Annual Monitoring Report

Monitoring Year 1 of 7

FINAL

Project Name: 601 East Stream Restoration
NCDMS Contract No.:004925
NCDMS Project No.: 95756

Union County, NC
Data Collected: September 2015 – November 2015
Date Submitted: November 2015

Submitted to:
North Carolina Division of Mitigation Services
DEQ-DMS, 1652 Mail Service Center Raleigh NC 27699-1652

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Prepared for:

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Contents

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1.0 PROJECT SUMMARY

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 miles (354 acres). Land use within the watershed is predominately used for agriculture with the remaining land use composed of low density residential and forested areas.

The project goals and objectives listed below were established in the 601 East Mitigation Plan and outlined in the "601 East Stream Restoration Baseline Monitoring Document and As-Built Baseline Report Final" (Resource Environmental Solutions, LLC 2015).

The project goals address the stressors identified in the Targeted Local Watershed 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 though the 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 a diverse native riparian buffer
- Removal of invasive exotic plant species
- Secure a protective conservation easement and establish fencing as needed

Monitoring Year 1 (MY1) data was collected from September to November 2015. Monitoring activities included visual assessment of all reaches and the surrounding easement, 20 permanent photo stations, ten permanent vegetation monitoring plots, eighteen cross-sections, and nine pebble counts.

Generally, visual assessment of the project as a whole indicates that the project is performing as desired. Summary tables and permanent photo station photos associated with the visual assessment are located in Appendix B. With the exception of a few bare area, totaling 0.08 acres, vegetation is becoming well

established throughout the easement (Figure 2 and Table 6). These bare areas consist mainly of small ditches that have migrated into the easement, each coinciding with existing ditches from outside the easement. No rip rap or grade control structures were observed, however RES will coordinate to make repairs in the coming monitoring year. Bare areas associated with ditches will be matted and seeded and grade control will be installed as necessary to stabilize channels within the easement.. At the downstream portion of Reach 2, a large plot of cattails was noted below XS-12, creating a monoculture within the wetland area. Additionally, an area of honeysuckle and privet were noted at the upper end of Reach 2, totaling 0.16 acres. Treatment is scheduled for spring 2016. Planted stems were difficult to assess with dense herbaceous vegetation covering the stems throughout most of the easement, however areas of sparse vegetation were noted during MY1 (Table 6 and Figure 2). These conditions are typical of a new mitigation site until the vegetation becomes established following construction activities. These areas will continue to be monitored in subsequent site visits. Encroachment was noted on Reaches 3 and 4, where an ATV had driven across the easement and tractors had turned into the easement while planting adjacent fields. RES is currently coordinating with the landowners and will be installing additional signage marking the easement in spring of 2016.

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. Visual assessment of this reach indicate that structures are performing as designed, stabilizing incision and capturing sediment from the upstream contributing area. No indications of new incision were observed during the assessment. Thus far, the settling areas are not in need of maintenance; however they will be assessed during upcoming site visits and maintained if needed.

Monitoring of permanent vegetation monitoring plots (n = 10) was completed during September 2015. Summary tables and photographs associated with MY1 monitoring are located in Appendix C. MY1 monitoring data indicates 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 Table 9). Stem densities ranged from 283 to 850 stems per acre with a mean of 469 stems per acre across all plots. When volunteer stems are included, the annual mean increases to 498 stems per acre. A total of 14 species were documented within the monitoring plots.

Geomorphic data for MY1 was collected during September 2015. Summary tables and cross-section plots related to stream morphology are located in Appendix D. With the exception of XS-13, noticeable change in the cross-section data between MY0 and MY1 were limited to pools (Appendix B, Table 11a). With the exception of XS-5, all pool cross sections showed an increase in bankfull width, ranging from 0.3 feet to 1.5 feet. Pebble counts indicate that six of the nine riffle cross sections sampled fall within the medium to very coarse gravel range. The other three cross sections indicate that silt deposition is occurring in riffles in the downstream portion of Reach 1 and Reach 2, with a D_{50} falling within the silt particle size class. This can be attributed to an herbaceous layer forming in the channel and trapping silt runoff from the adjacent field as well as low flows between the baseline and MY1 monitoring events, which allows for little sediment transport. Substrate will be monitored in future years for shifts in composition. The bank pin arrays indicate that no erosion is taking place in the pools with the exception of the downstream end of XS-7. Field data indicated that there was localized erosion around the downstream pin at XS-7, at a rate of 0.02 ft/year (Table 12). This likely can be attributed to the bent bank pin, and is not cause for concern.

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

For MY1, visual assessment was performed during the morph and vegetation collection event. For future monitoring years, visual assessment of the project will be 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 outlined in the Harrelson et al (1994) and processed using Microsoft Excel.

Vegetation success is being monitored using 10 permanent monitoring plots. Vegetation monitoring follows the CVS-EEP Level 1 Protocol for MY1 and will follow Level 2 Protocol for monitoring years 2-7 for Recording Vegetation, version 4.2 (Lee et al. 2008) and includes analysis of 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 are 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, 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 corkline 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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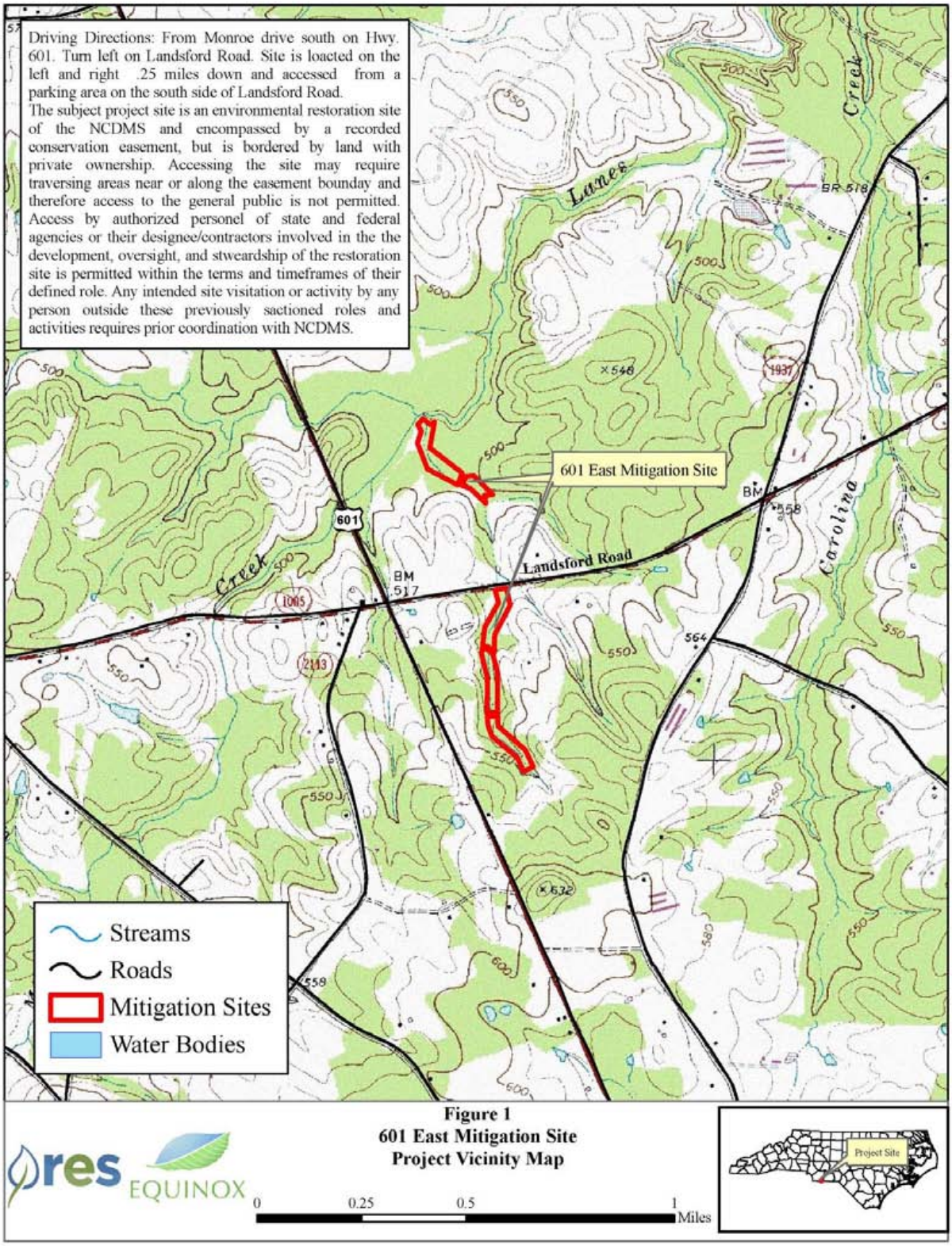

Figure 1
601 East Mitigation Site
Project Vicinity Map

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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
November 2015

Crest Gauge
Thalweg
Top of Bank
Log Vane
Degradation
Bank Erosion
Sheet Boundary
Easement
Bare Area
Encroachment
Invasives Present

Vegetation Plots
Criteria Met
Criteria Unmet

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

0 75 150 300 450 600 Feet

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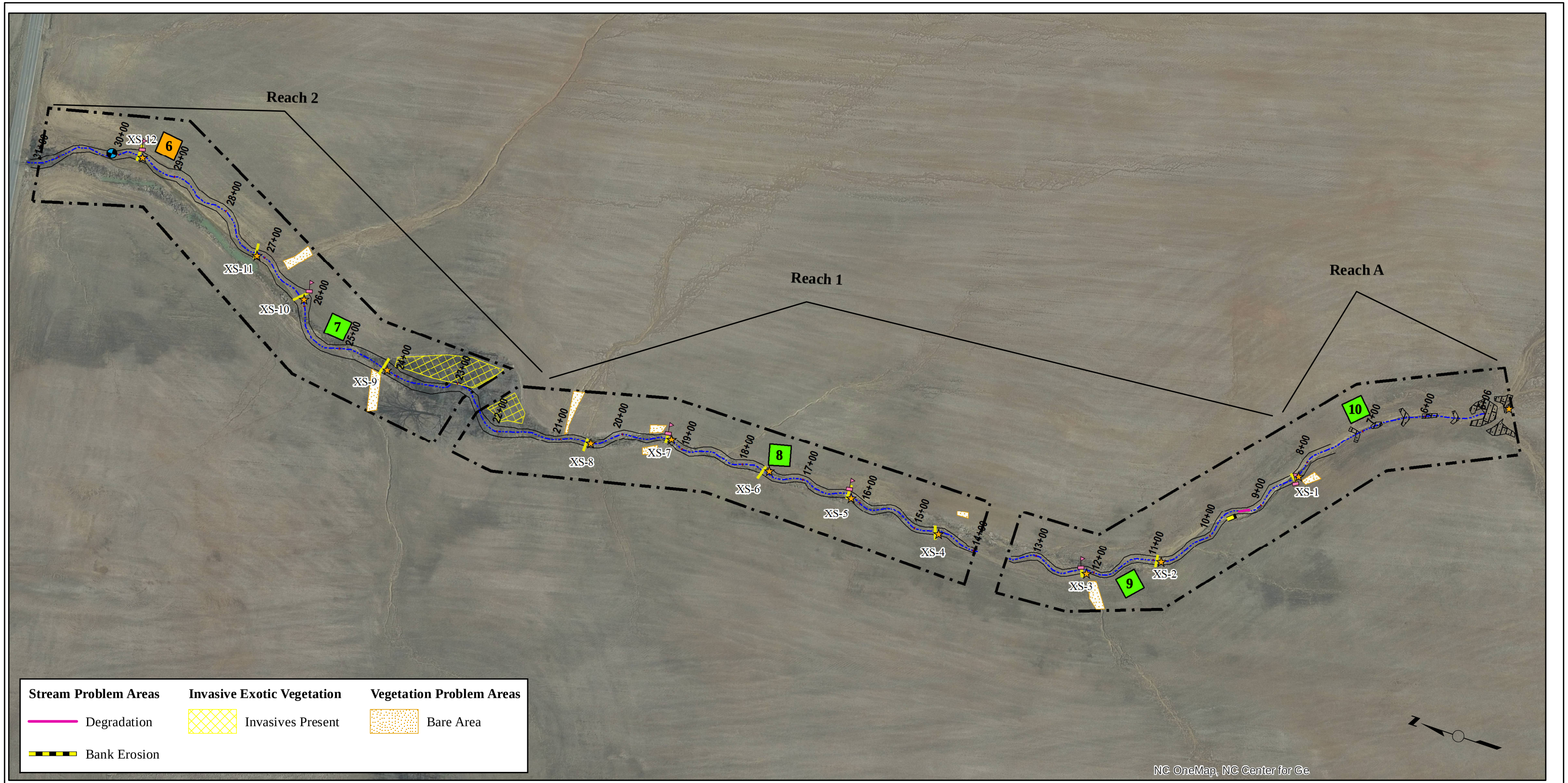

Figure 2. Current Condition Plan View
Sheet 1 of 2
601 East Stream Restoration Site
Union County, North Carolina
NCDMS Contract No. 004925
NCDMS Project No.: 95756
November 2015

Crest Gauge
Photo Point
Bankpin Array
Cross-Section
Thalweg
Top of Bank
BMP
Easement

Vegetation Plots
Criteria Met
Criteria Not Met

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

0 75 150 300 Feet

Prepared for:

Prepared by:

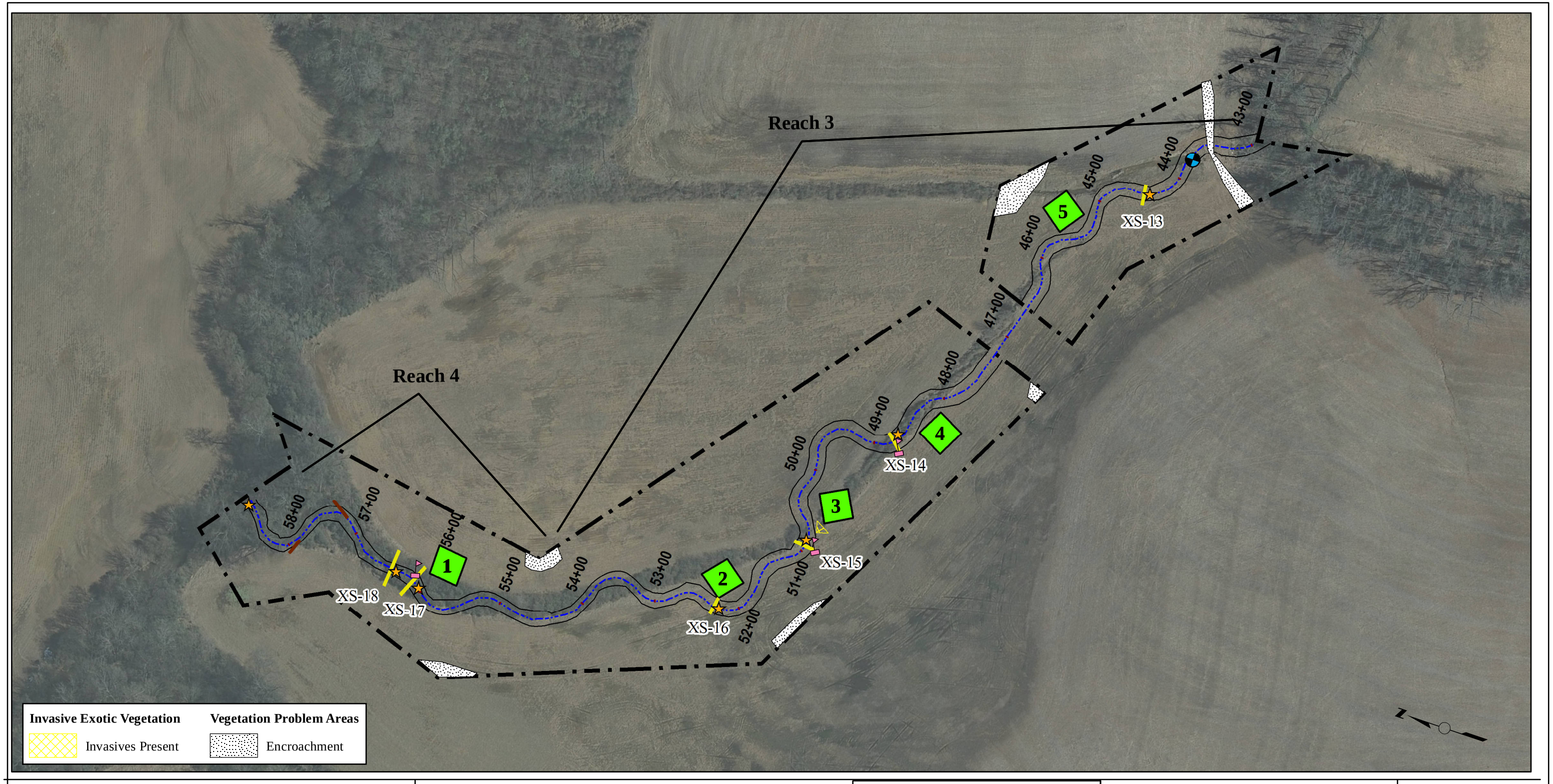

Figure 2. Current Condition Plan View
Sheet 2 of 2
601 East Stream Restoration Site
Union County, North Carolina
NCDMS Contract No. 004925
NCDMS Project No.: 95756
November 2015

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.

0 50 100 200 Feet

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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	E1	85	1 :1.5	57
Reach 1c Perennial	11+95 – 13+47	136	Enhancement	E1	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	E1	45	1 : 1.5	30
Reach 2b Perennial	22+75 – 24+02	125	Enhancement	E1	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

BMP Elements

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		
Activity or Deliverable	**Data Collection Complete**	**Completion or Delivery**
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
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

Table 3. Project Contact Table 601 East Stream Restoration Site	
Designer Primary project design POC	Ward Consulting Engineers, P.C. (WCE) 4805 Green Road, Suite 100, Raleigh, NC 27616 Becky Ward (919) 870-0526
Construction Contractor Construction contractor POC	Wright Contracting P.O. Box 545, Siler City, NC 27344 Joseph Wright (919) 663-0810
Planting Contractor Planting contractor POC	H & J Forest Services 1416 Ocean Boulevard, Holly Ridge, NC 28445 (910) 512-6754
Construction Survey Contractor Survey contractor POC	Turner Land Survey, PLLC 3719 Benson Drive, Raleigh, NC 27629 Elizabeth Turner (919) 827-0745
Seeding Contractor Construction contractor POC	Wright Contracting P.O. Box 545, Siler City, NC 27344 Andrew Dimmette (919) 663-0810
Seed Mix Sources	Green Resource - Raleigh, NC As Purchased by EBX (919) 829-9909 x 213
Nursery Stock Suppliers	Arbor Gen - Blenheim, SC (800) 222-1290
	NC Forest Service Nursery - Goldsboro, NC (888) 628-7337
[Baseline] Monitoring Performers	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) 2015	Equinox 37 Haywood Street, Suite 100 Asheville, NC 28801
Stream Monitoring POC	Hunter Terrell (828) 253-6856
Vegetation Monitoring POC	Hunter Terrell (828) 253-6857

Table 4. Project Baseline Information and Attributes 601 East Stream Restoration Site				
Project Information				
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		
Project Watershed Summary Information				
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		
Reach Summary Information				
Parameters	**Reach 1**	**Reach 2**	**Reach 3**	**Reach 4**
Length of reach (LF)	1418, 1393 LF Restored	906, 902 LF Restored	1080, 1018 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 Perrenial: 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

Table 4 con't. Project Baseline Information and Attributes 601 East Stream Restoration Site			
Wetland Summary Information			
Parameters	**Wetland 1**		
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	**Herbaceous**-Vegetation is domninated by herbaceous vegetation such as Cattail (*Typha latifolia*), Bulrush (*Scirpus cyperinus*), Common Rush (*Juncus effuses*). Some tree species such as Black Willow (*Salix nigra*), and Red Maple (*Acer rubrum*) are present in the wetland margins.		
Percent composition of exotic invasive vegetation	**95%** -The invasive Parrot Feather (*Miriophyllum aquaticum*) is dominant throughout the wetland where there is standing water.		
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
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 1393 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**
1. Bed	**1. Vertical Stability** (Riffle and Run Units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. Degradation - Evidence of downcutting.			1	15	99%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate.	32	32			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	33	33			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	33	33			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	33	33			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	33	33			100%			
2. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			1	15	99%	0	0	97%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	1	15	99%	N/A	N/A	N/A
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	N/A	N/A			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	N/A	N/A			N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	N/A	N/A			N/A			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 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**
1. Bed	**1. Vertical Stability** (Riffle and Run Units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. Degradation - Evidence of downcutting.			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate.	16	16			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	17	17			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	17	17			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	17	17			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	17	17			100%			
2. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	N/A	N/A			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	N/A	N/A			N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	N/A	N/A			N/A			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 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 1018 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
1. Bed	**1. Vertical Stability** (Riffle and Run Units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. Degradation - Evidence of downcutting.			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate.	18	18			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	18	18			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	18	18			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	18	18			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	18	18			100%			
2. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	N/A	N/A			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	N/A	N/A			N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	N/A	N/A			N/A			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 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
1. Bed	**1. Vertical Stability** (Riffle and Run Units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. Degradation - Evidence of downcutting.			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate.	9	9			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	9	9			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	9	9			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	9	9			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	9	9			100%			
2. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
				Totals	0	0	100%	N/A	N/A	N/A
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 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**
1. Bare Areas	Very limited cover of both woody and herbaceous material.	N/A	0	0.08	1%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	N/A	0	0.00	0%
		Totals	0	0.08	1%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	N/A	0	0.00	0%
		Cumulative Totals	0	0.08	1%
Vegetation Category	**Definitions**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	Cross Hatch (Red - Dense/Yellow - Present)	0	0.16	1%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	N/A	0	0.12	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+50 Left Descending Bank

Project Reach 1 – Headcut/ Degradation 9+25

Project Reach 1 – Bank Erosion 9+50

Project Reach 1 – Ditch/ Bare Area 12+00 Left Descending Bank

Project Reach 1 – Ditch/ Bare Area 20+75 Right Descending Bank

Project Reach 2 – Bare Area/ Ditch 24+25 Left Descending Bank

Project Reach 3 – Encroachment 43+50

Project Reach 3 – Encroachment 45+50

Project Reach 3 – Encroachment 47+50 Left Descending Bank

Project Reach 3 – Encroachment 51+50 Left Descending Bank

Appendix C
Vegetation Plot Data

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

Table 8. CVS Vegetation Plot Metadata 601 East Stream Restoration Site	
Report Prepared By	Drew Alderman
Date Prepared	9/21/2015 10:48
database name	Equinox-2015-A-601East.mdb
database location	Z:\ES\NRI&M\EBX Monitoring\601_East\MY1-2015\Data\Veg
computer name	FIELD-PC
file size	44625920
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY	
Project Code	95756
project Name	601 East
Description	
River Basin	Yadkin-Pee Dee
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	10

Table 9. Planted Total Stem Counts (Species by Plot with Annual Means)
601 East Stream Restoration Site

			Current Plot Data (MY1 2015)																											Annual Means					
			Plot 1			Plot 2			Plot 3			Plot 4			Plot 5			Plot 6			Plot 7			Plot 8			Plot 9			Plot 10			MY1 (2015)			MY0 (2015)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Asimina triloba	Pawpaw	Tree																											1	1	1	1	1	1	2	2	2
Betula nigra	River Birch	Tree	2	2	2							3	3	3							1	1	1	2	2	2	6	6	6				14	14	14	24	24	24
Cephalanthus occidentalis	Common Buttonbush	Shrub																1	1	1	1	1	1							2	2	2	4	4	4	6	6	6
Fraxinus pennsylvanica	Green Ash	Tree													1	1	1										2	2	2				3	3	3	3	3	3
Liriodendron tulipifera var.	Tulip-tree, Yellow Poplar, Whitewood	Tree	1	1	1	2	2	2	3	3	3	3	3	3	2	2	2				3	3	3							2	2	2	16	16	16	30	30	30
Nyssa sylvatica	Blackgum	Tree													2	2	2	1	1	1													3	3	3	18	18	18
Platanus occidentalis var.	Sycamore, Plane-tree	Tree	6	6	6	13	13	13	10	10	10	3	3	3	4	4	4							3	3	3				8	8	8	47	47	47	58	58	58
Populus deltoides var. delt	Eastern Cottonwood					1	1	1		2	2																						1	3	3	1	8	8
Quercus	Oak	Tree							1	1	1							4	4	4	1	1	1	1	1	1	1	1	1	1	1	1	9	9	9	12	12	12
Quercus michauxii	Swamp Chestnut Oak	Tree				4	4	4										1	1	1	4	4	4							1	1	1	10	10	10	20	20	20
Quercus phellos	Willow Oak	Tree	1	1	1																1	1	1	2	2	2				1	1	1	5	5	5	26	26	26
Quercus rubra	Northern Red Oak	Tree	1	1	1																												1	1	1			
Quercus velutina	Black Oak	Tree	1	1	1	1	1	1																									2	2	2			
Salix nigra	Black Willow	Tree								5	5																							5	5			
		Stem count	12	12	12	21	21	21	14	21	21	9	9	9	9	9	9	7	7	7	11	11	11	8	8	8	9	9	9	16	16	16	116	123	123	200	207	207
		size (ares)	1			1			1			1			1			1			1			1			1			1			10			10		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.25			0.25		
		Species count	6	6	6	5	5	5	3	5	5	3	3	3	4	4	4	4	4	4	6	6	6	4	4	4	3	3	3	7	7	7	13	14	14	11	11	11
		Stems per ACRE	486	486	486	850	850	850	567	850	850	364	364	364	364	364	364	283	283	283	445	445	445	324	324	324	364	364	364	647	647	647	469	498	498	800	828	828

[1]PnoLS: No livestakes included in tally; P-all: All planted stems included in tally; T: Total stems including recruitment.

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

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601 East - Vegetation Monitoring Plot 1
September 3, 2015

601 East - Vegetation Monitoring Plot 2
September 3, 2015

601 East - Vegetation Monitoring Plot 3
September 3, 2015

601 East - Vegetation Monitoring Plot 4
September 3, 2015

601 East - Vegetation Monitoring Plot 5
September 3, 2015

601 East - Vegetation Monitoring Plot 6
September 3, 2015

601 East - Vegetation Monitoring Plot 7
September 3, 2015

601 East - Vegetation Monitoring Plot 8
September 3, 2015

601 East - Vegetation Monitoring Plot 9
September 3, 2015

601 East - Vegetation Monitoring Plot 10
September 3, 2015

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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 (1393 feet)

Parameter	Gauge	Regional Curve			Pre- Existing Conditions						Reference Reach(es) Data						Design			As-built / Baseline					
Dimension and Substrate - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)					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^2)					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)																									
Profile																									
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^3)																									
Pattern																									
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		
Substrate, bed and transport parameters																									
Ri%/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/di^p/di^{sp} (mm)					2.71	6.72	10.56	24.89	38.23																
Reach Shear Stress (competency) lb/f^2																									
Max part size (mm) Mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
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)					1425						378														
Channel Thalweg length (ft)					1479						440						1438			1438					
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 (%)																									
Entenchment 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					
Dimension and Substrate - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)					7	21		19			10	12.2		14.3				12		15.50	19.73	19.63	24.18	3.56	4
Floodprone Width (ft)					40	60		214			42	77		11			48	91.5	135	62.00	108.75	102.50	168.00	50.05	4
Bankfull Mean Depth (ft)					0.5	0.5		1.33			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		1.9			1.2	1.6		2.2				1.5		1.49	2.01	2.02	2.53	0.58	4
Bankfull Cross Sectional Area (ft^2)					6	1		21			12.2	13		13.4				10.7		9.43	18.42	19.49	25.26	6.75	4
Width/Depth Ratio					6.1	27		38			7.7	11.3		15.6				13.3		14.64	23.00	22.13	33.10	8.07	4
Entrenchment Ratio					2.2	2.4		10			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	0.34		1.7			1.1	1.5		1.7				1		0.90	0.96	0.96	1.00	0.05	4
d50 (mm)																									
Profile																									
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^3)																									
Pattern																									
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		
Rc: 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		
Substrate, bed and transport parameters																									
Ri%/Ru%/P%/G%/S%					12.6%		87.4%		0.0%		27.2%	3.7%	61.5%	7.6%	0%					39.5%		60.5%		0.0%	
SC%/Sa%/G%/C%/B%/Be%					0.0%	33.7%	66.3%	0.0%	0.0%	0.0%															
d16/d35/d50/d84/d95/di^b/di^{sp} (mm)					0.90	4.57	8.92	24.42	47.93																
Reach Shear Stress (competency) lb/f^2																									
Max part size (mm) Mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
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)					1479						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 (%)																									
Entenchment 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 RestorationSite - Reach 3 (1018 feet)

Parameter	Gauge	Regional Curve			Pre- Existing Conditions						Reference Reach(es) Data						Design			As-built / Baseline					
Dimension and Substrate - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)					65	15.7		29			10	12.2		14.3				17		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^2)					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)																									
Profile																									
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^3)																									
Pattern																									
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		
Rc: 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		
Substrate, bed and transport parameters																									
Ri%/Ru%/P%/G%/S%					38.0%		62.0%		0.0%		27.2%	3.7%	61.5%	7.6%	0.0%					43.0%		57.0%		0.0%	
SC%/Sa%/G%/C%/B%/Be%					4.0%	51.9%	44.1%	0.0%	0.0%	0%															
d16/d35/d50/d84/d95/di^p/di^{sp} (mm)					0.8	3.5	5.4	12.8	19.6																
Reach Shear Stress (competency) lb/f^2																									
Max part size (mm) Mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Drainage Area (SM)					0.52						0.5														
Impervious cover estimate (%)																									
Rosgen Classification					C4-G4						E4/C4						C4			C4					
Bankfull Velocity (fps)					3.2												3			3					
Bankfull Discharge (cfs)					55																				
Valley length (ft)																									
Channel Thalweg length (ft)																	1064			1064					
Sinuosity (ft)					1.05						1.2						1.2			1.2					
Water Surface Slope (Channel) (ft/ft)																	0.0056			0.0056					
BF slope (ft/ft)																	0.0056			0.0056					
Bankfull Floodplain Area (acres)																									
Proportion over wide (%)																									
Entenchment 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					
Dimension and Substrate - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)					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^2)					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					3.3	3.5		4.2			0.97	1.39		1.82				1		1.00	1.10	1.10	1.20	0.14	2
d50 (mm)																									
Profile																									
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
^{3}Pool Volume (ft^3)																									
Pattern																									
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		
Substrate, bed and transport parameters																									
Ri%/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/di^p/di^{sp} (mm)																									
Reach Shear Stress (competency) lb/f^2																									
Max part size (mm) Mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
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 (%)																									
Entenchment 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

	Cross-Section 1 Pool								Cross-Section 2 Riffle								Cross-Section 3 Pool								Cross-Section 4 Riffle							
Dimension	**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							540.40	540.40							537.87	537.87							533.69	533.69						
Bankfull Width (ft)	13.6	15.1							15.1	14.7							9.4	10.6							8.8	9.1						
Floodprone Width (ft)	45.0	>45							77.0	>77							154.0	>154							75.0	>75						
Bankfull Mean Depth (ft)	1.0	0.9							0.6	0.5							0.9	0.8							0.5	0.5						
Bankfull Max Depth (ft)	2.1	2.2							1.2	1.2							1.8	1.7							0.9	0.9						
Bankfull Cross Sectional Area (ft^2)	14.1	13.7							9.0	8.0							8.7	8.6							4.5	4.8						
Bankfull Width/Depth Ratio	13.2	16.6							25.3	27.0							10.2	13.0							17.5	17.1						
Bankfull Entrenchment Ratio	10.3	>3							9.3	>5.2							14.9	>14.6							15.9	>8.3						
Bankfull Bank Height Ratio	1.0	1.0							1.0	1.0							1.0	1.0							0.9	1.0						
Cross Sectional Area between End Pins (ft^2)	23.0	21.5							14.3	13.4							14.6	13.3							8.6	4.7						
d50 (mm)	-	-							-	8.3							-	-							-	22.0						
	Cross-Section 5 Pool								**Cross-Section 6 Riffle**								**Cross-Section 7 Pool**								**Cross-Section 8 Riffle**							
Dimension	**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							528.11	528.11							525.02	525.02							522.48	522.48						
Bankfull Width (ft)	12.9	12.1							11.3	11.3							10.3	11.4							10.1	8.8						
Floodprone Width (ft)	61.0	>61							80.0	>80							63.0	>63							40.0	>40						
Bankfull Mean Depth (ft)	1.0	0.9							0.6	0.6							1.2	1.0							0.6	0.6						
Bankfull Max Depth (ft)	2.0	1.8							1.3	1.3							2.0	2.0							1.0	1.0						
Bankfull Cross Sectional Area (ft^2)	12.8	11.0							6.6	6.6							12.3	11.2							6.2	5.6						
Bankfull Width/Depth Ratio	13.0	13.2							19.3	19.5							8.6	11.5							16.6	13.9						
Bankfull Entrenchment Ratio	17.42	>5.1							9.7	>7.1							10.7	>5.5							10.9	>4.5						
Bankfull Bank Height Ratio	0.9	1.0							1.0	1.0							1.0	1.0							1.0	1.0						
Cross Sectional Area between End Pins (ft^2)	20.5	16.4							16.7	13.3							24.9	16.3							11.4	7.5						
d50 (mm)	-	-							-	26.0							-	-							-	0.062						

-Information Unavailble

Table 11a cont'd. Monitoring Data - Dimensional Morphology Summary
(Dimensional Parameters - Cross-Sections)
601 East Stream Restoration Site - Reach 2

	Cross-Section 9 Riffle								Cross-Section 10 Pool								Cross-Section 11 Riffle								Cross-Section 12 Pool							
Dimension	**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	517.50	517.50							516.22	516.22							515.16	515.16							513.68	513.68						
Bankfull Width (ft)	24.2	24.3							19.2	19.7							15.5	15.8							20.0	20.6						
Floodprone Width (ft)	62.0	>62							132.0	>132							73.0	>73							168.0	>168						
Bankfull Mean Depth (ft)	0.7	0.7							1.3	1.2							0.6	0.5							1.1	1.0						
Bankfull Max Depth (ft)	1.5	1.4							2.5	2.6							1.5	1.3							2.5	2.4						
Bankfull Cross Sectional Area (ft^2)	17.7	16.5							25.3	24.4							9.4	8.6							21.3	21.4						
Bankfull Width/Depth Ratio	33.1	35.6							14.6	16.0							25.5	28.9							18.8	19.9						
Bankfull Entrenchment Ratio	5.8	>2.6							11.7	>6.7							7.1	>4.6							7.0	>8.1						
Bankfull Bank Height Ratio	1.0	1.0							1.0	1.0							0.9	1.0							0.9	1.0						
Cross Sectional Area between End Pins (ft^2)	30.4	22.3							44.9	41.0							28.4	18.8							37.3	31.3						
d50 (mm)	-	0.062							-	-							-	0.062							-	-						

- Information Unavailable

Table 11a cont'd. Monitoring Data - Dimensional Morphology Summary
(Dimensional Parameters - Cross-Sections)
601 East Stream Restoration Site - Reach 3

	Cross-Section 13 Riffle								Cross-Section 14 Pool								Cross-Section 15 Pool								Cross-Section 16 Riffle							
Dimension	**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**	**MY5**	**MY6**	**MY7**	**MY5**
Record Elevation (datum) Used	497.88	497.88							495.50	495.50							494.42	494.42							493.73	493.73						
Bankfull Width (ft)	15.9	16.9							17.6	18.4							19.6	21.1							17.7	17.5						
Floodprone Width (ft)	75.0	>75							350.0	>350							350.0	>350							150.0	>150						
Bankfull Mean Depth (ft)	0.8	0.8							1.6	1.5							1.8	1.6							0.8	0.7						
Bankfull Max Depth (ft)	1.6	1.7							3.4	3.1							3.4	3.3							1.6	1.6						
Bankfull Cross Sectional Area (ft^2)	12.8	13.6							28.2	28.0							36.1	34.4							14.1	12.9						
Bankfull Width/Depth Ratio	19.6	21.0							11.0	12.0							10.6	13.0							22.4	23.8						
Bankfull Entrenchment Ratio	8.8	>4.4							12.8	>19.1							5.6	>16.6							7.9	>8.5						
Bankfull Bank Height Ratio	1.0	1.0							1.0	1.0							1.0	1.0							1.0	1.0						
Cross Sectional Area between End Pins (ft^2)	21.5	15.5							34.2	14.9							39.7	36.2							18.9	16.5						
d50 (mm)	-	20.0							-	-							-	-							-	31.0						

- Information Unavailable

Table 11a cont'd. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections) 601 East Stream Restoration Site - Reach 4																
	Cross-Section 17 Pool								Cross-Section 18 Riffle							
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Record Elevation (datum) Used	489.11	489.11							490.01	490.01						
Bankfull Width (ft)	16.9	17.2							14.9	14.6						
Floodprone Width (ft)	42.0	>42							30.4	>31						
Bankfull Mean Depth (ft)	1.8	1.7							1.0	1.0						
Bankfull Max Depth (ft)	2.7	2.9							1.5	1.6						
Bankfull Cross Sectional Area (ft^2)	29.8	29.1							14.7	14.5						
Bankfull Width/Depth Ratio	9.6	10.2							15.2	14.6						
Bankfull Entrenchment Ratio	2.5	>2.4							2.0	>2.1						
Bankfull Bank Height Ratio	1.2	1.1							1.0	1.0						
Cross Sectional Area between End Pins (ft^2)	99.9	99.7							86.2	71.1						
d50 (mm)	-	-							-	47.0						

- Information Unavailable

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Table 11b. Monitoring Data - Stream Reach Data Summary
601 East - Reach 1 (1393 feet)

Parameter	Baseline[1]						MY - 1[2]						MY - 2						MY - 3						MY - 4						MY - 5						MY - 6						MY - 7					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	8.8	11.4	10.8	15.1	2.2	8	9.1	11.3	10.8	14.7	2.4	4																																				
Floodprone Width (ft)	40.0	74.4	69.0	154.0	35.3	8	40.0	68.0	76.0	80.0	18.8	4																																				
Bankfull Mean Depth (ft)	0.5	0.8	0.8	1.2	0.3	8	0.5	0.6	0.6	0.6	0.1	4																																				
Bankfull Max Depth (ft)	0.9	1.5	1.5	2.1	0.5	8	0.9	1.1	1.1	1.3	0.2	4																																				
Bankfull Cross-Sectional Area (ft^2)	4.5	9.3	8.9	14.1	3.5	8	4.8	6.3	6.2	8.0	1.4	4																																				
Width/Depth Ratio	8.6	15.4	14.9	25.3	5.4	8	17.1	20.5	18.9	27.0	4.5	4																																				
Entrenchment Ratio	3.3	6.9	5.6	16.4	4.2	8	3.9	6.1	6.2	8.3	2.0	4																																				
Bank Height Ratio	0.9	1.0	1.0	1.0	0.0	8	1.0	1.0	1.0	1.0	0.0	4																																				
Profile																																															
Riffle Length (ft)	10.0	22.1	18.5	95.3	14.5	32																																									
Riffle Slope (ft/ft)	0.015	0.034	0.032	0.064	0.0	32																																									
Pool Length (ft)	13.4	24.3	21.2	65.7	11.5	33																																									
Pool Max Depth (ft)	1.2	2.2	2.2	3.2	0.4	33																																									
Pool Spacing (ft)	31.4	44.6	40.2	116.5	16.9	32																																									
Pattern																																															
Channel Belt Width (ft)	13.0	-	18.0	21.0	-	-																																								
Radius of Curvature (ft)	16.0	-	32.1	52.0	-	-																																								
Rc: Bankfull Width (ft/ft)	4.30	-	6.10	8.90	-	-																																								
Meander Wavelength (ft)	43.0	-	61.0	89.0	-	-																																								
Meander Width Ratio	1.3	-	1.8	2.1	-	-																																								
Additional Reach Parameters																																															
Rosgen Classification	B4/C4b																																														
Channel Thalweg Length (ft)	1,438																																														
Sinuosity (ft)	1.17																																														
Water Surface Slope (Channel) (ft/ft)	0.0170																																														
Bankfull Slope (ft/ft)	0.0170																																														
Ri% / Ru% / P% / G% / S%	44.3%	-	55.7%	-	-																																									

N/A - Information does not apply.
Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
[1] Based on riffle and pool dimensions
[2] Based solely on riffle dimensions

Table 11b cont'd. Monitoring Data - Stream Reach Data Summary
601 East - Reach 2 (902 feet)

Parameter	Baseline[1]						MY - 1[2]						MY - 2						MY - 3						MY - 4						MY - 5						MY - 6						MY - 7					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	15.5	19.7	19.6	24.2	3.6	4	15.8	20.1	20.1	24.3	6.0	2																																				
Floodprone Width (ft)	62.0	108.8	102.5	168.0	50.0	4	62.0	67.5	67.5	73.0	7.8	2																																				
Bankfull Mean Depth (ft)	0.6	0.9	0.9	1.3	0.3	4	0.5	0.6	0.6	0.7	0.1	2																																				
Bankfull Max Depth (ft)	1.5	2.0	2.0	2.5	0.6	4	1.3	1.4	1.4	1.4	0.1	2																																				
Bankfull Cross-Sectional Area (ft^2)	9.4	18.4	19.5	25.3	6.7	4	8.6	12.6	12.6	16.5	5.6	2																																				
Width/Depth Ratio	14.6	23.0	22.1	33.1	8.1	4	28.9	32.3	32.3	35.6	4.7	2																																				
Entrenchment Ratio	2.6	5.6	5.8	8.4	2.5	4	2.6	3.6	3.6	4.6	1.4	2																																				
Bank Height Ratio	0.9	1.0	1.0	1.0	0.0	4	1.0	1.0	1.0	1.0	0	2																																				
Profile																																															
Riffle Length (ft)	12.1	23.4	19.0	50.2	10.7	18																																									
Riffle Slope (ft/ft)	0.004	0.019	0.015	0.036	0.010	17																																									
Pool Length (ft)	15.1	32.9	29.1	74.3	14.7	17																																									
Pool Max Depth (ft)	1.9	2.9	2.7	4.0	0.6	17																																									
Pool Spacing (ft)	32.9	55.6	47.6	110.3	20.5	17																																									
Pattern																																															
Channel Belt Width (ft)	25.0	-	40.0	65.0	-	-																																								
Radius of Curvature (ft)	38.0	-	47.0	58.0	-	-																																								
Rc: Bankfull Width (ft/ft)	3.20	-	3.90	4.80	-	-																																								
Meander Wavelength (ft)	61.0	-	84.0	97.0	-	-																																								
Meander Width Ratio	2.1	-	3.3	5.4	-	-																																								
Additional Reach Parameters																																															
Rosgen Classification	C4/E4																																														
Channel Thalweg Length (ft)	945																																														
Sinuosity (ft)	1.34																																														
Water Surface Slope (Channel) (ft/ft)	0.0069																																														
Bankfull Slope (ft/ft)	0.0069																																														
Ri% / Ru% / P% / G% / S%	39.5%	-	60.5%	-	-																																									

N/A - Information does not apply.
Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
[1] Based on riffle and pool dimensions
[2] Based solely on riffle dimensions

Table 11b cont'd. Monitoring Data - Stream Reach Data Summary
601 East - Reach 3 (1018 feet)

Parameter	Baseline[1]						MY - 1[2]						MY - 2						MY - 3						MY - 4						MY - 5						MY - 6						MY - 7					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	15.9	17.7	17.7	19.6	1.5	4	16.9	17.2	17.2	17.5	0.4	2																																				
Floodprone Width (ft)	75.0	231.3	250.0	350.0	140.5	4	75.0	112.5	112.5	150.0	53.0	2																																				
Bankfull Mean Depth (ft)	0.8	1.3	1.2	1.8	0.5	4	0.7	0.8	0.8	0.8	0.1	2																																				
Bankfull Max Depth (ft)	1.6	2.5	2.5	3.4	1.1	4	0.7	0.8	0.8	0.8	0.1	2																																				
Bankfull Cross-Sectional Area (ft^2)	12.8	22.8	21.1	36.1	11.3	4	12.9	13.3	13.3	13.6	0.5	2																																				
Width/Depth Ratio	10.6	15.9	15.3	22.4	6.0	4	21.0	22.4	22.4	23.8	2.0	2																																				
Entrenchment Ratio	4.7	12.7	13.2	19.9	7.3	4	4.4	6.5	6.5	8.5	2.9	2																																				
Bank Height Ratio	1.0	1.0	1.0	1.0	0.0	4	1.0	1.0	1.0	1.0	0.0	2																																				
Profile																																																
Riffle Length (ft)	10.1	24.1	16.8	110.3	22.1	19																																										
Riffle Slope (ft/ft)	0.00	0.018	0.015	0.041	0.011	17																																										
Pool Length (ft)	27.4	35.2	35.2	49.7	6.7	18																																										
Pool Max Depth (ft)	1.9	2.9	3.0	3.5	0.4	18																																										
Pool Spacing (ft)	41.1	58.5	54.4	137.9	20.9	18																																										
Pattern																																																
Channel Belt Width (ft)	35.0	-	56.0	92.0	-	-																																										
Radius of Curvature (ft)	27.0	-	43.0	63.0	-	-																																										
Rc: Bankfull Width (ft/ft)	1.6	-	2.5	3.7	-	-																																										
Meander Wavelength (ft)	87.0	-	119.0	134.0	-	-																																										
Meander Width Ratio	2.1	-	3.3	5.4	-	-																																										
Additional Reach Parameters																																																
Rosgen Classification	C4																																															
Channel Thalweg Length (ft)	1064																																															
Sinuosity (ft)	1.2																																															
Water Surface Slope (Channel) (ft/ft)	0.0056																																														
Bankfull Slope (ft/ft)	0.0056																																															
Ri% / Ru% / P% / G% / S%	43.0%	-	57.0%	-	-																																										

N/A - Information does not apply.

Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step

[1] Based on riffle and pool dimensions

[2] Based solely on riffle dimensions

Table 11b cont'd. Monitoring Data - Stream Reach Data Summary
601 East - Reach 4 (495 feet)

Parameter	Baseline[1]						MY - 1[2]						MY - 2						MY - 3						MY - 4						MY - 5						MY - 6						MY - 7					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	14.9	15.9	15.9	16.9	1.4	2	14.6	14.6	14.6	14.6	N/A	1																																				
Floodprone Width (ft)	30.4	36.2	36.2	42.0	8.2	2	31.0	31.0	31.0	31.0	N/A	1																																				
Bankfull Mean Depth (ft)	1.0	1.4	1.4	1.8	0.5	2	1.0	1.0	1.0	1.0	N/A	1																																				
Bankfull Max Depth (ft)	1.5	2.1	2.1	2.7	0.9	2	1.6	1.6	1.6	1.6	N/A	1																																				
Bankfull Cross-Sectional Area (ft^2)	14.7	22.3	22.3	29.8	10.7	2	14.5	14.5	14.5	14.5	N/A	1																																				
Width/Depth Ratio	9.6	12.4	12.4	15.2	3.9	2	15.6	15.6	15.6	15.6	N/A	1																																				
Entrenchment Ratio	2.0	2.3	2.3	2.5	0.3	2	2.1	2.1	2.1	2.1	N/A	1																																				
Bank Height Ratio	1.0	1.1	1.1	1.2	0.1	2	1.0	1.0	1.0	1.0	N/A	1																																				
Profile																																																
Riffle Length (ft)	15.8	20.8	18.2	29.0	4.8	9																																										
Riffle Slope (ft/ft)	0.018	0.027	0.030	0.038	0.007	9																																										
Pool Length (ft)	30.8	35.0	35.8	38.8	3.1	9																																										
Pool Max Depth (ft)	2.0	2.8	2.8	3.4	0.4	9																																										
Pool Spacing (ft)	49.8	56.1	54.8	69.3	6.2	8																																										
Pattern																																																
Channel Belt Width (ft)	21.0	-	28.0	32.0	-	-																																										
Radius of Curvature (ft)	26.0	-	52.0	84.0	-	-																																										
Rc: Bankfull Width (ft/ft)	162.0	-	3.3	5.3	-	-																																										
Meander Wavelength (ft)	69.0	-	97.0	142.0	-	-																																										
Meander Width Ratio	1.3	-	1.8	2.0	-	-																																										
Additional Reach Parameters																																																
Rosgen Classification	B4																																															
Channel Thalweg Length (ft)	465																																															
Sinuosity (ft)	1.13																																															
Water Surface Slope (Channel) (ft/ft)	0.0114																																														
Bankfull Slope (ft/ft)	0.0114																																															
Ri% / Ru% / P% / G% / S%	39.1%	-	65.6%	-	-																																										

N/A - Information does not apply.

Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step

[1] Based on riffle and pool dimensions

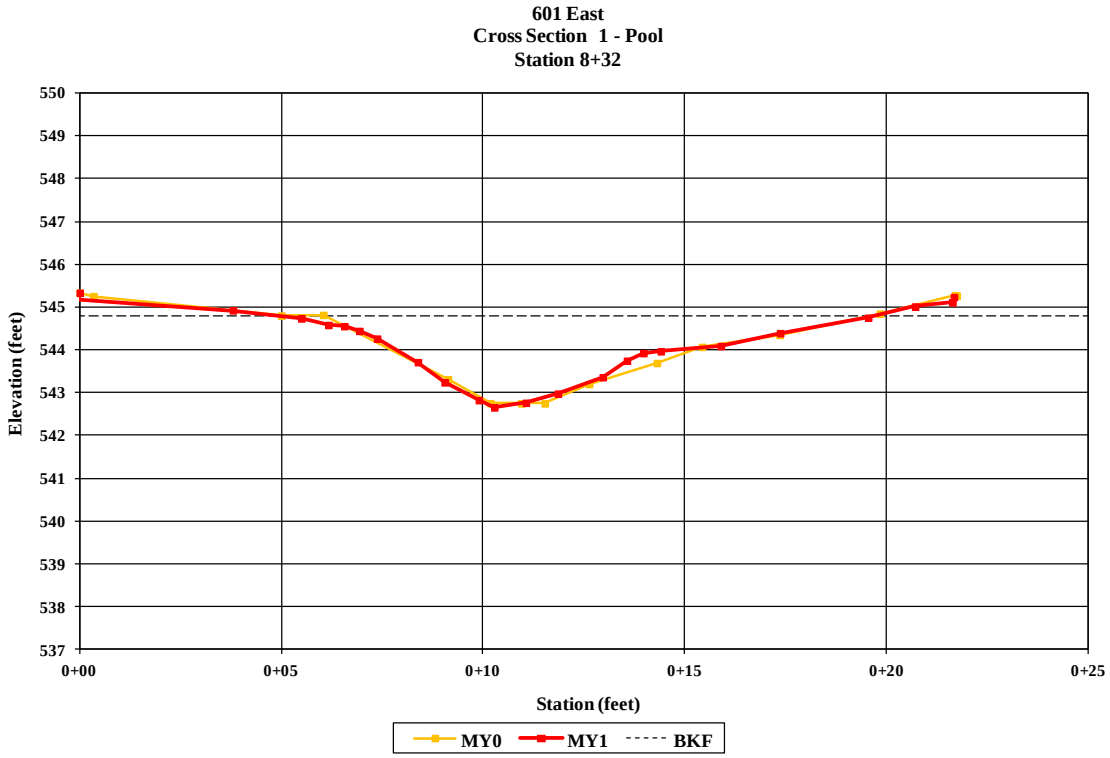
[2] Based solely on riffle dimensions

Table 12. 601 East Stream Restoration Site Bank Pin Arrays					
Cross Section #	Length of Exposed Pin (mm)				
	Upstream	At Cross Section	Downstream	Rate[1] (mm/yr)	Rate (ft/yr)
1	0	0	0	0	0.00
3	0	0^B	0^B	0	0.00
5	0	0	0	0	0.00
7	0	0	12.7 [2]	6.8	0.02
10	0^B	0^B	0^B	0	0.00
12	0^B	0^B	0^B	0	0.00
14	0^B	0	0^B	0	0.00
15	0^B	0	0^B	0	0.00
17	0	0^B	0	0	0.00

0^B= Buried Bank Pin

[1] Rate based on 7.5 month span since installation

[2] Localized erosion caused by bent tip of bank pin

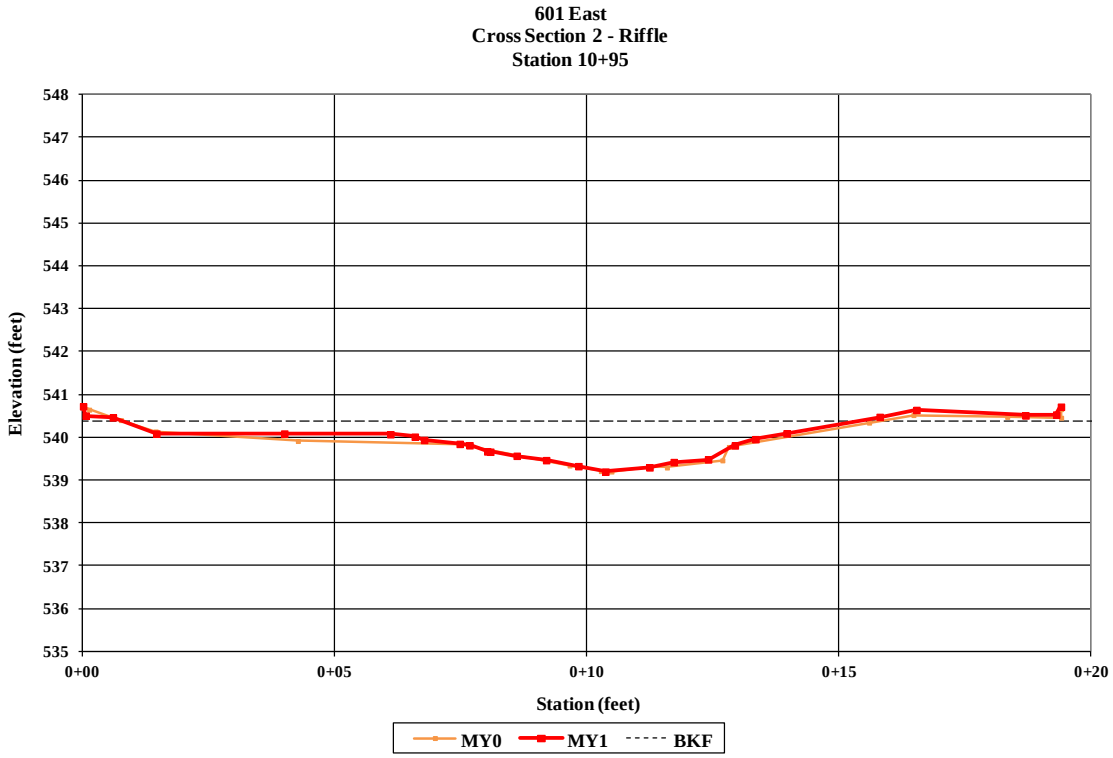


Left Descending Bank

Right Descending Bank

Upstream

Downstream

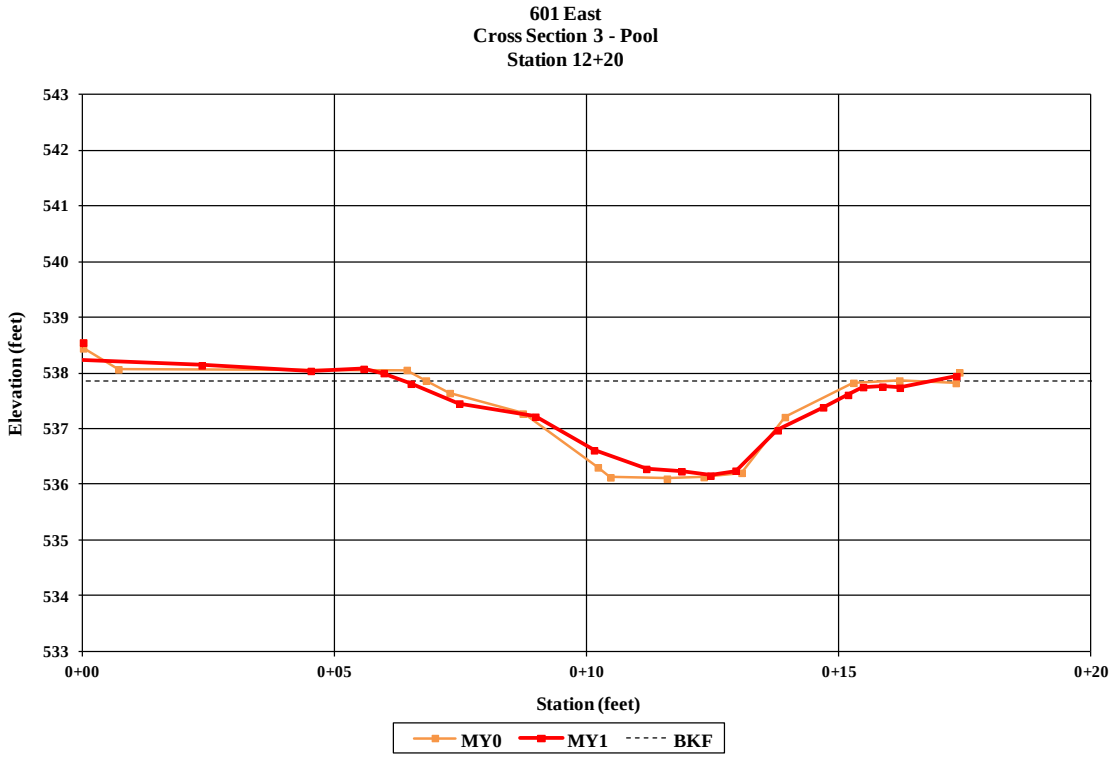


Left Descending Bank

Right Descending Bank

Upstream

Downstream

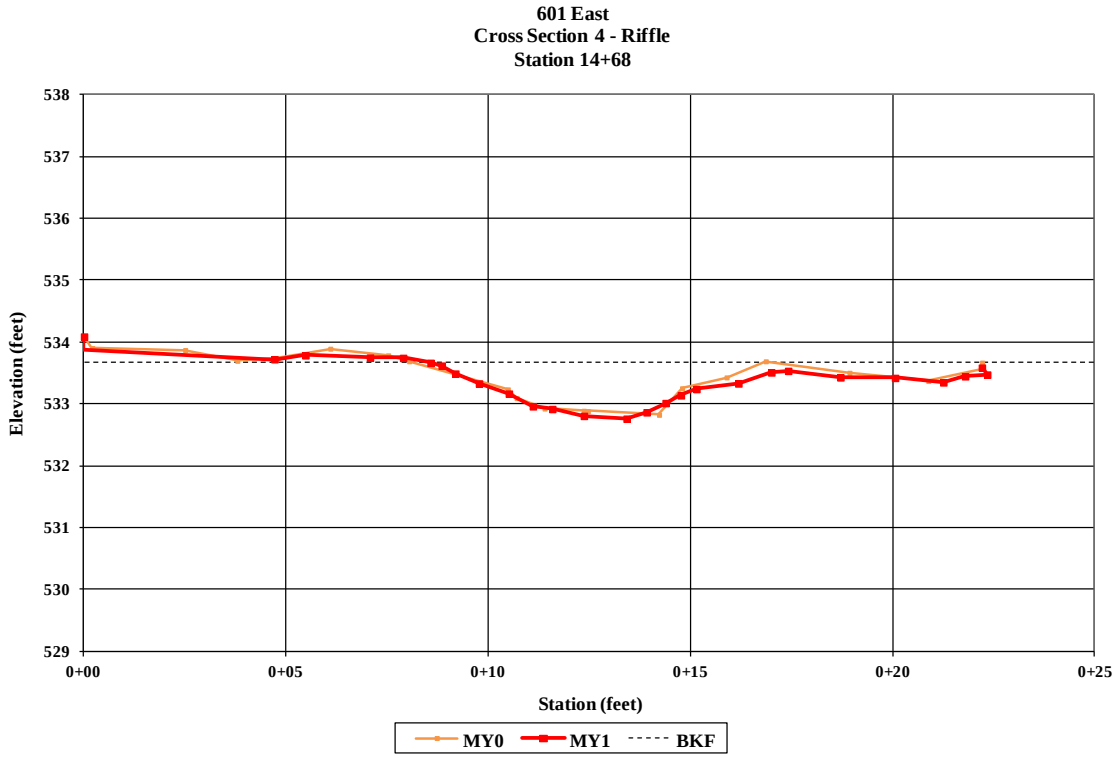


Left Descending Bank

Right Descending Bank

Upstream

Downstream

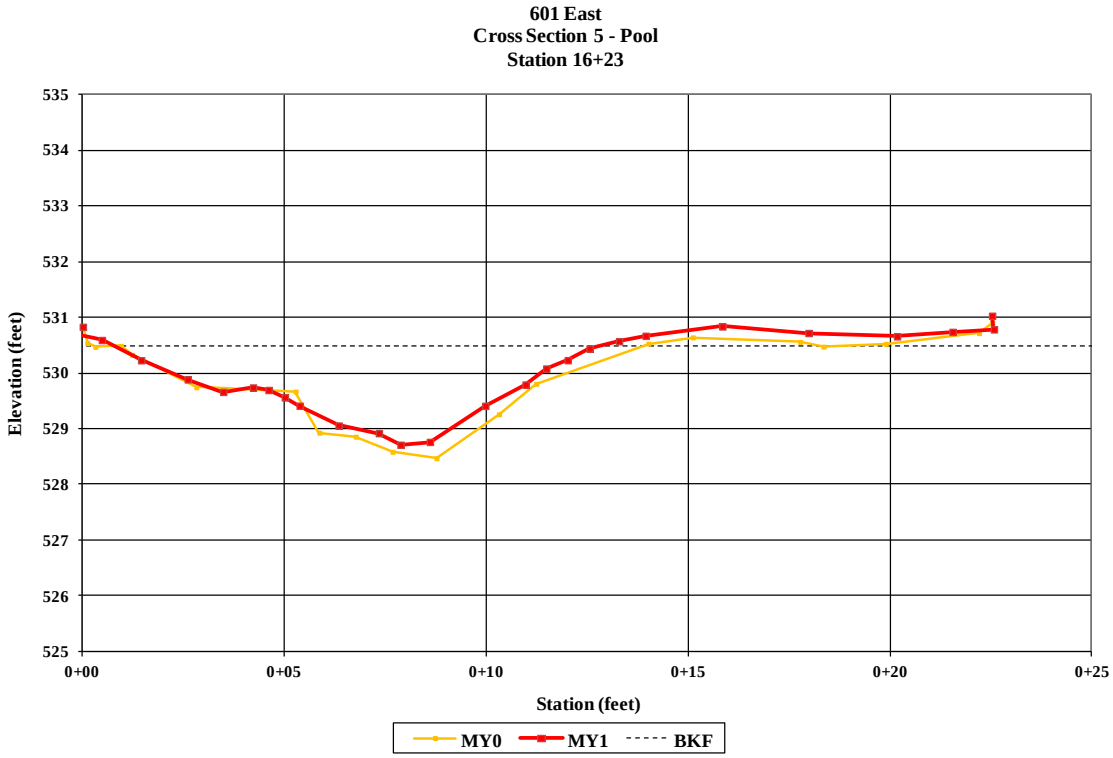



Left Descending Bank


Right Descending Bank


Upstream


Downstream

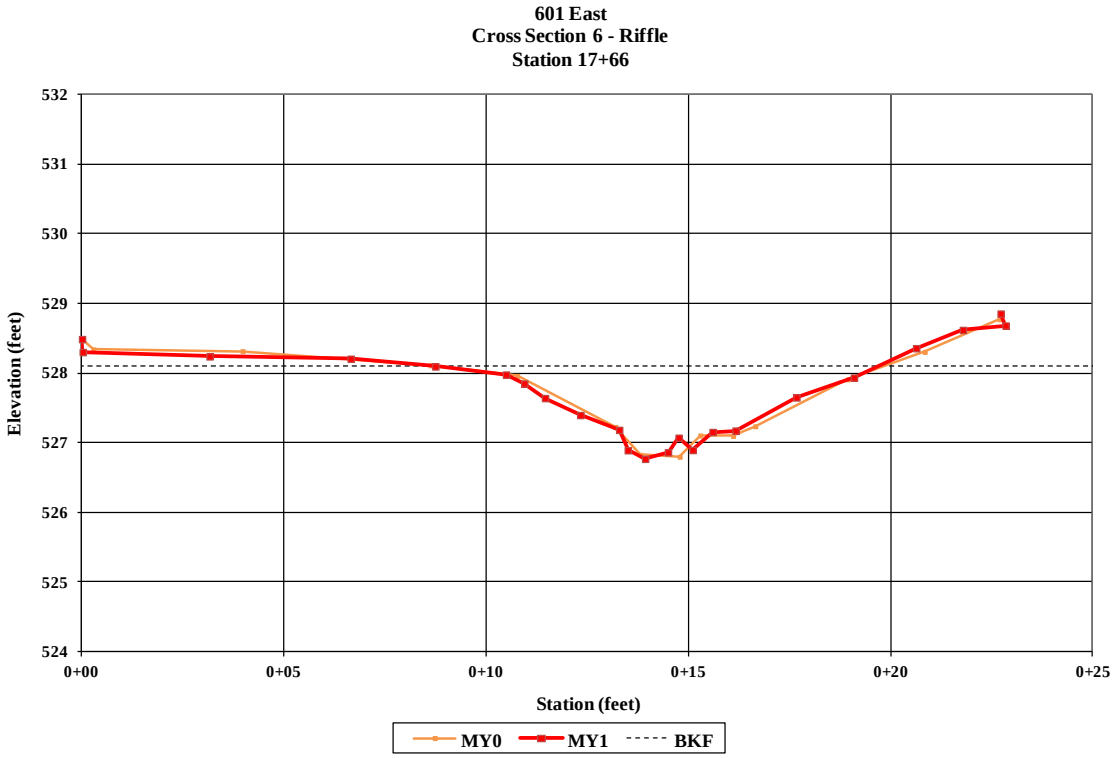


Left Descending Bank

Right Descending Bank

Upstream

Downstream

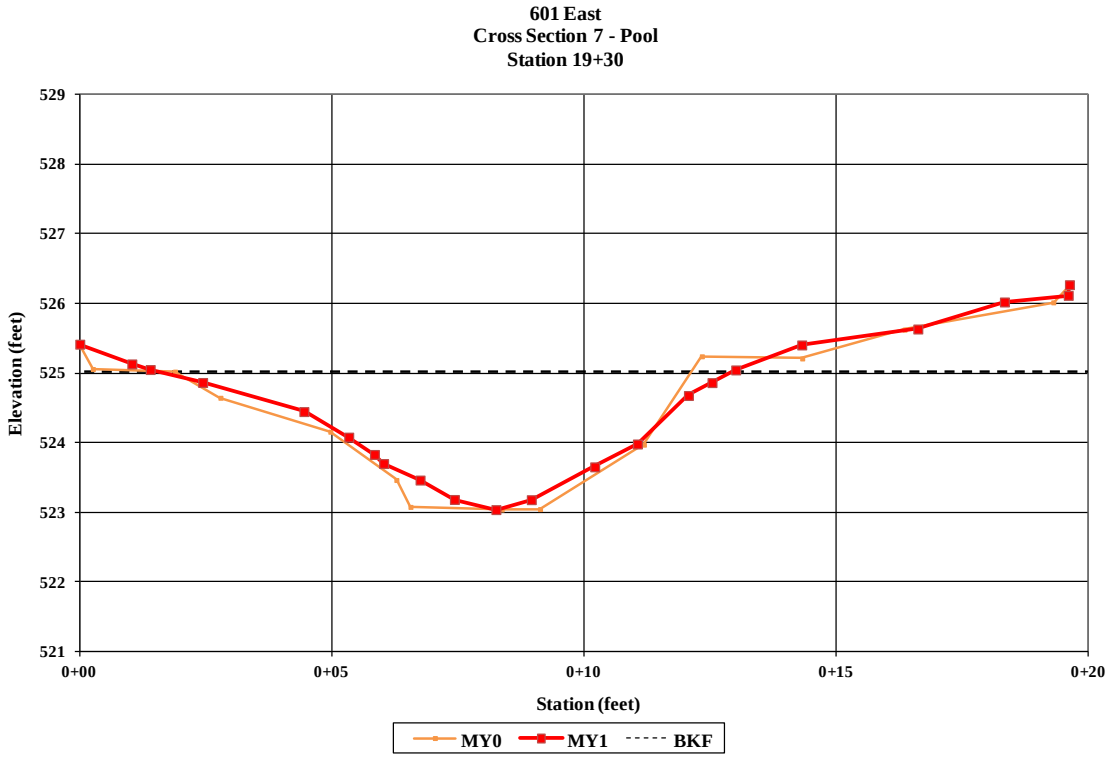


Left Descending Bank

Right Descending Bank

Upstream

Downstream

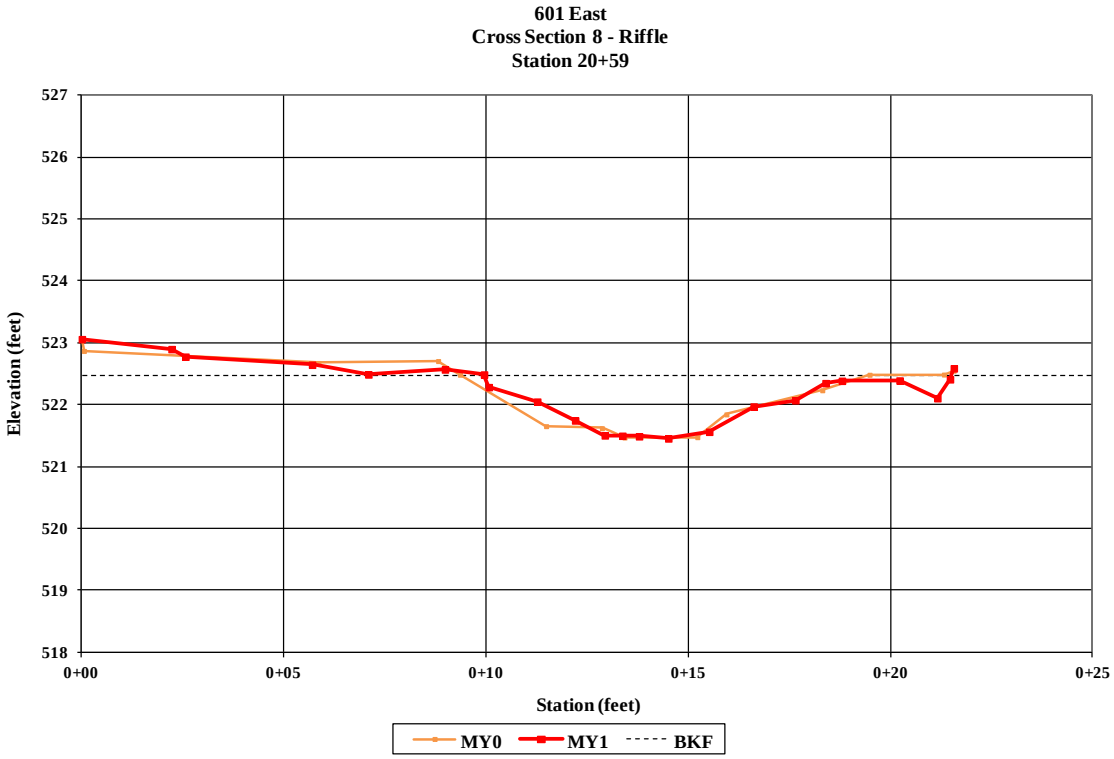


Left Descending Bank

Right Descending Bank

Upstream

Downstream

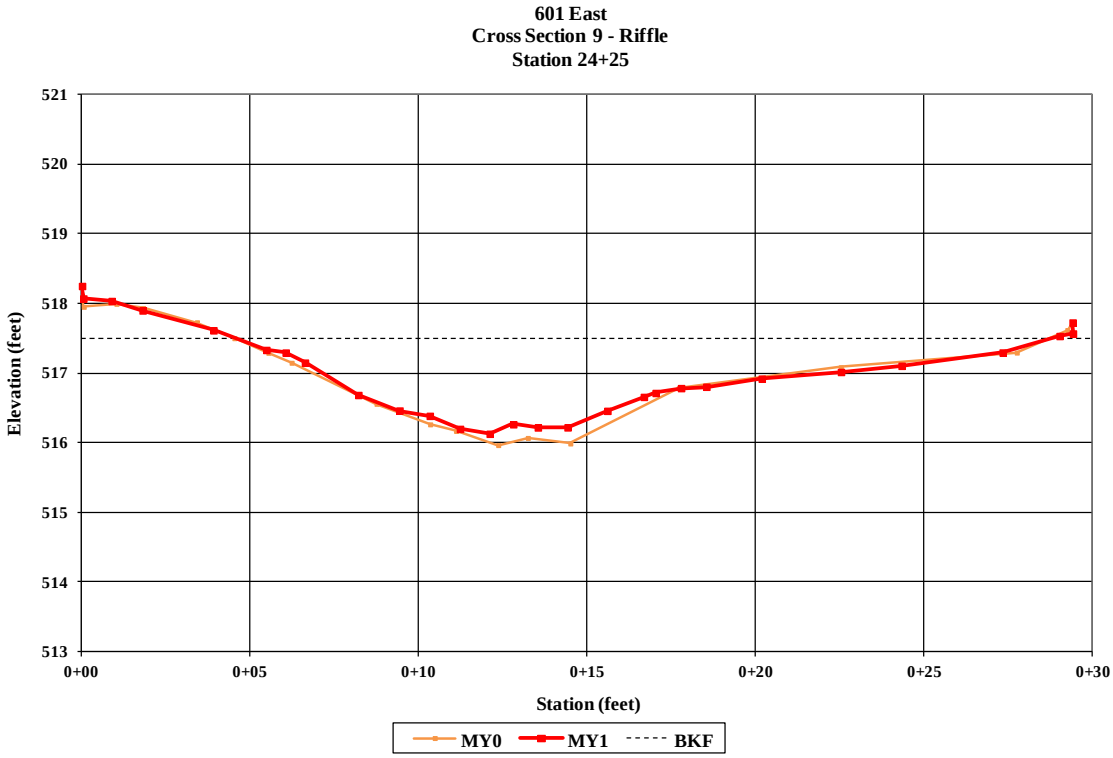



Left Descending Bank


Right Descending Bank


Upstream


Downstream

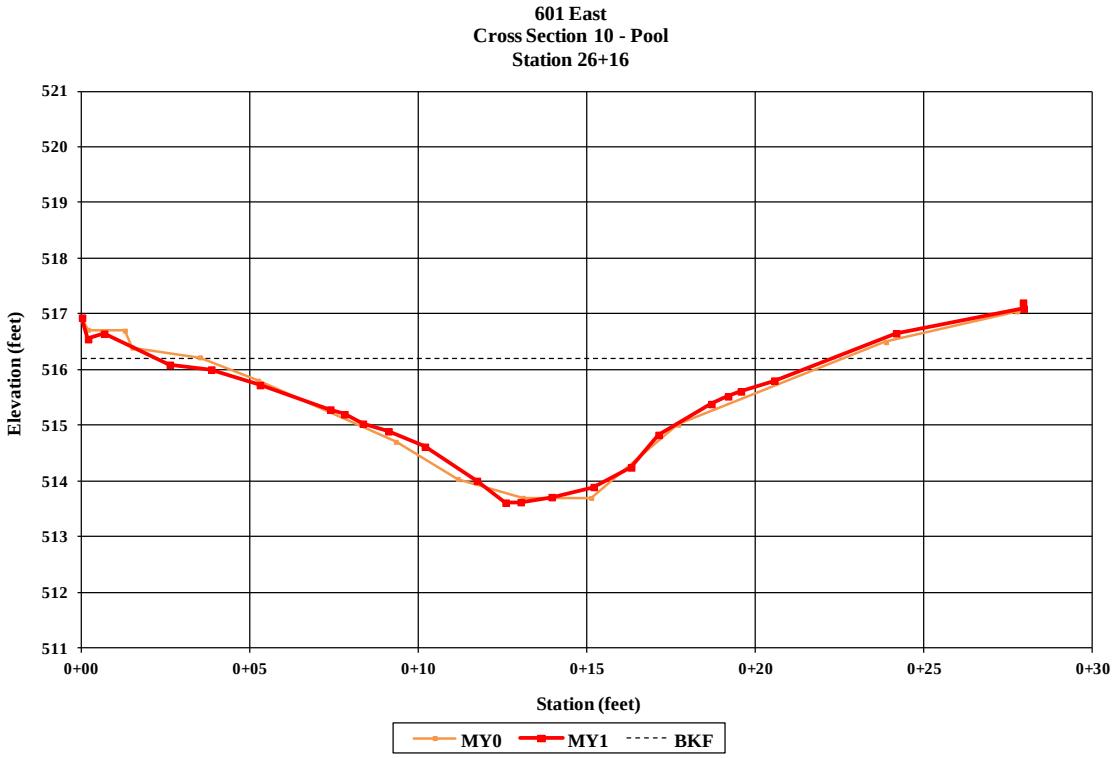



Left Descending Bank


Right Descending Bank


Upstream


Downstream

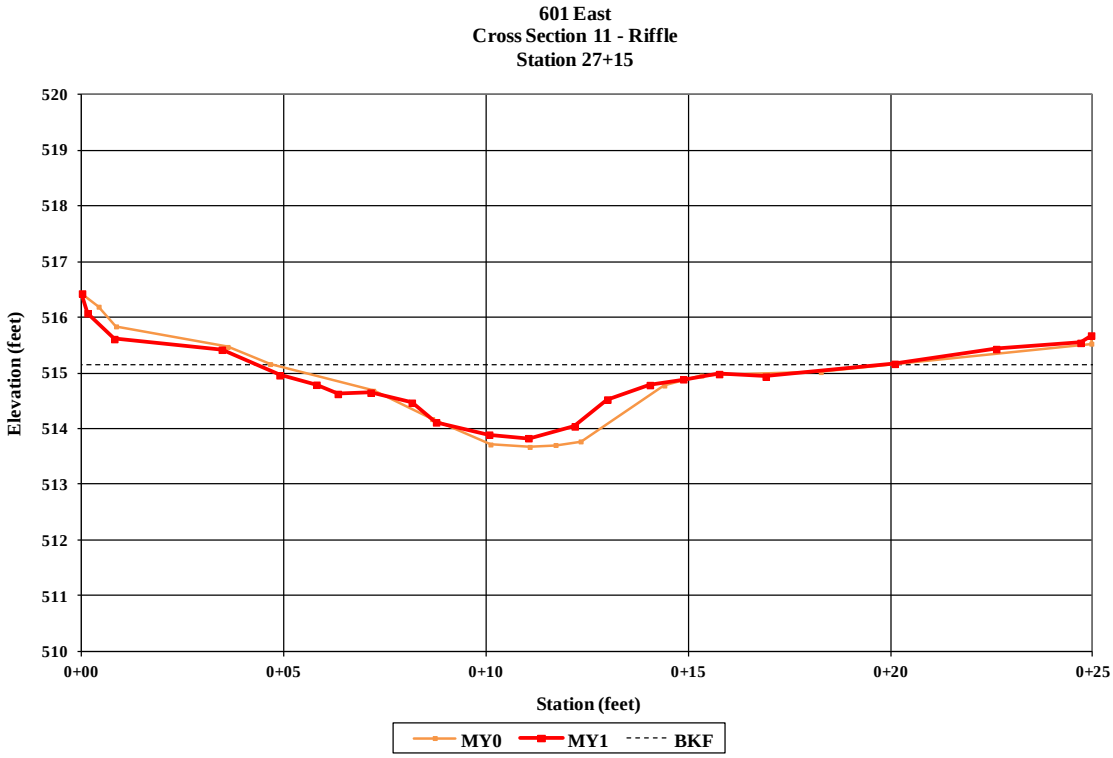


Left Descending Bank

Right Descending bank

Upstream

Downstream

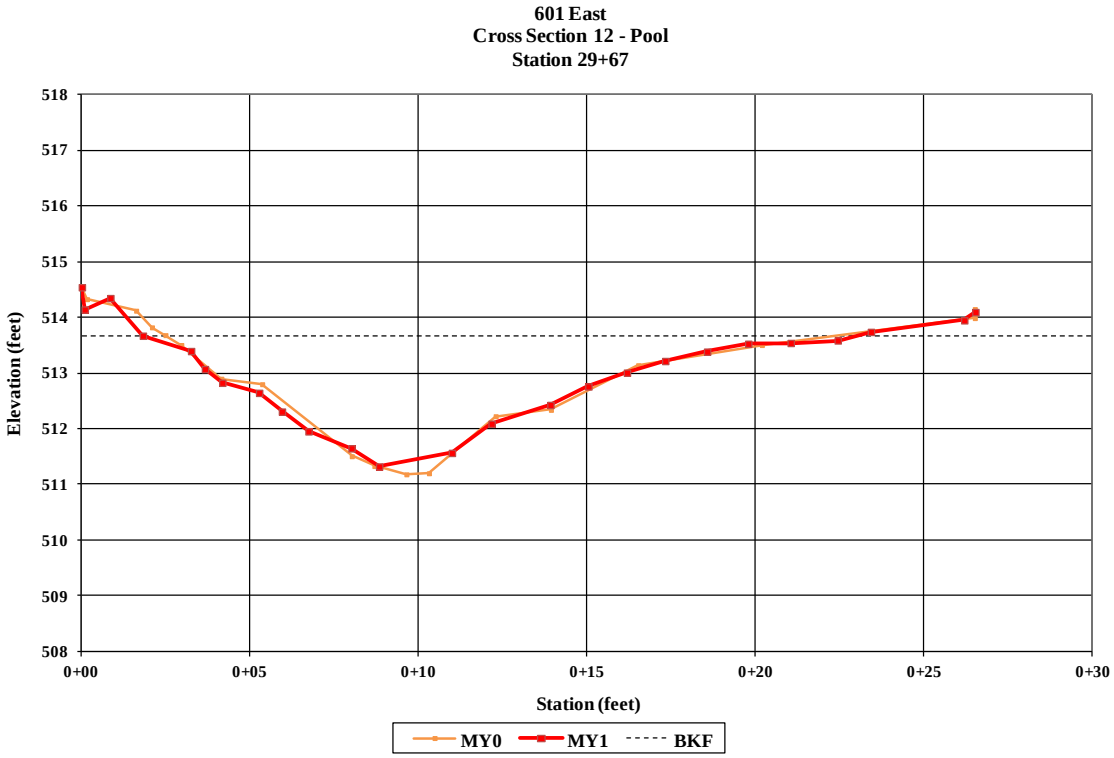


Left Descending Bank

Right Descending Bank

Upstream

Downstream

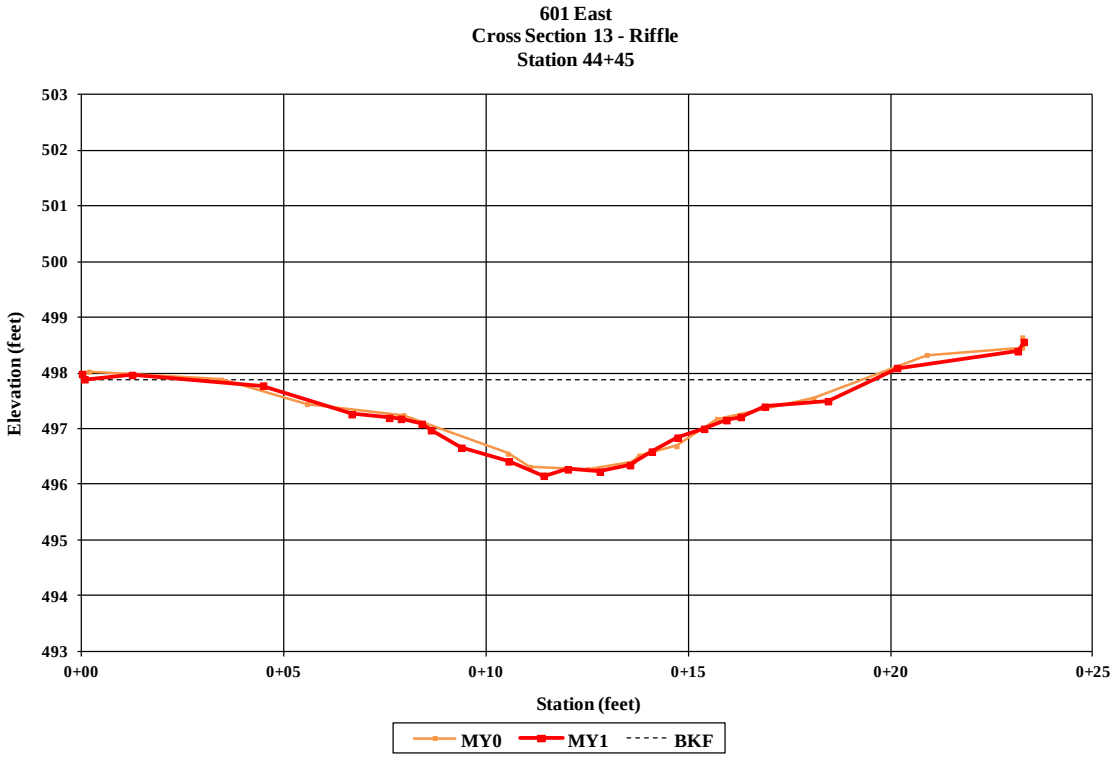


Left Descending Bank

Right Descending Bank

Upstream

Downstream

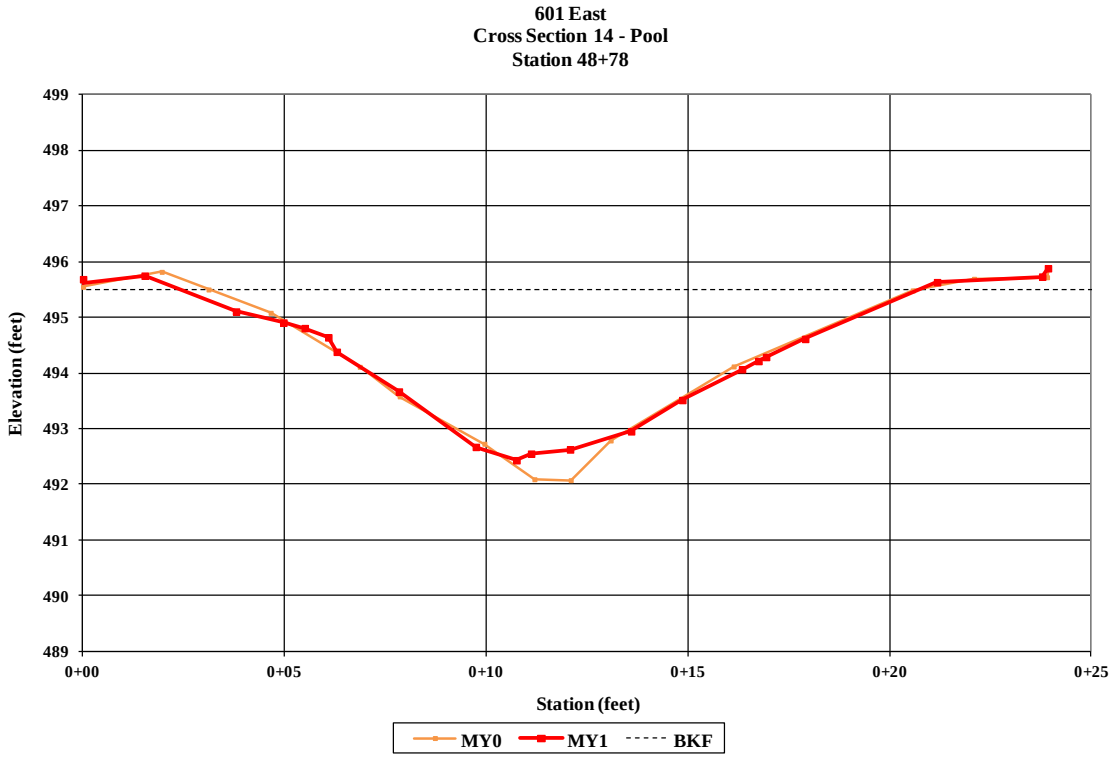


Left Descending Bank

Right Descending Bank

Upstream

Downstream

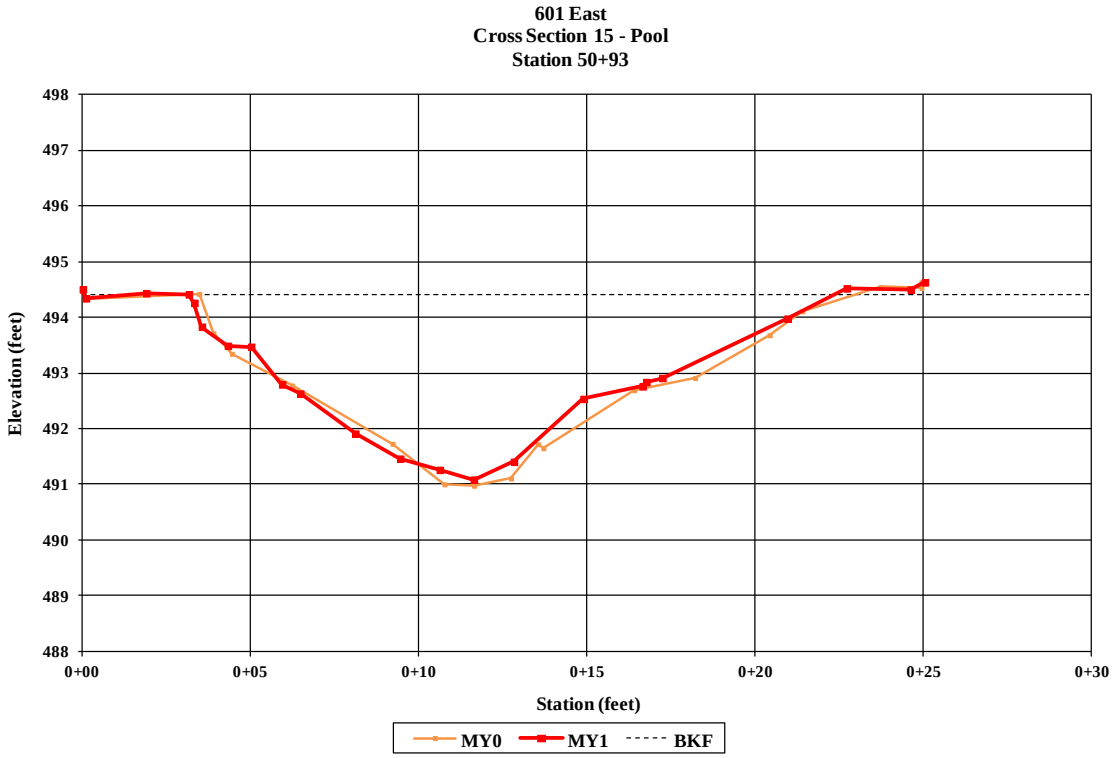


Left Descending Bank

Right Descending Bank

Upstream

Downstream

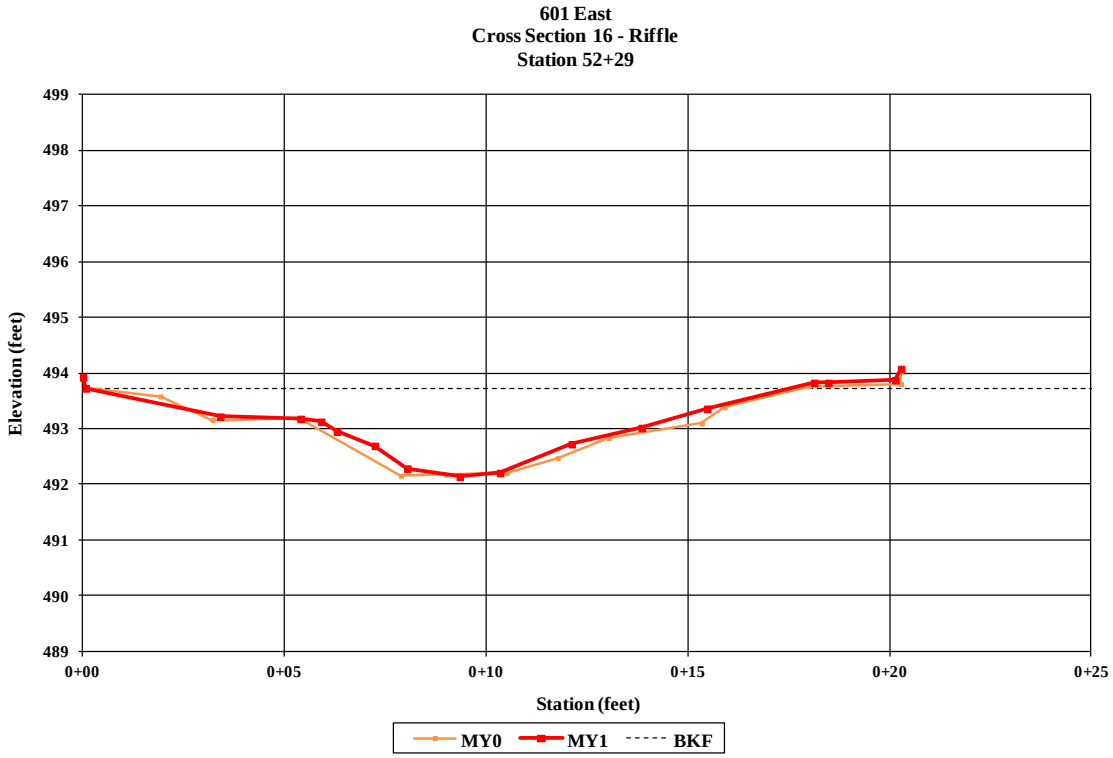


Left Descending Bank

Right Descending Bank

Upstream

Downstream

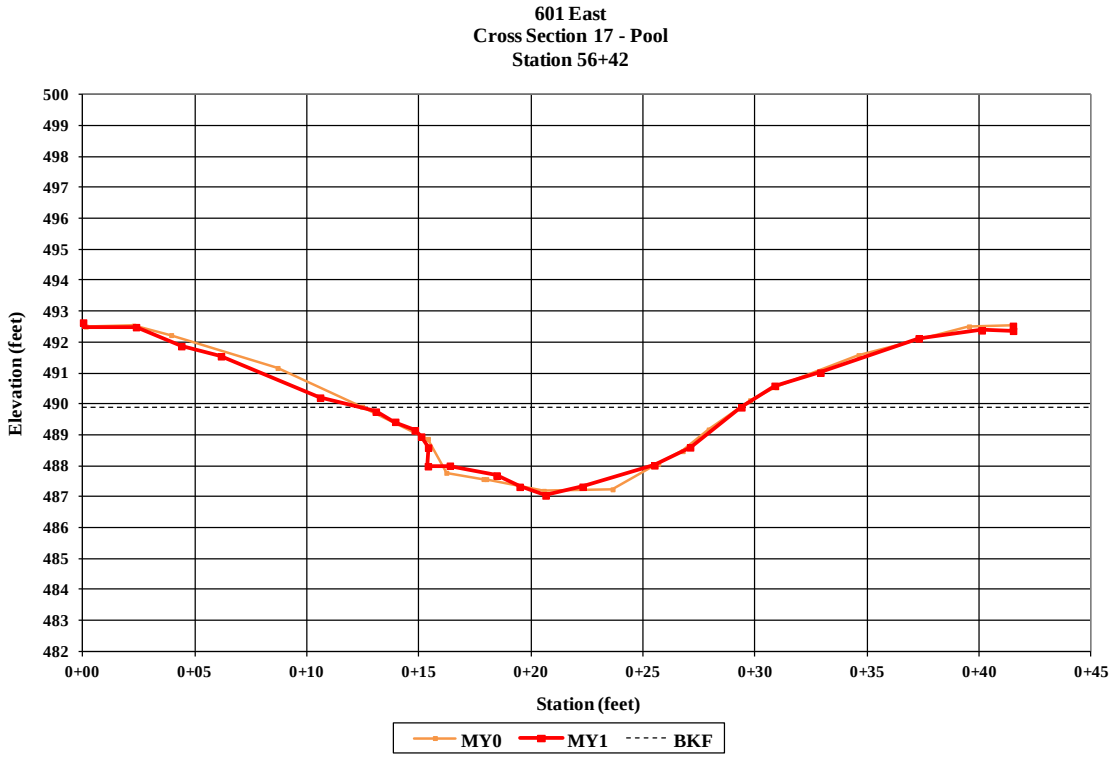


Left Descending Bank

Right Descending Bank

Upstream

Downstream

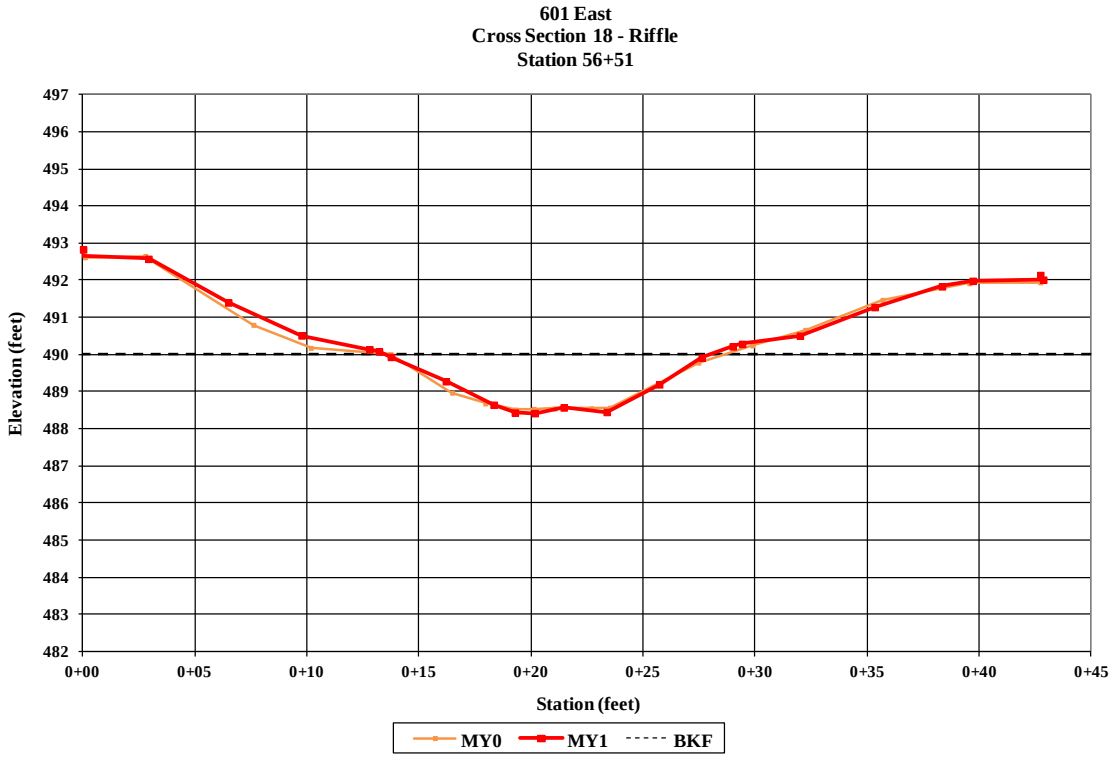


Left Descending Bank

Right Descending Bank

Upstream

Downstream



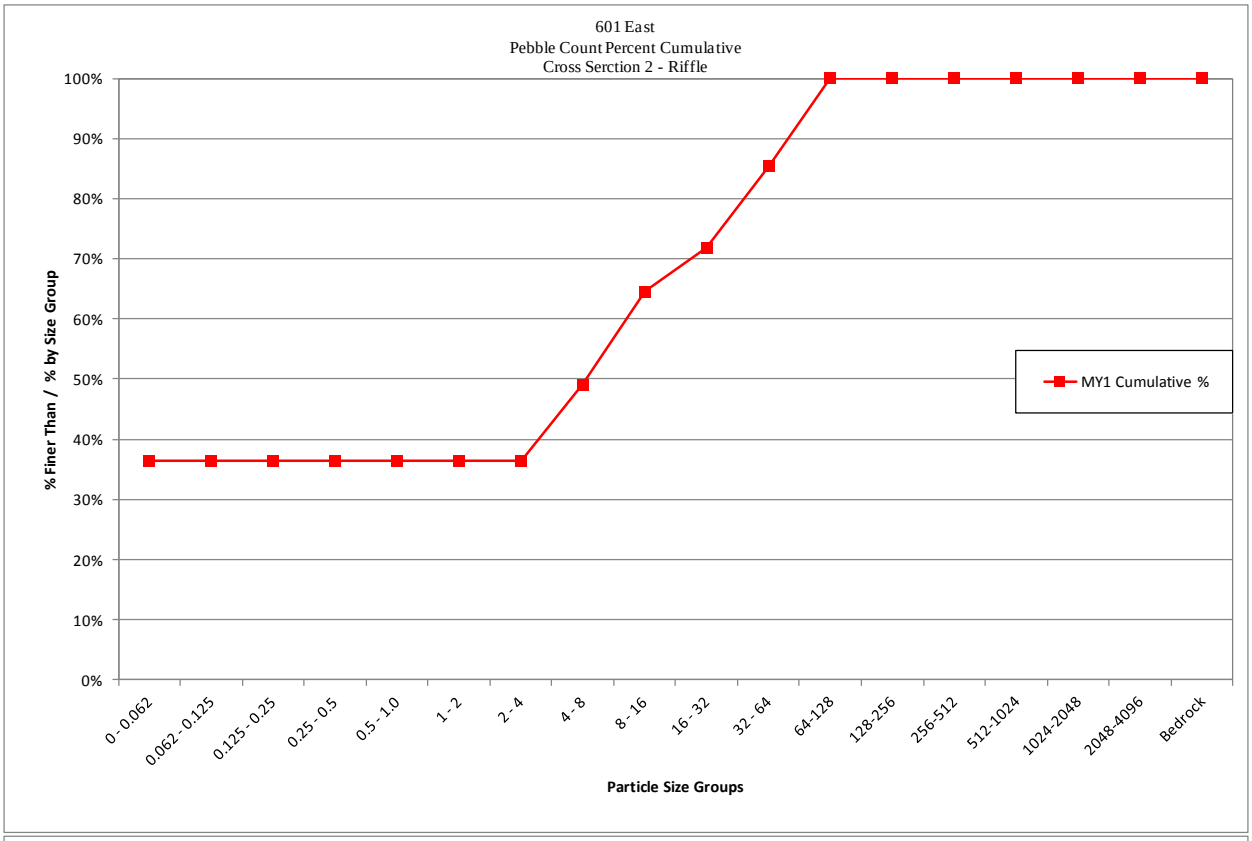
Left Descending Bank

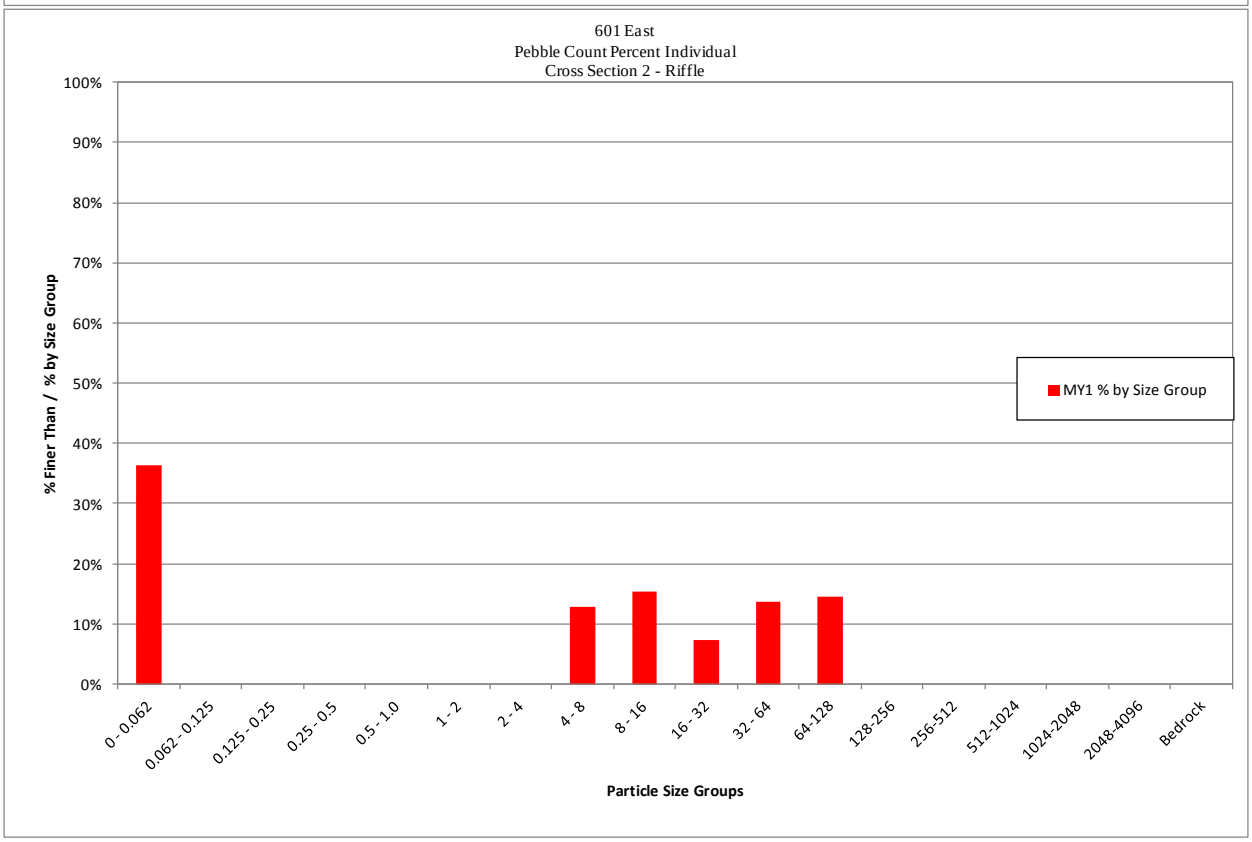
Right Descending Bank

Upstream

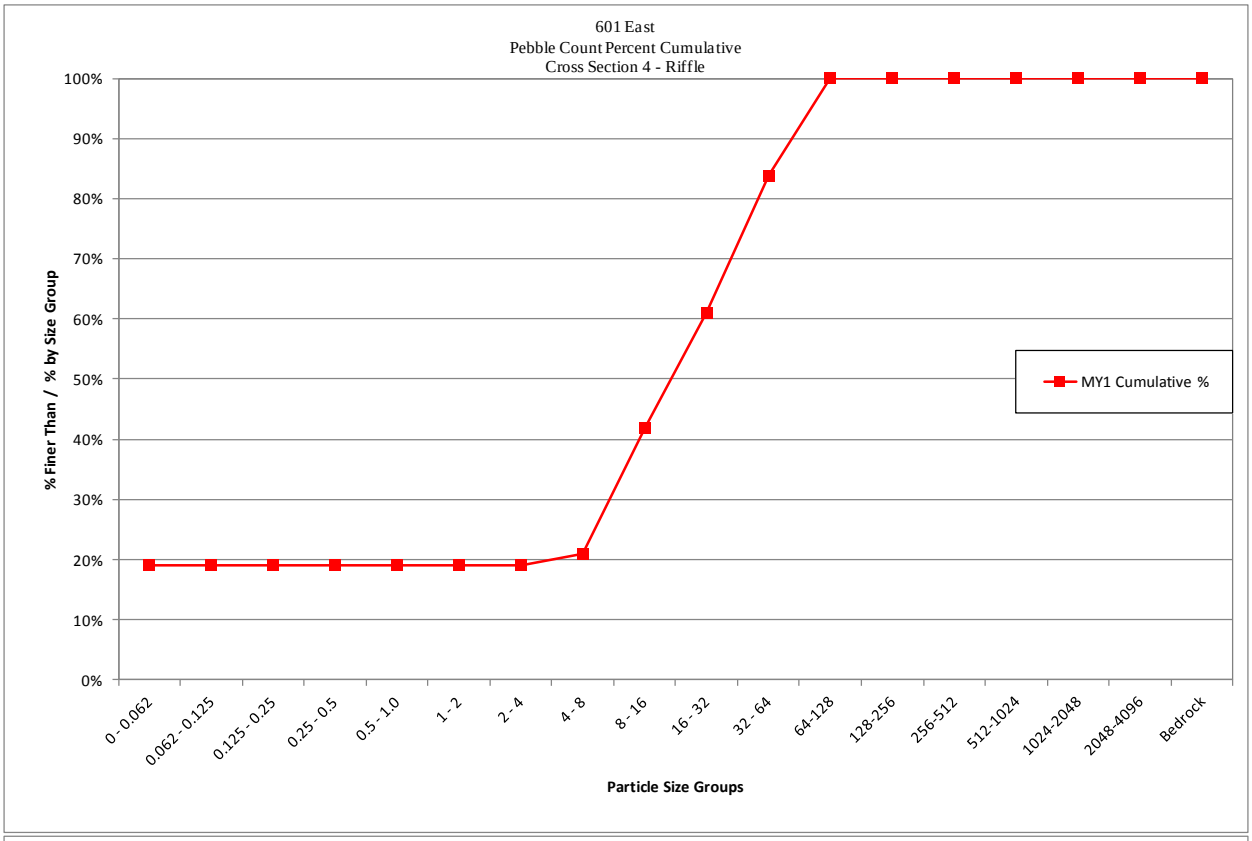
Downstream

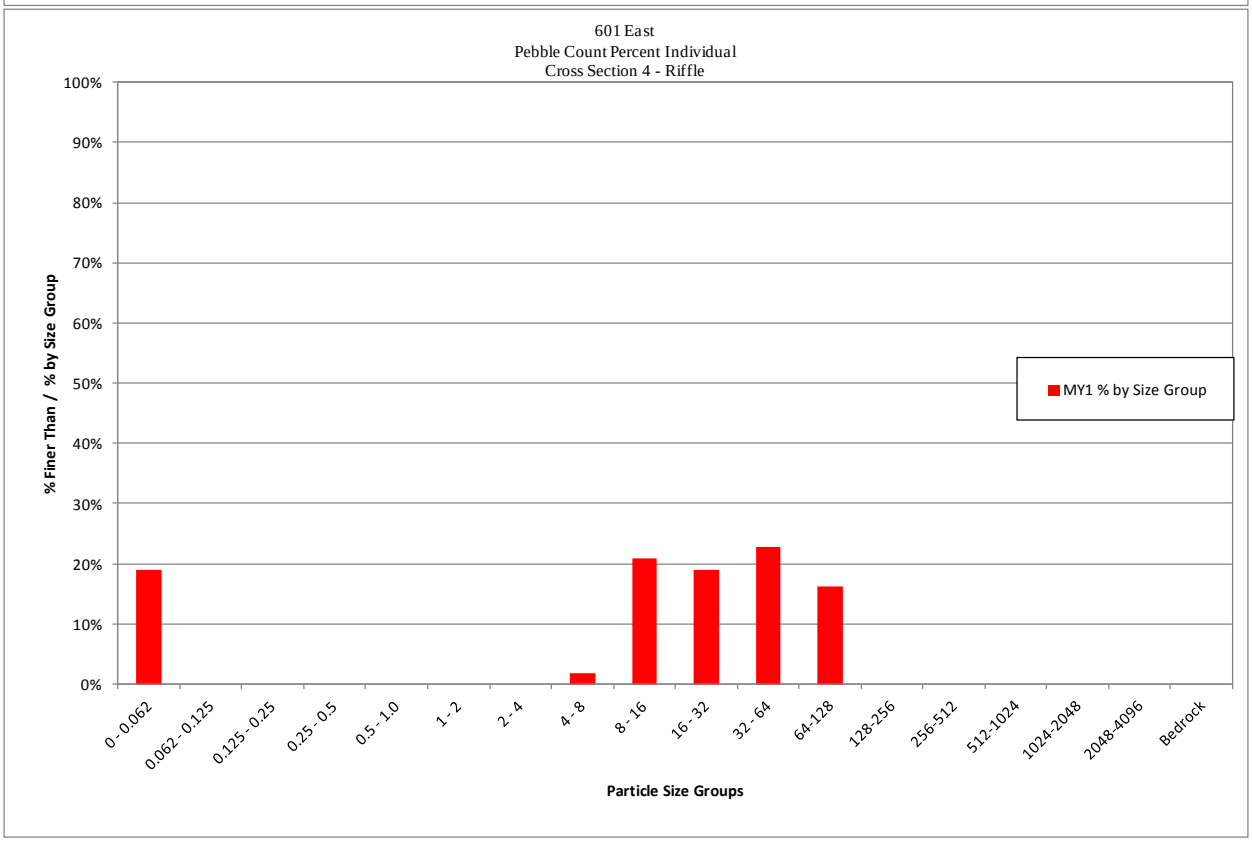
601 East			
Cross Section 2 - Riffle			
Monitoring Year - 2015; MY1			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	40	36.4%	36%
0.062 - 0.125	0	0.0%	36%
0.125 - 0.25	0	0.0%	36%
0.25 - 0.5	0	0.0%	36%
0.5 - 1.0	0	0.0%	36%
1 - 2	0	0.0%	36%
2 - 4	0	0.0%	36%
4 - 8	14	12.7%	49%
8 - 16	17	15.5%	65%
16 - 32	8	7.3%	72%
32 - 64	15	13.6%	85%
64-128	16	14.5%	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%
Total	**110**	**100%**	**100%**
		Summary Data	
		D50	**8.3**
		D84	**60**
		D95	**100**


601 East
Pebble Count Percent Cumulative
Cross Serction 2 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

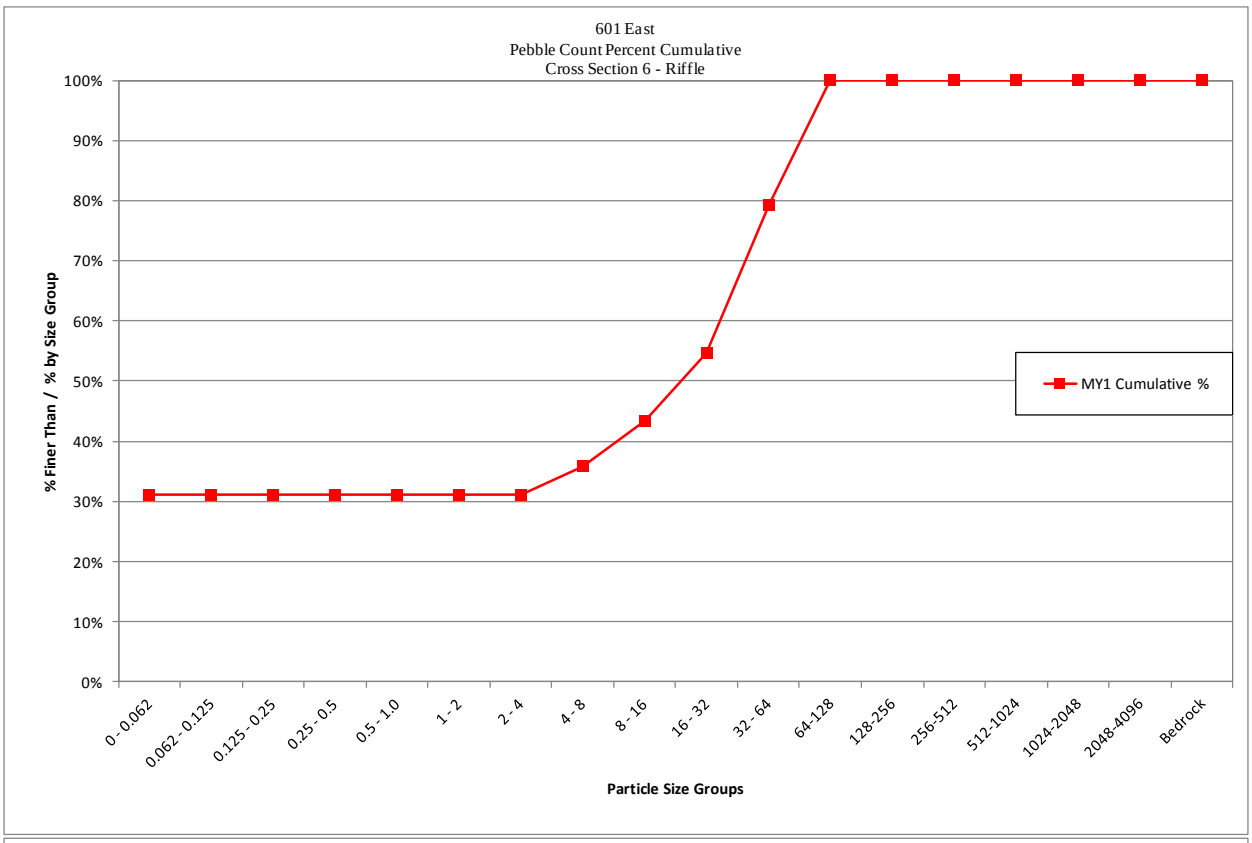

601 East
Pebble Count Percent Individual
Cross Section 2 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 % by Size Group
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

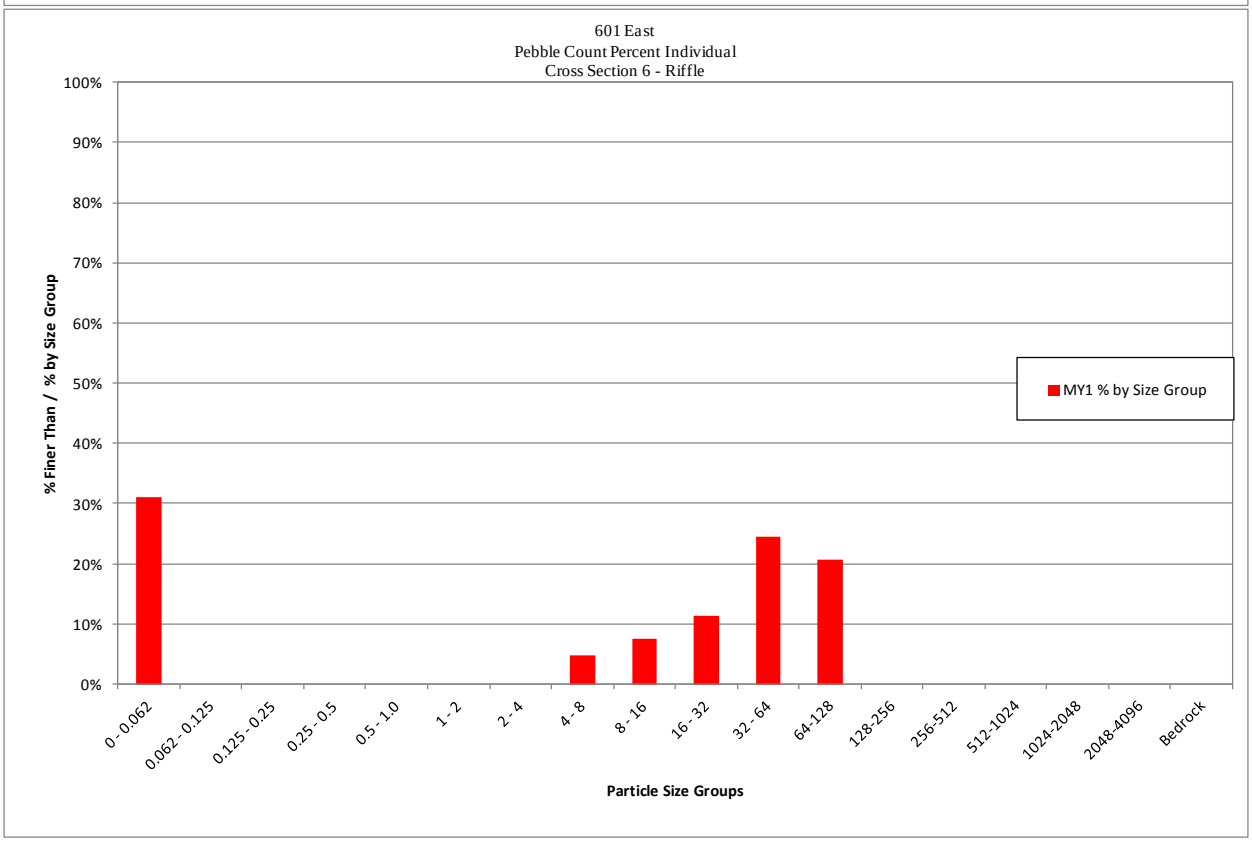
601 East			
Cross Section 4 - Riffle			
Monitoring Year - 2015; MY1			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	20	19.0%	19%
0.062 - 0.125	0	0.0%	19%
0.125 - 0.25	0	0.0%	19%
0.25 - 0.5	0	0.0%	19%
0.5 - 1.0	0	0.0%	19%
1 - 2	0	0.0%	19%
2 - 4	0	0.0%	19%
4 - 8	2	1.9%	21%
8 - 16	22	21.0%	42%
16 - 32	20	19.0%	61%
32 - 64	24	22.9%	84%
64-128	17	16.2%	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%
Total	**105**	**100%**	**100%**
		Summary Data	
		D50	**22**
		D84	**64**
		D95	**89**


601 East
Pebble Count Percent Cumulative
Cross Section 4 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

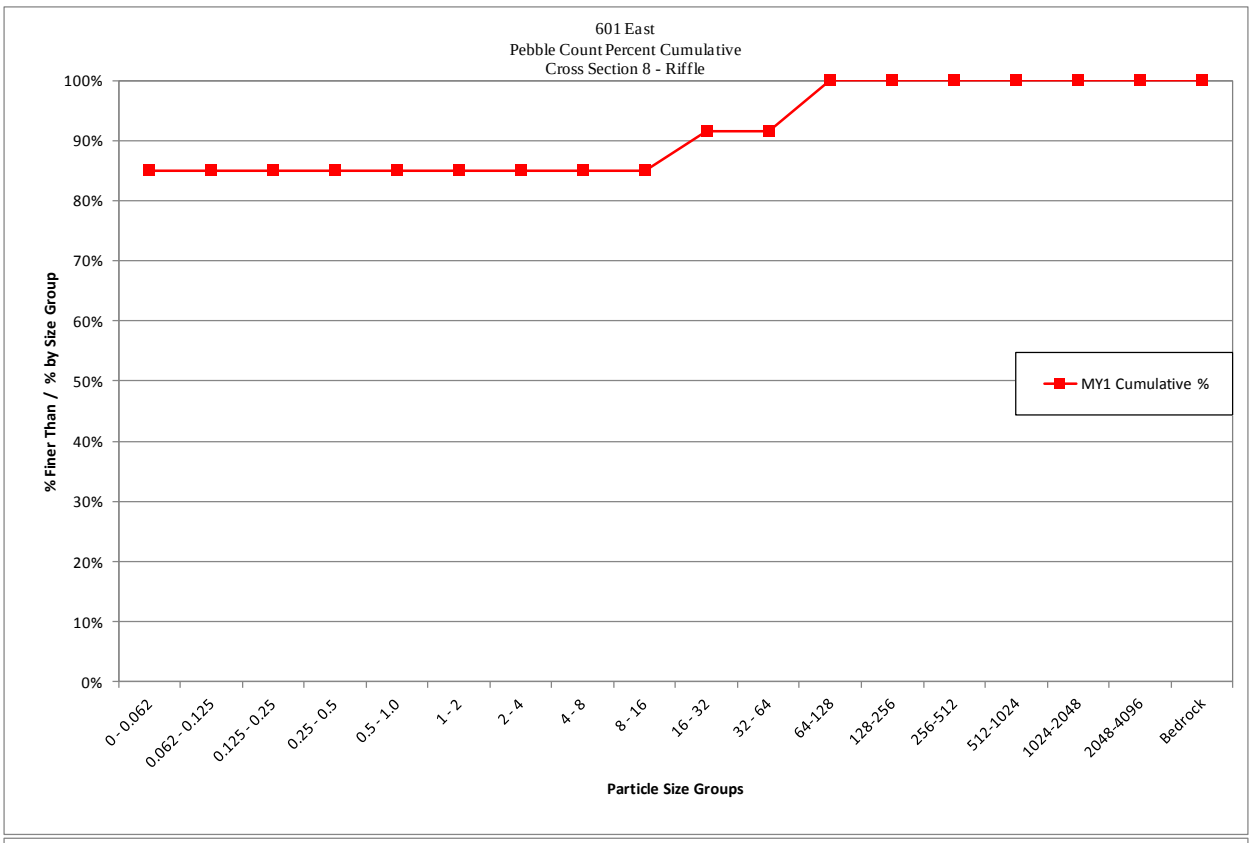

601 East
Pebble Count Percent Individual
Cross Section 4 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 % by Size Group
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

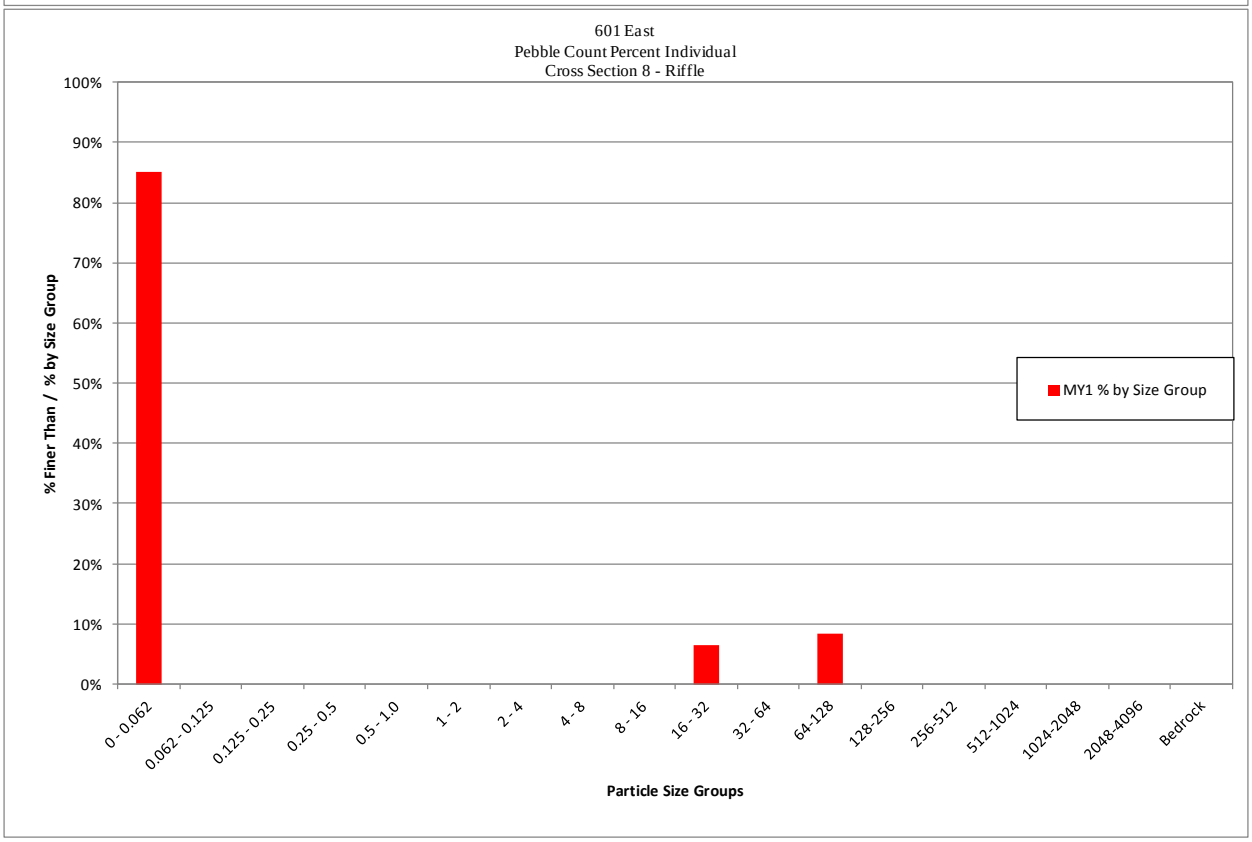
601 East			
Cross Section 6 - Riffle			
Monitoring Year - 2015; MY1			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	33	31.1%	31%
0.062 - 0.125	0	0.0%	31%
0.125 - 0.25	0	0.0%	31%
0.25 - 0.5	0	0.0%	31%
0.5 - 1.0	0	0.0%	31%
1 - 2	0	0.0%	31%
2 - 4	0	0.0%	31%
4 - 8	5	4.7%	36%
8 - 16	8	7.5%	43%
16 - 32	12	11.3%	55%
32 - 64	26	24.5%	79%
64-128	22	20.8%	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%
Total	**106**	**100%**	**100%**
		Summary Data	
		D50	**26**
		D84	**71**
		D95	**89**


601 East
Pebble Count Percent Cumulative
Cross Section 6 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

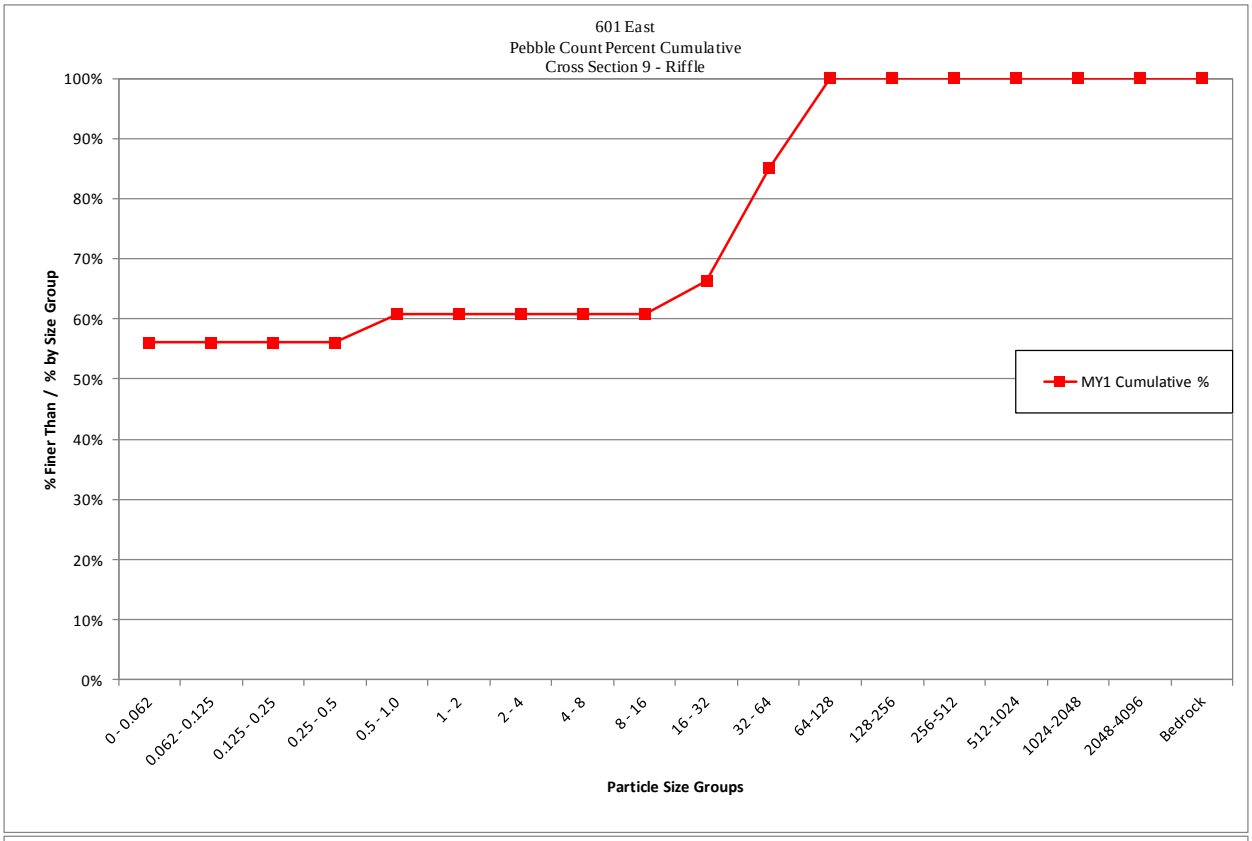

601 East
Pebble Count Percent Individual
Cross Section 6 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 % by Size Group
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

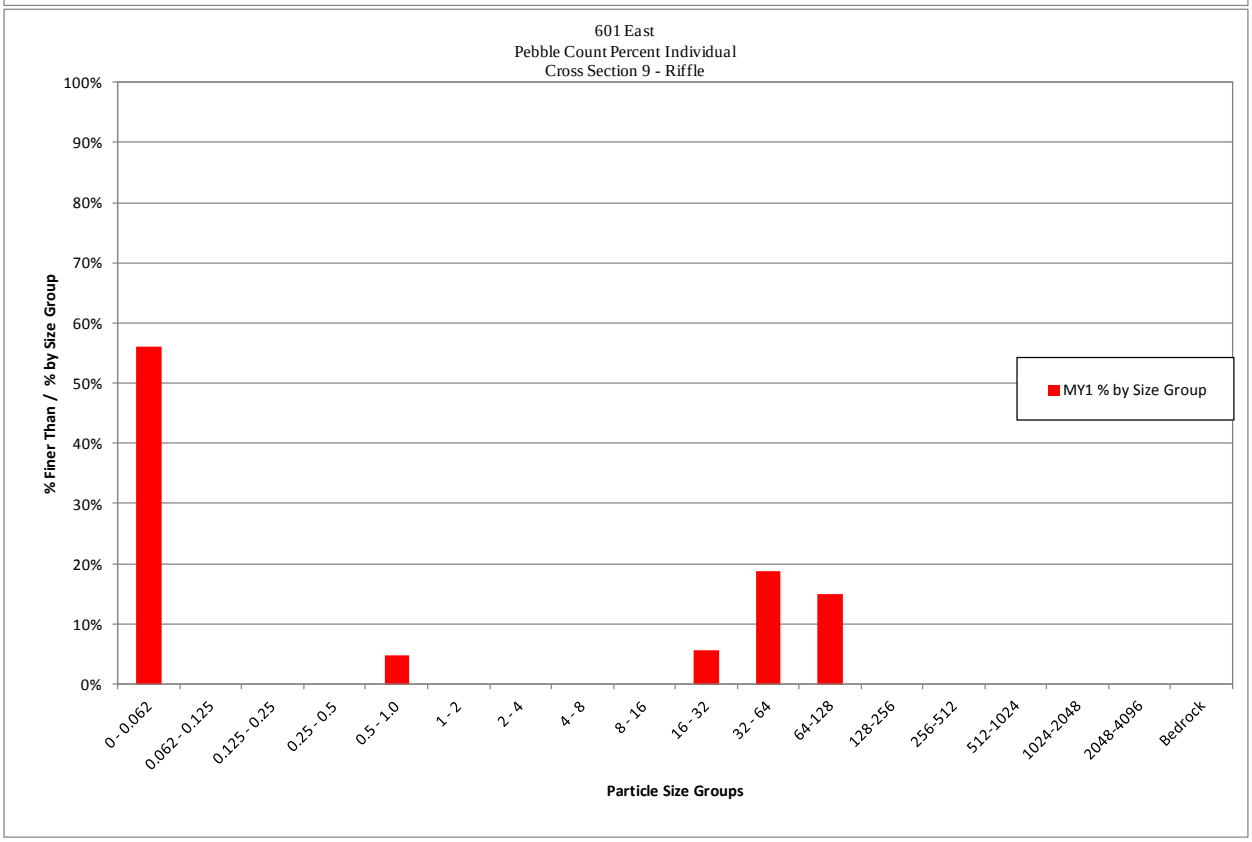
601 East			
Cross Section 8 - Riffle			
Monitoring Year - 2015; MY1			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	91	85.0%	85%
0.062 - 0.125	0	0.0%	85%
0.125 - 0.25	0	0.0%	85%
0.25 - 0.5	0	0.0%	85%
0.5 - 1.0	0	0.0%	85%
1 - 2	0	0.0%	85%
2 - 4	0	0.0%	85%
4 - 8	0	0.0%	85%
8 - 16	0	0.0%	85%
16 - 32	7	6.5%	92%
32 - 64	0	0.0%	92%
64-128	9	8.4%	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%
Total	**107**	**100%**	**100%**
		Summary Data	
		D50	**0.062**
		D84	**0.062**
		D95	**73**


601 East
Pebble Count Percent Cumulative
Cross Section 8 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

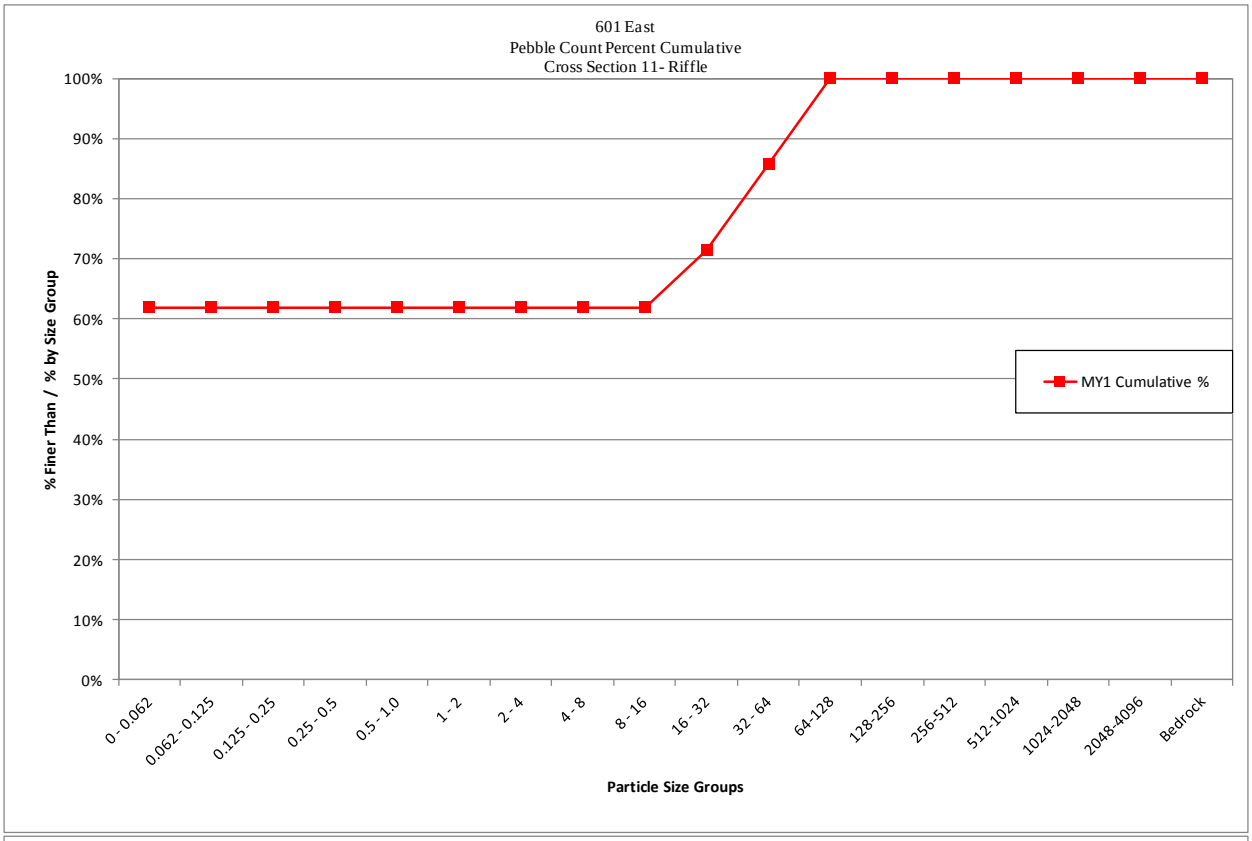

601 East
Pebble Count Percent Individual
Cross Section 8 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 % by Size Group
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

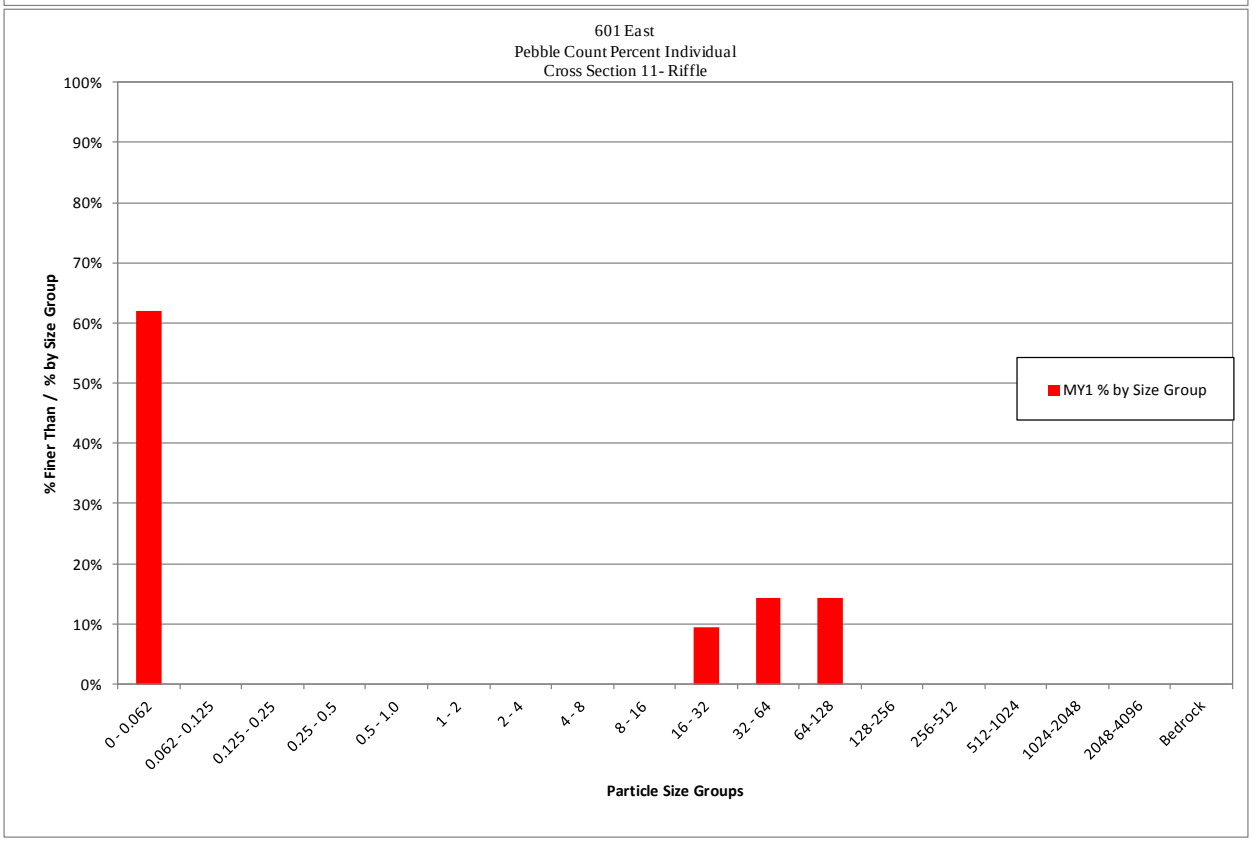
601 East			
Cross Section 9 - Riffle			
Monitoring Year - 2015; MY1			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	60	56.1%	56%
0.062 - 0.125	0	0.0%	56%
0.125 - 0.25	0	0.0%	56%
0.25 - 0.5	0	0.0%	56%
0.5 - 1.0	5	4.7%	61%
1 - 2	0	0.0%	61%
2 - 4	0	0.0%	61%
4 - 8	0	0.0%	61%
8 - 16	0	0.0%	61%
16 - 32	6	5.6%	66%
32 - 64	20	18.7%	85%
64-128	16	15.0%	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%
Total	**107**	**100%**	**100%**
		Summary Data	
		D50	**0.062**
		D84	**62**
		D95	**94**


601 East
Pebble Count Percent Cumulative
Cross Section 9 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

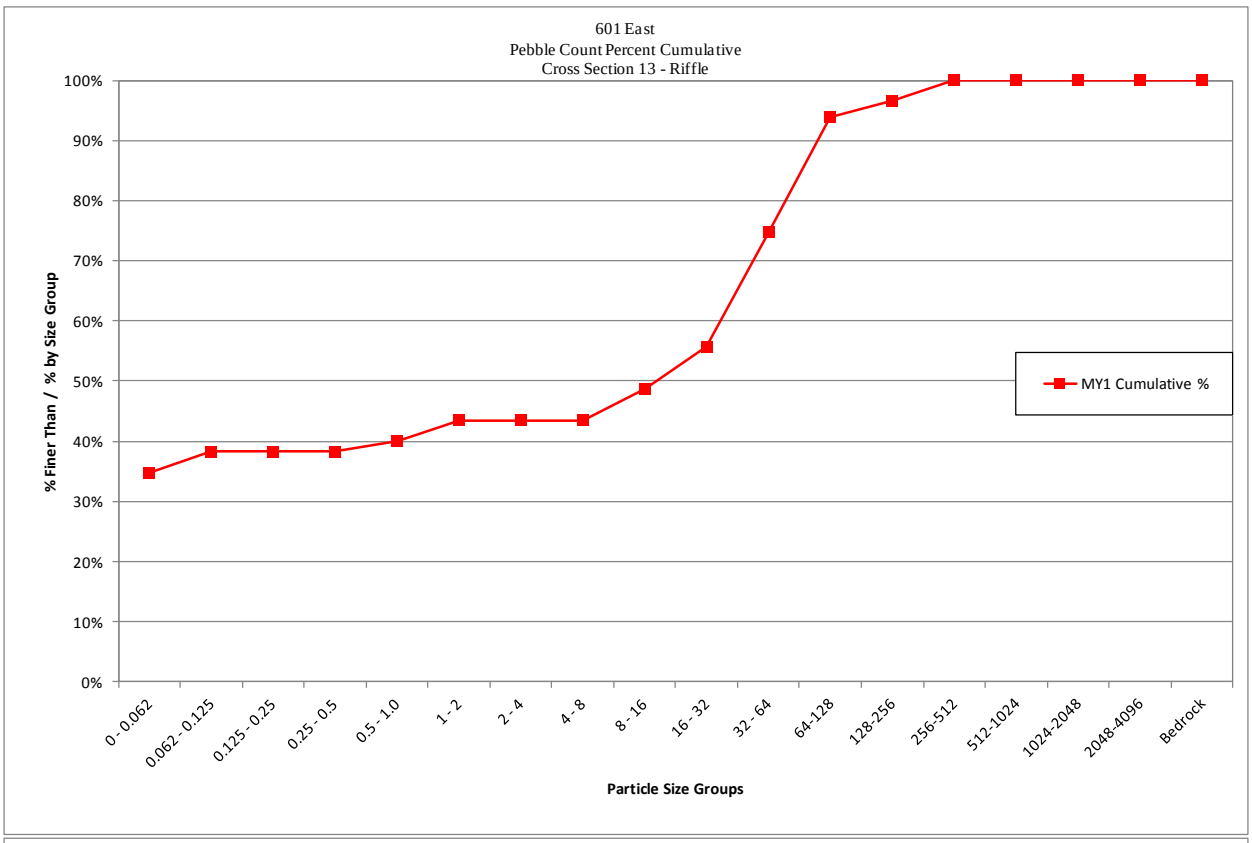

601 East
Pebble Count Percent Individual
Cross Section 9 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 % by Size Group
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

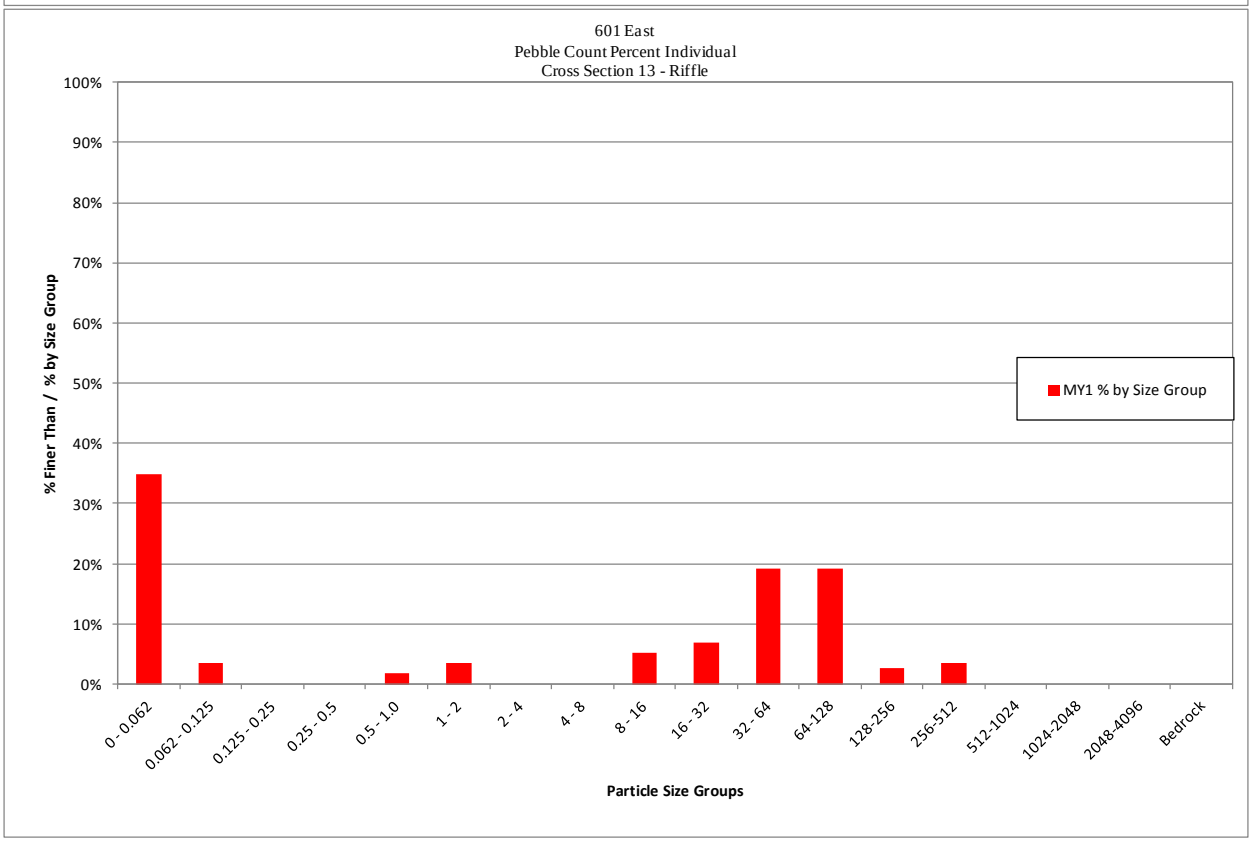
601 East			
Cross Section 11 - Riffle			
Monitoring Year - 2015; MY1			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	65	61.9%	62%
0.062 - 0.125	0	0.0%	62%
0.125 - 0.25	0	0.0%	62%
0.25 - 0.5	0	0.0%	62%
0.5 - 1.0	0	0.0%	62%
1 - 2	0	0.0%	62%
2 - 4	0	0.0%	62%
4 - 8	0	0.0%	62%
8 - 16	0	0.0%	62%
16 - 32	10	9.5%	71%
32 - 64	15	14.3%	86%
64-128	15	14.3%	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%
Total	**105**	**100%**	**100%**
		Summary Data	
		D50	**0.062**
		D84	**60**
		D95	**89**


601 East
Pebble Count Percent Cumulative
Cross Section 11- Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

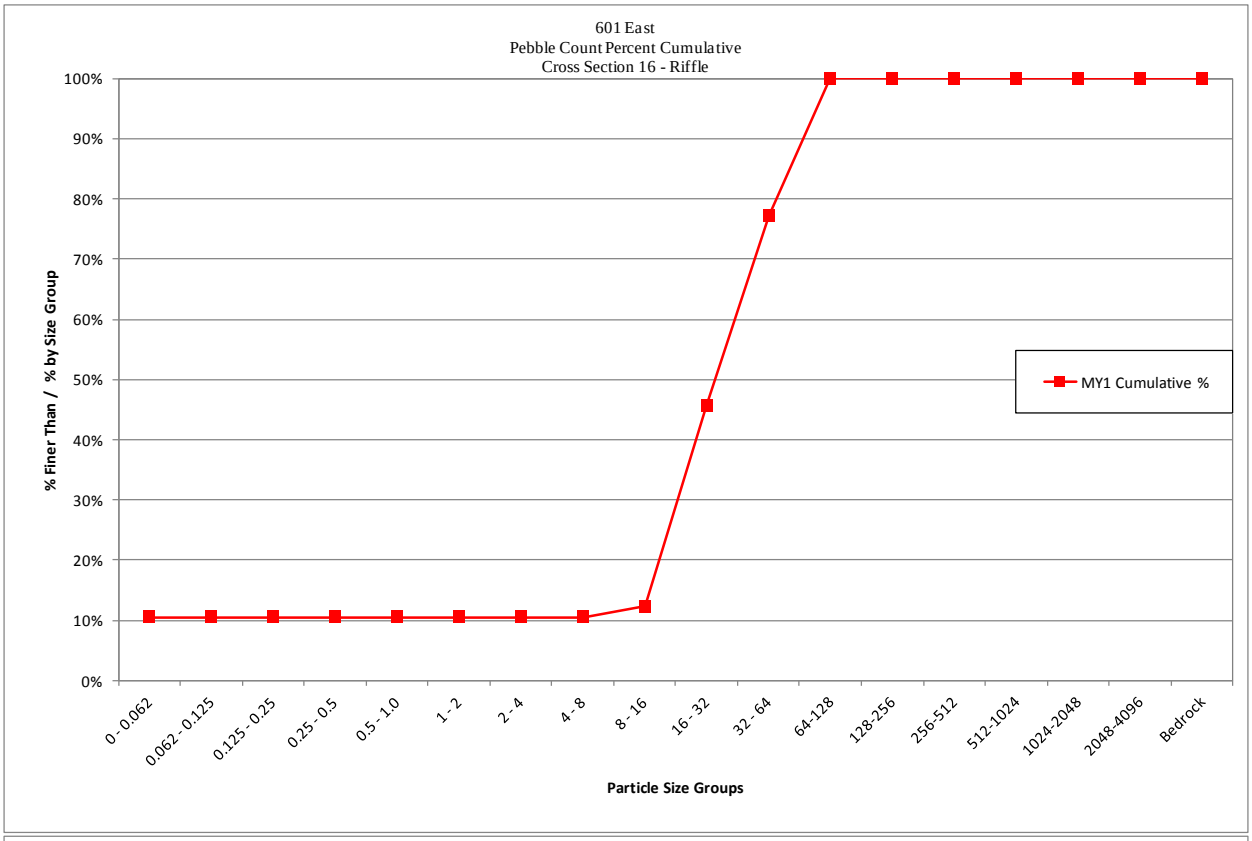

601 East
Pebble Count Percent Individual
Cross Section 11- Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 % by Size Group
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

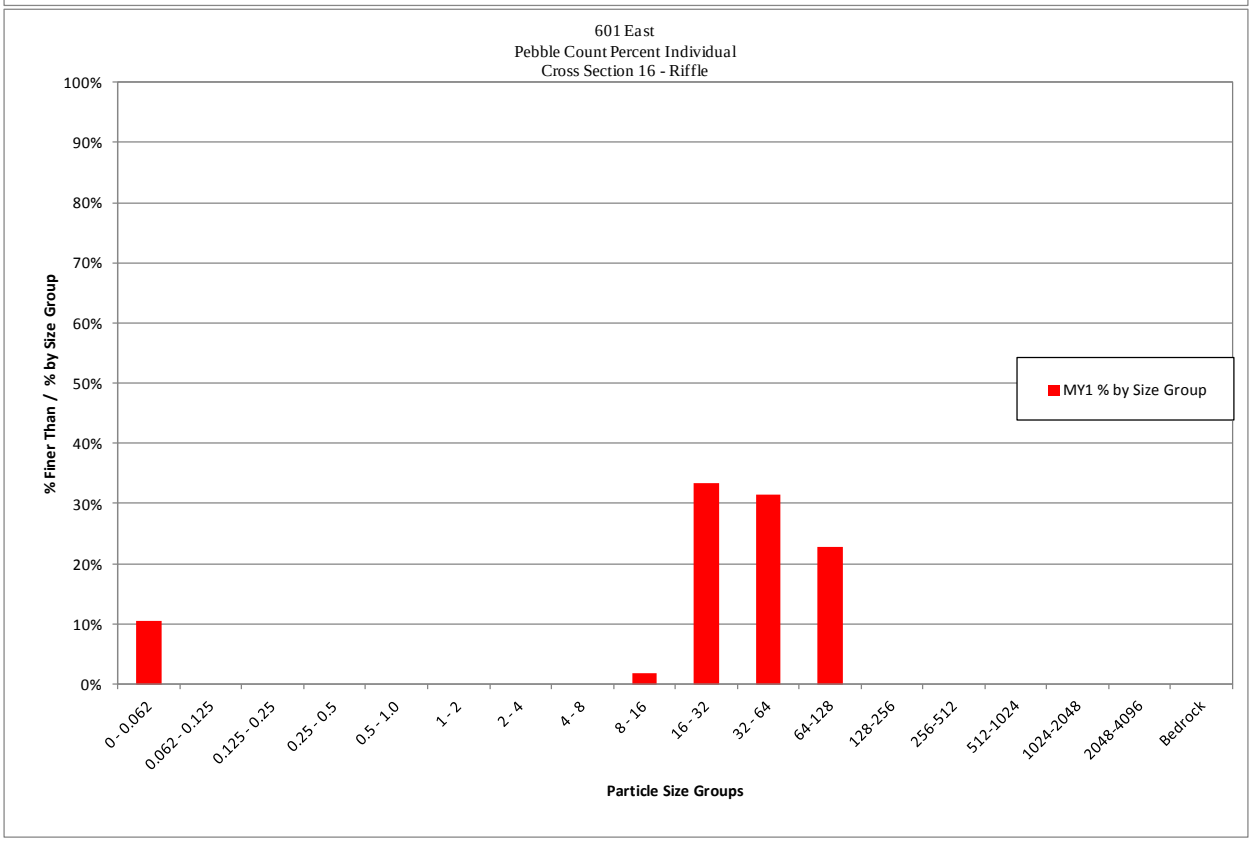
601 East			
Cross Section 13 - Riffle			
Monitoring Year - 2015; MY1			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	40	34.8%	35%
0.062 - 0.125	4	3.5%	38%
0.125 - 0.25	0	0.0%	38%
0.25 - 0.5	0	0.0%	38%
0.5 - 1.0	2	1.7%	40%
1 - 2	4	3.5%	43%
2 - 4	0	0.0%	43%
4 - 8	0	0.0%	43%
8 - 16	6	5.2%	49%
16 - 32	8	7.0%	56%
32 - 64	22	19.1%	75%
64-128	22	19.1%	94%
128-256	3	2.6%	97%
256-512	4	3.5%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	**115**	**100%**	**100%**
		Summary Data	
		D50	**20**
		D84	**83**
		D95	**190**


601 East
Pebble Count Percent Cumulative
Cross Section 13 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

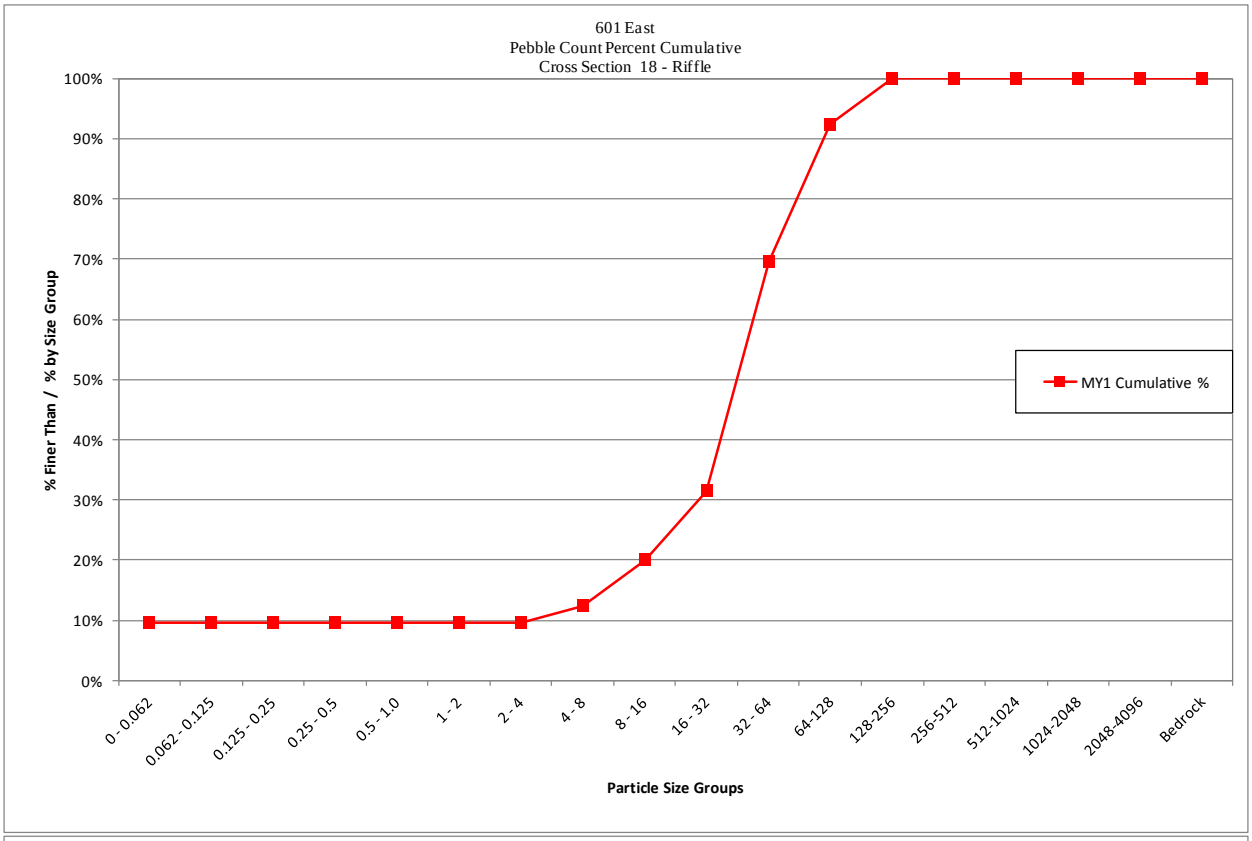

601 East
Pebble Count Percent Individual
Cross Section 13 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 % by Size Group
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

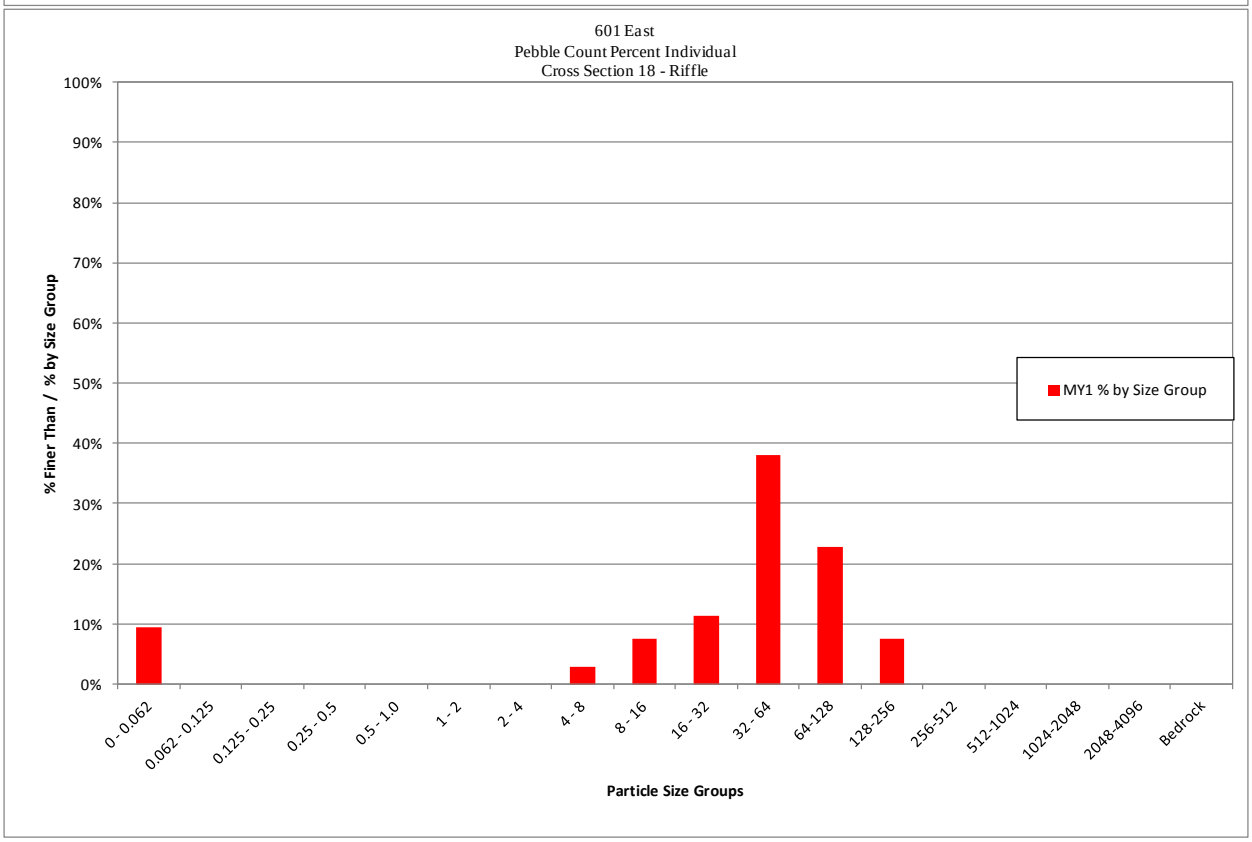
601 East			
Cross Section 16 - Riffle			
Monitoring Year - 2015; MY1			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	12	10.5%	11%
0.062 - 0.125	0	0.0%	11%
0.125 - 0.25	0	0.0%	11%
0.25 - 0.5	0	0.0%	11%
0.5 - 1.0	0	0.0%	11%
1 - 2	0	0.0%	11%
2 - 4	0	0.0%	11%
4 - 8	0	0.0%	11%
8 - 16	2	1.8%	12%
16 - 32	38	33.3%	46%
32 - 64	36	31.6%	77%
64-128	26	22.8%	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%
Total	**114**	**100%**	**100%**
		Summary Data	
		D50	**34**
		D84	**76**
		D95	**100**


601 East
Pebble Count Percent Cumulative
Cross Section 16 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups


601 East
Pebble Count Percent Individual
Cross Section 16 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 % by Size Group
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

601 East			
Cross Section 18 - Riffle			
Monitoring Year - 2015; MY1			
Bed Surface Material Particle Size Class (mm)	**Number**	**% Individual**	**% Cumulative**
0 - 0.062	10	9.5%	10%
0.062 - 0.125	0	0.0%	10%
0.125 - 0.25	0	0.0%	10%
0.25 - 0.5	0	0.0%	10%
0.5 - 1.0	0	0.0%	10%
1 - 2	0	0.0%	10%
2 - 4	0	0.0%	10%
4 - 8	3	2.9%	12%
8 - 16	8	7.6%	20%
16 - 32	12	11.4%	31%
32 - 64	40	38.1%	70%
64-128	24	22.9%	92%
128-256	8	7.6%	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%
Total	**105**	**100%**	**100%**
		Summary Data	
		D50	**47**
		D84	**110**
		D95	**150**


601 East
Pebble Count Percent Cumulative
Cross Section 18 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 Cumulative %
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups


601 East
Pebble Count Percent Individual
Cross Section 18 - Riffle
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Finer Than / % by Size Group
MY1 % by Size Group
0 - 0.062
0.062 - 0.125
0.125 - 0.25
0.25 - 0.5
0.5 - 1.0
1 - 2
2 - 4
4 - 8
8 - 16
16 - 32
32 - 64
64-128
128-256
256-512
512-1024
1024-2048
2048-4096
Bedrock
Particle Size Groups

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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)**
November - 2015	Unknown[1]	Crest Gauge/ Wrack Lines	Unknown	Figure 3/4/5

[1]Suspected bankfull date 9/30/2015

Figure 3. Photo Verification of Bankful Events

Wrack Lines Downstream of Crest Gauge on Reach 2

Figure 4. Photo Verification of Bankful Events

Reach 3 Crest Gauge

Figure 5. Photo Verification of Bankful Events

Wrack Lines Downstream of Crest Gauge on Reach 3

Figure 6. Daily Precipitation Totals for Monroe, NC (CRONOS Station 315771 Monroe 2 SE)

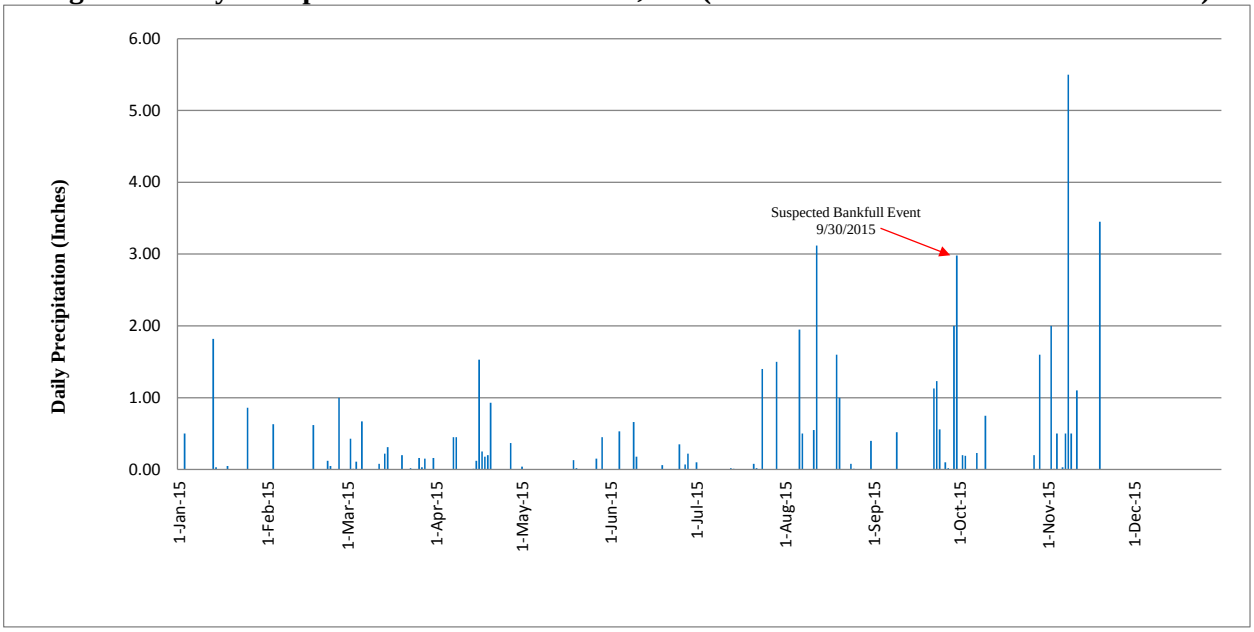

Figure 7. Monthly Precipitation Data Compared to 30th and 70th Percentiles for Union County