

# **Annual Monitoring Report**

Monitoring Year 2 of 7

**FINAL**

Project Name: 601 East Stream Restoration

NCDMS Contract No.:004925

NCDMS Project No.: 95756

Union County, NC

Data Collected: January 2016 – September 2016

Date Submitted: October 2016



Submitted to:

**North Carolina Division of Mitigation Services**

DEQ-DMS, 1652 Mail Service Center Raleigh NC 27699-1652

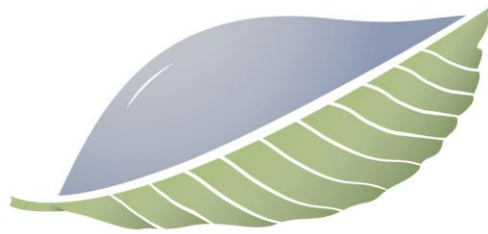
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## **1.0 PROJECT SUMMARY**

### **1.1. Goals and Objectives**

The project goals address stressors identified in the TLW and include the following:

- Reduce water quality stressors originating in and around the project area affecting the project reaches and downstream watercourses, which include population of the Savannah Lilliput (*Toxolasma pullus*) and the Carolina Creekshell (*Vilosa vaughiana*), both listed species of concern. Specifically involving:
  - Reducing turbidity and sediment loading
  - Input reductions of nutrients and crop protection chemicals
  - Improving thermoregulation
- Improving aquatic habitat quality and diversity within project reaches
- Improving recruitment of instream fine organic matter (FOM) in the near term and both FOM and large wood in the long term
- Improving terrestrial habitat diversity and quality in the vicinity of project reaches
- Establishing habitat continuity between the reach headwaters and Lanes Creek
- Improving flood flow attenuation and floodplain interaction

The project goals will be addressed through the following project objectives:

- Restore or enhance reach pattern, dimension, and profile
- Stabilize eroding stream banks
- Install stream structures to maintain grade and improve bed form complexity
- Implement BMP detention devices on lateral agricultural drainages
- Install diverse native riparian buffer
- Removal of invasive exotic plant species
- Secure a protective conservation easement and establish fencing as needed

### **1.2. Success Criteria**

The success criteria for the 601 East Stream Restoration Site follows accepted and approved success criteria presented in the USACE Stream Mitigation Guidelines and subsequent NCDMS and agency guidance. Specific success criteria components are presented below.

#### **1.2.1. Stream Restoration**

**Dimension** – The dimension parameters of the restored channel should remain stable throughout the monitoring period. Cross sectional overlays should show modest changes from year to year. The channel should not show a trend towards widening or increases in cross sectional area. Riffle depths should maintain a low bank height ratio (<1.2).

**Pattern and Profile** – The longitudinal profile should not indicate any significant aggradation or degradation over any substantial continuous lengths of channel. The bedform should develop or be maintained during the monitoring period and be consistent with reference and designed reaches. Variation within bedform parameters is acceptable as long as they are within design distributions. Pattern parameters should show little change over the monitoring period.

**Substrate** – The substrate should maintain or progress towards the design distribution. Particle size distribution within riffles should coarsen throughout the monitoring period.

**Sediment Transport** – The success of parameters described above should be demonstrated by the lack of any significant aggradation or deposition within the channel. Point bars and inner berms should not encroach excessively into the channel. Mid-channel bars should not be present.

### **1.2.2. Surface Water Hydrology**

Two bankfull storm events must be recorded during the standard 7-year monitoring period. For the monitoring to be completed, these events must occur in separate monitoring years.

### **1.2.3. Vegetation**

Vegetation success is based on the criteria established in the *Ecosystem Enhancement Program Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation* dated November 7, 2011. Density of preferred species must be at a minimum 320 stems/acre at the end of the three years of monitoring and 260 stems/acre after five years. At year 7, density must be no less than 210 seven year-old planted stems/acre. Level II of the CVS protocol, which includes natural stems and planted stems, will be followed beginning in monitoring year 2 and for subsequent years until the project closeout year. Invasive exotic plant species were observed before construction and treated at the end of construction. Additional treatments will be conducted where deemed necessary if regeneration of these invasive species is observed.

## **1.3. Project Setting and Background**

The 601 East Stream Restoration Site is located in Union County, approximately 13 miles south of Monroe, NC (Figure 1). The site encompasses 12.8 acres of formerly agricultural land and includes portions of Tanyard Branch, a tributary of Lanes Creek. The Site is located within the Yadkin River Basin, United States Geological Survey (USGS) 14-digit Hydrologic Unit 03040105081010 and the North Carolina Division of Water Resources (NCDWR) sub-basin 03-04-14. The drainage area of Tanyard Branch at the downstream end of the site is 0.56 square mile (354 acres). Land use within the watershed is predominately agriculture with the remaining land use composed of low density residential and forested areas.

## **1.4. Project Performance**

Monitoring Year 2 (MY2) data was collected from March to September 2016. Monitoring activities included visual assessment of all reaches and the surrounding easement, 20 permanent photo stations, 10 permanent vegetation monitoring plots, three temporary vegetation plots, 18 cross-sections, nine pebble counts, and nine bankpin arrays.

Summary information and data related to the occurrence of items such as beaver activity 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 Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly Restoration Plan) documents available on the NCDMS website (<http://portal.ncdenr.org/web/eep>). All raw data supporting the tables and figures in the appendices is available from DMS upon request.

### **1.4.1. Vegetation**

Visual assessment of the easement (Appendix B – Table 6; Figure 2) indicates that with the exception of a few bare areas, totaling 0.13 acre, vegetation is becoming well established throughout the easement (Figure 2 and Table 6). Small bare areas are typical of a newly constructed mitigation site and usually become vegetated after a couple of growing seasons. These areas will be monitored in subsequent site

visits. During MY1, small bare areas were noted, coinciding with ditches from outside the easement that had migrated into the easement. These areas have since become vegetated and have not caused increased sedimentation or instability within the easement, so no action was taken during MY2. These areas will be monitored in the future to make sure they remain stabilized. At the downstream portion of Reach 2, a large monoculture plot of cattails within the wetland below XS-12, was noted. The invasive exotic plant, Parrot Feather (*Microphyllum aquaticum*), was also noted in pools from STA 26+00 to STA 27+50. Additionally, a 0.16 acre area of honeysuckle (*Lonicera japonica*) and privet (*Lingustrum sinense*) were noted at the upper end of Reach 2. Invasive populations have remained stable at the site. While no treatments were performed during MY2, treatment of these areas will be scheduled as needed in coming monitoring years. Easement encroachment was noted on Reaches 3 and 4 where it appears a tractor had turned into the easement while planting adjacent fields. A complete replanting of the site occurred in April 2016, which included all of the encroachment areas. Efficacy of the replanting and area of the encroachment will be monitored in future site visits. RES is currently coordinating with the landowners and will be installing additional signage marking the easement boundary during 2017. Fencing or another type of deterrent will be added as necessary to keep tractors from driving through the easement.

Monitoring of permanent vegetation monitoring plots (n = 10) was completed during June 2016. Summary tables and photographs associated with MY2 monitoring are located in Appendix C. In April 2016 the entire site was replanted with bare root seedlings, due to large swaths of planted stem mortality throughout the site. MY2 monitoring data collected after the supplemental planting indicated that nine of the ten vegetation monitoring plots are on track to meet the MY3 interim success criteria of 320 stems per acre (Table 7 and 9). Stem densities ranged from 283 to 1,012 stems per acre with a mean of 720 stems per acre across all plots. When volunteer stems are included, the annual mean increases to 1,012 stems per acre. A total of 15 species were documented within the monitoring plots. Three additional temporary random plots were set up to monitor the effects of the re-planting, one on Reach 1 (Plot 1), Reach 2 (Plot 2), and Reach 3 (Plot 3). In each temporary plot, all of the woody stems located within the plot were counted to determine stem densities. Temporary plot 1 had 18 stems, temporary plot 2 had 20 stems, and temporary plot 3 had 24 stems which led to 900, 1,000, and 1,200 stems/ acre respectively in each plot.

#### **1.4.2. Stream Geomorphology**

Visual assessment of the stream was performed to document signs of instability, such as eroding banks, structural instability, or excessive sedimentation. Only a few stream problem areas were noted during visual assessment (Table 5 and Figure 2). Structures are intact and performing as designed. The project approach on the ephemeral channel at the upstream end of the project—Reach A—was to install a series of energy dissipating structures to provide vertical stability and sediment settling capacity within the reach. Two small areas of degradation were noted on reach 1. These areas are associated with small headcuts that formed within riffles located at STA 9+25 and 10+00. The headcuts have remained stable between MY1 and MY2 and have not migrated upstream or caused the riffle to cut down any further. Visual assessment of this reach indicates that the structures are performing as designed, reducing downcutting and capturing sediment from the upstream contributing area. No indications of new incision were observed during the assessment.

Geomorphic data for MY2 was collected during April 2016. Summary tables and cross-section plots related to stream morphology are located in Appendix D. Cross-sectional overlays showed modest dimensional change between MY1 and MY2 data collection efforts (Appendix B; Table 11a). Cross-sections 7, 11, and 15 showed a decrease in bankfull width due to the formation of an inner berm on either the right descending bank (RDB), left descending bank (LDB), or both banks, ultimately decreasing the bankfull cross-sectional area. Cross-section 16 showed a 0.8 foot increase in bankfull width due to minor

bank scour on both the RDB and LDB. This increase in bankfull width led to an increase in bankfull cross-sectional area as well.

Substrate monitoring was performed during MY2. Pebble count  $D_{50}$  fell in the silt/clay to coarse gravel range for Reach 1, silt/clay to fine gravel for Reach 2, very fine gravel to medium gravel for Reach 3, and fine gravel for Reach 4. The channel substrate will be monitored in future years for shifts in particle size distributions.

The bank pin arrays indicate that no erosion is taking place in the pools with the exception of the upstream end of XS-1. Field data indicated that there was localized erosion around the upstream pin at XS-1, at a rate of 0.04 foot/year (Table 12).

### **1.4.3. Stream Hydrology**

During MY2 bankfull events were documented on both the Reach 2 and Reach 3 crest gauges (Table 13; Figures 3 and 4).

Summary information/data related to the 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 Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly Restoration Plan) documents available on NCDMS' website. All raw data supporting the tables and figures in the appendices is available from NCDMS upon request.

## **2.0 METHODS**

Visual assessments of the project were performed at the beginning and end of the monitoring year. Permanent photo station photos were collected during the initial visual assessment during leaf-off conditions. Additional photos of vegetation or stream problem areas were documented with photographs throughout the project area.

Geomorphic measurements were taken during low flow conditions using a Nikon NPR 332 Total Station. Three-dimensional coordinates associated with cross-section and profile data were collected in the field and geo-referenced (NAD83 State Plane feet FIPS 3200). Morphological data was limited to 18 cross-sections. Survey data was imported into CAD, ArcGIS, and Excel for data processing and analysis. Channel substrate was characterized using a Wolman Pebble Count as outlined in Harrelson et al. (1994) and processed using Microsoft Excel.

Vegetation success is being monitored using 10 permanent monitoring plots. Vegetation monitoring followed CVS-EEP Level 1 Protocol for MY1 and is following Level 2 Protocol Version 4.2 for monitoring years 2-7 (Lee et al. 2008). Level 2 Protocol includes analysis of species composition and density of planted species. Data is processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with rebar and photos of each plot taken from the origin each monitoring year.

Precipitation data was reported from the NCCRONOS station number 315771 in Monroe, NC. Two crest gauges were installed on the mainstem channel, one upstream of Lansford Road in Reach 2 and another downstream of Lansford Road in Reach 3. During quarterly visits to the site, the height of the cork-line was recorded and cross-referenced with known bankfull elevations at each crest gauge.

### **3.0 REFERENCES**

Resource Environmental Solutions, LLC. 2015. 601 East Stream Restoration, Baseline Monitoring Document and As-Built Baseline Report Final, Union County, North Carolina. NCEEP Project No. 95756

Harrelson, Cheryl, C. Rawlins and J. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Rocky Mountain Forest and Range Experiment Station. USDA Forest Service. Fort Collins, Colorado

Lee, M.T.,R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. <http://cvs.bio.unc.edu/methods.htm>; accessed November 2008.

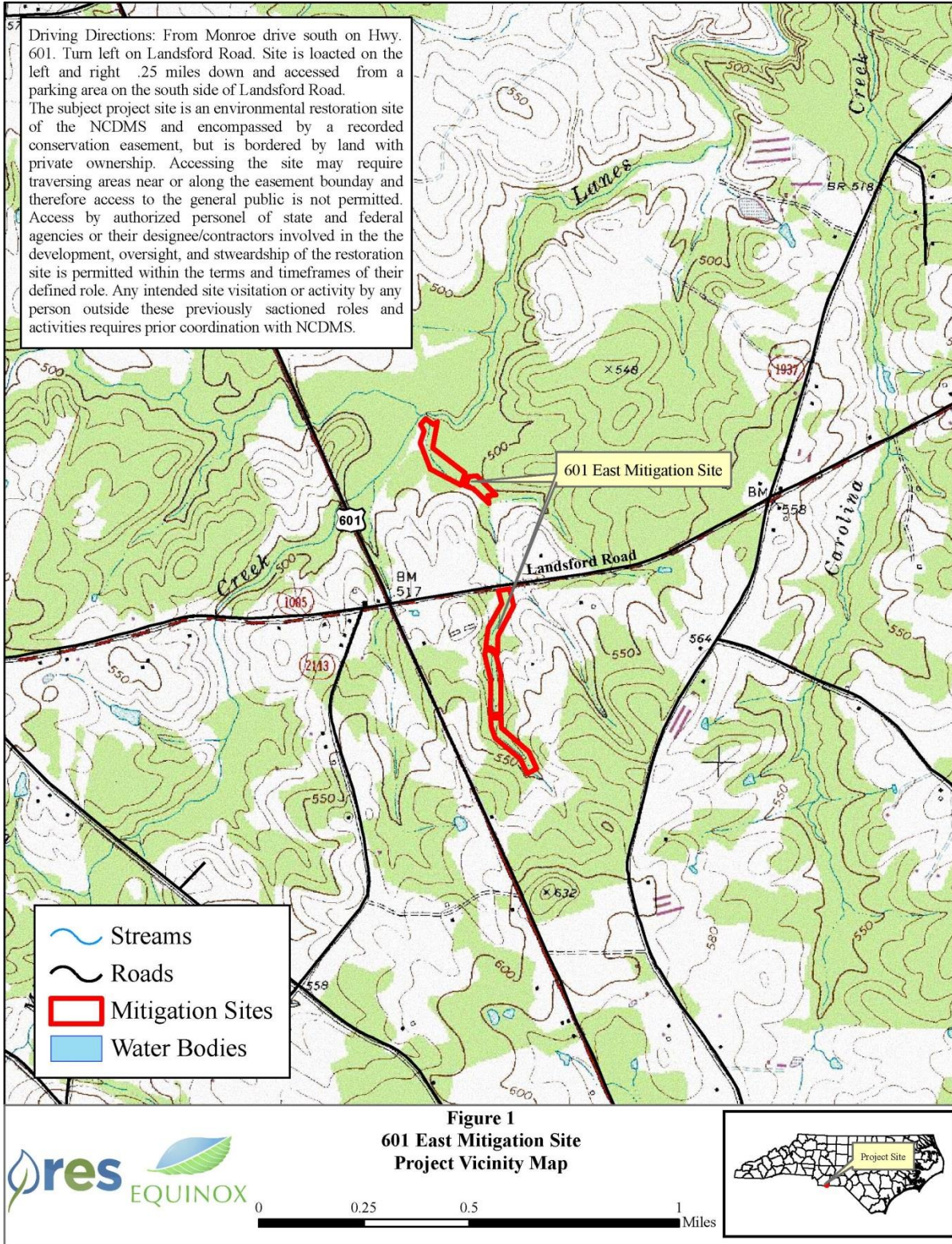
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# Appendix A

## General Tables and Figures

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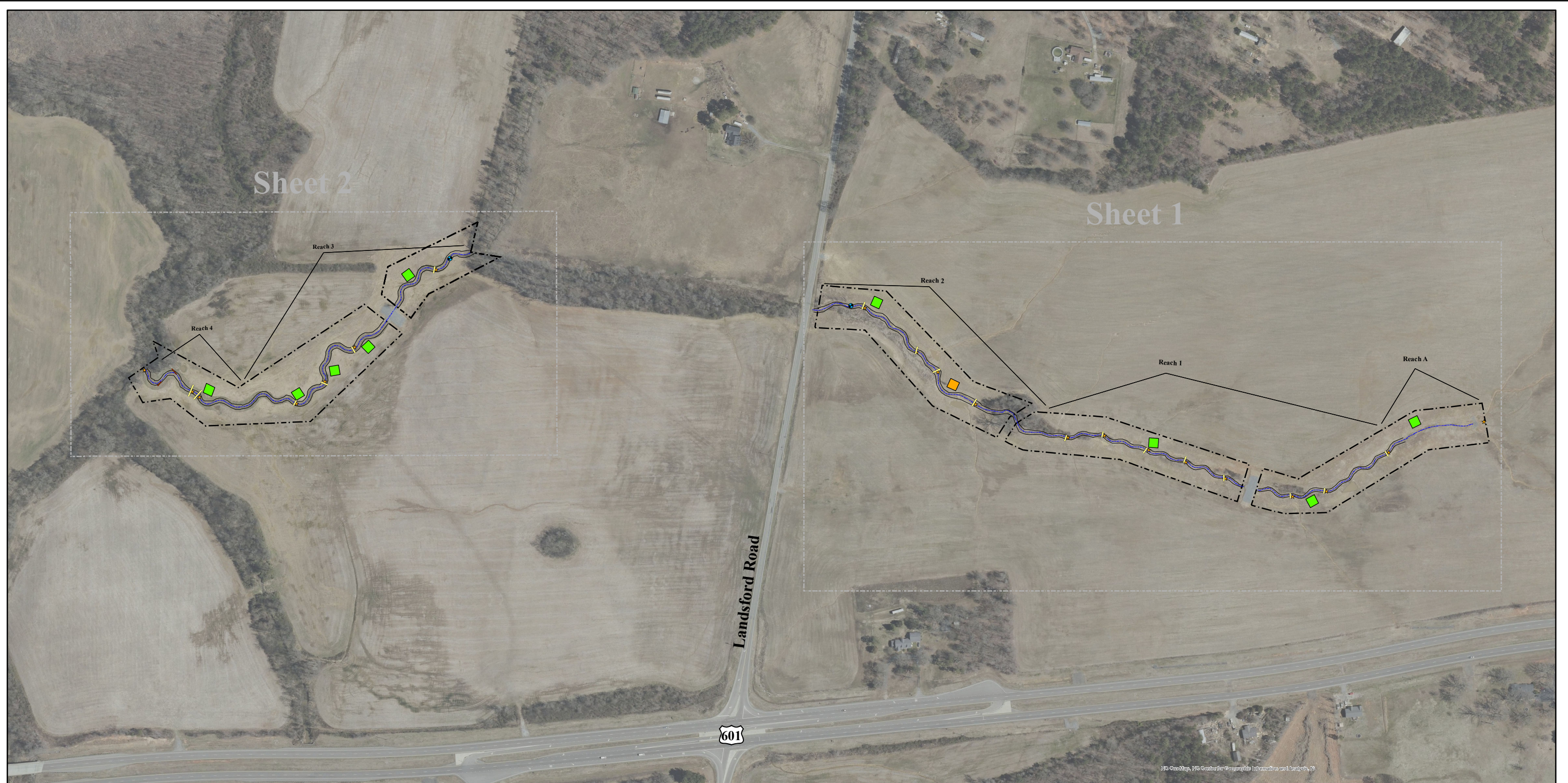
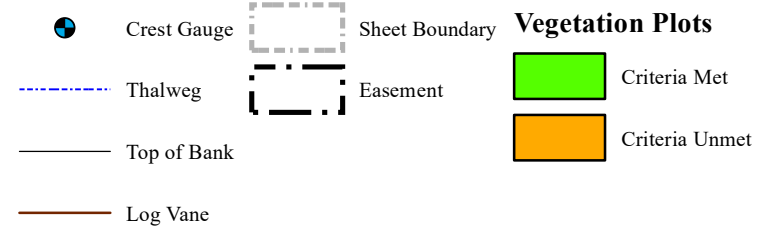
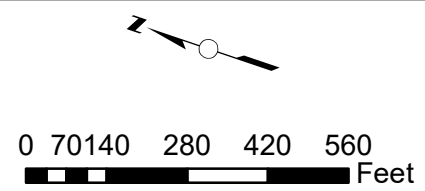


Figure 2. Current Condition Plan View  
 Overview  
 601 East Stream Restoration Site  
 Union County, North Carolina  
 NCDMS Contract No. 004925  
 NCDMS Project No.: 95756  
 September 2016



Notes:  
 1) This is not a survey and should not be construed as such.



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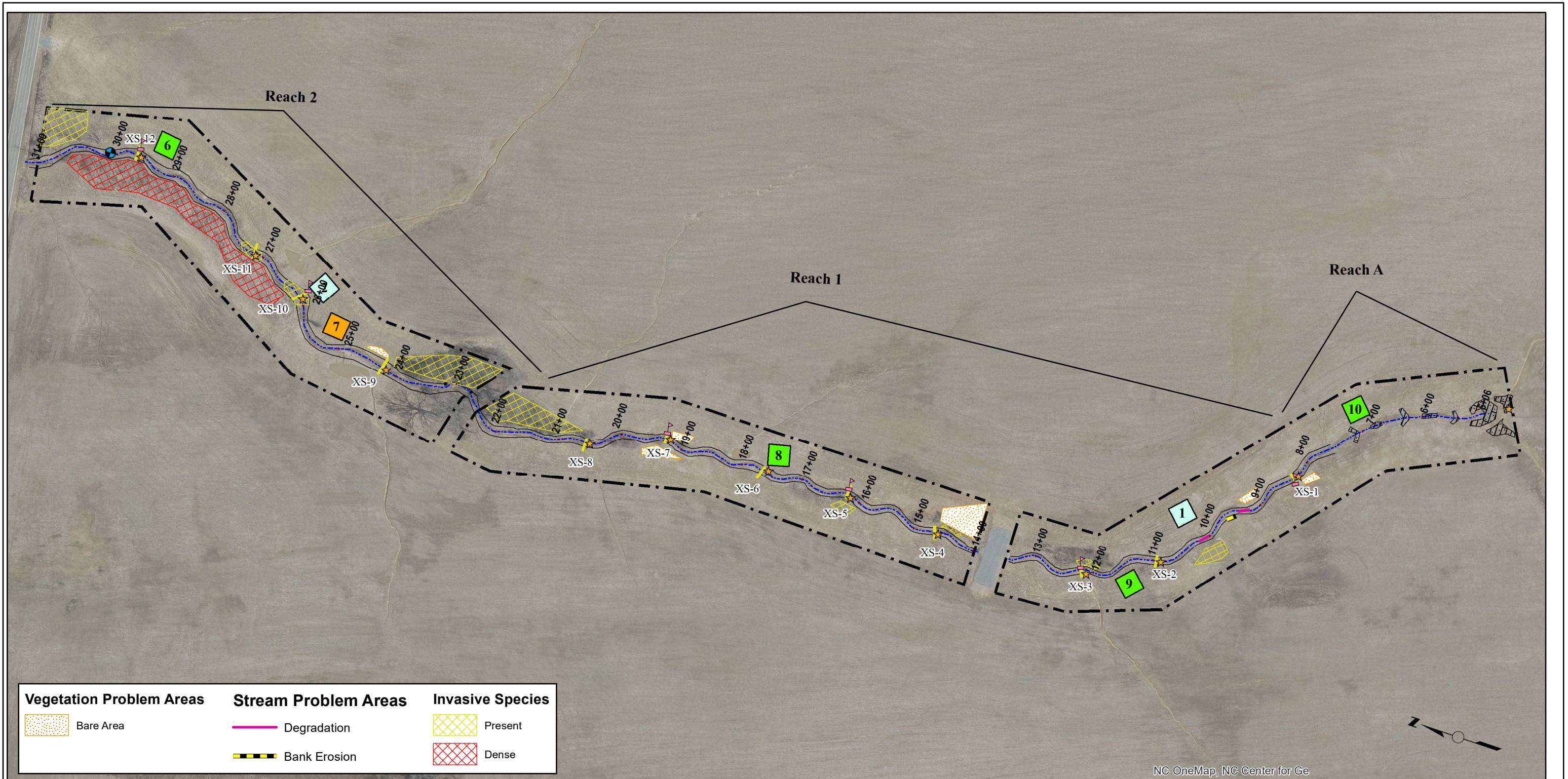
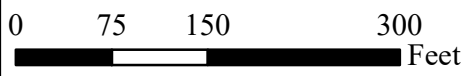


Figure 2. Current Condition Plan View  
 Sheet 1 of 2  
 601 East Stream Restoration Site  
 Union County, North Carolina  
 NCDMS Contract No. 004925  
 NCDMS Project No.: 95756  
 September 2016

- |               |             |                         |
|---------------|-------------|-------------------------|
| Crest Gauge   | Thalweg     | <b>Vegetation Plots</b> |
| Photo Point   | Top of Bank | Criteria Met            |
| Bankpin Array | BMP         | Criteria Not Met        |
| Cross-Section | Easement    |                         |

Notes:  
 1) This is not a survey and should not be construed as such.



NC OneMap, NC Center for Ge

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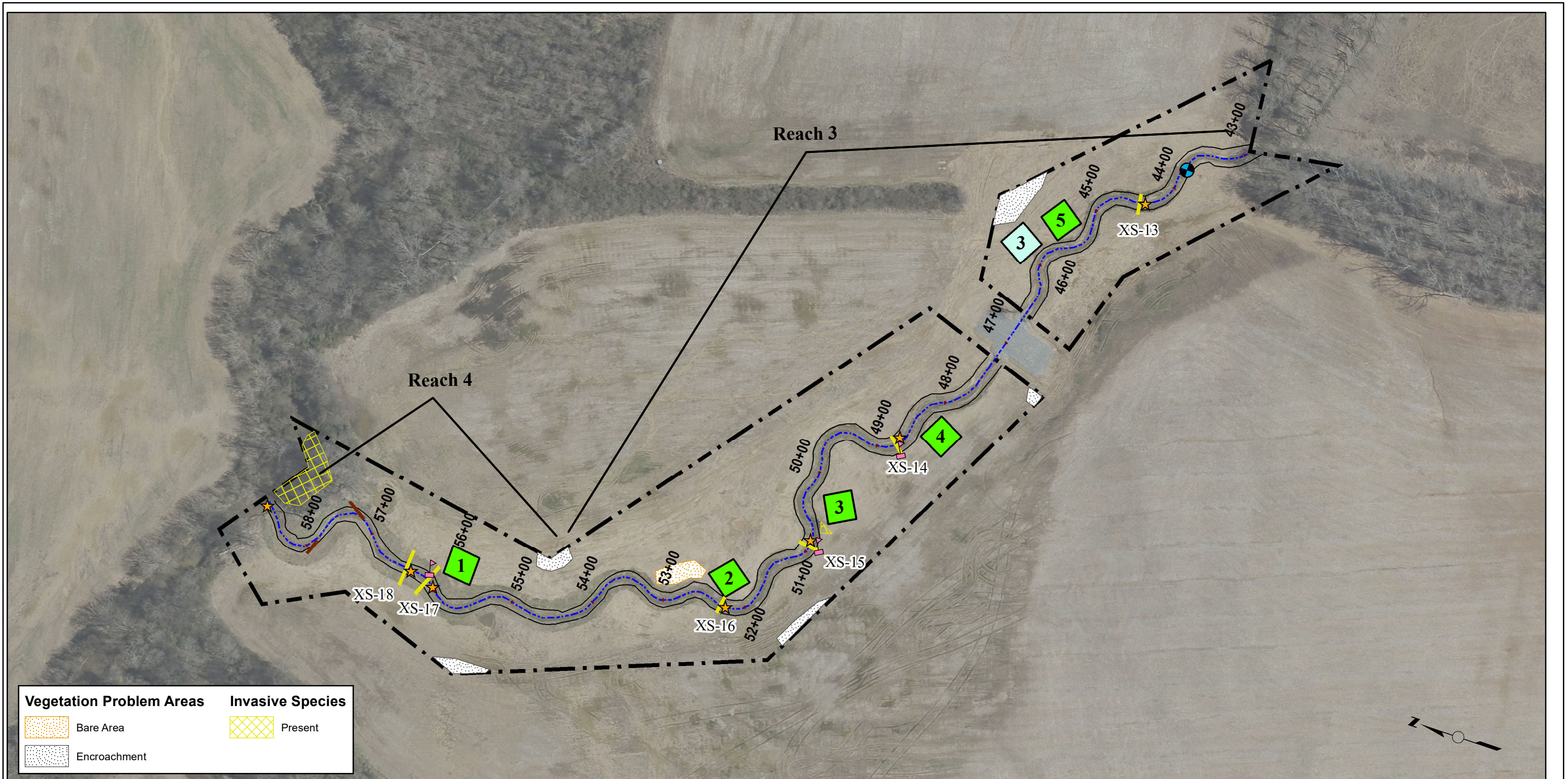
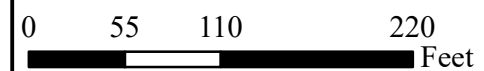


Figure 2. Current Condition Plan View  
 Sheet 2 of 2  
 601 East Stream Restoration Site  
 Union County, North Carolina  
 NCDMS Contract No. 004925  
 NCDMS Project No.: 95756  
 September 2016

- Crest Gauge
  - Photo Point
  - Bankpin Array
  - Cross-Section
  - Log Vane
  - Thalweg
  - Top of Bank
  - Easement
- Vegetation Plots**
- Criteria Met
  - Criteria Not Met

Notes:  
 1) This is not a survey and should not be construed as such.



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Table 1: Project Components and Mitigation Credits									
601 East Stream Restoration Site									
Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	3671	43							
Project Components									
Project Component - or- Reach ID	Stationing/Location		Existing Footage/Acreage		Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage or Acreage	Mitigation	
								Ratio	Credits
Reach A Ephemeral	5+45 – 7+60		215			Buffer establishment and BMP sediment import reduction	215	1 : 5	43
Reach 1a Intermittent	7+60 – 11+10		336		P1	R	350	1 : 1	350
Reach 1b Intermittent	11+10 – 11+95		85		Enhancement	EI	85	1 : 1.5	57
Reach 1c Perennial	11+95 – 13+47		136		Enhancement	EI	155	1 : 1.5	103
Reach 1d Perennial	13+97 – 22+00		790		P1	R	803	1 : 1	803
Reach 2a Perennial	22+00 – 22+45		40		Enhancement	EI	45	1 : 1.5	30
Reach 2b Perennial	22+75 – 24+02		125		Enhancement	EI	127	1 : 1.5	85
Reach 2c Perennial	24+02 – 31+32		669		P1	R	730	1 : 1	730
Reach 3a Perennial	42+92 – 46+61		80' active channel 112' relic channel		P1	R	369	1 : 1	369
Reach 3b Perennial	47+21 – 53+70		502' relic channel		P1	R	649	1 : 1	649
Reach 4 Perennial	53+70 – 58+65		470' relic channel		P3	R	495	1 : 1	495
Component Summation									
Restoration Level	Stream (linear feet)		Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)	Mitigation Credits	
	Riverine	Non-Riverine							
Restoration	3396								3396
Enhancement									
Enhancement I	412								275
Enhancement II									
Creation									
Preservation/Other	215								43
HQ Preservation									
BMP Elements									
Element	Location			Purpose/Function			Notes		
FB, LS, S, FS	Ephemeral Channel 5+45 – 7+60			Slowing the water down for settling and filtering excess sediment			Sediment expected from future degradation upstream		
<b>BMP Elements</b>									
BR = Bioretention cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spread; NI = Natural Infiltration Area; FB = Forested Buffer									

**Table 2. Project Activity and Reporting History  
601 East Stream Restoration Site**

<b>Activity or Deliverable</b>	<b>Data Collection Complete</b>	<b>Completion or Delivery</b>
Restoration Plan	May 2013	Jan 2014
Final Design – Construction Plans	Sept 2013	Jan 2014
Construction	-	Dec 2014
Containerized, bare root and B&B plantings	-	Jan 2015
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	Feb 2015	Feb 2015
Year 1 Monitoring	Nov 2015	Nov 2015
Supplemental Planting (Entire Site)	-	Apr 2016
Year 2 Monitoring	Sept 2016	Oct 2016
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

**Table 3. Project Contact Table  
601 East Stream Restoration Site**

<b>Designer</b>	Ward Consulting Engineers, P.C. (WCE) 4805 Green Road, Suite 100, Raleigh, NC 27616
Primary project design POC	Becky Ward (919) 870-0526
<b>Construction Contractor</b>	Wright Contracting P.O. Box 545, Siler City, NC 27344
Construction contractor POC	Joseph Wright (919) 663-0810
<b>Planting Contractor</b>	H & J Forest Services 1416 Ocean Boulevard, Holly Ridge, NC 28445
Planting contractor POC	(910) 512-6754
<b>Construction Survey Contractor</b>	Turner Land Survey, PLLC 3719 Benson Drive, Raleigh, NC 27629
Survey contractor POC	Elizabeth Turner (919) 827-0745
<b>Seeding Contractor</b>	Wright Contracting P.O. Box 545, Siler City, NC 27344
Construction contractor POC	Andrew Dimmette (919) 663-0810
<b>Seed Mix Sources</b>	Green Resource - Raleigh, NC As Purchased by EBX (919) 829-9909 x213
<b>Nursery Stock Suppliers</b>	Arbor Gen - Blenheim, SC (800) 222-1290
	NC Forest Service Nursery - Goldsboro, NC (888) 628-7337
<b>[Baseline] Monitoring Performers</b>	Ward Consulting Engineers, P.C. 4805 Green Road, Suite 100, Raleigh, NC 27616
Stream Monitoring POC	Rachael Zigler - WCE - (919) 870-0526
Vegetation Monitoring POC	Chris Sheats - The Cantena Group - (919) 732-1300
Monitoring Performers (MY1-MY2) 2015-2016	Equinox 37 Haywood Street, Suite 100 Asheville, NC 28801
Stream Monitoring POC	Drew Alderman (828) 253-6856
Vegetation Monitoring POC	Drew Alderman (828) 253-6856

**Table 4. Project Baseline Information and Attributes  
601 East Stream Restoration Site**

<b>Project Information</b>				
Project Name	601 East Stream Restoration Site			
County	Union County			
Project Area (acres)	12.78			
Project Coordinates (latitude and longitude)	34° 50' 21.62" N, 80° 25' 32.26"N			
<b>Project Watershed Summary Information</b>				
Physiographic Province	Piedmont			
River Basin	Yadkin River Basin			
USGS Hydrologic Unit 8-Digit		USGS Hydrologic Unit 14-digit	3040105081010	
DWQ Sub-basin	3/4/2014			
Project Drainage Area (acres)	361.33			
Project drainage Area Percentage of Impervious Area	2%			
CGIA Land Use Classification	2.01.01.07 Annual Row Crop Rotation			
<b>Reach Summary Information</b>				
<b>Parameters</b>	<b>Reach 1</b>	<b>Reach 2</b>	<b>Reach 3</b>	<b>Reach 4</b>
Length of reach (LF)	1,418; 1,393 LF Restored	906; 902 LF Restored	1,080; 1,018 LF Restored	Relic Channel, 495 LF Restored
Valley Classification	II	II	VIII	VIII
Drainage area (acres)	109	135	333	359
NCDWQ stream identification score	Intermittent: 19.5 Perennial: 33.5	33.5	33.5	33.5
NCDWQ Water Quality Classification	13-17-40-(1)	13-17-40-(1)	13-17-40-(1)	13-17-40-(1)
Morphological Description (stream type)	G4/B4/C4b	C4/E4/DA	C4/G4	G4
Evolutionary trend (reference channel evolution model used)	G	C/DA	G	G
Underlying mapped soils	Intermittent: Tatum gravelly silty Perennial: Cid channery silt loam	Cid channery silt loam, Tatum gravelly silt loam	Chewacla silt loam	Chewacla silt loam
Drainage class	Well Drained	Moderately Well Drained	Somewhat Poorly Drained	Somewhat Poorly Drained
Soil Hydric status	Non Hydric	Non Hydric	Non Hydric	Non Hydric
Slope	2%	0.84%	0.67%	1.25%
FEMA classification	N/A	N/A	N/A	N/A
Native vegetation community	Agriculture along upstream  The remaining stream buffer within this reach is composed of Willow Oak, Red Maple, River Birch, Black Willow, Elderberry, and Blackberry.	Canopy species include Willow Red Maple, Sweetgum, Eastern  Wetland A is composed of Cattails, spike rush arrow-arum, and duckweed.	Canopy species include Red Maple, Hackberry, Willow Oak, and Sweetgum. The presence of Chinese privet outcompete any shrub and herb layer.	Canopy species include Red Maple, Hackberry, Willow oak, and Sweetgum. The presence of Chinese privet outcompete any shrub and herb layer.
Percent composition of exotic invasive vegetation	0%	50% of Parrot feather	5% of Japanese stilt grass, 80% Chinese privet, and kudzu	80% Chinese privet

<b>Table 4 con't. Project Baseline Information and Attributes 601 East Stream Restoration Site</b>			
<b>Wetland Summary Information</b>			
<b>Parameters</b>	<b>Wetland 1</b>		
Size of Wetland (acres)	0.43 ac		
Wetland Type (non-riparian, riparian riverine,	Non-Tidal Freshwater Marsh		
Mapped Soil Series	Cid channery Silt Loam		
Drainage class	Moderately Well Drained to Somewhat Poorly Drained		
Soil Hydric Status	Non-Hydric		
Source of Hydrology	Tanyard Branch headwaters, groundwater, and adjacent runoff		
Hydrologic Impairment	Wetland A formed from accumulating sediments filling the channel resulting in a braided channel system through the wetland.		
Native vegetation community	<b>Herbaceous</b> -Vegetation is dominated by herbaceous vegetation such as Cattail ( <i>Typha latifolia</i> ), Bulrush ( <i>Scirpus cyperinus</i> ), Common Rush ( <i>Juncus effuses</i> ). Some tree species such as Black Willow ( <i>Salix nigra</i> ), and Red Maple ( <i>Acer rubrum</i> ) are present in the wetland margins.		
Percent composition of exotic invasive vegetation	<b>95%</b> -The invasive Parrot Feather ( <i>Miriophyllum aquaticum</i> ) is dominant throughout the wetland where there is standing water.		
<b>Regulatory Considerations</b>			
<b>Regulation</b>	<b>Applicable?</b>	<b>Resolved?</b>	<b>Supporting Documentation</b>
Waters of the United States-Section 404	Yes	SAW 2013-00265; EEP IMS #95756	
Waters of the United States – Section 401	Yes	DWR# 14-0547	
Endangered Species Act	No	Yes	ERTR
Historic Preservation Act	No	Yes	ERTR
Coastal Zone Management Act (CZMA)/Costal Area Management Act (CAMA)	No	N/A	
FEMA Floodplain Compliance	No	N/A	
Essential Fisheries Habitat	No	N/A	

# Appendix B

## Visual Assessment Data

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**Table 5. Visual Stream Morphology Stability Assessment  
601 East Stream Restoration Site - Reach 1  
Assessed Length 1,393 feet**

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	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
<b>1. Bed</b>	<b>1. Vertical Stability</b> (Riffle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting.			2	32	98%			
	<b>2. Riffle Condition</b>	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	32	32		100%				
	<b>3. Meander Pool Condition</b>	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6).	33	33		100%				
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	33	33		100%				
	<b>4. Thalweg Position</b>	1. Thalweg centering at upstream of meander bend (Run).	33	33	100%					
		2. Thalweg centering at downstream of meander bend (Glide).	33	33	100%					
<b>2. Bank</b>	<b>1. Scoured / Eroding</b>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			1	15	99%	0	0	97%
	<b>2. Undercut</b>	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	<b>3. Mass Wasting</b>	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
<b>Totals</b>					1	15	99%	N/A	N/A	N/A
<b>3. Engineered Structures</b>	<b>1. Overall Integrity</b>	Structures physically intact with no dislodged boulders or logs.	N/A	N/A			N/A			
	<b>2. Grade Control</b>	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A			N/A			
	<b>2a. Piping</b>	Structures lacking any substantial flow underneath sills or arms.	N/A	N/A			N/A			
	<b>3. Bank Protection</b>	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	N/A	N/A			N/A			
	<b>4. Habitat</b>	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			N/A			

N/A - Item does not apply.

**Table 5 cont'd. Visual Stream Morphology Stability Assessment  
601 East Stream Restoration Site - Reach 2  
Assessed Length 902 feet**

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	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
<b>1. Bed</b>	<b>1. Vertical Stability</b> (Riffle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting.			0	0	100%			
	<b>2. Riffle Condition</b>	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	16	16			100%			
	<b>3. Meander Pool Condition</b>	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6).	17	17			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	17	17			100%			
	<b>4. Thalweg Position</b>	1. Thalweg centering at upstream of meander bend (Run).	17	17			100%			
2. Thalweg centering at downstream of meander bend (Glide).		17	17			100%				
<b>2. Bank</b>	<b>1. Scoured / Eroding</b>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	<b>2. Undercut</b>	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	<b>3. Mass Wasting</b>	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
<b>Totals</b>					0	0	100%	N/A	N/A	N/A
<b>3. Engineered Structures</b>	<b>1. Overall Integrity</b>	Structures physically intact with no dislodged boulders or logs.	N/A	N/A			N/A			
	<b>2. Grade Control</b>	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A			N/A			
	<b>2a. Piping</b>	Structures lacking any substantial flow underneath sills or arms.	N/A	N/A			N/A			
	<b>3. Bank Protection</b>	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	N/A	N/A			N/A			
	<b>4. Habitat</b>	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			N/A			

N/A - Item does not apply.



**Table 5 cont'd. Visual Stream Morphology Stability Assessment  
601 East Stream Restoration Site - Reach 3  
Assessed Length 1,018 feet**

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	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
<b>1. Bed</b>	<b>1. Vertical Stability</b> (Riffle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting.			0	0	100%			
	<b>2. Riffle Condition</b>	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	18	18			100%			
	<b>3. Meander Pool Condition</b>	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6).	18	18			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	18	18			100%			
	<b>4. Thalweg Position</b>	1. Thalweg centering at upstream of meander bend (Run).	18	18			100%			
2. Thalweg centering at downstream of meander bend (Glide).		18	18			100%				
<b>2. Bank</b>	<b>1. Scoured / Eroding</b>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	<b>2. Undercut</b>	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	<b>3. Mass Wasting</b>	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
<b>Totals</b>					0	0	100%	N/A	N/A	N/A
<b>3. Engineered Structures</b>	<b>1. Overall Integrity</b>	Structures physically intact with no dislodged boulders or logs.	N/A	N/A			N/A			
	<b>2. Grade Control</b>	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A			N/A			
	<b>2a. Piping</b>	Structures lacking any substantial flow underneath sills or arms.	N/A	N/A			N/A			
	<b>3. Bank Protection</b>	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	N/A	N/A			N/A			
	<b>4. Habitat</b>	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			N/A			

N/A - Item does not apply.

**Table 5 cont'd. Visual Stream Morphology Stability Assessment  
601 East Stream Restoration Site - Reach 4  
Assessed Length 495 feet**

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	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
<b>1. Bed</b>	<b>1. Vertical Stability</b> (Rifle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).					100%			
		2. <u>Degradation</u> - Evidence of downcutting.					100%			
	<b>2. Rifle Condition</b>	1. <u>Texture/Substrate</u> - Rifle maintains coarser substrate.	9	9		100%				
		<b>3. Meander Pool Condition</b>	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6).	9		9	100%			
	<b>4. Thalweg Position</b>	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	9	9	100%					
		1. Thalweg centering at upstream of meander bend (Run).	9	9	100%					
		2. Thalweg centering at downstream of meander bend (Glide).	9	9	100%					
<b>2. Bank</b>	<b>1. Scoured / Eroding</b>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.					100%	0	0	100%
	<b>2. Undercut</b>	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.					100%	N/A	N/A	N/A
	<b>3. Mass Wasting</b>	Bank slumping, calving, or collapse.					100%	N/A	N/A	N/A
<b>Totals</b>					0	0	100%	N/A	N/A	N/A
<b>3. Engineered Structures</b>	<b>1. Overall Integrity</b>	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	<b>2. Grade Control</b>	Grade control structures exhibiting maintenance of grade across the sill.	2	2			100%			
	<b>2a. Piping</b>	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	<b>3. Bank Protection</b>	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	2	2			100%			
	<b>4. Habitat</b>	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio $\geq$ 1.6. Rootwads/logs providing some cover at base-flow.	2	2			100%			

N/A - Item does not apply.

**Table 6. Vegetation Condition Assessment  
601 East Stream Restoration Site  
Planted Acreage 12.8  
Easement Acreage 12.8**

Vegetation Category	Definitions	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
<b>1. Bare Areas</b>	Very limited cover of both woody and herbaceous material.	Stipple (Brown)	7	0.13	1%
<b>2. Low Stem Density Areas</b>	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	N/A	0	0.00	0%
<b>Totals</b>			7	0.13	1%
<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.	N/A	0	0.00	0%
<b>Cumulative Totals</b>			7	0.13	1%
Vegetation Category	Definitions	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
<b>4. Invasive Areas of Concern</b>	Areas or points (if too small to render as polygons at map scale).	Cross Hatch (Red - Dense/Yellow - Present)	12	0.73	6%
<b>5. Easement Encroachment Areas</b>	Areas or points (if too small to render as polygons at map scale).	Stipple (Black/ White)	5	0.08	1%

N/A - Item does not apply.



Project Reach 1 – Permanent Photo Station 1  
Top of Project – Looking Downstream



Project Reach 1 – Permanent Photo Station 2  
Cross Section 1 – Looking Downstream





Project Reach 1 – Permanent Photo Station 3  
Cross Section 2 – Looking Downstream



Project Reach 1 – Permanent Photo Station 4  
Cross Section 3 – Looking Downstream





Project Reach 1 – Permanent Photo Station 5  
Cross Section 4 – Looking Downstream



Project Reach 1 – Permanent Photo Station 6  
Cross Section 5 – Looking Downstream





Project Reach 1 – Permanent Photo Station 7  
Cross Section 6 – Looking Downstream



Project Reach 1 – Permanent Photo Station 8  
Cross Section 7 – Looking Downstream





Project Reach 1 – Permanent Photo Station 9  
Cross Section 8 – Looking Downstream



Project Reach 2 – Permanent Photo Station 10  
Cross Section 9 – Looking Downstream





Project Reach 2 – Permanent Photo Station 11  
Cross Section 10 – Looking Downstream



Project Reach 2 – Permanent Photo Station 12  
Cross Section 11 – Looking Downstream





Project Reach 2 – Permanent Photo Station 13  
Cross Section 12 – Looking Downstream



Project Reach 3 – Permanent Photo Station 14  
Cross Section 13 – Looking Downstream





Project Reach 3 – Permanent Photo Station 15  
Cross Section 14 – Looking Downstream



Project Reach 3 – Permanent Photo Station 16  
Cross Section 15 – Looking Downstream





Project Reach 3– Permanent Photo Station 17  
Cross Section 16 – Looking Downstream



Project Reach 4– Permanent Photo Station 18  
Cross Section 17 – Looking Downstream





Project Reach 4 – Permanent Photo Station 19  
Cross Section 18 – Looking Downstream



Project Reach 4– Permanent Photo Station 20  
Bottom of Project – Looking Upstream



## Problem Area Photos



Project Reach 1 – Bare Area 8+25 Left Descending Bank



Project Reach 1 – Headcut/Degradation 9+25





Project Reach 1 – Bank Erosion 9+50 Left Descending Bank



Project Reach 1 – Ditch / Bare Area 14+00 Right Descending Bank





Project Reach 2 – Bare Area 24+50 Right Descending Bank



Project Reach 2 – 26+25 Parrot Feather within Pool





Project Reach 2 – Cattail monoculture along Left Descending Bank



Project Reach 3 – Easement Encroachment 45+50



Project Reach 3 – Easement Encroachment 47+50 Left Descending Bank

# Appendix C

## Vegetation Plot Data

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<b>Table 7. Vegetation Plot Criteria Attainment</b>		
<b>601 East Stream Restoration Site</b>		
Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	90%
2	Yes	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	No	
8	Yes	
9	Yes	
10	Yes	

<b>Table 8. CVS Vegetation Plot Metadata 601 East Stream Restoration Site</b>	
<b>Report Prepared By</b>	Drew Alderman
<b>Date Prepared</b>	6/20/2016 15:01
<b>database name</b>	Equinox-2016-A-601East_V2.mdb
<b>database location</b>	Z:\ES\NRI&M\EBX Monitoring\601_East\MY 2-2016\Data\Veg
<b>computer name</b>	FIELD-PC
<b>file size</b>	45551616
<b>DESCRIPTION OF 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>ALL Stems by Plot and spp</b>	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
<b>PROJECT SUMMARY-----</b>	
<b>Project Code</b>	1
<b>project Name</b>	601 East
<b>Description</b>	
<b>River Basin</b>	Yadkin-Pee Dee
<b>length(ft)</b>	
<b>stream-to-edge width (ft)</b>	
<b>area (sq m)</b>	
<b>Required Plots (calculated)</b>	
<b>Sampled Plots</b>	10



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601 East - Vegetation Monitoring Plot 1  
June 13, 2016



601 East - Vegetation Monitoring Plot 2  
June 13, 2016





601 East - Vegetation Monitoring Plot 3  
June 13, 2016



601 East - Vegetation Monitoring Plot 4  
June 13, 2016





601 East - Vegetation Monitoring Plot 5  
June 13, 2016



601 East - Vegetation Monitoring Plot 6  
June 13, 2016





601 East - Vegetation Monitoring Plot 7  
June 13, 2016



601 East - Vegetation Monitoring Plot 8  
June 13, 2016





601 East - Vegetation Monitoring Plot 9  
June 13, 2016



601 East - Vegetation Monitoring Plot 10  
June 13, 2016

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# Appendix D

## Stream Geomorphology Data



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**Table 10. Baseline Stream Data Summary**  
**601 East Stream Restoration Site - Reach 1 (1,393 feet)**

Parameter	Gauge	Regional Curve			Pre- Existing Conditions						Reference Reach(es) Data						Design			As-built / Baseline						
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n	
<b>Dimension and Substrate - Riffle</b>																										
Bankfull Width (ft)					7	21		60			7.42	9.88		11.61				10		8.82	11.45	10.77	15.13	2.23	8	
Floodprone Width (ft)					8	60		101			18.51	26.43		33.59				22	28	35	40.00	74.38	69.00	154.00	35.32	8
Bankfull Mean Depth (ft)					0.2	0.5		0.9			0.68	0.79		0.97				0.72		0.50	0.81	0.77	1.20	0.26	8	
Bankfull Max Depth (ft)					0.7	1		1.4			1.28	1.78		2.16				1.2		0.87	1.53	1.54	2.07	0.49	8	
Bankfull Cross Sectional Area (ft <sup>2</sup> )					8	1		1.4			0.97	1.39		1.82				7.2		4.45	9.27	8.85	14.07	3.48	8	
Width/Depth Ratio					1.1	27		47			8.14	12.95		16.82				13.9		8.56	15.45	14.89	25.33	5.40	8	
Entrenchment Ratio					0.4	2.4		9.5			2.02	2.4		3.24				2.2	2.8	3.5	3.30	6.90	5.62	16.40	4.19	8
Bank Height Ratio						0.34		2			0.97	1.39		1.82				1		0.93	0.98	1.00	1.00	0.03	8	
d50 (mm)																										
<b>Profile</b>																										
Riffle Length (ft)					2.7	24.9		107.3			5.97	11.26		26.78				14	23	90	10.04	22.09	18.54	95.26	14.52	32
Riffle Slope (ft/ft)					0.0007	1.7		40			0.015	0.031		0.05				0.021	0.036	0.046	0.015	0.034	0.032	0.064	0.012	32
Pool Length (ft)					9.03	16.89		56.86			13.6	20.13		31.74				14	22	29	13.38	24.28	21.23	65.67	11.47	33
Pool Max depth (ft)					1	2.4		3.9			1.4	1.83		2.2				2.2		1.16	2.19	2.17	3.15	0.38	33	
Pool Spacing (ft)					15.5	50		128			23.5	36.2		57.4				24	36.7	58	31.42	44.63	40.18	116.51	16.87	32
Pool Volume (ft <sup>3</sup> )																										
<b>Pattern</b>																										
Channel Beltwidth (ft)					10	19.6		25			13	17.33		20				13	18	21	13		18	21		
Radius of Curvature (ft)					14.5	84		118			16	33		53				16	32.1	52	16		32.1	52		
Rc: Bankfull width (ft/ft)					1.7	4.6		11.5			4.35	6.04		8.9				4.3	6.1	8.9	4.3		6.1	8.9		
Meander Wavelength (ft)					36	96		240			43	59.67		88				43	61	89	43		61	89		
Meander Width Ratio					0.5	0.94		1.7			1.32	1.76		2.03				1.3	1.8	2.1	1.3		1.8	2.1		
<b>Substrate, bed and transport parameters</b>																										
R%/Ru%/P%/G%/S%					45.5%			53.6%			0.0%			26.8%	17.2%	47.9%	8.1%	0.0%			44.3%		55.7%		0.0%	
SC%/Sa%/G%/C%/B%/Be%					4.1%	27.3%		67.6%	1.0%	0.0%	0.0%															
d16/d35/d50/d84/d95/d <sup>90</sup> /d <sup>95</sup> (mm)					2.71	6.72		10.56	24.89	38.23																
Reach Shear Stress (competency) lb/ft <sup>2</sup>																										
Max part size (mm) Mobilized at bankfull																										
Stream Power (transport capacity) W/m <sup>2</sup>																										
<b>Additional Reach Parameters</b>																										
Drainage Area (SM)								0.166						0.144												
Impervious cover estimate (%)																										
Rosgen Classification								G4/B4/C4b						B4/C4						B4/C4b					B4/C4b	
Bankfull Velocity (fps)								3.2												3.2						
Bankfull Discharge (cfs)								24																		
Valley length (ft)								1,425						378												
Channel Thalweg length (ft)								1,479						440						1,438					1,438	
Sinuosity (ft)								1.04						1.16						1.17					1.17	
Water Surface Slope (Channel) (ft/ft)								0.0196												0.017					0.017	
BF slope (ft/ft)																				0.017					0.017	
Bankfull Floodplain Area (acres)																										
Proportion over wide (%)																										
Entrenchment Class (ER Range)																										
Incision Class (BHR Range)																										
BEHI VL%/L%/M%/H%/VH%/E%																										
Channel Stability or Habitat Metric																										
Biological or Other																										

**Table 10. Baseline Stream Data Summary**  
**601 East Stream Restoration Site - Reach 2 (902 feet)**

Parameter	Gauge	Regional Curve			Pre- Existing Conditions						Reference Reach(es) Data						Design			As-built / Baseline						
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n	
<b>Dimension and Substrate - Riffle</b>																										
Bankfull Width (ft)					7	19		21			10	12.2		14.3				12		15.50	19.73	19.63	24.18	3.56	4	
Floodprone Width (ft)					40	214		60			42	77		11			48	91.5	135	62.00	108.75	102.50	168.00	50.05	4	
Bankfull Mean Depth (ft)					0.5	1.33		0.5			0.92	1.12		1.34				0.9		0.61	0.93	0.90	1.31	0.32	4	
Bankfull Max Depth (ft)					0.7	1.9		1			1.2	1.6		2.2				1.5		1.49	2.01	2.02	2.53	0.58	4	
Bankfull Cross Sectional Area (ft <sup>2</sup> )					6	21		1			12.2	13		13.4				10.7		9.43	18.42	19.49	25.26	6.75	4	
Width/Depth Ratio					6.1	38		27			7.7	11.3		15.6				13.3		14.64	23.00	22.13	33.10	8.07	4	
Entrenchment Ratio					2.2	10		2.4			2.9	6.5		8.6			3.6	7.6	10	2.56	5.63	5.79	8.39	2.54	4	
Bank Height Ratio					0.9	1.7		0.34			1.1	1.5		1.7				1		0.90	0.96	0.96	1.00	0.05	4	
d50 (mm)																										
<b>Profile</b>																										
Riffle Length (ft)					10.9	24.9		19.7			4.03	14.18		13.61				14	23	90	12.13	23.38	18.96	50.22	10.70	18
Riffle Slope (ft/ft)					0.00	1.7		0.04			0.006	0.02		0.05				0.021	0.036	0.046	0.004	0.02	0.02	0.04	0.01	17
Pool Length (ft)					11.1	16.89		525.4			18.51	32.11		58.03				14	22	29	15.06	32.87	29.14	74.26	14.68	17
Pool Max depth (ft)					1.9	2.4		4.2			1.7	2.47		3.1					2.5		1.91	2.87	2.67	4.03	0.59	17
Pool Spacing (ft)					20	50		512			29	48		84				38	57	85	32.94	55.57	47.60	110.28	20.48	17
Pool Volume (ft <sup>3</sup> )																										
<b>Pattern</b>																										
Channel Beltwidth (ft)					12	32		42			25	40		65				25	40	65	25		40	65		
Radius of Curvature (ft)					68	75		77			20	31		65				38	47	58	38		47	58		
Re: Bankfull width (ft/ft)					5.2	5.7		5.9			3.2	3.9		4.8				3.2	3.9	4.8	3.2		3.9	4.8		
Meander Wavelength (ft)					46	70		97			61	84		97				61	84	97	61		84	97		
Meander Width Ratio					0.9	2.4		3.2			2.1	3.3		5.4				2.1	3.3	5.4	2.1		3.3	5.4		
<b>Substrate, bed and transport parameters</b>																										
R <sub>35</sub> /R <sub>45</sub> /P <sub>35</sub> /G <sub>35</sub> /S <sub>35</sub>					12.6%			87.4%			0.0%															
SC <sub>35</sub> /Sa <sub>35</sub> /G <sub>35</sub> /C <sub>35</sub> /B <sub>35</sub> /Be <sub>35</sub>					0.0%	33.7%		66.3%	0.0%	0.0%	0.0%															
d <sub>16</sub> /d <sub>35</sub> /d <sub>50</sub> /d <sub>84</sub> /d <sub>95</sub> /d <sub>95</sub> /d <sub>95</sub> (mm)					0.90	4.57		8.92	24.42		47.93															
Reach Shear Stress (competency) lb/ft <sup>2</sup>																										
Max part size (mm) Mobilized at bankfull																										
Stream Power (transport capacity) W/m <sup>2</sup>																										
<b>Additional Reach Parameters</b>																										
Drainage Area (SM)								0.212						0.5												
Impervious cover estimate (%)																										
Rosgen Classification								C4/E4/DA						C4						C4/E4					C4/E4	
Bankfull Velocity (fps)								2.1												2.6						
Bankfull Discharge (cfs)								27																		
Valley length (ft)								830						378												
Channel Thalweg length (ft)								1,479						440						945					945	
Sinuosity (ft)								1.01						1.1						1.34					1.34	
Water Surface Slope (Channel) (ft/ft)																				0.0069					0.0069	
BF slope (ft/ft)																				0.0069					0.0069	
Bankfull Floodplain Area (acres)																										
Proportion over wide (%)																										
Entrenchment Class (ER Range)																										
Incision Class (BHR Range)																										
BEHI VL%/L%/M%/H%/VH%/E%																										
Channel Stability or Habitat Metric																										
Biological or Other																										



**Table 10. Baseline Stream Data Summary**  
**601 East Stream Restoration Site - Reach 3 (1,018 feet)**

Parameter	Gauge	Regional Curve			Pre- Existing Conditions						Reference Reach(es) Data						Design			As-built / Baseline							
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n		
<b>Dimension and Substrate - Riffle</b>																											
Bankfull Width (ft)					65	15.7		29			10	12.2		14.3					15.86	17.69	17.66	19.58	1.52	4			
Floodprone Width (ft)					150	200		2601.26			42	77		11				150	200	300	75.00	231.25	250.00	350.00	140.50	4	
Bankfull Mean Depth (ft)					0.5	0.9		2.1			0.92	1.12		1.34					1.18			0.79	1.26	1.21	1.84	0.54	4
Bankfull Max Depth (ft)					1.28	1.7		19.4			1.2	1.6		2.2					2			1.58	2.51	2.52	3.44	1.06	4
Bankfull Cross Sectional Area (ft <sup>2</sup> )					10.5	14.5		31			12.2	13		13.4				21			12.85	22.79	21.12	36.08	11.26	4	
Width/Depth Ratio					12.8	17.5		16.5			7.7	11.3		15.6				14.4			10.62	15.88	15.27	22.36	5.98	4	
Entrenchment Ratio					9.6	12.7		4			2.9	6.5		8.6			8.8	11.8	17.6		4.73	12.74	13.17	19.90	7.31	4	
Bank Height Ratio					1.3	2.2		1.7			1.1	1.5		1.7				1			0.99	1.00	1.00	1.00	0.01	4	
d50 (mm)																											
<b>Profile</b>																											
Riffle Length (ft)					0.97	10.58		23.77			4.03	14.18		13.61				15	25	103	10.12	24.10	16.77	110.25	22.07	19	
Riffle Slope (ft/ft)					0	0.2		0.6			0.006	0.02		0.05			0.008	0.018	0.03	0.00	0.02	0.02	0.04	0.01	17		
Pool Length (ft)					7.83	20.87		64.91			18.51	32.11		58.03			25	35	50	27.38	35.18	35.18	49.71	6.68	18		
Pool Max depth (ft)					1.8	2.7		3.4			1.7	2.47		3.1				3.4			1.93	2.91	2.98	3.50	0.36	18	
Pool Spacing (ft)					8	48		125			29	48		84			39	66	117	41.11	58.55	54.44	137.89	20.86	18		
Pool Volume (ft <sup>3</sup> )																											
<b>Pattern</b>																											
Channel Beltwidth (ft)					13	41		58			25	40		65			35	56	92	35		56	92				
Radius of Curvature (ft)					22.5	49.7		78			20	31		65			27	43	63	27		43	63				
Re: Bankfull width (ft/ft)					1.4	3.2		4.9			3.2	3.9		4.8			1.6	2.5	3.7	1.6		2.5	3.7				
Meander Wavelength (ft)					32	57		89			61	84		97			87	119	134	87		119	134				
Meander Width Ratio					1.3	2.6		3.7			2.1	3.3		5.4			2.1	3.3	5.4	2.1		3.3	5.4				
<b>Substrate, bed and transport parameters</b>																											
R <sub>h</sub> %/R <sub>u</sub> %/P%/G%/S%					38.0%			62.0%			0.0%						27.2%	3.7%	61.5%	7.6%					0.0%		
SC%/Sa%/G%/C%/B%/Be%					4.0%	51.9%	44.1%	0.0%	0.0%	0%											43.0%		57.0%		0.0%		
d16/d35/d50/d84/d95/d <sub>75</sub> /d <sub>90</sub> (mm)					0.8	3.5	5.4	12.8	19.6																		
Reach Shear Stress (competency) lb/ft <sup>2</sup>																											
Max part size (mm) Mobilized at bankfull																											
Stream Power (transport capacity) W/m <sup>2</sup>																											
<b>Additional Reach Parameters</b>																											
Drainage Area (SM)							0.52						0.5														
Impervious cover estimate (%)																											
Rosen Classification							C4-G4						E4/C4				C4						C4				
Bankfull Velocity (fps)							3.2																				
Bankfull Discharge (cfs)							55																				
Valley length (ft)																											
Channel Thalweg length (ft)																											
Sinuosity (ft)							1.05						1.2														
Water Surface Slope (Channel) (ft/ft)																											
BF slope (ft/ft)																											
Bankfull Floodplain Area (acres)																											
Proportion over wide (%)																											
Entrenchment Class (ER Range)																											
Incision Class (BHR Range)																											
BEHI VL%/L%/M%/H%/VH%/E%																											
Channel Stability or Habitat Metric																											
Biological or Other																											

**Table 10. Baseline Stream Data Summary**  
**601 East Stream Restoration Site - Reach 4 (495 feet)**

Parameter	Gauge	Regional Curve			Pre- Existing Conditions						Reference Reach(es) Data						Design			As-built / Baseline						
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n	
<b>Dimension and Substrate - Riffle</b>																										
Bankfull Width (ft)					5.2	11.6		20			7.42	9.88		11.61				16		14.93	15.92	15.92	16.91	1.40	2	
Floodprone Width (ft)					16	20		25			18.51	26.43		33.59				30	35	40	30.39	36.19	36.19	42.00	8.21	2
Bankfull Mean Depth (ft)					0.76	0.9		1.1			0.68	0.79		0.97				0.98			0.98	1.37	1.37	1.76	0.55	2
Bankfull Max Depth (ft)					.	1.2		1.33			1.28	1.78		2.16				1.8			1.49	2.11	2.11	2.72	0.87	2
Bankfull Cross Sectional Area (ft <sup>2</sup> )					12.3	15		16			0.97	1.39		1.82				15.7			14.70	22.25	22.25	29.81	10.68	2
Width/Depth Ratio					7	12.9		18			8.14	12.95		16.82				16.3			9.60	12.38	12.38	15.16	3.93	2
Entrenchment Ratio					1.4	1.7		2.2			2.02	2.4		3.24				1.9	2.2	2.5	2.04	2.26	2.26	2.48	0.32	2
Bank Height Ratio d50 (mm)					3.3	3.5		4.2			0.97	1.39		1.82				1			1.00	1.10	1.10	1.20	0.14	2
<b>Profile</b>																										
Riffle Length (ft)					0.79	10.58		23.7			5.97	11.26		26.78				15	23	103	15.84	20.829	18.18	28.96	4.7764	9
Riffle Slope (ft/ft)					0	0.02		0.06			0.015	0.031		0.05				0.021	0.036	0.03	0.018	0.0274	0.0298	0.0382	0.0068	9
Pool Length (ft)					7.83	20.7		64.91			13.6	20.13		31.74				14	22	42	30.82	35.01	35.78	38.85	3.1243	9
Pool Max depth (ft)					2	2.5		3.2			1.4	1.83		2.2				2.2			1.997	2.8154	2.753	3.392	0.3909	9
Pool Spacing (ft)					12	29		55			23.5	36.2		57.4				38	59	93	49.77	56.111	54.805	69.26	6.2441	8
<sup>3</sup> Pool Volume (ft <sup>3</sup> )																										
<b>Pattern</b>																										
Channel Beltwidth (ft)					12	32		82			13	17.33		20				21	28	32	21		28	32		
Radius of Curvature (ft)					18	34.9		61			16	33		53				26	52	84	26		52	84		
Rc: Bankfull width (ft/ft)					1.6	3		5.3			4.35	6.04		8.9				162	3.25	5.25	162		3.25	5.25		
Meander Wavelength (ft)					30	56		113			43	59.67		88				69	97	142	69		97	142		
Meander Width Ratio					1.1	2.8		7.2			1.32	1.76		2.03				1.32	1.76	2.03	1.32		1.76	2.03		
<b>Substrate, bed and transport parameters</b>																										
Rf%/Ru%/P%/G%/S%					19.9%			80.1%			0.0%			26.8%	17.2%	47.9%	8.1%			0.0%			39.1%	65.6%		0.0%
SC%/Sa%/G%/C%/B%/Be%																										
d16/d35/d50/d84/d95/dP/di <sup>p</sup> (mm)																										
Reach Shear Stress (competency) lb/ft <sup>2</sup>																										
Max part size (mm) Mobilized at bankfull																										
Stream Power (transport capacity) W/m <sup>2</sup>																										
<b>Additional Reach Parameters</b>																										
Drainage Area (SM)							0.56						0.144													
Impervious cover estimate (%)																										
Rosgen Classification							G4						B4/C4					B4					B4			
Bankfull Velocity (fps)							4											3.27					3.27			
Bankfull Discharge (cfs)							55																			
Valley length (ft)													378													
Channel Thalweg length (ft)													440					465					465			
Sinuosity (ft)							1.04					1.16					1.13					1.13				
Water Surface Slope (Channel) (ft/ft)																	0.0114					0.0114				
BF slope (ft/ft)																	0.0114					0.0114				
Bankfull Floodplain Area (acres)																										
Proportion over wide (%)																										
Entrenchment Class (ER Range)																										
Incision Class (BHR Range)																										
BEHI VL%/L%/M%/H%/VH%/E%																										
Channel Stability or Habitat Metric																										
Biological or Other																										

**Table 11a. Monitoring Data - Dimensional Morphology Summary  
(Dimensional Parameters - Cross-Sections)  
601 East Stream Restoration Site - Reach 1**

Dimension	Cross-Section 1 Pool								Cross-Section 2 Riffle								Cross-Section 3 Pool								Cross-Section 4 Riffle							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1*	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Record Elevation (datum) Used	544.82	544.82	544.82						540.40	540.40	540.40						537.87	537.87	537.87						533.69	533.69	533.69					
Bankfull Width (ft)	13.6	15.1	15.1						15.1	14.7	15.2						9.4	9.5	9.3						8.8	9.1	9.4					
Floodprone Width (ft)	45.0	>45.0	>45.0						77.0	>77.0	>77.0						154.0	>154.0	>154.0						75.0	>75	>75.0					
Bankfull Mean Depth (ft)	1.0	0.9	0.9						0.6	0.5	0.5						0.9	0.9	0.9						0.5	0.5	0.6					
Bankfull Max Depth (ft)	2.1	2.2	2.2						1.2	1.2	1.2						1.8	1.7	1.8						0.9	0.9	1.1					
Bankfull Cross Sectional Area (ft <sup>2</sup> )	14.1	13.7	14.3						9.0	8.0	8.0						8.7	8.5	8.8						4.5	4.8	5.8					
Bankfull Width/Depth Ratio	13.2	16.6	15.9						25.3	27.0	28.9						10.2	10.7	9.8						17.5	17.1	15.3					
Bankfull Entrenchment Ratio	10.3	>3.0	>3.0						9.3	>5.2	>5.1						14.9	>14.6	>16.6						15.9	>8.3	>8.0					
Bankfull Bank Height Ratio	1.0	1.0	1.0						1.0	1.0	1.0						1.0	1.0	1.0						0.9	1.0	1.0					
d50 (mm)	-	-	-						-	8.3	0.062						-	-	-						-	22.0	17.0					
Dimension	Cross-Section 5 Pool								Cross-Section 6 Riffle								Cross-Section 7 Pool								Cross-Section 8 Riffle							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Record Elevation (datum) Used	530.49	530.49	530.49						528.11	528.11	528.11						525.02	525.02	525.02						522.48	522.48	522.48					
Bankfull Width (ft)	12.9	12.1	12.0						11.3	11.3	11.3						10.3	11.4	10.3						10.1	8.8	9.2					
Floodprone Width (ft)	61.0	>61.0	>61.0						80.0	>80.0	>80.0						63.0	>63	>63.0						40.0	>40	>40.0					
Bankfull Mean Depth (ft)	1.0	0.9	0.9						0.6	0.6	0.6						1.2	1.0	1.0						0.6	0.6	0.6					
Bankfull Max Depth (ft)	2.0	1.8	1.8						1.3	1.3	1.4						2.0	2.0	2.1						1.0	1.0	1.0					
Bankfull Cross Sectional Area (ft <sup>2</sup> )	12.8	11.0	11.2						6.6	6.6	7.2						12.3	11.2	10.4						6.2	5.6	5.8					
Bankfull Width/Depth Ratio	13.0	13.2	12.9						19.3	19.5	17.9						8.6	11.5	10.3						16.6	13.9	14.7					
Bankfull Entrenchment Ratio	17.4	>5.1	>5.1						9.7	>7.1	>7.1						10.7	>5.5	>6.1						10.9	>4.5	>4.3					
Bankfull Bank Height Ratio	0.9	1.0	1.0						1.0	1.0	1.0						1.0	1.0	1.0						1.0	1.0	1.0					
d50 (mm)	-	-	-						-	26.0	2.6						-	-	-						-	0.062	0.062					

-Information Unavailable  
\*data updated to show corrected calculations





**Table 11a cont'd. Monitoring Data - Dimensional Morphology Summary  
(Dimensional Parameters - Cross-Sections)  
601 East Stream Restoration Site - Reach 4**

Dimension	Cross-Section 17 Pool								Cross-Section 18 Riffle							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Record Elevation (datum) Used	489.11	489.11	489.11						490.01	490.01	490.01					
Bankfull Width (ft)	16.9	17.2	17.2						14.9	14.6	14.1					
Floodprone Width (ft)	42.0	>42.0	>42.0						30.4	>31.0	>31.0					
Bankfull Mean Depth (ft)	1.8	1.7	1.7						1.0	1.0	1.0					
Bankfull Max Depth (ft)	2.7	2.9	2.9						1.5	1.6	1.7					
Bankfull Cross Sectional Area (ft <sup>2</sup> )	29.8	29.1	28.7						14.7	14.5	14.0					
Bankfull Width/Depth Ratio	9.6	10.2	10.3						15.2	14.6	14.2					
Bankfull Entrenchment Ratio	2.5	>2.4	>2.4						2.0	>2.1	>2.2					
Bankfull Bank Height Ratio	1.2	1.1	1.1						1.0	1.0	1.0					
d50 (mm)	-	-	-						-	47.0	4.2					

- Information Unavailable

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<b>Table 9. 601 East Stream Restoration Site Bank Pin Arrays</b>					
<b>Cross Section #</b>	<b>Length of Exposed Pin (mm)</b>				
	<b>Upstream</b>	<b>At Cross Section</b>	<b>Downstream</b>	<b>Rate (mm/yr)</b>	<b>Rate (ft/yr)</b>
1	35.6	0	0	11.9	0.04
3	0 <sup>B</sup>	0 <sup>B</sup>	0 <sup>B</sup>	0	0.00
5	0 <sup>B</sup>	0 <sup>B</sup>	0 <sup>B</sup>	0	0.00
7	0 <sup>B</sup>	0 <sup>B</sup>	0 <sup>B</sup>	0	0.00
10	0 <sup>B</sup>	0 <sup>B</sup>	0 <sup>B</sup>	0	0.00
12	0 <sup>B</sup>	0 <sup>B</sup>	0 <sup>B</sup>	0	0.00
14	0 <sup>B</sup>	0 <sup>B</sup>	0 <sup>B</sup>	0	0.00
15	0 <sup>B</sup>	0 <sup>B</sup>	0 <sup>B</sup>	0	0.00
17	0	0	0	0	0.00

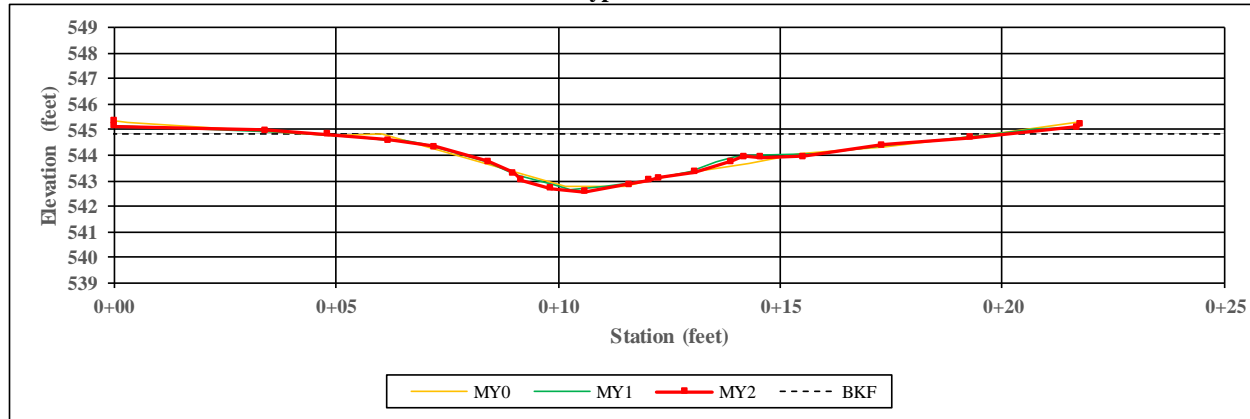
0<sup>B</sup> - Buried Bankpin



**Project Name:** 601 East  
**Reach Name:** Reach 1

**XS Number:** 1  
**XS Type:** Pool

**Station:** 8+32



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	13.6	15.1	15.1	-	-	-	-	-
Floodprone Width (ft)	45.0	45.0	45.0	-	-	-	-	-
Bankfull Mean Depth (ft)	1.0	0.9	0.9	-	-	-	-	-
Bankfull Max Depth (ft)	2.1	2.2	2.2	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	14.1	13.7	14.3	-	-	-	-	-
Width/Depth Ratio	13.2	16.6	15.9	-	-	-	-	-
Entrenchment Ratio	10.3	3.0	3.0	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

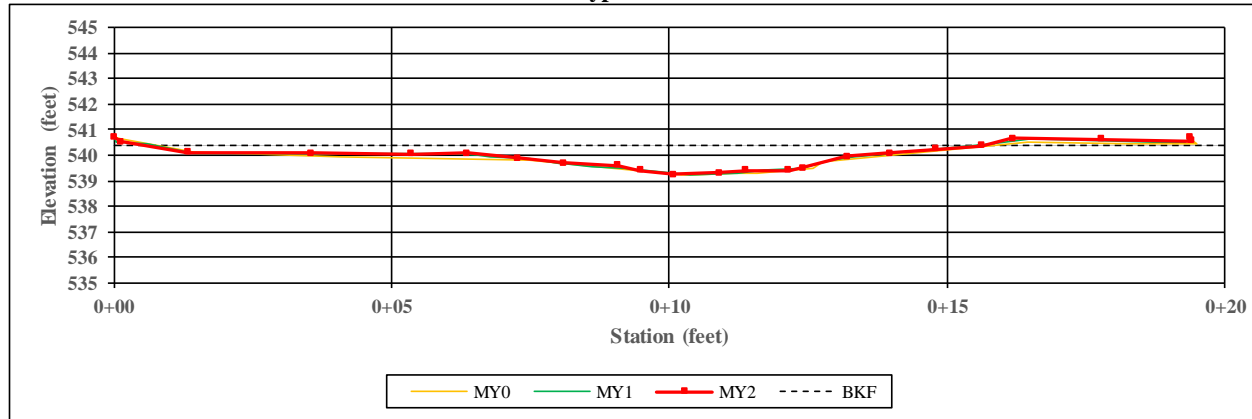


Right Descending Bank

**Project Name:** 601 East  
**Reach Name:** Reach 1

**XS Number:** 2  
**XS Type:** Riffle

**Station:** 10+95



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	15.1	14.7	15.2	-	-	-	-	-
Floodprone Width (ft)	77.0	77.0	77.0	-	-	-	-	-
Bankfull Mean Depth (ft)	0.6	0.5	0.5	-	-	-	-	-
Bankfull Max Depth (ft)	1.2	1.2	1.2	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	9.0	8.0	8.0	-	-	-	-	-
Width/Depth Ratio	25.3	27.0	28.9	-	-	-	-	-
Entrenchment Ratio	9.3	5.2	5.1	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

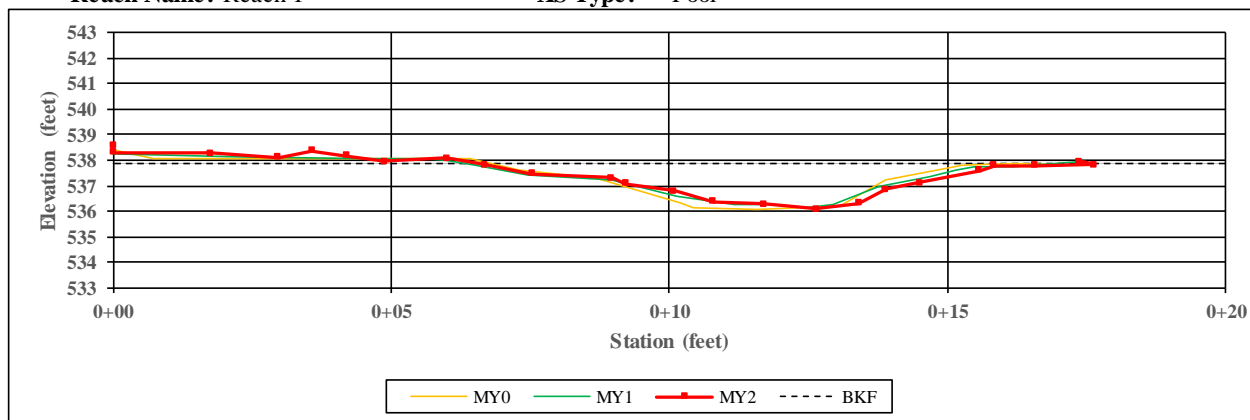


Right Descending Bank

**Project Name:** 601 East  
**Reach Name:** Reach 1

**XS Number:** 3  
**XS Type:** Pool

**Station:** 12+20



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	9.4	9.5	9.3	-	-	-	-	-
Floodprone Width (ft)	154.0	154.0	154.0	-	-	-	-	-
Bankfull Mean Depth (ft)	0.9	0.9	0.9	-	-	-	-	-
Bankfull Max Depth (ft)	1.8	1.7	1.8	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	8.7	8.5	8.8	-	-	-	-	-
Width/Depth Ratio	10.2	10.7	9.8	-	-	-	-	-
Entrenchment Ratio	14.9	14.6	16.6	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank



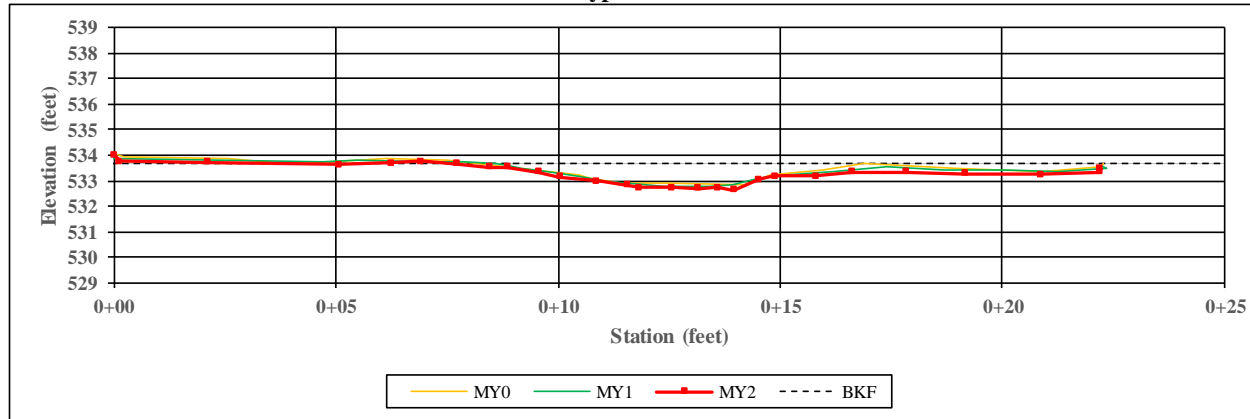
Right Descending Bank



**Project Name:** 601 East  
**Reach Name:** Reach 1

**XS Number:** 4  
**XS Type:** Riffle

**Station:** 14+68



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	8.8	9.1	9.4	-	-	-	-	-
Floodprone Width (ft)	75.0	75.0	75.0	-	-	-	-	-
Bankfull Mean Depth (ft)	0.5	0.5	0.6	-	-	-	-	-
Bankfull Max Depth (ft)	0.9	0.9	1.1	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	4.5	4.8	5.8	-	-	-	-	-
Width/Depth Ratio	17.5	17.1	15.3	-	-	-	-	-
Entrenchment Ratio	15.9	8.3	8.0	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

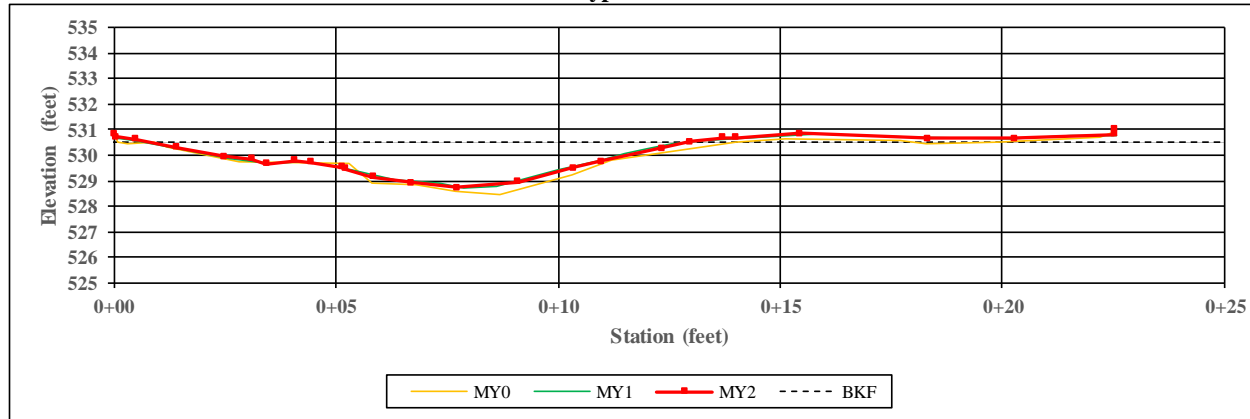


Right Descending Bank

**Project Name:** 601 East  
**Reach Name:** Reach 1

**XS Number:** 5  
**XS Type:** Pool

**Station:** 16+23



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	12.9	12.1	12.0	-	-	-	-	-
Floodprone Width (ft)	61.0	61.0	61.0	-	-	-	-	-
Bankfull Mean Depth (ft)	1.0	0.9	0.9	-	-	-	-	-
Bankfull Max Depth (ft)	2.0	1.8	1.8	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	12.8	11.0	11.2	-	-	-	-	-
Width/Depth Ratio	13.0	13.2	12.9	-	-	-	-	-
Entrenchment Ratio	17.4	5.1	5.1	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

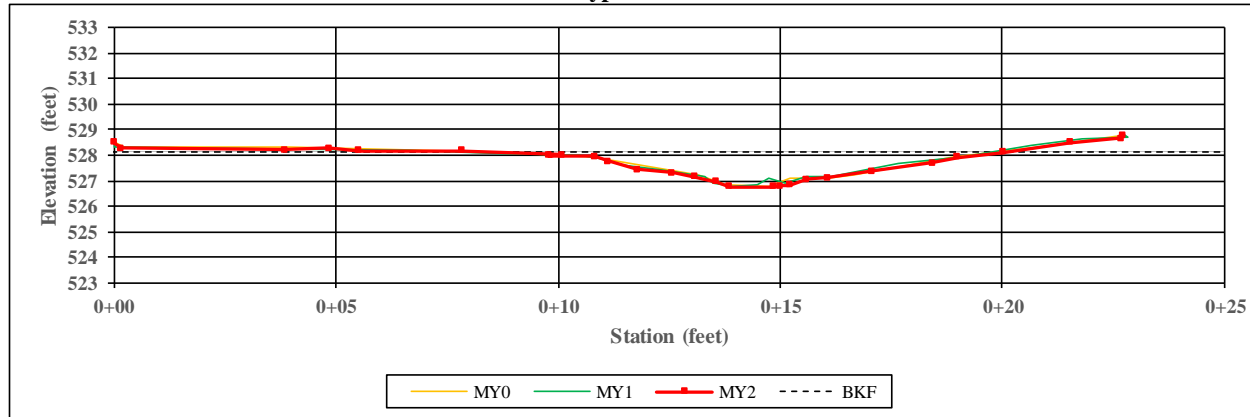


Right Descending Bank

Project Name: 601 East  
 Reach Name: Reach 1

XS Number: 6  
 XS Type: Riffle

Station: 17+66



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	11.3	11.3	11.3	-	-	-	-	-
Floodprone Width (ft)	80.0	80.0	80.0	-	-	-	-	-
Bankfull Mean Depth (ft)	0.6	0.6	0.6	-	-	-	-	-
Bankfull Max Depth (ft)	1.3	1.3	1.4	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	6.6	6.6	7.2	-	-	-	-	-
Width/Depth Ratio	19.3	19.5	17.9	-	-	-	-	-
Entrenchment Ratio	9.7	7.1	7.1	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank



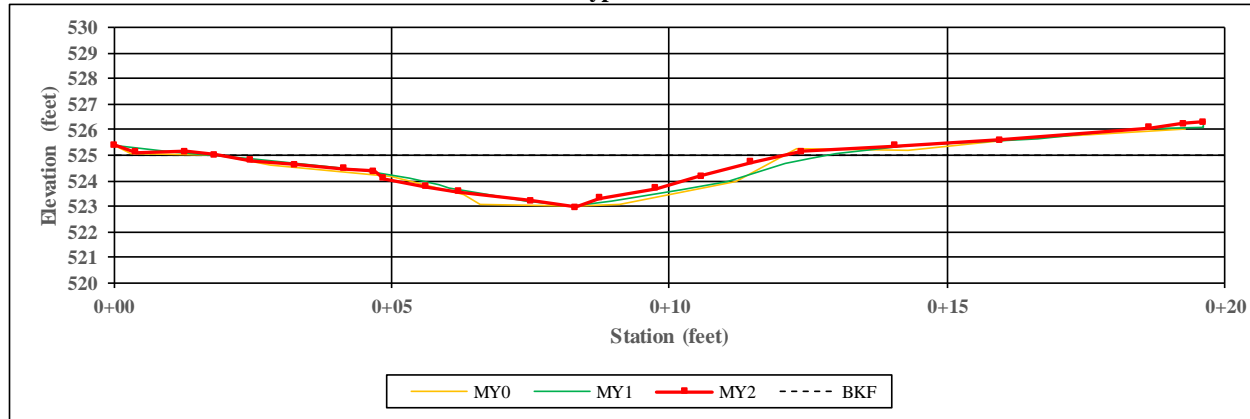
Right Descending Bank



**Project Name:** 601 East  
**Reach Name:** Reach 1

**XS Number:** 7  
**XS Type:** Pool

**Station:** 19+30



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	10.3	11.4	10.3	-	-	-	-	-
Floodprone Width (ft)	63.0	63.0	63.0	-	-	-	-	-
Bankfull Mean Depth (ft)	1.2	1.0	1.0	-	-	-	-	-
Bankfull Max Depth (ft)	2.0	2.0	2.1	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	12.3	11.2	10.4	-	-	-	-	-
Width/Depth Ratio	8.6	11.5	10.3	-	-	-	-	-
Entrenchment Ratio	10.7	5.5	6.1	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

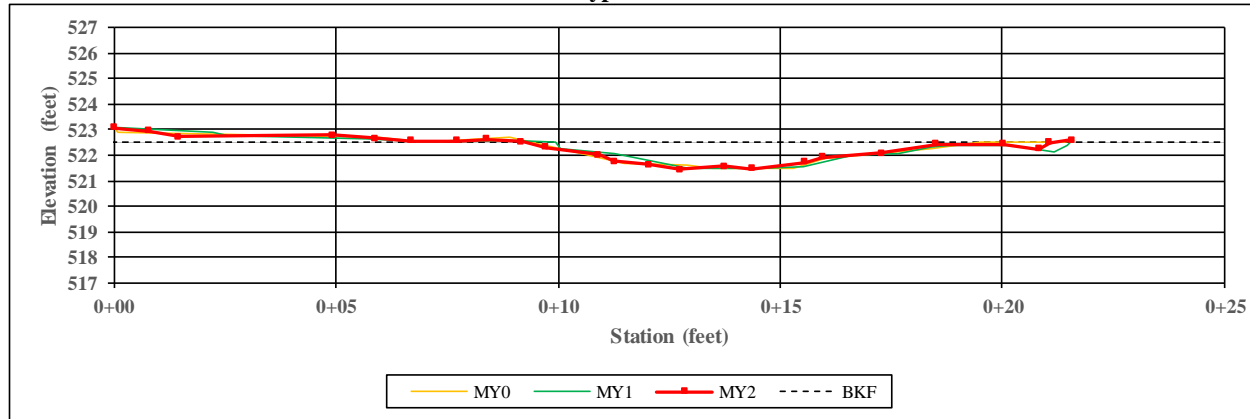


Right Descending Bank

**Project Name:** 601 East  
**Reach Name:** Reach 1

**XS Number:** 8  
**XS Type:** Riffle

**Station:** 20+59



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	10.1	8.8	9.2	-	-	-	-	-
Floodprone Width (ft)	40.0	40.0	40.0	-	-	-	-	-
Bankfull Mean Depth (ft)	0.6	0.6	0.6	-	-	-	-	-
Bankfull Max Depth (ft)	1.0	1.0	1.0	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	6.2	5.6	5.8	-	-	-	-	-
Width/Depth Ratio	16.6	13.9	14.7	-	-	-	-	-
Entrenchment Ratio	10.9	4.5	4.3	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

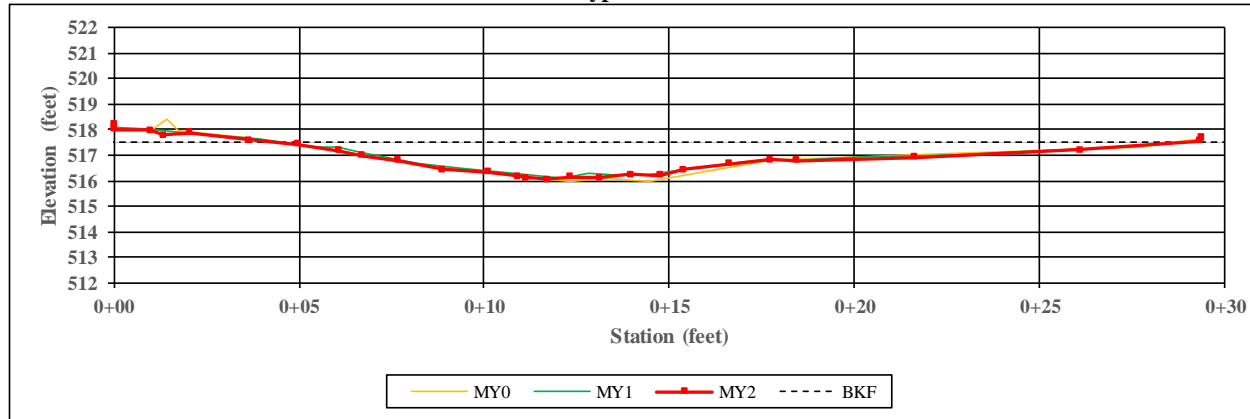


Right Descending Bank

Project Name: 601 East  
 Reach Name: Reach 2

XS Number: 9  
 XS Type: Riffle

Station: 24+25



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	24.2	24.3	24.4	-	-	-	-	-
Floodprone Width (ft)	62.0	62.0	62.0	-	-	-	-	-
Bankfull Mean Depth (ft)	0.7	0.7	0.7	-	-	-	-	-
Bankfull Max Depth (ft)	1.5	1.4	1.4	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	17.7	16.5	17.5	-	-	-	-	-
Width/Depth Ratio	33.1	35.6	34.2	-	-	-	-	-
Entrenchment Ratio	5.8	2.6	2.5	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank



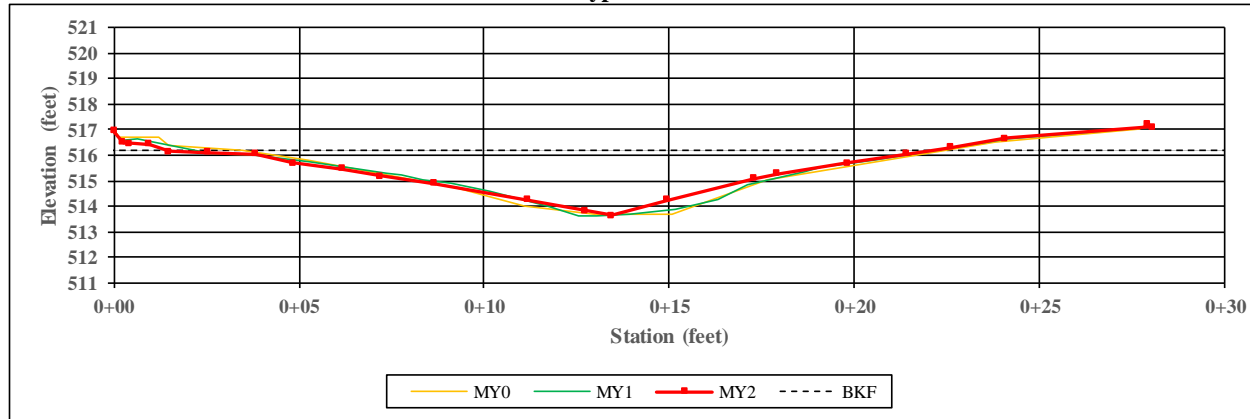
Right Descending Bank



**Project Name:** 601 East  
**Reach Name:** Reach 2

**XS Number:** 10  
**XS Type:** Pool

**Station:** 26+16



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	19.2	19.7	19.7	-	-	-	-	-
Floodprone Width (ft)	132.0	132.0	132.0	-	-	-	-	-
Bankfull Mean Depth (ft)	1.3	1.2	1.2	-	-	-	-	-
Bankfull Max Depth (ft)	2.5	2.6	2.6	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	25.3	24.4	23.1	-	-	-	-	-
Width/Depth Ratio	14.6	16.0	16.8	-	-	-	-	-
Entrenchment Ratio	11.7	6.7	6.7	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

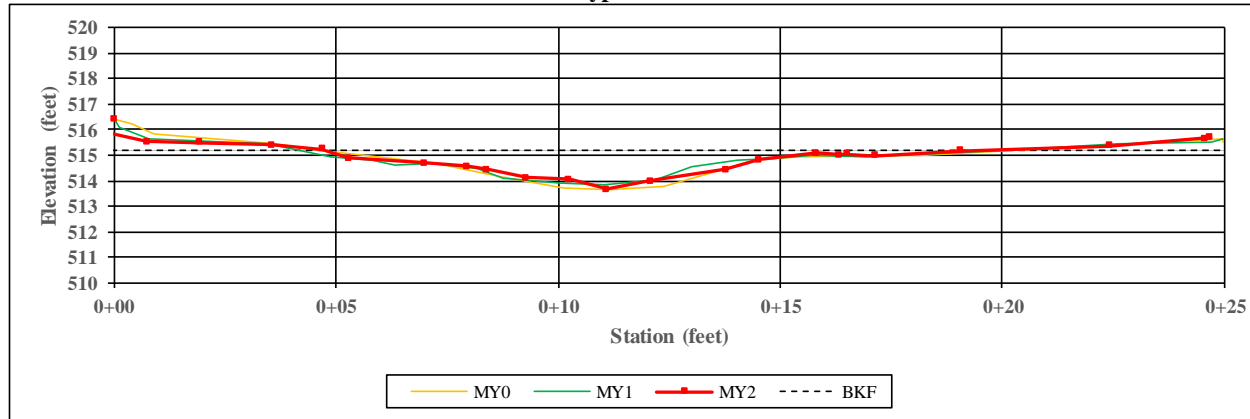


Right Descending Bank

**Project Name:** 601 East  
**Reach Name:** Reach 2

**XS Number:** 11  
**XS Type:** Riffle

**Station:** 27+15



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	15.5	15.8	14.1	-	-	-	-	-
Floodprone Width (ft)	73.0	73.0	73.0	-	-	-	-	-
Bankfull Mean Depth (ft)	0.6	0.5	0.6	-	-	-	-	-
Bankfull Max Depth (ft)	1.5	1.3	1.5	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	9.4	8.6	8.3	-	-	-	-	-
Width/Depth Ratio	25.5	28.9	23.8	-	-	-	-	-
Entrenchment Ratio	7.1	4.6	5.2	-	-	-	-	-
Bank Height Ratio	0.9	1.0	1.0	-	-	-	-	-



Left Descending Bank

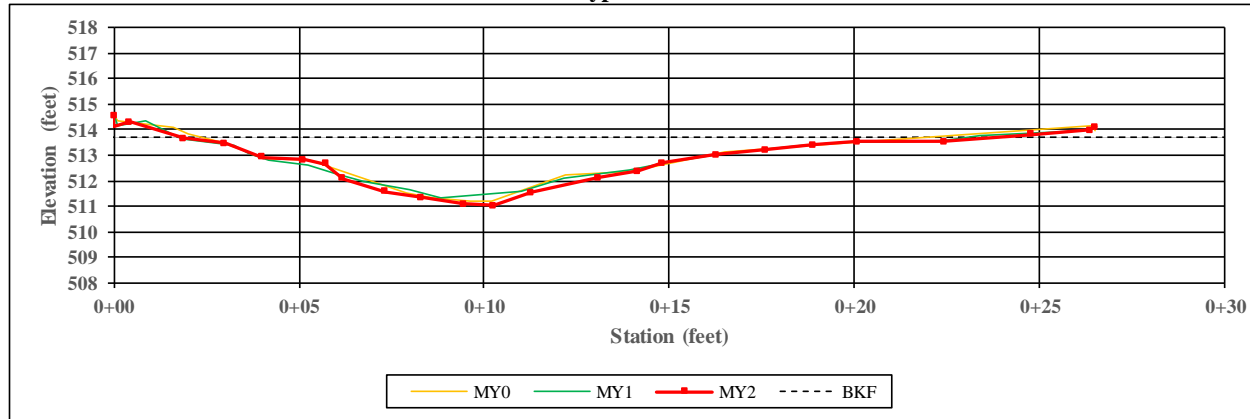


Right Descending Bank

**Project Name:** 601 East  
**Reach Name:** Reach 2

**XS Number:** 12  
**XS Type:** Pool

**Station:** 29+67



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	20.0	20.6	20.6	-	-	-	-	-
Floodprone Width (ft)	168.0	168.0	168.0	-	-	-	-	-
Bankfull Mean Depth (ft)	1.1	1.0	1.1	-	-	-	-	-
Bankfull Max Depth (ft)	2.5	2.4	2.6	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	21.3	21.4	23.1	-	-	-	-	-
Width/Depth Ratio	18.8	19.9	18.4	-	-	-	-	-
Entrenchment Ratio	7.0	8.1	8.2	-	-	-	-	-
Bank Height Ratio	0.9	1.0	1.0	-	-	-	-	-



Left Descending Bank



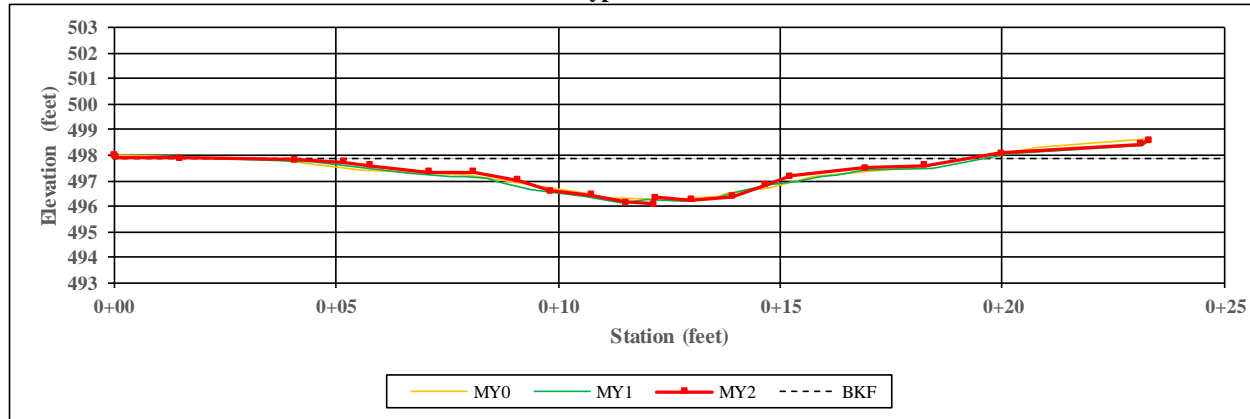
Right Descending Bank



**Project Name:** 601 East  
**Reach Name:** Reach 3

**XS Number:** 13  
**XS Type:** Riffle

**Station:** 44+45



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	15.9	16.9	17.5	-	-	-	-	-
Floodprone Width (ft)	75.0	75.0	75.0	-	-	-	-	-
Bankfull Mean Depth (ft)	0.8	0.8	0.7	-	-	-	-	-
Bankfull Max Depth (ft)	1.6	1.7	1.8	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	12.8	13.6	12.2	-	-	-	-	-
Width/Depth Ratio	19.6	21.0	25.0	-	-	-	-	-
Entrenchment Ratio	8.8	4.4	4.3	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

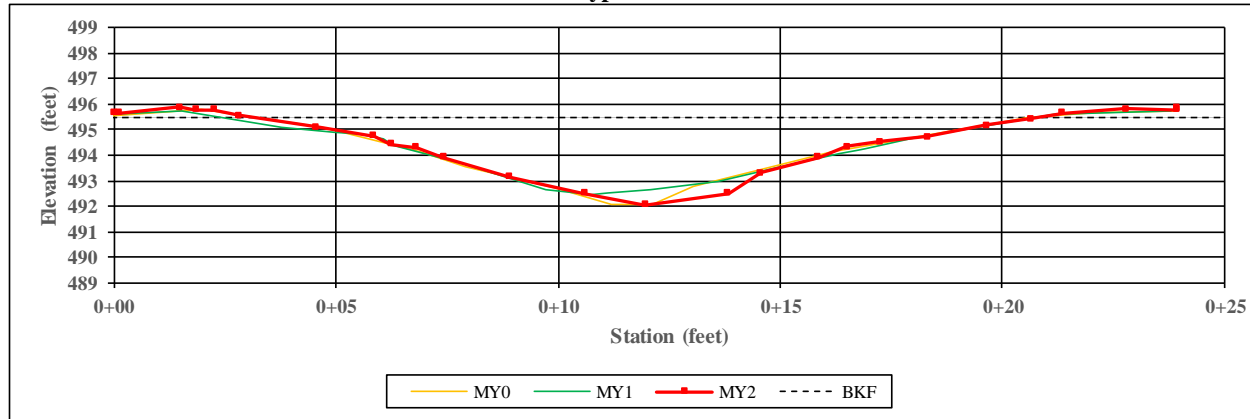


Right Descending Bank

**Project Name:** 601 East  
**Reach Name:** Reach 3

**XS Number:** 14  
**XS Type:** Pool

**Station:** 48+78



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	17.5	18.4	17.9	-	-	-	-	-
Floodprone Width (ft)	350.0	350.0	350.0	-	-	-	-	-
Bankfull Mean Depth (ft)	1.6	1.5	1.6	-	-	-	-	-
Bankfull Max Depth (ft)	3.4	3.1	3.4	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	28.2	28.0	28.7	-	-	-	-	-
Width/Depth Ratio	11.0	12.0	11.2	-	-	-	-	-
Entrenchment Ratio	12.8	19.1	19.6	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

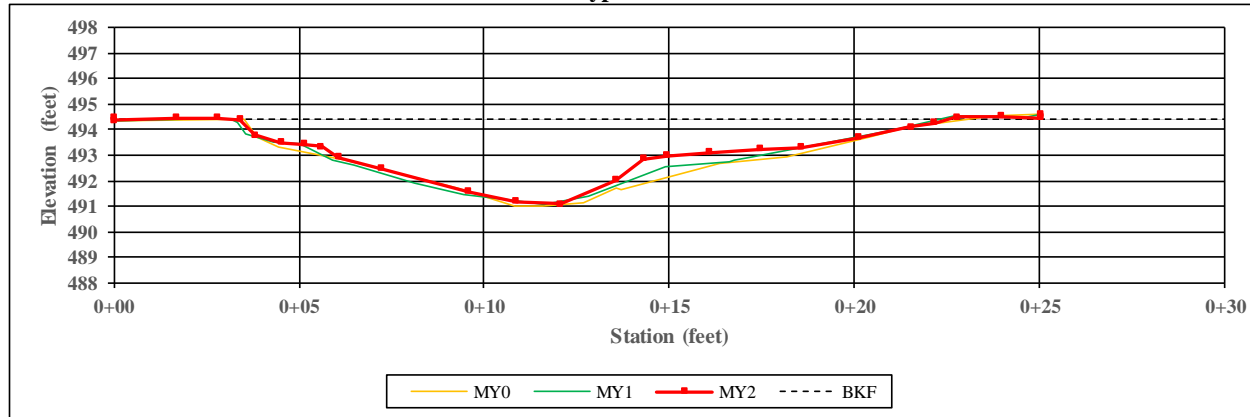


Right Descending Bank

**Project Name:** 601 East  
**Reach Name:** Reach 3

**XS Number:** 15  
**XS Type:** Pool

**Station:** 50+93



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	19.6	21.1	20.5	-	-	-	-	-
Floodprone Width (ft)	350.0	350.0	350.0	-	-	-	-	-
Bankfull Mean Depth (ft)	1.8	1.6	1.5	-	-	-	-	-
Bankfull Max Depth (ft)	3.4	3.3	3.3	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	36.1	34.4	31.5	-	-	-	-	-
Width/Depth Ratio	10.6	13.0	13.3	-	-	-	-	-
Entrenchment Ratio	5.6	16.6	17.1	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank



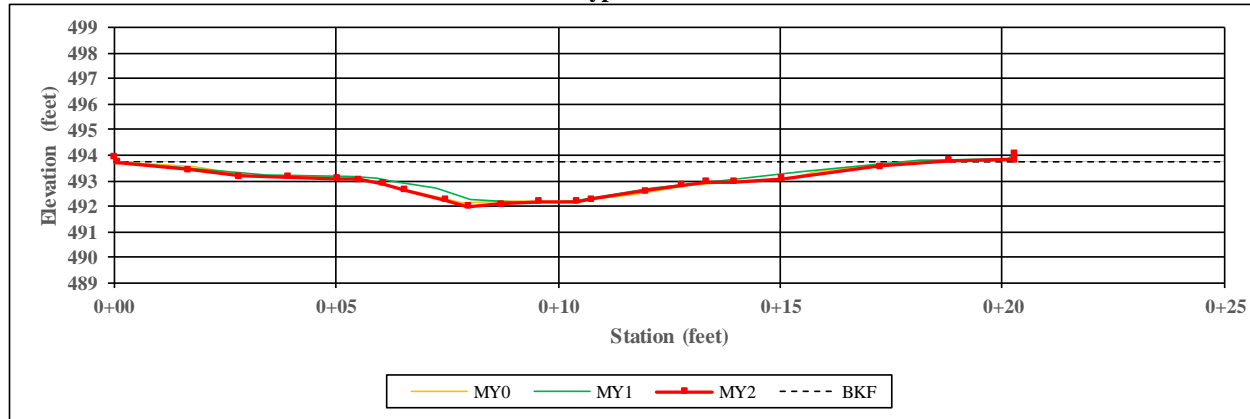
Right Descending Bank



**Project Name:** 601 East  
**Reach Name:** Reach 3

**XS Number:** 16  
**XS Type:** Riffle

**Station:** 52+29



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	17.7	17.5	18.3	-	-	-	-	-
Floodprone Width (ft)	150.0	150.0	150.0	-	-	-	-	-
Bankfull Mean Depth (ft)	0.8	0.7	0.8	-	-	-	-	-
Bankfull Max Depth (ft)	1.6	1.6	1.7	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	14.1	12.9	14.8	-	-	-	-	-
Width/Depth Ratio	22.4	23.8	22.5	-	-	-	-	-
Entrenchment Ratio	7.9	8.5	8.2	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

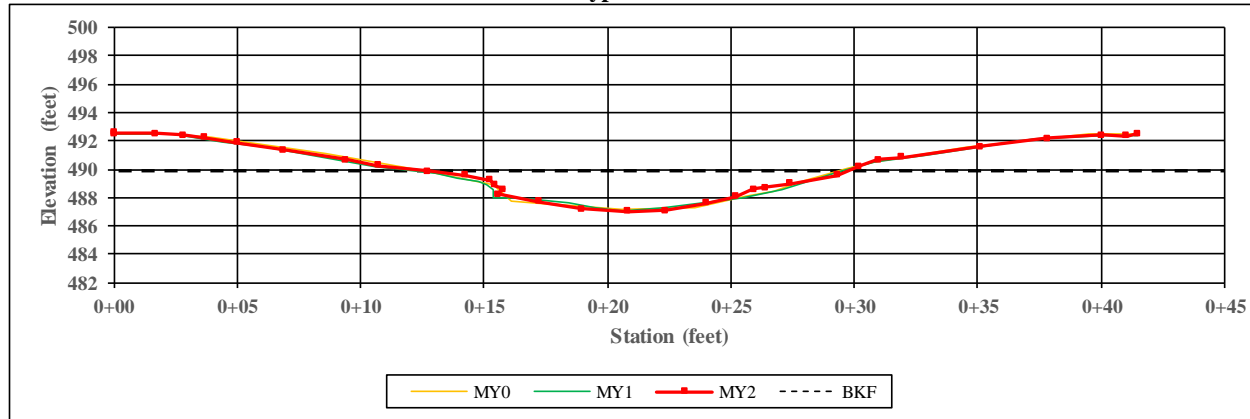


Right Descending Bank

**Project Name:** 601 East  
**Reach Name:** Reach 4

**XS Number:** 17  
**XS Type:** Pool

**Station:** 56+42



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	16.9	17.2	17.2	-	-	-	-	-
Floodprone Width (ft)	42.0	42.0	42.0	-	-	-	-	-
Bankfull Mean Depth (ft)	1.8	1.7	1.7	-	-	-	-	-
Bankfull Max Depth (ft)	2.7	2.9	2.9	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	29.8	29.1	28.7	-	-	-	-	-
Width/Depth Ratio	9.6	10.2	10.3	-	-	-	-	-
Entrenchment Ratio	2.5	2.4	2.4	-	-	-	-	-
Bank Height Ratio	1.2	1.1	1.1	-	-	-	-	-



Left Descending Bank

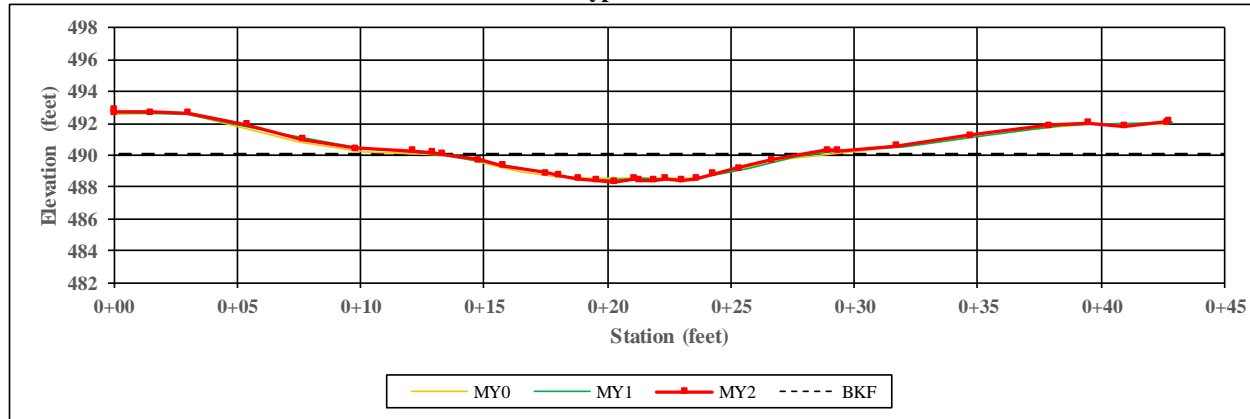


Right Descending Bank

Project Name: 601 East  
 Reach Name: Reach 4

XS Number: 18  
 XS Type: Riffle

Station: 56+42



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft)	14.9	14.6	14.1	-	-	-	-	-
Floodprone Width (ft)	30.4	31.0	31.0	-	-	-	-	-
Bankfull Mean Depth (ft)	1.0	1.0	1.0	-	-	-	-	-
Bankfull Max Depth (ft)	1.5	1.6	1.7	-	-	-	-	-
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	14.7	14.5	14.0	-	-	-	-	-
Width/Depth Ratio	15.2	14.6	14.2	-	-	-	-	-
Entrenchment Ratio	2.1	2.1	2.2	-	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	-	-	-	-	-



Left Descending Bank

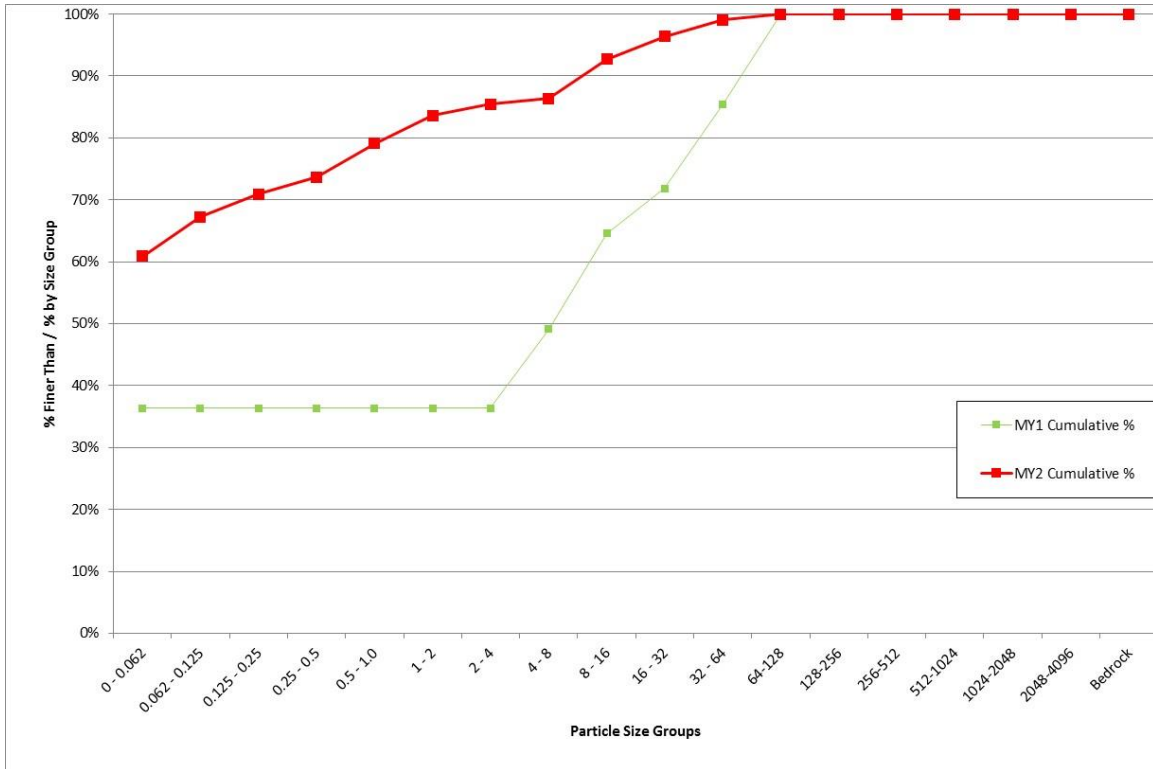


Right Descending Bank

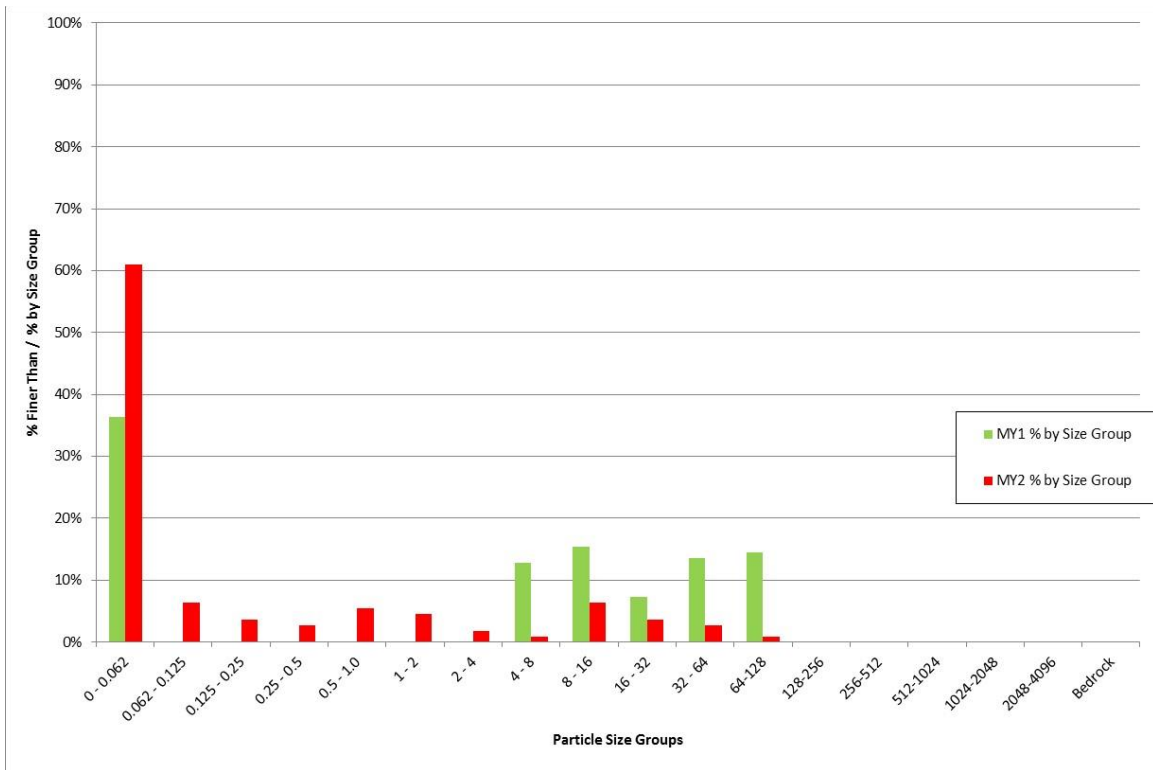


<b>601 East</b>			
<b>Cross Section 2 - Riffle</b>			
<b>Monitoring Year - 2016; MY2</b>			
<b>Bed Surface Material Particle Size Class (mm)</b>	<b>Number</b>	<b>% Individual</b>	<b>% Cumulative</b>
0 - 0.062	67	60.9%	61%
0.062 - 0.125	7	6.4%	67%
0.125 - 0.25	4	3.6%	71%
0.25 - 0.5	3	2.7%	74%
0.5 - 1.0	6	5.5%	79%
1 - 2	5	4.5%	84%
2 - 4	2	1.8%	85%
4 - 8	1	0.9%	86%
8 - 16	7	6.4%	93%
16 - 32	4	3.6%	96%
32 - 64	3	2.7%	99%
64-128	1	0.9%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
<b>Total</b>	<b>110</b>	<b>100%</b>	<b>100%</b>
<b>Summary Data</b>			
<b>D50</b>		<b>0.062</b>	
<b>D84</b>		<b>2.3</b>	
<b>D95</b>		<b>24</b>	

601 East Cross-Section 2 – Riffle  
Pebble Count Percent Cumulative



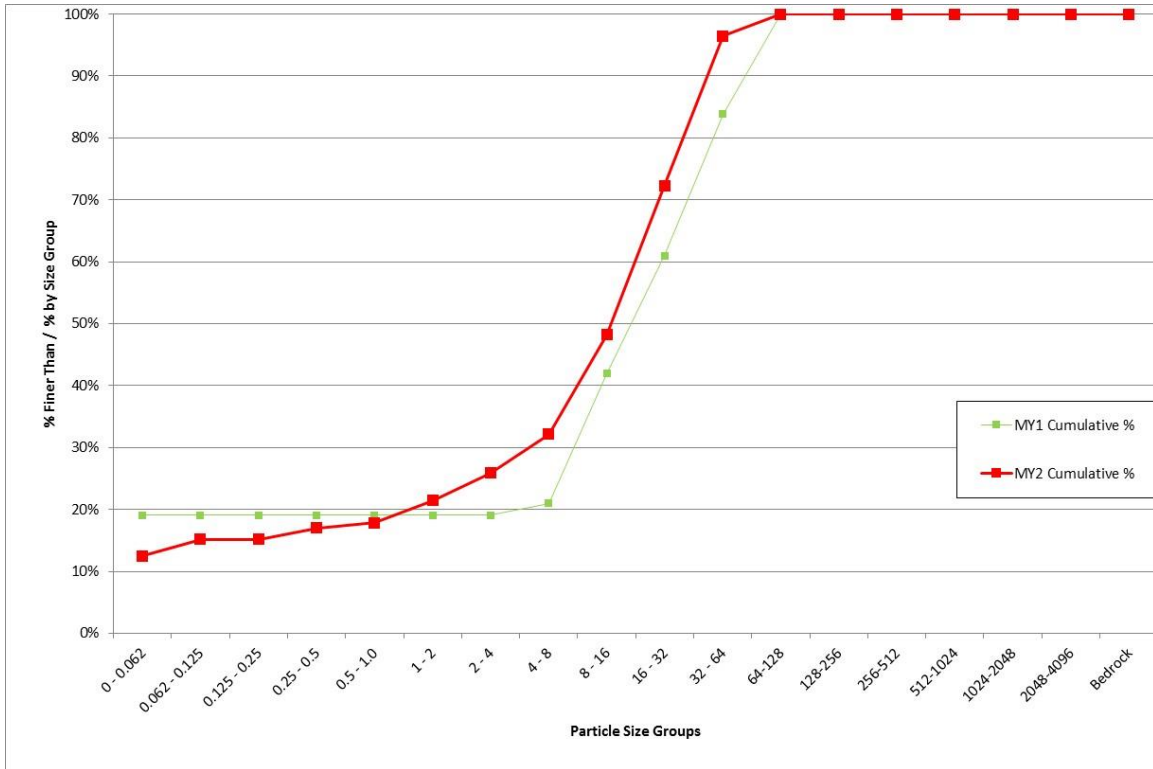
601 East Cross-Section 2 – Riffle  
Pebble Count Percent Individual



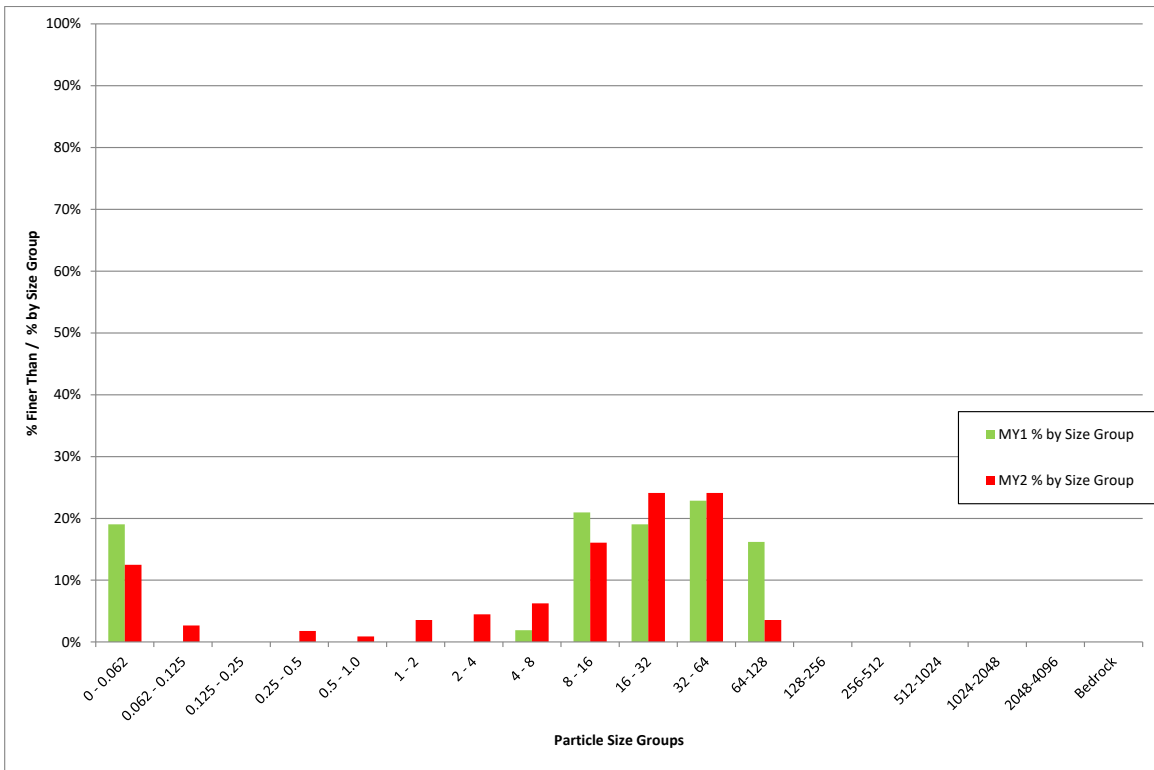
<b>601 East</b>			
<b>Cross Section 4 - Riffle</b>			
<b>Monitoring Year - 2016; MY2</b>			
<b>Bed Surface Material Particle Size Class (mm)</b>	<b>Number</b>	<b>% Individual</b>	<b>% Cumulative</b>
0 - 0.062	14	12.5%	13%
0.062 - 0.125	3	2.7%	15%
0.125 - 0.25	0	0.0%	15%
0.25 - 0.5	2	1.8%	17%
0.5 - 1.0	1	0.9%	18%
1 - 2	4	3.6%	21%
2 - 4	5	4.5%	26%
4 - 8	7	6.3%	32%
8 - 16	18	16.1%	48%
16 - 32	27	24.1%	72%
32 - 64	27	24.1%	96%
64-128	4	3.6%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
<b>Total</b>	<b>112</b>	<b>100%</b>	<b>100%</b>
<b>Summary Data</b>			
<b>D50</b>		<b>17</b>	
<b>D84</b>		<b>42</b>	
<b>D95</b>		<b>61</b>	



601 East Cross-Section 4 – Riffle  
Pebble Count Percent Cumulative

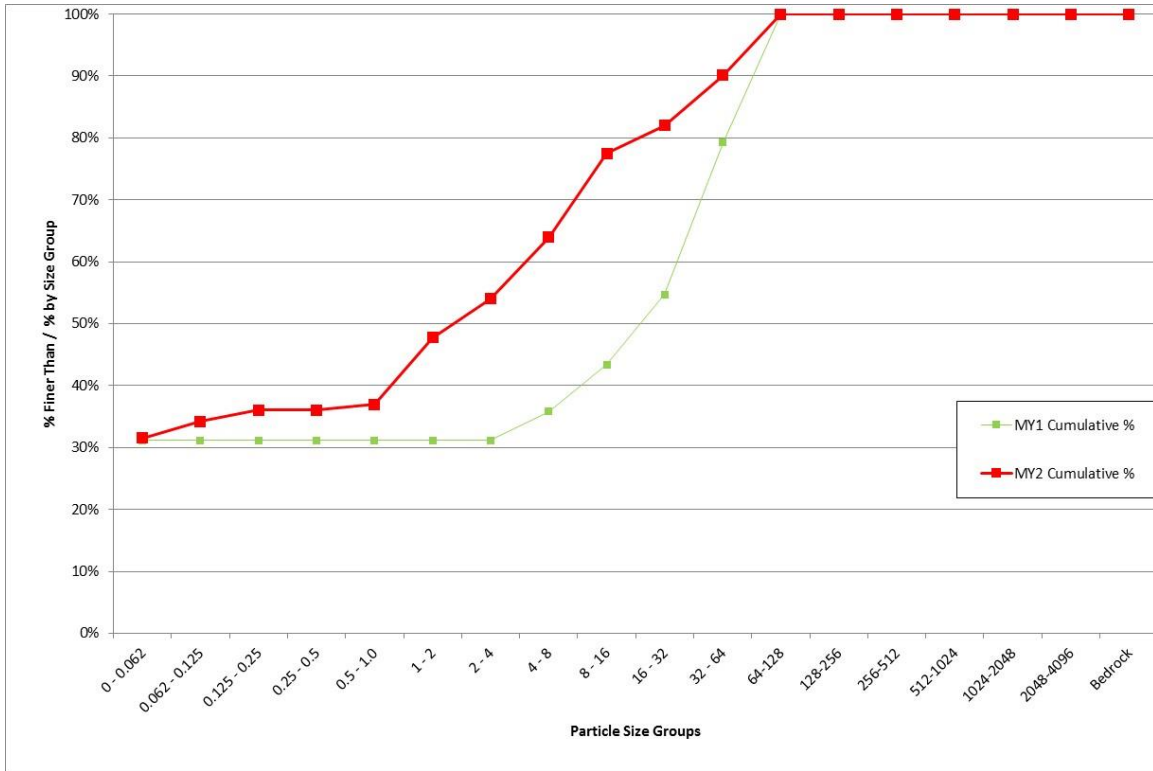


601 East Cross-Section 4 – Riffle  
Pebble Count Percent Individual

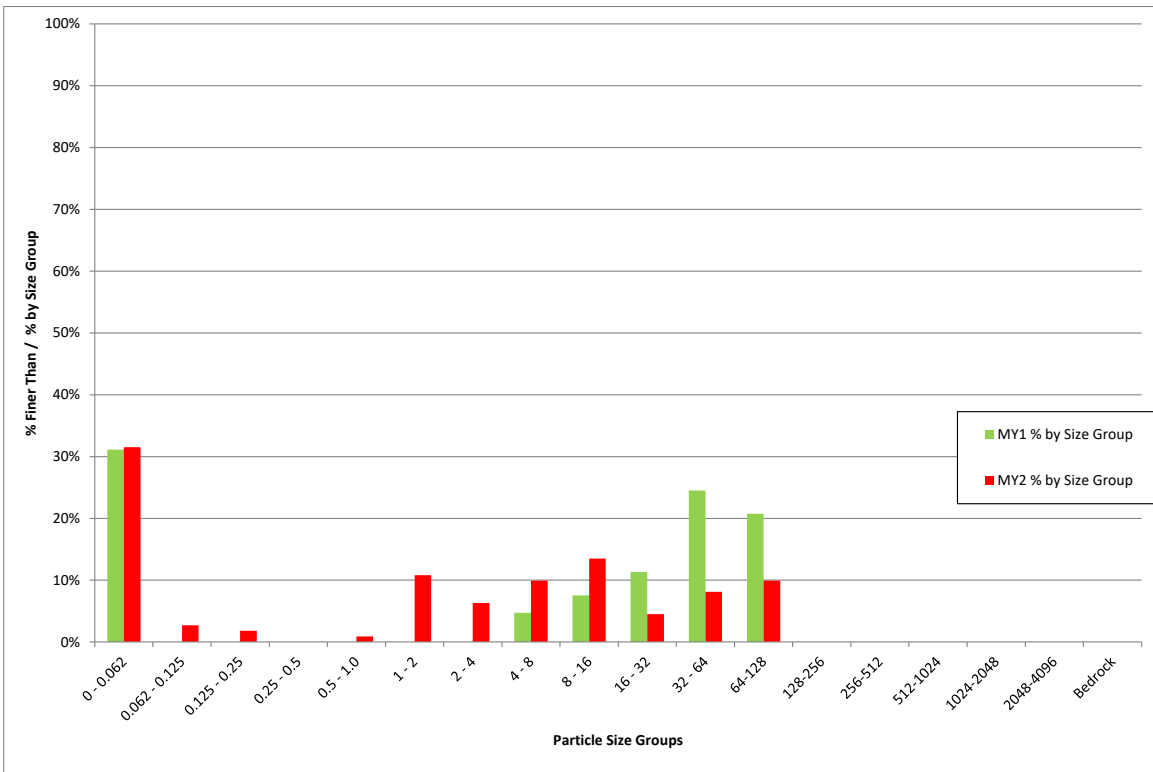


<b>601 East</b>			
<b>Cross Section 6 - Riffle</b>			
<b>Monitoring Year - 2016; MY2</b>			
<b>Bed Surface Material Particle Size Class (mm)</b>	<b>Number</b>	<b>% Individual</b>	<b>% Cumulative</b>
0 - 0.062	35	31.5%	32%
0.062 - 0.125	3	2.7%	34%
0.125 - 0.25	2	1.8%	36%
0.25 - 0.5	0	0.0%	36%
0.5 - 1.0	1	0.9%	37%
1 - 2	12	10.8%	48%
2 - 4	7	6.3%	54%
4 - 8	11	9.9%	64%
8 - 16	15	13.5%	77%
16 - 32	5	4.5%	82%
32 - 64	9	8.1%	90%
64-128	11	9.9%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
<b>Total</b>	<b>111</b>	<b>100%</b>	<b>100%</b>
<b>Summary Data</b>			
<b>D50</b>		<b>2.6</b>	
<b>D84</b>		<b>36</b>	
<b>D95</b>		<b>77</b>	

601 East Cross-Section 6 – Riffle  
Pebble Count Percent Cumulative



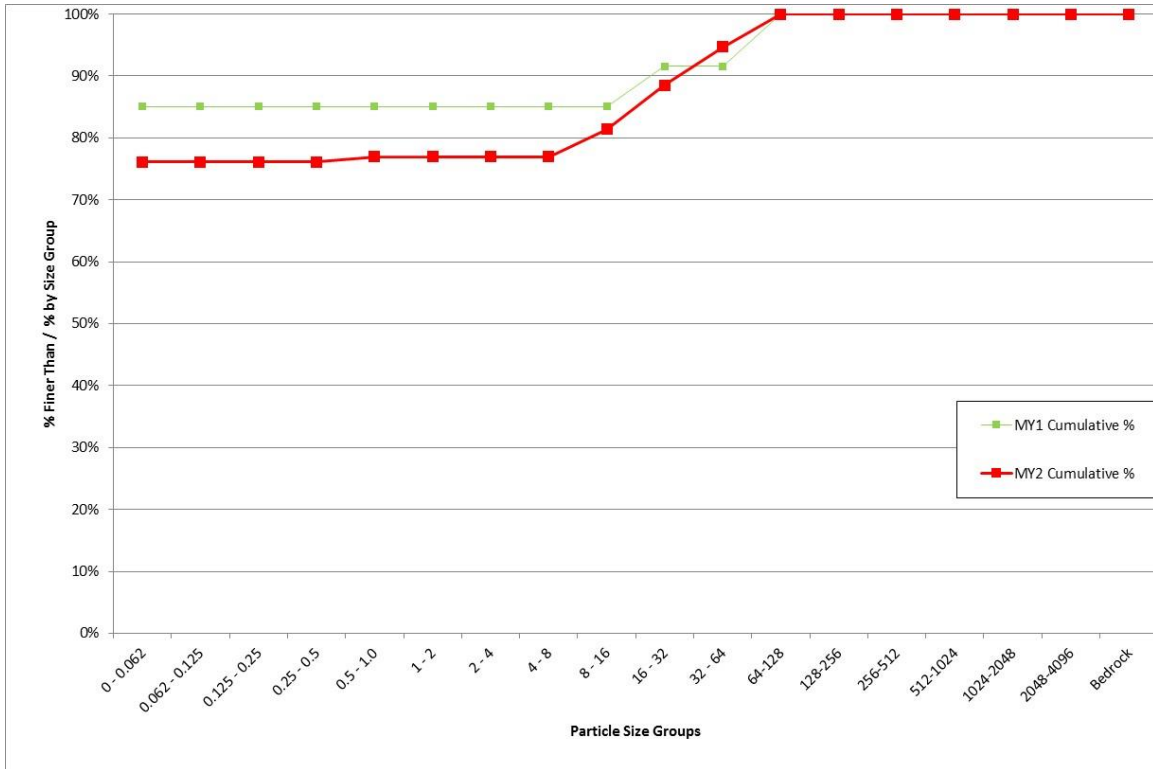
601 East Cross-Section 6 – Riffle  
Pebble Count Percent Individual



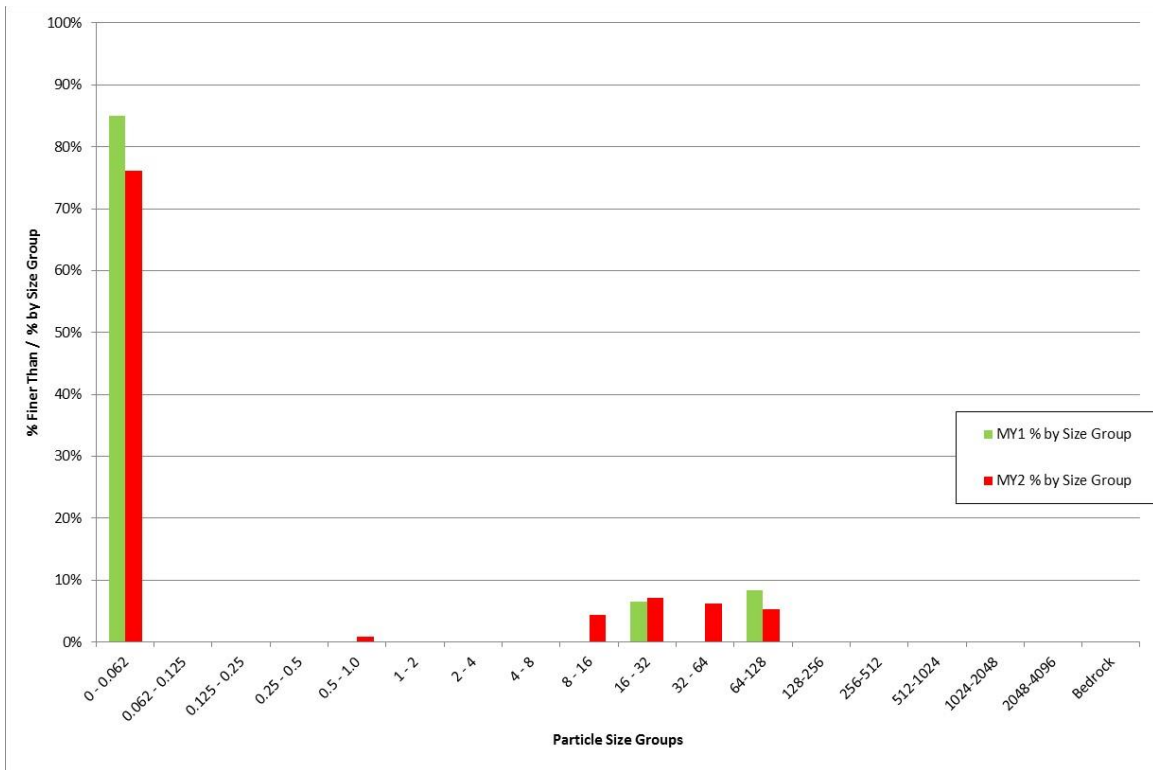


<b>601 East</b>			
<b>Cross Section 8 - Riffle</b>			
<b>Monitoring Year - 2016; MY2</b>			
<b>Bed Surface Material Particle Size Class (mm)</b>	<b>Number</b>	<b>% Individual</b>	<b>% Cumulative</b>
0 - 0.062	86	76.1%	76%
0.062 - 0.125	0	0.0%	76%
0.125 - 0.25	0	0.0%	76%
0.25 - 0.5	0	0.0%	76%
0.5 - 1.0	1	0.9%	77%
1 - 2	0	0.0%	77%
2 - 4	0	0.0%	77%
4 - 8	0	0.0%	77%
8 - 16	5	4.4%	81%
16 - 32	8	7.1%	88%
32 - 64	7	6.2%	95%
64-128	6	5.3%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
<b>Total</b>	<b>113</b>	<b>100%</b>	<b>100%</b>
		<b>Summary Data</b>	
		<b>D50</b>	<b>0.062</b>
		<b>D84</b>	<b>22</b>
		<b>D95</b>	<b>66</b>

601 East Cross-Section 8 – Riffle  
Pebble Count Percent Cumulative



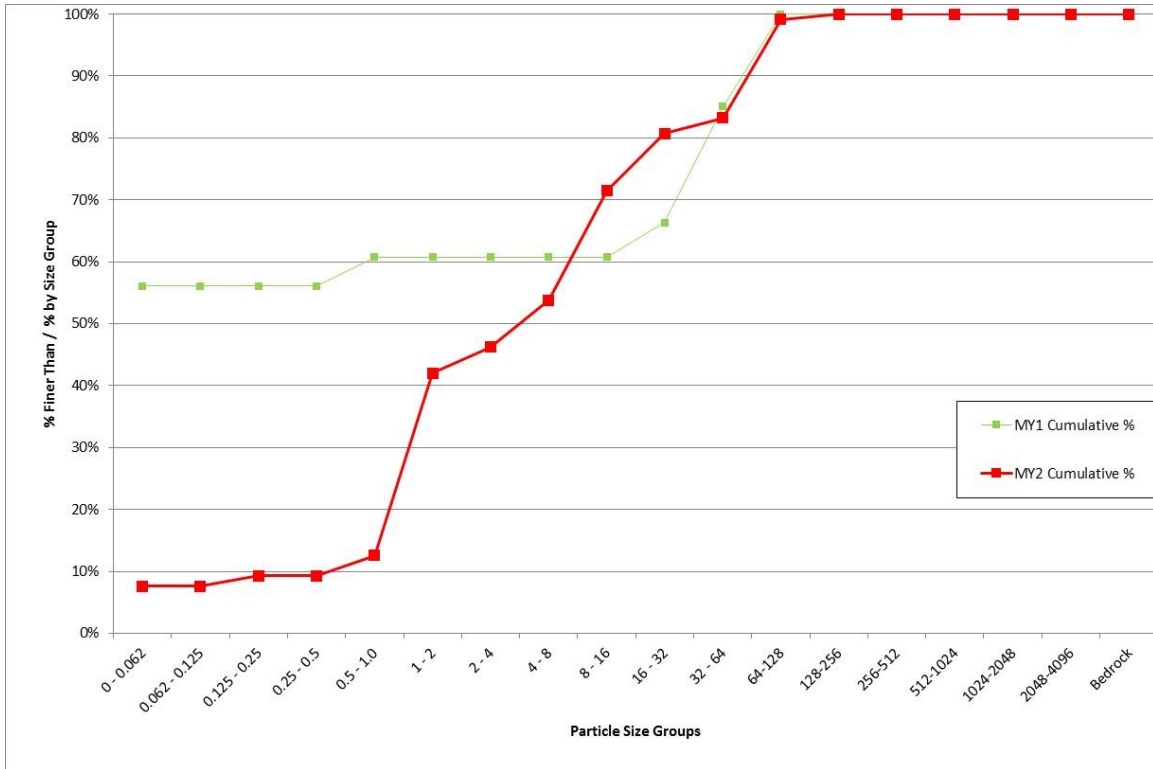
601 East Cross-Section 8 – Riffle  
Pebble Count Percent Individual



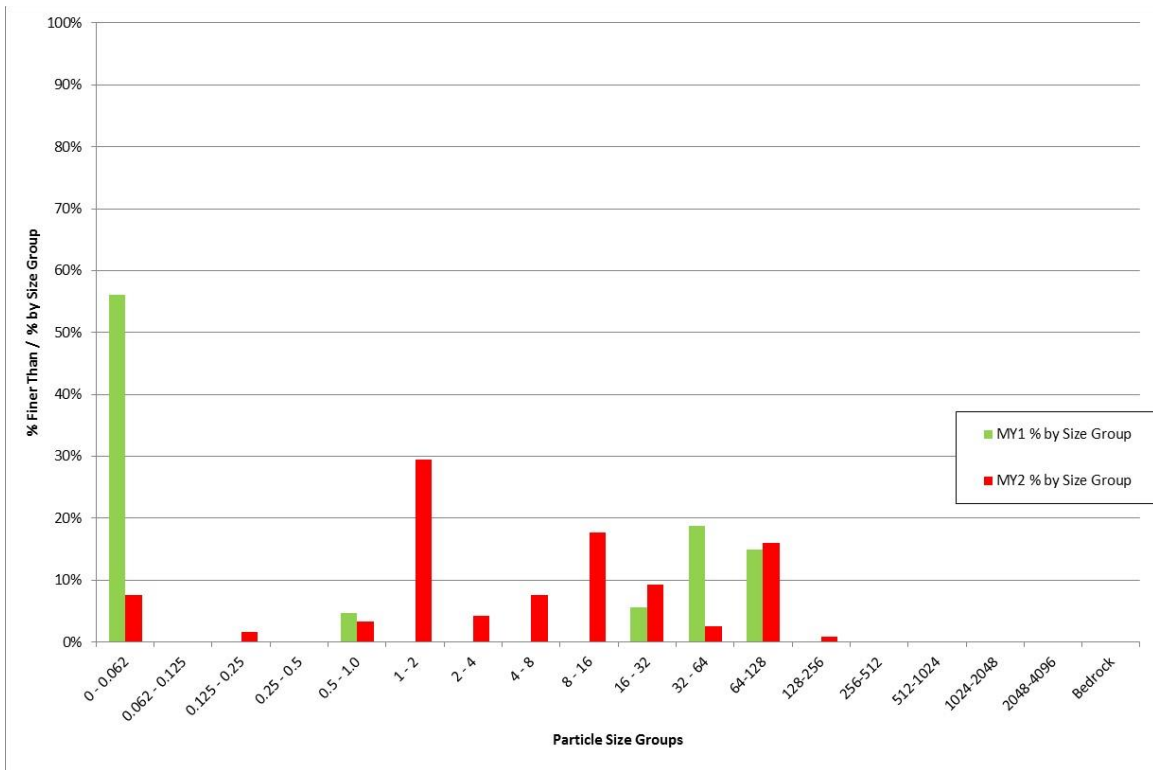
<b>601 East</b>			
<b>Cross Section 9 - Riffle</b>			
<b>Monitoring Year - 2016; MY2</b>			
<b>Bed Surface Material Particle Size Class (mm)</b>	<b>Number</b>	<b>% Individual</b>	<b>% Cumulative</b>
0 - 0.062	9	7.6%	8%
0.062 - 0.125	0	0.0%	8%
0.125 - 0.25	2	1.7%	9%
0.25 - 0.5	0	0.0%	9%
0.5 - 1.0	4	3.4%	13%
1 - 2	35	29.4%	42%
2 - 4	5	4.2%	46%
4 - 8	9	7.6%	54%
8 - 16	21	17.6%	71%
16 - 32	11	9.2%	81%
32 - 64	3	2.5%	83%
64-128	19	16.0%	99%
128-256	1	0.8%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
<b>Total</b>	<b>119</b>	<b>100%</b>	<b>100%</b>
		<b>Summary Data</b>	
		<b>D50</b>	<b>5.8</b>
		<b>D84</b>	<b>68</b>
		<b>D95</b>	<b>110</b>



601 East Cross-Section 9 – Riffle  
Pebble Count Percent Cumulative

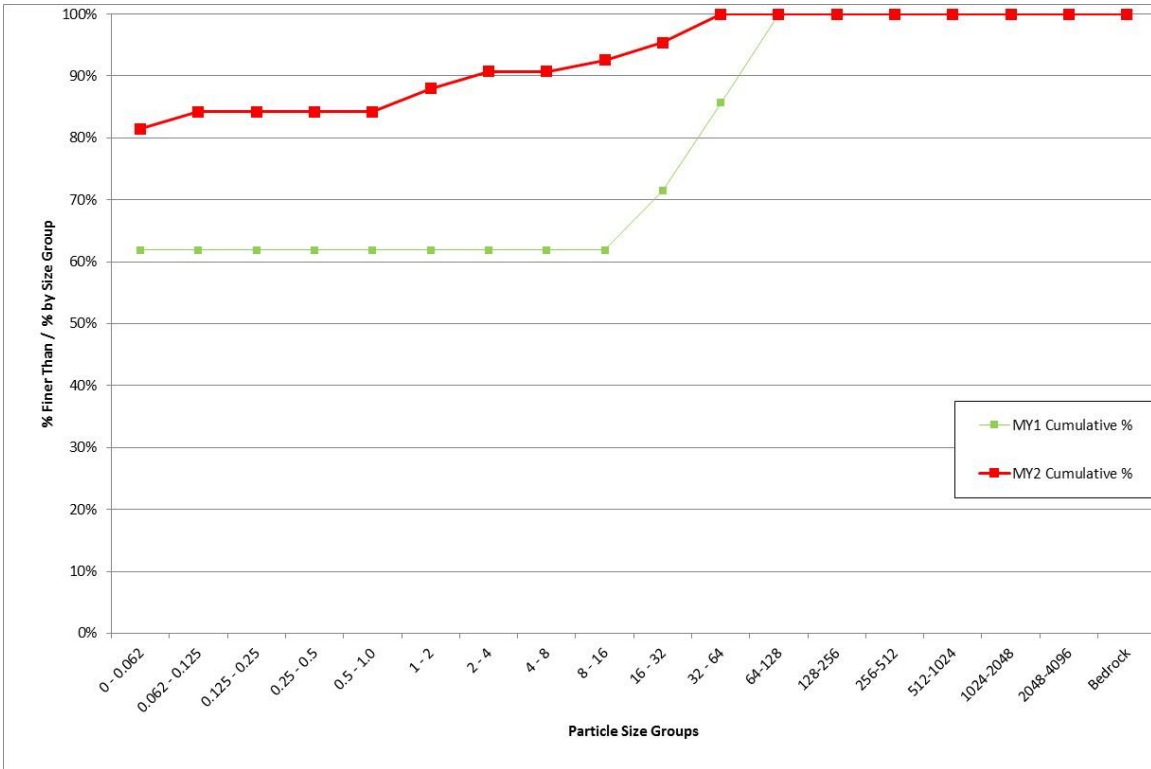


601 East Cross-Section 9 – Riffle  
Pebble Count Percent Individual

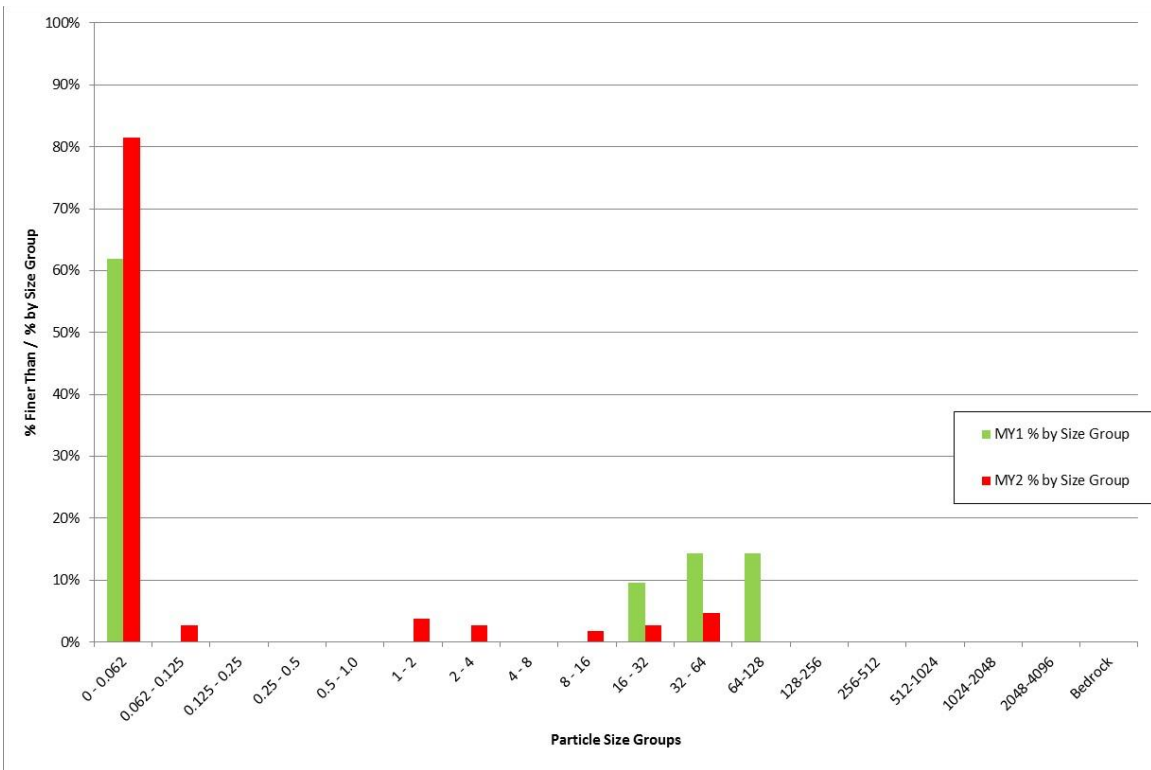


<b>601 East</b>			
<b>Cross Section 11 - Riffle</b>			
<b>Monitoring Year - 2016; MY2</b>			
<b>Bed Surface Material Particle Size Class (mm)</b>	<b>Number</b>	<b>% Individual</b>	<b>% Cumulative</b>
0 - 0.062	88	81.5%	81%
0.062 - 0.125	3	2.8%	84%
0.125 - 0.25	0	0.0%	84%
0.25 - 0.5	0	0.0%	84%
0.5 - 1.0	0	0.0%	84%
1 - 2	4	3.7%	88%
2 - 4	3	2.8%	91%
4 - 8	0	0.0%	91%
8 - 16	2	1.9%	93%
16 - 32	3	2.8%	95%
32 - 64	5	4.6%	100%
64-128	0	0.0%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
<b>Total</b>	<b>108</b>	<b>100%</b>	<b>100%</b>
<b>Summary Data</b>			
<b>D50</b>		<b>0.062</b>	
<b>D84</b>		<b>0.12</b>	
<b>D95</b>		<b>30</b>	

601 East Cross-Section 11 – Riffle  
Pebble Count Percent Cumulative



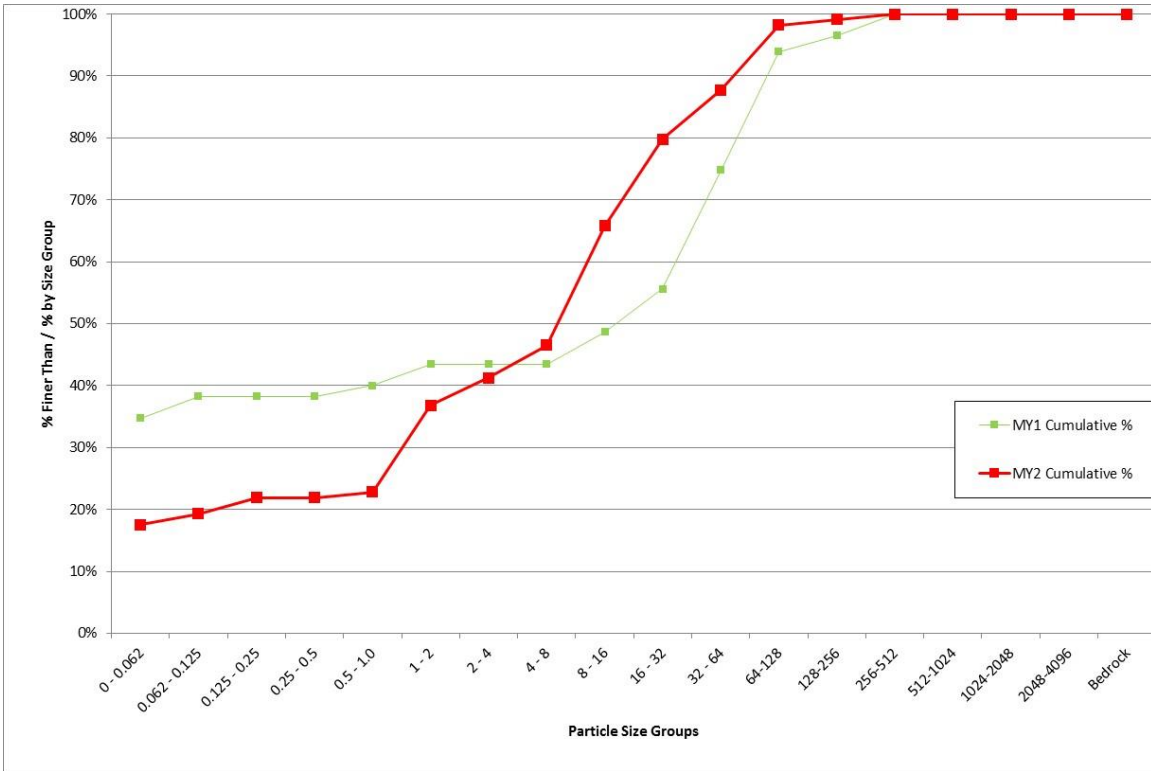
601 East Cross-Section 11 – Riffle  
Pebble Count Percent Individual



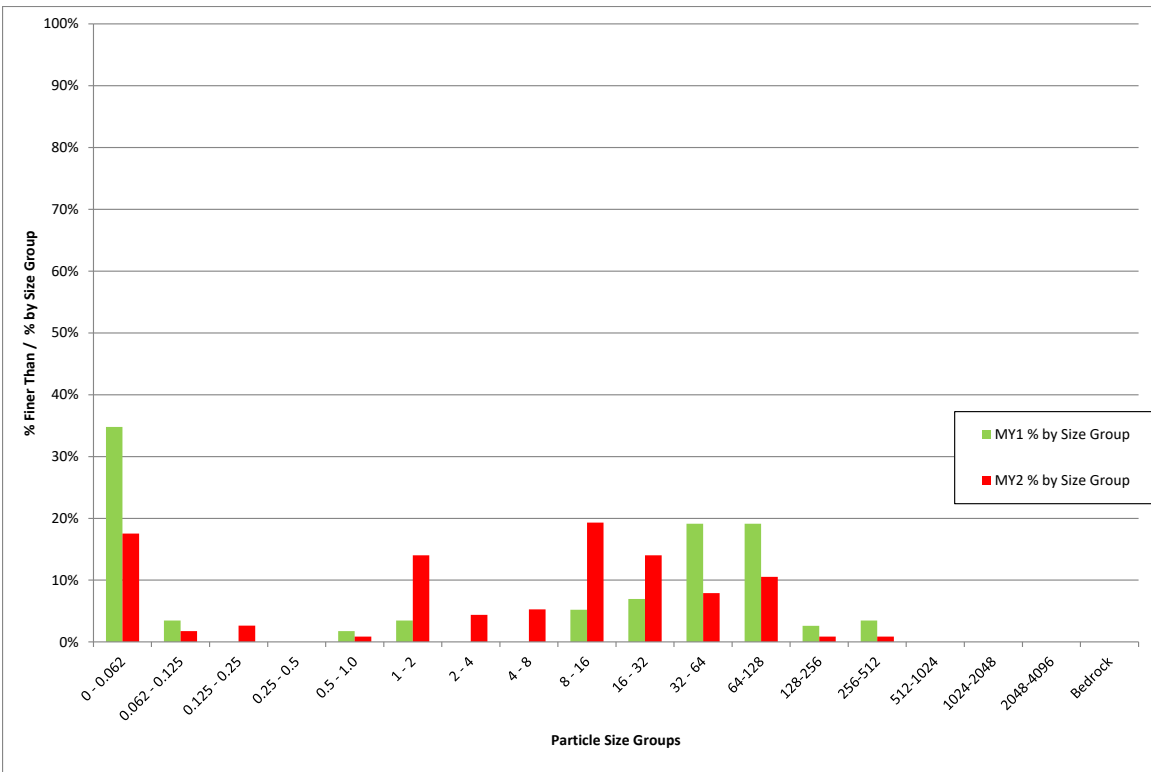


<b>601 East</b>			
<b>Cross Section 13 - Riffle</b>			
<b>Monitoring Year - 2016; MY2</b>			
<b>Bed Surface Material Particle Size Class (mm)</b>	<b>Number</b>	<b>% Individual</b>	<b>% Cumulative</b>
0 - 0.062	20	17.5%	18%
0.062 - 0.125	2	1.8%	19%
0.125 - 0.25	3	2.6%	22%
0.25 - 0.5	0	0.0%	22%
0.5 - 1.0	1	0.9%	23%
1 - 2	16	14.0%	37%
2 - 4	5	4.4%	41%
4 - 8	6	5.3%	46%
8 - 16	22	19.3%	66%
16 - 32	16	14.0%	80%
32 - 64	9	7.9%	88%
64-128	12	10.5%	98%
128-256	1	0.9%	99%
256-512	1	0.9%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
<b>Total</b>	<b>114</b>	<b>100%</b>	<b>100%</b>
		<b>Summary Data</b>	
		<b>D50</b>	<b>9.1</b>
		<b>D84</b>	<b>47</b>
		<b>D95</b>	<b>100</b>

601 East Cross-Section 13 – Riffle  
Pebble Count Percent Cumulative



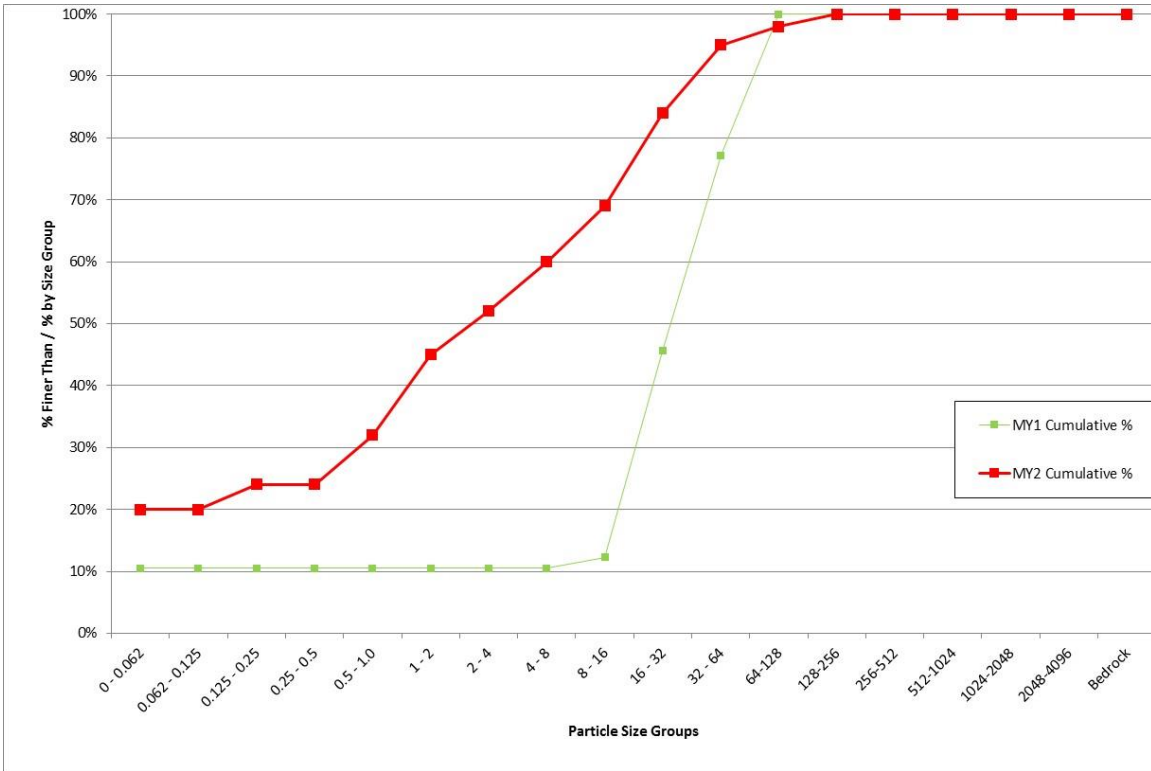
601 East Cross-Section 13 – Riffle  
Pebble Count Percent Individual



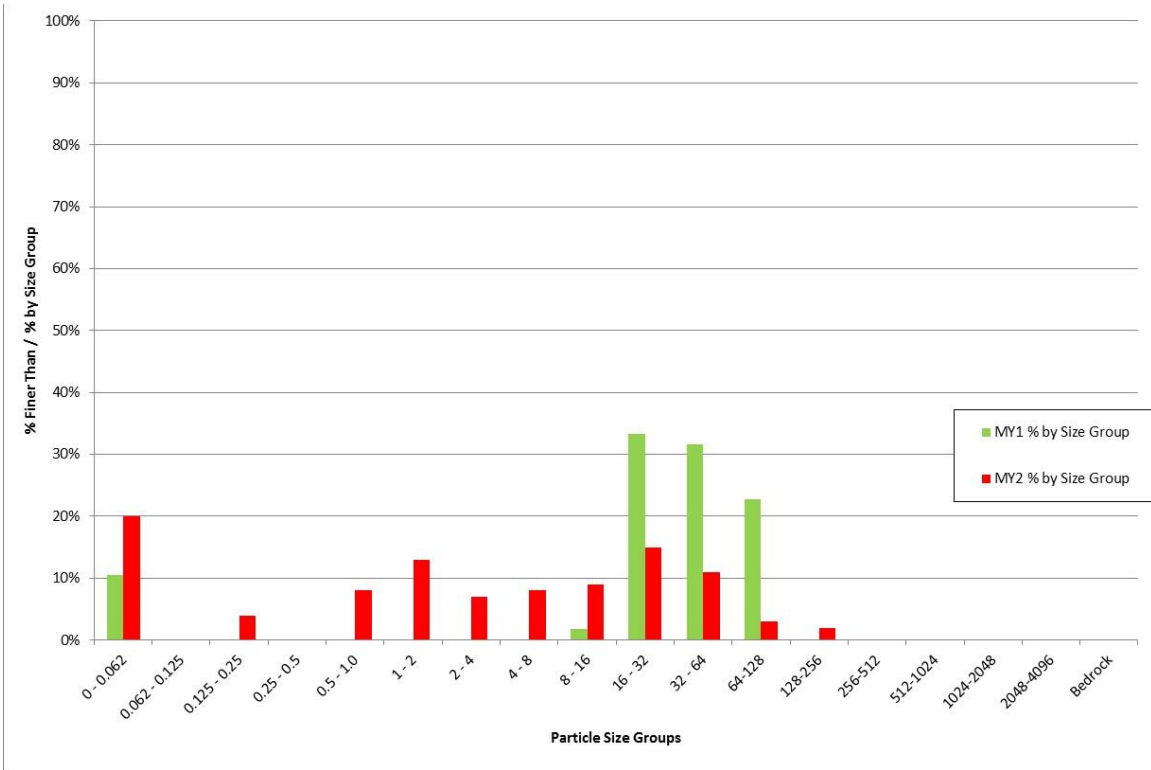
<b>601 East</b>			
<b>Cross Section 16 - Riffle</b>			
<b>Monitoring Year - 2016; MY2</b>			
<b>Bed Surface Material Particle Size Class (mm)</b>	<b>Number</b>	<b>% Individual</b>	<b>% Cumulative</b>
0 - 0.062	20	20.0%	20%
0.062 - 0.125	0	0.0%	20%
0.125 - 0.25	4	4.0%	24%
0.25 - 0.5	0	0.0%	24%
0.5 - 1.0	8	8.0%	32%
1 - 2	13	13.0%	45%
2 - 4	7	7.0%	52%
4 - 8	8	8.0%	60%
8 - 16	9	9.0%	69%
16 - 32	15	15.0%	84%
32 - 64	11	11.0%	95%
64-128	3	3.0%	98%
128-256	2	2.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
<b>Total</b>	<b>100</b>	<b>100%</b>	<b>100%</b>
		<b>Summary Data</b>	
		<b>D50</b>	<b>3.3</b>
		<b>D84</b>	<b>32</b>
		<b>D95</b>	<b>64</b>



601 East Cross-Section 16 – Riffle  
Pebble Count Percent Cumulative

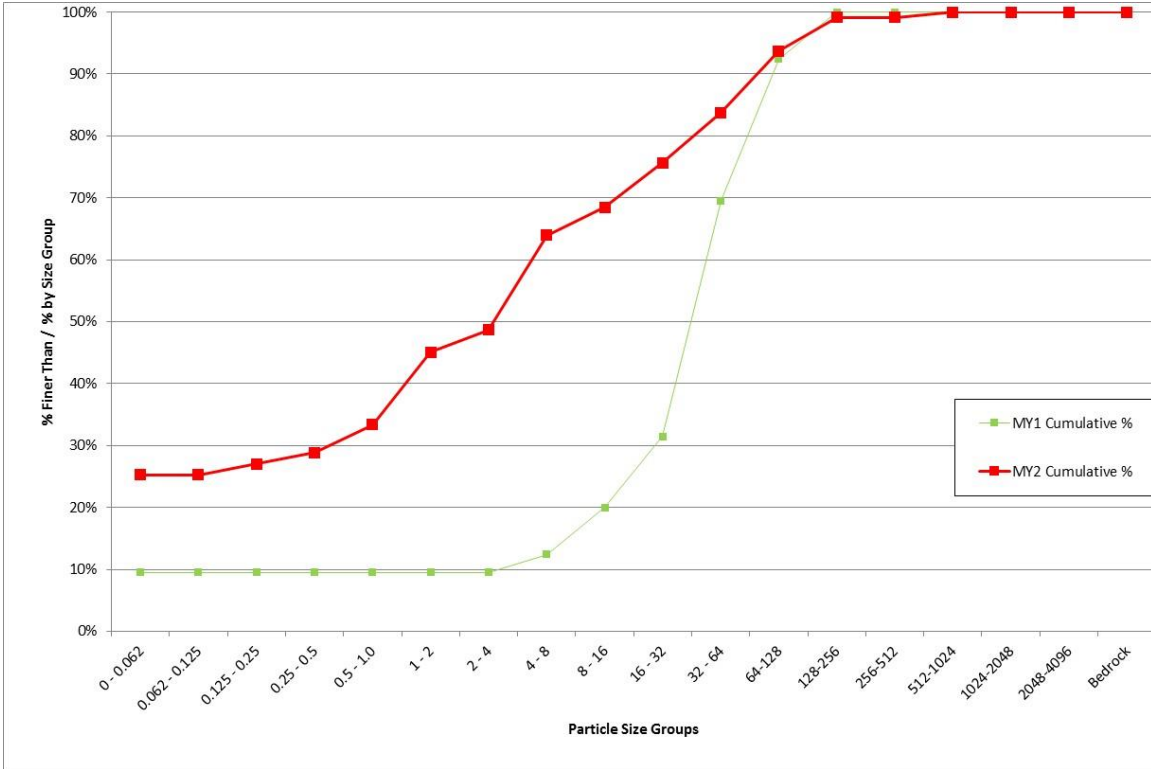


601 East Cross-Section 16 – Riffle  
Pebble Count Percent Individual

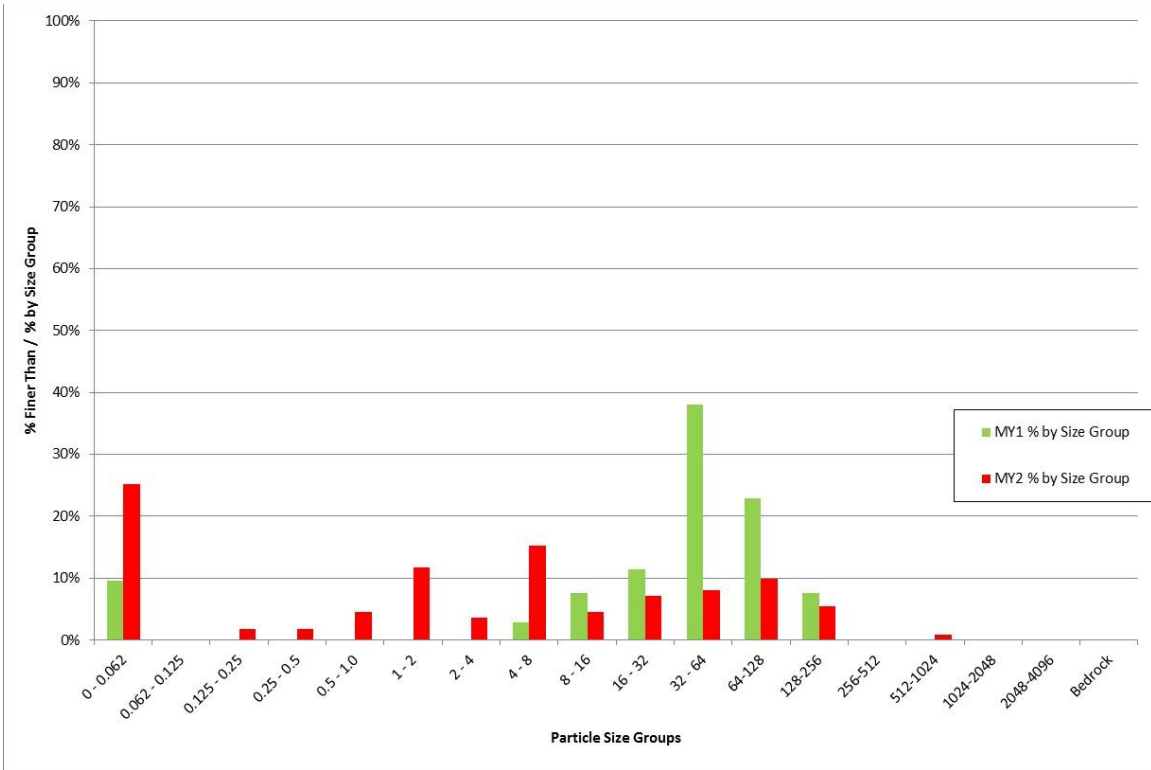


<b>601 East</b>			
<b>Cross Section 18 - Riffle</b>			
<b>Monitoring Year - 2016; MY2</b>			
<b>Bed Surface Material Particle Size Class (mm)</b>	<b>Number</b>	<b>% Individual</b>	<b>% Cumulative</b>
0 - 0.062	28	25.2%	25%
0.062 - 0.125	0	0.0%	25%
0.125 - 0.25	2	1.8%	27%
0.25 - 0.5	2	1.8%	29%
0.5 - 1.0	5	4.5%	33%
1 - 2	13	11.7%	45%
2 - 4	4	3.6%	49%
4 - 8	17	15.3%	64%
8 - 16	5	4.5%	68%
16 - 32	8	7.2%	76%
32 - 64	9	8.1%	84%
64-128	11	9.9%	94%
128-256	6	5.4%	99%
256-512	0	0.0%	99%
512-1024	1	0.9%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
<b>Total</b>	<b>111</b>	<b>100%</b>	<b>100%</b>
		<b>Summary Data</b>	
		<b>D50</b>	<b>4.2</b>
		<b>D84</b>	<b>66</b>
		<b>D95</b>	<b>140</b>

601 East Cross-Section 18 – Riffle  
Pebble Count Percent Cumulative



601 East Cross-Section 18 – Riffle  
Pebble Count Percent Individual



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# Appendix E

## Hydrologic Data

Table 13. Verification of Bankfull Events 601 East Stream Restoration Site				
Date of Data Collection	Date of Occurrence	Method	Feet Above Bankfull Elevation	Photo # (if available)
<b>Reach 2</b>				
November - 2015	Unknown <sup>1</sup>	Crest Gauge/ Wrack Lines	Unknown	-
March - 2016	Unknown	Crest Gauge	1.4	Figure 3
<b>Reach 3</b>				
March - 2016	Unknown	Crest gauge	0.2	Figure 4

<sup>1</sup>Suspected bankfull date 9/30/2015

**Photo Verification of Bankfull Events**



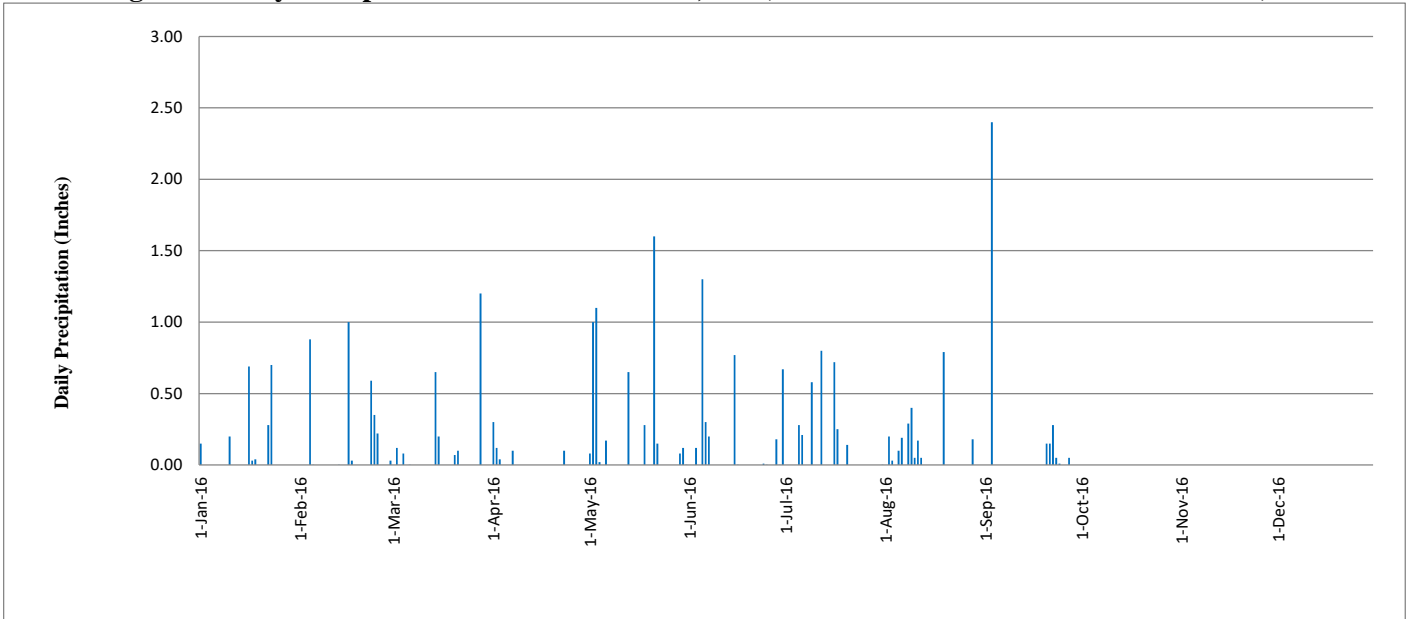
Reach 2 Crest Gauge

**Photo Verification of Bankfull Events**



R Reach 3 Crest Gauge

**Figure 3. Daily Precipitation Totals for Monroe, NC (CRONOS Station 315771 Monroe 2 SE)**



**Figure 4. Monthly Precipitation Data Compared to 30<sup>th</sup> and 70<sup>th</sup> Percentiles for Union County**

