	Various	Violet	2	.1 acre	1%
<b>2. Low Stem Density Areas*</b>	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria	100 m <sup>2</sup> 0.0247 acre	RED	7	.17 acre	2%
<b>3. Areas of Poor Growth Rates or Vigor</b>	Areas with woody stems of a size class that are obviously small given the monitoring year	100 m <sup>2</sup> 0.0247 acre	RED	7	.17 acre	2%

\*Areas quantified via CVS monitoring. Other areas throughout the site have low stem densities quantified visually. Supplemental planting areas with low woody stem densities have been put under contract by EEP.

**Stream Photo Station Photos** (all photos recorded on October 5, 2010)



Photo Station 1. Beginning of Western Reach – Upstream



Photo Station 2. Beginning of Western Reach – Downstream



Photo Station 3. Riffle Cross-section 1 – Downstream – Western Reach



Photo Station 4 Riffle Cross-section 1 – Upstream – Western Reach



Photo Station 5. Pool Cross-section 2 - Downstream – Western Reach



Photo Station 6. Pool Cross-section – Upstream – Western Reach





Photo Station 9. Beginning of Upper Reach – Upstream



Photo Station 10. Beginning of Upper Reach – Downstream



Photo Station 11. Pool Cross-section 3 – Downstream – Upper Reach



Photo Station 12. Pool Cross-section 3 – Upstream – Upper Reach



Photo Station 13. Riffle Cross-section 4 – Downstream – Upper Reach



Photo Station 14. Riffle Cross-section 4 – Upstream – Upper Reach



Photo Station 17. Confluence of Western and Upper Reaches – Western Reach



Photo Station 18. Confluence of Western and Upper Reaches – Upper Reach



Photo Station 19. Ford Crossing – Downstream – Middle Reach



Photo Station 20. Ford Crossing – Upstream – Middle Reach



Photo Station 23. Riffle Cross-section 5 - Downstream – Middle Reach



Photo Station 24. Riffle Cross-section 5 - Upstream – Middle Reach



Photo Station 25. Pool Cross-section 6 - Downstream – Middle Reach



Photo Station 26. Pool Cross-section 6 - Upstream – Middle Reach



Photo Station 27. Gravel Crossing- Upstream – Middle Reach



Photo Station 28. Gravel Crossing - Downstream – Lower Reach





Photo Station 31. Riffle Cross-section 7 – Upstream – Lower Reach



Photo Station 32. Riffle Cross-section 7 – Downstream – Lower Reach



Photo Station 33. Pool Cross-Section 8 – Upstream – Lower Reach



Photo Station 34. End of Project – Upstream – Lower Reach

**Stream Problem Area Photos** (all photos recorded on October 5, 2010)



SPA 1 – Rooted woody vegetation growing in the stream bed. Western Reach and Lower Reach



SPA 2 – Cattail growing in stream channel – Throughout project site



SPA 3 - Vegetation growing in the channel bed. Middle Reach

**Vegetation Monitoring Plot Photos** (all photos recorded on October 5, 2010)



Vegetation Plot 1



Vegetation Plot 2



Vegetation Plot 3



Vegetation Plot 4

## *APPENDIX C*

<b>Table 7. Vegetation Plot Criteria Attainment</b>			
<b>Mill Branch Stream Restoration Project EEP No: 251</b>			
<b>Tract</b>	<b>Vegetation Plot ID</b>	<b>Vegetation Survival Threshold Met?</b>	<b>Tract Mean</b>
Western	VP1	Y	100%
Upper	VP2	N	0%
Middle	VP3	N	0%
Lower	VP4	Y	100%



**Table 8. CVS Vegetation Plot Metadata  
Mill Branch Stream Restoration Project EEP No: 251**

Report Prepared By	William (Pete) Stafford
Date Prepared	10/27/2010 11:50
Database Name	MillBranch-2010-A.mdb
Database Location	C:\Documents and Settings\pstafford\Desktop\CVS Veg Data
Computer Name	STAFFORDP
<b>Description Worksheets In This Document</b>	
<b>Metadata</b>	Description of database file, the report worksheets, and a summary of project(s) and project data.
<b>Proj, planted</b>	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
<b>Proj, total stems</b>	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.
<b>Plots</b>	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
<b>Vigor</b>	Frequency distribution of vigor classes for stems for all plots.
<b>Vigor by Spp</b>	Frequency distribution of vigor classes listed by species.
<b>Damage</b>	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
<b>Damage by Spp</b>	Damage values tallied by type for each species.
<b>Damage by Plot</b>	Damage values tallied by type for each plot.
<b>Planted Stems by Plot and Spp</b>	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
<b>Project Summary</b>	
<b>Project Code</b>	251
<b>Project Name</b>	Mill Branch Stream Restoration
<b>Description</b>	Stream and Wetland Restoration
<b>River Basin</b>	Lumber
<b>Length(ft)</b>	
<b>Stream-to-edge width (ft)</b>	
<b>Area (sq m)</b>	
<b>Required Plots (calculated)</b>	

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

		CURRENT DATA (MY4 2010)								ANNUAL MEANS										
		Plot 1		Plot 2		Plot 3		Plot 4		Current Mean		MY3 (2009)		MY2 (2008)		MY1 (2007)**		AB (2007)**		
Scientific Name	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T		
<i>Betula nigra</i>	River Birch	Tree	1	1	1	1	1				3	2	3	2	3	2	3	3	3	
<i>Carpinus caroliniana var. caroliniana</i>	American Hornbeam	Tree	2		1				2	1	5	1	5	1	5	2	5	5	5	
<i>Cephalanthus occidentalis</i>	Buttonbush	Shrub			1					1	0	2	0	1	0	1	0	0	0	
<i>Cornus amomum</i>	Silky Dogwood	Tree	1		2		4		1	1	8	1	8	3	8	5	8	8	8	
<i>Liriodendron tulipifera var. tulipifera</i>	Tulip Poplar	Tree	2	1		1		3		1	2	6	2	2	2	2	2	2	2	
<i>Platanus occidentalis var. occidentalis</i>	Sycamore	Tree	1	1	1		1		1		4	1	4	3	4	3	4	4	4	
<i>Quercus lyrata</i>	Overcup Oak	Tree	1	1	3		1	1			5	2	5	5	5	4	5	5	5	
<i>Quercus pagoda</i>	Cherrybark Oak	Tree			1		2		1	1	1	4	1	1	1	1	1	1	1	
<i>Quercus phellos</i>	Willow Oak	Tree	2				1		3	1	6	1	6	5	6	6	6	6	6	
<i>Quercus nigra</i>	Water Oak	Tree		2					1	3	1	5	1	0	1	1	1	1	1	
<i>Salix sericea</i>	Silky Willow	Tree			3		1	1	4	1	8	2	8	3	8	4	8	8	8	
		Plot Area	0.025 acre		0.025 acre		0.025 acre		0.025 acre											
*No baseline data for this project		Species Count	7		3		4		7		11		10		11		10		10	
Type = Tree or Shrub		Stem Count	8		4		6		9		27		26		31		43		43	
P = Planted, T = Total		Stems/Acre	320		160		240		360		270		260		310		430		430	

**Table 9a - Random Transect Plot Total Count**

Plot	Size and Layout	Planted Stem Count	Trees Per Acre
Random Transect Plot 1	0.025 acre	7	280
Random Transect Plot 2	0.025 acre	8	320
Random Transect Plot 3	0.025 acre	7	280
Random Transect Plot 4	0.025 acre	8	320
Random Transect Plot 5	0.025 acre	13	520
Random Transect Plot Totals	0.125 acre	43	344
Site Totals: Permanent Vegetation Plots Random Transect Plots	0.225 acre	70	307

## ***APPENDIX D***

**Project Name** Mill Branch, MY4  
**Watershed**  
**Cross Section** 1  
**Drainage Area** NA  
**Date** Jun-10  
**Crew** Tutt, Stafford

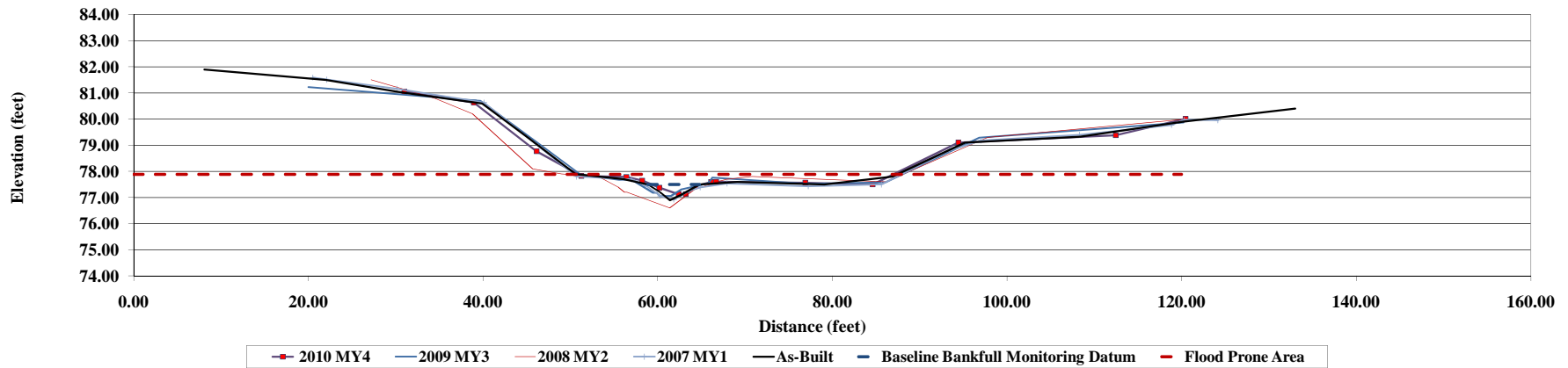
Photo of Cross-Section 1 - Looking Downstream @ STA 2+15

Picture Taken October 5 2010

As-Built Survey			2007.00			2008.00			2009.00			2010.00			2011.00			Summary Data	
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5			Bankfull Elev.	77.5
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	BF Area	1.2
8.10	81.90		20.54	81.59		27.20	81.50		20.00	81.22		31.00	81.06		42.00	80.90		BF Width	5.7
22.00	81.50	LPIN	22.12	81.51		34.40	80.80		39.72	80.70		38.96	80.63		46.14	78.77		Flood Prone Elev.	77.88
30.60	81.03		30.12	81.16		38.80	80.20		46.69	78.99		46.14	78.77		51.27	77.82		Flood Prone Width	36
39.90	80.60		40.13	80.63		45.70	78.10		51.21	77.87		51.27	77.82		56.42	77.78		Max Depth	0.6
45.10	79.30		50.70	77.80		49.00	77.90		55.58	77.67		56.42	77.78		58.23	77.65		Mean Depth	0.2
50.60	77.90		57.01	77.70		53.20	77.80		57.00	77.69		58.23	77.65		60.19	77.38		W/D Ratio	28
56.10	77.70		58.64	77.46		55.50	77.40		59.49	77.18		60.19	77.38		62.41	77.12		ER	6.3
58.90	77.50	LBKF	60.30	77.06		56.20	77.20		59.92	77.18		62.41	77.12		63.23	77.13		Bank Height Ratio	
60.30	77.20		61.85	76.92		56.50	77.20		60.25	77.05		63.23	77.13		64.35	77.44		Stream Type	C5
61.40	76.90		63.60	77.26		61.40	76.60		61.55	77.06		64.35	77.44		66.13	77.59			
62.70	77.10		64.88	77.39		64.20	77.30		62.75	77.31		66.13	77.59		66.71	77.60			
64.80	77.50	RBKF	67.97	77.54		66.80	77.60		65.86	77.55		66.71	77.60		76.92	77.57			
69.10	77.60		77.23	77.43		67.90	77.70		66.28	77.77		76.92	77.57		84.64	77.50			
79.10	77.50		85.63	77.50		70.80	77.80		76.98	77.52		84.64	77.50		94.43	79.11			
86.90	77.80		93.42	78.79		86.10	77.60		86.11	77.58		94.43	79.11		112.46	79.38			
95.20	79.10		97.04	79.18		97.80	79.30		96.84	79.29		112.46	79.38		120.48	80.01			
108.40	79.33		108.31	79.40		120.50	80.00		120.24	79.87									
120.10	79.90	RPIN	118.85	79.77															
133.00	80.40		120.29	79.98															
			124.16	79.96															



Mill Branch 2010 - Riffle  
Cross Section 1 - Western Reach



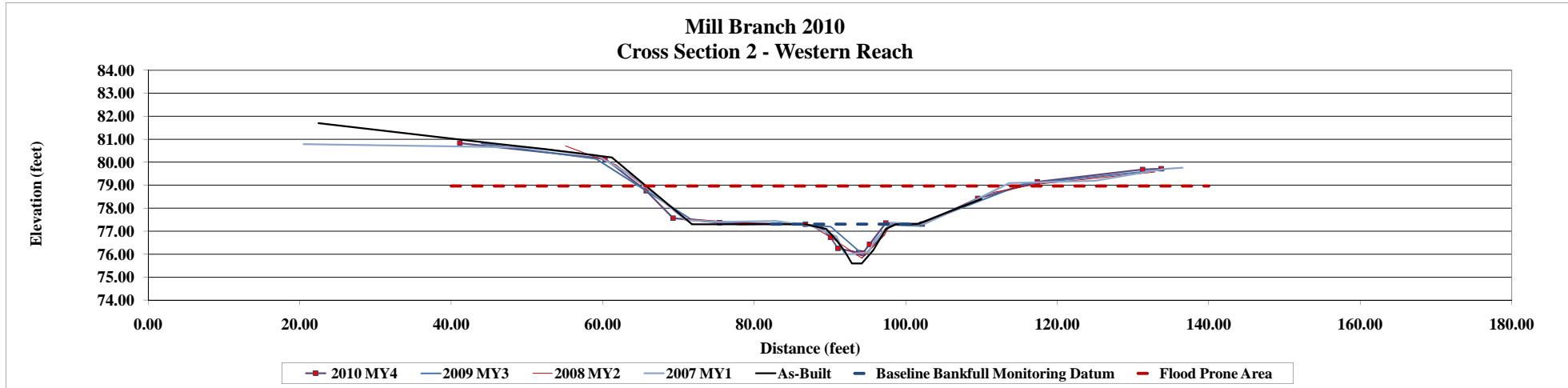
<b>Project Name</b>	Mill Branch, MY4
<b>Watershed</b>	
<b>Cross Section</b>	2
<b>Drainage Area</b>	NA
<b>Date</b>	Jun-10
<b>Crew</b>	Tutt, Stafford

Photo of Cross-Section 2 - Looking Downstream @ STA 1+35

Picture Taken October 5 2010

As-Built Survey			2007			2008			2009			2010			2011		
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
22.50	81.70		20.54	80.78		55.10	80.71		44.00	80.81		41.15	80.83				
46.10	80.80	LPIN	49.95	80.64		61.79	79.88		59.09	80.14		60.29	80.15				
52.60	80.56		59.14	80.31		71.05	77.53		71.59	77.53		65.73	78.76				
61.20	80.20		63.79	79.44		80.99	77.31		78.17	77.29		69.29	77.57				
71.80	77.30		70.90	77.49		84.05	77.32		84.70	77.34		75.45	77.36				
82.30	77.30	LBKF	75.34	77.40		87.63	77.22		90.13	77.19		86.76	77.30				
86.70	77.30		82.81	77.45		90.42	76.67		94.53	75.93		88.77	77.18				
89.50	77.10		87.69	77.22		94.20	75.83		98.08	77.28		90.07	76.73				
90.90	76.60		90.87	76.77		97.23	76.85		101.98	77.22		91.07	76.26				
92.00	76.10		92.02	75.99		97.99	77.34		103.17	77.48		93.78	76.07				
92.90	75.60		93.64	76.04		102.41	77.34		115.44	79.04		94.32	76.04				
94.20	75.60		95.07	76.07		111.29	78.67		134.15	79.68		95.22	76.42				
95.80	76.20		95.93	76.60		116.92	79.02					97.38	77.35				
97.40	77.10		98.10	77.37		132.86	79.57					102.17	77.31				
98.70	77.30		102.53	77.32								109.51	78.43				
101.60	77.31	RBKF	107.26	78.03								117.38	79.15				
110.00	78.40		113.67	79.09								131.26	79.68				
118.90	79.10		125.03	79.19								133.74	79.72				
134.20	79.60	RPIN	134.13	79.70													
150.80	80.10		136.53	79.76													

Summary Data	
Bankfull Elv.	77.3
BF Area	7
BF Width	10.5
Flood Prone Elv.	78.96
Flood Prone Width	44.6
Max Depth	1.3
Mean Depth	0.7
W/D Ratio	15.8
ER	4.2
Bank Height Ratio	
Stream Type	C5



Project Name: Mill Branch, MY4  
 Watershed: Cross Section 3  
 Drainage Area: NA  
 Date: Jun-10  
 Crew: Tutt, Stafford

Photo of Cross-Section 3 - Looking Downstream @ STA 1+07

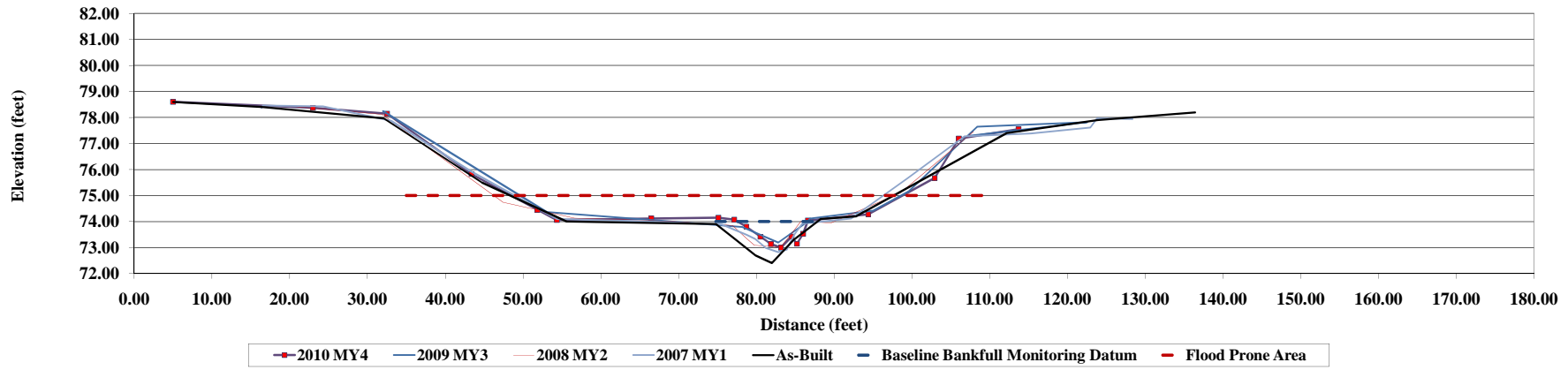
Picture Taken October 5 2010

As-Built Survey			2007			2008			2009			2010			2011		
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MYS		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
5.00	78.60		16.37	78.36		19.25	78.46		32.00	78.25		5.00	78.60				
16.50	78.40	LPIN	16.57	78.46		31.88	78.12		53.03	74.37		23.00	78.37				
32.10	77.97		24.25	78.43		47.44	74.74		67.89	74.03		32.52	78.14				
44.70	75.50		33.02	77.87		56.58	74.13		78.20	73.79		43.37	75.83				
55.60	74.00		43.29	75.93		68.91	74.01		82.83	73.19		51.84	74.45				
74.80	73.90	LBKF	54.40	74.09		76.96	73.85		86.07	73.88		54.36	74.06				
77.40	73.30		64.66	74.02		78.67	73.37		86.92	74.12		66.49	74.12				
79.90	72.70		71.46	73.93		79.76	73.09		95.02	74.42		75.12	74.15				
82.00	72.40		75.54	73.89		83.12	73.02		99.58	75.16		77.17	74.08				
84.80	73.30		78.79	73.49		84.69	73.60		108.39	77.65		78.72	73.80				
88.30	74.10	RBKF	79.85	73.33		85.72	74.00		122.55	77.83		80.53	73.42				
92.80	74.20		81.23	72.99		89.58	73.95		107.39	77.30		81.86	73.14				
112.20	77.40		82.80	72.82		98.49	75.09					83.16	73.00				
123.90	77.90	RPIN	83.89	72.92		107.90	77.46					84.54	73.42				
136.40	78.20		84.85	73.49								85.21	73.15				
			85.92	73.92								86.01	73.53				
			92.18	74.12								86.63	74.04				
			99.48	75.67								94.40	74.28				
			106.77	77.28								102.93	75.67				
			115.33	77.39								106.04	77.19				
			122.93	77.61								113.72	77.55				
			123.83	77.97													
			128.35	77.94													

Summary Data	
Bankfull Elv.	74
BF Area	5.2
BF Width	9
Flood Prone Elv.	75
Flood Prone Width	50.4
Max Depth	1
Mean Depth	0.6
W/D Ratio	15.4
ER	5.6
Bank Height Ratio	
Stream Type	C5



Mill Branch 2010 - Pool  
 Cross Section 3 - Upper Reach



**Project Name** Mill Branch, MY4  
**Watershed**  
**Cross Section** 4  
**Drainage Area** NA  
**Date** Jun-10  
**Crew** Tutt, Stafford

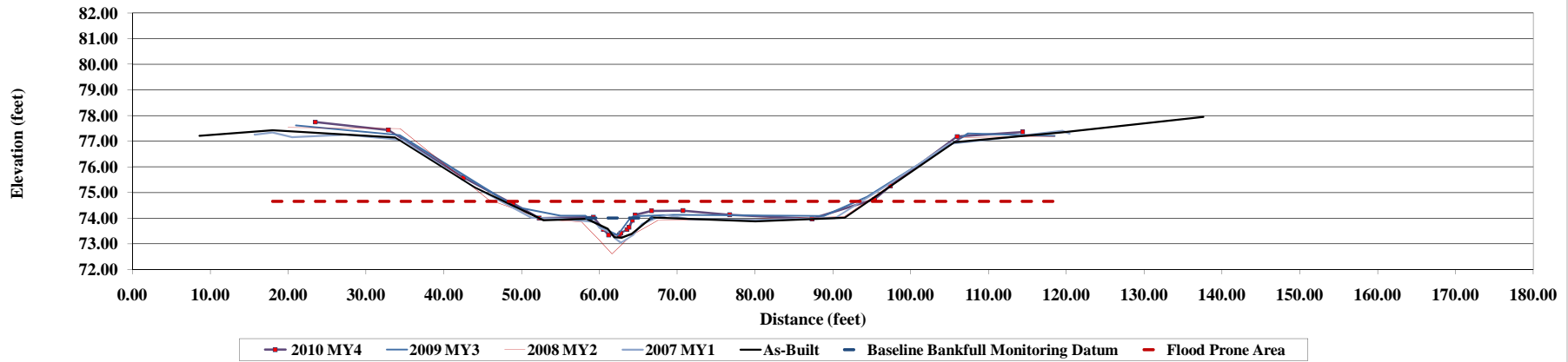
**Photo of Cross-Section 1 - Looking  
 Downstream @ STA 1+53**

Picture Taken October 5 2010

As-Built Survey			2007			2008			2009			2010			2011			Summary Data	
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5			Bankfull Elev.	BF Area
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	BF Width	Flood Prone Elev.
8.63	77.21		15.71	77.26		20.00	77.53		21.00	77.62		23.50	77.75		23.50	77.75		7.4	46.2
18.00	77.43	LPIN	15.74	77.25		34.38	77.49		34.31	77.24		32.90	77.44		32.90	77.44		7.4	74.65
33.76	77.15		17.97	77.34		45.71	74.73		49.14	74.44		42.54	75.58		42.54	75.58		0.7	0.7
43.99	75.20		20.51	77.16		52.87	73.95		54.99	74.10		48.73	74.57		48.73	74.57		0.3	23.7
52.83	73.92		27.45	77.25		57.74	73.85		58.22	74.09		48.90	74.57		48.90	74.57		6.3	6.3
58.36	73.97	LBKF	34.71	77.05		58.36	73.65		60.25	73.65		52.25	74.00		52.25	74.00		Bank Height Ratio	23.7
61.09	73.58		43.48	75.29		59.89	73.17		62.34	73.34		59.22	74.04		59.22	74.04		Stream Type	C5
61.89	73.26		51.28	74.02		61.62	72.61		63.73	73.90		60.52	73.56		60.52	73.56			
62.82	73.23		55.19	73.97		64.14	73.33		64.36	74.07		61.20	73.35		61.20	73.35			
64.17	73.39		59.44	73.85		66.74	73.78		69.53	74.13		62.58	73.35		62.58	73.35			
66.74	74.03	RBKF	60.02	73.63		67.52	73.92		88.85	74.08		62.75	73.42		62.75	73.42			
80.08	73.87		61.39	73.46		72.80	73.92		94.50	74.85		63.54	73.55		63.54	73.55			
91.55	74.01		62.01	73.21		91.46	74.06		107.40	77.30		63.80	73.64		63.80	73.64			
105.64	76.96		62.76	73.04		106.47	77.15		118.50	77.20		64.25	73.92		64.25	73.92			
119.34	77.34	RPIN	64.31	73.33		118.51	77.19					64.60	74.13		64.60	74.13			
137.60	77.95		65.45	73.77								66.72	74.28		66.72	74.28			
			67.10	73.98								70.74	74.30		70.74	74.30			
			68.70	74.11								76.73	74.13		76.73	74.13			
			71.52	73.96								87.31	73.97		87.31	73.97			
			79.67	73.93								95.36	74.74		95.36	74.74			
			90.30	74.00								97.40	75.26		97.40	75.26			
			97.10	75.30								105.97	77.18		105.97	77.18			
			104.90	76.90								114.39	77.36		114.39	77.36			
			111.20	77.10															
			119.50	77.40															
			120.40	77.30															



**Mill Branch 2010 - Riffle  
 Cross Section 4 - Upper Reach**



<b>Project Name</b>	Mill Branch, MY4
<b>Watershed</b>	
<b>Cross Section</b>	5
<b>Drainage Area</b>	NA
<b>Date</b>	Jun-10
<b>Crew</b>	Tutt, Stafford

Photo of Cross-Section 5 - Looking Downstream @ STA 0+94

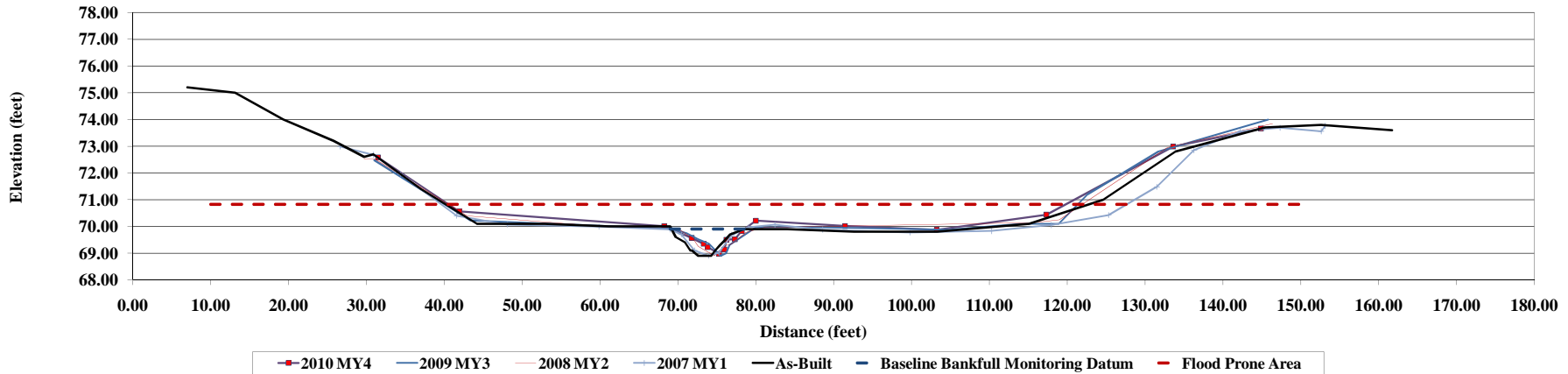
Picture Taken October 5 2010

As-Built Survey			2007			2008			2009			2010			2011		
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
7.00	75.20		26.63	72.99		29.70	72.52		31.00	72.47		31.50	72.59				
13.10	75.00		30.90	72.68		31.08	72.52		43.40	70.22		41.92	70.56				
19.30	74.00		34.38	71.95		42.94	70.39		69.20	69.92		68.24	70.00				
25.80	73.20		41.58	70.40		60.00	70.01		71.15	69.74		71.77	69.57				
29.70	72.60		48.12	70.07		70.22	69.88		72.60	69.52		73.30	69.35				
30.90	72.70	LPIN	59.86	69.99		71.95	69.54		74.01	69.35		73.83	69.22				
37.00	71.40		68.98	69.89		72.63	69.25		75.51	68.90		75.30	68.97				
44.20	70.10		70.44	69.70		73.55	69.10		76.19	69.00		75.97	69.14				
52.90	70.10		72.13	69.10		74.69	68.91		76.61	69.30		76.23	69.50				
61.10	70.00		73.93	68.90		76.15	69.29		80.02	69.96		77.31	69.52				
66.90	70.00		75.27	69.02		76.65	69.30		85.32	69.98		78.20	69.83				
69.00	70.00	LBKF	76.90	69.68		77.27	69.42		104.81	69.87		80.02	70.21				
69.70	69.60		79.08	69.97		78.72	69.78		114.00	70.10		91.46	70.01				
70.90	69.40		82.45	70.06		81.18	69.96		118.90	70.10		103.22	69.87				
71.60	69.10		88.60	69.88		88.29	70.00		122.60	71.20		117.32	70.44				
71.80	69.10		99.81	69.77		115.81	70.14		131.70	72.80		133.60	72.99				
72.60	68.90		110.30	69.83		119.00	70.25		145.80	74.00		144.87	73.66				
73.00	68.90		117.95	70.05		123.58	71.15										
73.40	68.90		125.31	70.42		132.88	72.95										
74.30	68.90		131.50	71.48		146.38	73.85										
74.80	69.10		136.29	72.85													
75.40	69.30		142.21	73.56													
76.10	69.50		147.31	73.69													
76.70	69.70		152.59	73.56													
78.50	69.90	RBKF	153.10	73.76													
81.30	69.90																
84.00	69.90																
92.60	69.80																
103.30	69.80																
115.1	70.1																

Summary Data	
Bankfull Elv.	69.9
BF Area	4
BF Width	12.7
Flood Prone Elv.	70.83
Flood Prone Width	79.3
Max Depth	0.9
Mean Depth	0.3
W/D Ratio	40.3
ER	6.2
Bank Height Ratio	
Stream Type	C5



Mill Branch 2010 - Riffle  
Cross Section 5 - Middle Reach





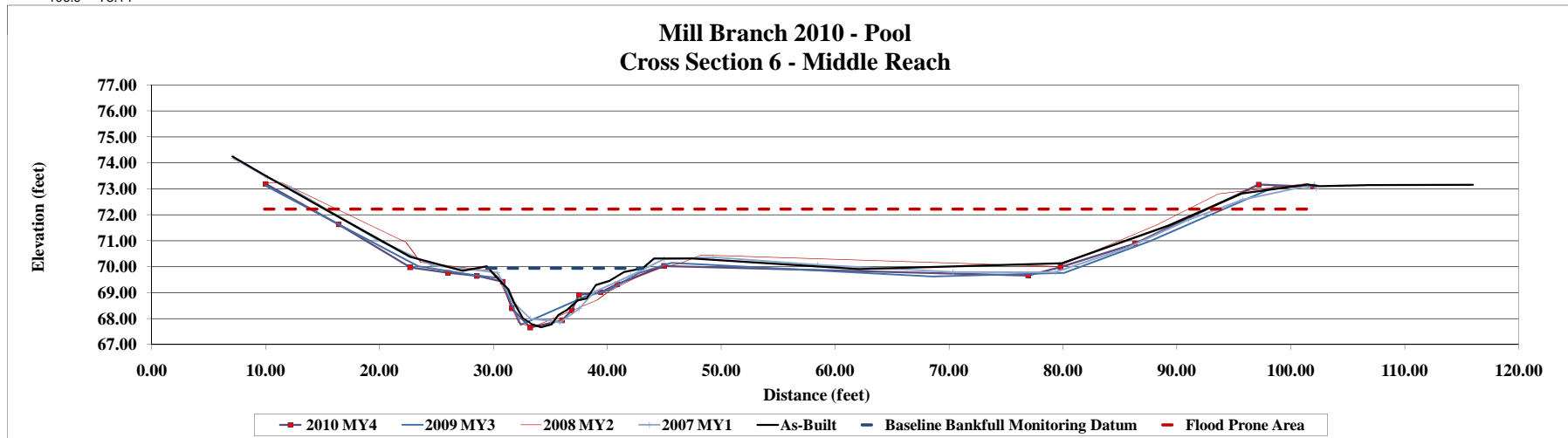
Project Name Mill Branch, MY4  
 Watershed  
 Cross Section 6  
 Drainage Area NA  
 Date Jun-10  
 Crew Tutt, Stafford

Cross Section 6 - Middle Reach - Pool -  
 Sta. 2+06 - Downstream

Picture Taken October 5 2010

As-Built Survey			2007			2008			2009			2010			2011		
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5		
Station	Elv.	Notes	Station	Elv.	Notes	Station	Elv.	Notes	Station	Elv.	Notes	Station	Elv.	Notes	Station	Elv.	Notes
7.10	74.24		7.23	74.17		9.90	73.21		10.00	73.12		10.00	73.18				
9.90	73.52	LPIN	10.15	73.44		11.37	73.25		23.38	70.02		16.41	71.63				
15.80	72.07		12.22	73.02		22.34	70.93		28.16	69.69		22.68	69.97				
22.70	70.38		19.78	71.05		23.60	70.17		30.61	69.56		26.01	69.76				
27.30	69.84		24.65	70.05		29.84	69.84		32.38	67.76		28.54	69.64				
29.40	70.01	LBKF	30.36	69.77		30.42	69.59		38.10	68.85		30.81	69.42				
30.20	69.63		31.75	68.63		32.19	67.85		40.14	69.09		31.62	68.39				
31.30	69.13		33.25	67.99		33.39	67.66		42.75	69.75		33.24	67.66				
31.80	68.63		34.99	67.92		39.12	68.72		45.63	70.15		36.01	67.93				
32.60	68.01		35.82	67.85		40.12	69.04		68.55	69.62		36.87	68.31				
33.40	67.78		37.55	68.39		43.68	69.85		80.09	69.76		37.51	68.92				
34.20	67.67		38.81	69.02		46.44	70.14		87.65	70.98		39.42	69.02				
35.10	67.78		42.08	69.66		48.24	70.45		98.70	73.10		40.86	69.32				
35.70	68.13		44.99	70.30		79.56	70.01		102.30	73.10		44.97	70.03				
36.40	68.31		49.30	70.36		88.20	71.60					76.95	69.66				
37.40	68.70		58.47	70.07		93.65	72.80					79.77	69.98				
38.20	68.78		70.35	69.79		101.50	73.20					86.31	70.88				
39.00	69.29		79.29	69.78								97.18	73.16				
40.20	69.45		85.54	70.71								101.98	73.08				
41.50	69.80		91.02	71.81													
43.10	69.94	RBKF	95.76	72.58													
44.10	70.32		102.06	73.17													
47.50	70.32		102.23	73.01													
62.10	69.91																
79.90	70.13																
89.20	71.57																
95.70	72.82																
101.50	73.16	RPIN															
102.50	73.10																
106.9	73.14																

Summary Data	
Bankfull Elv.	69.94
BF Area	21.8
BF Width	47.9
Flood Prone Elv.	72.22
Flood Prone Width	78.7
Max Depth	23
Mean Depth	0.5
W/D Ratio	104.9
ER	1.5
Bank Height Ratio	
Stream Type	C5



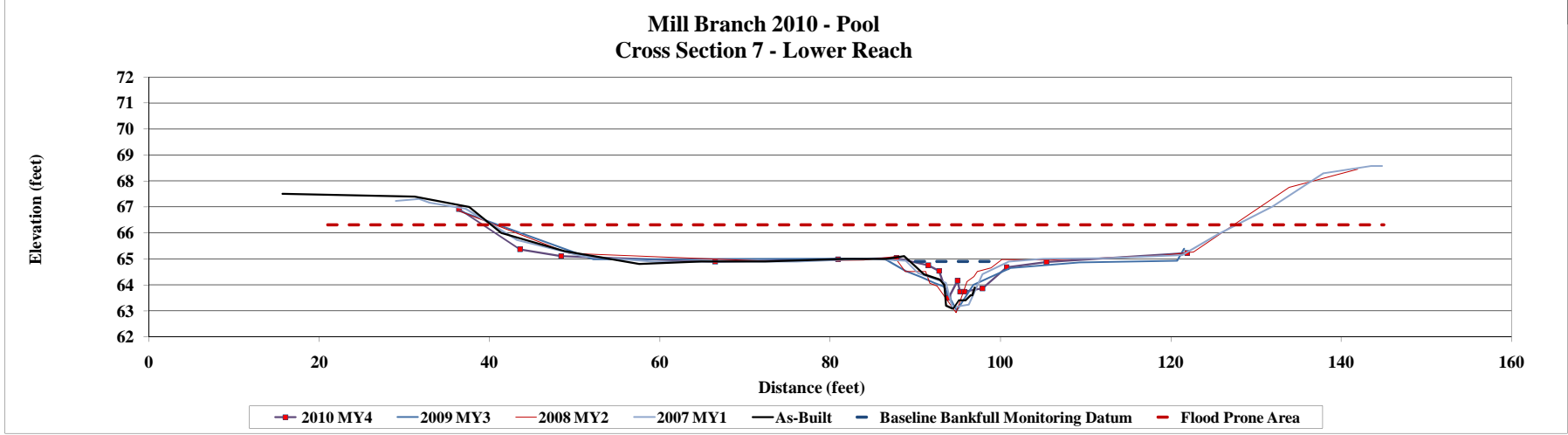
**Project Name** Mill Branch, MY4  
**Watershed**  
**Cross Section 7**  
**Drainage Area** NA  
**Date** Jun-10  
**Crew** Tutt, Stafford

**Photo of Cross-Section 7 - Looking  
 Upstream @ STA 0+12**

Picture Taken October 5 2010

As-Built Survey			2007			2008			2009			2010			2011		
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5		
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes
15.7	67.5		29.01	67.23		36.40	66.85		36.4	66.85		36.4	66.92				
31.2	67.4	LPIN	31.77	67.31		49.36	65.21		52.2	64.98		43.58	65.37				
37.6	67		32.93	67.17		72.83	64.91		86.33	65.01		48.41	65.1				
41.4	66		37.21	66.93		83.97	64.95		88.89	64.53		66.49	64.89				
48.8	65.3		43.28	65.72		87.54	65.08		90.7	64.29		80.93	64.99				
57.6	64.8		50.94	65.10		88.83	64.51		92.28	64.07		87.76	65.03				
64.9	64.9		59.60	64.88		91.22	64.51		93.34	63.93		91.53	64.75				
72.4	64.9		66.87	64.89		91.70	64.06		94.9	63.01		92.78	64.53				
81.7	65		76.08	64.90		92.57	63.95		96.8	64.0		93.89	63.49				
86.6	65		84.71	65.00		94.80	62.93		98.8	64.3		94.96	64.16				
88.7	65.1		88.86	64.93		96.06	64.12		101.2	64.6		95.24	63.74				
89.7	64.8		90.30	64.45		96.88	64.32		109.3	64.9		95.75	63.74				
91	64.4		93.60	64.08		97.28	64.51		120.7	64.9		97.89	63.86				
92.9	64.2	LBKF	94.34	63.13		98.90	64.65		121.6	65.4		100.7	64.68				
93.4	64		95.31	63.18		100.16	64.97					105.4	64.88				
93.6	63.2		96.29	63.24		105.74	64.95					121.9	65.23				
94.4	63.08		97.89	64.41		118.90	65.13										
94.5	63.1		100.96	64.90		122.66	65.27										
95.1	63.4		105.06	65.00		133.88	67.75										
95.9	63.4		112.02	65.02		141.91	68.45										
96.5	63.6		121.33	65.14													
96.7	63.6		125.49	65.94													
97	63.9		131.95	67.02													
97.00	64.20	RBKF	137.94	68.29													
98.10	64.40		143.52	68.58													
101.00	64.90		144.78	68.58													
103.70	64.80																
113.90	65.00																
121.90	65.10																
124	65.8																

Summary Data	
Bankfull Elev.	64.9
BF Area	8.2
BF Width	18.9
Flood Prone Elev.	66.31
Flood Prone Width	82.7
Max Depth	1.4
Mean Depth	0.4
W/D Ratio	43.6
ER	4.4
Bank Height Ratio	
Stream Type	C5



**Project Name** Mill Branch, MY4  
**Watershed**  
**Cross Section** 8  
**Drainage Area** NA  
**Date** Jun-10  
**Crew** Tutt, Stafford

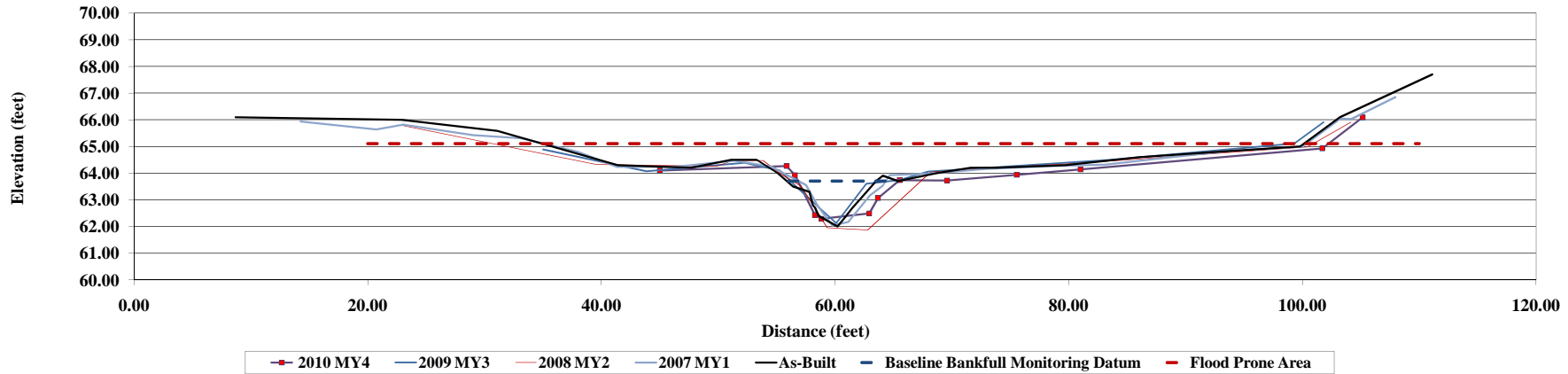
**Photo of Cross-Section 8 - Looking  
 Downstream @ STA 1+71**

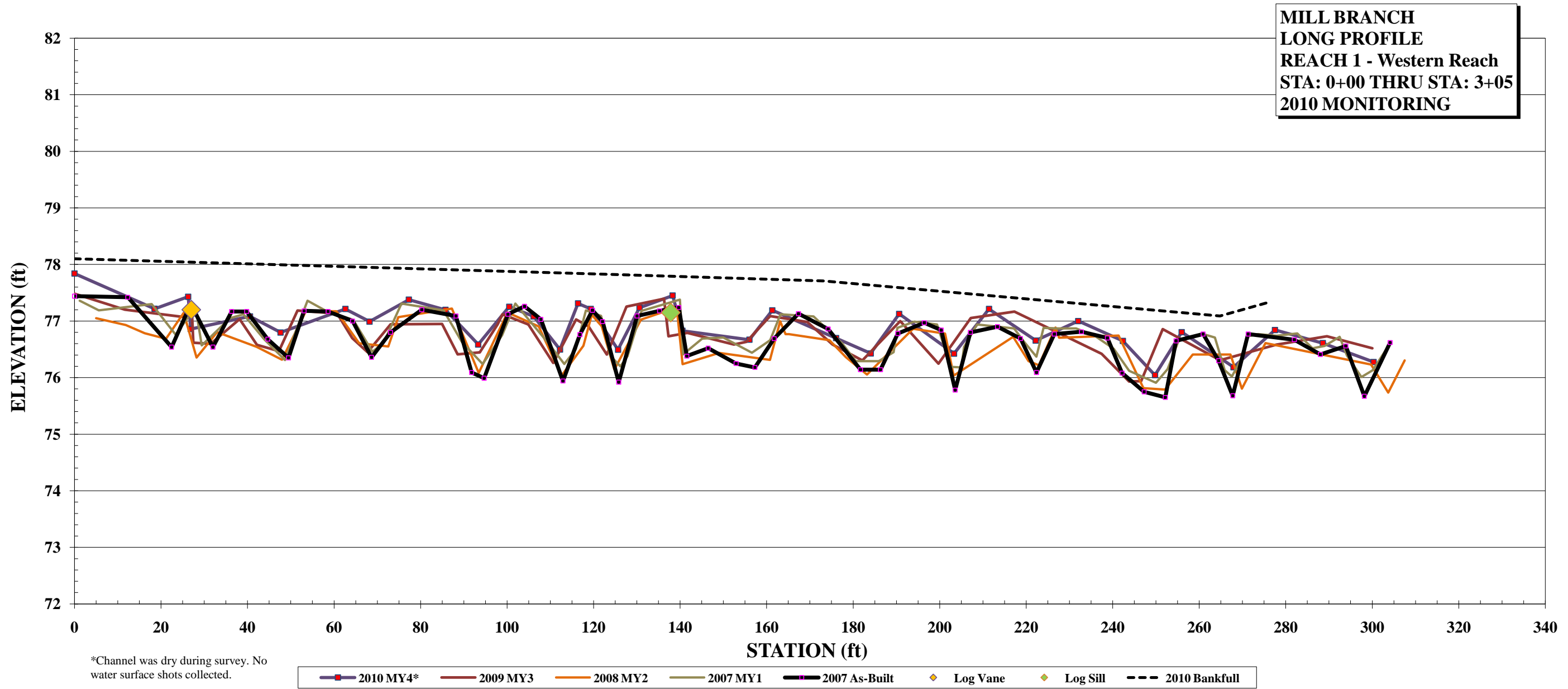
Picture Taken October 5 2010

As-Built Survey			2007			2008			2009			2010			2011			Summary Data	
As-Built Survey			2007 MY1			2008 MY2			2009 MY3			2010 MY4			2011 MY5			Bankfull Elev.	BF Area
Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	Station	Elv	Notes	BF Width	Flood Prone Elev.
8.70	66.10		14.25	65.94		22.90	65.79		35.00	64.88		45.00	64.10		58.82	62.29		8.6	65.11
22.90	66.00	LPIN	20.74	65.64		39.58	64.33		43.87	64.07		55.85	64.27		58.82	62.29		8.6	65.11
31.10	65.58		23.03	65.82		49.89	64.26		52.26	64.39		56.56	63.93		58.82	62.29		8.6	65.11
41.40	64.30		29.00	65.43		51.26	64.47		55.28	64.10		58.27	62.43		58.82	62.29		8.6	65.11
47.70	64.20		33.14	65.31		53.84	64.47		56.82	63.43		58.82	62.29		58.82	62.29		8.6	65.11
51.10	64.50		38.00	64.80		54.93	64.10		60.10	62.13		62.93	62.49		58.82	62.29		8.6	65.11
53.30	64.50		41.35	64.23		55.66	63.89		62.66	63.61		63.67	63.07		58.82	62.29		8.6	65.11
55.10	64.00		46.47	64.25		57.08	63.52		65.51	63.74		65.53	63.74		58.82	62.29		8.6	65.11
56.40	63.50	LBKF	51.39	64.47		59.33	61.95		67.98	64.06		69.59	63.72		58.82	62.29		8.6	65.11
57.80	63.30		54.54	64.25		62.79	61.87		83.44	64.49		75.55	63.94		58.82	62.29		8.6	65.11
58.10	62.80		57.52	63.55		68.17	64.04		99.31	65.11		81.00	64.14		58.82	62.29		8.6	65.11
58.30	62.70		58.51	62.78		71.86	64.15		101.80	65.91		101.70	64.93		58.82	62.29		8.6	65.11
58.40	62.60		59.77	62.03		81.13	64.38					105.17	66.09		58.82	62.29		8.6	65.11
58.60	62.40		61.13	62.17		100.46	64.98								58.82	62.29		8.6	65.11
60.20	62.00		63.00	63.17		104.15	65.91								58.82	62.29		8.6	65.11
60.80	62.31		64.09	63.53											58.82	62.29		8.6	65.11
61.50	62.70		64.67	63.93											58.82	62.29		8.6	65.11
62.10	63.00		67.97	63.98											58.82	62.29		8.6	65.11
63.50	63.70	RBKF	72.93	64.16											58.82	62.29		8.6	65.11
64.10	63.90		77.92	64.26											58.82	62.29		8.6	65.11
65.40	63.70		83.14	64.32											58.82	62.29		8.6	65.11
68.70	64.00		88.51	64.59											58.82	62.29		8.6	65.11
71.60	64.20		93.85	64.84											58.82	62.29		8.6	65.11
73.80	64.20		99.97	64.99											58.82	62.29		8.6	65.11
79.70	64.30		103.26	66.04											58.82	62.29		8.6	65.11
86.00	64.60		104.20	66.03											58.82	62.29		8.6	65.11
92.70	64.80		107.95	66.85											58.82	62.29		8.6	65.11
99.80	65.00														58.82	62.29		8.6	65.11
103.20	66.10	RPIN													58.82	62.29		8.6	65.11
111.4	67.7														58.82	62.29		8.6	65.11

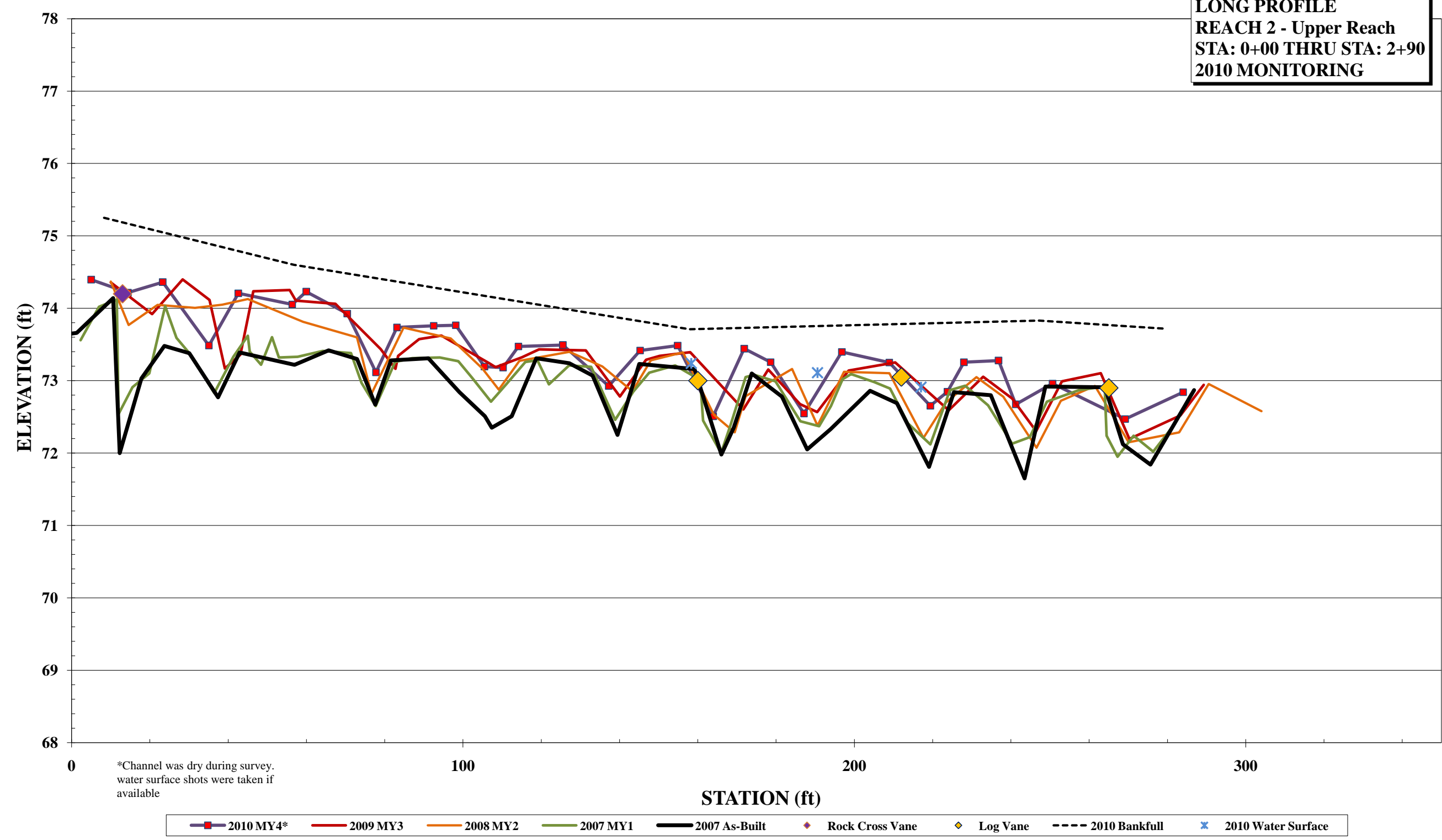


**Mill Branch 2010 - Pool  
 Cross Section 8 - Lower Reach**

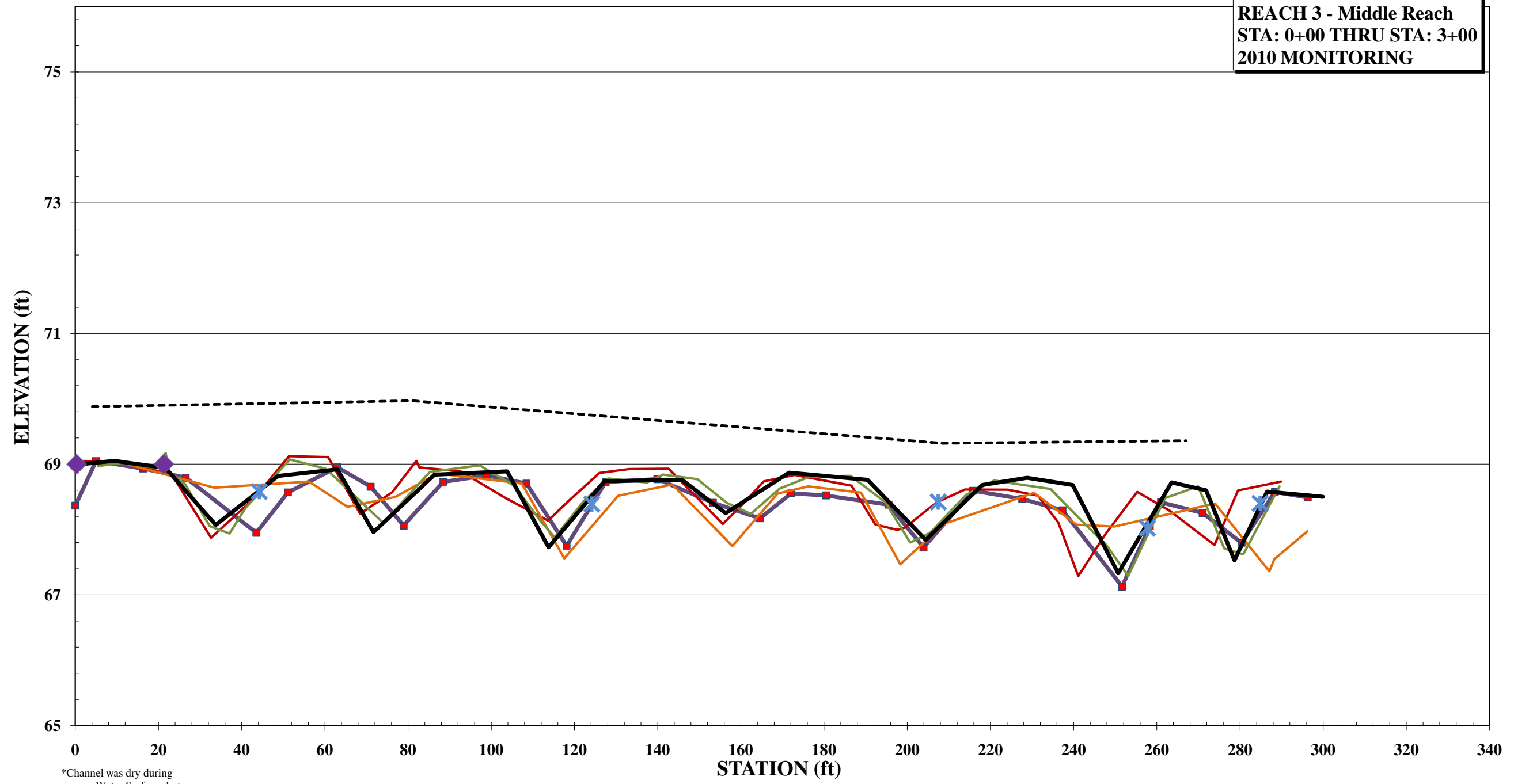




**MILL BRANCH  
LONG PROFILE  
REACH 2 - Upper Reach  
STA: 0+00 THRU STA: 2+90  
2010 MONITORING**

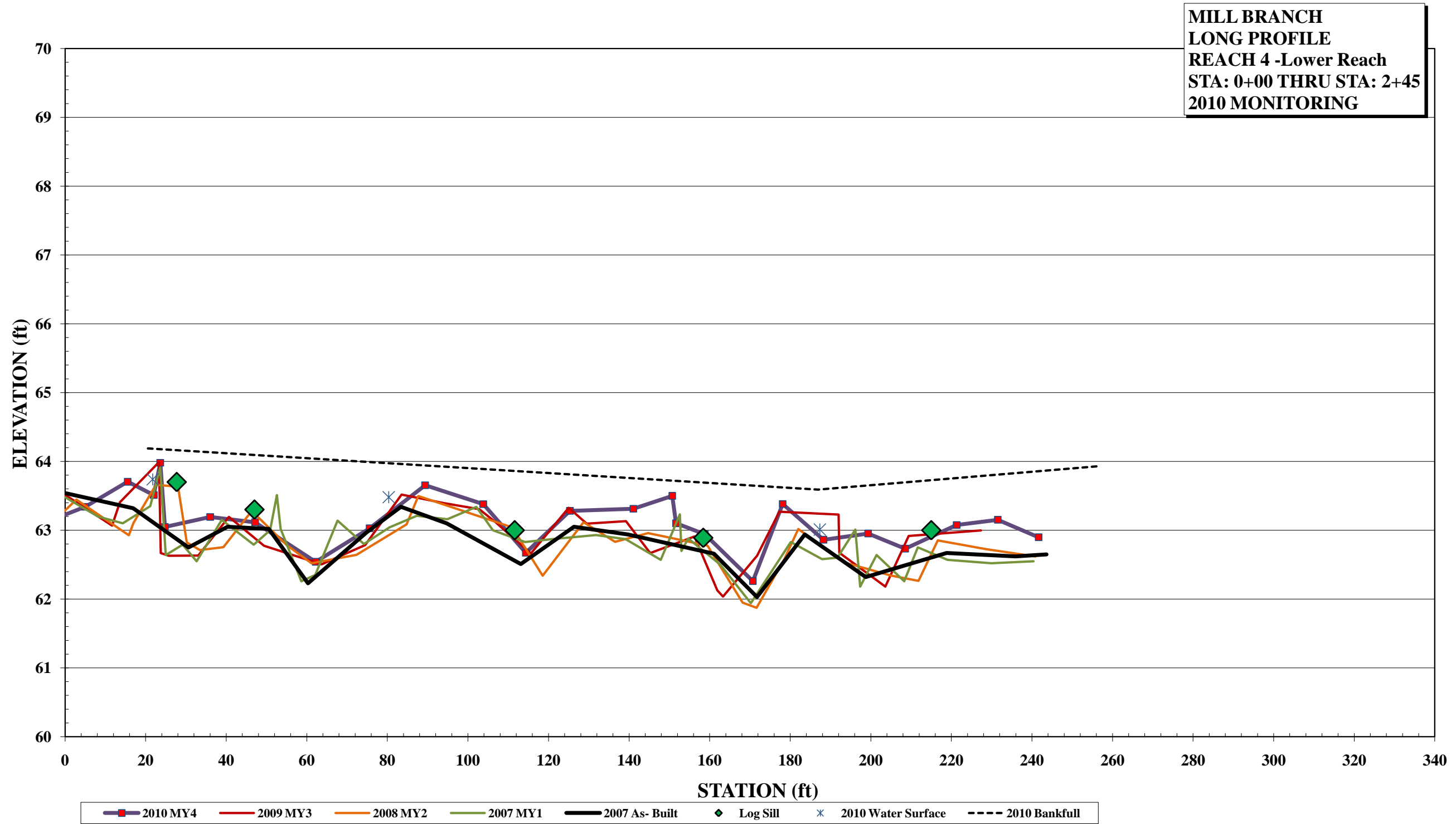


**MILL BRANCH  
LONG PROFILE  
REACH 3 - Middle Reach  
STA: 0+00 THRU STA: 3+00  
2010 MONITORING**



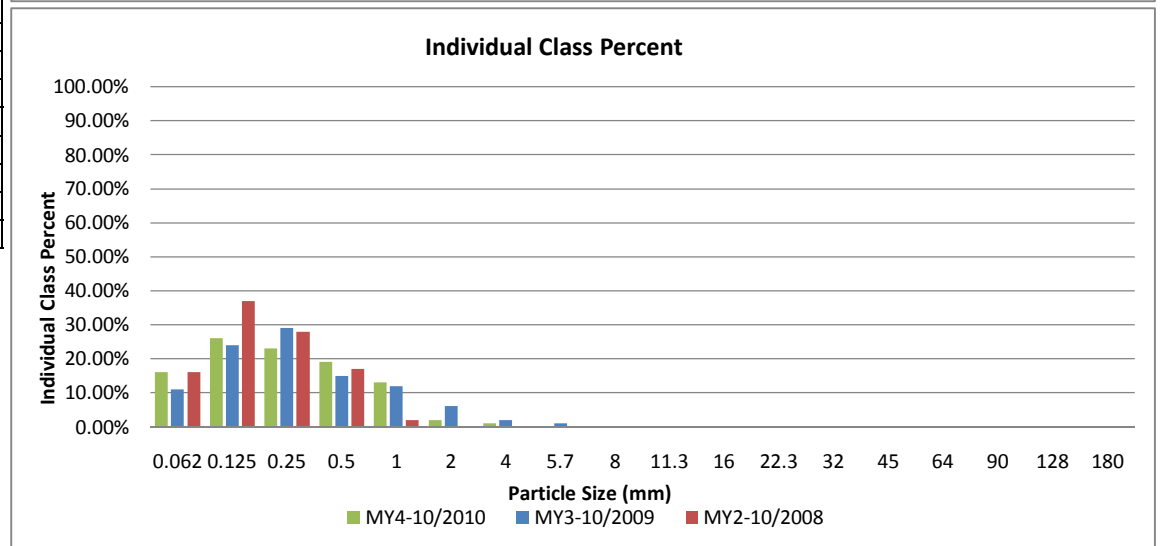
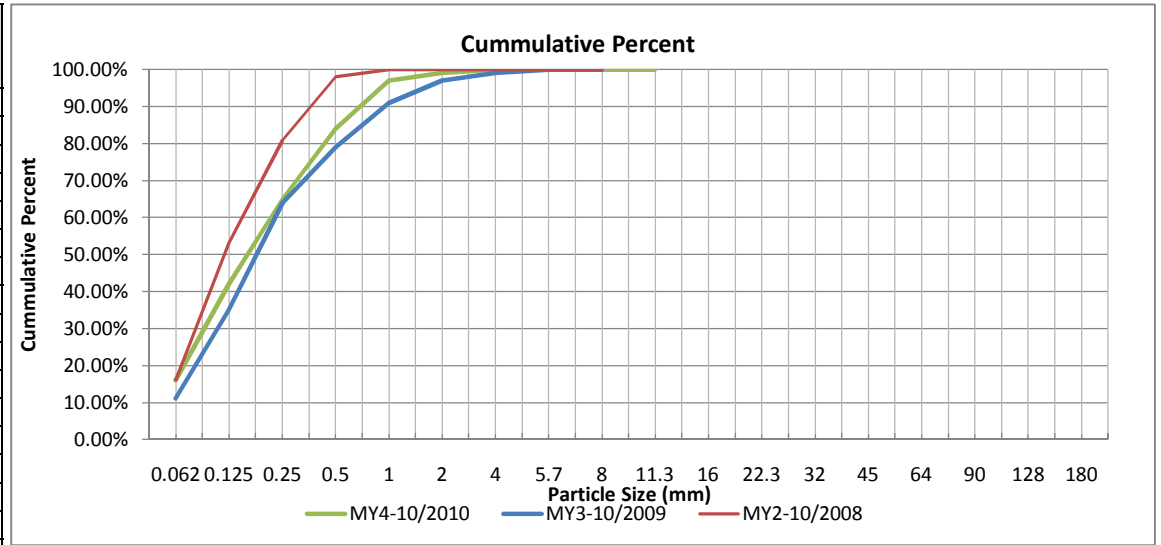
\*Channel was dry during survey. Water Surface shots were taken if available.

■ 2010 MY3\*   
 — 2009 MY3   
 — 2008 MY2   
 — 2007 MY1   
 — 2007 As-Built   
 ◆ Log Vane   
 - - - 2010 Bankfull   
 ✱ 2010 Water Surface



Project Name: Mill Branch Western Reach Monitoring Year 4 - 2010					
Desc.	Material	Size (MM)	Count	% of Total	Cumulative %
SAND	silt/clay	0.062	16	16.00%	16.00%
	very fine sand	0.125	26	26.00%	42.00%
	fine sand	0.25	23	23.00%	65.00%
	medium sand	0.5	19	19.00%	84.00%
	coarse sand	1	13	13.00%	97.00%
	very coarse sand	2	2	2.00%	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			
	small cobble	90			
COBBLE	medium cobble	128			
	large cobble	180			
	very large cobble	256			
BOULDER	small boulder	362			
	small boulder	512			
	medium boulder	1024			
	large boulder	2048			
<b>TOTAL % of whole count:</b>			<b>100</b>	<b>100%</b>	<b>100%</b>

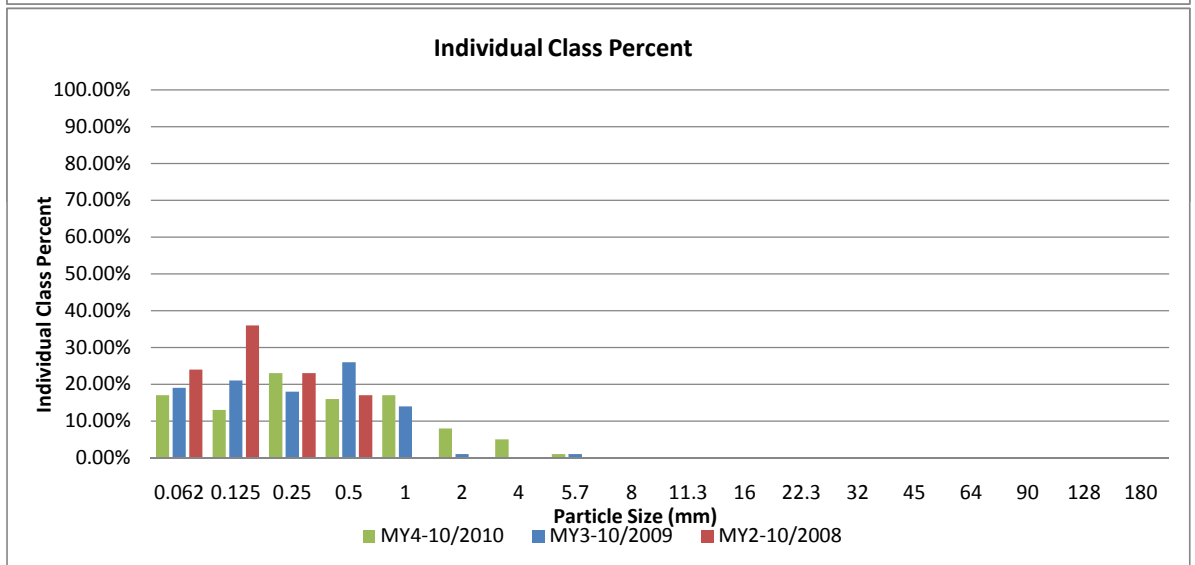
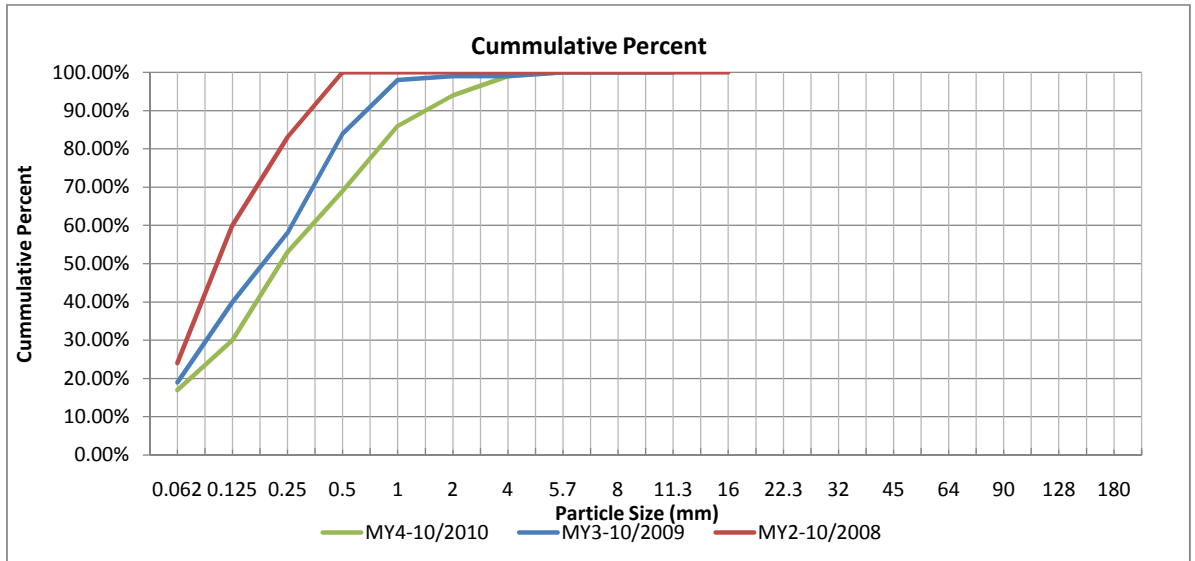
Sumamry Data	
D50	0.16
D84	0.5
D95	0.9





Project Name: Mill Branch Upper Reach Monitoring Year 4 - 2010					
Desc.	Material	Size (MM)	Count	% of Total	Cumulative %
SAND	silt/clay	0.062	17	17.00%	17.00%
	very fine sand	0.125	13	13.00%	30.00%
	fine sand	0.25	23	23.00%	53.00%
	medium sand	0.5	16	16.00%	69.00%
	coarse sand	1	17	17.00%	86.00%
	very coarse sand	2	8	8.00%	94.00%
GRAVEL	very fine gravel	4	5	5.00%	99.00%
	fine gravel	5.7	1	1.00%	100.00%
	fine gravel	8	0	0.00%	100.00%
	medium gravel	11.3	0	0.00%	100.00%
	medium gravel	16	0	0.00%	
	coarse gravel	22.3	0	0.00%	
	coarse gravel	32	0	0.00%	
	very coarse gravel	45	0	0.00%	
	very coarse gravel	64	0	0.00%	
	small cobble	90	0	0.00%	
COBBLE	medium cobble	128	0	0.00%	
	large cobble	180	0	0.00%	
	very large cobble	256	0	0.00%	
BOULDER	small boulder	362	0	0.00%	
	small boulder	512	0	0.00%	
	medium boulder	1024	0	0.00%	
large boulder	2048	0	0.00%		
<b>TOTAL % of whole count:</b>			<b>100</b>	<b>100%</b>	<b>100%</b>

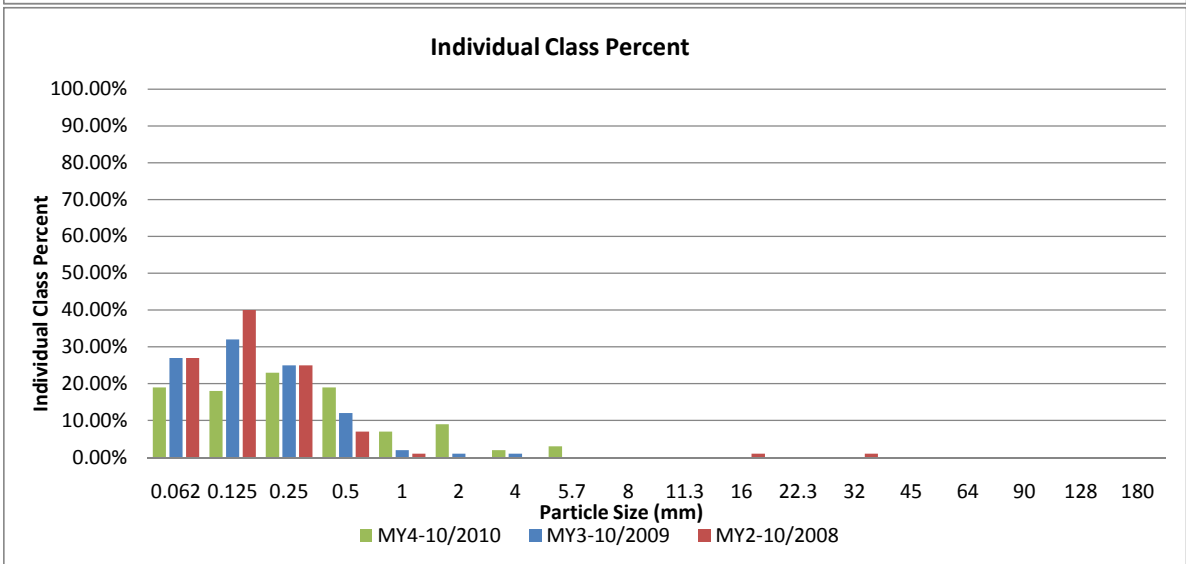
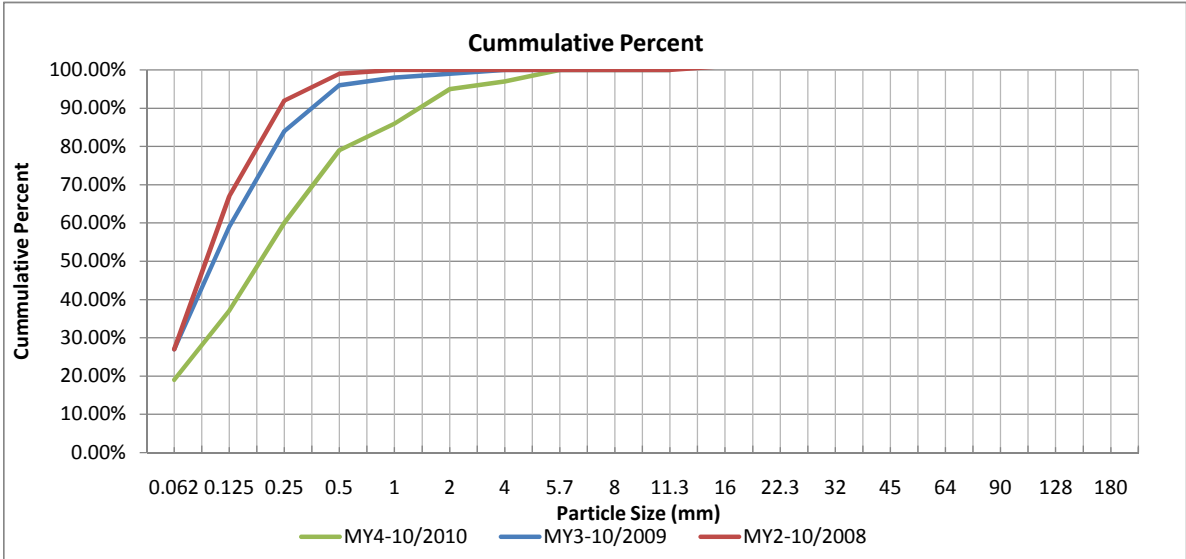
Sumamry Data	
D50	0.23
D84	0.92
D95	2.3



**Project Name: Mill Branch  
Middle Reach  
Monitoring Year 4 - 2010**

Desc.	Material	Size (MM)	Count	% of Total	Cumulative %
SAND	silt/clay	0.062	19	19.00%	19.00%
	very fine sand	0.125	18	18.00%	37.00%
	fine sand	0.25	23	23.00%	60.00%
	medium sand	0.5	19	19.00%	79.00%
	coarse sand	1	7	7.00%	86.00%
	very coarse sand	2	9	9.00%	95.00%
GRAVEL	very fine gravel	4	2	2.00%	97.00%
	fine gravel	5.7	3	3.00%	100.00%
	fine gravel	8	0	0.00%	100.00%
	medium gravel	11.3	0	0.00%	100.00%
	medium gravel	16	0	0.00%	
	coarse gravel	22.3	0	0.00%	
	coarse gravel	32	0	0.00%	
	very coarse gravel	45	0	0.00%	
COBBLE	very coarse gravel	64	0	0.00%	
	small cobble	90	0	0.00%	
	medium cobble	128	0	0.00%	
	large cobble	180	0	0.00%	
BOULDER	very large cobble	256	0	0.00%	
	small boulder	362	0	0.00%	
	small boulder	512	0	0.00%	
	medium boulder	1024	0	0.00%	
	large boulder	2048	0	0.00%	
<b>TOTAL % of whole count:</b>			<b>100</b>	<b>100%</b>	<b>100%</b>

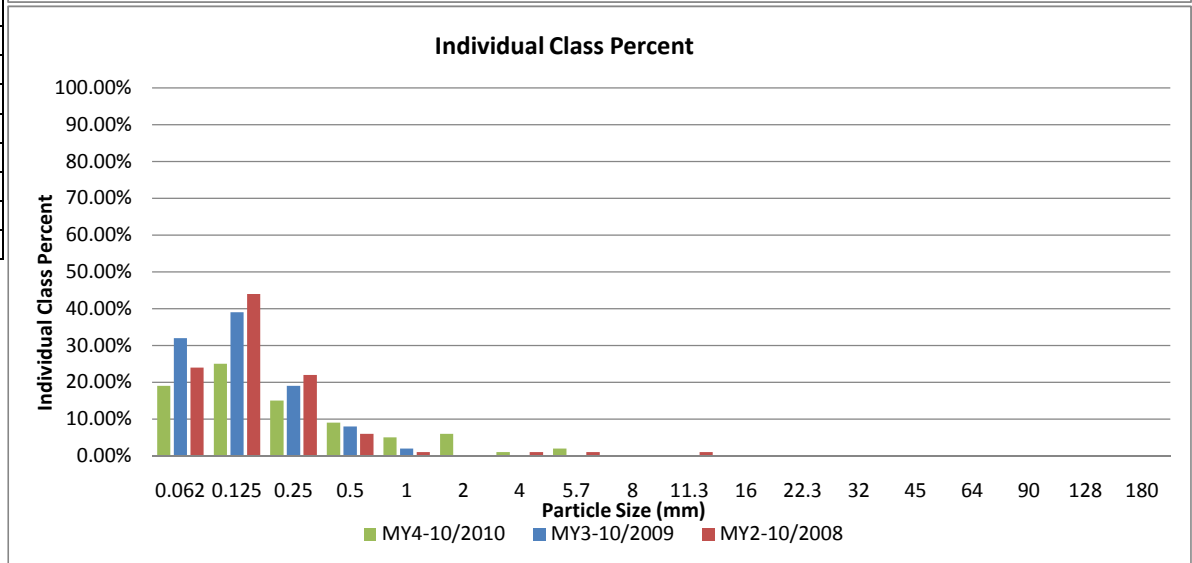
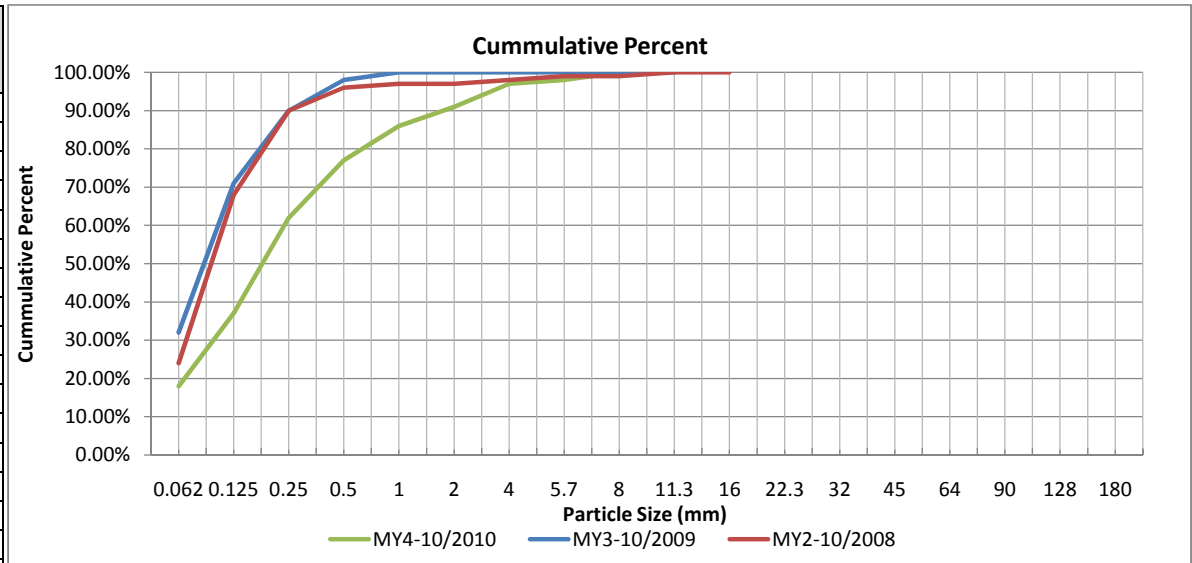
Sumamry Data	
D50	0.18
D84	0.82
D95	2



**Project Name: Mill Branch  
Lower Reach  
Monitoring Year 4 - 2010**

Desc.	Material	Size (MM)	Count	% of Total	Cumulative %
SAND	silt/clay	0.062	18	18.00%	18.00%
	very fine sand	0.125	19	19.00%	37.00%
	fine sand	0.25	25	25.00%	62.00%
	medium sand	0.5	15	15.00%	77.00%
	coarse sand	1	9	9.00%	86.00%
	very coarse sand	2	5	5.00%	91.00%
GRAVEL	very fine gravel	4	6	6.00%	97.00%
	fine gravel	5.7	1	1.00%	98.00%
	fine gravel	8	2	2.00%	100.00%
	medium gravel	11.3	0	0.00%	
	medium gravel	16	0	0.00%	
	coarse gravel	22.3	0	0.00%	
	coarse gravel	32	0	0.00%	
	very coarse gravel	45	0	0.00%	
COBBLE	very coarse gravel	64	0	0.00%	
	small cobble	90	0	0.00%	
	medium cobble	128	0	0.00%	
	large cobble	180	0	0.00%	
BOULDER	very large cobble	256	0	0.00%	
	small boulder	362	0	0.00%	
	small boulder	512	0	0.00%	
BOULDER	medium boulder	1024	0	0.00%	
	large boulder	2048	0	0.00%	
	<b>TOTAL % of whole count:</b>			<b>100</b>	<b>100%</b>

Sumamry Data	
D50	0.18
D84	0.86
D95	3.2



**Table 10a. Baseline Stream Data Summary**  
**Mill Branch Stream Restoration Site - EEP Project No. 251**

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Stream Reference			Design			As-Built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)							2.8	6.5	4.7	3.8	14.2	9.0	6.0	12.0	9.0	5.9	10.8	8.4
Flood Prone Width (ft)							2.9	70.0	36.5	100.0	300.0	200.0	38.0	90	64.0	40.6	85.8	63.2
BF Cross Sectional Area (SF)							0.9	5.6	3.3	1.5	21.0	11.3	2.0	9	5.5	2.2	9.0	5.6
BF Mean Depth (ft)							0.3	0.9	0.59	0.5	1.9	1.2	0.4	1.1	0.7	0.4	0.8	0.6
BF Max Depth (ft)							0.5	2.0	1.2	0.7	2.6	1.7	0.6	2	1.3	0.7	1.8	1.3
Width/Depth Ratio							4.0	8.7	6.4	6.1	15	10.7	12.0	18	15.0	13.1	20.2	16.6
Entrenchment Ratio							1.00	10.8	5.9	20.4	26.6	23.5	4.0	10	7.0	6.3	8.7	7.5
Bank Height Ratio																		
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
<b>Pattern</b>																		
Channel Beltwidth (ft)							50	85	67.5	10	59	34.5	18	38	28	20	36	28
Radius of Curvature (ft)							10	25	17.5	10	46	28	10	18	14	11	20	15
Meander Wavelength (ft)							210	260	235	12	97	54.5	32	80	56	36	82	59
Meander Width ratio							40	78.6	59.3	2.1	4.4	3.25	5.0	9.0	7	6.00	7.50	7
<b>Profile</b>																		
Riffle Length																6.3	12.5	9
Riffle Slope																0.003	0.005	0.004
Pool Length																13	19.1	16
Pool Spacing							1.3	1.3	1.3	1	5.4	3.2				26.9	41.00	34
<b>Substrate</b>																		
d50 (mm)																0.09	0.1	0.1
d84 (mm)																0.27	0.4	0.34
<b>Additional Reach Parameters</b>																		
Valley Length (ft)																		
Channel Length (ft)																		
Sinuosity																		
Water Surface Slope																		
BF Slope																		
Rosgen Classification																		
*Habitat Index																		
*Macrobenthos																		

**Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)**  
**Mill Branch EEP No. 251 Western Reach**

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation <sup>1</sup>	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	77.5				77.5			77.3				77.3																							
Bankfull Width (ft)	6	8.7	28.1	23.4	5.7			11.7	11.2	17.4	23.7	10.5																							
Floodprone Width (ft)	45	45	47	39.5	36			52	43	45.6	46	44.6																							
Bankfull Mean Depth (ft)	0.3	0.3	0.2	0.2	0.2			0.7	0.7	0.5	0.3	0.7																							
Bankfull Max Depth (ft)	0.6	0.6	1.2	0.6	0.4			1.7	1.3	1.4	1.4	1.3																							
Bankfull Cross Sectional Area (ft <sup>2</sup> )	1.8	2.3	6.5	4.1	1.2			8.7	7.5	8.2	6.7	7																							
Bankfull Width/Depth Ratio	33.5	19.8	121.8	133	28			15.7	16.7	37.1	83.2	15.8																							
Bankfull Entrenchment Ratio	7.5	5.2	1.7	1.7	6.3			4.4	3.8	2.6	1.9	4.2																							
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft <sup>2</sup> )																																			
d50 (mm)		0.12	0.11	0.18	0.16				0.12	0.11	0.18	0.16																							
	Cross Section 6 (Riffle)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
Based on fixed baseline bankfull elevation <sup>1</sup>	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 <sup>2</sup> )																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft <sup>2</sup> )																																			
d50 (mm)																																			

<sup>1</sup> = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "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)**  
**Mill Branch EEP No. 251 Upper Reach**

	Cross Section 1 (Pool)							Cross Section 2 (Riffle)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation <sup>1</sup>	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	74				74			74				74																							
Bankfull Width (ft)	8.1	8.4	4.5	6.7	9			8.1	8.4	4.5	6.7	7.4																							
Floodprone Width (ft)	47	45	23.8	14.1	50.4			47	45	23.8	14.1	46.2																							
Bankfull Mean Depth (ft)	0.4	0.4	0.5	0.3	0.6			0.4	0.4	0.5	0.3	0.3																							
Bankfull Max Depth (ft)	0.7	0.9	1.3	0.8	1			0.9	0.9	1.3	0.8	0.7																							
Bankfull Cross Sectional Area (ft <sup>2</sup> )	3.2	3.7	2.2	1.7	5.2			3.2	3.7	2.2	1.7	2.3																							
Bankfull Width/Depth Ratio	20.3	18.9	9	26.8	15.4			20.3	18.9	9	26.8	23.7																							
Bankfull Entrenchment Ratio	5.8	5.4	5.3	2.1	5.6			5.8	5.4	5.3	2.1	6.3																							
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft <sup>2</sup> )																																			
d50 (mm)		0.1	0.07	0.09	0.23				0.1	0.07	0.086	0.23																							
	Cross Section 6 (Riffle)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
Based on fixed baseline bankfull elevation <sup>1</sup>	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 <sup>2</sup> )																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft <sup>2</sup> )																																			
d50 (mm)																																			

<sup>1</sup> = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "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)**  
**Mill Branch EEP No. 251 Middle Reach**

	Cross Section 5 (Riffle)							Cross Section 6 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
<b>Based on fixed baseline bankfull elevation<sup>1</sup></b>	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	69.9				69.9			69.94				69.94																							
Bankfull Width (ft)	9.5	9.7	15.1	14.1	12.7			13.7	14.2	19	20.6	47.9																							
Floodprone Width (ft)	88	93	79.5	61.9	79.3			77	75	31.5	28.5	78.8																							
Bankfull Mean Depth (ft)	0.6	0.5	0.3	0.3	0.3			1.1	1.2	0.8	0.5	0.5																							
Bankfull Max Depth (ft)	1	1	1	1	0.9			2.2	2.3	2.5	2.2	2.3																							
Bankfull Cross Sectional Area (ft <sup>2</sup> )	5.2	5.1	4.8	4	4			15.5	16.6	14.8	11	21.8																							
Bankfull Width/Depth Ratio	17.2	18.8	47.9	61.9	40.3			12.2	12.1	24.4	38.6	104.9																							
Bankfull Entrenchment Ratio	9.1	9.8	5.3	3.9	6.2			4.5	5.4	1.7	1.4	1.6																							
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft <sup>2</sup> )																																			
d50 (mm)		0.09	0.0622	0.18	0.18				0.09	0.0622	0.18	0.18																							
	Cross Section 6 (Riffle)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
<b>Based on fixed baseline bankfull elevation<sup>1</sup></b>	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 <sup>2</sup> )																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft <sup>2</sup> )																																			
d50 (mm)																																			

<sup>1</sup> = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "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)**  
**Mill Branch EEP No. 251 Lower Reach**

	Cross Section 7 (Run)							Cross Section 8 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
<b>Based on fixed baseline bankfull elevation<sup>1</sup></b>	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	64.9				64.9			63.7				63.7																							
Bankfull Width (ft)	10.8	11.8	18.3	10.3	18.9			17	16.9	11.2	15.4	8.6																							
Floodprone Width (ft)	84	84	92.7	72.3	82.7			-	-	17.5	26.8	57.2																							
Bankfull Mean Depth (ft)	0.8	0.8	0.5	0.5	0.4			0.7	0.7	0.8	0.5	1																							
Bankfull Max Depth (ft)	1.8	1.7	2	1.5	1.4			2.2	2.2	2.6	2.3	1.4																							
Bankfull Cross Sectional Area (ft <sup>2</sup> )	8.9	8.9	8.5	5.2	8.2			12.6	12.5	8.7	7	8.3																							
Bankfull Width/Depth Ratio	13.6	15.6	39.4	20.4	43.6			22.9	22.8	14.5	34	8.9																							
Bankfull Entrenchment Ratio	7.8	7.2	5.1	7	4.4			-	-	1.5	1.7	6.7																							
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft <sup>2</sup> )																																			
d50 (mm)		0.1	0.067	0.1	0.18				0.1	0.067	0.1	0.18																							
	Cross Section 6 (Riffle)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
<b>Based on fixed baseline bankfull elevation<sup>1</sup></b>	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 <sup>2</sup> )																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft <sup>2</sup> )																																			
d50 (mm)																																			

<sup>1</sup> = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "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  
Mill Branch - EEP No. 251 - Western Reach**

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n
<b>Dimension and Substrate</b>																																				
Bankfull Width (ft)	6		8.85	11.7			8.7		9.95	11.2			17.4		22.8	28.1			23.4		23.6	23.7			5.7		8.1	10.5								
Floodprone Width (ft)	45		48.5	52			4.5		23.8	43			45.6		46.3	47			39.5		42.8	46			36		40.3	44.6								
Bankfull Mean Depth (ft)	0.3		0.5	0.7			0.3		0.5	0.7			0.2		0.35	0.5			0.2		0.25	0.3			0.2		0.45	0.7								
<sup>1</sup> Bankfull Max Depth (ft)	0.6		1.15	1.7			0.6		0.95	1.3			1.2		1.3	1.4			0.6		1	1.4			0.4		0.85	1.3								
Bankfull Cross Sectional Area (ft <sup>2</sup> )	1.8		5.25	8.7			2.3		4.9	7.5			6.5		7.35	8.2			4.1		5.4	6.7			1.2		4.1	7								
Width/Depth Ratio	15.7		24.6	33.5			16.7		18.3	19.8			37.1		79.5	122			83.2		108	133			15.8		21.9	28								
Entrenchment Ratio	4.4		5.95	7.5			3.8		4.5	5.2			1.7		2.15	2.6			1.7		1.8	1.9			4.2		5.25	6.3								
<sup>1</sup> Bank Height Ratio																																				
<b>Profile</b>																																				
Riffle Length (ft)			6																						3		10.8	18.5								
Riffle Slope (ft/ft)																																				
Pool Length (ft)			23																						8		28	48								
Pool Max depth (ft)			1.15																						0.4		1.25	2.1								
Pool Spacing (ft)			40																						7.1		36.4	65.7								
<b>Pattern</b>																																				
Channel Beltwidth (ft)			26																																	
Radius of Curvature (ft)			15																																	
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)			42																																	
Meander Width Ratio			7.12																																	
<b>Additional Reach Parameters</b>																																				
Rosgen Classification			C5																																	
Channel Thalweg length (ft)			439.2																																	
Sinuosity (ft)			1.2																																	
Water Surface Slope (Channel) (ft/ft)																																				
BF slope (ft/ft)																																				
<sup>3</sup> Ri% / Ru% / P% / G% / S%																																				
<sup>3</sup> SC% / Sa% / G% / C% / B% / Be%																																				
<sup>3</sup> d16 / d35 / d50 / d84 / d95 /																																				
<sup>2</sup> % 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

**Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary**  
**Mill Branch - EEP No. 251 - Upper Reach**

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n
<b>Dimension and Substrate</b>																																				
Bankfull Width (ft)	8.1		10.4	12.7			8.4		9.78	11.2			4.5		5.9	7.3			6.7		7.55	8.4			5.7		8.1	10.5								
Floodprone Width (ft)	47		52	57			45		46.5	48			23.1		23.5	23.8			14.1		19.5	24.8			36		40.3	44.6								
Bankfull Mean Depth (ft)	0.4		0.6	0.8			0.4		0.45	0.5			0.3		0.4	0.5			0.3		0.3	0.3			0.2		0.45	0.7								
<sup>1</sup> Bankfull Max Depth (ft)	0.7		1.1	1.5			0.7		0.9	1.1			1		1.15	1.3			0.8		0.8	0.8			0.4		0.85	1.3								
Bankfull Cross Sectional Area (ft <sup>2</sup> )	3.2		6.5	9.8			3.7		4.75	5.8			2		2.1	2.2			1.7		2.15	2.6			1.2		4.1	7								
Width/Depth Ratio	20.3		18.5	16.6			18.9		20.1	21.2			9		18	26.9			26.8		27.2	27.7			15.8		21.9	28								
Entrenchment Ratio	5.8		5.15	4.5			4.3		4.85	5.4			5.3		5.75	6.2			2.1		2.5	2.9			4.2		5.25	6.3								
<sup>1</sup> Bank Height Ratio																																				
<b>Profile</b>																																				
Riffle Length (ft)	5		9.5	14																					6		24	42								
Riffle Slope (ft/ft)	0		0	0																																
Pool Length (ft)	5		13	21																					5		9.9	14.8								
Pool Max depth (ft)																									0.5		1	1.5								
Pool Spacing (ft)	23		31.5	40																					4.8		23.8	42.7								
<b>Pattern</b>																																				
Channel Beltwidth (ft)	23		26	29																																
Radius of Curvature (ft)	11		14.5	18																																
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)	39		49	59																																
Meander Width Ratio	2.94		3.33	3.72																																
<b>Additional Reach Parameters</b>																																				
Rosgen Classification			C5																																	
Channel Thalweg length (ft)			286																																	
Sinuosity (ft)			1.25																																	
Water Surface Slope (Channel) (ft/ft)			0.0026																																	
BF slope (ft/ft)			0.0027																																	
<sup>3</sup> Ri% / Ru% / P% / G% / S%																																				
<sup>3</sup> SC% / Sa% / G% / C% / B% / Be%																																				
<sup>3</sup> d16 / d35 / d50 / d84 / d95 /																																				
<sup>2</sup> % of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.

**Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary**  
**Mill Branch - EEP No. 251 - Middle Reach**

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n
<b>Dimension and Substrate</b>																																				
Bankfull Width (ft)	9.5		11.6	13.7			9.7		12	14.2			15		17	19			15.8		18.2	20.6			12.7		30.3	47.9								
Floodprone Width (ft)	77		82.5	88			75		84	93			31.5		55.5	79.5			28.5		45.2	61.9			79.3		79.1	78.8								
Bankfull Mean Depth (ft)	0.6		0.85	1.1			0.5		0.85	1.2			0.3		0.55	0.8			0.3		0.4	0.5			0.3		0.4	0.5								
<sup>1</sup> Bankfull Max Depth (ft)	1		1.6	2.2			1		1.65	2.3			1		1.75	2.5			1		1.6	2.2			0.9		1.6	2.3								
Bankfull Cross Sectional Area (ft <sup>2</sup> )	5.2		10.4	15.5			5.1		10.9	16.6			4.8		9.8	14.8			4		7.5	11			4		12.9	21.8								
Width/Depth Ratio	12.2		14.7	17.2			12.1		15.5	18.8			24.4		36.2	47.9			38.6		50.3	61.9			40.3		72.6	105								
Entrenchment Ratio	4.5		6.8	9.1			5.4		7.6	9.8			1.7		3.5	5.3			1.4		2.65	3.9			1.6		3.9	6.2								
<sup>1</sup> Bank Height Ratio																																				
<b>Profile</b>																																				
Riffle Length (ft)	7		12	17																					9		11.2	13.4								
Riffle Slope (ft/ft)																																				
Pool Length (ft)	10		16.5	23																					8		13.5	19								
Pool Max depth (ft)																									1		1.7	2.4								
Pool Spacing (ft)	28		38	48																					11.3		29.5	47.7								
<b>Pattern</b>																																				
Channel Beltwidth (ft)	31		36	41																																
Radius of Curvature (ft)	15		17.5	20																																
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)	60		64	68																																
Meander Width Ratio	8		6	4																																
<b>Additional Reach Parameters</b>																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	299																																			
Sinuosity (ft)	1.28																																			
Water Surface Slope (Channel) (ft/ft)	0.0011																																			
BF slope (ft/ft)	0.0011																																			
<sup>3</sup> Ri% / Ru% / P% / G% / S%																																				
<sup>3</sup> SC% / Sa% / G% / C% / B% / Be%																																				
<sup>3</sup> d16 / d35 / d50 / d84 / d95 /																																				
<sup>2</sup> % 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

**Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary**  
**Mill Branch - EEP No. 251 - Lower Reach**

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n	Min	Mean	Med	Max	SD <sup>4</sup>	n
<b>Dimension and Substrate</b>																																				
Bankfull Width (ft)	10.8		13.9	17			11.8		14.4	16.9			18.3		14.8	11.2			10.3		12.9	15.4			8.6		13.8	18.9								
Floodprone Width (ft)	84		84				84		84				92.7		55.1	17.5			26.8		49.6	72.3			57.2		72.2	87.2								
Bankfull Mean Depth (ft)	0.7		0.75	0.8			0.7		0.75	0.8			0.5		0.6	0.7			5.2		6.1	7			0.4		0.7	1								
<sup>1</sup> Bankfull Max Depth (ft)	1.8		1.45	2.2			1.7		1.95	2.2			0.8		1.4	2			0.5		0.5	0.5			1.4		1.4	1.4								
Bankfull Cross Sectional Area (ft <sup>2</sup> )	8.9		7.2	12.6			8.9		10.7	12.5			2.6		5.55	8.5			1.5		1.9	2.3			8.2		8.25	8.3								
Width/Depth Ratio	13.6		18.3	22.9			15.6		19.2	22.8			14.5		27	39.4			20.4		27.2	34			8.9		26.3	43.6								
Entrenchment Ratio	7.8		7.8				7.2		7.2				1.5		3.3	5.1			1.7		4.35	7			4.4		5.55	6.7								
<sup>1</sup> Bank Height Ratio																																				
<b>Profile</b>																																				
Riffle Length (ft)	4		7.5	11																					5		7.8	10.6								
Riffle Slope (ft/ft)	0		0	0.01																																
Pool Length (ft)	28		40.5	53																					8		26	44								
Pool Max depth (ft)																									1		1.55	2.1								
Pool Spacing (ft)	18		19	20																					9.2		30.6	52								
<b>Pattern</b>																																				
Channel Beltwidth (ft)	37		37	37																																
Radius of Curvature (ft)	17		20.5	24																																
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)	77		81.5	86																																
Meander Width Ratio	7.1		7.6	8.1																																
<b>Additional Reach Parameters</b>																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	243																																			
Sinuosity (ft)	1.21																																			
Water Surface Slope (Channel) (ft/ft)	0.0036																																			
BF slope (ft/ft)	0.0042																																			
<sup>3</sup> Ri% / Ru% / P% / G% / S%																																				
<sup>3</sup> SC% / Sa% / G% / C% / B% / Be%																																				
<sup>3</sup> d16 / d35 / d50 / d84 / d95 /																																				
<sup>2</sup> % 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***

<b>Table 12. Verification of Bankfull Events</b>			
<b>Date of Data Collection</b>	<b>Date of Occurrence</b>	<b>Method</b>	<b>Photo #</b>
October 5, 2010	September 2010	Photographed on-site (Wreck Line)	Photo Station 9. Appendix B